CLEAN WATER

WATER POLLUTION CONTROL RESEARCH SERIES • 18010DPV12/70

# Water Quality Criteria Data Book
# Volume I

## Organic Chemical Pollution of Freshwater

ENVIRONMENTAL PROTECTION AGENCY • WATER QUALITY OFFICE

WATER POLLUTION CONTROL RESEARCH SERIES

The Water Pollution Control Research Series describes the results and progress in the control and abatement of pollution in our Nation's waters. They provide a central source of information on the research, development, and demonstration activities in the Water Quality Office, Environmental Protection Agency, through inhouse research and grants and contracts with Federal, State, and local agencies, research institutions, and industrial organizations.

Inquiries pertaining to Water Pollution Control Research Reports should be directed to the Head, Project Reports Office, Environmental Protection Agency, Room 1108, Washington, D.C. 20242.

Water Quality Criteria Data Book, Vol. 1

# ORGANIC CHEMICAL POLLUTION OF FRESHWATER

for the

ENVIRONMENTAL PROTECTION AGENCY

Water Quality Office

prepared by

ARTHUR D. LITTLE, INC.

CAMBRIDGE, MASSACHUSETTS

Project #18010 DPV
Contract # 14-12-538

December 1970

442-963

---

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C. 20402 - Price $3.50
Stock Number 5501-0144

## EPA Review Notice

This report has been reviewed by the Water Quality Office, EPA, and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the Environmental Protection Agency, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

# FOREWORD

The quantity of literature since the publication of WATER QUALITY CRITERIA, McKee and Wolfe, Second Edition, 1963, has been so great that rather than a revision, the Environmental Protection Agency is publishing, as its successor, a series of volumes under the general title, WATER QUALITY CRITERIA DATA BOOK. This series is the Environmental Protection Agency's response to California State Water Resources Control Board Resolution, No. 69-1 titled, "Requesting the Federal Water Pollution Control Administration to Assume Responsibility for Conducting Further Work on the Publication Titled 'Water Quality Criteria'." The Federal Water Quality Administration was asked to give reconsideration to assuming the responsibility for the continuance of summarizing and referencing worldwide literature on water quality criteria.

Volume I, "Organic Pollution of Freshwater," is the first in the series. Volume II, "Inorganic Chemical Pollution," is scheduled for publication late 1971; Volume III, "Effects of Industrial Chemicals on Aquatic Life," early summer 1971; Volume IV, "Recreational Water Quality Criteria," early autumn 1971.

Subsequent volumes will be announced at a later date.

TABLE OF CONTENTS

LIST OF TABLES

# I. SUMMARY

A survey of the available literature on organic chemical pollution of fresh water showed that 496 organic chemicals have been reported to be found or are suspected to be in fresh water. Of these, 66 have been identified. The informational and scientific quality of the literature are not of a high order. As might be expected, evidence which directly relates the presence of organic chemicals in fresh water with human health is generally lacking.

Industrial sources were responsible for the largest number and variety of structural types of organic chemical pollutants. Reported agricultural sources of pollutants were all pesticides and domestic sources were all detergents. Animal toxicity information was available on all compounds in one form or another, but consisted mainly of acute toxicity data. Most of the limited chronic animal toxicity information pertinent to the problem of organic chemical pollution of fresh water and human health came from Russian sources. These results were used directly by the Russian investigators as quality criteria for humans. Pesticides were shown to be the most acutely toxic organic chemicals in water and only methyl mercuric chloride was found to be more toxic. Although the information on chronic threshold doses was insufficient for meaningful interpretation, the organometallics ranked high in chronic toxicity effects.

Of 120 compounds examined for carcinogenicity in animals, 22.5 percent were positive. Of 32 compounds examined for teratogenicity in animals, 62.5 percent were positive. It would appear that methyl mercuric chloride has been found to be teratogenic in man. Although there is no proven chemical mutagen for man, of 29 compounds examined for mutagenicity, mostly in plant cell systems, all showed some effects on genetic material. High concentrations of certain compounds (mostly pesticides) were shown to be present in the tissues of animals and man. Some of these have been reported to be potential carcinogens, teratogens or mutagens. The available data on pesticides are predominantly American and on non-pesticide compounds predominantly Russian.

This survey has shown that factual information upon which quality criteria of water can be rationally based, is generally lacking for compounds occurring in fresh water. This is further complicated by the threshold and no-threshold controversy in terms of potential carcinogenicity and mutagenicity and to a lesser extent of teratogenicity. The practical proximate solution will presumably have to resemble that employed in the radiation area where some baseline human exposure is unavoidable.

## II. INTRODUCTION

Population growth, increasing demands by this population, new technology, and a burgeoning industry all contribute to the overall increase in chemical pollution of fresh water and its potential effects as a health hazard.

The average individual ingests 1 liter of water per day in one form or another in order to maintain body water requirements in the face of what has to be excreted for removal of the wastes of metabolism. This daily intake goes on throughout life and the maintenance of body water is so important that a loss equivalent to more than 5% of body weight at any one time seriously affects normal function.

Some, if not most, of the chemicals we ingest with water on a daily basis can produce acute and/or long-term adverse effects on health. In the past we have learned how to detect and in large measure to control the contamination of water by pathogens. Just as clear water can contain bacteria, so also can clear water contain a host of chemical substances, many of which are unidentified, which may be deleterious to health. Just as new knowledge was needed in the past to identify and control contamination from microorganisms, so is new technology now needed to identify and control chemicals in water.

At one time chemical wastes were in quantities which could be dispersed efficiently in water. This situation no longer exists as witnessed by the frank polluted condition of many of our rivers and lakes. This condition will undoubtedly get worse unless something is done about it. Ideally, nothing should be put in water, but this is unrealistic. The present techniques of haphazard dumping of wastes into the nearest watercourse is producing damaging effects when the wastes reach proportions which cannot be handled by the watercourse. The problem is further compounded by sanitary landfill operations, presently the only means of disposal of trash in many urban and rural communities, contaminating underground water resources. The solution is the formulation of present and new knowledge into a set of standards which will allow predictions of the effects of inputs on the system. In general, water has an inherent capacity to deal with pollution but our understanding of the way it deals with chemical pollution is negligible. We can predict in some general way that chemicals will react with other chemicals in the water and form new compounds which may or may not be harmful, that organisms will degrade toxic chemicals to more simple and maybe less toxic compounds and that toxic metals are difficult to change chemically and difficult to remove from water. However, few specific examples are available.

We can probably, in part, physiologically adapt to chemical pollution in terms of taste, odor, physiological response and perhaps even cellular response. This adaptability creates difficulties in relating the chemical components of a water supply to a health problem. It is well known that local residents find no cause to believe that their water supply can create grastroenteric problems for newcomers. However, it can be expected that there is a point at which no further adaptation can take place and that our health will be impaired by continuous ingestion of water containing a host of chemical substances some of which are proven to have carcinogenic, teratogenic, and mutagenic properties, and others of which can induce histopathological effects. These are effects which in most instances cannot be evidentially related to water.

In order to understand the meaning of chemical pollution of fresh water, a baseline is needed. This baseline varies with the intended use of water. For instance, water which is adequate for industrial use may not be acceptable for drinking purposes. The problem we are concerned with in chemical pollution and health is water intended for human consumption which contains chemicals at concentrations which can produce harmful effects on an acute or a chronic basis. Therefore, the baseline for a particular chemical would be a concentration which we know will not produce harmful effects.

An aspect of chemical pollution which should not be neglected is that which is concerned with the accumulation of chemicals in aquatic food sources. This accumulation can be both direct or indirect. In either case large concentrations of toxic chemicals in tissues have been demonstrated. While it is to be admitted that the consumption of fresh water sources of food is small compared to the consumption of water, this should be considered as a potential human health hazard.

The sources of chemical pollution are multiple and may be classified as arising from agricultural use (fertilizers and pesticides), natural sources (leaching of chemicals from geological formations), industrial manufacturing processes, domestic sources (detergents, pesticides) and accidental spills. In this report we are concerned with those sources which supply a continuous and often increasing rate of chemicals in water directly by the use of watercourses as a means of waste removal or indirectly by the purposeful or unintended use of chemicals in locations which are watersheds.

The supply of naturally occurring fresh water for the use of mankind is fixed and increasing pollution of water so that it becomes unusable, decreases the total quantity available for use for man's physiological and domestic needs, for industrial purposes, for recreational pursuits, for aesthetic enjoyment, and for aquatic life as a food source.

Methods for detecting chemicals in fresh water are technologically feasible provided that we know what we want to detect and given time to develop or modify methods and make the necessary determinations. Our current knowledge of chemicals in water has been entirely dependent upon the analytical methodology available and chemicals actually looked for. As a result the chemical pollution picture of fresh water is undoubtedly far from complete. We already know that certain rivers are replete with a host of chemicals some of which are known carcinogens, teratogens, and mutagens. Most of these have unknown fates and their toxicity to aquatic life and terrestrial plants, animals and man are poorly characterized.

Although public health emphasis on food quality has been with us for sometime, public health concern and action concerning water quality has not received nearly the same attention despite the proven presence of chemicals which have visibly changed the bio-environment so drastically in the past 50 years. At present, concern with food quality is centered on trace amounts of pesticides, fertilizers, preservatives, radioactive fission products, and carcinogens, representatives of which can be found in fresh water, but which to date have not elicited the same degree of concern or action.

Currently, municipal waters are treated principally to make them microbiologically safe for drinking. Very little is done to make them chemically safe and it is difficult to factually relate a human health problem with the chemical condition of our municipal water supplies. Since the successful control of communicable diseases in general and waterborne diseases in particular has increased our average life span, other health problems such as metabolic diseases, cardiovascular diseases, cancer and others have come to the fore. Although we consider these as diseases of our increased average life span, we do not know to what extent pollution is a contributory etiologic agent. On the other hand, we know that carcinogens exist in a proportion of our water supplies and we cannot assume that they are not contributory to the rate of cancer in our society. Unfortunately, evidence of the relationship between chemicals in water and the physical ills that beset us is tenuous.

Americans have become increasingly involved in the area of drug abuse and the probability of drugs reaching water supplies has increased. It is recognized that disposal of drugs in the waste water system is one means of destruction by both police departments and hospitals. This specific area of concern was excluded from consideration in this report.

Although it is difficult to extrapolate animal data to humans, the use of animals has served us well in the past for assessing the effects of therapeutic drugs, environmental stresses, psychological stresses, and chemical agents on man. The very fact that the bioecology of rivers has been changed by chemical pollution, should give us food for thought in a rapidly increasing general pollution problem. Therefore, in the general absence of human data, this report principally presents available animal toxicological and pathological data on chemicals actually found or potentially could be found in water so that some assessment of their effects on man can be made.

## III. METHODS AND APPROACH

### 1. Literature Search

More than 7,000 publications, the titles of which appeared to be pertinent, were collected and examined. Of these, approximately 1,000 were found to have some pertinency and were examined more closely. Approximately 600 of these were actually found to have information which could be used. Only those publications which presented quantitative data were considered. Publications which contained pertinent data but which were published or received after completion of our information search are listed separately in the bibliography. In carrying out the literature search, the following sources were explored:

#### a. Abstracts and Indexes

| | |
|---|---|
| Applied Science & Technology | 1960-June 1970 |
| Abstracts on Hygiene | 1960-1969 |
| Bibliography of Agriculture | 1960-1969 |
| Biological Abstracts | 1960-May 1970 |
| Chemical Abstracts | 1907-June 1970 |
| Excerpta Medica, Section 17, Public Health, Social Medicine and Hygiene | 1968-1969 |
| Index Medicus | 1960-June 1970 |
| Monthly Catalogue U.S. Government Publications | 1960-March 1970 |
| Public Health Engineering Abstracts | 1962-1967 |
| Publications of the U.S. Geological Surveys | 1941-1964 |
| Toxicity Bibliography | 1968-March 1970 |
| Water Pollution Abstracts | 1950-February 1970 |
| Technical Translations | 1964-July 1967 |
| University of Wisconsin Water Resources Center Eutrophication Program | March-July 1969 |

b. Journals

| | |
|---|---|
| Air and Water Pollution | 1964-1966 |
| Archives of Environmental Health (Arch. Ind. Health) | 1955-July 1970 |
| Bulletin of Environmental Contamination and Toxicology | 1966-1969 |
| Food and Cosmetics Toxicology | 1969-1970 |
| Gigiena i Sanitaria (Hygiene & Sanitation) | 1960-Jan. 1970 |
| Journal of the American Water Works Association | 1960-May 1970 |
| Pesticides Monitoring Journal | 1967-1969 |
| Toxicology and applied Pharmacology | 1969-1970 |
| Water Pollution Control Federation Journal | 1957-June 1970 |
| Water Research | 1967-1969 |
| Journal of Environmental Health | 1968-March 1970 |
| WHO Technical Reports | 1966-1968 |
| Gesundheits-Ingenieur | 1968-1969 |

c. Books, proceedings of symposia and international conferences, bibliographies and citations in review articles.

d. Once the chemicals which were demonstrated to be in fresh water and the chemicals which potentially could be found in water were compiled, existing acute and chronic toxicological information was searched and extracted.

Reviews, abstracts, papers and compilations of information on carcinogenicity, teratogenicity, and mutagenicity were examined for pertinent information.

Where possible, the more recent information was used in preference to information contained in the older literature.

## 2. Quality of Literature

The quality of the literature searched was not of a high order in terms of the information required for the purpose of this study. Much of the literature gave no rationale for why a chemical was selected for study. Information concerning the origin of a pollutant and its geographical location from the point at which the sample was taken for study was rarely reported. Descriptions of the waters being investigated, such as approximate width, depth, and velocity, which would give some general idea of dilution effects and therefore some idea of the quantities at the point of origin were never given. Interpretation of results, their meaning, conclusions, recommendations, and probable relationships of results to health was rarely discussed by investigators.

In general toxicity information poorly characterized dose relationships. Therefore, it was difficult to obtain from the data the probable concentrations which would be of interest for use in obtaining quality criteria. In fact, much of the toxicity data, although obtained for the specific purpose of characterizing toxicity effects, were not always relevant to the problem of formulating quality criteria. The information on carcinogenicity, mutagenicity and teratogenicity were not, in general, studied in terms of dose-response. In chronic toxicity studies, including carcinogenicity studies, information such as dose, duration, species of animal used and frequency of administration of doses were not always given. Frequently doses were expressed in a manner which could not be converted to units used in most reports. The rationale for the doses selected for study were generally lacking. A disproportionately large effort was expended on pesticides and a disproportionately small amount of effort was put into chemical pollution of rivers and lakes as a result of industrial wastes.

In the United States, toxicity information were obtained on fish or other aquatic organisms of little use for the purpose of this study so that the Russian literature had to be used for toxicity information on mammals. The quality of the Russian literature suffered mostly from an absence of information on what was done and how it was done. Names of researchers were cited with no literature references and original works could not be examined. In many cases, the periodicals were not available or translations could not be obtained and results had to be taken directly from abstracts. In contrast to information in the English literature, the Russians did provide most of the acute and chronic toxicity information although their use of this information can be subject to criticism.

3. Information extracted

Where available, the concentrations of chemicals in water were obtained together with information as to source and location. Available information on chemicals which for one reason or another have not been measured in water, but have been considered in the literature to be potentially present in water, was also obtained along with information on source. Included in this toxicity data, information, where available, on duration, dose response, and specific effects were obtained for both chemicals which have been found in water and chemicals which have been considered to be potentially present in water. Only the oral route of administration was considered for inclusion. However, where no oral data is available an alternative route of administration is presented and denoted as such.

## 4. Chemical Organization of Information

It was hoped to use structure activity relationships as a means of predicting the potential toxicity of novel compounds. To further this end it was necessary to group compounds on the basis of their structural components which might lead to kindred toxicity. Therefore, compounds have been specifically classified under 17 major headings. Within a number of these major chemical groupings, sub-groupings exist so that compounds can be compared as to their toxicity and evaluated for the importance of various contributing constituents to the toxicity of these compounds. In this section chemical structures and their importance as pollutants of fresh water will be discussed.

In accord with standard organic chemical classification, the first category considered was the alkanes and alkenes. The unsubstituted forms of these compounds have low water solubility and in general a low degree of toxicity. They can occur in fresh water as natural pollutants arising from petroleum reserves but may also appear through their use as a basic material in the petrochemical industry or as solvents in numerous processes.

The halogenated alkanes and alkenes, by contrast, are all the result of chemical synthesis. By far the majority of these compounds which have been found in fresh water are chlorinated pesticides resulting from their use for agricultural purposes. These compounds have received special notoriety in recent years. While these compounds in general have a low solubility, their high degree of toxicity and resistance to natural degradation make them of great concern in considering potential human health hazard. Besides the hydrocarbon pesticides, other more simple halogenated alkanes and alkenes do exist and also show a resistance to decay, but these compounds in general are found to be less toxic. No nitroalkanes have been found as organic pollutants in water but some of these are potential pollutants. However, they make up a small group of compounds.

The alcohols are among the most soluble of organic compounds in water. Many of these compounds (carbohydrates) are natural food constituents and are of little danger, therefore, in terms of toxicity. Others of these compounds, arising from industrial processes and appearing in fresh water as industrial waste, do show toxic effects in mammals. However, in general, the lability of these compounds to both air and microbial oxidation gives them a short lifetime in water. Enhancement of microbial growth as a result of the presence of a pollutant would affect dissolved oxygen levels.

The amines are subdivided into different categories because of the different properties these may have in terms of structure activity relationships. The amines show a reasonable solubility in water. The aliphatic amines are produced by the petro-chemical industry. A number of these have been found as pollutants in water. As a class they show an acute toxicity of less than a gram per kilogram in mammals. Many of these compounds have a sufficient vapor pressure to be rapidly eliminated from water by evaporation.

The aromatic amines with a potential for being present in water are mostly derivatives of aniline. These compounds are related to dye manufacture and use. On the other hand, quarternary amines are most widely used and would appear in water because of their application as cationic surfactants.

The nitriles are nitrogen compounds containing the cyano group which, in certain cases, can be released as cyanide. These compounds are both pesticides and have a use in organic synthesis in the petro-chemical industry. According to the literature, only one of these compounds has been found as a pollutant of fresh water. Heterocyclic compounds in which nitrogen, sulphur or oxygen is incorporated into a ring structure with carbon atoms can occur as natural breakdown products of plants or bacteria. However, it is the use of such compounds as pesticides and their presence in some industrial wastes which is of more concern in relation to water pollution. Since the heterocyclic ring may serve as the base of many diverse chemical compounds, more divergency in toxicity is apparent in this subgroup. Thus in this group we have toxins such as nicotine and strychnine as well as some herbicides with a low degree of mammalian toxicity.

The carboxylic organic acids can also occur as natural components of fresh water. The straight chain acids are found in our own bodies and the short chain forms are one of the major end products of bacterial catabolism. However, another source of these compounds is their use in industry and the use of the phenoxyalkylacids as herbicides. All of these compounds, once diluted in water so as to limit their specific acidic effect, show a limited toxicity except in a few occasions where other portions of the molecule contribute.

The organic sulfates have not been looked for in fresh water. These compounds are used to some extent as detergents but not to the extent of the sulfonic acids. Sulfonics are the major active components of detergents and have been widely found as pollutants of fresh water. The form in which the major amount of alkylbenzene sulfonates are presently synthesized allows them to be readily degraded by microorganisms present in fresh water.

No carboxylic esters have been reported in fresh water. The lability to hydrolysis of these compounds would make them nonpersistent.

Certain of these compounds which are being used as pesticides, however, do show a high degree of toxicity.

Amides (amine derivatives which are analogous to the esters) also have not been looked for in fresh water. Certain of the amides do have a high toxicity, however. Of more concern, because of their greater use as agricultural products, are the carbamates. Even though they degrade comparatively rapidly, their high acute toxicity in mammals should elicit some concern. Of lesser acute toxicity are the thiocarbamates. The final amine derivatives in our listing which are potential pollutants are the ureas. These are widely used as herbicides but do not have the acute toxicity of the carbamates or thiocarbamates.

The phosphate esters are a specific group of compounds which exist in fresh water solely because of their use as effective pesticides. They work specifically by inhibiting nerve transmission in both insects and man (although presumably more effectively in the former). They have not been widely reported in fresh water, probably because of their lability to hydrolysis.

The aldehydes, ketones and ethers are all products of industrial processes. A few have been used as pesticides and these specific compounds, because of other portions of their molecules, can be of concern toxicologically. However, these compounds also have not yet been reported as being present in fresh water. The group of compounds as a whole is otherwise generally innocuous. In fresh water these compounds are oxidized to carboxylic acids.

The unsubstituted aromatic compounds are not found at high concentrations in fresh water because of their limited solubility. These compounds can occur naturally in oil wastes or may be the result of industrial processes. Because of their limited solubility they present little threat for acute toxicity. However, their efficacy in carcinogenesis is well known and, for this reason, their presence in fresh water should be a matter of concern.

The phenols and quinones are hydroxylated aromatics with increased water solubility and toxicity. Some of these compounds arise from natural sources but most arise from industrial wastes or through their use as biocides. Many of these compounds have a high level of acute toxicity. A number of them have been discovered as pollutants of fresh water and their concentration in water is a subject of increasing concern. Many of these compounds interact in water with other materials to give less toxic derivatives.

The aromatic derivatives are widely distributed because of their production as industrial products and wastes or because of their use in agriculture. The most well known halogenated aromatic derivative is DDT. Compounds such as DDE and DDD are modifications of this material. The halogenated aromatic derivatives, just as the halogenated alkanes and alkenes, are extremely persistent in fresh water. In general, they have a low acute toxicity but many of the long-term effects of these compounds are just beginning to be realized. Because of their low solubility and, therefore, low concentration in water, they are presumably of little concern as a problem in drinking water but do become concentrated through the food chain where their real effect is felt. The other aromatic derivatives potentially to be found in fresh water contain nitro groups or alkyl groups. These compounds result from manufacturing processes or from petroleum wastes. In general they have a low acute toxicity.

Sulfur compounds which are potential pollutants do not have a unified mechanism of mammalian toxicity as in some of the other groupings, but may range from the lethal compound, mustard gas, to various mercaptans of low acute toxicity but high organoleptic effect.

Many of the organometallics are highly toxic. On the other hand, the polymers form a chemical class without any uniform basis in structure activity relations. The miscellaneous surfactants exhibit toxicity by alterations in membrane function. Other organics are listed in the final miscellaneous organic classification without any reference to structure-activity relations.

5. Indexing

In order to facilitate locating information on any particular chemical in this report, we have prepared an alphabetical index which consists of names of chemicals as used in this report with synonyms, chemical names, trade names, etc. This is presented in Section X.

## IV. RESULTS

Table I lists the concentrations of organic pollutants that have been found in water based on the search of the literature. The chemicals listed in this table as in subsequent tables have been characterized and tabulated, where appropriate, by their chemical composition described earlier under Section III-4. The source of the chemical (agricultural pesticide, industrial waste, domestic waste, etc.) is also tabulated for each chemical where this information was available. The location of the sample is tabulated under a separate heading, and indicates where the sample was taken from. For a number of chemicals several concentrations found at the same location at different times or at different locations are indicated where this information was available.

No attempt was made in searching through the literature to assess the qualitative or quantitative results of the analytical data. The techniques used by different investigators, sampling techniques and the sensitivity of analytical procedures was not assessed. There will no doubt be variations even with the same investigator as more sensitive analytical techniques are employed.

The greatest proportion of compounds measured in fresh water was made up of pesticides. As pointed out earlier, sources were poorly characterized in terms of physical location, distance from point of test sample and topographical characteristics which would throw some light on the nature of chemical pollution of fresh water.

Where information was available on a sequential time basis, concentrations of pesticides varied considerably presumably due either to times of application of pesticides or to periods of rainfall run-off or both. Therefore, pertinent climatological data might have been helpful in assessing the characteristics of pollution with agricultural products. In some intensely agricultural areas, such as cotton growing areas, concentrations of pesticides in rivers and municipal water supplies reached relatively high levels.

Concentrations of pesticides in fresh water formed the largest contribution of the U.S. literature while the largest input of industrial and domestic sources of chemical pollution were obtained from the foreign literature. Thus, little information on industrial chemical pollution in the U.S. is available.

Table II presents acute and chronic toxicological information on chemicals presented in Table I. $LD_{50}$ is the dose at which 50% of the animals die. TLm designates the Median Tolerance Limit which is the concentration which kills 50% of fish for the indicated time in hours. $LC_{50}$ is the concentration at which 50% of fish die in 24 hours. TLm and $LC_{50}$ were exclusively obtained on fish. $LD_{50}$ formed the highest proportion of the acute toxicity information available and was exclusively for non-aquatic animals. Included under the $LD_{50}$ column was data available on humans where fatalities can occur and are estimates only and are essentially $LD_{100}$ data. As stated earlier, all doses are oral unless otherwise indicated if oral information was not available.

It will be noted that large gaps of information exist for chronic toxicity and the greatest proportion of the toxicological data presented in this table comes from the Russian literature. The doses presented for chronic toxicity are those which elicited an effect and where this was not available the doses used are presented. The chronic toxicity effects varied according to what was looked for. The Russian data included changes in conditioned behavior and insufficient information was presented in order to determine exactly how this was done. Other doses which may have been presented in the literature,but were excluded from this table are presented in the Quality Criteria Section because of the presumed relevancy to the problem associated with arriving at quality criteria.

Table III presents acute and chronic toxicity of potential organic pollutants of fresh water. This table is in all details similar to Table II with, however, the inclusion of sources. These chemicals are suspected to be in water because of their use for industrial, agricultural, and domestic purposes or because they are known to be involved in manufacturing processes the waste products of which are likely to be discharged into fresh water. This listing is probably incomplete but what is available involves a far greater number of chemicals than those which have been measured in water indicating that available factual information on chemicals in water gives an incomplete story of the total picture. Again, as with Table II, there are gaps in our knowledge of both acute and chronic toxicity information. The human data, though inadequate, are somewhat more meaningful than those presented in Table II.

Table IV presents the available information of chemicals the concentrations and effects of which have been examined in tissues. It will be noted that all information contained in this table refers to pesticides. In general, the data indicate that pesticides can be stored in the tissues of humans normally exposed to them. As a result of accidental exposure, deaths have occurred and large concentrations of these pesticides were found in tissue. Sequential data, where this was available, showed that some pesticides had increasing concentrations in body fat with time in the U.S. and Indian population but not in the English or in some cases in the French population, indicating that use of the pesticides in question had increased in the U.S. and India during the periods of study and had decreased or remained steady in countries like England and France. However, the possibility that these pesticides were accumulating over the period of study without any change in usage should not be excluded. The information in this table also appears to show that storage occurred in all animals studied. In general, the studies dealt poorly with characteristics of human population studied in terms of relative exposure potential. However, a few studies did give information of this nature and showed that concentrations in tissues were related to degree of exposure. In like manner, information on animal tissues showed extremely high tissue concentrations in animals living in highly pesticide treated areas. Data on aquatic animals generally indicated low concentrations as compared to man and terrestial animals, presumably because of the generally low concentration of pesticides in water as shown in Table I. In general, high concentrations of pesticides in tissues, at least of DDT, were found in India and Israel. Studies on storage of DDT as a function of dose ingested for a period of 12 and 18 months indicate that below 0.0034 mg/kg/day storage does not take place while doses higher than this show storage to be proportional to dosage.

Tables V and VI present the available information on the carcinogenicity of chemicals which have been found in water (Table I) and chemicals which could potentially be present in water (Table III). Most of the carcinogenicity information was obtained from books which summarize the available data on carcinogenicity of chemicals in general. By far the greatest majority of studies reported results on a few animals only and a few studies attempted to show a dose-response relationship. These tables include data obtained by oral administration and where this is not available, the results from other routes of administration are given in Tables Va and VIa. The dosage forms used varied considerably. Some were given in the diet and, therefore, the amount of chemical in terms of body weight cannot be computed without knowledge of food intake and weight of animals. In other instances, the oral dose was available as mg/kg of body weight. The incidence of appearance of tumors in many cases is not available and results are denoted only as positives. The results appear to be different depending upon the species of animals studied with mice giving the highest proportion of positives. Presumably many of the studies used mice selected for their susceptibility to tumor formation. In some studies there was a high incidence of tumor formation in rats used as controls.

Of the 66 chemicals the concentrations of which have been measured in water, 33 have been examined for carcinogenicity and of these 15 or approximately 45 percent were found to be positive in one or more animal tests. Of the 430 potential pollutants, 87 have been examined for carcinogenicity and 17 or approximately 20 percent were found to be potentially positive carcinogenic agents.

Tables VII and VIII present available information with more or less pertinency to mutagenicity and teratogenicity of chemicals measured in water and chemicals which potentially could be present in water. In considering presumptive tests for mutagenicity, caution is necessary in interpreting the results. It can be seen from the tables that a variety of test systems have been employed. Although these tell us different things about the mutagen and the nature of mutation, it should be remembered that most are of little reliability in terms of extrapolating to man. Further reservations with respect to pesticides (which constitute a large proportion of the compounds considered here) were expressed by others (337):"Although we can point to no pesticide now in wide use that has been demonstrated to be mutagenic, the overwhelming majority have, however, not been adequately tested, although appropriate methodologies are now available." Except in 11 instances in Tables VII and VIII, all the data relating to mutagenicity or chromosomal effects were obtained on plants or fungi. Of the 11 exceptions, 4 were obtained on human cells in culture, 6 on mice, 1 on the kangaroo rat, and 1 on the fruit fly. Of the 29 chemicals examined, all showed positive results in one form or another. Plant tissues were exposed to the agent usually by soaking in high concentrations, but duration of exposure was not available for these and the frequency and duration of dosage for the animal and human studies were not available or applicable.

The teratogenicity information was obtained on 32 chemicals and positive results were obtained on 29, and only 1 of these was obtained on humans while the rest were examined in mammals and the chick. The latter is often considered to be an overly sensitive system. The frequency and duration of these doses were not reported. The one human study concerned methyl mercury chloride and exposure was through eating contaminated fish. Teratogenic effects were seen in this instance.

## Factors to be considered in assessing Toxicity Data

### 1. Chemical Interaction

The fate of active chemicals within the environment is important in assessing their ultimate toxicity. The reactions which are usually involved in the alteration of chemical species introduced into the biosphere are often quite simple and can be easily predicted, such as hydrolysis, air oxidation, and changes brought about by UV irradiation. Irradiation, for instance, converts dieldrin to photodieldrin, a compound with four times greater toxicity. The ability to predict the product of such reactions and to evaluate the toxicity of the resulting materials is possible because the water, air, and light necessary for these reactions are known parts of the biosphere. However, more complex interactions are possible which are not easily predictable.

It has recently been found that the two anilide herbicides, propanil and solan, are capable of interacting in the soil to yield an asymmetric azobenzene (22). The presence of this new and potentially toxic agent is dependent upon the high concentration of both propanil and solan available for degradation and subsequent reaction. This example illustrates the importance of having a thorough knowledge of the individual components involved in any chemical pollution situation before it can be stated that such chemicals are not present in the water at concentrations which may cause toxic symptoms. The extent and importance of such molecular interaction has not yet begun to be either appreciated or evaluated. Furthermore, the presence of interacting compounds, as with any chemical pollutant, can only be suspected until tests for their detection are available and used.

## 2. Microbial Decomposition

The molecular structure of almost all pollutants can be altered by the action of microorganisms. Such bacterial action is the basis of sewage treatment and is the major mechanism by which detoxification of our natural waters is effected. Structures, no matter how complex, can be metabolized by the concerted action of various microbial species to inorganic compounds ($CO_2$, $NH_3$, $H_2S$) and the structural elements of the organisms themselves (polysaccharides, proteins, lipids, nucleic acids, and the subunits of these macromolecules). Such structural elements themselves become part of the water's chemical milieu when the microorganisms die and disassociate.

The decomposition of any complex compound to inorganic end products is a dynamic process. It is uncommon for one organism to degrade fully any complex molecule intracellularly. Rather, individual species will usually effect a single oxidation, dechlorination, demethylation, hydrolysis, etc., converting a known material into one of many new compounds. For instance, depending on the species of microorganism present, even a resistant chemical like DDT (1,1-bis(p-chlorophenyl)-2,2,2-trichloroethane) may be converted to DDE (200), DDD, DDA, and a dicofol-like compound. Other acidic metabolites may also be formed (305).

It is often difficult to predict the compounds which will or will not be produced by microbial degradation. Of the 20 microorganisms capable of degrading DDT in the second study above, none produced DDE. Because of this, it is unrealistic to confine one's attention solely to known parent compounds in natural waters when assuredly the bacterial flora in the microenvironment will have produced a spectrum of metabolites, all of which may have their own toxicological properties. However, the data available does not allow an evaluation of the impact of chemical pollution beyond parent compounds.

3. Solubility

Many of the pollutant compounds which have been measured for acute and chronic toxicity have limited solubility in water. This may have led to errors in the past in arriving at $LD_{50}$ values for such materials, especially for those measured using aquatic test animals such as fish. It has only recently been realized that the inconsistencies in the tolerance of fish to chlorinated pesticides have been due to the adsorption of these compounds to the walls of test containers, making them unavailable to the fish. The toxicity of such compounds may then vary with the material out of which the test container is constructed. This leads to errors in the data, in addition to those caused by such earlier recognized problems as loss by vaporization and hydrolysis during the course of the study.

In the natural state, chlorinated pesticides have been found adsorbed to microparticulates in suspension in fresh water. The presence of these toxic compounds in a colloidal state both decreases the reliability of determinations of their concentration in water, and provides a reservoir of such compounds which may dissociate back into the water system with time and decreased soluble concentration. The distribution of compounds on microparticulates may vary. Certain molecules may be adsorbed to inorganic colloids, while others may be associated with detritus and microorganisms. In addition, the presence of detergents in the water supply may alter the distribution of such compounds between the soluble phase and an adsorbed phase.

4. Analytical Accuracy

In an evaluation of this type the presence of a highly toxic material in low concentration is more important than the exact concentration of an inert material. Thus, it is essential that the analytical methods used be accurate. For instance, the liver toxicity associated with halothane is thought to be due to a 0.02% contamination by dichlorohexafluorobutene (65). The teratogenic effect of 2,4,5-T herbicide is even now in question because of the presence of active impurities in the samples tested (142).

Some of the analytical methods used in evaluating water quality are poorly applicable to the generation of data relevant to a toxicological evaluation. Atomic absorption spectroscopy indicates the concentration of elements but not their form. Thus, for example, it does not differentiate between metallic mercury, mercuric ion, and organomercurials, all of which have differing toxicities (306).

Those analytical methods which depend upon separatory methods for identification (TLC, GLC, liquid chromatography) are likely to miss or misidentify compounds with migration characteristics similar to expected compounds or compounds present in high concentration. The sensitivity of read out with these methods is also a source of error. Many highly toxic substances present in low concentration can be overlooked as a result of such considerations.

Then, too, certain analytical tests are designed to measure only a particular functional group and we find values in the literature for "phenol concentration". While biologically-derived phenols are generally innocuous, most industrially produced phenols do show some toxicity which varies with the compound tested. The same is true within any organic series.

5. Chemical Homogeneity

The literature contains data for both the toxicity and concentration in water sources of alkyl benzene sulfonates. While it is probably reasonable to correlate the two kinds of data in order to arrive at an estimate of the potential toxicity of such water sources, it should be realized that such a correlation is imprecise. Alkyl benzene sulfonate is a mixture of numerous similar compounds as are many industrial chemicals. Thus it is never certain that the chemical composition of a batch which was used for toxicity testing is the same as that found in fresh, natural water.

Commercial DDT contains less than 80% of the *p,p*-bis(dichlorophenyl)-tri-chloroethane. Most of the remainder is the *o,p*-isomer with a significant amount of DDD being present. Toxicity studies on such a compound would probably be performed using a homegeneous analytical grade of DDT, yet this compound would never be introduced into the environment in such a form. This fact, too, decreases the reliability of correlating toxicity data with water concentration data for a compound.

## 6. Altered Metabolism

The interaction of multiple pollutants within the test organism or within man is probably of greater importance in invalidating toxicological correlations than the chemical interactions occurring within the water system. The presence of one compound can entirely change the physiological disposition of another. Parathion, paraoxon and sumithion all interfere with the catabolism of propanil and thus cause the latter compound to show increased toxicity. A more important and commoner effect is the induction of liver enzyme systems, especially microsomal enzymes, which catalyze the more rapid degradation of common pollutants once induced. Thus the $LD_{50}$ values obtained in single dose toxicity studies may bear no resemblance to the $LD_{50}$ values one would find in an animal in which these metabolic enzymes had been increased by prior treatment with the same material or related materials. This effect is most important in relating toxicity to the real world where a continued input of drugs and foreign compounds through ingestion and possibly inhalation may cause these catabolic enzyme systems to exist continually in a more induced state.

Similarly, the increasing use of pesticidal synergists may greatly alter the toxicity of compounds with which they find themselves in association. The synergistic toxicity of a variety of actual and potential pollutants should be considered. The pyrethrum synergists, for instance, inhibit the microsomal oxygenase system in the insect. As such, they are important in preventing the rapid biodegradation *in vivo* of insecticides. However, such synergists may also prevent a similar degradation in man of a wide variety of organic compounds and hence cause increased toxicity.

Sources

Tables IX and X present chemicals which have been found in water (Table IX) and chemicals which could potentially be found in water (Table X) according to sources as given in the literature. The sources are ranked in accordance with the number of chemicals originating from each source and are categorized into three groups, namely industrial, agricultural and domestic. In the industrial category the sources which were defined as industrial without reference to the specific industry are listed separately. Since Table IX represents chemicals which have been measured in water on a more or less randomized basis, the number of chemicals originating from a particular source is a matter of chance rather than a matter of the contribution of a source to the total water pollution problem. On the other hand, Table X lists chemicals which could be present in water and, therefore, to some extent reflect the contribution of a source to the total problem of water pollution at least in terms of number of chemicals but not necessarily in terms of the health aspects of chemical pollution of water. Taking the two tables together we find that in the industrial category chemical plants contribute the highest number of chemicals which have been actually found or could potentially be found in fresh water and exceeds any other industrial source by at least a factor of 2.

The agricultural source of pollution is one of pesticides, while domestic sources of pollution consist of detergents. In terms of numbers of chemicals as well as classes of compounds, chemicals of industrial origin contribute to fresh water pollution to a greater extent than those originating from agricultural or domestic sources.

## V. QUALITY CRITERIA

From the health point of view, chemical quality criteria of water should be based on concentrations of chemicals which, when exceeded, is likely to produce physiologic, toxicologic, histopathologic, carcinogenic, teratogenic, mutagenic and any other undesirable effects. Any of these can be considered to be health limiting indices. Although organoleptic effects are undesirable, they may not strictly be considered to have a health effect if threshold concentrations are below those indicating a demonstrable health effect as broadly defined above. However, this approach deals only with chemicals as entities in water and disregards the products of interactions between chemicals in water and alterations brought about by organisms and environmental factors. In addition, it ignores the synergistic biologic effects of chemicals acting in combination.

If we accept the premise that quality criteria should be based on the maximum ineffective concentration, then it would appear that the most important information we require for each chemical in water is that pertaining to the maximum concentration which can be shown to have no health effects in humans. Obviously, this cannot be obtained in a practical manner using humans except by epidemiological studies which, because of the variety of chemicals in water and the generally polluted condition of our environment together with adaptive compensations, cannot be expected to be fruitful in terms of specific information on some chemicals. This epidemiological approach in some instances has borne fruit and should not be eliminated from consideration. The beneficial (<8 ppm) and harmful concentrations (>10 ppm) of fluoride were demonstrated using this approach and undoubtedly it should be considered as being useful for assessing the effects of chemicals which are not easily altered in water and for which there are specific demonstrable effects. In general, however, we must resort to animal studies to obtain the necessary information but must consider the attendant problems of extrapolation to human effects.

Except for the Russian literature, the basis upon which different countries arrive at quality criteria is not clear. Publications which purport to discuss the rationale for arriving at quality criteria present generalizations which are of little value (70, 82, 109, 145, 146, 162, 163, 171, 172, 326, 327, 391, 398, 446). The Russians arrive at suggested maximum permissible concentrations by examination of three factors:

- Organoleptic thresholds using human subjects
- Biochemical oxygen demand
- Toxicological effects from acute, medium, and long-term animal studies

With this approach the lowest oral maximum ineffective dose obtained for the parameters examined and animal species tested is used as the MPC after direct conversion to mg/l.

Generally, their toxicological studies are carried out in one or more of 4 species, namely mice, rats, guinea pigs, and rabbits using the oral route of administration. From the acute studies, $LD_{50}$ and acute toxic effects are determined. Chronic effects are examined in medium-term studies (1-2 months) and are further studied in long-term studies covering a period ranging from 5 to 8 months. From the data obtained, the suggested MPC is generally but not always based on the highest dose examined which does not induce an effect in either of the three factors studied. If we examine the table (Table XI) of reported maximum no-effect concentrations, we find that organoleptic effects form the highest proportion of cases. This general approach initiated by Cherkinskii (55, 59, 61) does not take into account effects which may be even more limiting, i.e. carcinogenicity, mutagenicity and teratogenicity. In addition, it is erroneous to assume that the highest dose which does not produce toxicological effects for the species of animals used is directly applicable to man. It may or may not be and a safety factor is undoubtedly desirable.

Within recent years we have increasingly recognized the importance of carcinogenic, teratogenic, and mutagenic effects of pharmaceutical agents and chemicals used as food additives. Tables V, VI, VII and VIII show that many of the chemicals which are found in water or potentially could be present in water are carcinogenic, teratogenic and/or mutagenic. To date these data have not been used systematically as limiting indices although food additives with carcinogenic properties are banned from use. Because of our daily physiological need for water, we are in much greater danger from the presence of these chemicals in water.

How carcinogenicity, mutagenicity and teratogenicity data can be used for setting water quality criteria is a question of some concern. Current regulations totally prohibit the addition of carcinogenic substances to foods regardless of how carcinogenicity was demonstrated in animals. At the time this report was written, the reasonability of this approach is being questioned and the alternative approach of a threshold dose is favored by some. However, as can be seen in Tables V and VI, evidence upon which the threshold approach to the question of carcinogens in water can be rationally considered is generally lacking.

An approach which prohibits the presence of carcinogenic chemicals in water is probably impractical and water quality criteria based on carcinogenicity may have to be resolved using the threshold approach. However, better information than is currently available will need to be obtained because currently available data are insufficient for the purposes of arriving at threshold doses.

Although no precedent exists upon which quality criteria of water can be based for teratogenicity and mutagenicity, the same questions and lack of data apply.

Information required specifically for use in arriving at quality criteria for water should be obtained by the oral route of administration.

On the basis of the information available, the most useful data for arriving at permissible concentrations are those obtained from chronic toxicity studies. However, acute tcxicity data is useful for determining relative toxicity and for arriving at doses for chronic toxicity.

The information obtained from animal studies needs to be assessed in terms of arriving at a basis for permissible concentrations for humans. In this respect the limiting index selected will be the lowest maximum ineffective dose found for all the parameters examined and animal species studied. This, however, can only be used as a starting point.

The applicability of animal toxicity information for predictions of toxic effects in man can vary considerably depending upon the compound and the choice of species. It is readily apparent that the choice of an insect to determine the toxicity of an organophosphate in man would be absurd. The organophosphates are useful as selective insecticides because of the differential metabolic rate of these compounds between insects and higher forms of life. However, even among the chordates, great differences in toxicity of specific compounds are apparent. Rotenone is very toxic to fish; warfarin is selectively toxic to Norway rats and mice. An extreme example is the compound norbormide which shows no toxicity at 1,000 mg/kg in mice, cats, dogs, sheep, swine, or primates but has an oral $LD_{50}$ of about 10 mg/kg in the Norway rat

A number of approaches to the problem of gaining information relating to the possible harmful effects of a compound using model species has been used. Attempts to obtain data which could more easily and effectively be applied to human beings using monkeys as experimental animals in toxicity studies have been made. It has been shown quite often, however, that although the monkey is a close phylogenetic relative of man, its metabolism quite often is not related. In a recent study of 23 anticancer drugs (358) it was found that the monkey was a predictor for organ-specific toxicity in man only 5 out of 8 times on the average. When dogs were included predictions were improved.

Attempts have been made to select a species which simulates man most closely in the absorption, distribution, metabolism and excretion of a compound and its metabolites. This is usually performed by giving the compound to a number of different species and selecting the one which simulates man most in its response and metabolism. This, of course, requires prior knowledge of the action and metabolism of the compound in man and although this approach is useful for screening a variety of chemically related compounds for pharmaceutical purposes, it may not be applicable for use in the wide variety of chemical species found in water.

Another attempt to obtain toxicological information which is applicable to man is the use of tissue culture techniques. These techniques involve the growing of human and animal cells outside of the body in chemically defined media. The advantages of this method are: the low cost of the technique, the fact that less compound is required, the ability to use cells of human origin, the establishment of reliable controls and the creation of exact conditions of concentration and local environment. Although this method holds great promise, the results obtained often do not correlate with clinical findings. By observing only the component parts of a complex system, one may miss effects which can be seen only with the whole system. The form and the concentration of an active compound which a cell is exposed to by the tissue culture approach may bear no resemblance to what that same cell may be exposed to within the living organism.

The Russians have faced this problem as applied to chemical pollutants of water ( 59) by administering the chemical to a number of animal species and selecting the species which proved to be most sensitive for more extensive study using a variety of parameters which involve a great deal of time and effort.

The foregoing serves as examples of the difficulties involved in using animal data for prediction of effects of chemicals in man and the problems involved in the toxicological evaluation of potentially harmful pollutants remain large.

Finally, the interaction of multiple compounds remains to be determined. As mentioned elsewhere in this report, the toxic effects evidenced when a person is brought into contact with one chemical entity within a short time after having been exposed to another may often be dramatically dissimilar to those evoked by either chemical alone. The type of analysis of the potential toxicological behavior of compounds present in fresh water presented in this report appears inadequate in relation to all these problems, but without extensive experimental programs, it is the best that can be performed in our current state of knowledge.

The exact means by which animal data can be used to arrive at permissible criteria will probably continue to be based on the availability of factual information combined with the best expert opinion and a reasonable inclination to err on the safe side. The Russian approach of directly applying the maximum ineffective concentration obtained in animals to man is not to be recommended.

With the above considerations in mind the available information on suggested maximum permissible criteria and information that can be used for arriving at permissible criteria can be examined for pertinency and usefulness.

Table XI presents reported maximum concentrations of organic chemicals which produce no effect when administered chronically or when tested for organoleptic effects in man. It will be noted that except in a few instances the sources for the information in this table are from Russian literature.

Approximately 80% of the data is derived from organoleptic effects using human subjects. In other words, the organoleptic threshold was found to be lower than either the biochemical oxygen demand doses or the maximum ineffective dose in toxicological animal studies.

Table XII presents the ranking of acute toxicity based on $LD_{50}$ data and show that the chlorinated hydrocarbons are outstanding in terms of their intense acute toxicity as measured by $LD_{50}$ in mammals. Since these compounds have all been found to be present in fresh water, it becomes of especial concern to direct our attention to them. Of the six compounds found to have an oral $LD_{50}$ of 1-100 mg/kg, five of these compounds are chlorinated hydrocarbons. More specifically, endrin, isodrin, aldrin, endosulfan and toxaphene can be considered to be all derivatives of norbornene. It is interesting that, except for methyl mercuric chloride, the most toxic compounds now found in fresh water should all have the same basic chemical nucleus.

Heptachlor, the ninth entry in this ordered list, and chlordane also have the same chlorinated norbornene nucleus. Aside from these compounds, however, the other most highly acute toxic compounds do not share common structural features. Most of them do contain chlorine atoms, however. Thus, within those compounds that have a reasonably high toxicity (100-200 mg/kg $LD_{50}$) in addition to those compounds already mentioned, can be seen three hexachlorocyclohexanes (lindane and BHC); two forms of a chlorinated phenol; the organometallic methyl mercury compounds; the chlorinated diarylalkanes, DDT and DDD; two simple amines; a benzonitrile; an organic phosphate (Def); and two chlorinated phenoxyacetic acids (2,4,5-T and 2,4-D).

Examination of the rest of the list reveals similar compounds: amines (some organic), another phenoxycarboxylic acid, another organic phosphate, another chlorinated diarylakane and a number of phenolic compounds. The only new group of compounds present toward the latter part of this list is the surfactant family represented by different forms of alkyl benzene sulfonates.

A different picture presents itself among those organic compounds considered potential pollutants of fresh water which have not yet been reported to be present in fresh water and which are listed in Table XIII. Because of their greater number, it is probably best to turn our attention first to those compounds having an oral $LD_{50}$ value of less than 10 mg/kg. Among this group of 23 compounds, 15 are phosphate esters. While the substituent groups may differ among these 15 compounds, it may be assumed that it is the phosphate ester constituent itself which is responsible for the high toxicity. The remaining eight compounds are substituted pyridines (nicotine and picoline); carbamates (Isolan and Temik); the substituted indanedione anticoagulant, diphacinone; acrolein; the organometallic, tetraethyltin; and acetone cyanohydrin (which is toxic due to the fact that it releases hydrogen cyanide).

Among the remaining compounds with an acute toxicity of 1-100 mg/kg, the organophosphorus compounds again make up the largest grouping, with 20 pesticides falling within this category. No other similarly large group is found. Seven of these remaining compounds are carbamates, five are phenols and four contain the nitrile group. The ability of the organic phosphate esters and of the carbamates, for instance, to rapidly hydrolyze in water, may prevent the accumulation of high concentrations of these materials in fresh water and so decrease the pollution hazard of these compounds.

It is apparent from the relatively small size of Table XIV that little has been published on the chronic threshold doses of compounds which may appear in fresh water. All of the data presented in this table are from the Russian literature and include threshold doses resulting from changes in conditioned reflex behavior. Most noticeable is the absence of pesticides from this table. Those which have been investigated, such as carbothione and simazine, are found to have a low ranking in terms of threshold dose. Most of the other compounds in the table are common organics which share little in terms of structural similarity. Extrapolations from this meager data is impossible because it is difficult to judge how much the presence of data on a functional chemical group is due to investigator interest or how much it is due to lack of investigation of other compounds.

The most noteworthy feature of Table XIV is the presence of the three organometallic compounds, tetraethyl tin, ethyl mercuric chloride, and diethyl mercury at the top of the listing. The next compound in the list has a 50-fold higher threshold dose than the least toxic of these compounds. Alcohols and diols are scattered throughout the list. Although the fourth through sixth compounds in order of decreasing toxicity are alcohols, it is difficult to call special attention to this group in terms of toxicity. This is likewise the case with the chlorinated compounds which are widely scattered throughout the list. The presence of both aliphatic and aromatic amines at the beginning and throughout the middle of the listing does not specifically call attention to amines as potentially toxic functions in relation to chronic threshold dose. To be able to determine toxicity information from such a ranking of threshold doses it would be necessary for many more compounds to be investigated and placed within such a ranking.

If, as noted elsewhere, threshold dose from chronic toxicity studies is an important means for arriving at quality criteria for chemicals in fresh water, the apparent incompleteness of this table indicates that efforts have not been particularly directed towards obtaining this information.

## TABLE I - CONCENTRATION OF ORGANIC POLLUTANTS LOOKED FOR AND FOUND IN FRESH WATER

This table lists the concentrations of organic pollutants that have been found in water and tabulated, where appropriate, according to their chemical composition described under Section 3 and 4. The source and location of the chemicals are also tabulated where this information was available. For a number of chemicals several concentrations found at the same location at different times or at different locations are shown, if available. Concentrations of pesticides in fresh water form the largest contribution in the US literature while the largest input from industrial and domestic sources were obtained from the foreign literature.

TABLE I - CONCENTRATION OF ORGANIC POLLUTANTS LOOKED FOR AND FOUND IN FRESH WATER

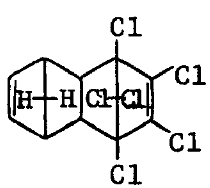
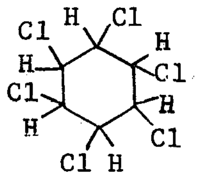
| Ref | Agent | Source | Location | Concentration |
|---|---|---|---|---|
| | | **ALKANES AND ALKENES** | | |
| | **UNSUBSTITUTED** | | | |
| 291 | METHANE | dissolved gases | well water, Ill. | 0.8 ml/1 |
| | $CH_4$ | " " | " " | 87 ml/1 |
| | | product of anaerobic decomposition of organic matter in marshes, mines and sludge, digestion tanks; waste from natural gas & petroleum plants | | |
| | **HALOGENATED** | | | |
| 69 | ALDRIN | pesticide 2-6 lb./acre | Snake R. Pullman, Wash. | 0.001 mg/1 |
| 439 |  | | Hudson R. below Poughkeepsie N.Y. | presumptive Sept. 1964 |
| | | | Maumee R. Toledo, Ohio | " |
| | | | Mississippi R. Dubuque, Iowa | " |
| | | | Detroit R. Detroit, Mich. | " |
| | | | Missouri R. Kansas City, Kans. | " |
| | | | Colorado R. near Boulder City Nev. | " |
| | | | Colorado R., Page, Arizona | 0.085 ug/1 " |
| | | | Rio Grande, Brownsville, Tex. | presumptive " |

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

| Ref | Agent | Source | Location | Concentration | |
|---|---|---|---|---|---|
| | | | **ALKANES AND ALKENES** | | |
| 439 | ALDRIN (cont.) | | Snake R. Ice Harbor Dam, Wash. | presumptive | Sept. 1964 |
| | | | Bear R. above Preston, Idaho | " | " |
| 174 | | | Snake R., Wash. | 0.001 mg/l | " |
| 42 | | agricultural | Missouri R. at Nebraska | 0.005 ug/l* | May 1966 |
| | | | Arkansas R. at van Buren, Ark. | 0.005 ug/l* | June 1966 |
| | | | Snake R. at King Hill, Idaho | 0.005 ug/l* | " |
| | | | Columbia R. at Dalles, Ore. | 0.005 ug/l* | April 1966 |
| 139 | | | Rio Grande, El Paso, Tex. | presumptive | 1966 |
| 102, 447 | | | Snake R. Pullman, Wash | 0.001 mg/l | 1967 |
| 37 | | | Red R., Alexandria, La. | 0.006 ug/l | 1964 |
| | | | Snake R. Wawawai, Wash. | 0.003 ug/l | 1959 |
| | | | Chattahoochee R. Lanett, Ala. | 0.002 ug/l | 1962 |
| | | | Savannah R., N. Augusta, S.C. | <0.001 ug/l | 1958-65 |
| | | | Merrimack R., Lowell Mass. | <0.001 ug/l | 1961 |
| | | | Yakima R., Richland, Wash. | <0.001 ug/l | 1958 |
| | | | Yellowstone R., Sidney, Mont. | <0.001 ug/l | 1964 |
| | | | 19 stations in various river basins | presumptive | |
| 259 | | | Hudson R. | 0.26 ug/l | 1964 |
| | | | other surface waters | 0.11 ug/l, minimum value | 1964-66 |

* samples taken monthly for one year

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

| Ref | Agent | Source | Location | Concentration | |
|---|---|---|---|---|---|
| | | | **ALKANES AND ALKENES** | | |
| 357 | ALDRIN (cont.) | | 400 samples (drinking water) | over 50 samples had detectable concentrations none over MPC | |
| 240 | | agricultural | Missouri R. at Nebraska City | 0.02 ug/l* | May 1968 |
| | | | Brazos R. at Richmond, Tex. | 0.01 ug/l* | Feb. 1967 |
| | | | | 0.04 ug/l* | March 1967 |
| | | | Rio Grande below Anzaldvas Dam, Tex. | 0.02 ug/l* | June 1967 |
| | | | Colorado R., Yuma, Ariz. | 0.02 ug/l* | Feb. 1967 |
| | | | Sacramento R., Verona, Calif. | 0.01 ug/l* | Feb. 1967 |
| | | | Yakima R. Kiona, Wash. | 0.01 ug/l* | Oct. 1966 |
| | | | Snake R., King Hill, Idaho | 0.01 ug/l* | Feb. 1967 |
| | | | Columbia R., Dalles, Ore. | 0.01 ug/l* | Feb. 1967 |
| 24 | | formulating plants at Greenville, Clarksdale, Indianola | Mississippi R. tributaries | | 1966 |
| | | primary manufacturer of endrin and heptachlor, Memphis, Tenn. | Memphis Wolf R. Cypress Creek complex | | 1966-67 |
| 289 | BENZENE HEXACHLORIDE  | pesticide | Tombigbee R. Ala. | found in fish | |



* samples taken monthly from each river for 2 years

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

| Ref | Agent | Source | Location | Concentration | |
|---|---|---|---|---|---|
| | | | **ALKANES AND ALKENES** | | |
| 439 | BENZENE HEXACHLORIDE (cont.) | | Martins Creek, Pa. | presumptive | 1964 |
| | | | Mississippi R. at West Memphis, Ark. | " | " |
| 139 | | | Connecticut R. at Enfield Dam, Conn. | 0.004 ug/l | Sept. 1966 |
| | | | Hudson R. at Narrows N.Y. | 0.034 ug/l | " |
| | | | Apalachiocola R., Chattahoochee, Fla. | presumptive | |
| | | | Chattahoochee R., Lanett, Ala. | 0.008 ug/l | " |
| | | | Allegheny R., Pittsburgh, Pa. | 0.013 ug/l | " |
| | | | Ohio R., Evansville, Ind. | 0.002 ug/l | " |
| | | | Ohio R., Cincinnati, Ohio | 0.056 ug/l | " |
| | | | Ohio R., Addison, Ohio | 0.026 ug/l | " |
| | | | Mississippi R., St.Paul, Minn. | 0.012 ug/l | " |
| | | | St. Joseph R., Benton Harbor, Mich. | 0.003 ug/l | " |
| | | | South Platte R., Julesburg, Colo. | 0.022 ug/l | " |
| | | | Arkansas R., Ponca City, Okla. | 0.008 ug/l | " |
| | | | Mississippi R., Vicksburg, Miss. | 0.011 ug/l | " |
| | | | Rio Grande, El Paso, Tex. | 0.023 ug/l | " |
| | | | Trinity R., Livingston, Tex. | 0.013 ug/l | " |
| | | | Colorado R., Loma, Colo. | 0.006 ug/l | " |
| | | | San Joaquin R., Vernalis, Calif. | 0.008 ug/l | " |

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

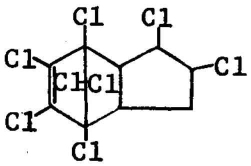
| Ref | Agent | Source | Location | Concentration | |
|---|---|---|---|---|---|
| | | | **ALKANES AND ALKENES** | | |
| 439 | BENZENE HEXACHLORIDE (cont.) | | Delaware R., Martins Creek, Pa. | presumptive | 1964 |
| | | | Mississippi R., W. Memphis, Ark. | " | " |
| | | | Red R., Grand Forks, N.D. | 0.004 ug/l | 1965 |
| | | | Ohio R. Cairo , Ill. | 0.002 ug/l | " |
| | | | Verdigris R., Nowata, Okla. | presumptive | " |
| | | | Connecticut R., Enfield Conn. | " | " |
| | | | Monongahela R., Pittsburgh Pa. | " | " |
| | | | Apalachicola R., Chattahoochee, Fla. | 0.022 ug/l | 1958-64 CAM top ten |
| | | | Sacramento R., Green's Landing Calif. | 0.011 ug/l | " |
| | | | Red R. Grand Forks, N.D. | 0.004 ug/l | " |
| | | | St. Lawrence R., Massena, N.Y. | 0.003 ug/l | " |
| | | | Missouri R., Kansas City | 0.003 ug/l | " |
| | | | Savannah R., N. Augusta, S.C. | <0.001 ug/l | " |
| 448 | | water supply cotton runoff areas | | up to 0.75 ug/l | |
| 134 | CHLORDANE   | pesticide applied at <1 lb./acre - not used on edible crops | rain water 0.15 in. Cincinnati - roof of Taft Center | 0.5 mg/l | |
| 139 | | | Delaware Bay | presumptive | Sept 1966 |
| | | | Roanoke R., John H. Kerr Reservoir and Dam | 0.019 ug/l | " |

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

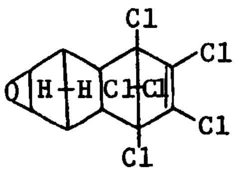
| Ref | Agent | Source | Location | Concentration | |
|---|---|---|---|---|---|
| | | | ALKANES AND ALKENES | | |
| 139 | CHLORDANE (cont.) | | Chattahoochee R., Lanett, Ala. | 0.075 ug/l | Sept. 1966 |
| | | | Tennessee R., Bridgeport, Ala. | presumptive | " |
| | | | Missouri R., St. Louis, Mo. | " | " |
| | | | Sacramento R., Green's Landing, Calif. | 0.006 ug/l | " |
| | | | Snake R. American Falls, Idaho | presumptive | " |
| 24 | | primary manufacturer of endrin & heptachlor Memphis, Tenn, | Memphis Wolf. R., Cypress Creek complex | | 1966 |
| | | pesticide formulating plants | Horseshoe Bayou, Fish Lake, Greenville, Jone's Bayou at Cleveland & Sunflower at Clarksdale & Indianola | | 1966 |
| 440 | DIELDRIN | pesticide | rain water 0.15 in. Cincinnati-roof of Taft Center | 0.003 mg/l | |
| 439 |  | | Connecticut R. below Northfield Mass. | >0.022 ug/l | Sept. 1964 |
| | | | Connecticut R., Wilder Vt. | 0.003 ug/l | " |
| | | | Hudson R. below Poughkeepsie N.Y. | 0.008 ug/l | " |
| | | | Merrimack R. above Lowell, Mass. | >0.071 ug/l | " |
| | | | St. Lawrence R., Massena, N.Y. | 0.003 ug/l | " |
| | | | Delaware R., Trenton, N.J. | 0.009 ug/l | " |
| | | | Potomac R., Great Falls, Md. | >0.040 ug/l | " |

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

| Ref | Agent | Source | Location | Concentration | |
|---|---|---|---|---|---|
| | | | **ALKANES AND ALKENES** | | |
| 439 | DIELDRIN (cont.) | | Schuylkill R., Philadelphia, Pa. | >0.032 ug/1 | Sept. 1964 |
| | | | Shenandoah R., Berryville, Va. | 0.005 ug/1 | " |
| | | | Susquehanna R.,Sayre, Pa. | 0.003 ug/1 | " |
| | | | Apalachicola R., Chattahoochee, Fla. | 0.016 ug/1 | " |
| | | | Escambia R., Century, Fla. | presumptive | " |
| | | | Roanoke R., John H. Kerr Reservoir and Dam, Va. | " | " |
| | | | Savannah R., Port Wentworth, Ga. | 0.020 ug/1 | " |
| | | | Savannah R., N. Augusta, S.C. | >0.118 ug/1 | " |
| | | | Clinch R. above Kingston, Tenn. | 0.014 ug/1 | " |
| | | | Tennessee R., Bridgeport, Ala. | 0.006 ug/1 | " |
| | | | Allegheny R., Pittsburgh, Pa. | presumptive | " |
| | | | Ohio R., at Evansville, Ind. | 0.015 ug/1 | " |
| | | | Ohio R., Cincinnati, Ohio | 0.013 ug/1 | " |
| | | | Wabash R., New Harmony, Ind. | 0.004 ug/1 | " |
| | | | Illinois R., Peoria, Ill. | 0.003 ug/1 | " |
| | | | Mississippi R., Cape Girardeau, Mo. | 0.008 ug/1 | " |
| | | | East St. Louis, Ill. | presumptive | " |
| | | | Burlington, Iowa | 0.004 ug/1 | " |
| | | | Lock and Dam 3 below St. Paul, Minn. | 0.008 ug/1 | " |
| | | | Rainy R., Baudette, Minn. | 0.008 ug/1 | " |

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

| Ref | Agent | Source | Location | Concentration | |
|---|---|---|---|---|---|
| | | | **ALKANES AND ALKENES** | | |
| 439 | DIELDRIN (cont.) | | Red. R., Grand Forks, N.D. | 0.004 ug/1 | Sept. 1964 |
| | | | Lake Michigan, Milwaukee, Wis. | 0.007 ug/1 | " |
| | | | Lake Superior, Duluth, Minn. | presumptive | " |
| | | | Big Horn R. Hardin, Mont. | 0.012 ug/1 | " |
| | | | Kansas R., DeSoto, Kans. | 0.004 ug/1 | " |
| | | | Missouri R., St.Louis, Mo. | 0.012 ug/1 | " |
| | | | Omaha, Nebr. | presumptive | " |
| | | | Yankton, S.D. | 0.009 ug/1 | " |
| | | | Bismark, N.D. | 0.005 ug/1 | " |
| | | | N. Platte R. above Henry Nebr. | 0.006 ug/1 | " |
| | | | Platte R. above Plattsmouth, Nebr. | 0.023 ug/1 | " |
| | | | S. Platte R., Julesburg, Colo. | 0.016 ug/1 | " |
| | | | Yellowstone R. near Sidney, Mont. | 0.008 ug/1 | " |
| | | | Arkansas R., Little Rock, Ark. | 0.004 ug/1 | " |
| | | | near Ponca City, Okla. | 0.008 ug/1 | " |
| | | | Coolidge, Kans. | presumptive | |
| | | | Mississippi R., New Orleans, La. | " | " |
| | | | New Roads, La. | 0.016 ug/1 | " |
| | | | Vicksburg, Miss. | 0.017 ug/1 | " |
| | | | Delta, Va. | presumptive | " |
| | | | West Memphis, Tenn. | " | " |
| | | | Red R. (south), Alexandria La. | 0.007 ug/1 | " |
| | | | Denison Tex. | 0.003 ug/1 | " |
| | | | Atchafalaya R., Morgan City, La. | 0.009 ug/1 | " |
| | | | Verdigris R., Nowata, Okla. | 0.005 ug/1 | " |

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

| Ref | Agent | Source | Location | Concentration | |
|---|---|---|---|---|---|
| | | | **ALKANES AND ALKENES** | | |
| 439 | DIELDRIN (cont.) | | Colorado R., Yuma, Ariz. | presumptive | Sept. 1964 |
| | | | Parker Dam, Ariz.-Calif. | " | |
| | | | Bolder City, Nev. | 0.002 ug/1 | " |
| | | | Page, Ariz. | 0.006 ug/1 | " |
| | | | Loma, Colo. | 0.008 ug/1 | " |
| | | | Rio Grande, Brownsville, Tex | 0.005 ug/1 | " |
| | | | Laredo, Tex. | 0.009 ug/1 | " |
| | | | El Paso, Tex. | 0.032 ug/1 | " |
| | | | below Alamosa, Colo. | 0.007 ug/1 | " |
| | | | Columbia R., Clatskanie, Ore. | 0.015 ug/1 | " |
| | | | Pasco, Wash. | 0.002 ug/1 | " |
| | | | Pend Oreille R., Albeni Falls Dam, Idaho | presumptive | " |
| | | | Snake R., Ice Harbor Dam, Wash. | 0.003 ug/1 | " |
| | | | Wawawai, Wash. | presumptive | " |
| | | | Spokane R., Post Falls Dam, Idaho | 0.007 ug/1 | " |
| | | | Willamette R., Portland, Ore. | 0.011 ug/1 | " |
| | | | Klamath R. near Keno, Ore. | presumptive | " |
| | | | Sacramento R., Green's Landing, Calif. | 0.004 ug/1 | " |
| | | | Bear R. above Preston, Idaho | 0.006 ug/1 | " |
| 42 | | agricultural | Missouri R. at Nebraska City, Nebr. | 0.010 ug/1* | Oct. 1965 |

* sample taken monthly from each river for one year

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

| Ref | Agent | Source | Location | Concentration | |
|---|---|---|---|---|---|
| | | | ALKANES AND ALKENES | | |
| 42 | DIELDRIN (cont.) | | Missouri R. at Nebraska City, Nebr. | 0.005 ug/l* | Feb. 1966 |
| | | | | 0.015 ug/l* | March 1966 |
| | | | | 0.005 ug/l* | April 1966 |
| | | | | 0.015 ug/l* | May 1966 |
| | | | Arkansas R. below John Martin Reservoir, Colo. | 0.005 ug/l* | Oct. 1966 |
| | | | | 0.005 ug/l* | April 1966 |
| | | | Arkansas R. at van Buren, Ark. | 0.005 ug/l* | Dec. 1965 |
| | | | | 0.005 ug/l* | Feb. 1965 |
| | | | | 0.005 ug/l* | Apr. 1966 |
| | | | | 0.010 ug/l* | July 1966 |
| | | | | 0.010 ug/l* | Aug. 1966 |
| | | | Brazos R. at Richmond Tex. | 0.010 ug/l* | Feb. 1966 |
| | | | | 0.015 ug/l* | May 1966 |
| | | | | 0.010 ug/l* | June 1966 |
| | | | Colorado R. at Wharton, Tex. | 0.005 ug/l* | Oct. 1965 |
| | | | | 0.010 ug/l* | Jan.-Feb. 1966 |
| | | | Rio Grande below Anzalduas Dam, Tex. | 0.010 ug/l* | Oct. 1965 |
| | | | | 0.015 ug/l* | Nov. 1965 |
| | | | | 0.015 ug/l* | Dec. 1965 |
| | | | | 0.010 ug/l* | Jan. 1966 |
| | | | | 0.010 ug/l* | July 1965 |
| | | | Colorado R. ( Yuma Main Canal) at Yuma, Colo. | 0.005 ug/l* | March 1966 |
| | | | Sacramento R. at Verona, Calif. | 0.010 ug/l* | March 1966 |
| | | | | 0.005 ug/l* | May 1966 |
| | | | Yakima R. at Kiona, Wash. | 0.005 ug/l* | March 1966 |

* sample taken monthly from each river for one year

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

| Ref | Agent | Source | Location | Concentration | |
|---|---|---|---|---|---|
| | | | ALKANES AND ALKENES | | |
| 42 | DIELDRIN (cont.) | | Snake R. at King Hill, Idaho | 0.005 ug/1* | April 1966 |
| | | | Columbia R. at Dalles, Ore. | 0.010 ug/1* | Dec. 1965 |
| 139 | | | Connecticut R. Enfield Dam, Conn. | 0.016 ug/1 | Sept. 1966 |
| | | | Connecticut R. Northfield, Mass. | 0.017 ug/1 | " |
| | | | Hudson R., Poughkeepsie, N.Y. | 0.003 ug/1 | " |
| | | | Hudson R., Narrows, New York | presumptive | |
| | | | Merrimack R., Lowell, Mass. | 0.167 ug/1 | " |
| | | | Delaware R., Trenton, N.J. | 0.003 ug/1 | " |
| | | | Delaware R., Martins Creek, Pa. | 0.014 ug/1 | " |
| | | | Schuylkill R. Philadelphia, Pa. | 0.015 ug/1 | " |
| | | | Delaware Bay | 0.010 ug/1 | " |
| | | | | 0.025 ug/1 | " |
| | | | Shenandoah R., Berryville, Va. | 0.008 ug/1 | " |
| | | | Susquehanna R., Conowingo, Md. | 0.031 ug/1 | " |
| | | | Roanoke R., John H. Kerr Reservoir and Dam, Va. | 0.006 ug/1 | " |
| | | | Neuse R., Raleigh, N.C. | 0.004 ug/1 | " |
| | | | Alapachicola R., Chattahoochee, Fla. | 0.004 ug/1 | " |
| | | | Savannah R., Port Wentworth, Ga. | 0.048 ug/1 | " |
| | | | North Augusta, Ga. | 0.110 ug/1 | " |

* sample taken monthly from each river for one year

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

| Ref | Agent | Source | Location | Concentration |
|---|---|---|---|---|
| | | | **ALKANES AND ALKENES** | |
| 139 | DIELDRIN (cont.) | | Tennessee R., Bridgeport, Ala. | 0.004 ug/1 Sept. 1966 |
| | | | Lenoir City, Tenn. | 0.005 ug/1 " |
| | | | Allegheny R., Pittsburgh, Pa. | 0.004 ug/1 " |
| | | | Kanawha R., Winfield Dam, West Va. | 0.015 ug/1 " |
| | | | Ohio R. Cairo, Ill. | 0.004 ug/1 " |
| | | | Evansville, Ind. | 0.004 ug/1 " |
| | | | Cincinnati, Ohio | 0.003 ug/1 " |
| | | | Illinois R., Peoria, Ill. | 0.003 ug/1 " |
| | | | Mississippi R., Cape Girardeau, Mo. | 0.009 ug/1 " |
| | | | Mississippi R., E. St. Louis Ill. | presumptive " |
| | | | Burlington, Iowa | 0.007 ug/1 " |
| | | | Dubuque, Iowa | 0.002 ug/1 " |
| | | | St. Joseph R., Benton Harbor, Mich. | presumptive |
| | | | Grand R., Grand Haven, Mich | " |
| | | | Kansas R., De Soto, Kansas | 0.004 ug/1 " |
| | | | Missouri R., St. Louis, Mo. | presumptive " |
| | | | Kansas City, Kans. | 0.004 ug/1 " |
| | | | North Platte R. above Henry, Nebr. | 0.004 ug/1 " |
| | | | Platte R. above Plattsmouth, Nebr. | 0.004 ug/1 " |
| | | | Red R. (north), Grand Forks, N.D. | presumptive " |

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

| Ref | Agent | Source | Location | Concentration | |
|---|---|---|---|---|---|
| | | | **ALKANES AND ALKENES** | | |
| 139 | DIELDRIN (cont.) | | Red R., Intern. Boundary | presumptive | Sept. 1966 |
| | | | Atchafalaya R., Morgan City, La. | " | " |
| | | | Arkansas R., Pendleton Ferry, Ark. | 0.005 ug/1 | " |
| | | | Fort Smith, Ark. | 0.001 ug/1 | " |
| | | | Ponca City, Okla. | presumptive | " |
| | | | Brazos R., Arcola, Tex. | 0.004 ug/1 | " |
| | | | Mississippi R., New Orleans, La. | 0.005 ug/1 | " |
| | | | Vicksburg, Miss. | 0.003 ug/1 | " |
| | | | Delta, La. | 0.005 ug/1 | " |
| | | | W. Memphis, Ark. | 0.004 ug/1 | " |
| | | | Red R. (S), Alexandria, La. | 0.012 ug/1 | " |
| | | | Rio Grande, below Alamosa, Colo. | presumptive | " |
| | | | Trinity R., Livingston, Tex. | 0.012 ug/1 | " |
| | | | Verdigris R., Nowata, Okla. | presumptive | " |
| | | | Bear R., Preston, Idaho | 0.010 ug/1 | " |
| | | | Colorado R., Page, Ariz. | 0.003 ug/1 | " |
| | | | Loma, Colo. | 0.002 ug/1 | " |
| | | | Sacramento R., Green's Landing, Calif. | 0.003 ug/1 | " |
| | | | Waikele Stream, Oahu, Hawaii | 0.004 ug/1 | " |
| | | | Columbia R., Clatskanie, Ore. | presumptive | " |
| | | | Snake R., Payette, Idaho | 0.004 ug/1 | " |
| | | | Willamette R., Portland, Ore. | 0.004 ug/1 | " |

TABLE I. (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

| Ref | Agent | Source | Location | Concentration | |
|---|---|---|---|---|---|
| | | | **ALKANES AND ALKENES** | | |
| 139 | DIELDRIN (cont.) | | Tombigbee R., Columbus, Miss. | 0.100 ug/1 | 1965 |
| | | | Merrimack R., Lowell, Mass. | 0.068 ug/1 | " |
| | | | Savannah R., N. Augusta, S.C. | 0.051 ug/1 | " |
| | | | Kanawha R., Winfield Dam, W. Va. | 0.045 ug/1 | " |
| | | | Rio Grande, Alamosa, Colo. | 0.029 ug/1 | " |
| | | | Tennessee R., Lenoir City, Tenn. | 0.028 ug/1 | " |
| | | | Ohio R., Cairo, Ill. | 0.028 ug/1 | " |
| | | | Mississippi R., Dubuque, Iowa | 0.024 ug/1 | " |
| | | | Missouri R., Kansas City, Kans. | 0.023 ug/1 | " |
| | | | Savannah R., Pt. Wentworth, Ga. | 0.022 ug/1 | " |
| | | | Mississippi R., W. Memphis, Ark. | 0.122 ug/1 | 1958-64 CAM |
| | | | Savannah R., Augusta, S.C. | 0.056 ug/1 | " |
| | | | Ohio R., Cincinnati, Ohio | 0.055 ug/1 | " |
| | | | Schuylkill R., Phila., Pa. | 0.035 ug/1 | " |
| | | | Mississippi R., New Orlean, La. | 0.034 ug/1 | " |
| | | | Delaware R., Phila., Pa. | 0.033 ug/1 | " |
| | | | Apalachicola R., Chattahoochie, Fla. | 0.024 ug/1 | " |
| | | | Mississippi R., Vicksburg, Miss. | 0.023 ug/1 | " |
| | | | Delta, La. | 0.022 ug/1 | " |
| | | | Savannah R., Pt. Wentworth, Ga. | 0.016 ug/1 | " |
| | | | Merrimack R., Lowell, Mass. | 0.016 ug/1 | " |

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

| Ref | Agent | Source | Location | Concentration | |
|---|---|---|---|---|---|
| | | | **ALKANES AND ALKENES** | | |
| 37 | DIELDRIN (cont.) | | Connecticut R., Northfield, Mass. | presumptive | Sept. 1965 |
| | | | Delaware R., Trenton, N.J. | 0.018 ug/l | " |
| | | | Potomac R., Washington, D.C. | 0.003 ug/l | " |
| | | | Great Falls, Md. | 0.016 ug/l | " |
| | | | Schuylkill R., Phila., Pa. | 0.014 ug/l | " |
| | | | Susquehanna R., Conowingo, Md. | 0.002 ug/l | " |
| | | | Sayre, Pa. | presumptive | " |
| | | | Apalachicola R., Chattahoochee Fla. | 0.016 ug/l | " |
| | | | Chattahoochee R., Lanett, Ala. | 0.005 ug/l | " |
| | | | Clinch R., Kingston, Tenn. | 0.007 ug/l | " |
| | | | Monongahela R., Pittsburgh, Pa. | 0.005 ug/l | " |
| | | | Ohio R., Evansville, Ind. | 0.002 ug/l | " |
| | | | Cincinnati, Ohio | 0.006 ug/l | " |
| | | | Addison, Ohio | 0.007 ug/l | " |
| | | | Maumee R., Toledo, Ohio | 0.024 ug/l | " |
| | | | Mississippi R., E. St. Louis, Ill. | 0.005 ug/l | " |
| | | | Burlington, Iowa | 0.009 ug/l | " |
| | | | Lock & Dam 3, St. Paul, Minn. | presumptive | " |
| | | | Red R. (N), Grand Forks, N.D. | 0.007 ug/l | " |
| | | | Detroit R., Detroit, Mich. | 0.018 ug/l | " |
| | | | Lake Michigan, Milwaukee, Wis. | 0.003 ug/l | " |

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

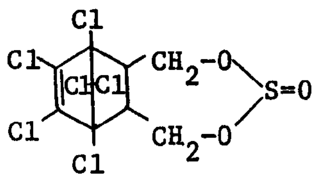
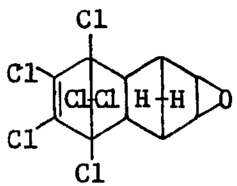
| Ref | Agent | Source | Location | Concentration | |
|---|---|---|---|---|---|
| | | | **ALKANES AND ALKENES** | | |
| 37 | DIELDRIN (cont.) | | Kansas R., DeSoto, Kans. | 0.003 ug/l | Sept. 1965 |
| | | | Missouri R., St. Louis, Mo. | 0.004 ug/l | " |
| | | | Kansas City, Kans. | 0.023 ug/l | " |
| | | | Platte R., Plattsmouth, Nebr. | 0.010 ug/l | " |
| | | | Atchafalaya R., Morgan City, La. | 0.013 ug/l | " |
| | | | Mississippi R., New Orleans, La. | 0.005 ug/l | " |
| | | | Vicksburg, Miss. | 0.004 ug/l | " |
| | | | Delta, La. | 0.004 ug/l | " |
| | | | W. Memphis, Ark. | 0.018 ug/l | " |
| | | | San Juan R., Shiprock, N. Mex. | presumptive | " |
| | | | Rio Grande, El Paso, Tex. | 0.003 ug/l | " |
| | | | Columbia R., Clatskanie, Ore. | 0.003 ug/l | " |
| | | | Willamette R., Portland, Ore. | 0.005 ug/l | " |
| | | | Sacramento R., Greens Landing, Calif. | 0.011 ug/l | " |
| | | | San Joaquin R., Vernalis, Calif. | 0.005 ug/l | " |
| | | | Waikele Stream, Hawaii | 0.018 ug/l | " |
| 448, 385 | | | 100 locations in U.S. | 0.0000-0.118 ug/l | 1965 |
| 24 | | Primary manufacturer of endrin & heptachlor Memphis, Tenn. | Memphis Wolf R., Cypress Creek Complex | | 1966-67 |

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

| Ref | Agent | Source | Location | Concentration |
|---|---|---|---|---|
| | | | **ALKANES AND ALKENES** | |
| 24 | DIELDRIN (cont.) | Pesticide formulating plants | Horseshoe Bayou and Fish Lake at Greenville, Jones Bayou at Cleveland and Sunflower R. at Clarksdale and Indianola | 1966 |
| | | | London, England (rainwater) | 3.3-17.3 ug/1 Aug. 66-July 67 |
| | | | Britain | 1.5-4.7 ug/1 |
| | | | USA (river basins) | 5.7-7.7 ug/1 1964<br>2.0-3.4 ug/1 1965 |
| 38 | | application to foliage soil and water courses | Savannah R., N. Augusta, S.C. | 1962 |
| 259 | | | Niagara R. | 0.083 ug/1 max. value August 1964<br>0.006 ug/1 min. value Sept. 1965 |
| | | | drinking water | found in 195 out of 455 samples |
| 357 | | | | 1 exceeds MPC |
| 240 | | agricultural | Missouri R. at Nebraska City Nebr. | 0.01 ug/1* March 1967<br>0.07 ug/1* June 1967<br>0.04 ug/1* May 1968 |
| | | | Platte R., Brady, Nebr. | 0.01 ug/1* Jan. 1968 |
| | | | Arkansas R. below John Martin Reservoir, Colo. | 0.01 ug/1* May 1968<br>0.01 ug/1* June 1968<br>0.01 ug/1* July 1968 |
| | | | Brazos R. at Richmond, Tex. | 0.01 ug/1* April 1968 |

* sample taken monthly from each river for two years.

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

| Ref | Agent | Source | Location | Concentration |
|---|---|---|---|---|
| | | | **ALKANES AND ALKENES** | |
| 240 | DIELDRIN (cont.) | | Colorado R., Wharton, Tex. | 0.01 ug/l* March 1967 |
| | | | Gila R. below Gillespie, Ariz. | 0.01 ug/l* Nov. 1967<br>0.02 ug/l* April 1968<br>0.01 ug/l* Sept. 1968 |
| | | | Yakima R., Kiona, Wash. | 0.01 ug/l* March 1967<br>0.02 ug/l* April 1967<br>0.04 ug/l* June 1967<br>0.01 ug/l* Oct. 67-July 68 |
| | | | Snake R., King Hill, Idaho | 0.01 ug/l* June 1967 |
| | | | Columbia R., Dalles, Ore. | 0.01 ug/l* Oct. 1966 |
| 309 | ENDOSULFAN (Thiodan)<br> | pesticide spillage | Rhine R. | |
| | ENDRIN<br> | chlorinated organic pesticide | | |
| 23 | | manufacturing plants | Mississippi R. (119 points) | High |
| 224 | | pesticide, cane farming | surface waters in Louisiana | 0.36 ug/l 1961<br>0.70 ug/l 1964 |
| 439 | | pesticides | Connecticut R. below Northfield Mass. | 0.25 ug/l Sept. 1964 |

* sample taken monthly from each river for two years.

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

| Ref | Agent | Source | Location | Concentration | |
|---|---|---|---|---|---|
| | | | **ALKANES AND ALKENES** | | |
| 439 | ENDRIN (cont.) | | St. Lawrence R., Massena, N.Y. | presumptive | Sept. 1964 |
| | | | Potomac R., Great Falls, Md. | 0.94 ug/l | " |
| | | | Shenandoah R., Berryville, Va. | 0.009 ug/l | " |
| | | | Escambia R., Century, Fla. | presumptive | " |
| | | | Susquehanna R., Sayre, Pa. | presumptive | " |
| | | | Clinch R., above Kingston, Tenn. | 0.015 ug/l | " |
| | | | Tennessee R., Bridgeport, Ala. | 0.005 ug/l | " |
| | | | Allegheny R., Pittsburgh, Pa. | presumptive | " |
| | | | Ohio R., Evansville, Ind. | " | " |
| | | | Mississippi R., E. St. Louis, Ill. | " | " |
| | | | Burlington, Iowa | 0.004 ug/l | " |
| | | | Lock & Dam 3 below St. Paul | 0.006 ug/l | " |
| | | | Rainy R., Baudette, Minn. | 0.011 ug/l | " |
| | | | Red R. (N), Grand Forks, N.D. | 0.023 ug/l | " |
| | | | Lake Michigan, Milwaukee, Wis. | 0.006 ug/l | " |
| | | | Big Horn R., Hardin, Mont. | 0.026 ug/l | " |
| | | | Kansas R., DeSoto, Kan. | 0.005 ug/l | " |
| | | | Missouri R., St. Louis, Mo. | 0.009 ug/l | " |
| | | | Bismark, N. D. | 0.009 ug/l | " |
| | | | S. Platte R., Julesburg, Colo., S. Channel | 0.014 ug/l | " |
| | | | Yellowstone R., near Sidney, Mont. | 0.021 ug/l | " |

| Ref | Agent | Source | Location | Concentration | |
|---|---|---|---|---|---|
| | | | **ALKANES AND ALKENES** | | |
| 439 | ENDRIN (cont.) | | Arkansas R., Little Rock, Ark. | 0.008 ug/1 | Sept. 1964 |
| | | | near Ponca City, Ark. | 0.014 ug/1 | |
| | | | Mississippi R., New Orleans, La. | presumptive | |
| | | | New Roads, La. | 0.023 ug/1 | |
| | | | Vicksburg, Miss. | 0.025 ug/1 | |
| | | | Delta, Miss. | presumptive | " |
| | | | W. Memphis, Ark. | " | " |
| | | | Red R. (S), Alexandria, La. | 0.013 ug/1 | " |
| | | | Denison, Tex. | 0.007 ug/1 | " |
| | | | Atchafalaya R.,Morgan City, La. | 0.018 ug/1 | " |
| | | | Verdrigis R., Nowata, Okla. | 0.013 ug/1 | " |
| | | | Colorado R., Yuma, Ariz. | presumptive | " |
| | | | Colorado R., above Parker Dam Ariz. | " | " |
| | | | Page, Ariz. | 0.012 ug/1 | |
| | | | Rio Grande, Laredo, Tex. | 0.003 ug/1 | |
| | | | El Paso, Tex. | 0.067 ug/1 | " |
| | | | Columbia R., Olatskanie, Ore. | 0.019 ug/1 | " |
| | | | Pasco, Wash. | presumptive | " |
| | | | Pend Oreille R., Albeni Fall Dam Idaho | " | " |
| | | | Willamette R., Portland, Ore. | 0.017 ug/1 | " |
| | | | Sacramento R., Greens Landing, Calif. | presumptive | " |
| | | | Bear R., above Preston, Idaho | 0.009 ug/1 | " |

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

| Ref | Agent | Source | Location | Concentration | |
|---|---|---|---|---|---|
| | | | ALKANES AND ALKENES | | |
| 37 | ENDRIN (cont.) | | Delaware R., Trenton, N.J. | 0.018 ug/1 | Sept. 1965 |
| | | | Tombigbee R., Columbus, Miss. | 0.015 ug/1 | " |
| | | | Clinch R., above Kingston, Tenn. | 0.015 ug/1 | " |
| | | | Tennessee R., Lenoir City, Tenn. | 0.009 ug/1 | " |
| | | | Kanawha R., Winfield Dam, W. Va. | presumptive | " |
| | | | Monongahela R., Pittsburgh, Pa. | 0.014 ug/1 | " |
| | | | Red R. (N), Grand Forks, N.Y. | 0.009 ug/1 | " |
| | | | Missouri R., St. Louis, Mo. | presumptive | Sept. 1965 |
| | | | Platte R., above Plattmouth, Nebr. | " | " |
| | | | S. Platte R., Julesburg, Colo. | " | " |
| | | | Atchafalaya R.,Morgan City, La. | 0.019 ug/1 | " |
| | | | Mississippi R., Delta, La. | 0.008 ug/1 | " |
| | | | W. Memphis, Ark. | 0.116 ug/1 | " |
| | | | Colorado R., Page, Ariz. | presumptive | " |
| | | | Rio Grande, below Alamosa, Colo. | 0.014 ug/1 | " |
| | | | San Joaquin R., near Vernalis, Calif. | 0.005 ug/1 | " |
| | | | Mississippi R., W. Memphis, Ark. | 0.214 ug/1 | 1958-1965 |
| | | | New Orleans, La. | 0.160 ug/1 | " |
| | | | Vicksburg, Miss. | 0.072 ug/1 | " |
| | | | Delta, La. | 0.044 ug/1 | " |
| | | | Connecticut R., Enfield Dam, Conn. | 0.023 ug/1 | " |
| | | | Atchafalaya R., Morgan City, La. | 0.015 ug/1 | " |

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

| Ref | Agent | Source | Location | Concentration | |
|---|---|---|---|---|---|
| | | | ALKANES AND ALKENES | | |
| 139 | ENDRIN (cont.) | pesticide | Connecticut R., Northfield, Mass. | 0.014 ug/1 | Sept. 1966 |
| | | | Hudson R., Narrows, N.Y. | 0.069 ug/1 | " |
| | | | Roanoke R., John Kerr Reservoir and Dam, Va. | 0.011 ug/1 | " |
| | | | Neuse R., Raleigh, N.C. | 0.008 ug/1 | " |
| | | | Savannah R., Port Wentworth, Ga. | 0.031 ug/1 | " |
| | | | N. Augusta, Ga. | 0.022 ug/1 | " |
| | | | Tennessee R., Bridgeport, Ala. | 0.004 ug/1 | " |
| | | | Lenoir City, Tenn. | 0.006 ug/1 | " |
| | | | Allegheny R., Pittsburgh, Pa. | 0.003 ug/1 | " |
| | | | Lake Superior, Duluth, Minn. | 0.022 ug/1 | " |
| | | | Mississippi R., Dubuque, Iowa | 0.003 ug/1 | " |
| | | | St. Joseph R., Benton Harbor, Mich. | 0.029 ug/1 | " |
| | | | Missouri R., Kansas City, Kan. | 0.005 ug/1 | |
| | | | N. Platte R., above Henry, Neb. | 0.009 ug/1 | " |
| | | | S. Platte R., Julesburg, Colo. | 0.063 ug/1 | " |
| | | | Atchafalaya R., Morgan City, La. | 0.006 ug/1 | " |
| | | | Arkansas .., Fort Smith, Ark. | 0.004 ug/1 | " |
| | | | Mississippi R., New Orleans, La. | 0.011 ug/1 | " |
| | | | Vicksburg, Miss. | 0.012 ug/1 | " |
| | | | Delta, La. | 0.014 ug/1 | " |
| | | | Bear R., Preston, Idaho | 0.019 ug/1 | " |

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

| Ref | Agent | Source | Location | Concentration | |
|---|---|---|---|---|---|
| | | | **ALKANES AND ALKENES** | | |
| 139 | ENDRIN (cont.) | | Sacramento R., Greens Landing, Calif. | 0.005 ug/1 | " |
| | | | Clearwater R., Lewiston, Idaho | 0.015 ug/1 | " |
| | | | Columbia R., Bonneville, Ore. | 0.009 ug/1 | " |
| | | | Willamette R., Portland, Ore. | presumptive | |
| | | | Mississippi R. | up to .214 ug/1 | 1963 |
| | | | | 0.015-0.116 ug/1 | 1964 |
| 42 | | agricultural | Missouri R., Nebraska City, Nebr. | 0.035 ug/1* | May 1966 |
| | | | Colorado R., Wharton, Tex. | 0.005 ug/1* | Oct. 1965 |
| | | | Rio Grande below Anzalduas Dam, Tex. | 0.010 ug/1* | Feb. 1966 |
| | | | | 0.040 ug/1* | May 1966 |
| | | | | 0.025 ug/1* | June 1966 |
| | | | Colorado R. (Yuma Main Canal) Yuma, Ariz. | 0.015 ug/1* | June 1966 |
| | | | Snake R., King Hill, Idaho | 0.025 ug/1* | Feb. 1966 |
| 269 | | commercial orchard | Knights Creek (Dunn County) Wis. | | June 1966 |
| | | | Mississippi R., Cape Girardeau, Mo. | 0.013 ug/1 | " |
| | | | Allegheny R., Pittsburgh, Pa. | 0.012 ug/1 | " |
| | | | Rio Grande, Brownsville, Tex. | 0.011 ug/1 | " |
| | | | Mississippi R., New Road, La. | 0.010 ug/1 | " |
| 447 | | | Mississippi and Sacramento R. | 0.500 ug/1 | |
| 448 | | | Analysis of water in 100 locations in the U.S. | 0.0-0.94 ug/1 | 1966 |

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

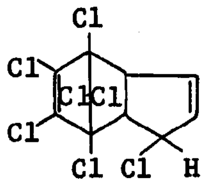
| Ref | Agent | Source | Location | Concentration | |
|---|---|---|---|---|---|
| | | | ALKANES AND ALKENES | | |
| 24 | ENDRIN (cont.) | primary manufacturer of endrin and heptachlor, Memphis, Tenn. | Memphis Wolf R., Cypress Creek Complex | | 1966-67 |
| | | pesticides formulating plants | Horseshoe Bayou and Fish Lake at Greenville, Jones Bayou at Cleveland and Sunflower R. at Clarksdale and Indianola | | |
| 23 | HEPTACHLOR | pesticide | 119 point along Mississippi R. | High concentration near plants which manufacture endrin and heptachlor | |
| 439 |  | | Delaware R., Martin's Creek, Pa. | presumptive | Sept. 1964 |
| | | | Potomac R., Washington, D.C. | " | " |
| | | | Escambia R., Century, Fla. | " | " |
| | | | Roanoke R., John H. Kerr Reservoir & Dam, Va. | " | " |
| | | | Savannah R., N. Augusta, S.C. | " | " |
| | | | Clinch R., Kingston, Tenn. | " | " |
| | | | Maumee R., Toledo, Ohio | " | " |
| | | | Red R. (N), Grand Forks, N.D. | " | " |
| | | | St. Claire R., Port Huron, Mich. | " | " |
| | | | Missouri R., Kansas City, Kan. | " | " |
| | | | S. Platte R., Julesburg, Colo. (N. Channel) | " | " |
| | | | Arkansas R., Ponca City, Okla. | " | " |

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

| Ref | Agent | Source | Location | Concentration | |
|---|---|---|---|---|---|
| | | | **ALKANES AND ALKENES** | | |
| 439 | HEPTACHLOR (cont.) | | Mississippi R., New Orleans, La. | presumptive | Sept. 1964 |
| | | | W. Memphis, Ark. | " | " |
| | | | Colorado R., Boulder City, Nev. | " | " |
| | | | Spokane R., Post Falls Dam, Idaho | " | " |
| 310, 42 | | agricultural | Missouri R. at Nebraska City, Nebr. | 0.005 ug/1* | Aug. 1966 |
| | | | Arkansas R. below John Martin Reservoir | 0.005 ug/1* | Oct. 1965 |
| | | | Arkansas R., Reservoir, Colo. | 0.010 ug/1* | May 1966 |
| | | | | 0.005 ug/1* | July 1966 |
| | | | at Van Buren, Ark. | 0.005 ug/1* | March 1966 |
| | | | Brazos R. at Richmond, Tex. | 0.015 ug/1* | June 1966 |
| | | | Colorado R., at Wharton Tex. | 0.005 ug/1* | Oct. 1965 |
| | | | Rio Grande below Anzalduas Dam, Tex. | 0.010 ug/1* | Oct. 1965 |
| | | | | 0.015 ug/1* | Dec. 1965 |
| | | | | 0.005 ug/1* | Jan. 1966 |
| | | | | 0.015 ug/1* | May 1966 |
| | | | Yakima R. at Kiona, Wash. | 0.005 ug/1* | July 1966 |
| | | | Snake R. at King Hill, Idaho | 0.005 ug/1* | Feb. 1966 |
| 139 | | | Missouri R., Kansas City, Kans. | 0.004 ug/1 | Sept. 1966 |
| 37 | | | Merrimack R., Lowell, Mass. | presumptive | Sept. 1965 |
| | | | St. Lawrence R., Massena, N.Y. | 0.031 ug/1 | " |
| | | | Delaware R., Martins Creek, Pa. | 0.025 ug/1 | " |

* samples taken from each river monthly for one year

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

| Ref | Agent | Source | Location | Concentration | |
|---|---|---|---|---|---|
| | | | ALKANES AND ALKENES | | |
| 37 | HEPTACHLOR (cont.) | | Potomac R., Great Falls, Md. | presumptive | Sept. 1965 |
| | | | Savannah R., Pt. Wentworth, Ga. | " | " |
| | | | Tennessee R., Lenoir City, Tenn. | 0.020 ug/1 | " |
| | | | Kanawha R., Winfield Dam, W. Va. | presumptive | " |
| | | | Ohio R., Cincinnati, Ohio | 0.024 ug/1 | " |
| | | | Addison, Ohio | presumptive | " |
| | | | Wabash R., New Harmony, Ind. | 0.009 ug/1 | " |
| | | | Illinois R., Peoria, Ill. | presumptive | " |
| | | | Mississippi R., Burlington, Iowa | " | " |
| | | | Dubuque, Iowa | 0.048 ug/1 | " |
| | | | Red R. (N), Grand Forks, N.D. | 0.115 ug/1 | " |
| | | | Detroit R., Detroit, Mich. | 0.015 ug/1 | " |
| | | | Missouri R., St. Louis, Mo. | 0.020 ug/1 | " |
| | | | Kansas City, Kans. | 0.008 ug/1 | " |
| | | | Atchafalaya R., Morgan City, La. | 0.010 ug/1 | " |
| | | | Colorado R., Page, Ariz. | presumptive | " |
| | | | San Juan R., Shiprock, N. Mex. | 0.012 ug/1 | " |
| | | | Rio Grande, Brownsville, Tex. | 0.035 ug/1 | " |
| | | | Alamosa, Colo. | presumptive | " |
| | | | Sabine R., Ruliff, Tex. | " | " |
| | | | Sacramento R., Greens Landing, Calif. | 0.020 ug/1 | " |
| | | | Atachfalaya R., Morgan City, La. | 0.002 ug/1 | 1958-65* |

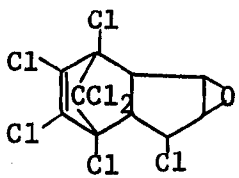
* Highest level during time studied

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

| Ref | Agent | Source | Location | Concentration | |
|---|---|---|---|---|---|
| | | | ALKANES AND ALKENES | | |
| 37 | HEPTACHLOR (cont.) | | Mississippi R., W. Memphis, Ark. | presumptive | 1958-65 |
| | | | Potomac R., Great Falls, Md. | " | " |
| | | | Detroit R., Detroit, Mich. | " | " |
| 240 | | | Missouri R., at Nebraska City | 0.01 ug/l* | March 1967 |
| | | | | 0.01 ug/l* | April 1967 |
| | | | | 0.04 ug/l* | June 1967 |
| | | | Arkansas R. below John Martin Reservoir, Colo. | 0.01 ug/l* | Feb. 1967 |
| | | | | 0.02 ug/l* | June 1967 |
| | | | at van Buren, Ark. | 0.01 ug/l* | March 1967 |
| | | | | 0.01 ug/l* | April 1967 |
| | | | | 0.01 ug/l* | May 1967 |
| | | | Brazos R. at Richmond, Tex. | 0.02 ug/l* | Feb. 1967 |
| | | | | 0.02 ug/l* | June 1967 |
| | | | Colorado R., Wharton, Tex. | 0.01 ug/l* | Jan. 1967 |
| | | | Rio Grande below Anzalduas Dam, Tex. | 0.01 ug/l* | Feb. 1967 |
| | | | | 0.01 ug/l* | March 1967 |
| | | | | 0.02 ug/l* | June 1967 |
| | | | Colorado R. (Yuma Main Canal), Yuma, Ariz. | 0.01 ug/l* | March 1967 |
| | | | Sacramento R. at Verona, Calif. | 0.02 ug/l* | Feb. 1967 |
| | | | Yakima R., Kiona, Wash. | 0.01 ug/l* | Oct. 1966-April 1967 |
| | | | Snake R., King Hill, Idaho | 0.02 ug/l* | Feb. 1967 |
| | | | | 0.01 ug/l* | March 1967 |
| | | | | 0.04 ug/l* | April 1967 |

* samples taken monthly from each river for two years.

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

| Ref | Agent | Source | Location | Concentration |
|---|---|---|---|---|
| | | | **ALKANES AND ALKENES** | |
| 240 | HEPTACHLOR (cont.) | | Columbia R., Dalles, Ore. | 0.01 ug/1* Jan. 1967<br>0.01 ug/1* Feb. 1967<br>0.02 ug/1* March 1967<br>0.01 ug/1* June 1967 |
| 357 | | | drinking water | 50 out of 125 samples - none over MPC |
| 24 | | manufacturer of endrin and heptachlor | Memphis Wolf R., Cypress Creek Complex | 1966-1967 |
| | | pesticide formulating plant | Horseshoe Bayou and Fish Lake at Greenville, Jones Bayou at Cleveland and the Sunflower R. at Clarksdale and Indianola | 1966 |
| 440 | HEPTACHLOR EPOXIDE | pesticide | rain water 0.15 in. Cincinnati roof of Taft Center | 0.04 ug/1 |
| 23 |  | | 119 points along Mississippi R. | High conc. near plants manufacturing endrin and heptachlor |
| 439 | | | None detected in any river tested | Sept. 1964 |
| 42 | | agricultural | Missouri R. at Nebraska City, Nebr. | 0.005 ug/1* May 1966<br>0.005 ug/1* July 1966 |
| | | | Arkansas R. below John Martin Reservoir, Colo. | 0.005 ug/1* Oct. 1965<br>0.005 ug/1* Feb. 1966<br>0.005 ug/1* July 1966 |

* samples taken monthly from each river for one year.

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

| Ref | Agent | Source | Location | Concentration |
|---|---|---|---|---|
| | | | ALKANES AND ALKENES | |
| 42 | HEPTACHLOR EPOXIDE (cont.) | | Arkansas R. at van Buren, Ark. | 0.005 ug/1* March 1966 |
| | | | Brazos R. at Richmond, Tex. | 0.005 ug/1* Feb. 1966<br>0.005 ug/1* April 1966 |
| | | | Colorado R. at Wharton, Tex. | 0.005 ug/1* Oct. 1965<br>0.005 ug/1* Jan. 1966 |
| | | | Rio Grande below Anzalduas Dam, Tex. | 0.005 ug/1* Oct. 1965<br>0.010 ug/1* March 1966 |
| | | | Colorado R. (Yuma Main Canal), Yuma, Ariz. | 0.005 ug/1* Jan. 1966 |
| 42 | | pesticide | Sacramento R. at Verona, Calif. | 0.005 ug/1* Jan. 1966<br>0.005 ug/1* March 1966 |
| | | | Yakima R. at Kiona, Wash. | 0.005 ug/1* March 1966<br>0.005 ug/1* July 1966 |
| | | | Snake R. at King Hill, Idaho | 0.005 ug/1* Jan. 1966 |
| | | | Columbia R. at Dalles, Ore. | 0.005 ug/1* Jan. 1966 |
| 139 | | | Connecticut R., Northfield, Mass. | 0.001 ug/1 Sept. 1966 |
| | | | Hudson R., Narrows, N.Y. | 0.007 ug/1 " |
| | | | Schuylkill R., Philadelphia, Pa. | presumptive " |
| | | | Shenandoah R., Berryville, Va. | " " |
| | | | Neuse R., Raleigh, N.C. | 0.008 ug/1 " |
| | | | Chattahoochie R., Lanett, Ala. | 0.004 ug/1 " |
| | | | Savannah R., Pt. Wentworth, Ga. | 0.006 ug/1 " |
| | | | Tennessee R., Bridgeport, Ala. | 0.001 ug/1 " |

* samples taken monthly for one year from each river.

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

| Ref | Agent | Source | Location | Concentration | |
|---|---|---|---|---|---|
| | | | **ALKANES AND ALKENES** | | |
| 139 | HEPTACHLOR EPOXIDE (cont.) | | Kanawha R., Winfield Dam, W. Va. | presumptive | Sept. 1966 |
| | | | St. Lawrence R., Massena, N.Y. | 0.003 ug/1 | " |
| | | | Lake Erie, Buffalo, N.Y. | presumptive | " |
| | | | Lake Superior, Duluth, Minn. | 0.010 ug/1 | " |
| | | | Mississippi R., Cape Girardeau, Mo. | 0.002 ug/1 | " |
| | | | St. Paul, Minn. | 0.004 ug/1 | " |
| | | | Fox R., Green Bay, Wis. | presumptive | " |
| | | | N. Platte R., Henry, Nebr. | 0.004 ug/1 | " |
| | | | Platte R., Plattsmouth, Nebr. | presumptive | " |
| | | | S. Platte R., Julesburg, Colo. | 0.019 ug/1 | " |
| | | | Mississippi R., New Orleans, La. | 0.003 ug/1 | " |
| | | | Delta, La. | 0.007 ug/1 | " |
| | | | Trinity R., Livingston, Tex. | presumptive | " |
| | | | Bear R., Preston, Idaho | 0.005 ug/1 | " |
| 37 | | | Lake Erie, Buffalo, N.Y. | 0.002 ug/1 | Sept. 1965 |
| | | | Lt. Lawrence R., Massena, N.Y. | 0.017 ug/1 | " |
| | | | Delaware R., Martin's Creek, Pa. | presumptive | " |
| | | | Potomac R., Washington, D.C. | 0.003 ug/1 | " |
| | | | Great Falls, Md. | presumptive | " |
| | | | Schuylkill R., Philadelphia, Pa. | " | " |
| | | | Tombigbee R., Columbus, Miss. | " | " |
| | | | Tennessee R., Lenoir, Tenn. | " | " |

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

| Ref | Agent | Source | Location | Concentration | |
|---|---|---|---|---|---|
| | | | **ALKANES AND ALKENES** | | |
| 37 | HEPTACHLOR EPOXIDE (cont.) | | Ohio R., Cairo, Ill. | 0.002 ug/1 | Sept. 1965 |
| | | | Addison, Ohio | 0.020 ug/1 | " |
| | | | Wabash R., New Harmony, Ind. | 0.012 ug/1 | " |
| | | | Mississippi R., Burlington, Iowa | presumptive | " |
| | | | Dubuque, Iowa | 0.067 ug/1 | " |
| | | | Red R. (N), Grand Forks, N.D. | 0.020 ug/1 | " |
| | | | Detroit R., Detroit, Mich. | presumptive | " |
| | | | Missouri R., St. Louis, Mo. | 0.007 ug/1 | " |
| | | | Kansas City, Kan. | 0.014 ug/1 | " |
| | | | Platte R., Plattsmouth, Nebr. | 0.002 ug/1 | " |
| | | | Yellowstone R., Sidney, Mont. | presumptive | " |
| | | | Mississippi R., W. Memphis, Ark. | 0.020 ug/1 | " |
| | | | Colorado R., Page, Ariz. | presumptive | " |
| | | | Rio Grande, Brownsville, Tex. | " | " |
| | | | Sabine R., Ruliff, Tex. | " | " |
| | | | Yakima R., Richland, Wash. | 0.002 ug/1 | " |
| | | | Sacramento R., Greens Landing, Calif. | 0.019 ug/1 | " |
| | | | Mississippi R., W. Memphis, Ark. | 0.020 ug/1 | 1958-65* |
| | | | Missouri R., St. Louis, Mo. | 0.002 ug/1 | " |
| | | | Mississippi R., New Orleans, La. | 0.001 ug/1 | " |
| | | | St. Lawrence R., Massena, N.Y. | 0.001 ug/1 | " |
| | | | Potomac R., Great Falls, Md. | <0.001 ug/1 | " |

* Highest levels during time studied

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

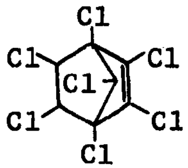
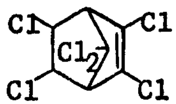
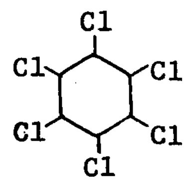
| Ref | Agent | Source | Location | Concentration | |
|---|---|---|---|---|---|
| | | | **ALKANES AND ALKENES** | | |
| 240 | HEPTACHLOR EPOXIDE (cont.) | | Missouri R. at Nebraska City, Nebr. | 0.02 ug/1 | June 1967 |
| | | | Yakima R. at Kiona, Wash. | 0.04 ug/1 | June 1967 |
| 23, 24 | HEPTACHLORONORBORNENE  | close to plants manufacturing endrin and heptachlor | 126 places in Mississippi R. between Tiptonville, Tenn. and New Orleans, La. | High | |
| | | manufacturers of endrin and heptachlor | Memphis Wolf R., Cypress Creek Complex | | |
| | | | below W. Memphis, Ark. | no residues in test sensitive enough to detect 0.1 mg/1 | |
| 23 | HEXACHLORONORBORNADIENE | close to plants manufacturing endrin and heptachlor | 126 places in Mississippi R. between Tiptonville, Tenn. and New Orleans, La. | High | |
| 24 |  | manufacturers of endrin and heptachlor | Memphis Wolf R., Cypress Creek Complex | | |
| | | pesticide formulating plants | Horseshoe Bayou and Fish Lake at Greenville, Jones Bayou at Cleveland, and the Sunflower R. at Clarksdale and Indianola | | |
| 23 | ISODRIN (endo-endo isomer of aldrin) | close to plants manufacturing endrin and heptachlor | 126 places in Mississippi R. between Tiptonville, Tenn. and New Orleans, La. | High | |

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

| Ref | Agent | Source | Location | Concentration | |
|---|---|---|---|---|---|
| | | | **ALKANES AND ALKENES** | | |
| 24 | ISODRIN (cont.) | manufacturers of endrin and heptachlor | Memphis Wolf R., Cypress Creek Complex | | |
| 42 | LINDANE ( γ-BHC)  | pesticide | | | |
| | | agricultural | Missouri R. at Nebraska City, Nebr. | 0.005 ug/l* | Nov. 1965- May 1966 |
| | | | Arkansas R. below John Martin Reservoir, Colo. | 0.005 ug/l* | Oct. 1965 |
| | | | | 0.010 ug/l* | Nov. 1965 |
| | | | | 0.005 ug/l* | Dec. 1965 |
| | | | | 0.010 ug/l* | Feb. 1966 |
| | | | | 0.005 ug/l* | March 1966 |
| | | | | 0.010 ug/l* | April 1966 |
| | | | | 0.010 ug/l* | May 1966 |
| | | | at van Buren, Ark. | 0.005 ug/l* | Dec. 1965 |
| | | | | 0.005 ug/l* | Feb. 1966 |
| | | | | 0.010 ug/l* | March 1966 |
| | | | | 0.005 ug/l* | April 1966 |
| | | | | 0.005 ug/l* | May, 1966 |
| | | | Brazos R. at Richmond, Tex. | 0.005 ug/l* | Feb. 1966 April 1966 May 1966 |
| | | | Colorado R. at Wharton, Tex. | 0.010 ug/l* | Jan. 1966 |
| | | | | 0.005 ug/l* | Feb. 1966 |
| | | | | 0.020 ug/l* | April 1966 |
| | | | Rio Grande below Anzalduas Dam, Tex. | 0.010 ug/l* | Oct. 1965 |

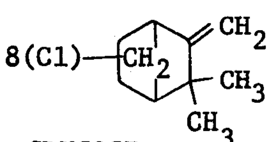
* sample from each river taken monthly for two years.

TABLE I. (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

| Ref | Agent | Source | Location | Concentration | |
|---|---|---|---|---|---|
| | | | ALKANES AND ALKENES | | |
| 42 | LINDANE (cont.) | | Rio Grande below Anzalduas Dam, Tex. | 0.005 ug/1* | Nov. 1965 |
| | | | | 0.010 ug/1* | Dec. 1965 |
| | | | | 0.005 ug/1* | Jan. 1966 |
| | | | | 0.005 ug/1* | Feb. 1966 |
| | | | | 0.010 ug/1* | March 1966 |
| | | | | 0.010 ug/1* | May 1966 |
| | | | | 0.005 ug/1* | Aug. 1966 |
| | | | Colorado R. (Yuma Main Canal) at Yuma, Ariz. | 0.005 ug/1* | March 1966 |
| | | | | 0.005 ug/1* | April 1966 |
| | | | | 0.005 ug/1* | May 1966 |
| | | | Sacramento R. at Verona, Calif. | 0.005 ug/1* | March 1966 |
| | | | | 0.005 ug/1* | April 1966 |
| | | | | 0.005 ug/1 | May 1966 |
| | | | Yakima R. at Kiona, Wash. | 0.010 ug/1* | March 1966 |
| | | | | 0.010 ug/1* | April 1966 |
| | | | | 0.005 ug/1* | May 1966 |
| | | | | 0.005 ug/1* | July 1966 |
| | | | Snake R., King Hill, Idaho | 0.005 ug/1* | April 1966 |
| | | | Columbia R., Dalles, Ore. | 0.005 ug/1* | Feb. 1966 |
| | | | | 0.005 ug/1* | March 1966 |
| | | | | 0.005 ug/1* | April 1966 |
| | | | | 0.020 ug/1* | Aug. 1966 |
| 447 | | cotton growing areas | river water and municipal water supply, Alabama | 0.015-0.760 ug/1 | |
| 259 | | | Lake Champlain | 0.015 ug/1 | Oct. 1965 |

* samples from each river taken monthly for period of one year.

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

| Ref | Agent | Source | Location | Concentration | |
|---|---|---|---|---|---|
| | | | ALKANES AND ALKENES | | |
| 240 | LINDANE (cont.) | | Arkansas R. below John Martin Reservoir, Colo. | 0.01 ug/1* | July 1968 |
| | | | Brazos R. at Richmond, Tex. | 0.02 ug/1* | May 1967 |
| | | | | 0.01 ug/1* | Dec. 1967 |
| | | | Rio Grande below Ansalduas Dam, Tex. | 0.01 ug/1* | June 1967 |
| | | | Pecos R. near Artesia, N. Mex. | 0.01 ug/1* | Dec. 1967 |
| | | | Gila R. below Gillespie Dam, Ariz. | 0.02 ug/1* | Nov. 1967 |
| | | | | 0.02 ug/1* | Dec. 1967 |
| | | | | 0.02 ug/1* | Jan. 1968 |
| | | | | 0.01 ug/1* | March 1968 |
| | | | | 0.01 ug/1* | April 1968 |
| | | | | 0.01 ug/1* | May 1968 |
| | | | | 0.01 ug/1* | Sept. 1968 |
| | | | Yakima R. at Kiona, Wash. | 0.01 ug/1* | Oct. 1966 |
| 24 | | pesticide formulating plant | Horseshoe Bayou and Fish Lake at Greenville, Jones Bayou at Cleveland and Sunflower R. at Clarksdale and Indianola | | 1966 |
| 448 | TOXAPHENE | | water supply in cotton growing areas | 0.0004 mg/1 | |
| 259 |  | | Mohawk R. | 0.00075 mg/1 | |
| 157 | GLUCOSE $C_6H_{12}O_6$ | | Lake Erken, Sweden | less than 6 ug/1 all year | |

* samples from each river taken monthly for two years.

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

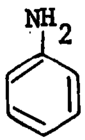
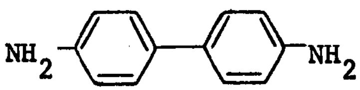
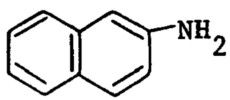
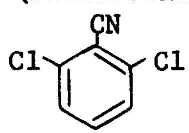
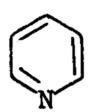
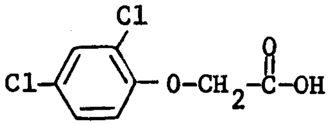
| Ref | Agent | Source | Location | Concentration | |
|---|---|---|---|---|---|
| | | | **AMINES** | | |
| **ALIPHATIC** | | | | | |
| 288 | DIETHYLAMINE $(C_2H_5)_2NH$ | sewage from herbicides and synthetic rubber production | U.S.S.R. - river water sewage | up to 1000 mg/1 | 1967 |
| | DIMETHYLAMINE $(CH_3)_2NH$ | sewage from herbicides and synthetic rubber production | U.S.S.R. - river water sewage | up to 1000 mg/1 | 1967 |
| | ETHYLAMINE $C_2H_5NH_2$ | sewage from herbicides and synthetic rubber production | U.S.S.R. - river water sewage | up to 1000 mg/1 | 1967 |
| | METHYLAMINE $CH_3NH_2$ | sewage from herbicides and synthetic rubber production | U.S.S.R. - river water sewage | up to 1000 mg/1 | 1967 |
| **AROMATIC** | | | | | |
| 180 | ANILINE (Phenyl-amine)  | dye, varnish, rubber, chemical and gas-plant wastes | Kama R. (foreign) | 0-traces | |
| 399 | BENZIDINE  | dye and pigment factories | Sumida R. (Japan), Senjyu Bridge | 0.257 mg/1 | Dec. 1964 |
| | | | Shirahig Bridge | 0.205 mg/1 | |
| | | | Odai Bridge | 0.439 mg/1 | |

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

| Ref | Agent | Source | Location | Concentration | |
|---|---|---|---|---|---|
| | | | **AMINES** | | |
| 399 | NAPHTHYLAMINE  | dye and pigment factories | Sumida R. (Japan) Odai Bridge | 0.290 mg/l* | 1964 |
| | | | Senjyu Bridge | 0.387 mg/l* | " |
| | | | Shirahige Bridge | 0.275 mg/l* | " |
| | **NITRILES** | | | | |
| 110 | 2,6-DICHLOROBENZONITRILE (Dichlobenil)  | pesticide | irrigation waters in Colo. | 8.82 ug/l | |
| | **HETEROCYCLICS** | | | | |
| 87 | PYRIDINE  | coke chemical plant's waste water | Zaporozh'e U.S.S.R. | 9.6 mg/l | |
| | | | Dnepropetrovsk U.S.S.R. | 17.4 mg/l | |
| | | | Ol'Khov U.S.S.R. | 5.0 mg/l | |
| | | waste water of gas generating plants | Gomel glass plant U.S.S.R. | 22.4 mg/l | |
| | | | Dulev porcelain plant | 15.0 mg/l | |
| | | | Gus-Khrustal glass plant | 23.4 mg/l | |
| | | | Tula "Podzemgas" Station | 15.6 mg/l | |
| | | | **ORGANIC ACIDS** | | |
| | **CARBOXYLIC** | | | | |
| 273 | ACETIC ACID $CH_3COOH$ | beet sugar, winery, vinegar, soured-fruit, wood distillation, textile, or chemical waste | Ohio R. | 25.2 ug/l | |
| | | | Lake Erken, Sweden | <10 ug/l | |

* naphthylamine and benzidine

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

| Ref | Agent | Source | Location | Concentration | |
|---|---|---|---|---|---|
| | | | **ORGANIC ACIDS** | | |
| 273 | BUTYRIC ACID (Butyrate)<br>$CH_3CH_2CH_2COOH$ | used to decalcify hides for varnishes mfg. of esters in artificial flavorings | Ohio R. | 0.18 ug/1 | |
| 273 | CAPROIC ACID<br>$CH_3(CH_2)_4COOH$ | | Ohio R. | 2.5 ug/1 | |
| 42 | 2,4-I | agricultural pesticide | | not present in rivers studied 1965-1966 taken each month | |
| 240 |  | agricultural | Missouri R. at Nebraska City, Nebr. | 0.07 ug/1* | Dec. 1967 |
| | | | | 0.12 ug/1* | May 1968 |
| | | | | 0.08 ug/1* | June 1968 |
| | | | Yellowstone R. near Billings, Mont. | 0.02 ug/1* | May 1968 |
| | | | | 0.07 ug/1* | Aug. 1968 |
| | | | James R. at Huron, S. D. | 0.07 ug/1* | Oct. 1967 |
| | | | | 0.08 ug/1* | April 1968 |
| | | | | 0.11 ug/1* | June 1968 |
| | | | | 0.35 ug/1* | July 1968 |
| | | | | 0.19 ug/1* | Oct. 1968 |
| | | | Arkansas R. below John Martin Reservoir, Colo. | 0.04 ug/1* | May 1968 |
| | | | | 0.24 ug/1* | June 1968 |

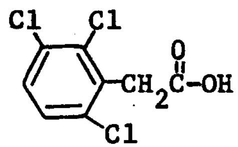
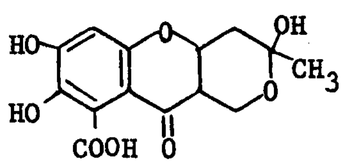
* samples taken every month for 1-2 years.

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

| Ref | Agent | Source | Location | Concentration | |
|---|---|---|---|---|---|
| | | | ORGANIC ACIDS | | |
| 240 | 2,4-D (cont.) | | Arkansas R. at van Buren, Ark. | 0.06 ug/1* | Aug. 1967 |
| | | | | 0.13 ug/1* | Dec. 1967 |
| | | | | 0.05 ug/1* | April 1968 |
| | | | | 0.03 ug/1* | May 1968 |
| | | | | 0.03 ug/1* | June 1968 |
| | | | | 0.11 ug/1* | Aug. 1968 |
| | | | Canadian R. near Whitefield, Okla. | 0.06 ug/1* | April 1968 |
| | | | | 0.01 ug/1* | May 1968 |
| | | | Brazos R. at Richmond, Tex. | 0.01 ug/1* | Sept. 1967 |
| | | | | 0.06 ug/1* | April 1968 |
| | | | | 0.07 ug/1* | May 1968 |
| | | | | 0.11 ug/1* | July 1968 |
| | | | Colorado R. at Wharton, Tex. | 0.05 ug/1* | April 1968 |
| | | | Green R. at Green River, Utah | 0.06 ug/1* | Sept. 1968 |
| | | | Humboldt R. near Rye Patch, Nev. | 0.08 ug/1* | Aug. 1968 |
| | | | Sacramento R., Verona, Calif. | 0.03 ug/1* | May 1968 |
| | | | Yakima R., Kiona, Wash. | 0.18 ug/1* | Aug. 1967 |
| | | | | 0.30 ug/1* | Sept. 1967 |
| | | | | 0.05 ug/1* | April 1968 |
| | | | | 0.24 ug/1* | May 1968 |
| | | | | 0.33 ug/1* | June 1968 |
| | | | | 0.21 ug/1* | July 1968 |
| | | | | 0.29 ug/1* | Aug. 1968 |
| | | | Snake R., King Hill, Idaho | 0.14 ug/1* | Aug. 1967 |
| | | | | 0.06 ug/1* | Oct. 1967 |
| | | | | 0.05 ug/1* | June 1968 |
| | | | | 0.10 ug/1* | July 1968 |

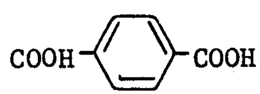
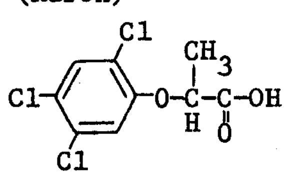
* all samples taken every month for 1-2 years.

TABLE L (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

| Ref | Agent | Source | Location | Concentration |
|---|---|---|---|---|
| | | | **ORGANIC ACIDS** | |
| 240 | 2,4-D | | Columbia R., Dalles, Ore. | 0.02 ug/1* Nov. 1967<br>0.03 ug/1* May 1968 |
| | **CARBOXYLIC** | | | |
| 110 | FENAC<br> | pesticide | irrigation water, Colo. | 8.82 mg/1 |
| 273 | FORMIC ACID (Formate)<br>HCOOH | decalcifier, reducer in dying wool fast colors, dehairing and pulping hides, tanning, sizing rubber processing | Ohio R. | 24.6 ug/1 |
| 31 | FULVIC ACID<br> | | 10 samples from colored water | 87.1% of total organics |
| 273 | ISOBUTYRIC ACID<br>$(CH_3)_2CHCOOH$ | | Ohio R. | 0.3 ug/1 |

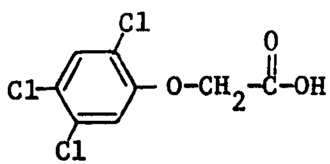
* all samples taken every month for 1-2 years.

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

| Ref | Agent | Source | Location | Concentration | |
|---|---|---|---|---|---|
| | | | **ORGANIC ACIDS** | | |
| 273 | ISOVALERIC ACID<br>$(CH_3)_2CHCH_2COOH$ | | Ohio R. | 0.22 ug/l | |
| 273 | PROPIONIC ACID<br>(Propionate)<br>$CH_3CH_2COOH$ | manufacturing of ester solvents fruit flavors, perfume | Ohio R. | 0.38 ug/l | |
| 325 | TEREPHTHALIC ACID<br> | production of Laosan waters, fibers | industrial reservoir | 0.1 mg/l | |
| 273 | VALERIC ACID<br>$CH_3CH_2CH_2CH_2COOH$ | | Ohio R. | 0.16 ug/l | |
| 42 | SILVEX<br>(Kuron) | pesticide | none found in western rivers studied 1966 | | |
| 240 |  | | Brazos R., Richmond, Tex. | 0.02 ug/l* | Nov. 1966 |
| | | | | 0.02 ug/l* | Aug. 1967 |
| | | | | 0.02 ug/l* | Sept. 1967 |
| | | | Colorado R., Wharton, Tex. | 0.01 ug/l* | Feb. 1968 |

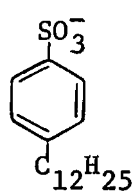
* collected monthly for two years.

TABLE I (CONT). - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

| Ref | Agent | Source | Location | Concentration | |
|---|---|---|---|---|---|
| | | | **ORGANIC ACIDS** | | |
| 240 | SILVEX (cont.) | | Humboldt R., Rye Patch, Nev. | 0.05 ug/1* | Oct. 1967 |
| | | | | 0.02 ug/1* | March 1968 |
| | | | | 0.03 ug/1* | April 1968 |
| | | | | 0.02 ug/1* | April 1968 |
| | | | | 0.01 ug/1* | June 1968 |
| | | | | 0.21 ug/1* | July 1968 |
| | | | | 0.13 ug/1* | Aug. 1968 |
| | | | | 0.12 ug/1* | Sept. 1968 |
| | | | Sacramento R., Verona, Calif. | 0.01 ug/1* | Oct. 1967 |
| | | | Columbia R., Dalles, Ore. | 0.03 ug/1* | Oct. 1966 |
| 440 | 2,4,5-T | | roof of Taft Center, Cincinnati Ohio (rainwater) | 0.04 mg/1 | |
| 42 |  | | Western Rivers studied 6 mos. 1966 | none present | |
| | | | Arkansas R. below John Martin Reservoir, Colo. | 0.02 ug/1* | Nov. 1967 |
| | | | | 0.02 ug/1* | July 1968 |
| | | | van Buren, Ark. | 0.02 ug/1* | Sept. 1967 |
| | | | | 0.01 ug/1* | Nov. 1967 |
| | | | | 0.04 ug/1* | Dec. 1967 |
| | | | | 0.02 ug/1* | March 1968 |
| | | | | 0.02 ug/1* | April 1968 |
| | | | | 0.02 ug/1* | June 1968 |
| | | | | 0.02 ug/1* | July 1968 |
| | | | | 0.04 ug/1* | Aug. 1968 |
| | | | Canadian R., Whitefield, Okla. | 0.04 ug/1* | Dec. 1967 |
| | | | | 0.03 ug/1* | Feb. 1968 |
| | | | | 0.02 ug/1* | March 1968 |

* samples taken monthly for 1-2 years.

TABLE I (CONT). - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

| Ref | Agent | Source | Location | Concentration | |
|---|---|---|---|---|---|
| | | | ORGANIC ACIDS | | |
| 240 | 2,4,5-T (cont.) | | Canadian R., Whitefield, Okla. | 0.04 ug/1* | April 1968 |
| | | | | 0.03 ug/1* | May 1968 |
| | | | | 0.03 ug/1* | July 1968 |
| | | | | 0.03 ug/1* | Sept. 1968 |
| | | | Brazos R., Richmond, Tex. | 0.02 ug/1* | Aug. 1967 |
| | | | | 0.06 ug/1* | Sept. 1967 |
| | | | | 0.02 ug/1* | Oct. 1967 |
| | | | | 0.01 ug/1* | July 1968 |
| | | | Colorado R., Wharton, Tex. | 0.01 ug/1* | April 1968 |
| | | | Pecos R., Artesia, N. Mex. | 0.05 ug/1* | April 1968 |
| | | | Green R., Green River, Utah | 0.07 ug/1* | Sept. 1968 |
| | | | Sacramento R., Verona, Calif. | 0.01 ug/1* | Oct. 1967 |
| | | | | 0.03 ug/1* | Dec. 1967 |
| | | | | 0.01 ug/1* | Feb. 1968 |
| | | | Yakima R., Kiona, Wash. | 0.01 ug/1* | Sept. 1967 |
| SULFONICS | | | | | |
| 69 | ABS (Alkyl benzene sulfonate) | detergent, industrial waste | | 0.6 mg/1 | |
| 243 |  | surfactants | Italian surface water | 3.5-100 mg/1 | |
| 20 | | anionic detergent | Czechoslovakia | 0.5 mg/1 | |
| | | synthetic detergent | Worcestershire | 0.03 mg/1 | |
| 369 | | synthetic detergent | Wisc. well water | 10 mg/1 | |
| | | | River and water supplies in 32 U.S. cities | $\leq$0.14 mg/1 av. = 0.024 mg/1 | |

* samples taken monthly 1-2 years.

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

| Ref | Agent | Source | Location | Concentration |
|---|---|---|---|---|
| | | | **ORGANIC ACIDS** | |
| 297 | ABS (cont.) | detergent | Michigan well waters (30 wells) surface water | 0.0-0.6 mg/1 (21 wells) |
| 4 | | | 32 U.S. cities | 0.00-0.14 mg/1 (before 1961) |
| 267 | | | Ill. streams | 3.0 mg/1 highly polluted water<br>0.01 mg/1 unpolluted waters |
| 78 | | | Ill. rivers | 0.5 mg/1 |
| 154 | | | streams in Kansas | 1.9-6.6 mg/1 |
| | | | Ohio R. at Wheeling, W. Va. | up to 12 mg/1, daily average 4 mg/1 |
| | | | Cincinnati, Ohio | 0.1 mg/1 |
| | | | sewage in various cities | 4-45 mg/1 |
| | | | Ottawa, Kansas sewage | 39-44 mg/1 |
| | | | 9 cities in Kansas (sewage) | 4.1-34 mg/1 |
| | | | Aurora, Ill. (sewage) | 45 mg/1 |
| | | | Indianapolis, Ind. (sewage) | 42 mg/1 |
| | | | Benton Harbor, Mich. | 8 mg/1 |
| | | | Maiais des Cygnes R., Kan. | 3.9-6.6 mg/1 |
| | | | Neosha R., Kansas | 1.0-1.9 mg/1 |
| | | | Creek R., Kansas | 11 mg/1 |
| | | | U.S. average (average) | 10 mg/1 |
| | | | Tama R., Japan | 15:18 ) ratio of linear<br>20:80 ) alkylate sulfonates |
| | | | Nogawa R., Japan | 25:75 ) to branch chain NBS measure by infra-red spectroscopy |

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

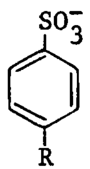
| Ref | Agent | Source | Location | Concentration |
|---|---|---|---|---|
| | | | ORGANIC ACIDS | |
| 396 | ABS (linear) | detergent | Illinois R. | <0.01 mg/1 |
| 394 | | | U.S. rivers | <0.01 mg/1 |
| 32 |  | sewage water | French cities | 3.08-3.5 mg/1 |
| | | | U.S. cities | 1-15 mg/1 |
| | | | Ruhr R. | 0.7-4.5 mg/1 |
| | | | Seine R. | 0.125 mg/1 |
| | | | Rhone R. | 0.03 mg/1 |
| | | | water works in England | 0.5 mg/1 |
| 395 | ABS (MBAS) | | Ohio R., Cincinnati, Ohio | 0.06-0.15 mg/1 |
| | | | most U.S. rivers prior to 1960 | 0.01-0.02 mg/1 |
| | | | Illinois R. | 0.5-1.3 mg/1 1959 |
| | | | at Peoria (pre LAS) | 0.056 mg/1 Sept. 1959-June 1965 |
| | | | at Peoria (LAS) | 0.022 mg/1 July 1965-June 1966 |
| 161 | ABS | | Coons Rapids, upper Mississippi R. | <0.15 mg/1 1963-64 |
| | | | Spring Lake, upper Mississippi R. | <0.49 mg/1 " |
| | | | Upper Mississippi R., near Spring Lake | up to 1.11 mg/1 " |
| 427 | | anion detergent | Modena(town sewage truckline) | 23.18 mg/1 |
| | | | (outgoing canal) | 33.6 mg/1 |
| 395 | | 14 waste processing plants | Germany | 5.4 mg/1 1962-1964 |
| | | | Ohio R., Cincinnati, Ohio | 0.06-0.15 mg/1 1965 |

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

| Ref | Agent | Source | Location | Concentration |
|---|---|---|---|---|
| | | | **ORGANIC ACIDS** | |
| 395 | ABS (cont.) | | most rivers | 0.01-0.02 mg/l |
| | | | Illinois R. | >0.5 mg/l 1964 |
| | | | sewage works in England | 3.0 mg/l 1962 (pre LAS)<br>1.3 mg/l 1965 (post LAS) |
| | | | waste processing plant, Germany | 5.4 mg/l 1962 (pre LAS) |
| | | | U.S. activated sludge plant | 5.0 mg/l (pre) Sept. 1965<br>0.7 mg/l (post) Mar. 1965 |
| | MBAS (ABS & LAS) | | Illinois R. | 0.56 mg/l (pre) Sept. 1959-June 1965<br>0.22 mg/l (post) July 1965-June 1966 |
| 39 | | | community water supplies; Camden, N.J. | 0.034 mg/l Aug. 1959<br>0.024 mg/l winter 1959<br>0.015 mg/l spring 1960 |
| | | | rivers in U.S. | <0.5 mg/l |
| | | | **PHOSPHATE ESTERS** | |
| 440 | RONNELL (Trolene) | pesticides | Roof of Taft Center, Cincinnati, Ohio (rainwater) | 0.2 mg/l |

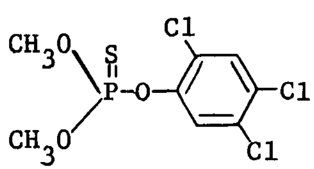
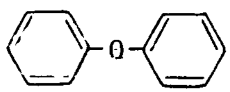
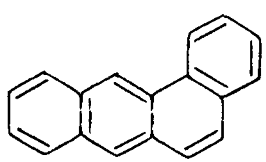
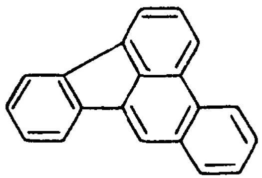
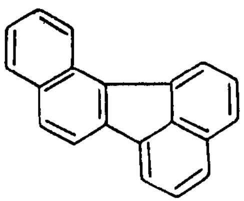
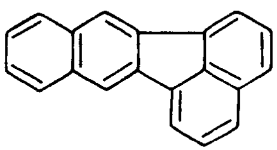
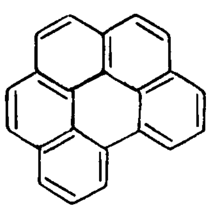


TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

| Ref | Agent | Source | Location | Concentration |
|---|---|---|---|---|
| | | | **PHOSPHATE ESTERS** | |
| 403 | Def (S,S,S-Tributyl-phosphorothioate) $(CH_3-CH_2-CH_2-CH_2-S)_3-P=O$ | chemical manufacturing plant | outfalls of manufacturing plant Ashlex R., Charleston Harbor, S.C. | 1966 |
| | | | **ETHERS** | |
| 261 | PHENYL ETHER  | industrial waste from perfuming soaps and organic synthesis | St. Clair R., Ohio R. | <10 mg/l |
| | | | **UNSUBSTITUTED AROMATICS** | |
| 34, 35 | 1,2-BENZANTHRACENE*  | | central portion of Rhine R. | 10 & 18 mg/kg dry material from paper chromatography and absorption spectra respectively |

* value found is for combination of all these compounds

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

| Ref | Agent | Source | Location | Concentration |
|---|---|---|---|---|
| | UNSUBSTITUTED AROMATICS | | | |
| 34, 35 | 3,4-BENZOFLUORANTHENE*  | | central portion of Rhine R. | 10 & 18 mg/kg dry material from paper chromatography and absorption spectra respectively |
| 34, 35 | 10,11-BENZOFLUORANTHENE*  | | central portion of Rhine R. | 10 & 18 mg/kg dry material from paper chromatography and absorption spectra respectively |
| 34, 35 | 11,12-BENZOFLUORANTHENE *  | | central portion of Rhine R. | 10 & 18 mg/kg dry material from paper chromatography and absorption spectra respectively |
| 32 | | | sludge from Lake Constance | 15 mg dry substance |
| 34, 35 | 1,12-BENZOPERYLENE*  | | central portion of Rhine R. | 10 & 8 mg dry substance |

* value found is for combination of all these compounds

TABLE I. (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

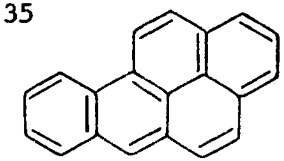
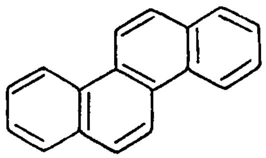
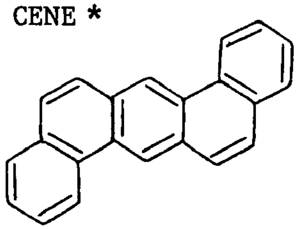
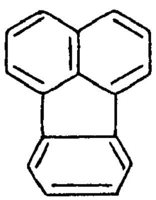
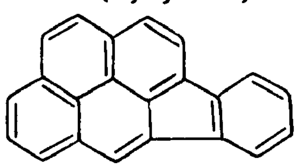
| Ref | Agent | Source | Location | Concentration |
|---|---|---|---|---|
| | | | **UNSUBSTITUTED AROMATICS** | |
| 35 | 3,4-BENZOPYRENE | | | |
| 336, 35 |  | | drinking water | 0.01 ug/1 |
| 34 | | | central portion of Rhine R. | |
| 97 | | industrial (petroleum) | Volga R. below Imeni P.I. Mendileeva refinery | 0.0001 ug/1 |
| | | | sample of sand from filter of Novoyaroslavskii Waterworks | 0.216 ug/kg dry sand |
| 409 | | sewage from shale re- fineries, coke plants, petroleum refineries | U.S.S.R. | 0.03-0.3 mg/1 |
| | | | water supplies of above | 0.001 mg/1 |
| 32 | | sewage from thermal pro- cessing of shales | U.S.S.R. (plant effluent) | 0.5 mg/1 |
| | | tunnel method on sewage from thermal processing of shales | U.S.S.R. | 9 mg/kg |
| | | coke gas plant | sewage effluent | 0.13-0.29 mg/1 |
| | | processing Kerosene | | 6 mg/1 |
| | | coke chemical plant | | 0.52-0.63 mg/1 |
| | | coke chemical plant | 35 km downstream from plant | 8.2-17.0 mg/kg (sediment from river) |
| | | | dried sediment from Seine R. | 1.5 mg/100 g |
| | | | Lake Constance | 15 mg/kg dry substance |
| 363 | | oil refinery | Moscow region; absorbed into soil and makes way to water eventually consumed by man | |

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

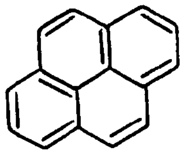
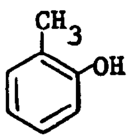
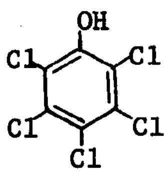
| Ref | Agent | Source | Location | Concentration |
|---|---|---|---|---|
| | | **UNSUBSTITUTED AROMATICS** | | |
| 56 | 3,4-BENZOPYRENE (cont.) | plants processing coke and coal tar products | U.S.S.R. (plant effluent) | 3 ug/1-0.29 mg/1 |
| 32 | | | sludge from Lake Constance | 15 mg dry substance |
| 166 | | shale by-product manufacture | U.S.S.R. effluent | 0.1 mg/1 |
| | | Slansty combine | U.S.S.R. effluent | 0.312 mg/1 |
| | | coke by-product | U.S.S.R. effluent | 0.04 mg/1 |
| | | coke-gas plant | U.S.S.R. effluent | 0.13-0.29 mg/1 |
| | | Neflegaz plant | U.S.S.R. effluent | 3-0.03 mg/1 |
| | | oil refinery | U.S.S.R. effluent | none |
| 79 | | "Shist" plant resins | U.S.S.R. | |
| | | (effluents - untreated) | | 10.9 mg/kg |
| | | (effluents - treated) | | 0.312 mg/kg |
| | | | Plyasa R. (site of discharge) | 0.012 mg/kg |
| | | | (3.5 km downstream) | 0.001 mg/kg |
| | | effluent of petroleum chemical enterprises | U.S.S.R. Grozny | |
| 348 | | a. eff. from thermal cracking, coking & pyrolysis | | 0.48-5.0 ug/1 |
| | | b. calalytic cracking | | 0.05-0.29 ug/1 |

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

| Ref | Agent | Source | Location | Concentration |
|---|---|---|---|---|
| | **UNSUBSTITUTED AROMATICS** | | | |
| 34 | CHRYSENE*  | | central portion of Rhine R. | 10 & 18 mg/kg dry material |
| 97 | 1,2,5,6-DIBENZANTHRACENE *  | petroleum refineries | Volga R., U.S.S.R. | not determined |
| | | | central portion of Rhine R. | 10 & 18 mg/kg dry material |
| | FLUORANTHENE*  | | central portion of Rhine R. | 10 & 18 mg/kg dry material |
| | INDENO(1,2,3-cd)PYRENE *  | | central portion of Rhine R. | 10 & 18 mg/kg dry material |

* value found is for combination of all these compounds

TABLE I. (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

| Ref | Agent | | Source | Location | Concentration |
|---|---|---|---|---|---|
| | **UNSUBSTITUTED AROMATICS** | | | | |
| | PYRENE*  | | | central portion of Rhine R. | 10 & 18 mg/kg dry material |
| | **PHENOLS AND QUINONES** | | | | |
| 170 | CRESOL | | distillation and chemical treatment of coal tar or wood tar | Poland (tap water) | 0.030 mg/l |
| | | (m-cresol) | | | 0.060 mg/l |
| | | | | | 0.120 mg/l |
| |   | (p-cresol) | | | 0.200 mg/l |
| | | (o-cresol) | | | 0.160 mg/l |
| 53 | PENTACHLOROPHENOL   | | roof timbers sprayed (house) | cold water storage tank | |

* value found is for combination of all these compounds

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

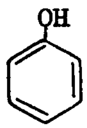
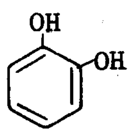
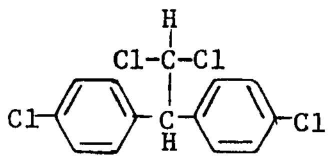
| Ref | Agent | Source | Location | Concentration | |
|---|---|---|---|---|---|
| | | | **PHENOLS AND QUINONES** | | |
| 103 | PHENOL | industrial and domestic waste | Hakensack R. basin | NS-13.0 ug/l | |
| |  | waste water | Passaic R. basin | NS-21.0 ug/l | |
| | | waste water | Elizabeth & Rahway R. | NS-79.0 ug/l | |
| | | industrial waste | Raritan R. basin | NS-210.0 ug/l | |
| 141 | | | Rhine R. at Ludwigshaven | 0.40 mg/l | Nov.-Dec. 1962 |
| 137 | | tannery sewage | | 10-20 mg/l | |
| 181 | | | Poland (tap water) | 0.050 mg/l<br>0.100 mg/l<br>0.200 mg/l | |
| 419 | | thermal processing of oil shale | U.S.S.R. (effluent) | small amount | |
| 235 | | | Missouri R., Omaha, Nebr. (spring run-off) | 0.00-10.0 mg/l | 1951-66 |
| 16 | PHENOLS & OIL RESIDUES | certain parts of rivers not subject to industrial pollution; suggests a biogenic origin of phenols in surface water | two regions of Rumania | | |
| 246 | PYROCATECHOL | regenerator of the Syava wood chemical factory | U.S.S.R. (effluent) | none | |
| |  | Amzya wood chemical factory | (effluent) | none | |

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

| Ref | Agent | Source | Location | Concentration |
|---|---|---|---|---|
| | | PHENOLS AND QUINONES | | |
| 246 | PYROCATECHOL (cont.) | effluent from continuous neutralization at the Dimitrievskii wood chemical factory | U.S.S.R | none |
| | | effluent from the washing of pyrolyzate | U.S.S.R. | 1700 mg/l |
| | | wash water from ethyl acetate manufacturing | | 350 mg/l |
| | | wash water from Syava wood chemical factory | | none |
| | | total discharge from the pumping station of the Syava wood chemical factory | | 5 mg/l |
| | | general drain pit of the tar-distillation shop of the Syava wood chemical factory | | 1260 mg/l |
| | | supposedly pure water | | none |
| | | effluent from the alcohol shop of the Syava wood chemical factory | | traces |

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

| Ref | Agent | Source | Location | Concentration | |
|---|---|---|---|---|---|
| | | | **AROMATIC DERIVATIVES** | | |
| | **HALOGENATED** | | | | |
| 304 | DDD (TDE) | spray 0.02 ppm for gnat control | Clear Lake, Calif. | | |
| 439 |  | pesticide | Shenandoah R., Berryville, Va. | 0.083 ug/1 | Sept. 1964 |
| 42 | | agricultural | Arkansas R., John Martin Reservoir, Colo. | 0.010 ug/1* | May 1966 |
| | | | van Buren, Ark. | 0.005 ug/1* | March 1966 |
| | | | | 0.010 ug/1* | Aug. 1966 |
| | | | Brazos R., Richmond, Tex. | 0.005 ug/1* | Feb. 1966 |
| | | | | 0.010 ug/1* | May 1966 |
| | | | Rio Grande, Anzalduas Dam, Tex. | 0.005 ug/1* | Oct. 1965 |
| | | | | 0.010 ug/1* | Nov. 1965 |
| | | | | 0.010 ug/1* | May 1966 |
| | | | | 0.015 ug/1* | July 1966 |
| | | | | 0.010 ug/1* | Sept. 1966 |
| | | | Sacramento R., Verona, Calif. | 0.010 ug/1* | Aug. 1966 |
| | | | Yakima R., Kiona, Wash. | 0.005 ug/1* | June 1966 |
| | | | | 0.010 ug/1* | July 1966 |
| 269 | | commercial orchard | Knights Creek, Dunn County, Wis. | | June 1966 |
| 139 | | | Connecticut R., Enfield Dam, Conn. | 0.013 ug/1 | Sept. 1966 |
| | | | Hudson R., Poughkeepsie, N.Y. | 0.006 ug/1 | " |
| | | | Narrows, N.Y. | 0.005 ug/1 | " |
| | | | Merrimack R., Lowell, Mass. | 0.007 ug/1 | " |
| | | | Delaware R., Trenton, N.J. | presumptive | " |

* samples taken monthly.

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

| Ref | Agent | Source | Location | Concentration |
|---|---|---|---|---|
| | | | **AROMATIC DERIVATIVES** | |
| 139 | DDD (cont.) | | Schuylkill R., Philadelphia, Pa. | 0.009 ug/l Sept. 1966 |
| | | | Delaware Bay | 0.005 ug/l " |
| | | | | presumptive " |
| | | | Raritan R., Perth Amboy, N.J. | 0.012 ug/l (bottom) " |
| | | | Potomac R., Great Falls, N.Y. | 0.012 ug/l " |
| | | | Susquehanna R., Conowingo, Md. | 0.003 ug/l " |
| | | | Sayre, Pa. | 0.005 ug/l " |
| | | | Neuse R., Raleigh, N.C. | 0.006 ug/l " |
| | | | Apalachicola R., Chattahoochee, Fla. | presumptive " |
| | | | Chattahoochee R., Lanett, Ala. | 0.011 ug/l " |
| | | | Savannah R., Port Wentworth, Ga. | 0.004 ug/l " |
| | | | N. Augusta, Ga. | presumptive " |
| | | | Tennessee R., Bridgeport, Ala. | 0.006 ug/l " |
| | | | Tombigbee R., Columbus, Miss. | 0.008 ug/l " |
| | | | Kanawha R., Winfield Dam, W. Va. | 0.005 ug/l " |
| | | | Ohio R., Evansville, Ind. | 0.003 ug/l " |
| | | | Addison, Ohio | 0.004 ug/l " |
| | | | St. Mary's R., Sault Ste. Marie, Mich. | presumptive " |
| | | | Lake Superior, Duluth, Minn. | 0.005 ug/l " |
| | | | Maumee R., Toledo, Ohio | 0.006 ug/l " |
| | | | Illinois R., Peoria, Ill. | 0.006 ug/l " |
| | | | Mississippi R., St. Paul, Minn. | 0.006 ug/l " |

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

| Ref | Agent | Source | Location | Concentration | |
|---|---|---|---|---|---|
| | | | **AROMATIC DERIVATIVES** | | |
| 139 | DDD (cont.) | | St. Joseph R., Benton Harbor, Mich. | 0.013 ug/1 | Sept. 1966 |
| | | | Grand R., Grand Haven, Mich. | 0.009 ug/1 | " |
| | | | Detroit R., Grosse Isle, Mich. | 0.012 ug/1 | " |
| | | | Fox R., Green Bay, Wis. | 0.007 ug/1 | " |
| | | | Missouri R., St. Louis, Mo. | 0.003 ug/1 | " |
| | | | Kansas City, Kan. | 0.010 ug/1 | " |
| | | | N. Platte R., Henry, Nebr. | 0.006 ug/1 | " |
| | | | Platte R., Plattsmouth, Nebr. | 0.005 ug/1 | " |
| | | | S. Platte R., Julesburg, Colo. | 0.002 ug/1 | " |
| | | | Rainy R., Beaudette, Minn. | 0.005 ug/1 | " |
| | | | Red R. (N), Intern. boundary | presumptive | " |
| | | | Atchafalaya R., Morgan City, La. | 0.010 ug/1 | " |
| | | | Arkansas R., Pendleton Ferry, Ark. | 0.012 ug/1 | " |
| | | | Ponca City, Okla. | 0.005 ug/1 | " |
| | | | Mississippi R., Vicksburg, Miss. | presumptive | " |
| | | | Delta, La. | 0.008 ug/1 | " |
| | | | Rio Grande, Brownsville, Tex. | 0.013 ug/1 | " |
| | | | El Paso, Tex. | 0.009 ug/1 | " |
| | | | Alamosa, Colo. | 0.002 ug/1 | " |
| | | | Sacramento R., Green's Landing, Calif. | 0.009 ug/1 | " |
| | | | San Joaquin R., Vernalis, Calif. | 0.009 ug/1 | " |

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

| Ref | Agent | Source | Location | Concentration | |
|---|---|---|---|---|---|
| | | | AROMATIC DERIVATIVES | | |
| 139 | DDD (cont.) | | Waikele Stream, Oahu, Hawaii | 0.009 ug/1 | Sept. 1966 |
| | | | Snake R., Wawawai, Wash. | 0.006 ug/1 | " |
| | | | Spokane R., Post Falls Dam, Idaho | 0.004 ug/1 | " |
| | | | Willamette R., Portland, Ore. | 0.003 ug/1 | " |
| 37 | | | Hudson R., Poughkeepsie, N.Y. | presumptive | Sept. 1965 |
| | | | Merrimack R., Lowell, Mass. | 0.007 ug/1 | " |
| | | | St. Lawrence R., Massena, N.Y. | 0.010 ug/1 | " |
| | | | Delaware R., Trenton, N.Y. | 0.018 ug/1 | " |
| | | | Potomac R., Washington, D.C. | 0.007 ug/1 | " |
| | | | Chattahoochee R., Lanett, Ala. | 0.012 ug/1 | " |
| | | | Savannah R., Port Wentworth, Ga. | 0.006 ug/1 | " |
| | | | Ohio R., Cairo, Ill. | 0.003 ug/1 | " |
| | | | above Addison, Ohio | presumptive | " |
| | | | Missouri R., Kansas City, Kans. | 0.011 ug/1 | " |
| | | | Platte R., Plattsmouth, Nebr. | 0.010 ug/1 | " |
| | | | Yellowstone R., Sidney, Mont. | 0.005 ug/1 | " |
| | | | Red R., Alexandria, La. | 0.008 ug/1 | " |
| | | | Brazos R., Arcola, Tex. | presumptive | " |
| | | | Rio Grande, Brownsville, Tex. | 0.026 ug/1 | " |
| | | | Williamette R., Portland, Ore. | 0.013 ug/1 | " |
| | | | Klamath R., Keno, Ore | presumptive | " |

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

| Ref | Agent | Source | Location | Concentration | |
|---|---|---|---|---|---|
| | | | **AROMATIC DERIVATIVES** | | |
| 37 | DDD (cont.) | | Waikele Stream, Hawaii | 0.008 ug/l | Sept. 1965 |
| | | | Delaware R., Philadelphia, Pa. | 0.080 ug/l | 1958-1965 |
| | | | Savannah R., N. Augusta, S.C. | 0.031 ug/l | CAM samples Top ten |
| | | | Rio Grande, Brownsille, Tex. | 0.019 ug/l | |
| | | | El Paso, Tex. | 0.012 ug/l | |
| | | | Mississippi R., New Roads, La. | 0.012 ug/l | 1958-1965 |
| | | | Red R., Alexandria, La. | 0.011 ug/l | CAM samples Top ten |
| | | | San Joaquin R., Vernalis, Calif. | 0.010 ug/l | |
| | | | Rio Grande, Laredo, Tex. | 0.009 ug/l | |
| | | | Apalachicola.R., Chattahoochee, Fla. | 0.008 ug/l | |
| | | | Sacramento R., Green's Landing, Calif. | 0.006 ug/l | |
| 156 | | | Clear Lake, Calif. | | |
| 259 | | | Maximum value in Niagara R. | 0.083 ug/l | Aug. 1964 |
| | | | | no trace since 1964 | |
| | | | U.S. surface waters | 0.006 ug/l | Sept. 1965 |
| 240 | | | Arkansas R., van Buren, Ark. | 0.01 ug/l* | May 1967 |
| | | | Canadian R., Whitefield, Okla. | 0.01 ug/l* | Dec. 1967 |
| | | | Brazos R., Richmond, Tex. | 0.03 ug/l* | May 1967 |
| | | | | 0.01 ug/l* | Oct. 1967 |
| | | | | 0.01 ug/l* | Jan 1968 |
| | | | | 0.01 ug/l* | March 1968 |
| | | | | 0.01 ug/l* | July 1968 |

* sample taken monthly for 2 years.

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

| Ref | Agent | Source | Location | Concentration | |
|---|---|---|---|---|---|
| | | | **AROMATIC DERIVATIVES** | | |
| 240 | DDD (cont.) | | Colorado R., Wharton, Tex. | 0.01 ug/1* | June 1967 |
| | | | | 0.01 ug/1* | Nov. 1967 |
| | | | | 0.04 ug/1* | Jan. 1968 |
| | | | | 0.01 ug/1* | Feb. 1968 |
| | | | | 0.01 ug/1* | March 1968 |
| | | | | 0.01 ug/1* | July 1968 |
| | | | | 0.01 ug/1* | Aug. 1968 |
| | | | Rio Grande, Anzalduas Dam, Tex. | 0.01 ug/1* | June 1967 |
| | | | | 0.01 ug/1* | Oct. 1967 |
| | | | Gila R., Gillespie Dam, Ariz. | 0.01 ug/1* | Nov. 1967 |
| | | | | 0.02 ug/1* | Dec. 1967 |
| | | | | 0.01 ug/1* | March 1968 |
| | | | | 0.02 ug/1* | May 1968 |
| | | | | 0.01 ug/1* | June 1968 |
| | | | | 0.01 ug/1* | Sept. 1968 |
| | | | Sacramento R., Verona, Calif. | 0.01 ug/1* | Nov. 1966 |
| | | | Yakima R., Kiona, Wash. | 0.02 ug/1* | Jan. 1967 |
| | | | | 0.02 ug/1* | April 1967 |
| | | | | 0.01 ug/1* | Oct. 1967 |
| | | | | 0.02 ug/1* | Dec. 1967 |
| | | | | 0.01 ug/1* | Feb. 1968 |
| | | | | 0.01 ug/1* | June 1968 |
| | | | | 0.02 ug/1* | July 1968 |
| | | | | 0.01 ug/1* | Aug. 1968 |
| | | | Columbia R., Dalles, Ore. | 0.01 ug/1* | Oct. 1966 |
| | | | | 0.01 ug/1* | Nov. 1967 |
| | | | | 0.01 ug/1* | Jan. 1968 |

* samples taken monthly for two years.

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

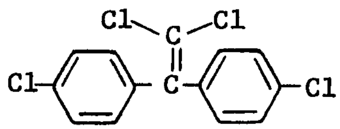
| Ref | Agent | Source | Location | Concentration | |
|---|---|---|---|---|---|
| | | | **AROMATIC DERIVATIVES** | | |
| 440 | DDE | | roof of Taft Center, Cincinnati, Ohio (rainwater) | 0.2 mg/1 | |
| 439 |  | | Connecticut R., Northfield, Mass. | presumptive | Sept. 1964 |
| | | | Hudson R., Poughkeepsie, N.Y. | 0.004 ug/1 | " |
| | | | St. Lawrence R., Massena, N.Y. | presumptive | " |
| | | | Delaware R., Martin's Creek, Pa. | 0.008 ug/1 | " |
| | | | Potomac R., Great Falls, Md. | presumptive | " |
| | | | Shenandoah R., Berryville, Va. | 0.002 ug/1 | " |
| | | | Savannah R., Port Wentworth, Ga. | 0.004 ug/1 | " |
| | | | N. Augusta, S.C. | presumptive | " |
| | | | Tennessee R., Bridgeport, Ala. | " | " |
| | | | Kanawha R., Winfield Dam, W. Va. | " | " |
| | | | Monongahela R., Pittsburgh, Pa. | 0.004 ug/1 | " |
| | | | Maumee R., Toledo, Ohio | 0.015 ug/1 | " |
| | | | Mississippi R., Burlington, Iowa | presumptive | " |
| | | | Lock & Dam 3, St. Paul, Minn. | 0.011 ug/1 | " |
| | | | Rainy R., Baudette, Minn. | presumptive | " |
| | | | Red R. (N), Grand Forks, N.D. | 0.004 ug/1 | " |
| | | | St. Clair R., Port Huron, Mich. | presumptive | " |
| | | | Lake Superior, Duluth, Minn. | " | " |
| | | | Big Horn R., Hardin, Mont. | " | " |
| | | | Missouri R., Yankton, S.D. | 0.004 ug/1 | " |

TABLE I (CONT). - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

| Ref | Agent | Source | Location | Concentration | |
|---|---|---|---|---|---|
| | | | **AROMATIC DERIVATIVES** | | |
| 439 | DDE (cont.) | | Missouri R., Bismarck, N.D. | 0.003 ug/1 | Sept. 1964 |
| | | | Platte R., Plattsmouth, Nebr. | 0.004 ug/1 | " |
| | | | S. Platte R., Julesburg, Colo. (N. channel) | 0.018 ug/1 | " |
| | | | Arkansas R., Little Rock, Ark. | presumptive | " |
| | | | Mississippi R., New Roads, La. | presumptive | " |
| | | | Vicksburg, Miss. | " | " |
| | | | W. Memphis, Ark. | 0.007 ug/1 | " |
| | | | Atchafalaya R., Morgan City, La. | 0.003 ug/1 | " |
| | | | Colorado R., Yuma, Ariz. | 0.004 ug/1 | " |
| | | | Green R., Dutch John, Utah | presumptive | " |
| | | | Rio Grande, Brownsville, Tex. | " | " |
| | | | Alamosa, Colo. | " | " |
| | | | Columbia R., Clatskanie, Ore. | 0.005 ug/1 | " |
| | | | Pasco, Wash. | presumptive | " |
| | | | Snake R., Wawawai, Wash. | " | " |
| | | | Payette, Idaho | 0.005 ug/1 | " |
| | | | San Joaquin R., Vernalis, Calif. | 0.005 ug/1 | " |
| | | | Bear R., Preston, Idaho | 0.011 ug/1 | " |
| | | | Arkansas R., John Martin Reservoir, Colo. | 0.005 ug/1 | Oct. 1965 |
| | | | | 0.005 ug/1 | May 1966 |
| | | | | 0.015 ug/1 | July 1966 |
| | | | van Buren, Ark. | 0.020 ug/1 | Oct. 1965 |
| | | | | 0.005 ug/1 | March 1966 |

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

| Ref | Agent | Source | Location | Concentration | |
|---|---|---|---|---|---|
| | | | **AROMATIC DERIVATIVES** | | |
| 42 | DDE (cont.) | | Brazos R., Richmond, Tex. | 0.005 ug/1 | April 1966 |
| | | | | 0.010 ug/1 | Aug. 1966 |
| | | | Colorado R., Wharton, Tex. | 0.015 ug/1 | April 1966 |
| | | | | 0.005 ug/1 | May 1966 |
| | | | Rio Grande, Anzalduas Dam, Tex. | 0.005 ug/1* | Oct. 1965 |
| | | | | 0.005 ug/1* | Feb. 1966 |
| | | | | 0.010 ug/1* | May 1966 |
| | | | | 0.010 ug/1* | Aug. 1966 |
| | | | Colorado R., Yuma, Ariz. | 0.005 ug/1* | May 1966 |
| | | | | 0.010 ug/1* | June 1966 |
| | | | Yakima R., Kiona, Wash. | 0.010 ug/1* | April 1966 |
| | | | | 0.010 ug/1* | May 1966 |
| | | | | 0.015 ug/1* | July 1966 |
| 269 | | commercial orchard amount pesticide applied not determined 1963-65 | Knight's Creek, Dunn County, Wis. | | June 1966 |
| 139 | | | Hudson R., Poughkeepsie, N.Y. | presumptive | Sept. 1966 |
| | | | Narrows, N.Y. | " | " |
| | | | Tennessee R., Bridgeport, Ala. | " | " |
| | | | St. Lawrence R., Massena, N.Y. | 0.002 ug/1 | " |
| | | | Lake Superior, Duluth, Minn. | presumptive | " |
| | | | Arkansas R., Pendleton Ferry, Ark. | " | " |
| | | | Brazos R., Arcola, Tex. | 0.004 ug/1 | " |
| | | | Red R., Alexandria, La. | presumptive | " |

* sample taken monthly.

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

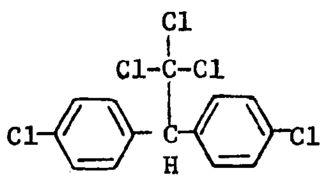
| Ref | Agent | Source | Location | Concentration | |
|---|---|---|---|---|---|
| | | | **AROMATIC DERIVATIVES** | | |
| 139 | DDE (cont.) | | Rio Grande, El Paso, Tex. | presumptive | Sept. 1966 |
| | | | San Joaquin R., Vernalis, Calif. | 0.003 ug/l | " |
| | | | Columbia R., Clatskanie, Ore. | 0.001 ug/l | " |
| 37 | | | Rainy R., Baudette, Minn. | presumptive | Sept. 1965 |
| | | | Detroit R., Detroit, Mich. | 0.008 ug/l | " |
| | | | Platte R., Plattsmouth, Nebr. | presumptive | " |
| | | | Yellowstone R., Sidney, Mont. | 0.002 ug/l | " |
| | | | San Juan R., Shiprock, N. Mex. | 0.009 ug/l | " |
| | | | Delaware R., Philadelphia, Pa. | 0.012 ug/l | " |
| | | | Mississippi R., Vicksburg, Miss. | 0.011 ug/l | CAM samples top ten 1958-65 |
| | | | Hudson R., Poughkeepsie, N.Y. | 0.006 ug/l | " |
| | | | S. Platte R., Julesburg, Colo. | 0.005 ug/l | " |
| | | | Mississippi R., N. Orleans, La. | 0.004 ug/l | " |
| | | | Rio Grande, Brownsville, Tex. | 0.004 ug/l | " |
| | | | Laredo, Tex. | 0.004 ug/l | " |
| | | | Lake Superior, Duluth, Minn. | 0.004 ug/l | " |
| | | | 12 stations in various river basins | 0.002 ug/l | " |
| 448 | | | samples from 100 locations in U.S. | 0.000-0.018 ug/l | " |
| 259 | | | Seneca R. | 0.011 ug/l | Sept. 1965 |
| | | | Lake Champlain | 0.011 ug/l | Oct. 1965 |

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

| Ref | Agent | Source | Location | Concentration | |
|---|---|---|---|---|---|
| | | | **AROMATIC DERIVATIVES** | | |
| 240 | DDE (cont.) | | Missouri R., Nebraska City, Nebr. | 0.01 ug/1 | May 1967 |
| | | | Arkansas R., van Buren, Ark. | 0.01 ug/1* | April 1967 |
| | | | | 0.01 ug/1* | May 1967 |
| | | | Brazos R., Richmond, Tex. | 0.01 ug/1* | Nov. 1966 |
| | | | | 0.01 ug/1* | May 1967 |
| | | | | 0.06 ug/1* | June 1967 |
| | | | | 0.01 ug/1* | Oct. 1967 |
| | | | | 0.01 ug/1* | Dec. 1967 |
| | | | | 0.02 ug/1* | Jan. 1968 |
| | | | | 0.01 ug/1* | March 1968 |
| | | | | 0.02 ug/1* | May 1968 |
| | | | | 0.01 ug/1* | July 1968 |
| | | | | 0.01 ug/1* | Sept. 1968 |
| | | | Colorado R., Wharton, Tex. | 0.01 ug/1* | June 1967 |
| | | | | 0.02 ug/1* | Jan. 1968 |
| | | | | 0.01 ug/1* | March 1968 |
| | | | | 0.01 ug/1* | April 1968 |
| | | | | 0.01 ug/1* | July 1968 |
| | | | | 0.01 ug/1* | Aug. 1968 |
| | | | Rio Grande, Ansalduas Dam, Tex. | 0.01 ug/1* | Feb. 1967 |
| | | | | 0.01 ug/1* | March 1967 |
| | | | | 0.01 ug/1* | June 1967 |
| | | | | 0.02 ug/1* | Oct. 1967 |
| | | | | 0.01 ug/1* | Nov. 1967 |
| | | | | 0.01 ug/1* | Dec. 1967 |
| | | | | 0.01 ug/1* | May 1968 |
| | | | | 0.01 ug/1* | Sept. 1968 |
| | | | Gila R., Gillespie Dam, Ariz. | 0.03 ug/1* | Nov. 1967 |
| | | | | 0.03 ug/1* | Dec. 1967 |

* samples taken monthly for 1-2 years.

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

| Ref | Agent | Source | Location | Concentration | |
|---|---|---|---|---|---|
| | | | AROMATIC DERIVATIVES | | |
| 240 | DDE (cont.) | | Gila R., Gillespie Dam, Ariz. | 0.01 ug/1* | Jan. 1968 |
| | | | | 0.03 ug/1* | Feb. 1968 |
| | | | | 0.02 ug/1* | March 1968 |
| | | | | 0.04 ug/1* | May 1968 |
| | | | | 0.03 ug/1* | June 1968 |
| | | | | 0.05 ug/1* | July 1968 |
| | | | | 0.03 ug/1* | Sept. 1968 |
| | | | Sacramento R., Verona, Calif. | 0.01 ug/1* | May 1968 |
| | | | Yakima R., Kiona, Wash. | 0.01 ug/1* | Feb. 1967 |
| | | | | 0.03 ug/1* | June 1967 |
| | | | | 0.01 ug/1* | Oct. 1967 |
| | | | | 0.02 ug/1* | Dec. 1967 |
| | | | | 0.01 ug/1* | Jan. 1968 |
| | | | | 0.01 ug/1* | Feb. 1968 |
| | | | | 0.01 ug/1* | May 1968 |
| | | | | 0.02 ug/1* | June 1968 |
| | | | | 0.01 ug/1* | July 1968 |
| | | | | 0.01 ug/1* | Aug. 1968 |
| | | | Columbia R., Dalles, Ore. | 0.01 ug/1* | Nov. 1967 |
| 69 | DDT | | Mississippi R., Quincy, Ill. | 1-20 ug/l | |
| 440 | <br> | rainwater | run off | 0.02-0.06 ug/l | |
| | | | roof of Taft Center, Cincinnati, Ohio | 1.2 ug/l | |
| 436 | | mosquito control | 48 areas Salt Lake County, Utah rivers, creeks, canals, ditches, drainage areas, etc. | 1.4-4.6 ug/l<br>0.6-2.8 ug/l | March 1965 |
| 433 | | | Angara | 0.005-0.04 mg/l | |

* samples taken monthly for 1-2 years.

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

| Ref | Agent | Source | Location | Concentration | |
|---|---|---|---|---|---|
| | | | AROMATIC DERIVATIVES | | |
| 280 | DDT (cont.) | | Ukranian water reservoirs | 0.01-0.04 mg/l<br>0.02-0.07 mg/l<br>traces - 0.03 mg/l<br>1.6-3.4 mg/l | |
| 290 | | | rivers in U.S. | 0.001-0.2 mg/l | |
| 17 | | | Sabago Lake, Maine | | |
| 445 | | 0.5 lb/acre | Boulder R. drainage area, Mont. | 0.02 mg/l | |
| 439 | | | Connecticut R., Northfield, Mass. | presumptive | Sept. 1964 |
| | | | Potomac R., Great Falls, Md. | " | " |
| | | | Shenandoah R., Berryville, Pa. | 0.026 ug/l | " |
| | | | Susquehanna R., Sayre, Pa. | presumptive | " |
| | | | Apalachicola R., Chattahoochee, Fla. | 0.027 ug/l | " |
| | | | Chattahoochee R., Lanett, Ala. | 0.007 ug/l | " |
| | | | Savannah R., Port Wentworth, Ga. | 0.020 ug/l | " |
| | | | Clinch R., Kingston, Tenn. | presumptive | " |
| | | | Tennessee R., Bridgeport, Ala. | " | " |
| | | | Kanawha R., Winfield Dam, W. Va. | 0.017 ug/l | " |
| | | | Monongahela R., Pittsburgh, Pa. | 0.018 ug/l | " |
| | | | Wabash R., New Harmony, Ind. | presumptive | " |
| | | | Maumee R., Toledo, Ohio | 0.087 ug/l | " |
| | | | Mississippi R., Burlington, Iowa | presumptive | " |
| | | | Lock & Dam 3, St. Paul, Minn. | " | " |

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

| Ref | Agent | Source | Location | Concentration | |
|---|---|---|---|---|---|
| | | | **AROMATIC DERIVATIVES** | | |
| 439 | DDT (cont.) | | Rainy R., Baudette, Minn. | presumptive | Sept. 1964 |
| | | | Red R. (N), Grand Forks, N.D. | 0.072 ug/1 | " |
| | | | Lake Michigan, Milwaukee, Wis. | presumptive | " |
| | | | Lake Superior, Duluth, Minn. | " | " |
| | | | Missouri R., Yankton, S.D. | 0.024 ug/1 | " |
| | | | Bismarck, N.D. | 0.014 ug/1 | " |
| | | | Platte R., Plattsmouth, Nebr. | 0.019 ug/1 | " |
| | | | Arkansas R., Little Rock, Ark. | presumptive | " |
| | | | Mississippi R., New Roads, La. | " | " |
| | | | Vicksburg, Miss. | 0.041 ug/1 | " |
| | | | Red R. (S), Alexandria, La. | 0.031 ug/1 | " |
| | | | Atchafalaya R., Morgan City, La. | 0.047 ug/1 | " |
| | | | Colorado R., Yuma, Ariz. | 0.021 ug/1 | " |
| | | | Loma, Colo. | presumptive | " |
| | | | Green R., Dutch John, Utah | " | " |
| | | | Rio Grande, Brownsville, Tex. | 0.025 ug/1 | " |
| | | | Alamosa, Colo. | presumptive | " |
| | | | Clearwater R., Lewiston, Idaho | 0.012 ug/1 | " |
| | | | Columbia R., Clatskanie, Ore. | 0.034 ug/1 | " |
| | | | Pasco, Utah | presumptive | " |
| | | | Pend Oreille R., Albeni Falls Dam, Idaho | " | " |
| | | | Snake R., Wawawai, Wash. | 0.014 ug/1 | " |
| | | | Payette, Idaho | presumptive | " |

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

| Ref | Agent | Source | Location | Concentration | |
|---|---|---|---|---|---|
| | | | AROMATIC DERIVATIVES | | |
| 439 | DDT (cont.) | | Willamette R., Portland, Ore. | 0.029 ug/l | Sept. 1964 |
| | | | Klamath R., Keno, Ore. | 0.016 ug/l | " |
| | | | Sacremento R., Green's Landing, Calif. | presumptive | " |
| | | | San Joaquin R., Vernalis, Calif. | 0.066 ug/l | " |
| | | | Bear R., Preston, Idaho | 0.034 ug/l | " |
| 369 | | | Detroit, Missouri & Mississippi Rivers | 0.001-0.2 mg/l | " |
| 42 | | agricultural | Missouri R. at Nebraska | 0.050 ug/l<br>0.045 ug/l | May 1966<br>Sept. 1966 |
| | | | Arkansas R., John Martin Reservoir, Colo. | 0.075 ug/l | May 1966 |
| | | | van Buren, Ark. | 0.070 ug/l<br>0.110 ug/l | July 1966<br>Aug. 1966 |
| | | | Brazos R., Richmond, Tex. | 0.055 ug/l<br>0.045 ug/l<br>0.105 ug/l | May 1966<br>June 1966<br>Aug. 1966 |
| | | | Colorado R., Wharton, Tex. | 0.025 ug/l<br>0.070 ug/l | Oct. 1965<br>April 1966 |
| | | | Rio Grande, Anzalduas, Tex. | 0.050 ug/l | July 1966 |
| | | | Colorado R., Yuma, Ariz. | 0.070 ug/l | March 1966 |
| | | | Yakima R., Kiona, Wash. | 0.065 ug/l | Aug. 1966 |
| | | | Snake R., King Hill, Idaho | 0.060 ug/l | July 1966 |
| 128 | | 1 lb/acre watersheds in Pa. | nearby streams | | |

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

| Ref | Agent | Source | Location | Concentration | |
|---|---|---|---|---|---|
| | | | AROMATIC DERIVATIVES | | |
| 139 | DDT (cont.) | | Hudson R., Poughkeepsie, N.Y. | 0.005 ug/l | Sept. 1966 |
| | | | Narrows, N.Y. | 0.007 ug/l | " |
| | | | Delaware R., Trenton, N.J. | 0.028 ug/l | " |
| | | | Potomac R., Great Falls, Md. | 0.038 ug/l | " |
| | | | Susquehanna R., Sayre, Pa. | 0.010 ug/l | " |
| | | | Neuse R., Raleigh, N.C. | presumptive | " |
| | | | Escambia R., Century, Fla. | " | " |
| | | | Tennessee R., Bridgeport, Ala. | " | " |
| | | | Ohio R., Cairo, Ill. | 0.020 ug/l | " |
| | | | Wabash R., Lafayette, Ind. | 0.007 ug/l | " |
| | | | Lake Superior, Duluth, Minn. | 0.026 ug/l | " |
| | | | Missouri R., Kansas City, Kans. | 0.029 ug/l | " |
| | | | Bismarck, N.D. | 0.013 ug/l | " |
| | | | Platte R., Plattsmouth, Nebr. | 0.023 ug/l | " |
| | | | Rainy R., Beaudette, Minn. | 0.015 ug/l | " |
| | | | Arkansas R., Pendleton Ferry, Ark. | 0.042 ug/l | " |
| | | | Coolidge, Kans. | presumptive | " |
| | | | Brazos R., Arcola, Tex. | 0.123 ug/l | " |
| | | | Mississippi R., Vicksburg, Miss. | 0.044 ug/l | " |
| | | | Delta, La. | 0.031 ug/l | " |
| | | | Rio Grande, Brownsville, Tex. | presumptive | " |
| | | | El Paso, Tex. | 0.046 ug/l | " |

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

| Ref | Agent | Source | Location | Concentration | |
|---|---|---|---|---|---|
| | | | **AROMATIC DERIVATIVES** | | |
| 139 | DDT (cont.) | | Colorado R., Page, Ariz. | presumptive | Sept. 1966 |
| | | | Kiikii Stream, Oahu, Hawaii | 0.013 ug/1 | " |
| | | | San Joaquin R., Vernalis, Calif. | 0.007 ug/1 | " |
| | | | Waikele Stream, Oahu, Hawaii | 0.013 ug/1 | " |
| | | | Pend Oreille R., Albeni Falls Dam, Idaho | presumptive | " |
| | | | Snake R., American Falls, Idaho | 0.025 ug/1 | " |
| | | | Willamette R., Portland, Ore. | 0.018 ug/1 | " |
| 147 | | | large U.S. rivers | 0.02 mg/1 | " |
| 102 | | | Lake St. Clair, Ont., Detroit R. | 1-20 ug/1 | 1953 |
| | | | Mississippi & Missouri rivers | 1-20 ug/1 | 1957 |
| 37 | | | Chattahoochee R., Lanett, Ala. | 0.017 ug/1 | Sept. 1965 |
| | | | Escambia R., Century, Fla. | 0.017 ug/1 | " |
| | | | Savannah R., Port Wentworth, Ga. | 0.016 ug/1 | " |
| | | | Clinch R., Kingston, Tenn. | presumptive | " |
| | | | Tennessee R., Bridgeport, Ala. | 0.015 ug/1 | " |
| | | | Allegheny R., Pittsburgh, Pa. | 0.004 ug/1 | " |
| | | | Monongahela R., Pittsburgh, Pa. | 0.016 ug/1 | " |
| | | | Ohio R., Cairo, Ill. | 0.023 ug/1 | " |
| | | | Addison, Ohio | presumptive | " |
| | | | Wabash R., New Harmony, Ind. | 0.012 ug/1 | " |
| | | | Illinois R., Peoria, Ill. | presumptive | " |

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

| Ref | Agent | Source | Location | Concentration | |
|---|---|---|---|---|---|
| | | | **AROMATIC DERIVATIVES** | | |
| 37 | DDT (cont.) | | Mississippi R., E. St. Louis, Ill. | presumptive | Sept. 1965 |
| | | | Red R. (N), Grand Forks, N.D. | 0.034 ug/l | " |
| | | | Missouri R., St. Louis, Mo. | 0.016 ug/l | " |
| | | | N. Platte R., Henry, Nebr. | 0.039 ug/l | " |
| | | | S. Platte R., Julesburg, Colo. | 0.023 ug/l | " |
| | | | Yellowstone R., Sidney, Mont. | 0.002 ug/l | " |
| | | | Mississippi R., Vicksburg, Miss. | 0.017 ug/l | " |
| | | | Delta, La. | 0.019 ug/l | " |
| | | | Colorado R., Page, Ariz. | 0.058 ug/l | " |
| | | | San Juan R., Shiprock, N. Mex. | 0.125 ug/l | " |
| | | | Rio Grande, El Paso, Tex. | 0.012 ug/l | " |
| | | | Alamosa, Colo. | 0.149 ug/l | " |
| | | | Spokane R., Post Falls Dam, Idaho | 0.037 ug/l | " |
| | | | Truckee R., Farad, Calif. (Nevada border) | presumptive | " |
| | | | Rio Grande, Brownsville, Tex. | 0.144 ug/l | top ten |
| | | | Laredo, Tex. | 0.052 ug/l | CAM samples |
| | | | El Paso, Tex. | 0.032 ug/l | 1958-1965 |
| | | | Ohio R., Cairo, Ill. | 0.023 ug/l | " |
| | | | Mississippi R., New Orleans, La. | 0.019 ug/l | " |
| | | | Delaware R., Philadelphia, Pa. | 0.015 ug/l | " |
| | | | Chattahoochee R., Lanett, Ala. | 0.011 ug/l | " |

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

| Ref | Agent | Source | Location | Concentration | |
|---|---|---|---|---|---|
| | | | **AROMATIC DERIVATIVES** | | |
| 37 | DDT (cont.) | | Tennessee R., Pickwick Landing, Tenn. | 0.011 ug/1 | 1958-65 |
| | | | Mississippi R., Vicksburg, Miss. | 0.010 ug/1 | " |
| | | | Sacramento R., Green's Landing Calif. | 0.009 ug/1 | " |
| | | | Tombigbee R., Columbus, Miss. | 0.009 ug/1 | " |
| 448 | | | analysis of water at 100 locations across U.S. | 0.000-0.087 ug/1 | " |
| 240 | | | Missouri R., Nebraska City, Nebr. | 0.01 ug/1* | April 1967 |
| | | | | 0.01 ug/1* | Dec. 1967 |
| | | | | 0.09 ug/1* | May 1968 |
| | | | Platte R., Brady, Nebr. | 0.01 ug/1* | Jan. 1968 |
| | | | Arkansas R., John Martin Reservoir, Colo. | 0.01 ug/1* | Oct. 1967 |
| | | | | 0.01 ug/1* | Dec. 1967 |
| | | | | 0.04 ug/1* | July 1968 |
| | | | van Buren, Ark. | 0.01 ug/1* | April 1967 |
| | | | | 0.01 ug/1* | Nov. 1967 |
| | | | | 0.01 ug/1* | Dec. 1967 |
| | | | | 0.01 ug/1* | Sept. 1968 |
| | | | Canadian R., Whitefield, Okla. | 0.01 ug/1* | Dec. 1967 |
| | | | | 0.01 ug/1* | Jan. 1968 |
| | | | | 0.01 ug/1* | Sept. 1968 |
| | | | Brazos R., Richmond, Tex. | 0.08 ug/1* | Nov. 1966 |
| | | | | 0.07 ug/1* | Dec. 1966 |
| | | | | 0.01 ug/1* | May 1967 |

* samples taken monthly for two years.

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

| Ref | Agent | Source | Location | Concentration | |
|---|---|---|---|---|---|
| | | | **AROMATIC DERIVATIVES** | | |
| 240 | DDT (cont.) | | Brazos R., Richmond, Tex. | 0.06 ug/1* | June 1967 |
| | | | | 0.01 ug/1* | Oct. 1967 |
| | | | | 0.01 ug/1* | Dec. 1967 |
| | | | | 0.04 ug/1* | Jan. 1968 |
| | | | | 0.01 ug/1* | March 1968 |
| | | | | 0.02 ug/1* | July 1968 |
| | | | | 0.01 ug/1* | Sept. 1968 |
| | | | Colorado R., Wharton, Tex. | 0.03 ug/1* | June 1967 |
| | | | | 0.04 ug/1* | Oct. 1967 |
| | | | | 0.01 ug/1* | Nov. 1967 |
| | | | | 0.12 ug/1* | Jan. 1968 |
| | | | | 0.03 ug/1* | Feb. 1968 |
| | | | | 0.05 ug/1* | March 1968 |
| | | | | 0.04 ug/1* | April 1968 |
| | | | | 0.09 ug/1* | May 1968 |
| | | | | 0.02 ug/1* | July 1968 |
| | | | | 0.01 ug/1* | Aug. 1968 |
| | | | Rio Grande, Anzalduas Dam, Tex. | 0.01 ug/1* | Oct. 1967 |
| | | | | 0.01 ug/1* | Nov. 1967 |
| | | | | 0.01 ug/1* | Dec. 1967 |
| | | | Colorado R., Yuma, Ariz. | 0.01 ug/1* | Nov. 1967 |
| | | | | 0.01 ug/1* | Jan. 1968 |
| | | | Green R., Green River, Utah | 0.01 ug/1* | Nov. 1967 |
| | | | | 0.01 ug.1* | Jan. 1968 |
| | | | Gila R., Gillespie Dam, Ariz. | 0.03 ug/1* | Nov. 1967 |
| | | | | 0.07 ug/1* | Dec. 1967 |
| | | | | 0.01 ug/1* | Jan. 1968 |
| | | | | 0.01 ug/1* | March 1968 |
| | | | | 0.01 ug/1* | May 1968 |
| | | | | 0.03 ug/1* | July 1968 |
| | | | | 0.04 ug/1* | Sept. 1968 |

* samples taken monthly for two years.

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

| Ref | Agent | Source | Location | Concentration | |
|---|---|---|---|---|---|
| | | | **AROMATIC DERIVATIVES** | | |
| 240 | DDT (cont.) | | Humboldt R., Rye Patch, Nev. | 0.06 ug/1* | Jan 1968 |
| | | | | 0.02 ug/1* | March 1968 |
| | | | Sacramento R., Verona, Calif. | 0.01 ug/1* | Oct. 1967 |
| | | | | 0.01 ug/1* | Nov. 1967 |
| | | | | 0.01 ug/1* | Dec. 1967 |
| | | | | 0.01 ug/1* | Jan. 1968 |
| | | | | 0.05 ug/1* | May 1968 |
| | | | | 0.02 ug/1* | July 1968 |
| | | | Feather R., Oroville, Calif. | 0.01 ug/1* | Oct. 1967 |
| | | | | 0.01 ug/1* | Jan. 1968 |
| | | | | 0.01 ug/1* | March 1968 |
| | | | Yakima R., Kiona, Wash. | 0.02 ug/1* | April 1967 |
| | | | | 0.03 ug/1* | June 1967 |
| | | | | 0.01 ug/1* | Oct. 1967 |
| | | | | 0.01 ug/1* | Nov. 1967 |
| | | | | 0.01 ug/1* | Dec. 1967 |
| | | | | 0.01 ug/1* | Jan. 1968 |
| | | | | 0.01 ug/1* | Feb. 1968 |
| | | | | 0.01 ug/1* | March 1968 |
| | | | | 0.03 ug/1* | April 1968 |
| | | | | 0.03 ug/1* | May 1968 |
| | | | | 0.02 ug/1* | June 1968 |
| | | | | 0.02 ug/1* | July 1968 |
| | | | | 0.02 ug/1* | Aug. 1968 |
| | | | Snake R., King Hill, Idaho | 0.02 ug/1* | Oct. 1967 |
| | | | | 0.01 ug/1* | Dec. 1967 |
| | | | | 0.01 ug/1* | Jan. 1968 |
| | | | | 0.02 ug/1* | Oct. 1968 |
| | | | Columbia R., Dalles, Ore. | 0.01 ug/1* | June 1967 |
| | | | | 0.01 ug/1* | Nov. 1967 |
| | | | | 0.01 ug/1* | Jan. 1968 |
| | | | | 0.01 ug/1* | May 1968 |

* samples taken monthly 1-2 years.

TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

| Ref | Agent | Source | Location | Concentration |
|---|---|---|---|---|
| | | | **AROMATIC DERIVATIVES** | |
| 432 | DDT (cont.) | | U.S.S.R.: open bodies of water<br>water supply sources | 0.0005-0.002 mg/l<br>0.0003-0.0005 mg/l |
| 24 | DDT AND ANALOGUES | municipal and agricultural | streams in Louisiana, Mississippi and Arkansas | 1966 |
| | | formulation wastes and/or agricultural | Coldwater Creek, Mississippi<br>Bear Creek, Mississippi | 1964,66 |
| 38 | | applied to foliage, soil water courses | Susquehanna R., Conowingo, Md. | 1962 |
| | | | Delaware R., Philadelphia, Pa. | " |
| | | | Chattahoochee R., Lanett, Ala. | " |
| | | | Tennessee R., Pickwick Ldg., Tenn. | " |
| | | | Rio Grande, El Paso, Tex. | " |
| | | | Brownsville, Tex. | " |
| | | | San Joaquin R., Vernalis, Calif. | " |
| | | | Sacramento R., Green's Landing, Calif. | " |
| | | | Yakima R., Richland, Wash. | " |
| | | | Columbia R., Northport, Wash. | " |
| | | | Wenatchee, Wash. | " |
| | | | Pasco, Wash. | " |
| | | | McNary Dam, Ore. | " |
| 432 | HEXACHLORANE (HCB) | | U.S.S.R.: open bodies of water<br>water supply sources | 0.0008-0.003 mg/l<br>0.0004 mg/l |

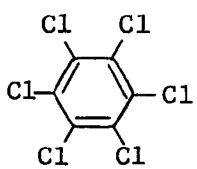
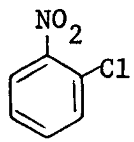
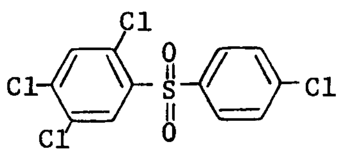


TABLE I (CONT.) - CONCENTRATION OF ORGANIC POLLUTANTS IN WATER

| Ref | Agent | Source | Location | Concentration |
|---|---|---|---|---|
| | | | **AROMATIC DERIVATIVES** | |
| 261 | NITROCHLOROBENZENE  | industrial waste | Cape Girardeau, Mo. (Mississippi R.) | 37 ug/l |
| | | dye chemistry | Mississippi R., New Orleans, La. | 1-2 ug/l |
| | | | **MERCAPTANS AND OTHER SULFUR ORGANICS** | |
| 259 | TEDION (Tetradifon)  | pesticide | Niagara R. | 0.11 ug/l Aug. 1964 |
| | | | **ORGANOMETALLICS** | |
| 169 | METHYLMERCURIC CHLORIDE | acetaldehyde plant | Minamata Bay, Japan | 9-85 mg Hg/kg/dry weight of fish 1960-1963 |
| 413 | $CH_3HgCl$ | acetaldehyde plant | Agano R., Japan | 14.4 mg/l 5km from mouth of the river 1965 |
| 1 | | industrial waste | Lake Erie | found |
| | | | Great Lakes, Canada | 5 mg/l in fish |
| | | used as seed dressing | Lakes and streams in Southern and Central Sweden | found |

# TABLE II - MAMMALIAN ACUTE AND CHRONIC TOXICITY OF ORGANIC POLLUTANTS FOUND IN FRESH WATER

This table contains acute and chronic toxicological information on chemicals found in water presented in Table I. $LD_{50}$ in mammals form the highest proportion of the acute toxicity information available and data on non-mammalian species (fish and birds were included only if toxicity information on mammals was not available or was scant.) Included under the $LD_{50}$ column was data available on humans at doses where fatalities can occur and are estimates only. These are essentially $LD_{100}$ data. All doses are oral unless otherwise indicated where oral information was not available. Large gaps of information exist for chronic toxicity and the greatest proportion of chronic toxicological data presented in this table came from the Russian literature. The doses presented for chronic toxicity are those which elicited an effect and where this was not available the doses used are presented. The chronic toxicity effects varied according to what was looked for. The Russian data included changes in conditioned behavior and little information was available on how the data was obtained or treated.

# TABLE II - MAMMALIAN ACUTE AND CHRONIC TOXICITY OF ORGANIC POLLUTANTS FOUND IN FRESH WATER

| Agent | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Ref | Species | Oral LD50 mg/kg | 96 hr. TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | ALKANES AND ALKENES | | | | | |
| UNSUBSTITUTED | | | | | | | | | |
| METHANE | 252 | sunfish | not toxic | | | | | | |
| | | fathead | not toxic at 65mg/l after 2 hrs | | | | | | |
| HALOGENATED | | | | | | | | | |
| ALDRIN | 252 | human | 5000 (fatal) | | | | | | |
| | 338 | rat | 50 | | | 48 | rat | 100 mg/kg daily | Gradual increase in esterase levels |
| | 124 | | 39 ♂ | | | | | | |
| | | | 60♀ | | | | | 10-12.5 mg/kg daily | Effects on reproduction |
| | | | 98 (dermal) | | | | | | |
| | 293 | | 67 | | | | | | |
| | 451 | | 45-60 | | | 48 | laboratory animals | 5 mg/l | Change in rate of weight gain and CNS |
| | 252 | | 39-66 | | | | | | |
| | 449 | | 42 | | | | | | |
| | 173 | | 40-60 | | | | | | |
| | 252 | chick | 25 | | | | | | |
| | | bobwhite quail | 4 | | | | | | |
| | | ringneck pheasant | 14 | | | | | | |
| | | mourning dove | 15-17 | | | | | | |

$LD_{50}$ - dose at which 50% of animals died.

96 hr TLm - concentration at which 50% of fish died in 96 hrs (or other time indicated).

$LC_{50}$ - concentration at which 50% of fish died in 24 hrs.

# TABLE II (CONT.) - ACUTE AND CHRONIC TOXICITY OF ORGANIC POLLUTANTS

| Agent | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Ref | Species | Oral LD50 mg/kg | 96 hr. TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | ALKANES AND ALKENES | | | | | |
| ALDRIN (cont.) | 101,174,252 | guppy | | 0.033 | | | | | |
| | 449 | fathead | | 0.028 | | | | | |
| | 101 | | | 0.033 | | | | | |
| | 101,449 | goldfish | | 0.028 | | | | | |
| | 338 | fish | | 0.024 | | | | | |
| | 431,438 | | | 0.02 | | | | | |
| | 431 | D. magna | | 0.01 | | | | | |
| | 449 | rainbow trout | | | 0.14 | | | | |
| | 174,252,449 | bluegill | | 0.033<br>0.013 | | | | | |
| BHC | 252 | rat | 600<br>200 | | | | | | |
| | | bobwhite quail | 250 | | | | | | |
| | | ringneck pheasant | 450 | | | | | | |
| | 338 | fish | | 2.0 | | | | | |
| | | trout | | 3.0 | | | | | |

## TABLE II (CONT.) - ACUTE AND CHRONIC TOXICITY OF ORGANIC POLLUTANTS

| Agent | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Ref | Species | Oral LD50 mg/kg | 96 hr. TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | ALKANES AND ALKENES | | | | | |
| BHC (cont.) | 101,449 | fathead | | 2.3 | | | | | |
| | 101,442,449 | bluegill | | 0.079 | | | | | |
| | 101,449 | goldfish | | 2.3 | | | | | |
| | | guppy | | 2.17 | | | | | |
| β-ISOMER BHC | 252 | rat | 6000 | | | | | | |
| CHLORDANE | 252 | human | 100 (fatal) | | | 444 | rat | 1-5 mg/kg daily for 7 days | Inhibition of steroid activity |
| | 338 | rat | 500 | | | | | | |
| | 293 | | 355 | | | | | | |
| | 49 | | 490 | | | 252 | bird | | Decrease in reproduction |
| | 340 | | 225-590 | | | | | | |
| | 451 | | 450-500 | | | | | | |
| | 452 | | 355-590 | | | | | | |
| | 173 | | 283 | | | | | | |
| | 124 | | 530 (dermal) | | | | | | |
| | 252 | bobwhite quail | 250 | | | | | | |
| | | ringneck pheasant | 500 | | | | | | |
| | 338 | fish | | 0.69 | | | | | |

# TABLE II (CONT.) - ACUTE AND CHRONIC TOXICITY OF ORGANIC POLLUTANTS

| Agent | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Ref | Species | Oral LD50 mg/kg | 96 hr. TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | ALKANES AND ALKENES | | | | | |
| CHLORDANE (cont.) | 174 | channelcat | | 0.5 | | | | | |
| | 101,449 | fathead | | 0.052 | | | | | |
| | 252 | | | 0.052-0.069 | | | | | |
| | 101,252 | goldfish | | 0.082 | | | | | |
| | 101,174,252 | guppy | | 0.19 | | | | | |
| | 101,252,442 | bluegill | | 0.022 | | | | | |
| | 449 | | | | 0.054 | | | | |
| | | rainbow trout | | | 0.022 | | | | |
| DIELDRIN | 252 | human | 5000 (fatal) | | | 444 | rat | purified substance 4 days I.P. | Stimulated activity of liver microsomal enzymes that metabolize estrone; inhibited the estrone-induced increase in uterine wet weight and decreased the amount of tritiated estrogen found in the uterus after an injection of tritiated estrone |
| | 338,340 | rat | 60 | | | | | | |
| | 126,293 | | 46 | | | | | | |
| | 173 | | 40 | | | | | | |
| | 240 | | 37-87 | | | | | | |
| | 449 | | 40 | | | | | | |
| | 451 | | 60-90 | | | | | | |
| | 49 | | 142 (18.6% active substance) | | | | | | |
| | 338 | fish | | 0.016 | | | | | |
| | 252 | | | 0.005-0.042 | | | | | |

# TABLE II (CONT.) - ACUTE AND CHRONIC TOXICITY OF ORGANIC POLLUTANTS

| Agent | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Ref | Species | Oral LD50 mg/kg | 96 hr. TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | ALKANES AND ALKENES | | | | | |
| DIELDRIN (cont.) | 174,252,442, 449 | bluegill | | 0.0079 | | 311 | human | 0-0.211 mg/d. | No ill effects |
| | 174,252 | channel cat | | < 2.5 | | 434 | Japanese quail | 10 mg/kg | Affected reproduction |
| | 101,174,252, 449 | fathead | | 0.016 | | | | | |
| | | goldfish | | 0.037 | | | | | |
| | | guppy | | 0.022 | | | | | |
| ENDOSULFAN | 124 | rat | 43♂ | | | | | | |
| | | | 18♀ | | | | | | |
| | | | 130 ♂) (dermal) | | | | | | |
| | | | 74 ♀ ) (dermal) | | | | | | |
| | 252 | | 90 | | | | | | |
| | | | 110 | | | | | | |
| | 366 | | 30 | | | | | | |
| | 173 | | 35 | | | | | | |
| ENDRIN | 338 | rat | 5-45 | | | 67 | catfish | | Inhibition of electron transport enzymes and cholinesterases |
| | 124 | | 18 ♂ | | | | | | |
| | | | 7.5 ♀ | | | 270 | warmblooded animals | 0.0003 mg/g | Threshold concentration in blood |
| | | | 18 ♂) (dermal) | | | | | | |
| | | | 15 ♀) (dermal) | | | | | | |
| | 173 | | 3-6 | | | | | | |
| | 293 | | 17.8 | | | | | | |
| | 451 | | 10-12 | | | | | | |
| | 252 | | 7.3-48 | | | | | | |

# TABLE II (CONT.) - ACUTE AND CHRONIC TOXICITY OF ORGANIC POLLUTANTS

| Agent | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Ref | Species | Oral LD50 mg/kg | 96 hr. TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | ALKANES AND ALKENES | | | | | |
| ENDRIN (cont.) | 252 | monkey | 3 | | | 295 | fish | | No change in proline levels in blood, brain, muscle, gills or liver; can tolerate many times TLm as accumulation in fat |
| | | rabbit | 7-10 | | | | | | |
| | | guinea pig | 36 ♂<br>16 ♀ | | | | | | |
| | | | | | | 90 | cockroach | | Blood and body proline decreased markedly |
| | | chick | 3.5 | | | | | | |
| | 338 | fish | | 0.0013 | | 252 | dog | 4 mg/kg daily in diet | Abnormal effects |
| | 174,251,252, 449 | goldfish | | 0.0019 | | | | | |
| | 174 | coho salmon | | 0.0005 | | | quail | 1 mg/kg in diet | 40% decrease in reproduct-ion |
| | 174,251,438, 449 | fathead | | 0.001<br>0.001-0.0013 | | | | | |
| | 174,252,442, 449 | bluegill | | 0.0006 | 0.0007 | | | | |
| | 174,252,449 | guppy | | 0.0015 | | | | | |
| | 449 | rainbow trout | | | 0.0008 | | | | |

## TABLE II (CONT.) - ACUTE AND CHRONIC TOXICITY OF ORGANIC POLLUTANTS

| Agent | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Ref | Species | Oral LD50 mg/kg | 96 hr. TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | ALKANES AND ALKENES | | | | | |
| HEPTACHLOR | 252,338,340 | rat | 90 | | | 444 | rat | purified, I.P., 4 days | Stimulated the activity of liver microsomal enzymes that metabolize estrone; inhibited the estrone-induced increase in uterine wet weight and decreased the amount of tritiated estrogen found in the uterus after an injection of tritiated estrone |
| | 124 | | 100 ♂ | | | | | | |
| | | | 162 ♀ | | | | | | |
| | | | 195 ♂) (dermal) | | | | | | |
| | | | 250 ♀) (dermal) | | | | | | |
| | 293 | | 100 | | | | | | |
| | 451 451 | | 90-130 | | | | | | |
| | 173 173 | | 40 | | | | | | |
| | 338 338 | fish | | 0.056 | | | | | |
| | 174,251,252 | bluegill | | 0.019 | | | | | |
| | 174,252 | catfish | | 0.175 | | 54 | rat | >0.0025 mg/kg daily | Changes in physiological and biochemical activities of the organism |
| | 101,174,252, 449 | fathead | | 0.094 | | | | | |
| | | goldfish | | 0.23 | | | | | |
| | | guppy | | 0.25<br>0.107 | | | | | |
| | 252 | red-sided shiner | | 0.096-0.11 | | | | | |
| ISODRIN | 252 | rat | 7-42 | | | | | | |
| | 449 | | 10 | | | | | | |
| | 173 | | 7-17 | | | | | | |
| | 252 | rabbit | 5-7 | | | | | | |
| | | chick | 2.7 | | | | | | |

## TABLE II (CONT.) - ACUTE AND CHRONIC TOXICITY OF ORGANIC POLLUTANTS

| Agent | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Ref | Species | Oral LD50 mg/kg | 96 hr. TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | ALKANES AND ALKENES | | | | | |
| LINDANE | 338,340,351 | rat | 125 | | | 444 | rat | purified, I.P. for 4 days | Stimulated the activity of liver microsomal enzymes that metabolize estrone; inhibited the estrone-induced increase in uterine wet weight and decreased the amount of tritiated estrogen found in the uterus after an injection of tritiated estrone |
| | 49 | | 107 | | | | | | |
| | 124 | | 88 ♂ | | | | | | |
| | | | 91 ♀ | | | | | | |
| | | | 1000 ♂ (dermal) | | | | | | |
| | | | 900 ♀ (dermal) | | | | | | |
| | 173 | | 200 | | | | | | |
| | 252 | bobwhite quail | 120-130 ♂ | | | | | | |
| | | | 190-210 ♀ | | | | | | |
| | | ringneck pheasant | 60-100 | | | | | | |
| | | mourning dove | 350-400 | | | | | | |
| | 338 | fish | | 0.056 | | | | | |
| | 101,174,252, 449 | bluegill | | 0.077 | 0.061 | | | | |
| | | fathead | | 0.062 | | | | | |
| | | | | 0.063 | | | | | |
| | | goldfish | | 0.152 | | | | | |
| | | guppy | | 0.138 | | | | | |
| | 449 | rainbow trout | | | 0.030 | | | | |

## TABLE II (CONT.) - ACUTE AND CHRONIC TOXICITY OF ORGANIC POLLUTANTS

| Agent | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Ref | Species | Oral LD50 mg/kg | 96 hr. TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | ALKANES AND ALKENES | | | | | |
| TOXAPHENE | 252 | human | 5000 (fatal) | | | 252 | dog | 4 mg/kg daily | Loss of weight; abnormal behavior |
| | 338 | rat | 40 | | | | | | |
| | 124 | | 90 ♂ | | | | | | |
| | | | 80 ♀ | | | | | | |
| | | | 1075 ♂) (dermal) | | | | | | |
| | | | 780 ♀ ) (dermal) | | | | | | |
| | 293 | | 90 | | | | | | |
| | 340 | | 69 | | | | | | |
| | 451 | | 60-100 | | | | | | |
| | 252 | | 69-90 | | | | | | |
| | 49 | | 123 | | | | | | |
| | 173 | | 283 | | | | | | |
| | 338 | fish | | 0.0051 | | | | | |
| | 101,174,449 | bluegill | | 0.0035 | | | | | |
| | 252 | fathead | | 0.0051 | | | | | |
| | 101, | | | 0.0075 | | | | | |
| | 101,251,252, 449 | goldfish | | 0.0056 | | | | | |
| | 101,174,252, 449 | guppy | | 0.020 | | | | | |
| | | | | 0.043 | | | | | |
| | 252 | trout (fingerling) | | 0.0135 | | | | | |
| | | | | 0.0165 | | | | | |
| | 252 | rainbow trout | | 0.0145 | | | | | |
| | | | | 0.0165 | | | | | |

## TABLE II (CONT.) - ACUTE AND CHRONIC TOXICITY OF ORGANIC POLLUTANTS

| Agent | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Ref | Species | Oral LD50 mg/kg | 96 hr. TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | AMINES | | | | | |
| ALIPHATIC | | | | | | | | | |
| DIETHYLAMINE | 252 | rat | 540 | | | 176 | rabbit | 6 mg/kg/day for 7 mos | Disturbance in carbohydrate function of the liver |
| | 176 | mouse | 648.6 | | | | rat | 64.8 mg/kg daily for 2 1/2 mos | No appreciable cumulative properties; decrease in weight gain; increase in ascorbic acid content of the liver |
| | 252 | creek chub | | 85 (48 hrs) | | | | | |
| DIMETHYLAMINE | 88,89 | rat | 698 | | | 89 | guinea pig | 107 mg/kg for 6 wks | Increase in blood hemoglobin; increased activity of blood cholinesterase |
| | | mouse | 316 | | | | rabbit | 160 mg/kg for 6 wks | Increased urea content in blood serum; increase in coproporphyrin excretion in urine; increase in weight coefficient of the liver; decrease in vitamin C in organs |
| | | guinea pig | 240 | | | | guinea pig | 3.5 mg/kg daily for 8 mos | Increased corproporphyrin excretion in urine; increase un urea content in serum; decrease in vitamin C content of suprarenals; increase in weight coefficient of the liver |
| | | rabbit | 240 | | | | | | |

# TABLE II (CONT.) - ACUTE AND CHRONIC TOXICITY OF ORGANIC POLLUTANTS

| Agent | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Ref | Species | Oral LD50 mg/kg | 96 hr. TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | AMINES | | | | | |
| DIMETHYLAMINE (cont.) | | | | | | 89 | rat | 0.35 mg/kg daily for 8 mos | Retards appearance and stabilization of the positive reflex; prolongs latent period; decrease in magnitude amd percentage incidence of the conditioned reflex |
| ETHYLAMINE | 252 | rat | 400 | | | 117 | rabbit | 0.25 mg/kg daily for 6 mos | Change in albumin/globulin coefficient |
| | | mouse | 530-580 | | | | | | |
| | | creek chub | | 40 (48 hrs) | | | rat | 2.5 mg/kg daily for 6 mos | Change in conditioned reflexes |
| METHYLAMINE | 252 | creek chub | | fatal at 30 survived at 10 for 24 hrs | | 328 | rat | 0.75 mg/kg daily for 9 mos | Change in general condition of animals; development of a lymphophenia within 2 months |
| | | | | | | | rabbit | 0.5 mg/kg daily for ≥ 7 mos | Decrease in cholinesterase activity of blood |

## TABLE II (CONT.) - ACUTE AND CHRONIC TOXICITY OF ORGANIC POLLUTANTS

| Agent | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Ref | Species | Oral LD50 mg/kg | 96 hr. TLm mg/l | LC50 mg/l | Ref | Speices | Dose | Effect |
| | | | | AMINES | | | | | |
| AROMATIC | | | | | | | | | |
| ANILINE | 217 | rat | 750 | | | 217 | rat | > 0.005 mg/kg daily | Effect on conditioned reflexes |
| | | mouse | 1075 | | | | | | |
| | 252 | dog | 500 | | | | | | |
| | | fathead | | 200 (toxic level) | | | | | |
| | | goldfish | | 1000 " " | | | | | |
| | | trout | | 1000 " " | | | | | |
| o-ANILINE | 269 | rat | 1246.1 | | | 252 | human | | Anemia, anorexia, loss of weight, cretaneous lesion and bladder trouble |
| | | guinea pig | 2350 | | | | | | |
| | | | | | | 253 | cat | | Increase in level of methaemoglobin |
| m-ANILINE | 269 | rat | 700 | | | | | | |
| | | guinea pig | 450 | | | | | | |

# TABLE II (CONT.) - ACUTE AND CHRONIC TOXICITY OF ORGANIC POLLUTANTS

| Agent | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Ref | Species | Oral LD50 mg/kg | 96 hr. TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | AMINES | | | | | |
| NITRILES | | | | | | | | | |
| 2,6-DICHLOROBENZONITRILE | 131 | rat | 4500 | | | 131 | rat | 100 mg/kg daily | Increase in liver weight |
| | | rabbit | 270 | | | | | 200 mg/kg daily | Increase in kidney weight |
| | | guinea pig | 2100 | | | | | | |
| | 417 | bluegill | | | 22 | | | | |
| | | trout | | | 23 | | | | |
| HETEROCYCLIC | | | | | | | | | |
| PYRIDINE | 252,435,449 | mosquito fish | | 1300<br>1350 | | 252 | rat | 0.125 mg/kg daily | Pathological effects |
| | | | | | | 464 | warm-blooded animals | 0.125 and 0.25 mg/kg daily | Failed to gain weight, change in prothrombin time, slight histological changes in the liver |

# TABLE II (CONT.) - ACUTE AND CHRONIC TOXICITY OF ORGANIC POLLUTANTS

| Agent | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Ref | Species | Oral LD50 mg/kg | 96 hr. TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | ORGANIC ACIDS | | | | | |
| CARBOXYLIC | | | | | | | | | |
| ACETIC ACID | 252 | rat | 3310 | | | | | | |
| | | mouse | 4960 | | | | | | |
| | | bluegill | | 75 | | | | | |
| | 170 | goldfish | | 100<br>423 (toxic dose) | | | | | |
| | 252,435 | mosquito fish | | 251 | | | | | |
| | 435 | creek chub | | 100-200 | | | | | |
| BUTYRIC ACID | 252 | rat | 8790 | | | | | | |
| | 88 | D. magna | | 61 (48 hrs) | | | | | |
| CAPROIC ACID | 88 | bluegill | | 150-200 ( 48 hrs) | | | | | |

# TABLE II (CONT.) - ACUTE AND CHRONIC TOXICITY OF ORGANIC POLLUTANTS

| Agent | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Ref | Species | Oral LD50 mg/kg | 96 hr. TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | ORGANIC ACIDS | | | | | |
| 2,4-D | 252 | human | 15,000 (MLD) | | | 252 | dog | 20 mg/kg daily | Toxic |
| | 252 | rat | 666 | | | | | | |
| | 173 | | 400-500 | | | 372 | human | 500g daily for 3 wks | No unfavorable effects |
| | 252,303 | mouse | 375 | | | | | | |
| | | rabbit | 800 | | | 378 | rat | 50 mg/kg daily for 12 mos | Slight decrease in blood catalase; slight decrease in liver glycogen concentration; no path-ological changes |
| | 252 | dog | 100 | | | | | | |
| | 174 | bluegill | | 375 (48 hrs)<br>350 (24 hrs) | | 378 | aquatic fauna | high conc. applied for mosquito control | No adverse effects |
| | 174<br>252 | largemouth bass | | 350 ( 48 hrs)<br>350 (24 hrs) | | | | | |
| FENAC | 173 | rat | 1780-3000 | | | | | | |
| FORMIC ACID | 252 | dog | 4000 | | | | | | |
| | 88 | bluegill | | 175 (24 hrs) | | | | | |
| PROPIONIC ACID | 88 | culex sp. larvae | | >1000 (48 hrs) | | | | | |

## TABLE II (CONT.) - ACUTE AND CHRONIC TOXICITY OF ORGANIC POLLUTANTS

| Agent | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Ref | Species | Oral LD50 mg/kg | 96 hr. TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | ORGANIC ACIDS | | | | | |
| SILVEX | 252<br>173 | rat | 650<br>650-1070 | | | | | | |
| | | laboratory animals | 500-2000 | | | | | | |
| | 252 | emerald shiner | | 7 (72 hrs) | | | | | |
| | 174 | chinook salmon | | 136 (24 hrs) | | | | | |
| 2,4,5-T | 252 | human | 54,000 (toxic) | | | | | | |
| | 173 | rat | 300<br>300-800 | | | | | | |
| VALERIC ACID | 88 | D. magna | | 45 (48 hrs) | | | | | |

## TABLE II (CONT.) - ACUTE AND CHRONIC TOXICITY OF ORGANIC POLLUTANTS

| Agent | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Ref | Species | Oral LD50 mg/kg | 96 hr. TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | ORGANIC ACIDS | | | | | |
| SULFONICS | | | | | | | | | |
| ABS | 81 | rat | 2200 | | | 266 | bluegill | 5-6 mg/l | Histological changes |
| | 397 | | 1400-2500 | | | | | | |
| | 260 | | 520 | | | 127 | rat | 230 mg/kg daily for 45 days | Increase in weight of spleen, liver, and adrenal gland, increase in vitamin C content of adrenal gland; increase in cholesterol level of blood |
| | 153 | | 300 | | | | | | |
| | 397 | mouse | 1400-2800 | | | | | | |
| | | hamster | 1130 | | | | | | |
| | | rabbit | 1730 | | | | | | |
| | 405 | bluegill | | 8.2 | | 366 | trout | 0.001 mg/l | Avoided water with this concentration |
| | 251 | | | 4.2-4.4 | | | | | |
| | 252,317 | | | 5.6 | | | | 10.0 mg/l | Caused confusion; unable to distinguish |
| | 174,251 | fathead | | 3.5-4.5 | | 265 | D. magna | small amounts | Decreased respiration; decreased metabolism; decreased reproduction |
| | 405 | | | 11.3 | | | | | |
| | 252 | | | 4.6 | | | | | |
| | 387 | fathead eggs | | 12.8 | | 323 | guinea pig | 2% in water for 6 mos | No alarming symptoms; no histological changes |
| | 405 | emerald shiner | | 7.4 | | | pig | 0.2% in food for 79 days | No effect; 99.5% eliminated within 8 days |
| | | bluntnose minnow | | 7.7 | | | | | |
| | | stoneroller | | 8.9 | | | | | |
| | | silver jaw minnow | | 9.2 | | | | | |

## TABLE II (CONT.) - ACUTE AND CHRONIC TOXICITY OF ORGANIC POLLUTANTS

| Agent | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Ref | Species | Oral LD50 mg/kg | 96 hr. TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | ORGANIC ACIDS | | | | | |
| ABS ( cont.) | 405 | rosefin shiner | | 9.5 | | | | | |
| | | common shiner | | 17.0 | | | | | |
| | | carp | | 18.0 | | | | | |
| | | black bul[illegible] | | 22.0 | | | | | |
| tp- ABS | 397 | rat | 520-1220 | | | | | | |
| ABS ( linear) | 397<br>260 | rat | 650-1260<br>650 | | | | | | |
| | 251 | bluegill fingerling | | 0.6-3.0 | | | | | |
| | 383 | fathead | | 3.5 | | | | | |
| | 387 | fathead (eggs) | | 3.4 (24 hrs) | | | | | |

## TABLE II (CONT.) - ACUTE AND CHRONIC TOXICITY OF ORGANIC POLLUTANTS

| Agent | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Ref | Species | Oral LD50 mg/kg | 96 hr. TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | PHOSPHATE ESTERS | | | | | |
| RONNELL | 124 | rat | 1250 ♂<br>2630 ♀<br>>5000 (dermal) | | | | | | |
| | 340 | | 1700 | | | | | | |
| | 173 | | 1000-3000 | | | | | | |
| | 252 | guinea pig | 3240 | | | | | | |
| | | rabbit | 640 | | | | | | |
| | | mouse | 2140 | | | | | | |
| | | dog | 500 | | | | | | |
| | | duck | 5000 | | | | | | |
| | | chicken | 5000 | | | | | | |
| | | turkey | 500 | | | | | | |
| DEF | 124 | rat | 233 ♂<br>150 ♀<br>360 ♂) (dermal)<br>168 ♀) | | | | | | |
| | 173 | | 325 | | | | | | |

# TABLE II (CONT.) - ACUTE AND CHRONIC TOXICITY OF ORGANIC POLLUTANTS

| Agent | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Ref | Species | Oral LD50 mg/kg | 96 hr. TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | UNSUBSTITUTED AROMATICS | | | | | |
| PYRENE | 333 | mouse | 9400 | | | | | | |
| | | | | PHENOLS AND QUINONES | | | | | |
| o-CRESOL | 252 | rat | 1350 | | | | | | |
| | | catfish | | 11.2 | | | | | |
| | 174 | bluegill | | 55-65 (lethal in 1 hr) | | | | | |
| | | perch | | 10-20 (lethal in 1 hr) | | | | | |
| p-CRESOL | 252 | rat | 1800 | | | | | | |
| | 174 | bluegill | | 80-90 (lethal in 1 hr) | | | | | |
| | | perch | | 10-20 (lethal in 1 hr) | | | | | |
| CRESOL | 435<br>449 | mosquito<br>fish | | 22<br>24 | | | | | |
| | 449 | bluegill | | 10.0-13.6 | | | | | |

## TABLE II (CONT.) - ACUTE AND CHRONIC TOXICITY OF ORGANIC POLLUTANTS

| Agent | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Ref | Species | Oral LD50 mg/kg | 96 hr. TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | PHENOLS AND QUINONES | | | | | |
| PENTACHLOROPHENOL | 124 | rat | 146 ♂<br>175 ♀<br>320 ♂) (dermal)<br>330 ♀) | | | 53 | human | | Pyrexia, acidosis, amino aciduria, and ketonuria |
| | 115 | | ~90 | | | 115 | rat | 40 mg/kg daily | Hypohemoglobinemia; different changes in the number of erythrocytes; decrease in oxygen demand proteinuria; decrease in phagocytic activity |
| | 252 | | 78 | | | | | | |
| | 115 | mouse | 250 | | | | | | |
| PENTACHLOROPHENATE, Na | 252 | rat | 210.6 | | | 115 | rat | 25 mg/kg daily | Hypohemoglobinemia; different changes in the number of erythrocytes; decrease in oxygen demand; proteinuria; decrease in phagocytic activity |
| | 115 | | 130.0 | | | | | | |
| | 115 | mouse | 260 | | | | | | |
| | | guinea pig | 170 | | | | | | |
| | 252 | bluegill | | 0.35 (48 hr) | | | | | |
| | | channel cat | | 0.46 | | | | | |
| PHENOL | 252 | bluegill | | 11.5-28.5<br>70-75 (lethal in 1 hr) | | 386 | trout | any conc. | Cannot avoid waters polluted with pehnol |
| | 449 | perch | | 9-20 (lethal in 1 hr)<br>9 ( lethal in 1 hr) | | | | | |

## TABLE II (CONT.) - ACUTE AND CHRONIC TOXICITY OF ORGANIC POLLUTANTS

| Agent | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Ref | Species | Oral LD50 mg/kg | 96 hr. TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | **PHENOLS AND QUINONES** | | | | | |
| PHENOL ( cont.) | 252,435,449 | mosquito fish | | 56 | | 373 | fish | 3-5 mg/l<br>>10 mg/l<br>> 16 mg/l | Change in behavior; foaming secretion from skin; paralyzed and sank; |
| | 252 | catfish | | 16.7 | | 335 | fish | | damaged nervous system, epithelial tissue, intestines, reproductive system and blood |
| PYROCATECHOL | 252 | rat | 3890 | | | | | | |
| | | | | **AROMATIC DERIVATIVES** | | | | | |
| **HALOGENATED** | | | | | | | | | |
| DDD | 124 | rat | >4000 | | | 444 | rat | | Affected steroid metabolism |
| | 252 | | 3400 | | | | | | |
| | 173 | | 400-3400 | | | 330 | human | | Significant increase of the mean DDD concentration was found in cases of hypertension |
| | 252 | bluegill | | 0.03 | | | | | |
| | 449 | | | | 0.056 | | | | |
| | 174,252 | channel cat | | <2.6 | | 329 | human | | Highly significant elevation of pesticide concentration in cases of carcinoma of various tissues |

# TABLE II (CONT.) - ACUTE AND CHRONIC TOXICITY OF ORGANIC POLLUTANTS

| Agent | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Ref | Species | Oral LD50 mg/kg | 96 hr. TLm mg/1 | LC50 mg/1 | Ref | Species | Dose | Effect |
| | | | | AROMATIC DERIVATIVES | | | | | |
| DDD (cont.) | | | | | | 156 | western grebe | | Inhibition of reproductive rate |
| DDE | 124 | rat | 880 ♂<br>1240 ♀ | | | 444 | rat | | Affects steroid metabolism |
| | | | | | | 330 | human | | Significant increase of the mean DDE concentration found in encephalomalacia, cerebral hemorrhage, carcinoma, and hypertension |
| | | | | | | 329 | | | Highly significant elevation of pesticide concentration in cases of carcinoma of various tissues |
| | | | | | | 152 | mallard | 10&40 mg/1 | Decrease in reproduction; shells 13% thinner than normal; reduced hatchability |
| DDT | 252,338 | human | 250 | | | 279 | rat | 0.05 mg/kg daily for 6 mos | Change in phagocytic activity; decrease in ascorbic acid in suprarenals; decrease in activity of total lactic |
| | 124 | rat | 217 | | | | | | |
| | 293 | | 113 | | | | | | |
| | 151,451 | | 250 | | | | | | |
| | 173 | | 300-500 | | | | | | |
| | 151 | | 728 (dermal) | | | | | | |

## TABLE II (CONT.) - ACUTE AND CHRONIC TOXICITY OF ORGANIC POLLUTANTS

| Agent | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Ref | Species | Oral LD50 mg/kg | 96 hr. TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | AROMATIC DERIVATIVES | | | | | |
| DDT (cont.) | 279 | mouse | 580 | | | 279 | | | and succinic dehydrases in hepatic tissue; change in conditioned reflexes; histological changes in liver, kidneys, myocardium, suprarenals and brain |
| | 252 | | 150 | | | | | | |
| | 252 | chicken | 1300 | | | | | | |
| | 338 | fish | | 0.034 | | | | | |
| | 101,174,252 | bluegill | | 0.016 | | | | | Affects steroid metabolism |
| | 449 | | | | 0.007 | | | | |
| | 101,174,252 | fathead | | 0.032 | | 302 | rat | 200 mg/kg daily | Increase in ringtail |
| | 383 | | | 0.0155 | | | | | May have effect on reproduction in the case of marginal fertility |
| | 174,252,449 | goldfish | | 0.027 | | | | | |
| | 251 | | | 0.028 | | 443 | | | Increase in uterine weight |
| | 101,174,252 | guppy | | 0.043 | | | | | |
| | 174 | channel cat | | >1.0 | | 330 | human | | Significant elevated concentrations in brain and adipose tissue in cases of hypertension |
| | 252 | rainbow trout | | 0.0237-0.074 | | | | | |
| | 449 | | | | 0.008 | 311 | warmblooded animals | 3.5 & 35 mg/day for 21 mos | No ill effects up to 27 mos after study |
| | 18,416 | goldfish | | 1.0 (loss of balance) | | | | | |
| | | | | | | 298 | poultry | 20 mg/kg for 10 wks | No effect on reproduction |
| | | | | | | | | 1000 mg/kg for 10 wks | Reduced egg production and hatchability |

## TABLE II (CONT.) - ACUTE AND CHRONIC TOXICITY OF ORGANIC POLLUTANTS

| Agent | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Ref | Species | Oral LD50 mg/kg | 96 hr. TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | AROMATIC DERIVATIVES | | | | | |
| DDT (cont.) | | | | | | 152 | mallard | 25 mg/l | Significant thinning of shells; reduced duckling survival by 35% |
| | | | | | | 324 | fish | 6.2 mg/l (whole body conc.) | No physiological stress |
| | | | | | | 30 | Japanese quail | 100 ppm for 45 days | Decrease in eggshell Ca |
| | | | | | | 402 | mouse | 0.4-0.7 mg/kg for 5 generations | Leucocytosis |
| NITROCHLOROBENZENE | 58 | rabbit | 520 | | | 58 | rabbit | 0.5 mg/kg at least 4 mos | Slight delay in the decrease of the agglutination titer; change in phagocytic activity of leucocytes |
| | | | | | | 144 | rat | 0.025 mg/kg daily for 8-9 mos | Change in conditioned reflexes |

## TABLE II (CONT.) - ACUTE AND CHRONIC TOXICITY OF ORGANIC POLLUTANTS

| Agent | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Ref | Species | Oral LD50 mg/kg | 96 hr. TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | ORGANOMETALICS | | | | | |
| METHYLMERCURIC CHLORIDE | 169 | cat | 10-50 (as Hg/kg) LD<br>20 ( most ofted LD) | | | 169 | cat | 1 mg/kg/day | Clumsiness in walking, unsteady movements, ataxic gait, dullness, tremor, blindness, paroxysmal fits (several weeks after administration) |
| | | rat | 20 (as Hg/100g) LD | | | | rat | 1-2 mg/100g/ day $CH_3HgCl$ and $(CH_3Hg)_2S$ | Body weight decrease, action slow, occasionally clonic cramps; symptom same as cats |
| | | | | | | 1,169, 349 | human | fish from Minamata Bay | Numbness of limbs, constriction of visual field, ataxia, impairment of hearing and speech; ( in severe cases unconsciousness, marked violent agitation and death) |
| | | | | | | 1,412, 413 | human | fish from Agano R. | 22 cases, 5 deaths;Hg found in hair of patients |

## TABLE III - MAMMALIAN ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS OF FRESH WATER

This table contains acute and chronic toxicity of potential organic pollutants in fresh water. These chemicals are suspected to be in water because of their use for industrial, agricultural or domestic purposes or because they are known to be involved in manufacturing processes the waste products of which are likely to be discharged into fresh water. This listing is probably incomplete. As with Table II, there are gaps in our knowledge of both acute and chronic toxicity information.

## TABLE III - MAMMALIAN ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS OF FRESH WATER

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | | ALKANES AND ALKENES | | | | | |
| UNSUBSTITUTED | | | | | | | | | | |
| AMYLENE $(CH_3)_2C=CHCH_3$ | tar and gas wastes | 252<br>174 | sunfish | | lethal in 1 hr at 655-693 | | | | | |
| BUTYLENE $CH_3CH_2CH=CH_2$ | effluent from production of styrene rubber | 252 | | | | | | | | |
| CYCLOHEXANE $C_6H_{12}$  | found in petroleum, used for solvents, for lacquers & resins or for paint remover | 354 | mouse | 4700 | | | 354 | rat | 400 mg/kg for 14-40 days | Decrease in catalase activity; decrease in cholinesterase activity |
| | | 435 | mosquito fish | | 15,000 | | | | 0.05 mg/kg daily for 4 mos | Change in conditioned reflexes |
| CYCLOHEXENE $C_6H_{10}$  | petroleum, used as solvent for lacquers & resins or for paint remover | 355 | mouse | 2300 | | | 355 | white mouse | 500-4000 mg/kg | Decrease in weight |
| | | | | | | | | white rat | 100 mg/kg during 14 days | Decrease in catalase and cholinesterase activity |
| | | | | | | | | white rat | 400 mg/kg during 14 days | Decrease in capacity of liver for synthesis of hippuric acid |
| | | | | | | | | rabbit | 0.05-0.005 mg/kg for 6 mos period | Decrease in catalase and cholinesterase activity |
| ETHYLENE $CH_2=CH_2$ | manufacture of plastics, alcohol, mustard gas, ethylene oxide, & other organics | 252 | sunfish | | lethal in 1 hr at 22-25 mg/l | | | | | |

$LD_{50}$ - dose at which 50% of animals died.

96 hr TLm - concentration at which 50% of fish died in 96 hrs (or other time indicated).

$LC_{50}$ - concentration at which 50% of fish died in 24 hrs.

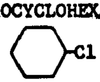
## TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | | ALKANES AND ALKENES | | | | | |
| ETHYLENE (Cont'd) | effluent from production of synthetic ethyl alcohol | | | | | | | | | |
| HEPTANE $CH_3(CH_2)_5CH_3$ | gasoline or other petroleum wastes | 252<br>435 | mosquito<br>fish | | 4924 | | | | | |
| ISOBUTYLENE $(CH_3)_2C=CH_2$ | effluent from production of styrene rubber | | | | | | 13 | | 8 mg/kg | Behavior changes & change in general condition 15-20 min after ingestion |
| ISOPRENE $CH_2=C(CH_3)-CH=CH_2$ | synthetic rubber industry | | | | | | 194 | warm blooded animals | 5 mg/l | No effect |
| | | | | | | | 191 | rabbit | 2.5 mg/kg daily for 2 mos | Change in catalase activity |
| | | | | | | | | rat | 0.25 mg/kg daily | Change in conditioned reflexes |
| PROPYLENE $CH_3CH=CH_2$ | effluent from production of synthetic ethyl alcohol | | | | | | | | | |
| <u>HALOGENATED</u> | | | | | | | | | | |
| ALLYL CHLORIDE $CH_2=CHCH_2Cl$ | | 179 | | less toxic than the alcohol | | | | | | |

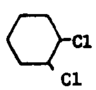
## TABLE III.1 (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/1 | LC50 mg/1 | Ref | Species | Dose | Effect |
| | | | | **ALKANES AND ALKENES** | | | | | | |
| BUTANE, POLYCHLORO. | pesticide | 274 | white mouse | 2000-2500 | | | | | | |
| $C_4Cl_xH_{10-x}$ | intermediate in hexa-chlorobutadiene production | | guinea pig | 940-1400 | | | | | | |
| CARBON TETRACHLORIDE | effluent from: manufacture of freons & tetra-chlor-alkanes, solvent in machine building, rubber & chemicopharmaceutical industries | 219 | albino rat | 6139♂ 5650♀ | | | 219 | albino rat | 1/10 LD50 for 1 mo. daily | Considerable cumulative properties |
| $CCl_4$ | | 340 | rat | 5730-9770 | | | | | | |
| | | 219 | white mouse | 9123 | | | | | 15 mg/kg | Reduced content of erythrocytes, leukocytes, & hemoglobin; increase in SH groups in blood serum followed by decrease; increased activity of glutamic oxalacetic glutamic-pyruvic transminases & lactic dehydrogenase in blood serum; prolonged prothrombin time increased concentration of urea in blood serum & of coproporphyrin in the urine; disturbance of renal function; increase of vitamin C in liver & kidneys |
| | | | guinea pig | 5760 | | | | | | |
| | | | rabbit | 5760 | | | | | | |
| | | | | | | | | | 1.5 mg/kg | Same effects as above; disturbance in interrelationships between the main cortical processes of inhibition and stimulation |
| | | | | | | | 252 | human | 5 mg/1 | Death |
| | | | | | | | | | skin (repeated contact) | Dermatitis |

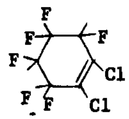
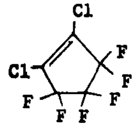
# TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | ALKANES AND ALKENES | | | | | | |
| CHLOROCYCLOHEXANE  | effluent from industry producing caprolactam | | | | | | 300 | experimental animals | 0.25-25 mg/l for 6 mos | Disturbed conditioned reflex |
| CHLOROFORM $CHCl_3$ | solvent for fats & varnishes manufacture of alkalies & rayon | 263 | white mouse | 1750 | | | 620 | guinea pig | 0.4 mg/kg | Increase in vitamin C in adrenals |
| | | | white rat | 1875 | | | | | 35 mg/kg | Decrease in blood catalase; decrease in phagocytic capacity of leukocytes; structural lesions in liver, heart muscle & stomach wall; fatty infiltration, necrobiosis, & cirrhosis of liver parenchyma, lipoid degeneration & proliferation of interstitial cells in myocardium, and acute edema of the submucous & muscular layers of the stomach |
| | | | guinea pig | 1750 | | | | | | |
| | | | | | | | | albino rat | 0.4 mg/kg | No effect |
| | | | | | | | | | 125 mg/kg | Decrease in conditioned reflex; decrease in cholinergic activity; histological changes |
| | | | | | | | 60 | | 12.5 mg/kg | Affects conditioned reflexes by fourth month |
| DBCP (NEMAGON) H H H / H-C-C-C-H / Br Br Cl | pesticide | 174 | bluegill | | 20 (48 hr) | | | | | |
| | | | largemouth bass | | 20 (48 hr) | | | | | |

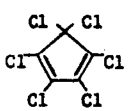
## TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | ALKANES AND ALKENES | | | | | | |
| DICHLOROBUTANE $CH_3CH_2CH_2CHCl_2$ | effluent from plants producing synthetic rubber from acetylene | 175 | rabbit<br>cat<br>mouse | 5 mg/l for 2 hr caused degenerative changes in all animals in bronchial epithelium<br>3 mg/l for 2 hr caused purulent and necrotic pneumonia and prebronchitis, swelling of kidney canaliculli and irritation of hemopoietic organs | | | 175 | dog | | Apathy; disturbed coordination; symptoms of paresis & paralysis; increased rate of respiration, cough, salivation, diarrhea, and progressive loss of weight |
| | | | | | | | | rabbit | 0.005-10 mg/kg daily for 6 mos | 0.005-0.1 mg/kg: no effect<br>1 and 10 mg/kg: weight loss, increase in blood sugar, increase in leukocyte number, increase in pyruvic acid content of blood<br>10 mg/kg: liver tissue hyperemia; change in liver, kidneys, brain, lungs & testicles |
| DICHLOROCYCLOHEXANE  | effluent from plants manufacturing caprolactam | 207 | white mouse | 480 | | | 207 | white rat | 12.5 mg/kg for 6 mos | Increase in reticulocyte number; decrease in normoblasts; other blood composition changes; wrinkling of nerve cells of brain; inflammation of liver; tissue edema in all organs; spleen capsule trabeculi and vascular walls of all organs indurated |
| DICHLOROETHANE $C_2H_4Cl_2$ | industrial organic solvent; manufacture of tobacco extract | 252 | rat | 770 | | | | | | |

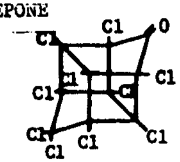
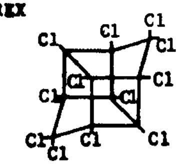
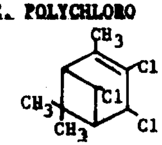
## TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/1 | LC50 mg/1 | Ref | Species | Dose | Effect |
| | | | | ALKANES AND ALKENES | | | | | | |
| 1,2-DICHLOROHEXA-FLUORO-1-CYCLOHEXENE  | | | | | | | 380 | rat & rabbit | 0.02 mg/kg daily | No effect on carbohydrate metabolism, SH group, or pyruvic acid blood concentrations, or conditioned reflexes; higher doses did produce morphological changes |
| 1,2-DICHLOROHEXA-FLUORO-CYCLOPENTENE-1  | synthesis of fluorine-containing rubbers & other polymers | 381 | mouse | 276 | | | 381 | rat | 28-30 mg/kg daily - 40 days | Decrease in $O_2$ consumption |
| | | | | | | | | rabbit | 28-30 mg/kg daily - 90 days | Inhibition of catalase activity; decrease in SH groups & total protein; increase in blood pyruvic acid; increase in hemoglobin, RBC & WBC; decrease in monocyte & leukocyte counts; protein dystrophy in liver; disappearance of transverse striae in cardiac muscle fibers |
| | | | | | | | | rat | 8.2 mg/kg daily - 185 days | Decrease in $O_2$ consumption; decrease in conditioned reflexes; histological changes in kidney, liver & heart cells |
| DICHLOROMETHANE $CH_2Cl_2$ | production of plastics & synthetic rubber used in refrigerators | 414 | mouse | 5600 | | | 414 | rat | 0.4 mg/kg daily - 6 mos | Disturbance in regulatory vegetative system |
| | | | | | | | | guinea pig | 0.4 mg/kg daily - 5 mos | Increase ascorbic acid content of adrenals |

## TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/1 | LC50 mg/1 | Ref | Species | Dose | Effect |
| | | | | **ALKANES AND ALKENES** | | | | | | |
| ETHYLENE DIBROMIDE (BROMOFUME, EDB) $BrCH_2CH_2Br$ | fumigant | 340 | rat | 108-170 | | | | | | |
| | | 174 | bluegill | | 18 (48 hr) | | | | | |
| | | | largemouth bass | | 15 (48 hr) | | | | | |
| ETHYLENE DICHLORIDE $ClCH_2CH_2Cl$ | fumigant | 340 | rat | 670-890 | | | | | | |
| FREON 253 (TRIFLUOROCHLOROPROPANE) $C_3H_4F_3Cl$ | | 360 | white mouse | 62 | | | 360 | rabbit & rat | 5, 0.005, 0.0005 mg/kg daily for 7 mos | Weight gain; decrease in glycogenic ability of liver; increase in blood pyruvic acid; conditioned reflexes affected at higher doses |
| HEXACHLOROBUTADIENE $CCl_2{=}CCl{-}CCl{=}CCl_2$ | pesticide | 274 | white rat | 350 | | | 274, 275 | guinea pig | 2 mg/kg daily | Depressed phagocytic activity; increase in vitamin C content of organs; affected conditioned reflexes |
| | | | white mouse | 87 | | | | | | |
| | | | guinea pig | 90 | | | | | | |
| | | | | | | | 275 | guinea pig | 2 mg/kg daily | Decrease in serum SH groups; histopathological changes in some organs |
| HEXACHLOROCYCLO-PENTADIENE  | manufacture of heat-resistant & shock-proof plastics | 284 | white mouse | 600 | | | 284 | white rat | 0.002 mg/kg daily - 6 mos | Lymphocytosis |
| | | | | | | | | | 0.0002-0.00002 mg/kg daily - 6 mos | No changes in peripheral blood cells; ascorbic acid content, the suprarenals, conditioned reflexes, or histological structure of organs |

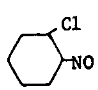
## TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | ALKANES AND ALKENES | | | | | | |
| HEXACHLOROETHANE $Cl_3CCCl_3$ | basic material in organic synthesis of plastics & celluloids; pesticide | 415 | mouse | 3100 | | | 415 | rabbit | 0.05 mg/kg daily | No significant effects |
| KEPONE  | pesticide | 124 | rat | 125<br>>2000 (dermal) | | | | | | |
| | | 340 | | 95 | | | | | | |
| | | 173 | | 114-140 | | | | | | |
| | | 40 | red-ear sunfish | | 0.029-0.14 (variation in temperature) | | | | | |
| MIREX  | pesticide | 124 | rat | 740♂<br>600♀ | | | | | | |
| | | 340 | | 300-600 | | | | | | |
| | | 124 | | >2,000 (dermal) | | | | | | |
| | | 173 | | 600-740 | | | | | | |
| PINENE, POLYCHLORO  | pesticide | 213 | rat | 450 | | | 213 | rabbit | 10 mg/l as drinking $H_2O$ for $\geq$ 9 wks | Change in sugar curve |
| | | | mouse | 360 | | | | | | |
| STROBANE ( TERPENE POLYCHLOR-INATES) | pesticide | 340, | rat | 200-500 | | | | | | |
| | | 449 | bluegill | | 12 | | | | | |
| | | | rainbow trout | | 15 | | | | | |
| TETRACHLOROETHANE $Cl_2CH\text{-}CHCl_2$ | basic material in organic synthesis of plastics & celluloids; pesticide | 415 | mouse | 740 | | | 415 | rabbit | 0.25 mg/kg daily | No significant changes |
| | | | | | | | | | 37 mg/kg daily | Change in blood sugar; pathological changes in liver and heart |

# TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | ALKANES AND ALKENES | | | | | | |
| TETRACHLOROETHYLENE $Cl_2C{=}CCl_2$ | industrial compound | 382 | rat | 8.00 (ml/kg undiluted) | | | | | | |
| TETRACHLOROHEPTANE $Cl_2CH(CH_2)_5CHCl_2$ | use in future for synthesis of polyamide fibers as emulsifiers, solvents, lacquers & heat carriers, etc. | 359 | laboratory animals | 475 | | | 359 | laboratory animals | 0.03 mg/l 4-6 mos daily inhalation | Change in CNS; change in $O_2$ consumption; leukocytosis; thickening of lung septi; moderate protein dystrophy; swelling of reticulo endothelium |
| | | | | | | | | rat | 150 mg/kg daily for 3 mos | Increase in blood leukocytes; no cumulative properties |
| TETRACHLORONONANE $Cl_2CH(CH_2)_7CHCl_2$ | use in future for synthesis of polyamide fibers as emulsifiers, solvents, lacquers & heat carriers, etc. | 359 | laboratory animals | 920 | | | 359 | laboratory animals | 0.03 mg/l 4-6 mos daily inhalation | Change in CNS; change in $O_2$ consumption; leukocytosis; thickening of lung septi; moderate protein dystrophy; swelling of reticulo endothelium; no cumulative properties |
| TETRACHLOROPENTANE $Cl_2CHCH_2CH_2CH_2CHCl_2$ | " | 359 | laboratory animals | 430 | | | 359 | laboratory animals | 2.1 mg/l 2 mos. - inhalation | Decrease in weight; decrease in $O_2$ consumption; increased size & weight of liver; leukocytosis |
| | | | | | | | | rat | 150 mg/kg daily for 3 mos | Increase in blood leukocytes; no cumulative properties |
| TETRACHLOROPROPANE $Cl_2CHCH_2CHCl_2$ | " | 359 | laboratory animals | 600 | | | 359 | laboratory animals | 2.1 mg/l 2 mos - inhalation | Decrease in weight; decrease in $O_2$ consumption; increased size & weight of liver; leukocytosis |
| | | | | | | | | rat | 150 mg/kg daily for 3 mos | Increase in blood leukocytes; no cumulative properties |

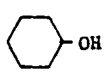
# TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | ALKANES AND ALKENES | | | | | | |
| TETRACHLOROUNDECANE $Cl_2CH(CH_2)_9CHCl_2$ | | 359 | laboratory animals | 4300 | | | 359 | laboratory animals | 0.03 mg/l 4-6 mos daily inhalation | Change in CNS; change in $O_2$ consumption; leukocytosis; thickening of lung septi; moderate protein dystrophy; swelling of reticulo endothelium; no cumulative properties |
| TRICHLOROETHYLENE $ClCH=CCl_2$ | used in dry cleaning; manufacture of chemicals & pharmaceuticals | 252 | dog | 5860 | | | 264 | test animals | 300 mg/kg daily for 2 mos | Decrease in phagocytic index; no significant changes |
| | | 264 | mouse | 5900 | | | | | | |
| NITRO COMPOUNDS | | | | | | | | | | |
| CHLORONITROSOCYCLOHEXANE  | effluent from plants manufacturing caprolactam | 207 | white rat | 384-450 | | | 207 | rat | 1 & 10 mg/kg | Increase in blood reticulocytes; increase in myeloerythroid proportion in bone marrow; decrease in erythropoietic cells; increase in weight of liver & spleen; degenerative necrobiotic changes |
| | | | | | | | | | 12.5 mg/kg | All of above plus dystrophic changes |
| | | | | | | | | | 0.1 mg/kg | Slight effect on functional state of organism |
| NITROCYCLOHEXANE $C_6H_{11}NO_2$ | | | | | | | 352 | rat | 1.5 mg/kg daily for 6 mos | Morphological changes in kidney, liver, & nervous system |
| NITROETHANE $CH_3CH_2NO_2$ | | 393 | rat | 1100 | | | 393 | rat | 0.05 mg/kg daily for 6 mos | Did not affect conditioned reflexes, thiol cholinesterase, or residual N concentration in blood, or tissue morphology |
| | | | mouse | 860 | | | | | | |

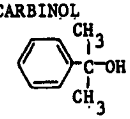
# TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | ALKANES AND ALKENES | | | | | | |
| NITROMETHANE $CH_3NO_2$ | | 393 | rat<br>mouse | 900<br>950 | | | 393 | rat | 0.05 mg/kg daily for 6 mos | Did not affect conditioned reflexes, thiol cholinesterase, or residual N concentration in blood, or tissue morphology |
| | | | | ALCOHOLS | | | | | | |
| ALLYL ALCOHOL $CH_2 = CHCH_2OH$ | | 77 | rat | 64 | | | | | | |
| AMYL ALCOHOL $CH_3(CH_2)_4OH$ | chemical wastes & some distilling wastes | 286 | human | two persons drank a mixture of butyl & amyl alcohol - state of narcosis | | | | | | |
| | | 449 | goldfish | | 10 (survival time= 94 hr →∞ ) | | | | | |
| BUTYL ALCOHOL $CH_3(CH_2)_3-OH$ | wastes from paint, varnish & chemical industries | 286 | human | two persons drank a mixture of butyl & amyl alcohol - state of narcosis | | | 286 | cat & dog | 1.85% | Reduced activity of pancreatic juice, pepsin, & trypsin |
| | | 252<br>77 | rat | 4360<br>2750 | | | | | | |
| 1.4-BUTANEDIOL $CH_2-(CH_2)_2-CH_2$ (OH on each terminal $CH_2$) | manufacture of polyurethanes as well as divinyl for manufacture of synthetic rubber; intermediate product of synthesis of the blood substitute polyvinyl-pyrrolidone; other industrial & agricultural effluents | 197 | white rat<br>white mouse<br>guinea pig<br>rabbit | 2062<br>1525<br>1200<br>2531 | | | 197 | rat | 30 mg/kg 6 mos study | Change in conditioned reflexes; decrease in cholinesterase activity; decrease in liver glycogen; decrease in SH groups in grey matter of brain & in whole blood; decrease in vitamin C in organs; increase in activity of blood transaminases; reduced content of nissl bodies & growth of glial elements in cerebral tissue |

## TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/1 | LC50 mg/1 | Ref | Species | Dose | Effect |
| | | | | | ALCOHOLS | | | | | |
| 1,4-BUTYNEDIOL<br>$CH_2OHC \equiv CCH_2OH$ | intermediate product in synthesis of the blood substitute polyvinyl pyrrolidone (PVP); other industrial & agricultural effluents | 197 | white rat | 104.75 | | | 197 | rat | 2 mg/kg 6 mos study | Change in conditioned reflexes; decrease in cholinesterase activity; decrease in liver glycogen; decrease in SH groups in grey matter of brain & in whole blood; decrease in vitamin C in organs; increase in activity of blood serum transaminases; reduced content of nissl bodies & growth of glial elements in cerebral tissue |
| | | | white mouse | 104.50 | | | | | | |
| | | | guinea pig | 130.00 | | | | | | |
| | | | rabbit | 150.00 | | | | | | |
| CYCLOHEXANOL<br> | effluent from production of caprolactam | 353 | mouse | 1240 | | | 353 | rabbit | 0.2, 2.0 & 20.0 mg/kg daily for 6 mos | Change in blood sugar levels; decrease in blood catalase; pathological changes in kidneys & liver at 2.0 and 20.0 mg/kg |
| | | | | | | | | rat | 0.02 & 2.0 mg/kg | Significant effect on conditioned reflexes |
| DICHLOROHYDRIN<br>$CH_2ClCHOHCH_2Cl$ | | 210 | mouse | 93 | | | | | | |
| DIETHYLENEGLYCOL<br>$O(CH_2CH_2OH)_2$ | effluent from textile, pharmaceutical, perfumery, & tobacco industries; effluent from manufacture of synthetic resins, fabrics, plastics, & explosives | 313<br>77 | rat | 15,650<br>20,760 | | | 314 | rabbit | 0.5 mg/kg daily | Affected kidney & liver function |
| | | 314 | mouse | 13,300 | | | | rabbit | 0.5 mg/kg daily | Increase in urea & indican in blood serum; decrease in indican in urine; shortened prothrombin time; inhibited excretory hepatic function |
| | | | guinea pig | 14,000 | | | | | | |
| | | | rabbit | 2,688 | | | | | | |
| | | 435,<br>449 | mosquito<br>fish | | 32000 | | | rabbit | 0.05 mg/kg daily | No effect |
| | | | | | | | | albino rat | 0.05 mg/kg daily | No effect on conditioned reflexes |

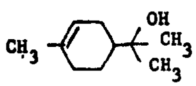
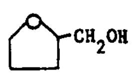
## TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | | ALCOHOLS | | | | | |
| DIMETHYLPHENYLCARBINOL  | effluent from production of phenol & acetone | 153 | rat | 2540 | | | 153 | rabbit | 2.5 mg/kg daily | Increase in cholinesterase activity; albuminuria; pathological changes in kidneys |
| | | | mouse | 1650 | | | | | | |
| ETHYL ALCOHOL $CH_3CH_2OH$ | used in manufacture of organic substances, perfumes, flavors, & drugs; used for beverages, fuel, paint and varnishes | 252 | stickleback | | 40,000 caused intoxication | | | | | |
| ETHYLENE GLYCOL $HOCH_2CH_2OH$ | | 313 | rat | 13,000 | | | 313, 314 | rabbit | 0.5 mg/kg daily | Affected kidney & liver function |
| | | 77 | | 8,540 | | | | | | Increase in urea & indican in blood serum; decrease in indican in urine; shortened prothrombin time; inhibited excretory hepatic function |
| | | 313 | mouse | 8,050 | | | | | | |
| | | | guinea pig | 11,150 | | | | | | |
| | | | rabbit | 5,017 | | | | | | |
| | | | | | | | | rat | 5 mg/kg daily | Functional changes in higher nervous activity |
| | | | | | | | 465 | | 0.5 mg/kg daily for 4 1/2 mos | No effect |
| ETHYL HEXANEDIOL (RUTGERS 612) | pesticide; repellent | 340 | rat | 2600 | | | | | | |
| HEPTYL ALCOHOL $CH_3(CH_2)_5CH_2OH$ | | | | | | | 256 | warm-blooded animals | 0.0025 mg/kg | Threshold causing slight changes in conditioned reflexes and carbohydrate metabolism |

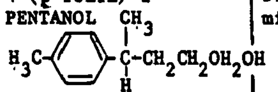
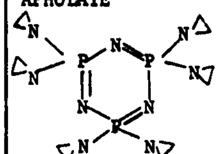
## TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | | ALCOHOLS | | | | | |
| HEXYL ALCOHOL $CH_3(CH_2)_5OH$ | | 252 | rat | 4.1 | | | | | | |
| ISOBUTYL ALCOHOL $(CH_3)_2CHCH_2OH$ | industrial | 286 | human | intoxication can occur in cases ingesting impure vodka | | | 286 | dog & cat | 1.85% conc. | Reduced activity of pancreatic juice |
| METHYL ALCOHOL $CH_3OH$ | used in chemical synthesis, as a fuel, as a solvent & in commercial manufacture of many products | 252 | trout | | 8100 mg/l had no harmful effects in 24 hr | | 252 | human | small amounts lead to blindness; 10 ml has caused death | |
| MONOCHLOROHYDRIN $ClCH_2CH_2OH$ | | 210 | mouse | 135 | | | | | | |
| NONYL ALCOHOL $CH_3(CH_2)_8OH$ | | | | | | | 256 | warm blooded animals | 0.005 mg/kg | Threshold - caused slight changes in conditioned reflexes and carbohydrate metabolism |
| OLEYL ALCOHOL EO $CH_3(CH_2)_7CH{=}CH(CH_2)_7CH_2O(CH_2CH_2O)_nH$ | surfactant | 77, 397 | rat | 2700-25800 | | | | | | |
| PINE OIL (CYCLIC TERPENE ALCOHOLS) | flotoreagents effluent from non-ferrous ore concentrating plants | 233 | | slight toxic properties when introduced orally | | | | | | |
| PROPYL ALCOHOL $CH_3CH_2CH_2OH$ | industrial solvent | 252 | rat | 3300 | | | | | | |

# TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/1 | LC50 mg/1 | Ref | Species | Dose | Effect |
| | | | | | **ALCOHOLS** | | | | | |
| STREPTOMYCIN $C_{21}H_{39}N_7O_{12}$ | effluent from manufacture of streptomycin | 262 | mouse | 75 | | | | | | |
| TERPINEOL  | flotoreagent effluent from non-ferrous ore concentrating plants | 233 | | slight toxic properties when introduced orally | | | | | | |
| TETRAHYDROFURFURYL ALCOHOL  | industrial effluent | 322 | albino rat | 2500 | | | 321 | rat, mouse, rabbit | 10 mg/kg daily for 4 mos | Affects conditioned reflexes |
| | | | white mouse | 2300 | | | | rat, mouse, rabbit | 20 mg/kg daily for 4 mos | Affects cholinesterase activities, prothrombin times, liver glycogen concentrations, and rates of immunization |
| | | | guinea pig | 3000 | | | 320 | laboratory animals | >5 ml/1 in drinking water | Pathological changes |
| | | | | | | | 322 | rabbit, mouse, rat | 20 mg/kg daily | Weight lag; 56% decrease in cholinesterase activity after 2 mos.; 40-70% increase in prothrombin time after 2 mos. |
| | | | | | | | | rabbit, mouse, rat | 20 mg/kg daily | Increase in liver glycogen level; leukocytosis; rise in oxygen consumption; hepatic lesions |
| | | | | | | | | rat | 10 mg/kg daily (long term) | Decrease in conditioned reflexes |

## TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | | **ALCOHOLS** | | | | | |
| 4-(p-TOLYL)-1-PENTANOL  | bleached kraft pulp mill waste | 450 | fish | | 22 (toxic level) | | 450 | fish | | Effective inhibitor for cytochrome oxidase *in vitro* |
| | | | | | **AMINES** | | | | | |
| **ALIPHATIC** | | | | | | | | | | |
| APHOLATE  | pesticide | 124 | rat | 98♂<br>113♀<br>400-800 (dermal) | | | | | | |
| DIAZOBUTYL AMINE<br>$H_2N-CH_2CH_2CH_2CH=N=N$ | | | | | | | 462 | rabbit | 1-10 mg/kg for 223 days | Altered cholinesterase activity, oxalacetic, and pyruvic transaminase; decrease in blood prothrombin activity; disturbance of proteinogenic function |
| DIBUTYLAMINE<br>$CH_3(CH_2)_3N(H)(CH_2)_3CH_3$ | | 252, 294 | rat | 550 | | | | | | |
| DIETHANOLAMINE<br>$(OHCH_2CH_2)_2NH$ | | 77 | rat | 1410-1820 | | | | | | |
| | | 435, 449 | mosquito fish | | 1400 | | | | | |

## TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | | | **AMINES** | | | | |
| DIISOPROPYLAMINE<br>$(CH_3)_2CH{-}NH{-}CH(CH_3)_2$ | effluent from production of chemical poisons | 252<br>122<br>122 | rat<br><br>mouse | 770<br>550<br>690 | | | 122, 361 | warm blooded animals | 0.025 mg/kg | Limiting permissible concentration |
| | | | | | | | 122 | rat & guinea pig | 0.5 mg/kg daily for 6 mos | Decrease in immunobiological organism reaction; increase in lymphocyte number |
| 2-ETHYLBUTYLAMINE<br>$CH_3CH_2CH(CH_2CH_3)(CH_2NH_2)$ | | 77, 252 | rat | 390 | | | | | | |
| ETHYLENEDIAMINE<br>$NH_2CH_2CH_2NH_2$ | | 77, 252 | rat | 1160 | | | | | | |
| HEXAMETHYLENE-DIAMINE<br>$H_2N(CH_2)_6NH_2$ | production of nylon | | | | | | 43 | rat | 100 mg/kg daily | Fur ruffled & lusterless; lack of desire for food; irritation of gastro-intestinal tract; death of most animals after 6-7 doses |
| | | | | | | | | rabbit | 0.05 & 0.005 mg/kg daily - 6 mos | Well defined shifts in blood leukocytes. nucleic acid content, cholinesterase activity, glutamic-alanine transferase activity, & in blood serum proteins |
| HEXAMETHYLENE DIAMINE ADIPATE<br>$NH_2(CH_2)_6NH_2$ + $HOOC(CH_2)_4COOH$ | raw product in production of nylon | 41 | white mouse | 700 | | | 41 | rabbit | 5.0 mg/kg daily for 7 mos | Decrease in cholinesterase activity; disturbed blood sugar curve following heavy administration of galactose; increase in number and total protein SH group |

## TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | AMINES | | | | | | |
| HEXYLAMINE $CH_3(CH_2)_5NH_2$ | | 252 | rat | 670 | | | | | | |
| ISOPROPYLAMINE $(CH_3)_2 > CHNH_2$ | production of Atrazine (a pesticide) | 116<br>77 | white rat | 880<br>820 | | | 116 | laboratory animal | | No appreciable cumulative effects; affects CNS |
| | | | white mouse | 600 | | | 361 | warm blooded animals | 0.05 mg/l | Limiting permissible concentration |
| β-MERCAPTODIETHYLAMINE $(HSCH_2CH_2)_2NH$ | pesticide; found in waste water from plants manufacturing the pesticide | 114 | rat<br>mouse<br>rabbit | 650<br>550<br>350 | | | 114 | rabbit | 5 mg/kg daily for 5-1/2 mos | Decrease in cholinesterase activity; pathological changes in gastro-intestinal tract; slight change in blood sugar curve |
| MONOETHANOLAMINE $NH_2CH_2CH_2OH$ | production of dyes, solvents, pharmaceuticals, detergents & some perfume; used in precision instrument construction, aviation, shipbuilding & others as an inhibitor of metal corrosion | 341<br>77 | mouse<br>rat | 15,000<br>20,000<br>2,140 | | | 341 | rat | 0.5 mg/kg daily for 7 mos | Weight change; sick & lethargic; cyanosis; decrease in cholinesterase activity; increase in weight of liver; decrease in blood prothrombin |
| | | | | | | | | | 0.025-0.25 mg/kg daily for 7 mos | Decrease in blood prothrombin |
| | | | | | | | | rabbit | 0.5 mg/kg daily for 7 mos | Decrease in cholinesterase activity; decrease in carbohydrate metabolism in 1 rabbit |

## TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/1 | LC50 mg/1 | Ref | Species | Dose | Effect |
| | | | | | **AMINES** | | | | | |
| PHENYLHYDRAZINE $C_6H_5NHNH_2$ | manufacture of dyes; & as a reagent for sugars, aldehydes & ketones; chemical treatment of water in hot water supply systems; used in preparation of synthetic fibers, films & plastics, as softeners & plasticizers in manufacture of rubber, as inhibitors of plant growth, as detergents & softeners in the textile industry | 92 | rat<br>white mouse<br>guinea pig<br>rabbit | 188<br>175<br>80<br>80 | | | | | | |
| TRIETHANOLAMINE $HOCH_2CH_2N\langle^{CH_2CH_2OH}_{CH_2CH_2OH}$ | | 77 | rat | 8680 | | | | | | |
| TRIETHYLAMINE $(C_2H_5)_3N$ | process of organic synthesis in the production of herbicides & accelerators for synthetic rubber | 176<br>77 | white mouse<br>rat | 545.8<br>460 | | | 176 | rabbit | 6 mg/kg daily for 7 mos | Disturbance in carbohydrate function of liver |
| | | | | | | | | albino rat | 54.5 mg/kg daily for 2 mos | No cumulative effects |
| | | | | | | | 177 | rat | 10.0 & 1.0 mg/kg daily | Significant changes in electro-encephalogram & conditioned reflexes |

## TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

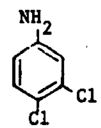
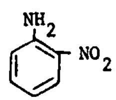
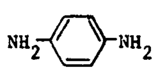
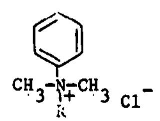
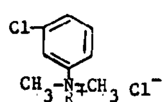
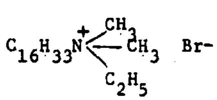
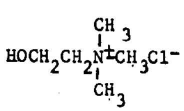
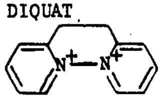
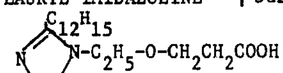
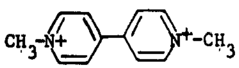
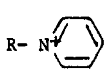
| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | AMINES | | | | | | |
| AROMATIC | | | | | | | | | | |
| 3.4-DICHLORANILINE  | | | | | | | 57 | rat | 20 mg/kg daily | Change in neutrophil phagocytosis |
| o-NITROANILINE  | | 269 | mouse | 1246.1 | | | 269 | rat | | Spasms; increased quantity of hemoglobin, erythrocytes, & reticulocytes, the phenomenon of Heinz bodies, leukocytosis. neutrophilis, lymphopenia (acute intoxication) |
| | | | guinea pig | 2350 | | | | | | |
| m-NITROANILINE | | 269 | rat | 700 | | | 269 | rat | | Same as o-Nitroaniline except had inhibitions & no spasms |
| | | | guinea pig | 450 | | | | | | |
| p-NITROANILINE | | 269 | rat | 1500 | | | 269 | rat | | Same as o-Nitroaniline |
| | | | guinea pig | 450 | | | | | | |
| p-PHENYLENEDIAMINE (URSOL)  | effluent from aniline dye & fur dyeing plants | | | | | | 461 | rabbit | 0.05 mg/kg daily for 6-7 mos | Change in blood sugar; induced allergic sensitivity |
| | | | | | | | 460 | rabbit | 0.5 mg/kg daily for 7 mos | Change in general condition & behavior; increase in number of reticulocytes; disturbed liver glycogenic function; disturbed carbohydrate liver function; induced allergy sensitivity |
| | | | | | | | | | 0.5-5.0 mg/kg daily for 7 mos | Change in conditioned reflexes |

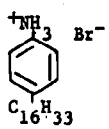
TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | | AMINES | | | | | |
| QUARTERNARY | | | | | | | | | | |
| ALKYLDIMETHYLBENZYL-AMMONIUM CHLORIDE  | synthetic surfactant; used in textile, mining, metal-working, food, paper & other industries, in agriculture, & as detergents | 138 | albino rat | 340 | | | 138 | human | | Skin irritation; CNS poison |
| ALKYLDIMETHYLCHLORO-BENZYLAMMONIUM CHLORIDE  | synthetic surfactant; used in textile, mining, metal-working, food, paper & other industries, in agriculture, & as detergents | 138 | albino rat | 2000 | | | 138 | human | | Skin irritation; CNS poison |
| BENZETHONIUM CHLORIDE (HYAMINE 1622) | pesticide | 174 | coho salmon | | 53 (48 hr) | | | | | |
| CETYLDIMETHYLETHYL-AMMONIUM CHLORIDE  | synthetic surfactant; used in textile, mining, metal-working, food, paper & other industries, in agriculture & as detergents | 138 | albino rat | 60 | | | 138 | human | | Skin irritation; CNS poison |
| CHOLINE CHLORIDE  | | 468 | human | 5-20 g/l - minimum to affect human organism | | | | | | |

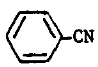
# TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/1 | LC50 mg/1 | Ref | Species | Dose | Effect |
| | | | | | AMINES | | | | | |
| DIQUAT  | pesticide | 173 | rat | 400-440 | | | | | | |
| | | 174 | chinook salmon | | 38.5 (24 hr) | | | | | |
| LAURYL IMIDAZOLINE  | surfactant | 397, 77 | rat | 3200 | | | | | | |
| PARAQUAT  | pesticide | 124 | rat | 100♂<br>110♀<br>80♂ ) (dermal)<br>90♀ ) | | | | | | |
| | | 173 | | 112-200 | | | | | | |
| QUARTERNARY AMMONIUM CHLORIDE (PREPARATION 34) $(R)_4N^+Cl^-$ | surfactant | 467 | rat | 750 | | | 467 | albino rat & rabbit | 0.05, 0.5 & 10 mg/kg daily for 6 mos | 0.05 had no effect on animals; alterations in transaminase activity; inhibition of cholinesterase activity at 0.5 mg/kg only; inhibition of blood catalase; decrease in ascorbic acid content in hepatic tissue; histological variations in organs |
| | | | mouse | 744 | | | | | | |
| QUARTERNARY PYRIDINIUM  | component in detergent or cleaning formulation | 397 | rat | 200-250 | | | | | | |
| | | | mouse | 470-2500 | | | | | | |
| | | | guinea pig | 200 | | | | | | |
| | | | rabbit | 400 | | | | | | |

## TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | | AMINES | | | | | |
| STERINOL  | detergent | 20 | rat | 250 | | | | | | |
| **NITRILES** | | | | | | | | | | |
| ACETONE CYANOHYDRIN $(CH_3)_2C(OH)CN$ | | 365 | rat | 13.3 | | | 365 | rat | 0.0005 mg/kg daily for 6 mos | Affect on blood morphology, catalase and cholinesterase activity, vitamin C concentrations and conditioned reflexes |
| | | | mouse | 2.9 | | | | | | |
| | | | guinea pig | 9.0 | | | | | | |
| | | | rabbit | 13.5 | | | | | | |
| ACETONITRILE $CH_3C\equiv N$ | petrochemical | 77 | rat | | 3800 | | | | | |
| | | 252 | bluegill | | 1850 | | | | | |
| | | | fathead | | 1000 | | | | | |
| | | | guppy | | 1650 | | | | | |
| ACRYLONITRILE $CH_2=CHCN$ | pesticide; used in manufacture of plastics & synthetic rubber | 340 | rat | 81-106 | | | 454 | rat | 1 mg/kg daily for 6 mos | Depressed response to weak stimulation and the appearance of narcotic, equalizing and paradoxical phases |
| | | 252 | pin perch | | 24.5 (24 hr) | | | rabbit | 10 mg/kg daily for 6 mos | Slight microcellular proliferation in the interstitial kidney tissue & some homogenation of blood vessels in internal organs |
| | | | bluegill | | 11.8 | | | | | |
| | | | fathead | | 14.3-18.1 | | | | | |
| | | | guppy | | 33.5 | | | | | |

# TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | | AMINES | | | | | |
| ADIPONITRILE | production of nylon; petrochemical | 196 | rat | 105 | | | 196 | | | Change in internal organs & behavior |
| $NC(CH_2)_4CN$ | | | white mouse | 48 | | | | | | |
| | | | rabbit | 19.4 | | | | | | |
| | | 449 | bluegill | | 720 | | | | | |
| | | | fathead | | 820 | | | | | |
| | | | guppy | | 775 | | | | | |
| BENZONITRILE | petrochemical | 449 | bluegill | | 78 | | | | | |
|  | | | fathead | | 78 | | | | | |
| | | | guppy | | 400 | | | | | |
| LACTONITRILE | petrochemical | 449 | bluegill | | 0.90 | | | | | |
| $CH_3$ | | | fathead | | 0.90 | | | | | |
| H-C-OH | | | guppy | | 1.37 | | | | | |
| CN | | | pin perch | | 0.215 (24 hr) | | | | | |
| LETHANE 384 | pesticide | 340 | rat | 90 | | | | | | |
| $CH_3(CH_2)_3$-O-$(CH_2)_2$-O-$(CH_2)_2$-SCN | | 49 | | 1190 (50% active agent) | | | | | | |
| | | 173 | | 90-300 | | | | | | |
| OXYDIPROPIONITRILE | petrochemical | 77 | rat | | 2830 | | | | | |
| $NCCH_2CH_2$-O- $CH_2CH_2CN$ | | 449 | bluegill | | 4200 | | | | | |
| | | | fathead | | 3600 | | | | | |
| | | | guppy | | 4450 | | | | | |

## TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

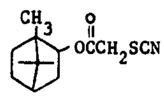
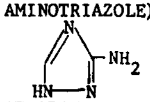
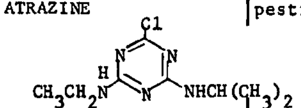
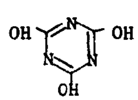
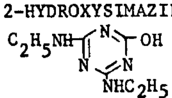
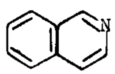
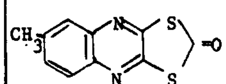
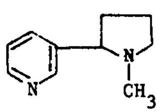
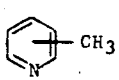
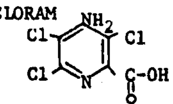
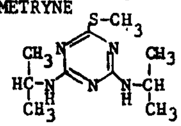
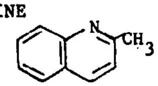
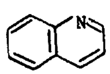
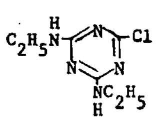
| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | | **AMINES** | | | | | |
| THANITE | | 340 | rat | 1600 | | | | | | |
| | | 49 | | 2140 (82% active agent) | | | | | | |
|  | | | | | | | | | | |
| **HETEROCYCLIC** | | | | | | | | | | |
| ACRIDINE $C_6H_4CHNC_6H_4$ | tar & gas wastes | 49 | perch | | 0.7 (fatal in 1 hr) | | | | | |
| AMITROLE (ATA, WEEDA ZOL, AMINOTRIAZOLE) | pesticide | 252 | rat | 14,700 | | | | | | |
| | | | | 25,000 | | | | | | |
| | | 173 | | 1100-2500 | | | | | | |
|  | | 252 | red-sided shiners | | 983.3-1370 | | | | | |
| ATRAZINE | pesticide | 173 | rat | 2000 | 1.25 (50% in A361; 48 hr) | | | | | |
|  | | 251 | minnow | | | | | | | |
| CYANURIC ACID | | | | | | | 249 | rat & guinea pig | 30 mg/kg daily for 6 mos | Reduced amount of ascorbic acid in kidneys and spleen of guinea pig; dystrophic changes in kidneys |
|  | | | | | | | | rat & guinea pig | 200 mg/kg daily for 6 mos | Suppression of weight increase; reduced amount of ascorbic acid in spleen & kidneys of guinea pig; dystrophic changes in kidneys |

TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | AMINES | | | | | | |
| 2-HYDROXYSIMAZINE  | pestici | | | | | | 249 | rat & guinea pig | 250 mg/kg daily for 6 mos | Atrophic gastritis |
| ISOQUINOLINE  | | 174 | sunfish | | 65 (fatal in 1 hr) | | | | | |
| | | | perch | | 100 (fatal in 1 hr) | | | | | |
| MORESTAN  | pesticide | 124 | rat | 1800♂<br>1100♀<br>>2000 (dermal) | | | | | | |
| MORPHOLINE  | industrial | 124 | rat | 1050 | | | | | | |
| NICOTINE  | pesticide | 304 | mammal | 2-10 | | | | | | |
| | | 124 | rat | 83 (as sulfate) | | | | | | |
| | | | | 285 (as sulfate) (dermal) | | | | | | |
| | | 340 | rat | 10 (as sulfate) | | | | | | |
| | | 252 | | 55.2 | | | | | | |
| PICOLINE  | some industrial wastes | 252 | rat | 1.29 | | | | | | |

## TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | | AMINES | | | | | |
| PICLORAM  | pesticide | | | | | | 182 | bird | | No chronic toxicity |
| PROMETRYNE  | pesticide | 19 | rat | 2138 | | | 19 | | 0.625 mg/kg daily for 6 mos | Affects conditioned reflexes, blood composition, carbohydrates, metabolism, and histology |
| | | | mouse | 3126 | | | | | | |
| QUINALDINE $C_{10}H_9N$  | coal tar & gas plant wastes | 252 | trout | | 5.0 (lethal in 1 hr) | | | | | |
| | | | rat | 1230 | | | | | | |
| QUINOLINE $C_9H_7N$  | tar & gas wastes | 174 | sunfish | | 52-56 (lethal in 1 hr) | | 252 | | | Paralyzes respiratory muscles |
| | | | perch | | 30-50 (lethal in 1 hr) | | | | | |
| | | 252 | | | <30 - lethal | | | | | |
| | | | trout | | 5.0 (lethal in 14 hr) | | | | | |
| | | | bluegill | | 5.0 (lethal in 4 hr) | | | | | |
| | | | fish | | 7.5 - lethal | | | | | |
| SIMAZINE  | pesticide | 173 | rat | 5000 | | | 249 | rat & guinea pig | 100 mg/kg daily for 6 mos | Suppressed weight increase; increase in number of leucocytes; decrease in cholinesterase activity in blood; atrophic gastritis |
| | | 174 | rainbow trout | | 85 (48 hr TLm) | | | | | |
| | | 174, 252 | chinook salmon | | 6.6 (48 hr) | | | | | |
| | | 251 | minnow | | 0.5 (lethal in 3 days) | | | | | |

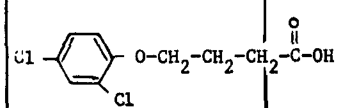
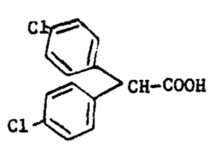
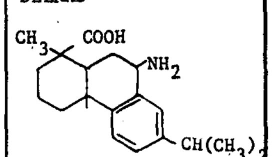
## TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | | **AMINES** | | | | | |
| STRYCHNINE $C_{21}H_{22}N_2O_2$ | pesticide | 304 | rat | 4.0♂ ) 1.8♀ ) (subcutaneous) | | | | | | |
| | | | | | **ORGANIC ACIDS** | | | | | |
| CARBOXYLIC | | | | | | | | | | |
| ACRYLIC ACID $CH_2$=CHCOOH | | 195 | rat | 1250 | | | 195 | mouse | ≧ 0.25 mg/kg daily for 2 mos | Physiological effects |
| | | | white mouse | 830 | | | | | | |
| | | | rabbit | 250 | | | | | | |
| ADIPIC ACID $HOOC(CH_2)_4COOH$ | | 88 | bluegill | | <330 (24 hr) | | | | | |
| BENZOIC ACID $C_6H_5COOH$ | tar & gas wastes | 174 | sunfish | | 550-570 (lethal in 1 hr) | | | | | |
| | | 435, 252 | mosquito fish | | 180 | | | | | |
| BUTYRIC ACID $CH_3CH_2CH_2COOH$ | | 88 | D. magna | | 61 (48 hr) | | | | | |
| CAPROIC ACID $CH_3(CH_2)_4COOH$ | | 88 | bluegill | | >150-<200 (24 hr) | | | | | |
| CHLORENANTHIC ACID $Cl(CH_2)_6COOH$ | effluent from production of enantha fiber | 215 | white mouse | 1800 | | | 215 | rat | 200 mg/kg daily for 2-1/2 mos | Slight decrease in cholinesterase activity |

TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | ORGANIC ACIDS | | | | | | |
| CHLORENANTHIC ACID (Cont.) | | | | | | | 215 | rat & rabbit | 5 mg/kg daily for 6-1/2 mos ; 50 mg/kg daily for 6-1/2 mos | No significant change in leukocyte number, blood sugar, blood cholinesterase or conditioned reflexes |
| | | | | | | | | rat | 300 mg/kg daily for 1-1/2 mos | Increase in leukocyte number |
| CHLOROPELARGONIC ACID $Cl(CH_2)_8COOH$ | effluent from production of enantha fiber | 215 | white mouse | 3000 | | | | rat | 300 mg/kg daily for 1-1/2 mos | Increase in leukocyte number |
| CHLORUNDECANOIC ACID $Cl(CH_2)_{10}COOH$ | effluent from production of enantha fiber | 215 | white mouse | 6000 | | | | | | |
| CITRIC ACID $C_6H_8O_7$ | industrial waste | 449 | D. magna | | 185 (fatal in 10-17 hr) | | | | | |
| DALAPON (DOWPON) $CH_3CCl_2COONa$ | pesticide | 198 | albino rat | 4700 | | | 199 | albino rat | 235 & 940 mg/kg daily for 2 mos | At 940 mg/kg animals showed a decrease in weight gain; decrease in serum SH groups; increase in vitamin C content of suprarenals; increase in weight coefficient of liver, kidneys, spleen, thyroid, pituitary & suprarenals; histological changes with both doses |
| | | 252 | | 6590-8120 | | | | | | |
| | | 173 | | 4000-9300 | | | | | | |
| | | 198 | white mouse | 7100 | | | | | | |
| | | 174 | coho salmon | | 340 (48 hr) | | | | | |
| | | 438 | bass | | >1000 (48 hr) | | | | | |

## TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/1 | LC50 mg/1 | Ref | Species | Dose | Effect |
| | | | | ORGANIC ACIDS | | | | | | |
| DALAPON (Cont.) | | | | | | | 199 | | 200 mg/kg P.O. 5 mos 6 x week | Lowered SH groups in serum; increase in weight of thyroid; slight dystrophyin parenchymatous organs |
| | | | | | | | | | 10 mg/kg P.O. 5 mos 6 x week | Lowered concentration in SH groups in serum; change in conditioned reflexes |
| 2,4-DB | pesticide | 438 | rat | 2500 (LD 100) | | | 129 | rat | 500 mg/kg daily for 10 days | Weight loss; decrease in blood catalase activity; histological damage in liver; intoxication |
| | | | mouse | 75 (LD 100) | | | | | | |
|  | | 174 | bluegill | | 8 (48 hr) | | | | | |
| | | | largemouth bass | | 10 (48 hr) | | | rat | 1 mg/kg daily for 6 mos | No appreciable effects |
| DDA | pesticide (metabolite of DDT) | 124 | rat | 740♂ 600♀ | | | | | | |
|  | | | | | | | | | | |
| DELRAD | pesticide | 252 | rat | 850 | | | | | | |
|  | | | fathead | | 0.16-0.23 | | | | | |
| | | | catfish | | 0.67 | | | | | |

# TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

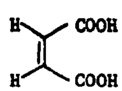
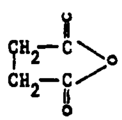
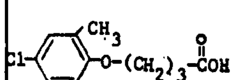
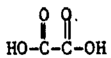
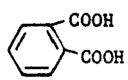
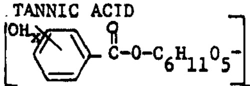
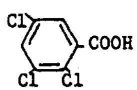
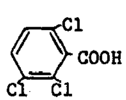
| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | | ORGANIC ACIDS | | | | | |
| ENDOTHALL  | pesticide | 252<br>173 | rat | 35<br>80 | | | | | | |
| | | 174<br>252 | largemouth bass | | 200 (48 hr)<br>>135 | | | | | |
| GLUTARIC ACID $CH_2(CH_2COOH)_2$ | | 88 | bluegill | | 330 (24 hr) | | | | | |
| LACTIC ACID $C_3H_6O_3$ | industrial waste | 449 | D. magna | | 191 (fatal in 6-48 hr) | | | | | |
| MALEIC ACID  | effluent from production of maleic anhydride | | rat | | | | 229 | rat | 0.06 mg/kg daily for 6 mos | Affects glycogen synthesizing liver function |
| | | | | | | | | rabbit | 6 mg/kg daily for 5 mos | Decrease in phagocytic activity |
| MALEIC ANHYDRIDE  | | 435 | mosquito fish | | 230 | | 232 | rabbit | 2.5 mg/kg daily for 6 mos | Disturbance in liver glycogenic synthesizing function; some histological changes |
| | | | | | | | | | 5 mg/kg daily for 5 mos | Change in phagocytic activity |
| MALONIC ACID HOOC $CH_2COOH$ | | 88 | bluegill | | 150 (24 hr) | | | | | |
| MCPB  | pesticide | 173 | rat | 680 | | | | | | |
| | | 174 | bluegill | | 15 (48 hr) | | | | | |
| | | | largemouth bass | | 10 (48 hr) | | | | | |

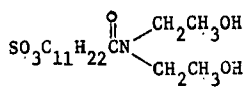
TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | | ORGANIC ACIDS | | | | | |
| OXALIC ACID | | 88 | bluegill | | 4000 (24 hr) | | | | | |
|  | | 435 | mosquito fish | | 1350 | | | | | |
| PHTHALIC ACID  | | 258 | rat | 1100 | | | 258 | laboratory animals | 0.56 mg/kg daily for 6 mos | Reduces thrombocyte conc., increases bilirubin excretion, morphological changes in internal organs |
| TANNIC ACID  | | 435 | mosquito fish | | 37 | | | | | |
| 2,3,5-TBA | pesticide | 174 | bluegill | | 90 (48 hr) | | | | | |
|  | | | largemouth bass | | 55 (48 hr) | | | | | |
| | | 252 | laboratory animals | 300-1500 | | | | | | |
| 2,3,6-TBA | pesticide | 174 | bluegill | | 1750 (48 hr) | | | | | |
|  | | | largemouth bass | | 1250 (48 hr) | | | | | |
| | | 173 | rat | 1500 | | | | | | |
| TCA | | 252 | rat | 3300-3370 | | | 252 | rat | 0.3%/day for 4 mos | Inhibited growth rate |
| | | 174 | channel cat | | >2000 (48 hr) | | | | | |
| $CCl_3COOH$ | | 252 | | | >2000 | | | | | |

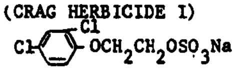
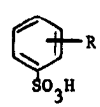
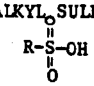
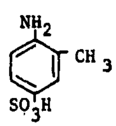
## TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | | | | | | | |
| | | | | **ORGANIC ACIDS** | | | | | | |
| **SULFATES** | | | | | | | | | | |
| ALKYL SULFATE $R-O-SO_3^-$ | | 251 | fathead | | 5.1-5.9 | | | | | |
| 3,9-DIETHYL-TRI-DECYL-6 SULFATE $(CH_3CH_2)_2CH-(CH_2)_2-CH(SO_4^-)-(CH_2)_2-CH((CH_2)_3CH_3)(CH_2CH_3)$ | surfactant | 397 | rat | 1430 | | | 397 | rat | 65 mg/kg daily for 30 days | No effects |
| | | | guinea pig | 425 | | | | | | |
| 2-ETHYLHEXYL SULFATE $CH_3(CH_2)_3CH(CH_2CH_3)CH_2OSO_3H$ | | 397 | rat | 4125 | | | 397 | rat | 175 mg/kg 30 days | No effects |
| | | | guinea pig | 1520 | | | | | | |
| | | | | | | | | rabbit | 100 mg/kg | Noticeable effect |
| 7-ETHYL-2-METHYL-UNDECYL-4 SULFATE $(CH_3)_2CHCH_2CH(OSO_3H)(CH_2)_2CH(CH_2CH_3)(CH_2)_3CH_3$ | surfactant | 397 | rat | 1250 | | | 397 | rat | 25 mg/kg 30 days | None |
| | | | guinea pig | 650 | | | | | | |

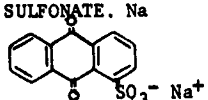
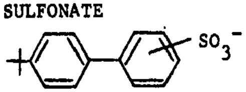
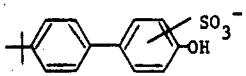
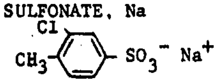
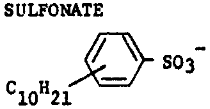
# TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | ORGANIC ACIDS | | | | | | |
| LAURIC DIETHANOLAMIDE SULFONATE  | surfactant | 397 | rat | 2700 | | | | | | |
| LAURYL ALCOHOL SULFATE EO $SO_4C_{12}H_{24}C$ | surfactant | 397 | rat | 4150-9350 | | | | | | |
| | | | mouse | 1170-7600 | | | | | | |
| LAURYL GLYCERYL SULFATE $SO_4C_{11}H_{22}CH_2OCH_2CHOHCH_2OH$ | surfactant | 397 | rat | 1820 | | | 397 | rat | 5000 ppm in diet 2 yrs | None |
| LAURYL SULFATE $C_{12}H_{25}OSO_3H$ | surfactant | 397 | rat | 1000-2730 | | | 397 | rat | 30 mg/kg 160 days | None |
| | | | | | | | | | 10,000 ppm in food 2 yrs | None |
| | | | | | | | | | 60 mg/kg 5 wks | None |

## TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | ORGANIC ACIDS | | | | | | |
| LAURYL SULFATE (Cont.) | | | | | | | 397 | mouse | 10,000 ppm in food 3 mos | None |
| | | | | | | | | dog | 135 mg/kg/ day | None |
| | | | | | | | | guinea pig | 2000 ppm $H_2O$ 180 days | None |
| SESONE (CRAG HERBICIDE I)  | pesticide | 252 | rat | 640-1330<br>700-1400 | | | 252 | dog | 360 mg/kg/ day in diet for 1 yr. | None |
| SULFONICS | | | | | | | | | | |
| ALKYLARYL SULFONATE  | surfactant | | | | | | 397 | rat | 700 mg/kg/ day for 2 mos | Some deaths |
| | | | | | | | | guinea pig | 2000 mg/l in water - 180 days | None |
| | | | | | | | 252 | human | 100 mg/day 4 mos. | No effect |
| ALKYL SULFONATE  | surfactant | 81 | rat | 2700<br>3000 | | | 397 | rat | 0.1 LD 50/day for 45 days | None |
| 4-AMINO-m-TOLUENE-SULFONIC ACID  | industrial waste | 435 | mosquito fish | | 375 | | | | | |

## TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/1 | LC50 mg/1 | Ref | Species | Dose | Effect |
| | | | | | ORGANIC ACIDS | | | | | |
| ANTHRAQUINONE-α SULFONATE, Na  | | 88 | D. magna | | 50 | | | | | |
| BUTYLBIPHENYL SULFONATE  | surfactant | 397 | mouse | 3400 | | | | | | |
| BUTYLPHENYLPHENOL SULFONATE  | surfactant | 397 | mouse | 2200-3800 | | | 397 | guinea pig | 2000 mg/1 in water for 180 days | None |
| BUTYL SULFONATE, Na $CH_3CH_2CH_2CH_2-S(=O)_2-O^-Na^+$ | | 88 | D. magna | 2700 | | | | | | |
| p-CHLOROBENZENE SULFONATE, Na $p\text{-}ClC_6H_4SO_3Na$ | | 88 | D. magna | | 2150 | | 292 | rat & rabbit | 250 mg/kg daily | No effect |
| 2-CHLOROTOLUENE-4-SULFONATE, Na  | | 88 | bluegill | | <1374 (24 hr) | | | | | |
| DECYLBENZENE SULFONATE  | surfactant | 397 | mouse | 2000 | | | | | | |
| | | 77 | albino rat | 2320 | | | | | | |

# TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

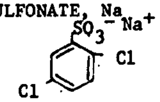
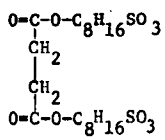
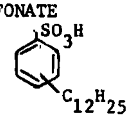
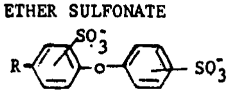
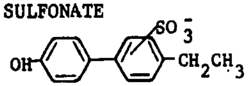
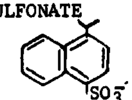
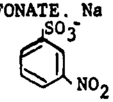
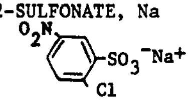
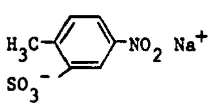
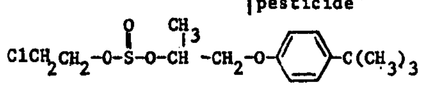
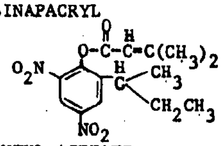
| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | | ORGANIC ACIDS | | | | | |
| 2,5-DICHLOROBENZENE SULFONATE, Na  | | 88 | D. magna | | 938 | | | | | |
| DIOCTYL SUCCINATE SULFONATE  | surfactant | 397 | rat | 1900 | | | 397 | rat | 200-900 mg/kg/day 6 mos | None |
| | | | mouse | 4800 | | | | mouse | 4 mg/day 7 mos | None |
| | | | | | | | | rabbit | 500 mg/kg/ day 24 wk. | Some deaths |
| | | | | | | | | rabbit | 250 mg/kg/ day 5 mos | None |
| | | | | | | | | dog | 250 mg/kg/ day 24 wk. | None |
| | | | | | | | | monkey | 125 mg/kg/ day 24 wk. | None |
| | | | | | | | | guinea pig | 2000 mg/l in $H_2O$ 180 days | None |
| DODECYLBENZENE SULFONATE  | surfactant | 81 | rat | 2300 | | | 241 | trout | 5 mg/l | Spermotocytes lost their mobility; fertilized eggs killed |
| | | | | | | | | carp fry | sublethal amounts | Growth rates affected |
| DODECYL DIPHENYL ETHER SULFONATE  | surfactant | 77, 397 | rat | 700 | | | | | | |

TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | ORGANIC ACIDS | | | | | | |
| ETHYLPHENYLPHENOL SULFONATE  | surfactant | 77, 397 | rat | 2000 | | | | | | |
| ISOPROPYL NAPHTHALENE SULFONATE  | surfactant | 397 | rat | 1900 | | | | | | |
| m-NITROBENEZENE SULFONATE. Na  | " | 88 | D. magna | | 5067 | | | | | |
| 4-NITROCHLOROBENZENE 2-SULFONATE, Na  | " | 88 | bluegill | | 948-1474 | | | | | |
| 4-NITROTOLUENE-2-SULFONATE, Na  | " | 88 | bluegill | | <1440 (24 hr) | | | | | |

# TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | ORGANIC ACIDS | | | | | | |
| OLEOYLMETHYL TAURIDE | surfactant | 397 | rat | 4000 | | | 397 | rat | 20,000 ppm in food 4 mos | None |
| $C_{17}H_{33}C(=O)$-N($CH_3$)-$CHCH_2CH_2SO_3H$ | | | mouse | 6300-6600 | | | | guinea pig | 2000 ppm in water | None |
| | | | | | ESTERS | | | | | |
| AMYL ACETATE | | 435 | mosquito fish | | 65 | | | | | |
| $CH_3CO_2C_5H_{11}$ | | | | | | | | | | |
| ARAMITE | pesticide | 252 | rat | 6300<br>3900 | | | 252 | rat & dog | 500 mg/kg in diet of rat 2 yr | None |
|  | | | mouse | 2300 | | | | | | |
| | | 449 | bluegill | | | 480 | | | | |
| | | | rainbow trout | | | 730 | | | | |
| BINAPACRYL | pesticide | 124 | rat | 63♂<br>58♀ | | | | | | |
|  | | | rat | 810♂ ) 720♀ ) (dermal) | | | | | | |
| | | 173 | | 58-225 | | | | | | |
| BUTYL ACETATE | industrial manufacture of plastics, lacquer, artificial leather, photographic films | 252 | rat | 4130 | | | | | | |
| $CH_3(CH_2)_3$-OC(=O)$CH_3$ | | 46 | | 13-100 | | | | | | |
| | | | rabbit | 3200 | | | | | | |
| | | | mouse | 7700 | | | | | | |
| | | 252 | | 7060 | | | | | | |
| | | 46 | guinea pig | 4700 | | | | | | |

## TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

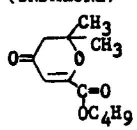
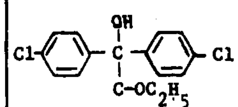
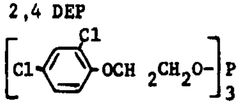
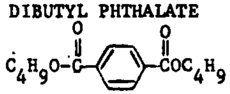
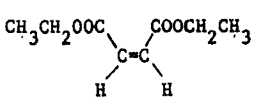
| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | | ESTERS | | | | | |
| BUTYL MESITYL OXIDE (INDALONE)  | pesticide | 340 | rat | 7400 | | | | | | |
| CHLOROBENZILATE  | pesticide | 124 | rat | 1040♂<br>1220♀<br>>5000 (dermal) | | | | | | |
| 2,4 DEP  | pesticide | 451<br>173 | rat | 7.5<br>850 | | | 451 | rat & monkey | | Inhibition of brain cholinesterase activity |
| DIBUTYL PHTHALATE  | | 340 | rat | 1200-20,000 | | | | | | |
| DIETHYL MALEATE  | effluent from plants manufacturing karbophos | 346 | rat<br>mouse<br>guinea pig | 1350<br>2590<br>1450 | | | 346 | rabbit | 100 mg/kg day, 6 mos | Increase in gamma-globulin; decrease in albumin; neutrophilic leukocytosis; increase in vitamin C in blood; bronchial pneumonia; slight fatty liver infiltration |
| | | | | | | | | | application to skin and mucous membrane | Irritation |

TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

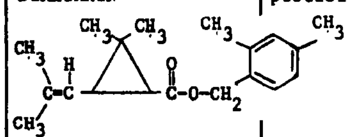
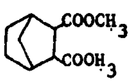
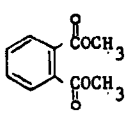
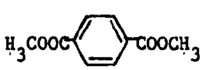
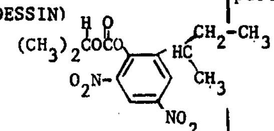
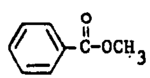
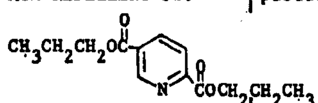
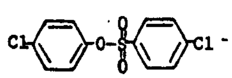
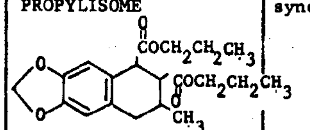
| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | | ESTERS | | | | | |
| DIMETHRIN  | pesticide | 124, 173 | rat | >15,000 | | | | | | |
| DIMETHYL CARBATE  | pesticide | 340 | rat | 1150 | | | | | | |
| DIMETHYL PHTHALATE  | | 340 | rat | 8200 | | | | | | |
| DIMETHYLTEREPHTHALATE  | | 325 | white rat | 2000 (did not lead to death) mg/kg | | | | | | |
| DINOBUTON (DESSIN)  | pesticide | 124 | rat | 59♂<br>71♀<br>1500-2000♂ (dermal)<br>>2000 (dermal) | | | | | | |

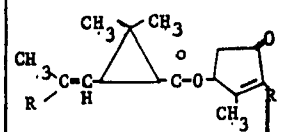
TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | ESTERS | | | | | | |
| DRIONE<br>$SiO_2$ + pyrethrins + piperonyl butoxide | pesticide | 340 | mammal | 0 | | | | | | |
| ETHYL ACETATE<br>$CH_3CH_2-O-\overset{O}{\overset{\parallel}{C}}-CH_3$ | | 221<br>294<br>221 | rat<br><br>white mouse | >5000<br>5620<br>>5000 | | | 221 | laboratory animals | 1000 mg/kg in food for one month | None |
| METHYL BENZOATE<br> | | 27 | rat<br>mouse | 3540<br>3000 | | | 27 | laboratory animals | 500 mg/kg 1-1/2 mos | Various physiological changes |
| METHYL HEXAFLUORO-2-BROMOBUTYRATE<br>$(CF_3)(CF_3)>CBrCOOCH_3$ | refrigerants, propellants, fire extinguishers, solvents | 106 | rat | 980 | | | | | | |
| METHYL HEXAFLUORO-ISOBUTYRATE<br>$(CF_3)(CF_3)>CHCOOCH_3$ | refrigerants, propellants, fire extinguishers, solvents | 106 | rat | 300 | | | | | | |
| METHYL PERFLUORO-METHACRYLATE<br>$CF_3(CF_2{=})CCOOCH_3$ | refrigerants, propellants, fire extinguishers, solvents | 106 | rat | 220 | | | | | | |

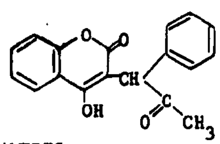
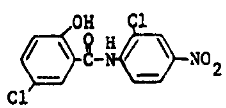
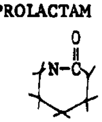
## TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/1 | LC50 mg/1 | Ref | Species | Dose | Effect |
| | | | | | **ESTERS** | | | | | |
| METHYL TETRAFLUORO-PROPIONATE $CF_3-CHF-CO-O-CH_3$ | refrigerants, propellants, fire extinguishers, solvents | 106 | rat | ~10,000 | | | | | | |
| MGK REPELLENT 326  | pesticide | 340 | rat | 5230-7230 | | | | | | |
| OMITE  | | 124 | rat | 1480<br>250♂ ) (dermal)<br>680♀ ) | | | | | | |
| OVEX (OVOTRAN)  | pesticide | 252 | rat | 2000 | | | 252 | rat | 1000 mg/kg in diet | Minimal liver damage |
| | | 449 | bluegill | | | 870 | | | | |
| | | | rainbow trout | | | 860 | | | 10,000 mg/kg in diet | Adverse growth and pronounced liver and kidney damage |
| PROPYLISOME  | synergist | 340 | rat | 5000-15,000 | | | | | | |

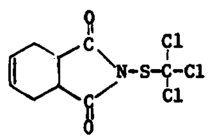
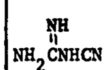
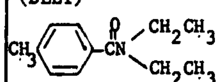
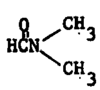
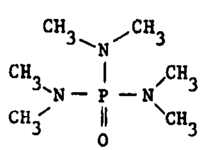
## TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/1 | LC50 mg/1 | Ref | Species | Dose | Effect |
| | | | | | ESTERS | | | | | |
| PYRETHRINS | pesticide | 340 | rat | 200-2600 | | | | | | |
| | | 252 | | 200 | | | | | | |
|  | | 449 | bluegill | | | 78 | | | | |
| | | | rainbow trout | | | 56 | | | | |
| | | 252 | man | fatal dose for 70 kg man is 50 g | | | | | | |
| SESAME OIL mixture of triglycerides | synergist | 340 | rat | >2000-2270 | | | | | | |
| STEAROYL EO | surfactant | 397 | rat | 53,000-64,000 | | | | | | |
| | | | hamster | 20,000-27,000 | | | | | | |
| $C_{18}H_{37}C(=O)-(CH_2CH_2O)_nH$ | | | rabbit | 12,000 + | | | | | | |
| TABUTREX $CH_2C(=O)-O-(CH_2)_3CH_3$ / $CH_2C(=O)-O-(CH_2)_3CH_3$ | pesticide | 340 | rat | 8000 | | | | | | |
| VINYL ACETATE $H_2C=CH-O-C(=O)CH_3$ | | 133 | rat | 2120 | | | | | | |
| | | 77 | | 2920 | | | | | | |
| | | 133 | mouse | 1613 | | | | | | |

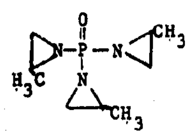
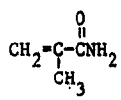
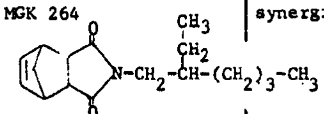
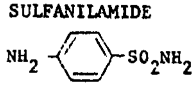
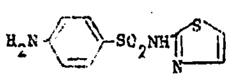
## TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | | ESTERS | | | | | |
| WARFARIN | pesticide | 124 | rat | 3.0 | | | | | | |
|  | | | | | | | | | | |
| | | | | | AMINE DERIVATIVES | | | | | |
| AMIDES | | | | | | | | | | |
| ACETAMIDE $CH_3CONH_2$ | refinery waste | 435 | mosquito fish | | 13,000 | | | | | |
| BAYLUSCIDE (BAYER 73)  | pesticide | 248 | rainbow trout | | 0.1 (death in 15 min) | | | | | |
| | | | flathead catfish | | 0.1 (death in 1 hr) | | | | | |
| | | | yellow perch | | 0.1 (death in 24 hr) | | | | | |
| | | | white sucker | | 1.0 (death in 15 min) | | | | | |
| | | | green sunfish | | 1.0 (death in 15 min) | | | | | |
| | | | yellow perch | | 1.0 (death in 15 min) | | | | | |
| | | | black bullhead | | 10.0 (death in 15 min) | | | | | |
| | | | bluegill | | 10.0 (death in 15 min) | | | | | |
| CAPROLACTAM  | effluent from plants producing caprone | | | | | | 350 | rabbit | 50-500 mg/kg in diet for 6 mos | Change in behavior; change in growth rate; change in mucous membrane of stomach and intestines |
| | | | | | | | | mouse | 15 mg/kg daily for 2 mos | Change in conditioned reflexes |

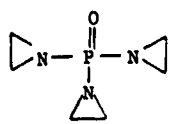
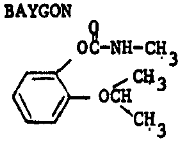
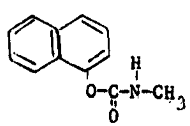
# TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | **AMINE DERIVATIVES** | | | | | | |
| CAPTAN (ORTHOCIDE) | pesticide | 252 | rat | 15,000<br>9000 | | | | | | |
| | | 173 | | 8400 | | | | | | |
|  | | 252 | rabbit | 3160 | | | | | | |
| DICYANODIAMIDE<br> | | 121 | laboratory animals | 50 mg/kg (not toxic) | | | | | | |
| DIETHYLTOLUAMIDE (DEET)<br> | pesticide | 340 | rat | 1950 | | | | | | |
| DIMETHYLFORMAMIDE<br> | effluent from acrynil manufacturing plants | | | | | | 457 | rabbit | >250 mg/kg | Reduced respiration rate |
| | | | | | | | 456 | rat | 1 g/kg | Affected central nervous system |
| HEMPA<br> | pesticide | 124 | rat | 2650♂<br>3360♀<br>3500-4500 (dermal) | | | | | | |

# TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | AMINE DERIVATIVES | | | | | | |
| METEPA  | pesticide | 124 | rat | 136♂<br>213♀<br>183 (dermal) | | | | | | |
| METHACRYLAMIDE  | | 392 | rat<br>mouse<br>rabbit | 1223<br>475<br>1865 | | | 392 | laboratory animals | 0.05-1.0 mg/kg daily | Decreased cholinesterase activity in blood; increased concentration of ascorbic acid in kidneys; decreased conditioned reflexes |
| METHYLOLMETHACRYLAMIDE | | 392 | rat<br>mouse<br>rabbit | 312<br>400<br>328 | | | 393 | laboratory animals | 0.05-1.0 mg/kg daily | Same as above |
| MGK 264  | synergist | 340 | rat | 2800 | | | | | | |
| SULFANILAMIDE  | | 99 | mouse | 6000 | | | 99 | rabbit | 200 mg/kg daily for 9 mos | Decrease in hemoglobin and total protein; increase in aldolase and aniline transaminase |
| SULFATHIAZOLE (NORSULFAZOLE)  | | | | | | | 94 | rabbit | 0.5 mg/kg | Critical concentration |

## TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | AMINE DERIVATIVES | | | | | | |
| TEPA | pesticide | 124 | rat | 37<br>87 (dermal) | | | | | | |
|  | | | | | | | | | | |
| CARBAMATES | | | | | | | | | | |
| BAYGON | pesticide | 124 | rat | >2400 (dermal)<br>83-86 | | | | | | |
|  | | 340 | | 95-104 | | | | | | |
| CARBARYL (SEVIN) | pesticide | 173 | rat | 400 | | | 123 | white rat | | No cumulative properties |
| | | 123 | white rat | 505 | | | | | | |
|  | | 309 | | 500 | | | | | | |
| | | 124 | | 850♂<br>500♀<br>>4000 (dermal) | | | | | | |
| | | 340 | | 500-700 | | | | | | |
| | | 252 | | 500-2190 | | | | | | |
| | | | cat | 125-250 | | | | | | |
| | | | dog | 250-795 | | | | | | |
| | | | rabbit | 710 | | | | | | |
| | | 174 | fathead | | 12.0 | | | | | |
| | | 252 | | | 6.7-41.0 | | | | | |
| | | 174 | bluegill | | 5.5 | | | | | |
| | | 252 | | | 5.6-11.0 | | | | | |
| | | 449 | | | | 3400 | | | | |
| | | | rainbow trout | | | 3500 | | | | |

## TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

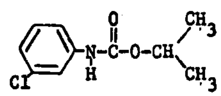
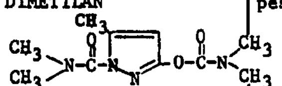
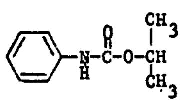
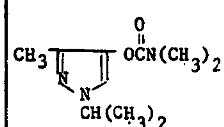
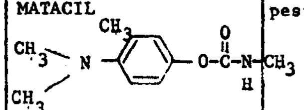
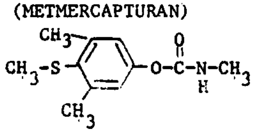
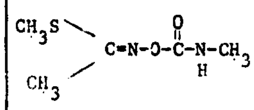
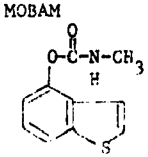
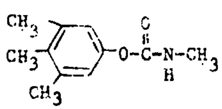
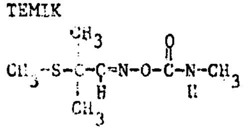
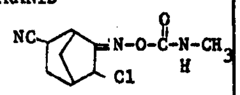
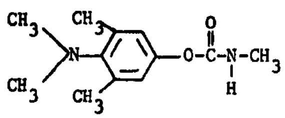
| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/1 | LC50 mg/1 | Ref | Species | Dose | Effect |
| | | | | **AMINE DERIVATIVES** | | | | | | |
| CHLORPROPHAM (CHLORO IPC) | pesticide | 252 | rat | 1500 | | | | | | |
| | | 173 | | 3800-8000 | | | | | | |
|  | | 174 | bluegill | | 12 (48 hr) | | | | | |
| | | | largemouth bass | | 10 (48 hr) | | | | | |
| | | 252 | catfish | | 86.5 | | | | | |
| DIMETILAN | pesticide | | rat | 25-64 | | | | | | |
|  | | | | 25-50 | | | | | | |
| IPC (PROPHAM) | pesticide | 252 | rat | 1000 | | | | | | |
|  | | 173 | | 1000-9000 | | | | | | |
| ISOLAN | pesticide | 124, 252 | rat | 23♂<br>13♀ | | | | | | |
| | | | | 5.6♂ ) (dermal)<br>6.2♀ ) | | | | | | |
|  | | 173 | | 12 | | | | | | |
| MATACIL | pesticide | 124 | rat | 40♂<br>38♀ | | | | | | |
|  | | | | 280♂ ) (dermal)<br>320♀ ) | | | | | | |
| | | 173 | | 30 | | | | | | |

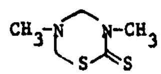
TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | AMINE DERIVATIVES | | | | | | |
| MESUROL (METMERCAPTURAN)  | pesticide | 124 | rat | 70♂<br>60♀<br>>2000 (dermal) | | | | | | |
| METHOMYL  | pesticide | 149 | carp | 4.2 mg/fish<br>0.036 mg/fish (tropical)<br>2.0 mg/fish (contact) | | | | | | |
| MOBAM  | pesticide | 124<br><br><br>173 | rat | 150♂<br>115♀<br>>2000 (dermal)<br>>234 | | | | | | |
| SD-8530  | pesticide | 124 | rat | 232♀<br>205♂<br>>2000 (dermal) | | | | | | |
| TEMIK  | pesticide | 124 | rat | 0.8♂<br>0.6♀<br>3.0♂ ) (dermal)<br>2.5♀ ) | | | | | | |

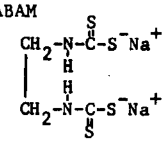
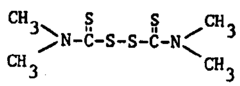
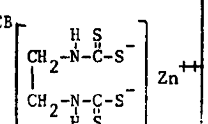
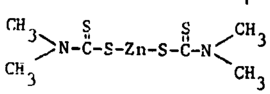
## TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | **AMINE DERIVATIVES** | | | | | | |
| TRANID  | pesticide | 124 | rat | 30♂<br>19♀<br>>2000 (dermal) | | | | | | |
| ZECTRAN  | pesticide | 124 | rat | 37♂<br>25♀<br>1500-2500 (dermal) | | | | | | |
| **THIOCARBAMATES** | | | | | | | | | | |
| CARBATHION<br>$CH_3-\underset{H}{N}-\underset{\underset{S}{\|}}{C}-S-Na$ | pesticide | 276, 278 | white rat<br>white mouse | 700<br>266 | | | 276 | | | Affects cholesterol level in serum & liver; anemia; slight cumulative effects |

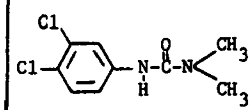
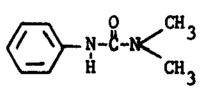
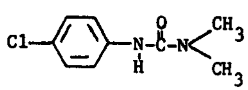
# TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | AMINE DERIVATIVES | | | | | | |
| DAZOMET (CRAG MYLONE)  | pesticide | 173<br>49 | rat | 320-1000<br>325 | | | | | | |
| DIETHYL DITHIO-CARBAMATE, Na<br>$(C_2H_5)_2$-N-C(=S)-S-Na | | 130 | chick embryo | 0.0058 | | | | | | |
| DIMETHYLDITHIO-CARBAMATE, $NH_4$<br>$(CH_3)_2$-N-C(=S)-S-$NH_4$ | | 276, 278 | white rat | 1458 | | | 276 | | | Affects cholesterol level in serum & liver; anemia; slight cumulative effect |
| | | | white mouse | 592 | | | | | | |
| | | | guinea pig | 1680 | | | | | | |
| FERBAM (FERMATE)<br>$((CH_3)_2NCS_2)_3Fe$ | pesticide | 438 | fish | | 1.0-4.0 (toxic level for fish) | | | | | |
| | | 252 | rat | 4000<br>17,000 | | | | | | |
| | | | channel catfish | | 2.2 | | | | | |
| | | 130 | chick embryo | 0.0022 | | | | | | |
| METHAM (VAPAM)<br>$CH_3$N(H)-C(=S)-S-Na·$2H_2O$ | pesticide | 252 | rat | 800 | | | | | | |
| | | 173 | | 82 | | | | | | |
| | | 252 | mouse | 285 | | | | | | |

## TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | AMINE DERIVATIVES | | | | | | |
| NABAM  | pesticide | 252 | rat | 395 | | | | | | |
| | | 130 | chick embryo | 0.140 | | | | | | |
| THIRAM  | pesticide | 124 | rat | 640♂<br>620♀<br>>2000 (dermal) | | | | | | |
| | | 173 | | 375-1000 | | | | | | |
| | | 252 | | 350<br>865 | | | | | | |
| | | 252 | rabbit | 350 | | | | | | |
| | | 130 | chick embryo | 350<br>0.0019 | | | | | | |
| | | 252 | channel cat | | 0.079 | | | | | |
| TRIARAM<br>bis (Dimethyl thio-carbamoyl) ethylene bis (dithiocarba-mate) | pesticide | 130 | chick embryo | 0.0048 | | | | | | |
| ZINEB  | pesticide | 124 | rat | >5000<br>>2500 (dermal) | | | | | | |
| | | 173 | | 1000-8000 | | | | | | |
| ZIRAM  | pesticide | 130 | chick embryo | 0.0021 | | | | | | |

## TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | **AMINE DERIVATIVES** | | | | | | |
| **UREAS** | | | | | | | | | | |
| DCU (CRAG HERBICIDE DCU) | pesticide | 49 | rat | 4760♂ | | | | | | |
| $(Cl_3C\text{-}CH(OH)\text{-}NH)_2\text{-}C{=}O$ | | 173 | | 6800 | | | | | | |
| DIURON (KARMEX) | pesticide | 252 | rat | 3400 | | | | | | |
|  | | 173 | | 3400-3700 | | | | | | |
| | | 449 | bluegill | | | 12.0 | | | | |
| | | 174 | coho salmon | | 28.5 (48 hr) | | | | | |
| | | 252 | | | 16.0 (48 hr) | | | | | |
| FENURON | pesticide | 252 | rat | 7500 | | | | | | |
|  | | 173 | | 6400-7500 | | | | | | |
| | | 252 | salmon | | >56 | | | | | |
| MONURON (CMU) | pesticide | 252 | human | lethal dose 326 g/90 kg | | | | | | |
|  | | | rat | 3500 | | | | | | |
| | | 173 | | 3600-3700 | | | | | | |
| | | 174 | coho salmon | | 110 (48 hr) | | | | | |
| | | 252 | shiner | | 40.1 | | | | | |
| | | | red-sided shiner | | 41.5 | | | | | |
| UREA $(NH_2)_2CO$ | | 250 | rat | ≤ 12,000 (did not cause death) | | | 250 | rat | 50 mg/kg | Did not alter urea balance or organism |

# TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

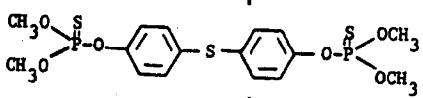
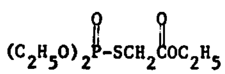
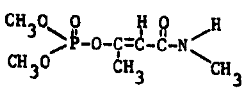
| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | **PHOSPHATE ESTERS** | | | | | | |
| ABATE | pesticide | 340<br>173<br>124 | rat | 1000-3000<br>1000-4000<br>8600♂<br>13,000♀<br>>4000 (dermal) | | | 299 | rat | 200 ppm for 99 days in diet | 70% inhibition of blood cholinesterase |
|  | | 299 | rat & mouse | 4000 | | | | rabbit | 10 mg/kg daily<br>100 mg/kg daily | Minor liver damage; liver necrosis |
| | | | | | | | | ewe | 5 mg/kg while nursing offspring | Inhibition of cholinesterase activity |
| | | | | | | | | human | 256 mg/day for 5 days or 64 mg/day for 4 wks | No toxic symptoms in 28 volunteers |
| ACETOPHOS | | 202 | rat | 45 | | | | | | |
|  | | | mouse | 210 | | | | | | |
| | | | guinea pig | 27.8 | | | | | | |
| | | | rabbit | 45 | | | | | | |
| AZODRIN | pesticide | 124 | rat | 17♂<br>20♀ | | | | | | |
|  | | | | 126♂ ) (dermal)<br>112♀ ) | | | | | | |

TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

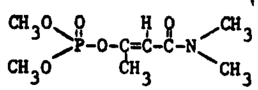
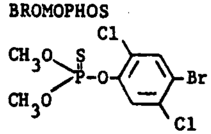
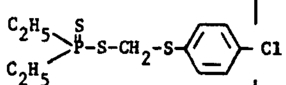
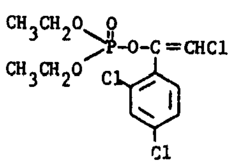
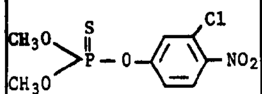
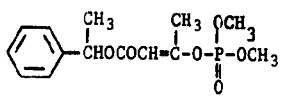
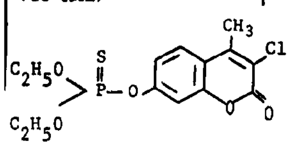
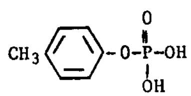
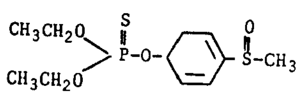
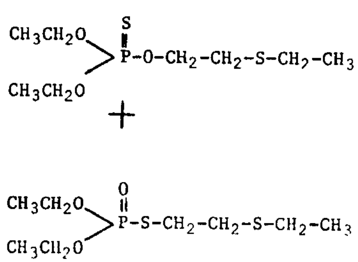
| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | **PHOSPHATE ESTERS** | | | | | | |
| BIDRIN | pesticide | 173 | rat | 22-45 | | | | | | |
| | | 309 | | 25 | | | | | | |
| | | 124 | | 21♂ | | | | | | |
|  | | | | 16♀ | | | | | | |
| | | | | 43♂ ) 42♀ ) (dermal) | | | | | | |
| BROMOPHOS | pesticide | 124 | rat | 1600♂ | | | | | | |
|  | | | | 1730♀ | | | | | | |
| | | | | >5000 (dermal) | | | | | | |
| | | 173 | | 3570-5180 | | | | | | |
| CARBOPHENOTHION (TRITHION) | pesticide | 124 | rat | 30♂ | | | | | | |
| | | | | 10♀ | | | | | | |
|  | | | | 54♂ ) 27♀ ) (dermal) | | | | | | |
| | | 49 | | 32 | | | | | | |
| | | 173 | | 7-30 | | | | | | |
| CHLORFENVINFOS | | 124 | rat | 15♂ | | | 299 | rat | 10-15 mg/kg | Death |
| | | | | 13♀ | | | | | | |
|  | | 173 | | 31♂ ) 30♀ ) (dermal) | | | | dog | 5000 mg/kg | Tolerates this dose probably due to its more efficient detoxication, less readily available blood levels of pesticide, slower rate of brain uptake and less sensitive brain central nervous system |
| | | 173 | | 10-155 | | | | | | |

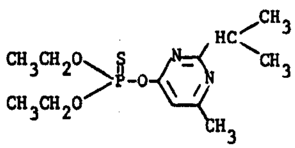
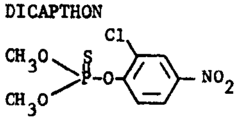
TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | PHOSPHATE ESTERS | | | | | | |
| CHLORTHION | pesticide | 124, 451 | rat | 880♂<br>980♀ | | | 252 | dog | 15 mg in diet | Questionable red cell inhibition |
|  | | | | 1500-4500♂ )<br>4100♀ ) (dermal) | | | 441 | goldfish | 0.1 mg/l | Effect on cholinesterase activity - may take up to 40 days to regain normal activity |
| | | 252<br>173 | rat | 550-1510<br>625-1500 | | | | | | |
| | | 252 | bobwhite quail | 700 | | | | | | |
| | | 174 | fathead | | 3.2 | | | | | |
| | | 442 | bluegill | | 0.70 | | | | | |
| | | 252 | human | | | 60 g/70 kg is fatal | | | | |
| CIODRIN | pesticide | 124 | rat | 110♂<br>74♀ | | | | | | |
|  | | | | 375♂ )<br>202♀ ) (dermal) | | | | | | |
| | | 173 | | 125 | | | | | | |
| COUMAPHOS (CO-RAL) | pesticide | 124 | rat | 41♂<br>16♀ | | | 451 | rat | | Inhibition of brain cholinesterase activity |
|  | | | | 860♂ (dermal) | | | | | | |
| | | 349<br>451<br>252<br>173 | | 90-110<br>100<br>56-230<br>13-180 | | | | | | |
| | | 174 | bluegill | | 0.18 | | | | | |
| | | 252 | fathead | | 18 | | | | | |

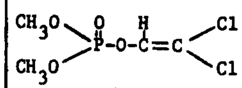
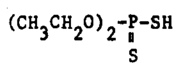
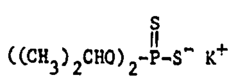
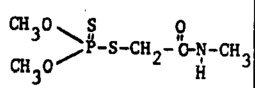
## TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | **PHOSPHATE ESTERS** | | | | | | |
| CRESYL DITHIO-PHOSPHATE  | flotoreagent | | | | | | 233 | rat | 2.5 mg/kg daily | Histopathological changes in liver, kidney, heart & lung |
| DASANIT (BAYER 25141)  | pesticide | 124 | rat | 4.1♂<br>1.8♀<br>19♂ ) (dermal)<br>4.1♀ ) | | | | | | |
| DEMETON (SYSTOX, MERCAPTOPHOS)  | pesticide | 252 | human | 0.1 g/70 kg man is fatal | | | 441 | goldfish | 0.1 mg/l | After 24 hr ChE decreased by 75% |
| | | 304<br>124 | rat | 7.5<br>6.2♂<br>2.5♀<br>14♂ ) (dermal)<br>8.2♀ ) | | | 252 | dog | 2 mg/kg in diet | Inhibition of plasma cholinesterase |
| | | | | | | | | | 5 mg/kg in diet | Inhibition of erythrocyte enzyme |
| | | 451<br>49<br>252<br>173 | rat | 30<br>9.2<br>2.5-40<br>3-5 | | | 252 | cow | 0.1 mg/kg in capsules for 3 days | Decrease in milk production; increase in percent fat |
| | | 449 | bluegill | | | 0.195 | | | 5 mg/kg in hay for 49 days | Adverse effects on weight gain; inhibition of red blood cell activity |
| | | 101<br>252,<br>449 | fathead | | 3.6<br>3.6-4.2 | | 252 | sheep | 1 mg/kg single dose | No toxic effects |
| | | | | | | | 451 | human | 0.1 g/70 kg | Fatal; inhibition of serum and erythrocyte activity |

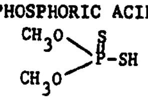
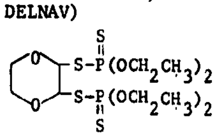
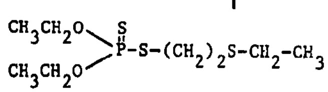
# TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | **PHOSPHATE ESTERS** | | | | | | |
| DIAZINON | pesticide | 252 | human | 25.0 g/70 kg is fatal | | | 441 | goldfish | 0.1 mg/l | 40% decrease in cholinesterase activity after 24 hr |
|  | | 124 | rat | 108-250♂<br>76-285♀ | | | 252 | dog | 6.5 mg/kg daily | Inhibited cholinesterase activity |
| | | | | 200-900♀ )<br>455♀ ) (dermal) | | | | | 75.0 mg/kg in diet | Depression of red cell cholinesterase |
| | | 340 | | 150-220 | | | | | | |
| | | 451 | | 76-108 | | | | | | |
| | | 49 | | 354 | | | | | | |
| | | 252 | | 100-150<br>125<br>235 | | | | | | |
| | | 252 | rat | 435♂<br>408<br>293 | | | | | | |
| | | 173 | | 300-600 | | | | | | |
| | | 252 | mouse | 82 | | | | | | |
| DICAPTHON | pesticide | 124 | rat | 400♂<br>330♀ | | | | | | |
|  | | | | 790♂ )<br>1250♀ ) (dermal) | | | | | | |
| | | 340 | | 284-650 | | | | | | |
| | | 252 | | 460 | | | | | | |
| | | 173 | | 330-475 | | | | | | |

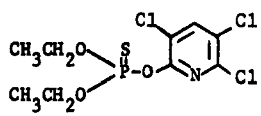
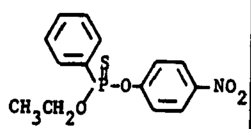
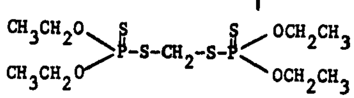
## TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | PHOSPHATE ESTERS | | | | | | |
| DICHLORVOS (DDVP)  | pesticide | 124, 451 | rat | 80♂<br>56♀ | | | 451 | | | Inhibition of erythrocyte cholinesterase activity |
| | | 124 | | 107♂ )<br>75♀ ) (dermal) | | | | | | |
| | | 340 | | 56-80<br>25-30 | | | | | | |
| | | 8 | guinea pig | 80 | | | | | | |
| | | | rabbit | 15.0 | | | | | | |
| DIETHYL DITHIOPHOSPHORIC ACID  | intermediate in production of M-74 (pesticide) | 119 | mouse | 1000-1250 | | | | | | |
| DIISOPROPYL DITHIOPHOSPHATE, K  | used in ore flotation | 118 | mouse | 2600 | | | 118 | rabbit | 5 mg/kg daily for 5 mos | No significant effects |
| | | | rat | 2960 | | | | | | |
| DIMETHOATE (CYGON, ROGOR)  | pesticide | 299 | human | 30 | | | 299 | rabbit | 5 mg/kg daily for 6 mos | Decrease in cholinesterase activity; hyperglycemia |
| | | 124 | rat | 28♂ 1959<br>30♀ 1959 | | | | | | |
| | | | | 61♂ 1959 )<br>55♀ 1959 ) (dermal) | | | | | | |
| | | | | 215♂ 1962<br>245♀ 1962 | | | | | | |

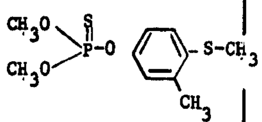
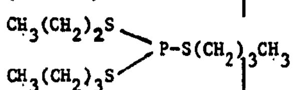
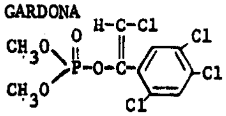
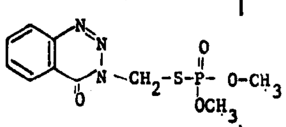
## TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | PHOSPHATE ESTERS | | | | | | |
| DIMETHOATE (Cont'd) | | 124 | rat | 610, 1962 (dermal) | | | | | | |
| | | 340 | | 155-220 | | | | | | |
| | | 451 | | 250-265 | | | | | | |
| | | 173 | | 200-300 | | | | | | |
| | | 449 | bluegill | | | 28.0 | | | | |
| | | | rainbow trout | | | 20.0 | | | | |
| DIMETHYL-DITHIO-PHOSPHORIC ACID  | | | | | | | 441 | goldfish | 0.1 mg/l | 40% decrease in cholinesterase activity in 24 hr |
| DIOXATHION (HERCULES 528, DELNAV)  | pesticide | 124 | rat | 43♂ | | | | | | |
| | | | | 23♀ | | | | | | |
| | | | | 235♂ ) 63♀ ) (dermal) | | | | | | |
| | | 340 | | 50 | | | | | | |
| | | 173 | | 20-40 | | | | | | |
| DISULFOTON (DISYSTON)  | pesticide | 173 | rat | 4 | | | 388 | rat | 1 mg/kg daily | Tolerance of cholinesterase inhibition after prolonged exposure |
| | | 124 | | 6.8♂ | | | | | | |
| | | | | 2.3♀ | | | | | | |
| | | | | 15.0♂ ) 6.0♀ ) (dermal) | | | | | | |
| | | 252 | | 2.6-12.5 | | | | | | |
| | | | guinea pig | 10.8 | | | | | | |
| | | 442 | bluegill | | 0.064 | | | | | |
| | | 252 | | | 0.07 | | | | | |
| | | | fathead | | 2.6-3.7 | | | | | |
| | | | | | 2.9-4.1 | | | | | |

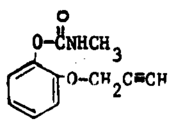
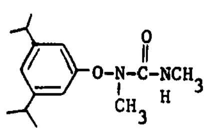
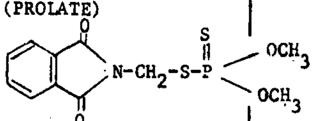
# TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | **PHOSPHATE ESTERS** | | | | | | |
| DURSBAN | pesticide | 124 | rat | 155♂<br>82♀<br>202♂ (dermal) | | | 379 | rat | | Dursban itself is not a cholinesterase inhibitor; oxygen analog is a potent inhibitor |
|  | | 340 | | 97-276 | | | | | | |
| | | 173 | | 135-163 | | | | | | |
| EPN | pesticide | 252 | human | 0.3 g/70 kg is fatal | | | 441 | goldfish | 0.1 mg/l | 50% decrease in cholinesterase activity after 24 hr |
|  | | 251 | rat | 36♂<br>7.7♀<br>230♂ )<br>25♀ ) (dermal) | | | 252 | rat | 225 and 450 mg/kg in diet 2 yrs | Retarded growth |
| | | 340 | | 7-65 | | | | dog | 2 mg/kg daily for 1 yr | Increased weight of kidney |
| | | 49 | | 23 | | | | | | |
| | | 252 | | 7-50 | | | | | | |
| | | 173 | | 8-17 | | | | | | |
| | | 101 | fathead | | 0.2 | | | | | |
| | | 442 | bluegill | | 0.10 | | | | | |
| ETHION | pesticide | 124 | rat | 65♂<br>27♀<br>245♂ )<br>62♀ ) (dermal) | | | | | | |
|  | | 173 | | 13-34 | | | | | | |

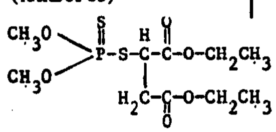
## TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/1 | LC50 mg/1 | Ref | Species | Dose | Effect |
| | | | | PHOSPHATE ESTERS | | | | | | |
| FENTHION (ENTEX, BAYTEX, TIGUVON)  | pesticide | 124 | rat | 215♂<br>245♀ | | | 451 | rat | | Decrease in brain cholinesterase activity |
| | | | | 330 (dermal) | | | | | | |
| | | 340 | | 178-310 | | | | | | |
| | | 451 | | 215-245 | | | | | | |
| | | 173 | | 200 | | | | | | |
| FOLEX (MERPHOS)  | pesticide | 124 | rat | 1475♂<br>910♀ | | | | | | |
| | | | | 690♂ ) (dermal)<br>615♀ ) | | | | | | |
| GARDONA  | pesticide | 124 | rat | 1125♀ | | | | | | |
| | | | | >4000 (dermal) | | | | | | |
| GUTHION (AZINPHOSMETHYL, BAYER 17147, DBD)  | pesticide | 252 | human | 0.2 g/70 kg is fatal | | | 441 | goldfish | 0.01 mg/1 | 50% decrease in cholinesterase activity |
| | | 124 | rat | 13<br>11 | | | | | | |
| | | | | 220 (dermal) | | | | | | |
| | | 49 | | 24 | | | | | | |
| | | 252 | | 11-80 | | | | | | |
| | | 173 | | 7-13 | | | | | | |
| | | 252 | mouse | 20 | | | | | | |
| | | 174 | bluegill | | 0.0052 | | | | | |
| | | 252 | | | 0.005 | | | | | |

## TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | PHOSPHATE ESTERS | | | | | | |
| HERCULES 9699  | pesticide | 124 | rat | 108♂<br>60♀<br>>2400 (dermal) | | | | | | |
| HRS-1422  | | 124 | rat | 280<br>200<br>>2400 (dermal) | | | | | | |
| IMIDAN (PROLATE)  | pesticide | 124 | rat | 113♂<br>160♀<br>>2000♂ ) (dermal)<br>>1550♀ ) | | | | | | |
| | | 173 | | 113-230 | | | | | | |

## TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

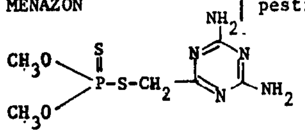
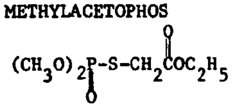
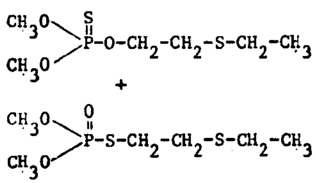
| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | PHOSPHATE ESTERS | | | | | | |
| MALAOXON: | pesticide metabolite | | | | | | 299 | guinea pig, mouse, & rat | | Inhibition of malathion-esterase activity |
| SUCCINATE MALAOXON | | 62 | mouse | 243<br>66* | | | | | | |
| MALONATE MALAOXON | | | | 215<br>80* | | | | | | |
| α-GLUTARIC MALAOXON | | | | 47.2<br>10.7* | | | | | | |
| β-GLUTARIC MALAOXON | | | | 449.1<br>379.7* | | | | | | |
| d-MALAOXON | | 150 | | 163<br>40* | | | | | | |
| l-MALAOXON | | | | 249<br>100* | | | | | | |
| dl-MALAOXON | | | | 243<br>66* | | | | | | |
| | | | * Tri-o-tolyl phosphate given 24 hrs before testing mice to prevent degregation of the compound by carboxylesterases | | | | | | | |
| MALATHION (KARBOFOS)<br> | pesticide | 252 | human | 60 g/70 kg is fatal | | | 441 | goldfish | 0.1 mg/l | 65% inhibition of cholinesterase activity in 24 hrs |
| | | 173 | rat | 1400-1900 | | | 112 | rat | 1 mg/kg daily for 6 mos | No observable change in cholinesterase activity of serum or in sugar response curves |
| | | 304 | | 1500 | | | | | | |
| | | 124 | | 1375♀<br>1000♂<br>>4444 (dermal) | | | 451 | rat | | Inhibition of cholinesterase activity in brain |
| | | 340 | | 900-5800 | | | | | | |
| | | 451 | | 940-1200 | | | | | | |
| | | 49 | | 2590 | | | | | | |
| | | 252 | | 1000-2830<br>1845 | | | | | | |

## TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

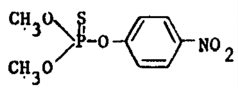
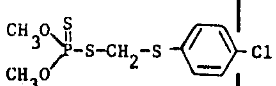
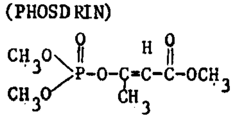
| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | PHOSPHATE ESTERS | | | | | | |
| MALATHION (Cont.) | | | | | | | | | | |
| SUCCINATE MALATHION | | 62 | mouse | 1942<br>159* | | | | | | |
| MALONATE MALATHION | | | | 3090<br>159* | | | | | | |
| α-GLUTARIC MALATHION | | | | 514<br>30.8* | | | | | | |
| β-GLUTARIC MALATHION | | | | 3760<br>183* | | | | | | |
| d-MALATHION | | 150 | | 1014<br>132* | | | | | | |
| l-MALATHION | | | | 2357<br>189* | | | | | | |
| dl-MALATHION | | | | 1942<br>159* | | | | | | |
| MALATHION | | 252 | | 3321 | | | | | | |
| | | 174 | channel cat | | 13.05 | | | | | |
| | | 101 | fathead | | 12.5 | | | | | |
| | | 252 | salmon fingerling | | 0.12 | | | | | |
| | | 449 | rainbow trout | | | 0.1 | | | | |
| | | 252 | red-sided shiner | | 8.9-9.6 | | | | | |
| | | 449 | bluegill | | | 0.12 | | | | |
| | | 442 | | | 0.090 | | | | | |

* Tri-o-tolyl phosphate given 24 hrs before treating with compound to prevent degradation of the compound by carboxylesterases

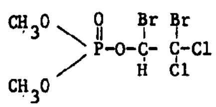
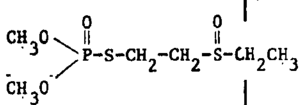
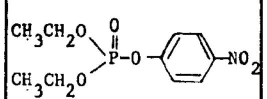
TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | PHOSPHATE ESTERS | | | | | | |
| MENAZON  | pesticide | 124<br>173 | rat | 1020♂<br>1450♀<br>>2000 (dermal)<br>1200-1600 | | | 124 | rat | 0.075 mg/kg daily for 10 mos | No observable changes in growth; conditioned reflexes, cholinesterase activities, phosphate metabolism, SH concentration |
| METHYLACETOPHOS  | pesticide | 202 | rat<br>mouse<br>guinea pig<br>rabbit | 38<br>322<br>214<br>423 | | | | | | |
| METHYLDEMETON (METHYL SYSTOX, THIOMETON)  | | 173 | rat | 50-75 | | | 47 | rat | 0.008 mg/kg daily | Affected conditioned reflexes |
| | | | | | | | | | 0.08, 0.8, & 8.0 mg/l in drinking water & by stomach tube for at least 6 mos | Decrease in hemoglobin; decrease in erythrocyte count; increase in leukocyte count; traces of protein in urine; no changes in internal organs |
| | | | | | | | 6 | rabbit | 1 mg/kg daily for 6 mos | Increase in erythrocyte count; increase in leukocyte count; decrease in cholinesterase activity |

## TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | PHOSPHATE ESTERS | | | | | | |
| METHYLPARATHION (METAPHOS) | pesticide | 252 | human | 0.15 g/70 kg is fatal | | | 252 | dog | 50 mg/kg in diet | Decrease in plasma and erythrocyte cholinesterase activity |
|  | | 124 | rat | 14♂<br>24♀<br>67 (dermal) | | | | | 20 mg/kg in diet | Decrease in erythrocyte and possible decrease in plasma cholinesterase activity |
| | | 252 | | 9-25 | | | | | | |
| | | 173 | | 12-16 | | | 231 | rat & rabbit | 1 mg/kg daily for 6 mos | Change in conditioned reflexes; vacuolization of some brain cells |
| | | 101 | fathead | | 8.3 | | | | | |
| | | 252 | | | 7.5-8.3 | | | | | |
| | | 442 | bluegill | | 1.9 | | | | | |
| METHYL TRITHION | pesticide | 124 | rat | 98♂<br>120♀ | | | | | | |
|  | | | | 215♂ ) (dermal)<br>190♀ ) | | | | | | |
| | | 173 | | 98-200 | | | | | | |
| MEVINPHOS (PHOSDRIN) | pesticide | 369 | rat | 6.1♂ | | | 451 | human | | Inhibition of cholinesterase activity of erythrocytes |
|  | | 124 | | 3.7♀ | | | | | | |
| | | | | 4.7♂ ) (dermal)<br>4.2♀ ) | | | 369 | rat | | Some cumulative effects |
| | | 451 | | 4-6 | | | | | | |
| | | 49 | | 6.5 | | | | | | |
| | | 252 | | 6-13.1 | | | | | | |
| | | 173 | | 3-5 | | | | | | |
| | | 252 | bobwhite quail | 90 | | | | | | |

## TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | | PHOSPHATE ESTERS | | | | | |
| NALED (DIBROM) | pesticide | 124 | rat | 250♂<br>800♀ | | | | | | |
| | | 173 | | 430 | | | | | | |
|  | | 449 | bluegill | | | 0.220 | | | | |
| | | | rainbow trout | | | 0.070 | | | | |
| OXYDEMETONMETHYL | pesticide | 124 | rat | 47♂<br>52♀ | | | | | | |
|  | | | | 173♂ )<br>158♀ ) (dermal) | | | | | | |
| | | 173 | | 57 | | | | | | |
| PARAOXON | pesticide | 451 | rat | 3.0 | | | 451 | rat | | Inhibition of cholinesterase activity in brain |
| | | 252 | | 3.5 | | | | | | |
|  | | 174 | fathead | | 0.33 | | | human | | Inhibition of cholinesterase activity in erythrocytes |
| | | 449 | | | 0.25-0.33 | | | | | |

## TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

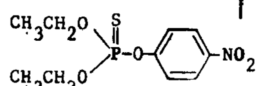
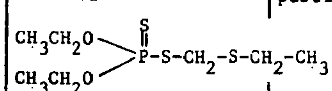
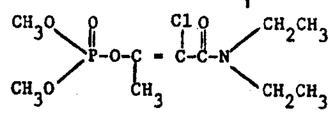
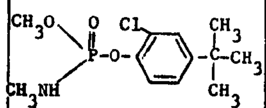
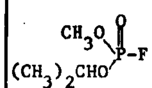
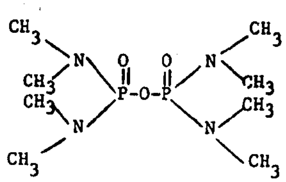
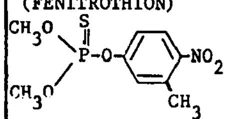
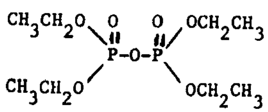
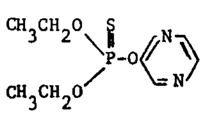
| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | PHOSPHATE ESTERS | | | | | | |
| PARATHION (THIOPHOS) | | 252 | human | 0.1 g/70 kg is fatal | | | 441 | goldfish | 0.1 mg/l | 40% decrease in cholinesterase activity after 24 hrs |
|  | | 173 | rat | 3-6 | | | 239 | rabbit | 1.0 & 5.0 mg/kg daily for 6 mos | Fluctuation in cholinesterase activity; chronaxy changes in flexor-extensor muscles; decrease in rate of weight gain |
| | | 124 | | 13.0♂<br>3.6♀<br>21.0♂<br>6.8♀ | | | | | | |
| | | 252 | | 3-15 | | | | | 5.0 mg/kg daily for 6 mos | Non-specific granular edema changes in parenchymatous organs |
| | | 451 | | 6.5 | | | | | | |
| | | 49 | | 8.1 | | | | | | |
| | | 304 | mammal | 5-10 | | | | human | | 72 deaths caused by pesticides; 44 were due to organophosphates and 33 of these due to parathion |
| | | 449 | bluegill | | | 0.056 | | | | |
| | | 442 | | | 0.095 | | | | | |
| | | 174 | fathead | | 1.4-2.7 | | | | | |
| | | 383 | | | 1.4 | | | | | |
| | | 449 | rainbow trout | | | 2.0 | | | | |
| | | 252 | caddisfly | | 0.001 | | | | | |
| | | | Acroneuria pacifica | | 0.0001 | | | | | |
| | | | Peteronarcys califorinica | | 0.0032 | | | | | |
| PHORATE | pesticide | 252 | rat | 2.3♂<br>1.1♀ | | | | | | |
|  | | | | 6.2♂ )<br>2.5♀ ) (dermal) | | | | | | |
| | | | | 2-3 | | | | | | |

TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | **PHOSPHATE ESTERS** | | | | | | |
| PHOSPHAMIDON | pesticide | 124 | rat | 24 | | | | | | |
|  | | | | 143♂ ) 107♀ ) (dermal) | | | | | | |
| | | 451 | | 7.5-10 | | | | | | |
| | | 173 | | 15 | | | | | | |
| | | 449 | bluegill | | | 0.056 | | | | |
| | | | rainbow trout | | | 2.0 | | | | |
| RUELENE | pesticide | 124 | rat | 635♂ | | | | | | |
|  | | | | 460♀ | | | | | | |
| | | 340 | | 950 | | | | | | |
| | | 173 | | 460-1000 | | | | | | |
| SARIN | nerve gas; pesticide | 252 | human | 0.01 is fatal | | | | | | |
|  | | | | | | | | | | |
| SCHRADAN (OMPA) | pesticide | 124 | rat | 9.1♂ | | | 252 | rat | 50 mg/kg in diet | Poisoning and diminished growth in males but not females |
| | | | | 42♀ | | | | | | |
|  | | | | 15♂ ) 44♀ ) (dermal) | | | | | ≧1 mg/kg | Some cholinesterase inhibition |
| | | 304 | | 20 | | | | | | |
| | | 173 | | 5 | | | | | | |
| | | 174 | fathead | | 121.0 | | | | | |
| | | 252 | | | 121-135 | | | | | |

## TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity Ref | Acute Toxicity Species | Acute Toxicity LD50 mg/kg | Acute Toxicity 96 hr TLm mg/l | Acute Toxicity LC50 mg/l | Chronic Toxicity Ref | Chronic Toxicity Species | Chronic Toxicity Dose | Chronic Toxicity Effect |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | PHOSPHATE ESTERS | | | | | | |
| SD-7438 | pesticide | 124 | rat | 320♂ | | | | | | |
| | | | | 265♀ | | | | | | |
| S,S'-benzylidene bis-(O, O-dimethyl phosphorodithioate) | | | | >5000 (dermal) | | | | | | |
| SUMITHION (FENITROTHION) | pesticide | 124 | rat | 740♂ | | | | | | |
| | | | | 570♀ | | | | | | |
|  | | | | 300-400 (dermal) | | | | | | |
| | | 173 | | 250-673 | | | | | | |
| TEPP | pesticide | 124 | rat | 1.05♂ | | | 252 | rat | | Inhibition of cholinesterase activity in brain |
| | | | | 2.4♀ | | | | | | |
|  | | 340 | | 0.5-2.0 | | | | human | 25 mg | Causes severe nervous symptoms |
| | | 451 | | 2.0 | | | | | | |
| | | 173 | | 0.5 | | | | | | |
| | | 174 | fathead | | 1.7 | | | | | |
| | | 252 | | | 1.0 | | | | | |
| | | 174 | channel cat | | 1.6 | | | | | |
| | | 252 | human | 0.05 g/70 kg is fatal | | | | | | |
| THIONAZIN | pesticide | 124 | rat | 6.4♂ | | | | | | |
| | | | | 3.5♀ | | | | | | |
|  | | | | 17.0♂ ) 11♀ ) (dermal) | | | | | | |
| | | 173 | | 9-16 | | | | | | |
| TRIBUTYL PHOSPHATE | | 469 | rat | 1400 | | | | | | |
| | | | mouse | 1200 | | | | | | |
| $(CH_3(CH_2)_3-O)_3P=O$ | | | | | | | | | | |

## TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

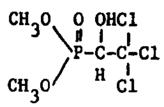
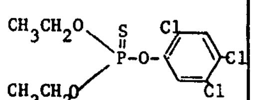
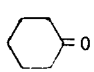
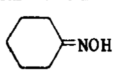
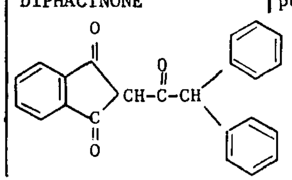
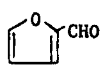
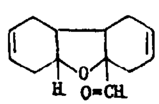
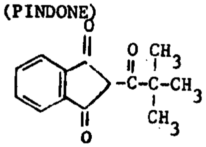
| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | PHOSPHATE ESTERS | | | | | | |
| TRICHLORFON (DIPTEREX, DYLOX) | pesticide | 252 | human | 25 g is fatal to 70 kg man | | | | | | |
|  | | 124 | rat | 630<br>560 | | | | | | |
| | | | | >2000 (dermal) | | | | | | |
| | | 340<br>252<br>173 | | 500<br>400-1100<br>650 | | | | | | |
| | | 449<br>442 | bluegill | | <br>3.8 | 5.6 | | | | |
| | | 174 | fathead | | 180 | | | | | |
| | | 449 | rainbow trout | | | 28.0 | | | | |
| TRICHLORONATE (BAYER 37289) | pesticide | 124 | rat | 55♂<br>34♀ | | | | | | |
|  | | | | 180♂ ) (dermal)<br>64♀ ) | | | | | | |
| | | | | ALDEHYDES AND KETONES | | | | | | |
| ACETALDEHYDE $CH_3CHO$ | manufacture of plastics, synthetic rubber, dyes & other chemical products | | | | | | 15 | warm blooded animals | 0.5 mg/kg | Ineffective dose during sanitary-toxicological tests |

TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | | ALDEHYDES AND KETONES | | | | | |
| ACETONE<br>$CH_3COCH_3$ | wastes from chemical industries, gas plants, coal tar processes, or paint manufacturing | 252 | rat | | 9750 | | | | | |
| | | 174 | sunfish | | 14,250 (toxic in<br>15,050 1 hr)<br>mg/l | | | | | |
| | | 435 | mosquito fish | | 13,000 | | | | | |
| | | 88 | D. magna | | 10 (48 hr) | | | | | |
| ACROLEIN<br>(F-98)<br>$CH_2$=CHCHO | pesticide | 252 | rat | 46 | | | | | | |
| | | 173 | | 42-46 | | | | | | |
| | | 252 | rabbit | 7.1 | | | | | | |
| | | 174 | chinook salmon | | 0.08 (24 hr) | | | | | |
| BUTYRALDEHYDE<br>$CH_3CH_2CH_2CHO$ | | | | | | | 292 | warmblooded animals | | Change in conditioned reflexes; change in blood serum composition |
| CYCLOHEXANONE<br> | effluent from production of caprolactam, resins, and from distillation of cyclohexanone raw materials | 422 | rabbit | 1000-1600<br>(MLD) | | | | | | |
| CYCLOHEXANONE OXIME<br> | intermediary compound in production of caprolactam | | | | | | 351 | rabbit | 0.5 and 5.0 mg/kg/ day for 6 mos | Decrease in blood catalase activity |
| DIPHACINONE<br> | pesticide | 124 | rat | 1.9 | | | | | | |

## TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | | ALDEHYDES AND KETONES | | | | | |
| FORMALDEHYDE<br>HCHO | occurs in tannery wastes, penicillin wastes, and effluent from manufacture of plastics and resins | 252 | rat | 800 | | | 287 | | | No significant effects on the animals studies |
| | | | channel cat | | 25 | | | | | |
| | | 88 | D. magna | | >100 <1000<br>(24 hr) | | | | | |
| FURFURAL<br>$C_5H_4O_2$<br> | used in manufacture of plastics, as a solvent in petroleum refining, in the manufacture of varnishes and as a pesticide | 220 | mouse | 425 | | | 220 | rat | 25 mg/kg/ day for 4 mos | No significant effect |
| | | | rat | 126.7 | | | | | | |
| | | 252 | dog | 2300 | | | | | | |
| | | 200 | guinea pig | 541.7 | | | | | | |
| | | 435, 449 | mosquito fish | | 24 | | | | | |
| | | 252 | bluegill | | 24 | | | | | |
| METHYL ETHYLKETONE<br>$CH_3COC_2H_5$ | solvent for resins, nitro, and acetylcellulose | 252 | rat | 3980 | | | 442 | warmblooded animals | | No significant effects |
| | | | bluegill | | 5640<br>(48 M) | | | | | |
| | | 435 | mosquito fish | | 5600 | | | | | |
| MGK REPELLENT 11<br> | pesticide (repellent) | 340 | rat | 2500 | | | | | | |
| PIVAL<br>(PINDONE)<br> | pesticide | 124 | rat | 280 | | | | | | |

# TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

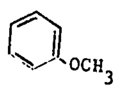
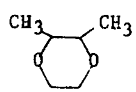
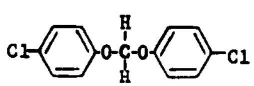
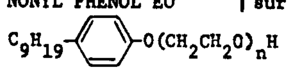
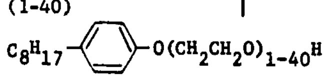
| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | | ETHERS | | | | | |
| ANISOLE  | in waste waters from synthesis of analogs and derivatives of DDT; trace amounts in BKME waste | 283 | mouse | 1150 | | | 283 | rabbit | 0.025 mg/kg daily for 6 mos | Change in blood sugar curve |
| DIBROMOHEPTAFLUORO-ISOBUTYL METHYL ETHER $(CF_3)_2CBrCBrFOCH_3$ | refrigerant, propellent, fire extinguisher, solvent | 106 | rat | 1150 | | | | | | |
| DIETHYL ETHER $CH_3CH_2$-O-$CH_2CH_3$ | | | | | | | 14 | warmblooded animals | 0.2 mg/kg daily | Ineffective dose during sanitary toxicological tests |
| DIMETHYLDIOXANE $C_6H_{12}O_2$  | | | | | | | 193, 193 | laboratory animals | 0.005 mg/kg daily | Does not affect functional condition |
| | | | | | | | 192 | rabbit | 0.25 mg/kg daily for 6 mos | Decrease in hemoglobin concentration; decrease in blood sugar; change in glycogenic liver function |
| | | | | | | | | rat | 0.0025 mg/kg daily for 6 mos | Change in rate of $O_2$ consumption; change in conditioned reflexes |

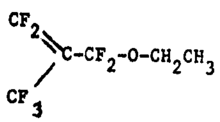
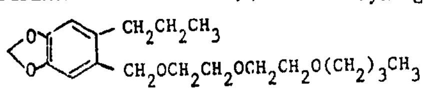
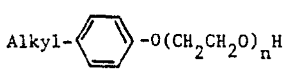
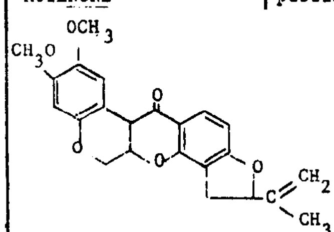
TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | ETHERS | | | | | | |
| EPICHLOROHYDRIN<br>$CH_2$–O–$CHCH_2Cl$ (epoxide ring) | manufacture of epoxy resins | 105 | rat | 141.1 | | | 105 | rabbit | 0.5 mg/kg daily for 6 mos | Low concentration of reduced glutathione 15 days after beginning of administration and a higher concentration of oxidized glutathione toward the end; change in reticulocyte number; decrease in vitamin C in liver, kidneys, and spleen |
| | | | mouse | 194.6 | | | | | | |
| | | | guinea pig | 280 | | | | | | |
| | | | rabbit | 345 | | | | | | |
| | | | | | | | | | 0.05 mg/kg daily for 6 mos | Similar effects as above |
| | | | | | | | | rat | 0.005-5 mg/kg/day | Affected conditioned reflexes |
| | | | | | | | | | 0.005-5 mg/kg/day | Decreased synthesis of hippuric acid |
| FATTY ACYL SORBITAN EO (20)<br>$R-\overset{O}{\overset{\|\|}{C}}-OCH_2(CH_2OH)_4CH_2O-(CH_2CH_2O)_{20}H$ | surfactant | 397 | rat | 20,000-60,000+ | | | | | | |
| | | | mouse | 25,000+ | | | | | | |
| | | | hamster | 18,000 | | | | | | |
| FURAN<br> | organosynthetic industry | | | | | | 343 | rat | 0.2-50 mg/kg daily for 3 mos | Liver damage from only the peripheral lobes at the lower dose to atrophic annular cirrhosis at the higher dose |
| HEPTAFLUOROISOBUTYLENE METHYL ETHER<br>$(CF_3)_2C=CF-O-CH_3$ | refrigerant, propellent, fire extinguisher | 106 | rat | 1070 | | | | | | |

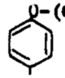
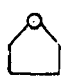
## TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | | ETHERS | | | | | |
| HEXAFLUOROPROPYL METHYL ETHER<br>$CF_3CHF\text{-}CF_2O\text{-}CH_3$ | refrigerant, propellent, fire extinguisher | 106 | rat | ~30,000 (IP) | | | | | | |
| LAURYL ALCHOHOL EO<br>$CH_3(CH_2)_{10}CH_2O(CH_2CH_2O)_nH$ | surfacant | 397 | mouse | 1170-7600 | | | | | | |
| | | | rat | 4150-9350 | | | | | | |
| NEOTRAN<br> | pesticide | 252 | rat | 5800 | | | 252 | rat | 100 mg/kg in diet 50 days | No effect |
| | | | channel cat | | 21.8 | | | | 3000 mg/kg in diet 50 days | Pronounced histo-pathology |
| NONYL PHENOL EO<br> | surfacant | 397 | rat | 1600 | | | | | | |
| OCTAFLUOROISOBUTYL METHYL ETHER<br>$(CF_3)_2CH\text{-}CF_2\text{-}O\text{-}CH_3$ | refrigerant, propellent, fire extinguisher, solvent | 106 | mouse | >1000 | | | | | | |
| OCTYLPHENOL EO (1-40)<br> | | 397 | rat | 1800-28,000 + | | | | | | |

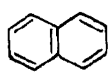
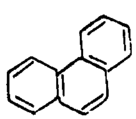
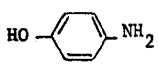
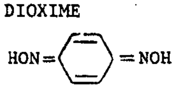
# TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/1 | LC50 mg/1 | Ref | Species | Dose | Effect |
| | | | | | **ETHERS** | | | | | |
| **PERFLUOROISOBUTENYL ETHYL ETHER**  | waste product from synthesis of fluorine containing plastics | 364, 370 | mouse | 164 | | | 364 | rabbit | 6 mg/kg daily for 7 mos | Change in blood composition; decrease in prothrombin time; affects glycogenic function of liver |
| | | | | | | | | rat | 6 mg/kg daily for 7 mos | Decrease in $O_2$ consumption weight loss, histological, histochemical and neuro-histological changes |
| | | | | | | | | | 0.15 mg/kg for 7 mos | Decrease in conditioned reflexes |
| **PIPERONYL BUTOXIDE**  | pesticide synergist | 124 | rat | 7500♂<br>6150♀<br>>7950 (dermal) | | | | | | |
| | | 340 | | 11,500 | | | | | | |
| POLYETHYLENE-CYCLOALKYL PHENYL ETHERS (OP-7, OP-10)  | detergents | | | | | | 132 | rat | 150 mg/kg OP-10 daily for 4 mos | Increase in weight of kidney fatty dystrophic liver changes |
| | | | | | | | | mouse | 4% (400 mg/l) OP-7 daily for 55-62 days | No changes |
| ROTENONE  | pesticide | 252 | human | 0.2 g/kg is fatal | | | 252 | rat | 5 mg/kg in diet daily | Necrosis of the liver |
| | | 340 | rat | 132-1500 | | | | | | |
| | | 252 | | 132 | | | | | | |
| | | 449 | bluegill | | | 0.024 | | | | |
| | | 252 | fathead | | 0.006-0.066 | | | | | |
| | | | catfish | | 0.47 | | | | | |
| | | 449 | rainbow trout | | | 0.032 | | | | |

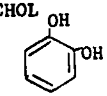
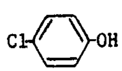
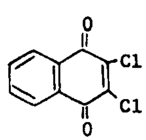
## TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | ETHERS | | | | | | |
| SAPONIN<br>$C_{30}H_xO_y(-C_6H_{11}O_5)_z$ | industrial effluent; charging fire extinguishers; detergents | | | | | | 216 | rat | 1, 10, and 50 mg/kg daily for 3-4 mos | Affected conditioned reflexes; change in nerve cells |
| | | | | | | | | | 10 and 50 mg/kg daily for 4 mos | Histological changes in liver and kidneys |
| STEARYL ALCOHOL EO<br>$C_{18}H_{37}O(CH_2CH_2O)_nH$ | | 397 | rat | 2900<br>25,000 + | | | | | | |
| STEROX<br>$O-(CH_2CH_2O)_n H$<br><br>R | detergent | 174 | silver salmon | | 20 mg/l (80% kill: in 22 hrs) | | | | | |
| TETRAHYDROFURAN<br> | | 319 | rat | 2300 | | | 320 | warmblooded animals | >5 mg/l in drinking water daily | Pathological changes |
| | | | mouse | 3000 | | | | | | |
| | | | guinea pig | 2300 | | | 319 | mouse, rat, rabbit | 20 mg/kg daily for 5-6 mos | Decrease in conditioned reflexes; increase in reticulocytes; decrease in cholinesterase activity; increase in liver glycogen |
| | | | | | | | | | 10 mg/kg daily for 5-6 mos | Growth impairment |

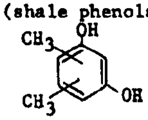
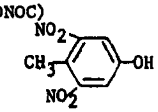
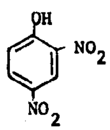
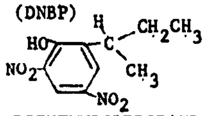
## TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | UNSUBSTITUTED AROMATICS | | | | | | |
| BENZENE  | tar and gas waste, dyeing and other textile operations | 252 | rat | 5600<br>5700 | | | | | | |
| | | 174 | sunfish | | 35-37 (lethal in 1 hr) | | | | | |
| | | 435 | mosquito fish | 386 | | | | | | |
| NAPHTHALENE  | tar and gas waste; refinery textile mill and other industrial waste | 124 | rat | 2000♂<br>2400♀<br>>2500 (dermal) | | | | | | |
| | | 174 | sunfish | | 4-5 (lethal in 1 hr) | | | | | |
| | | | perch | | 20-40 (lethal in 1 hr) | | | | | |
| | | 435 | mosquito fish | | 150 | | | | | |
| PHENANTHRENE  | | 333 | mouse | 700 | | | | | | |
| | | 174 | sunfish | | 1-2 (lethal in 1 hr) | | | | | |
| | | | | PHENOLS AND QUINONES | | | | | | |
| p-AMINOPHENOL  | | | | | | | 410 | rat | 0.05 mg/kg daily for 7 mos | Ineffective dose |
| BENZOQUINONE DIOXIME  | | 45 | rat | 1580 | | | | | | |
| | | | mouse | 1420 | | | | | | |

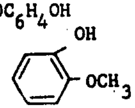
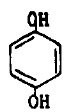
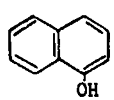
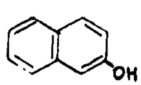
## TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | | PHENOLS AND QUINONES | | | | | |
| CATECHOL  | | 174 | perch | | 20 (fatal in 1 hr) | | | | | |
| CHEREMKBOVSK TAR - INTERMEDIATE FRACTION (high MW phenols 30%, hydrocarbons 50%, neutral oxycompounds 15%) | semi-coking of coal | 211 | mouse | 1380 | | | 211 | guinea pig | 100 mg/kg daily for 4 mos | Loss of weight; increase in weight of adrenals; change in electrocardiogram; change glycemic curves |
| | | | | | | | | | 10 mg/kg daily for 4 mos | Change in glycemic curves |
| CHLOROPHENOL  | petrochemical | 174 | bluegill | | 8.1 | | | | | |
| DICHLONE (PHYGON)  | pesticide | 252 | rat | 1500 | | | 252 | human | | Skin irritation |
| | | | coho salmon | | 0.42 (48 hrs) | | | rat | 1580 mg/kg in food | Retarded growth |
| | | | channel cat | | 0.14 | | | | | |
| | | | fathead | | 0.15 | | | | | |
| | | 252, 449 | largemouth bass | | 0.07 (48 hrs) | | | | | |
| | | 252 | rainbow trout | | 0.074 | | | | | |
| | | | red-sided shiner | | 0.011 | | | | | |

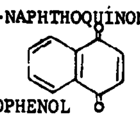
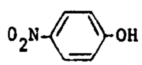
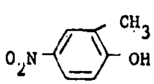
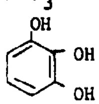
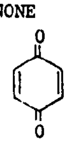
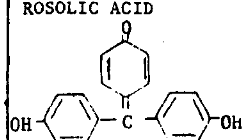
## TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | PHENOLS AND QUINONES | | | | | | |
| DIMETHYLRESORCINOLS (shale phenols)  | carbonization of oil shales; production of tanning compounds | 420 | rat | 1000 | | | 420 | rat | 100 mg/kg daily for 20 wks | Decreased weight<br>Affected kidneys and liver |
| DINITROCRESOL (DNOC)  | pesticide | 173 | rat | 25-40 | | | | | | |
| 2, 4-DINITROPHENOL  | pesticide, production of dyes | 316 | rat<br>mouse<br>guinea pig<br>rabbit | 31.2<br>46.5<br>81.0<br>30 | | | 316 | rat | 0.031 and 0.62 mg/kg for 7 mos | Decrease in conditioned reflexes; changes in content of urea; decrease in content of high-energy phosphorus compounds in the liver |
| | | | | | | | | rabbit | 0.03 mg/kg for 7 mos | Decrease in SH groups |
| DINOSEB (DNBP)  | pesticide | 173 | rat | 50 | | | | | | |
| DIPHENYLOLPROPANE $(CH_3)_2C(C_6H_4OH)_2$ | | | | | | | 104 | rat | 0.25 mg/kg daily for 6 mos | Change in acid resistance of erythrocytes; decrease in ascorbic acid concentrations;<br>Also affects: oxidation-reduction processes, SH-groups of reactive proteins, the liver function, the neuro-hormonal regulation and the central nervous system |

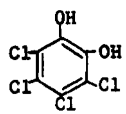
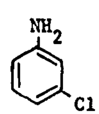
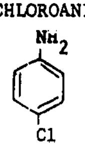
## TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | PHENOLS AND QUINONES | | | | | | |
| GUAIACOL $CH_3OC_6H_4OH$  | tar and gas wastes, component of BKME | 174 | perch | | 70-80 (48 hr) | | | | | |
| HYDROQUINONE $C_6H_4(OH)_2$  | anti-oxidant, as a reducer in photographic development and as a chemical reagent in phosphate tests | 252 | rat | 320 | | | 271 | warmblooded animals | | Considerable effect on bone marrow |
| | | | goldfish | | 0.287 (48 hrs) | | | | | |
| α-NAPHTHOL  | waste from dye and insecticide industry; also from plants engaged in distillation of bituminous coal | 331, 332 | rat | 2400 | | | | | | |
| | | | mouse | 280 | | | | | | |
| | | | guinea pig | 2000 | | | | | | |
| | | | rabbit | 9000 | | | | | | |
| | | | cat | 134 | | | | | | |
| β-NAPHTHOL  | waste from dye and insecticide industry; also from plants engaged in distillation of bituminous coal | 331, 332 | rat | 1960 | | | 331 | rat | 4.4 mg/kg daily for 8 mos | Changes in CNS function; change in conditioned reflexes; decrease in cholinesterase activity |
| | | | mouse | 96 | | | | | | |
| | | | guinea pig | 1335 | | | | | | |
| | | | rabbit | 5400 | | | | | 196.0 mg/kg /day for 8 mos | Decrease in cholinesterase activity; increase in prothrombin time; decrease in SH groups; decrease in phagocytic activity of leucocytes |
| | | 252 | | 3800 | | | | | | |
| | | 331 | cat | 89 | | | | | 12.0 mg/kg /day for 8 mos | Change in glycogenic function of liver |

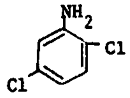
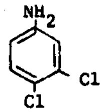
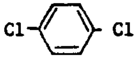
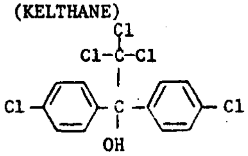
## TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | | PHENOLS AND QUINONES | | | | | |
| 1, 4-NAPHTHOQUINONE  | | 400 | | 2000 (lethal) | | | | | | |
| NITROPHENOL  | | 236 | laboratory animals | 328 | | | 236 | warmblooded animals | | Alterations in functional state of organism |
| | | 449 | bluegill | | 46.3 (48 hrs) | | | | | |
| NITROTOLUOL  | | 204 | rat | 2400 | | | 215 | rat | 120 mg/kg daily | Increase in number of leucocytes, and methemoglobin blood levels; decrease in erythrocytes and hemoglobin level; affects liver; raised prothrombin index |
| | | | mouse | 330 | | | | | | |
| | | | rabbit | 2400 | | | | | | |
| PYROGALLOL $C_6H_3(OH)_3$  | used in dyeing of woolens, & furs, for staining leather, and as a developer in photography | 252 | dog | 25 | | | | | | |
| | | | goldfish | | 18 (48 hr) | | | | | |
| QUINONE  | used in photography, dye manufacture, tanning, and as an oxidizing agent | 252 | rat | 130 | | | | | | |
| ROSOLIC ACID  | tar and gas waste | 250 | perch | | 100 (lethal in 1 hr) | | | | | |

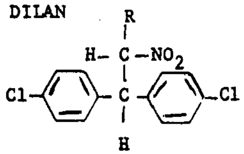
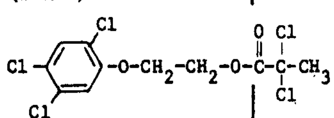
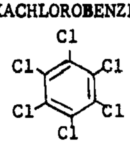
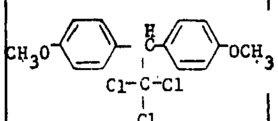
## TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | PHENOLS AND QUINONES | | | | | | |
| TETRACHLOROCATECHOL  | possible component of Kraft pulp mill bleach waste | 362 | fish | sub-lethal concentrations caused an increase in rate of respiration which was thought to indicate disruption of cellular processes by uncoupled oxidative phosphorylation | | | | | | |
| VETLUZHSK OIL (25-37% high MW phenols & esters, 10-15% aromatic acids, 10-15% fatty acids, 20% hydrocarbons) | wood resin distillation; used as a flotoreagent in concentrating iron ore of low magnetic content | 111 | mouse | 624-2850 | | | 111 | guinea pig | 100 mg/kg daily | Decrease in $O_2$ consumption; adrenal hypertrophy shifts in form of shortened B-P intervals and changes in QRST complex revealed by electrocardiograms; histological changes in liver and kidneys |
| | | | | | | | | | 10 and 100 mg/kg daily for 4 mos | Effect on glycogen synthesizing function of the liver |
| | | | | AROMATIC DERIVATIVES | | | | | | |
| HALOGENATED | | | | | | | | | | |
| m-CHLOROANILINE  | agricultural and chemical effluent | 186 | rat | 1084 ♀<br>880 ♂ | | | 230, 237 | rat | 25 mg/kg daily for 8 mos | Decrease in hemoglobin & erythrocytes; increase in reticulocytes; decrease in liver glycogen; change in CNS; histological changes in liver and kidney; increase in vitamin C content of suprarenals. |
| | | 230 | | 256 | | | | | | |
| | | 136 | mouse | 1100 | | | | | | |
| | | 230 | | 368 | | | | | | |
| | | 186 | guinea pig | 750 | | | | | | |
| | | 230 | | 250 | | | | | | |
| p-CHLOROANILINE  | agricultural and chemical effluent | 186 | rat | 370 ♀<br>300 ♂ | | | 186 | guinea pig | 5 mg/kg daily for 7 mos | Glycogenic malfunction of the liver; decrease in phagocytic activity of leucocytes |
| | | | mouse | 400 | | | | | | |

# TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | | AROMATIC DERIVATIVES | | | | | |
| p-CHLOROANILINE (cont) | | 186 | guinea pig | 350 | | | 186 | guinea pig | 0.5 and 5 mg/kg daily for 8 mos | Protein dystrophy in liver |
| | | | | | | | | rat | 0.1 mg/kg daily for 8 mos | Disturbance of conditioned reflexes |
| 2, 5-DICHLOROANILINE  | | 347 | rat | 3000 | | | 347 | rat | 20 mg/kg daily for 6 mos | Changes in conditioned reflexes, kidney and liver function and blood concentrations |
| | | | mouse | 2500 | | | | | | |
| | | | guinea pig | 3750 | | | | | | |
| | | | rabbit | 3750 | | | | | | |
| 3, 4-DICHLOROANILINE  | | 347 | rat | 700 | | | 347 | rat | 20 mg/kg daily for 6 mos | Changes in conditioned reflexes, kidney and liver function and blood concentrations |
| | | | mouse | 1000 | | | | | | |
| | | | guinea pig | 6750 | | | | | | |
| | | | rabbit | 675 | | | | | | |
| DICHLOROBENZENE  | insulator, plasticizer, pesticide | 340 | rat | 500-5500 | | | 143 | rat | 0.003 mg/kg daily for 5 mos | No significant effects |
| DICOFOL (KELTHANE)  | pesticide | 252 | rat | 575-1100 | | | | | | |
| | | 124 | | 1100 ♂<br>1000 ♀ | | | | | | |
| | | | | 1230 ♂ ) (dermal)<br>1000 ♀ ) | | | | | | |
| | | 173 | | 575->2000 | | | | | | |

## TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | | AROMATIC DERIVATIVES | | | | | |
| DILAN  | pesticide | 124 | rat | 600 ♂<br>475 ♀<br>>3000 (undiluted technical grade) | | | | | | |
| | | 173 | | 475-4000 | | | | | | |
| | | 174 | channelcat | | <0.5 | | | | | |
| ERBON (BARON)  | | 449 | chinook salmon | | 2.3 (48 hrs) | | | | | |
| | | 174 | channelcat | | 6.9 (48 hrs) | | | | | |
| HEXACHLOROBENZENE  | | | | | | | 143 | rat | 0.005 mg/kg daily for 4 mos | Changes in conditioned reflexes |
| METHOXYCHLOR  | pesticide | 252 | human | 350,000 (fatal to 70 g man) | | | 252 | quail | 1000 mg/kg in diet | 40% reduction in reproduction |
| | | 293 | rat | 6000 | | | | | | |
| | | 252 | | 5000-7000 | | | | | | |
| | | | bobwhite quail | 22,000 | | | | | | |
| | | | ring neck pheasant | 25,000 | | | | | | |
| | | 101 | fathead | | 0.064 | | | | | |
| | | 449 | | | | 0.031 | | | | |

# TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

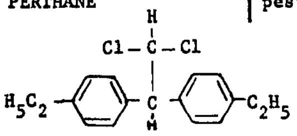
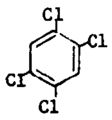
| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | | AROMATIC DERIVATIVES | | | | | |
| METHOXYCHLOR (cont) | | | | | | | | | | |
| | | 101, 174 | bluegill | | 0.062 | | | | | |
| | | 449 | | | | 0.020 | | | | |
| | | 101 | goldfish | | 0.056 | | | | | |
| | | 174 | guppies | | 0.120 | | | | | |
| | | | rainbow trout | | 0.05 (24 hr) | | | | | |
| PERTHANE  | pesticide | 124 | rat | >4000 | | | | | | |
| | | 340 | | 8170 | | | | | | |
| | | 252 | | 8200 | | | | | | |
| | | | | 8500 | | | | | | |
| | | 449 | bluegill | | | 0.021 | | | | |
| | | | rainbow trout | | | 0.009 | | | | |
| TETRACHLOROBENZENE  | pesticide; intermediate product in the manufacture of the effective fungicide copper trichlorophenolate | 108 | rat | 1500 | | | 108 | rat | 0.005 mg/kg daily for 8 mos | Change in conditioned reflexes; increase in weight coefficients of the liver; decrease in SH groups |
| | | | mouse | 1035 (in oil) 2650 (in starch) | | | | | 0.05 mg/kg daily for 8 mos | Increase in ascorbic acid content of organs |
| | | | rabbit | 1500 | | | | rabbit | 0.05 mg/kg daily for 8 mos | Disorders of glycogen function of the liver; increase in SH groups in blood serum followed by a decrease; increase in hemoglobin content of blood; increase in content of reticulocytes in the peripheral blood |

TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

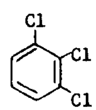
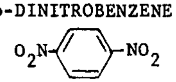
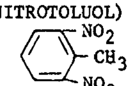
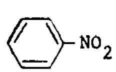
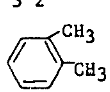
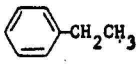
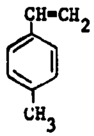
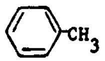
| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | | AROMATIC DERIVATIVES | | | | | |
| TETRACHLOROBENZENE (cont.) | | | | | | | 108 | rabbit | 0.005 mg/kg daily for 8 mos | Disorder of glycogen function of liver; change in content of SH groups in serum in last month of experiment |
| TRICHLOROBENZENE  | insulator, plasticizer, synthesis of some explosives | | | | | | 255 | rat | 0.01 mg/kg daily for 5.5 mos | Increase in eosinophiles, reticulocytes, and leucocytes in the blood; reduced $O_2$ consumption |
| | | | | | | | 143 | | 0.003 mg/kg daily for 7-8 mos | Did not affect conditioned reflexes |
| NITRO COMPOUNDS | | | | | | | | | | |
| p-DINITROBENZENE  | | 252 | rat | 29.4 | | | | | | |
| DINITROTOLUENE (DINITROTOLUOL)  | aniline dye and other industries | | | | | | 126 | rabbit | 0.5 and 0.05 mg/kg daily for 8 mos | Histological changes in liver |
| NITROBENZENE $C_6H_5NO_2$  | manufacture of aniline, soaps, and shoe polishes | 252 | rabbit | 700 | | | | | | |
| XYLENE $C_6H_4(CH_3)_2$  | solvent and cleaning agent; manufacture of dyes and organics | 252 | rat | 4300 | | | 435 | rat | 4 and 48 mg/kg daily for 5 1/2 mos | Occasional variation in hemoglobin, erythrocytes, and leucocytes; marked eosinophilia; change in reticulocyte number |
| | | 124 | sunfish | | 47-48 (lethal in 1 hr) | | | | 48 mg/kg daily for 5 1/2 mos | Lymphopenia |
| | | 88 | D. Magna | | >100 <1000 (48 hrs) | | | | | |

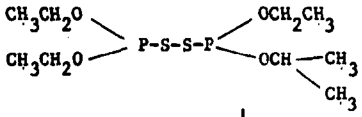
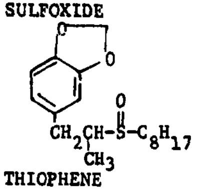
TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | | AROMATIC DERIVATIVES | | | | | |
| **ARYLALKANES** | | | | | | | | | | |
| ETHYL BENZENE   | | | | | | | 463 | rabbit | 5 g/kg in drinking water | Effect on: CNS, growth, morphological composition of blood, pathological and histological changes in organs |
| METHYLSTYRENE   | | 296 | rat | 10,500 | | | | | | |
| | | | mouse | 5,000 | | | | | | |
| TOLUENE   | tar and gas waste | 252 | rat | 7000 | | | 3 | rabbit | 0.25, 1.0 and 10 mg/kg for 9 1/2 and 5 mos | No significant effects |
| | | 3 | man | effect: headache, intoxication, nausea, vomiting, disturbance of equilibrium, paresthesia, loss of conscience | | | | | | |
| | | 174 | sunfish | | 61-65 (lethal in 1 hr) | | | | | |
| | | 435, 449 | | | 1180 | | | | | |
| | | | | MERCAPTANS AND OTHER SULFUR ORGANICS | | | | | | |
| BUTYL MERCAPTAN, Na $CH_3CH_2CH_2CH_2-S^-Na^+$ | effluent from oil refineries | 449 | fish | | 7.3 (24 hrs) | | | | | |

## TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | MERCAPTANS AND OTHER SULFUR ORGANICS | | | | | | |
| BUTYL XANTHOGENATE<br>$C_2H_5OC(=S)-S-CH_2CH_2CH_2CH_3$ | flotoreagent | 234 | mouse & rat | 600-800 | | | 435, 233 | rat | 1 mg/kg daily for 4 mos | Decrease in blood prothrombin, histopathological changes in liver and kidneys |
| | | | | | | | 233 | | 10 mg/kg daily for 4 mos | Change in conditioned reflexes |
| CARBON DISULFIDE<br>$CS_2$ | | 435 | mosquito fish | 135 | | | 424 | rabbit | 70 mg/kg daily for 6 mos | Change in phagocytic activity; change in carbohydrate metabolism |
| | | | | | | | 201 | rat & rabbit | 15 mg/kg daily for 7 1/2 mos | Decrease in rate of weight gain in rabbit only; decrease in cholinesterase activity; decrease in blood |
| DIMETHYLSULFIDE<br>$(CH_3)_2S$ | waste from production of cellulose by sulfate method | 201 | rat | 3300 | | | | | | |
| | | | mouse | 3700 | | | | | | |
| DIMETHYLSULFOXIDE<br>$CH_3-S(=O)-CH_3$ | | 201 | chinook salmon | 12,000 | | | 201 | fish | high concentration or over a long period of time | Change in number of various blood components; histopathological change in liver, kidney, brain, gills, and spleen |
| | | | sockeye salmon | 13,000 | | | | | | |
| | | | coho salmon | 16,000 | | | | | | |
| | | | rainbow trout | 17,000 | | | | | | |
| METHYL MERCAPTAN<br>$CH_3SH$ | bleached Kraft pulp mill effluent | | | | | | 449 | fish | 1 mg/l | Restlessness, a progressive respiratory depression, muscular weakness, convulsions, spastic paralysis |

# TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | **MERCAPTANS AND OTHER SULFUR ORGANICS** | | | | | | |
| MUSTARD GAS $ClCH_2CH_2SCH_2CH_2Cl$ | chemical warfare agent | 252 | rabbit | 500 mg/l causes gastrointestinal inflammation | | | | | | |
| | | | guppy | 20 mg/l fatal in 15 min | | | | | | |
| PHOSTEX  | pesticide | 124 | rat | 350 ♂<br>265 ♀<br>480 ♂ ) (dermal)<br>500 ♀ ) | | | | | | |
| SULFOXIDE  | synergist | 340 | rat | 500-5000 | | | | | | |
| THIOPHENE $C_4H_4S$  | organosynthetic industry, tar and gas waste | 174 | sunfish | | 27 (fatal in 1 hr) | | 343 | rat | 10 mg/kg daily for 4 mos. | Change in conditioned reflexes |
| | | | | **ORGANOMETALICS** | | | | | | |
| DIETHYLMERCURY $CH_3CH_2HgCH_2CH_3$ | effluent from synthesis of ethyl mercuric chloride and phosphate | 458 | rat | 51.2 | | | 458 | rabbit | 0.0005-0.005 mg/kg daily for 6 mos | Decrease in blood serum SH groups in rabbits; disturbance in liver parenchyma |
| | | | | | | | | rat | 0.000005-0.00005 mg/kg daily for 6 mos | Higher doses disturbed catalase activity; higher dose affected conditioned reflexes |
| | | | | | | | | rat & rabbit | 0.005 mg/kg daily for 6 mos | Histopathological changes in liver and kidneys |

## TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | ORGANOMETALLICS | | | | | | |
| ETHYLMERCURIC CHLORIDE $CH_3CH_2HgCl$ | | 458 | rat | 211.8 | | | 458 | rabbit | 0.0005-0.005 mg/kg daily for 6 mos | Decrease in blood serum SH groups |
| | | | | | | | | rat | 0.000005-0.00005 mg/kg daily for 6 mos | Higher dose affects conditioned reflexes |
| | | | | | | | | rat & rabbit | 0.005 mg/kg/day for 6 mos | Histopathological changes in liver and kidneys |
| TETRAETHYL LEAD $Pb(C_2H_5)_4$ | effluent from crude oil distillation plants | 449 | bluegill | | 0.20 | | | | | |
| TETRAETHYL TIN $Sn(C_2H_5)_4$ | | 371 | rat | 15.9 | | | 371 | rat & guinea pig | 0.0001 mg/kg daily for 7-9 mos | Decrease in hemoglobin; decrease in erythrocyte count; decrease in cholinesterase activity; increased leucocyte count; change in kidney function; change in conditioned reflexes |
| | | | mouse | 39.8 | | | | | | |
| | | | guinea pig | 37 | | | | | | |
| | | | rabbit | 7 | | | | | | |
| | | | | POLYMERS | | | | | | |
| BUTOXY POLYPROPYLENE GLYCOL (CRAG FLY REPELLENT, OPS-B) $C_4H_9O(CH_2\underset{CH_3}{C}HO)_nH$ | pesticide, flotoreagent | 340<br>49 | rat | 9100-11,200<br>17,000 | | | 308 | rat | 400 mg/kg daily for 6 mos | Change in cholinesterase activity |
| | | | | | | | | | 7 -400 mg/kg daily for 6 mos | Change in conditioned reflexes |

TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | POLYMERS | | | | | | |
| METHOXYPOLYPROPYLENE GLYCOL (OPS-M) | flotoreagent | | | | | | 308 | rat | 2.5 mg/kg daily for 6 mos | Change in conditioned reflexes; change in cholinesterase activity |
| METHYL SILICONATE | | 212 | mouse | 3900 | | | 308 | guinea pig | 25 mg/kg daily for 6 mos | Slight protein distrophy in liver and kidneys |
| POLY(ETHYLHYDRO-SILOXANE | water repellent | | | | | | 308 | rat | ≤80 g/kg | no toxic effect |
| POLYMETHACRYLATE, cationic (VA-102) | used for purification of water | | | | | | 408 | rat | 1 g/kg daily for 30 days | Decrease in CNS; change in vegetative nervous system |
| POLYSTYRENE, cationic (VA-2, VA-3) | flocculant for water purification | 425 | laboratory animals | 1500-3000 | | | 425 | rat | 0.1 mg/kg daily for 10 mos | Slight change in conditioned reflexes;change in stomach histology; increase in eosinophiles |
| | | | | SURFACTANTS (structure unknown) | | | | | | |
| ACTUSOL | oil dispersant | 407 | fingerling steelhead | | 24.0 | | | | | |

# TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | | SURFACTANTS | | | | | |
| BLAST | detergent | | | | (Structure unknown) | | 174 | fish | high concentration | Fatal due to alkalinity of solutions; exhibited symptoms of distress, and at death were excessively slimy with opaque corneas |
| CHEVRON NI-0 | oil dispersant | 407 | fingerling steelhead | 3.2 | | | | | | |
| COREXIT-7664 | oil dispersant | 407 | fingerling steelhead | 15.8 | | | | | | |
| E-314 | oil dispersant | 407 | fingerling steelhead | 22.5 | | | | | | |
| F. O. 300B | oil dispersant | 407 | fingerling steelhead | 65.0 | | | | | | |
| GAMLEN-CW | used to precipitate paint from the surface of water | 174 | chinook salmon | 10-17.8 (critical level) | | | 174 | fish | | Irritation and intoxication, including spasmodic snapping of the jaws, violent activity and twitching of eyes and fins |
| HOLL-CHEM 662 | oil dispersant | 407 | fingerling steelhead | 3.2 | | | | | | |
| JAN-SOLV-60 | oil dispersant | 407 | fingerling steelhead | 35.5 | | | | | | |
| PETROLITE W-1439 | oil dispersant | 407 | fingerling steelhead | 35.5 | | | | | | |
| POLYCOMPLEX A-11 | oil dispersant | 407 | fingerling steelhead | 13.0 | | | | | | |
| SEASWEEP | oil dispersant | 407 | fingerling steelhead | 20.2 | | | | | | |

TABLE III (CONT.) - ACUTE AND CHRONIC TOXICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | Source | Acute Toxicity | | | | | Chronic Toxicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ref | Species | LD50 mg/kg | 96 hr TLm mg/l | LC50 mg/l | Ref | Species | Dose | Effect |
| | | | | SURFACTANTS (Structure unknown) | | | | | | |
| SPILL-X | oil dispersant | 407 | fingerling steelhead | 35.5 | | | | | | |
| | | | | ORGANICS (Structure Unknown) | | | | | | |
| ALGIBIOL | pesticide | 251 | fathead | | 20 (24 hrs) | | | | | |
| C 56 | pesticide | 174 | bluegill | | 30 (48 hrs) | | | | | |
| | | | largemouth bass | | 35 (48 hrs) | | | | | |
| MEZIDINE | aniline dye intermediate | | | | | | 28 | rat | small doses | Changes of the hemopioetic and nervous systems and hepatic functions, oxidative and tropic processes of the body |
| SHELL D50 | pesticide | 174 | rainbow trout | | 210 (48 hrs) | | | | | |
| SORICIDE TETRAMINOL | pesticide | 251 | fathead | | 8 (48 hrs) | | | | | |

TABLE IV - CONCENTRATION AND EFFECTS OF ORGANIC POLLUTANTS IN HUMAN AND ANIMAL TISSUE

This table contains available information on chemicals the concentrations and effects of which have been examined in tissues. It will be noted that all information contained in this table refers to pesticides. The data indicates that pesticides can be stored in the tissues of humans normally exposed to pesticides and deaths have occurred as a result of accidental exposure which have resulted in high concentrations in tissue. In some instances sequential information was examined and shows that some pesticides had increasing concentrations with time in the US and in India, but not in England or in some cases in France. Information on animal tissues shows extremely high tissue concentrations in animals living in highly pesticide-treated areas while aquatic life generally indicate low concentrations as compared to man and terrestrial animals.

TABLE IV – CONCENTRATION AND EFFECTS OF ORGANIC POLLUTANTS IN HUMAN AND ANIMAL TISSUE

| Ref | Agent | Species | Dose or Exposure | | Effect |
|---|---|---|---|---|---|
| | | | ALKANES AND ALKENES | | |
| | Halogenated | | | | |
| 83 | BENZENE HEXA-CHLORIDE | man | normal exposure to pesticides during life | | |
| | | | France | | stored |
| | | | US | | stored (< France) |
| 84 | | | normal exposure to pesticides | | |
| | | | US | 1961-62 | 0.20 ppm in body fat |
| | | | | 1962-63 | 0.57 " " " " |
| | | | | 1964 | 0.60 " " " " |
| | | | England | 1963-64 | 0.42 " " " " |
| | | | | 1964 | 0.02 " " " " |
| | | | France | 1961 | 1.19 " " " " |
| | | | India | 1964 | 1.43 " " " " |
| 315 | | | normal exposure to pesticides | | pregnant women: mean concentration in fat tissue 0.14 ppm<br>" " blood " 0.0045 "<br>non-pregnant women: mean concentration in blood tissue: 0.42ppm<br>fetus " " " 0.0012 ppm |
| 337 | | | accidental contamination of seed grain (Turkey) | | >3000 cases, 3-11% deaths (annually in different years) |
| 71 | CHLORDANE | fish (50 nationwide sampling stations) | normal exposure | | storage in 22% of 590 samples |

TABLE IV. (CONT.) -- CONCENTRATION AND EFFECTS OF ORGANIC POLLUTANTS IN HUMAN AND ANIMAL TISSUE

| Ref | Agent | Species | Dose or Exposure | Effect |
|---|---|---|---|---|
| | | | **ALKANES AND ALKENES** | |
| | **Halogenated** | | | |
| 91 | DIELDRIN | human | normal exposure to pesticides | storage in adipose tissue |
| | | | | 0-5 years (white)<br>range: < .05-.73 ppm (mean 0.23) |
| | | | | 6+ years (white)<br>range: <.05-.77 ppm (mean 0.23) |
| | | | | 0-5 years (nonwhite)<br>range: <.05-.46 (mean .21)<br>6+ years (nonwhite)<br>range: <.05-.43 (mean .20) |
| | | | " " "<br>in various locations | storage in adipose tissue |
| | | | US (3 cities) | range .02-.36 ppm mean .15 ppm |
| | | | US (4 cities) | .07-2.82 " " .31 " |
| | | | India | < .02-.36 " " .03 " |
| | | | New Orleans | .03-1.15 " " .29 " |
| | | | England, Wales | < .10-.90 " " .26 " |
| | | | England | .10-.73 " " .22 " |
| | | | Chicago | .01-1.39 " " .14 " |
| | | | Toronto, Canada | .07-.53 " " .22 " |
| | | | Miami | < .05-.77 " " .22 " |
| 83 | | | normal exposure to pesticides | storage in fat |
| | | | England | 0.21 ppm (mean) |
| | | | US | 0.15 ppm (mean) |
| 84 | | | normal exposure to pesticides | storage |
| | | | US 1961-62 | 0.15 ppm in body fat |
| | | | 1962-63 | 0.11 " " " " |
| | | | 1964 | 0.31 " " " " |
| | | | 1964 | 0.29 " " " " |
| | | | Denmark 1965 | 0.20 " " " " |

TABLE IV (CONT.) - CONCENTRATION AND EFFECTS OF ORGANIC POLLUTANTS IN HUMAN AND ANIMAL TISSUE

| Ref | Agent | Species | Dose or Exposure | Effect |
|---|---|---|---|---|
| | | | **ALKANES AND ALKENES** | |
| | DIELDRIN (continued) | human | normal exposure to pesticides | storage |
| | | | England 1961-62 | 0.21 ppm in body fat |
| | | | 1963-64 | 0.26 " " " " |
| | | | 1964 | 0.21 " " " " |
| | | | India 1964 | 0.04 " " " " |
| | | | Italy 1965 | 0.59 " " " " |
| 84 | | | general population, male, US, 1965 | 0.0014 ppm in whole blood |
| | | | " " " " " | 0.0019 " " plasma |
| | | | " " female " " | 0.0013 " " serum |
| | | | " " England, 1964 | 0.0014 " " whole blood |
| | | | occupational exposure, 1964 | 0.0463 " " " " |
| 315 | | | normal exposure to pesticides | storage<br>pregnant women: mean conc. in fat tissue: 0.08 ppm<br>mean conc. in blood: 0.0016 ppm<br>nonpregnant women: mean conc. in blood: 0.17 ppm<br>fetus: mean conc. in blood: 0.0013 ppm |
| 50 | | | normal exposure to pesticides during life (range: 28 weeks gestation to 88 years of age) | 44 autopsies provided following mean values:<br>perirenal fat: 0.0300 ppm of whole tissue<br>mesenteric fat: 0.0630 " " "<br>panniculus fat: 0.0270 " " "<br>bone marrow: 0.0620 " " "<br>TBLN*: 0.0190 " " "<br>adrenal 0.0060 " " "<br>kidney 0.0056 " " "<br>liver 0.0037 " " "<br>brain 0.0031 " " "<br>gonad 0.0021 " " "<br>* tracheo bronchial lymph nodes |

TABLE IV (CONT.) - CONCENTRATION AND EFFECTS OF ORGANIC POLLUTANTS IN HUMAN AND ANIMAL TISSUE

| Ref | Agent | Species | Dose or Exposure | Effect |
|---|---|---|---|---|
| | | | **ALKANES AND ALKENES** | |
| | DIELDRIN<br>(continued) | human | normal exposure to pesticides during life (continued) | lung: 0.0022 ppm of whole tissue<br>spleen: 0.0021 " " " |
| 337 | | | 0; 0.05; 0.211 mg/man/day for two years (≤ 0.0028-0.0036 mg/kg/day) | only difference was increased concentration of dieldrin in adipose tissue, blood |
| 125 | | fish<br>bluegills<br>redears<br>goldfish<br>white catfish | sublethal concentration followed by recovery period (up to 41 days) | stored in all tissues in varying amounts<br>liver ) gall bladder ) pyloric caeca ) intestine ) high concentrations<br>muscle low concentration |
| 334 | | eagles | normal exposure to pesticides | storage<br>bald eagles: carcass: (median value)<br>1965 / 1964<br>0.33 ppm / 0.65 ppm<br>liver:<br>0.21 " / 0.35 "<br>brain:<br>0.08 " / 0.10 "<br>gold eagles: carcass: 1964-65 0.09 ppm<br>liver " threshold<br>brain " " |
| 71 | | fish from 50 nationwide sampling stations | normal exposure to pesticides | storage in 75% of 590 samples (≤ 1.94) |
| 337 | | fish | poor handling in sandfly control (Wisconsin or boundary waters) | range: trace 12.5 ppm of whole fish<br>average: 0.158 ppm " " " |

TABLE IV (CONT.) - CONCENTRATION AND EFFECTS OF ORGANIC POLLUTANTS IN HUMAN AND ANIMAL TISSUE

| Ref | Agent | Species | Dose or Exposure | Effect |
|---|---|---|---|---|
| | | | ALKANES AND ALKENES | |
| 140 | DIELDRIN (continued) | hen pheasants | 4 mg/week | average: 41.2 ppm in fat had no adverse effect on feeding, weight or egg production |
| 84 | ENDRIN | man | normal exposure to pesticides | storage |
| | | | US 1964 | < 0.02 ppm in body fat |
| | | | 1964 | < 0.03 " " " " |
| | | | England 1964 | < 0.02 " " " " |
| | | | Italy 1965 | 0.93 " " " " |
| 334 | | bald eagle | normal exposure 1965 | carcass (median value) 0.09 ppm |
| | | | | liver 0.09 " |
| | | | | brain " threshold |
| 50 | HEPTACHLOR-EPOXIDE | man | from normal exposure to pesticides during life (range 28 weeks gestation to 88 years of age) | 44 autopsies provided following mean values: |
| | | | | perirenal fat 0.0220 ppm of whole tissue |
| | | | | mesenteric fat 0.0320 " " " |
| | | | | panniculus fat 0.0270 " " " |
| | | | | bone marrow 0.0040 " " " |
| | | | | TBLN* 0.0001 " " " |
| | | | | adrenal 0.0012 " " " |
| | | | | kidney 0.0009 " " " |
| | | | | liver 0.0019 " " " |
| | | | | brain 0.0002 " " " |
| | | | | gonad 0.0001 " " " |
| | | | | lung 0.0003 " " " |
| | | | | spleen trace " " " |
| | | | | * tracheobronchial lymph nodes |

TABLE IV (CONT.) - CONCENTRATION AND EFFECTS OF ORGANIC POLLUTANTS IN HUMAN AND ANIMAL TISSUE

| Ref | Agent | Species | Dose or Exposure | Effect |
|---|---|---|---|---|
| | | | ALKANES AND ALKENES | |
| | HEPTACHLOR-<br>EPOXIDE<br>(continued) | man | normal exposure to pesticides | storage |
| | | | US 1964 | 0.10 ppm in body fat |
| | | | 1964 | 0.24 " " " " |
| | | | England 1963-64 | < 0.1 " " " " |
| | | | 1964 | < 0.01" " " " |
| 84 | | | normal exposure to pesticides | storage |
| | | | general population, male<br>US 1965 | 0.0008 ppm in whole blood |
| | | | general population, male<br>US 1965 | 0.0011 " " plasma |
| | | | general population, female<br>US 1965 | 0.0008 " " serum |
| 334 | | bald eagle | normal exposure | (median value)<br>1965 1964<br>carcass 0.06 ppm 0.09 ppm<br>liver threshold 0.15 ppm<br>brain " 0.10 ppm |
| | | golden eagle | | carcass (median value)<br>1964-65 threshold<br>liver " "<br>brain " " |
| 71 | HEPTACHLOR<br>and/or<br>HEPTACHLOR<br>EPOXIDE | fish from 50<br>nationwide<br>sampling<br>stations | normal exposure to pesticides | storage - found in 32% of (590)<br>samples |

TABLE IV (CONT.) - CONCENTRATION AND EFFECTS OF ORGANIC POLLUTANTS IN HUMAN AND ANIMAL TISSUE

| Ref | Agent | Species | Dose or Exposure | Effect |
|---|---|---|---|---|
| | | | ALKANES AND ALKENES | |
| 125 | LINDANE | fish | sublethal concentration followed by recovery period (up to 41 days) | storage<br>visceral fat - concentration greatly exceeded those of any other tissue<br>liver ) gall bladder ) pyloric caeca ) intestine ) high concentration<br>muscle - low concentration |
| 71 | | fish (50 nation-wide sampling stations | normal exposure | storage in 16% of 590 samples ($\leq$ 0.1 ppm) |
| 50 | DDD | human | normal exposure to pesticides (28 weeks gestation to 88 yrs.) | 44 autopsies (whole tissue basis)<br>perirenal fat 0.0110 ppm<br>mesenteric fat 0.0470 "<br>panniculus fat 0.0180 "<br>bone marrow 0.0760 "<br>tracheobronchial lymph nodes 0.0100 "<br>adrenal 0.0570 "<br>kidney 0.0022 "<br>liver 0.326 "<br>brain 0.0020 "<br>gonad 0.0015 "<br>lung 0.0009 "<br>spleen 0.0031 " |

TABLE IV (CONT.) - CONCENTRATION AND EFFECTS OF ORGANIC POLLUTANTS IN HUMAN AND ANIMAL TISSUE

| Ref | Agent | Species | Dose or Exposure | Effect | | |
|---|---|---|---|---|---|---|
| | | | AROMATIC DERIVATIVES | | | |
| | Halogenated | | | | | |
| 50 | DDE | human | normal exposure to pesticides (28 weeks gestation to 88 yrs.) | 44 autopsies (whole tissue basis) | | |
| | | | | perirenal fat | 4.64 ppm | |
| | | | | mesenteric fat | 4.40 " | |
| | | | | panniculus fat | 4.48 " | |
| | | | | bone marrow | 2.08 " | |
| | | | | tracheobronchial lymph nodes | 1.38 " | |
| | | | | adrenal | 0.875 " | |
| | | | | kidney | 0.209 " | |
| | | | | liver | 0.200 " | |
| | | | | brain | 0.0831" | |
| | | | | gonad | 0.0688" | |
| | | | | lung | 0.0585" | |
| | | | | spleen | 0.0305" | |
| 83 | | | normal exposure to pesticides; ordinary dietary habits | fat | 6.1 ppm (average) | no adverse effects |
| | | | appreciable environmental exposure to pesticides from drift from fields and orchards | fat | 8.6 " " | " |
| | | | moderate occupational exposure | fat | 19.0 ppm " | " |
| | | | extensive occupational exposure | fat | 434 ppm " | " |
| 334 | | bald eagles | normal exposure to pesticides | | 1965 | 1964 |
| | | | | carcass | 8.90 ppm | 7.80 ppm |
| | | | | liver | 4.91 " | 5.15 " |
| | | | | brain | 1.37 " | 1.00 " |
| | | golden eagles | " " " | carcass | 0.49 " | (1964-65) |
| | | | | liver | 0.33 " | " |
| | | | | brain | 0.10 " | " |

TABLE IV (CONT.) - CONCENTRATION AND EFFECTS OF ORGANIC POLLUTANTS IN HUMAN AND ANIMAL TISSUE

| Ref | Agent | Species | Dose or Exposure | Effect |
|---|---|---|---|---|
| | | | AROMATIC DERIVATIVES | |
| 83 | DDT | human | 3.5 mg/man/day for 21 mos. | storage of increasing amounts of DDE, excretion of increasing amounts of DDA; steady state achieved and maintained until dosage stopped, excretion dropped off |
| | | | 35 mg/man/day for 21 mos. | same as for 3.5; excretion decreased very slowly after dosage stopped and higher than controls after 27 mos. |
| 84 | | | 0.041 mg/day meat abstainers 1958 | 2.3 ppm |
| | | | 0.164 mg/day - general population 1954 | 4.9 ppm |
| | | | 0.202 mg/day - prison volunteers 1956 | 7.4 ppm |
| 315 | | | normal exposure pregnant women | fat 12.6 ppm, blood 0.0183 ppm |
| | | | nonpregnant woman | fat 13.7 ppm |
| | | | fetus | blood 0.0081 ppm |
| 63 | | | normal exposure<br>US 1961-62 | 6.7 ppm |
| | | | France 1962-63 | 8.8 ppm |
| | | | India 1964 (Delhi area, civilians) | 27.2ppm |
| | | | India (other cities - military) | 11.8ppm |
| 50 | | | normal exposure to pesticides (28 weeks gestation to 88 yrs.) | 44 autopsies (whole tissue basis)<br>perirenal fat 1.33 ppm<br>mesenteric fat 1.35 "<br>panniculus fat 1.16 "<br>bone marrow 0.411 "<br>tracheobronchial lymph nodes 0.892 "<br>adrenal 0.125 " |

TABLE IV (CONT.) - CONCENTRATION AND EFFECTS OF ORGANIC POLLUTANTS IN HUMAN AND ANIMAL TISSUE

| Ref | Agent | Species | Dose or Exposure | Effect |
|---|---|---|---|---|
| | | | AROMATIC DERIVATIVES | |
| | DDT (continued) | human | normal exposure to pesticides (28 weeks gestation to 88 yrs.) | kidney 0.0827 ppm<br>liver 0.0467 "<br>brain 0.0105 "<br>gonad 0.0150 "<br>lung 0.0147<br>spleen 0.0112 |
| 73 | | | normal exposure to pesticides during life | 0-5 years (white)<br>0.49-25.7 ppm in body fay |
| | | | | 6+ years (white)<br>1.9-21.1 ppm in body fat |
| | | | | 0-5 years (nonwhite)<br>0.81-25.4 ppm in body fat |
| | | | | 6+ years (nonwhite)<br>7.9-32.8 ppm in body fat |
| 437 | | | USA (1955) | 19.9 ppm in body fat |
| | | | (1954-56) | 11.7 " " " " |
| | | | (1961-62) | 12.6 " " " " |
| | | | (1963) | 6.7 " " " " |
| | | | (1963) | 11.1 " " " " |
| | | | meat abstainers 1955-56 | 5.9 " " " " |
| | | | Eskimos 1960 | 3.0 " " " " |
| | | | 1964 | 10.3 " " " " |
| | | | Canada 1959-60 | 4.9 " " " " |
| | | | Germany 1958-59 | 2.3 " " " " |
| | | | France 1961 | 5.2 " " " " |
| | | | Hungary 1960 | 12.4 " " " " |
| | | | England 1961-62 | 2.2 " " " " |
| | | | 1964 | 4.0 " " " " |
| | | | India (I) 1964 | 26.0 " " " " |
| | | | (II) 1964 | 31.0 " " " " |
| | | | (III) 1964 | 12.8 " " " " |
| | | | USA 1964-65 | 3.1-8.6 " " " |

TABLE IV (CONT.) - CONCENTRATION AND EFFECTS OF ORGANIC POLLUTANTS IN HUMAN AND ANIMAL TISSUE

| Ref | Agent | Species | Dose or Exposure | Effect |
|---|---|---|---|---|
| | | | AROMATIC DERIVATIVES | |
| | DDT (continued) | Human | Czechoslovakia 1963-64 | 9.2 ppm in body fat |
| | | | Israel 1963-64 | 19.2 |
| | | | Group I (0-9 yrs.) 1965-66 | 10.2 |
| | | | Group II (10-89yrs.) " | 18.1 |
| 437 | | | normal exposure to pesticides in Israel (range 0-89 yrs. of age) | storage: 0-9 years (in body fat) |
| | | | | stillborns 1.0-49.1 ppm |
| | | | | neonates I (1-7 days) 0.8-32.8 " |
| | | | | " II 8-30 days) 1.0-14.0 " |
| | | | | infants (30 days to 2 years) 1.0-60.0 " |
| | | | | children (3-9 yrs.) 4.8-13.3 " |
| | | | | total 0.8-60.0 " |
| | | | | storage: 10-89 yrs. (in body fat) |
| | | | | 10-19 years 5.9-18.3 ppm |
| | | | | 20-29 " 6.5-33.0 " |
| | | | | 30-39 " 6.4-23.3 " |
| | | | | 40-49 " 3.7-35.5 " |
| | | | | 60-69 " 2.0-52.3 " |
| | | | | 70-79 " 1.9-31.9 " |
| | | | | 80-89 " 9.2-41.5 " |
| | | | | total 1.9-82.6 " |
| 84 | | | normal exposure to pesticides | storage (whole tissue basis) adrenal glands 0.7 ppm |
| | | | | storage (in extractable lipid) 3.4 ppm |
| | | | | " periadrenal fat 7.5 ppm in extractable lipid |
| | | | | storage found in brain, kidney, liver, gonads |
| 160 | | | normal exposure through life | no correlation between concentration in fat and pathological abnormalities |

TABLE IV (CONT.) - CONCENTRATION AND EFFECTS OF ORGANIC POLLUTANTS IN HUMAN AND ANIMAL TISSUE

| Ref | Agent | Species | Dose or Exposure | Effect |
|---|---|---|---|---|
| | | | **AROMATIC DERIVATIVES** | |
| 151 | DDT (continued) | human | exposure status general population in USA | |
| | | | < 1942 | 0 ppm in body fat |
| | | | 1950 | 5.3 " " " |
| | | | 1955 | 19.9" " " |
| | | | 1954-56 | 11.7" " " |
| | | | 1961-62 | 12.9" " " |
| | | | meat abstainers 1955-56 | 5.9 " " " |
| | | | Eskimos (Alaska) 1960 | 3.9 " " " |
| | | | residents near orchards 1954-56 | 15.6" " " |
| | | | agricultural applicators 1954-56 | 35.1" " " |
| | | | formulator 1951 | 263 " " " |
| | | | formulator 1954 | 1.131 " " |
| | | | Canada - general population | 4.9 ppm " " |
| | | | Germany - general population | 2.3 " " " |
| | | | England - general population | 2.2 " " " |
| | | | France - general population | 5.2 " " " |
| 337 | | | variable exposure | storage directly related to daily intake; correlation between concentration of DDT in blood and other tissues |
| | | | | in 44 autopsies subjects with highest total residues in tissues showed emaciation, variety of cancers, extensive focal or generalized pathological conditions of the liver |

TABLE IV (CONT.) - CONCENTRATION AND EFFECTS OF ORGANIC POLLUTANTS IN HUMAN AND ANIMAL TISSUE

| Ref | Agent | Species | Dose or Exposure | Effect |
|---|---|---|---|---|
| | | | AROMATIC DERIVATIVES | |
| | DDT (continued) | human | | comparison of healthy controls and those dying of diseases of liver, CNS, and miscellaneous pathologies showed:<br>1. strong association of DDT residues with some CNS pathologies, carcinoma, portal cirrhosis and hypertension<br>2. equally strong association of these residues in sick with histories of domestic used of pesticides |
| 84 | | | normal exposure - general population, male, US 1965 | 0.0193 ppm in whole blood<br>0.0415 ppm in plasma |
| | | | general population, female, US, 1965 | 0.0260 ppm in serum |
| | | | general population, England, 1964 | 0.013 ppm in whole blood |
| 337 | | | 0.0021-0.0034 mg/kg/day for 12 or 18 months | storage proportional to dosage |
| | | | 0.038-0.063 mg/kg/day " | storage proportional to dosage |
| | | | 0.36-0.61 mg/kg/day " | " " " |
| | | | same as above for 21.5 months | no effects<br>storage proportional to dosage |
| 405 | | | lived in vicinity of aldrin and dieldrin manufacturing plant | white matter of brain 0.023 ppm<br>grey matter of brain 0.020 ppm<br>liver 0.11 ppm |

TABLE IV (CONT.) - CONCENTRATION AND EFFECTS OF ORGANIC POLLUTANTS IN HUMAN AND ANIMAL TISSUE

| Ref | Agent | Species | Dose or Exposure | Effect |
|---|---|---|---|---|
| | | | AROMATIC DERIVATIVES | |
| 72 | DDT (continued) | men and pregnant and lactating woman (control: nonpregnant women) | normal exposure to pesticides in metropolitan area | concentration in plasma of pregnant and lactating women within same range as for nonpregnant<br>small, significant decrease in concentrations of all DDT derived compounds, dieldrin, and total BHC at or soon after delivery; returned to levels of early pregnancy |
| 83 | | | normal exposure to pesticides, ordinary dietary habits | body fat 4.9 ppm (no adverse effects) |
| | | | appreciable environmental exposure to pesticides from drift from fields, orchards | body fat 6.0 ppm (difference small but significant) (no adverse effects) |
| | | | moderate occupational exposure | fat 14.0 ppm |
| | | | extensive occupational exposure | body fat 648 ppm |
| 189 | | fish | | range: 0.021-16.20 ppm of whole fish<br>average: 0.845 ppm |
| 71 | | | normal exposure | in all but 6 of 590 samples (≤ 45 ppm) |
| 337 | | birds | found | influences physiology of egg; produces thinning of shell |
| 63 | | ringneck pheasants | exposure in highly treated areas | average: 58 ppm<br>upper limit: 2770 ppm |
| | | penguins | exposure in untreated areas | ≤ 0.18 ppm |
| | | fish | | ≤ 0.44 ppm |
| | | seals | | ≤ 0.12 ppm |
| | | snails | 20 ug/l | 0.16 ppm |
| | | bluegill sunfish | " | 1.0 ppm |
| 334 | | bald eagles | normal exposure | (median values) 1965 1964<br>carcass 0.20 ppm 0.42 ppm<br>liver threshold 0.10 " |

TABLE IV (CONT.) - CONCENTRATION AND EFFECTS OF ORGANIC POLLUTANTS IN HUMAN AND ANIMAL TISSUE

| Ref | Agent | Species | Dose or Exposure | Effect | | |
|---|---|---|---|---|---|---|
| | | | AROMATIC DERIVATIVES | | | |
| 334 | DDT (continued) | bald eagles | normal exposure | (median values) | 1965 | 1964 |
| | | | | brain | threshold | threshold |
| | | golden eagles | " " | carcass | 1964-65 | threshold |
| | | | | liver | | " |
| | | | | brain | | " |

## TABLE V - CARCINOGENICITY IN MAMMALS OF ORGANIC POLLUTANTS FOUND IN FRESH WATER EXAMINED BY THE ORAL ROUTE OF ADMINISTRATION

This table presents the available information on the carcinogenicity of chemicals which have been found in water and examined by the oral route of administration. Most of this information was obtained from books which summarized available data on carcinogenicity of chemicals in general. The majority of studies reported results on a few animals only and only a few studies attempted to show a dose response relationship. Dosage forms varied considerably and could not be computed to a common expression. The incidence of appearance of tumors were not always available and results were expressed only as positive. The results appear to be different depending upon the species of animals studied with mice having the highest proportion of positives. In some instances there was a high tumor formation in rats used as controls.

TABLE V - CARCINOGENICITY IN MAMMALS OF ORGANIC POLLUTANTS FOUND IN FRESH WATER EXAMINED BY THE ORAL ROUTE OF ADMINISTRATION

| Ref | Agent | Species | Tumor | Dose |
|---|---|---|---|---|
| | | | ALKANES AND ALKENES | |
| | HALOGENATED | | | |
| 74 | ALDRIN | mouse | 76/215 | 10 ppm in diet for 2 yrs. |
| 384 | | | + | 15 ppm in diet for 330 days. |
| 368 | | rat | 0/120 | 25.0 ppm in diet for 2 yrs. |
| | | dog | 0/8 | 3 ppm in diet 6 d./wk for 15.6 mos. |
| 64 | | rat | 2/61* | 2.5 ppm/2 yr in diet. |
| | | | 3/66* | 12.5 ppm in diet for 2 yrs. |
| | | | 2/59* | 25.0 ppm in diet for 2 yrs. |
| | | | 9/91* | Control |
| 368 | BENZENE HEXACHLORIDE | rat | 0/12 | 100 ppm in diet up to 8 mos. |
| 367 | CHLORDANE | rat | 0/40 | 150 ppm in diet for 104 wks. |
| | | rabbit | 0/9 | 400 mg/kg daily for 31 days. |
| 74 | DIELDRIN | mouse | 77/218 | 100 ppm in diet for 2 yrs. |
| 384 | | | Positive | 15 ppm in diet for 375 days. |
| 64 | | rat | 8/59* | 2.5 ppm in diet for 2 yrs. |
| | | | 10/70* | 12.5 ppm in diet for 2 yrs. |
| | | | 7/62* | 25.0 ppm in diet for 2 yrs. |
| | | | 9/91* | Control |
| 368 | | rat | Negative | 75.0 ppm in diet/6 mos. |

* Considered negative because of control data.

TABLE V (CONT.) - CARCINOGENICITY OF ORGANIC POLLUTANTS FOUND IN WATER

| Ref | Agent | Species | Tumor | Dose |
|---|---|---|---|---|
| | | | ALKANES AND ALKENES | |
| 167 | ENDOSULFAN | mouse | Negative | 2.15 mg/kg/d. from 7-28 days of age (P.O. stomach tube), then 6 ppm/d. in diet (0.5% gelatin) for 18 mos. |
| 337 | HEPTACHLOR | mouse | Postive | In diet/2 yrs. |
| 337 | HEPTACHLOR EPOXIDE | mouse | Positive | In diet/2 yrs. |
| 367 | | rat | 0/66 | 30 ppm in diet/12 wks. |
| 368 | LINDANE | rat | 0/48 | 32 mg/kg in aqueous emuls. (gastric tube) daily for 6 mos. |
| | | | ALCOHOLS | |
| 368 | GLUCOSE | rat | 0/13 | 1 ml soln in water, 20%, in dose of 0.8 ml every other day/1 yr. |
| | | | AMINES | |
| | AROMATIC | | | |
| 367 | ANILINE | rat | 4/12 | 1.10% in synthetic basic diet, 10-65 mg/d./ body weight. |
| | | | 2/10 | 0.1% in diet/312 days. |
| 368 | BENZIDINE | rat | 2/10 | 0.017% in diet for 224 days. |
| | | | 3/10 | 0.017% in diet for 424 days. |
| | | dog | 0/2 | 0.50-0.1 g once a wk for 20-128 days. |

TABLE V (CONT.) - CARCINOGENICITY OF ORGANIC POLLUTANTS FOUND IN WATER

| Ref | Agent | Species | Tumor | Dose |
|---|---|---|---|---|
| | | | AMINES | |
| | BENZIDINE (continued) | rabbit | 0/9 | 0.50-0.1 g once a wk for 20-128 days. |
| 367 | | dog | 1/7 | 200 mg in capsule daily (6/wk) for 15 mos. followed by 300 mg in capsule daily (6/wk) for 45 mos (total 325 gm). |
| 148 | α-NAPHTHYLAMINE | rat | 1/10 | 0.06% in food for 288 days. |
| 368 | β-NAPHTHYLAMINE | dog | 9/9 | 300 mg capsule in diet daily for 24-35 mos. |
| | | | 10/10 | 600 mg capsule daily. Dose varied up to 17 mos. |
| | | | 2/4 | 200 mg in gelatin capsule 6 d./wk (increased after 6 mos to 600 mg: max cumulative dose 310 gm/animals) for 3 yrs. |
| | | | 1/3 | 500 mg daily/18 mos. |
| | | | 2/7 | 500 mg daily/26 mos. |
| | | | 3/3 | 500 mg daily/35 mos. |
| | | | 3/5 | 500 mg daily/34 mos. |
| | | | 1/6 | 500 mg daily/34 mos. |
| | | | 3/3 | 500 mg daily/31 mos. |
| | | | 1/3 | 30 mg daily/ 24 mos. |
| | | | 2/2 | 90 mg daily/29 mos. |
| | | | 1/2 | 60 mg daily/ 29 mos. |
| | | | 2/2 | 120 mg daily/ 22 mos. |
| | | | 2/3 | 500 mg daily/29 mos. |
| | | | 3/3 | 500 mg daily/30 mos. |
| | | | 5/5 | 300 mg daily in food for 372 days. |

TABLE V (CONT.) - CARCINOGENICITY OF ORGANIC POLLUTANTS FOUND IN WATER

| Ref | Agent | Species | Tumor | Dose |
|---|---|---|---|---|
| | | | AMINES | |
| 368 | β-NAPHTHYLAMINE (continued) | rat | 6/11 | 0.067% in diet/925 days. |
| | | rabbit | 2/29 | 0.1% soln. for 2 yrs. Avg. intake 350 mg/day. |
| 68 | | dog | 1/ | 25-50 mg/kg/d./24 mos. |
| | | rhesus monkey | 9/24 | 50-100 mg/kg/d./24 mos. |
| | | mouse | Negative | 200 mg/kg/d./24 mos. |
| | HETEROCYLIC | | | |
| 367 | PYRIDINE | rat | 0/8 | 10% in diet/35 days. |
| | | | ORGANIC ACIDS | |
| | CARBOXYLIC | | | |
| 367 | ACETIC ACID | rabbit | 0/5 | 0.1-0.7 gm/kg weight, dissolved in 50-100 ml drinking water, twice daily for 13 mos. |
| 367 | η-BUTYRIC ACID | rat | +/4 | 25% in synthetic diet for 3-35 wks. |
| 368 | 2,4-D | rat | 0/5 | 1 ml of 2% soln in water in diet/daily/6 mos. |
| 367 | | dog | 0/11 | 2, 5, 10 or 20 mg/kg in capsules, 5 d./wk/ 13 wks. |
| 167 | | mouse | Negative | 100 mg/kg/d. from 7-28 days of age (P.O. stomach tube), then 323 ppm/d. in diet (0.5% gelatin) for 18 mos. |
| 367 | 2,4,5-T | dog | 0/11 | 20 mg/kg in capsules, 5 d./wk/113 wks. |
| 167 | | mouse | Negative | 21.5 mg/kg/d. from 7-28 days of age (P.O. stomach tube), then 60 ppm/d. in diet (0.5% gelatin) for 18 mos. |

TABLE V (CONT.) - CARCINOGENICITY OF ORGANIC POLLUTANTS FOUND IN WATER

| Ref | Agent | Species | Tumor | Dose |
|---|---|---|---|---|
| | | | ORGANIC ACIDS | |
| | SULFONICS | | | |
| 188 | ABS | mouse | Negative | |
| | | rabbit | Negative | |
| 368 | 1,2-BENZANTHRACENE | mouse | Positive | 0.5 mg in 0.1 ml heavy mineral oil 8 times at 3-7 d. intervals. |
| | | | Positive | 0.5 mg in 0.1 ml heavy mineral oil 16 times at 3-7 d. intervals. |
| 368 | 1,12-BENZOPERYLENE | mouse | Negative | |
| | 3,4-BENZPYRENE | mouse | +/55 | 0.3 ml of 0.5% PB in PEG*solvent, once (30 weekly doses .3 ml of 3% croton oil in PEG after treatment). |
| 368 | | | +/30 | 30 wkly adm. of 0.3 ml of 0.5% carcinogen in polyethylene glycol-400. |
| | | | +/20 | 1 dose of 0.3 ml of 0.5% carcinogen in PEG-400. |
| | | | +/24 | 0.3 ml of 0.5% in PEG solvent once (30 wkly doses .3 ml of PEG after treatment). |
| | | | 17/20 | 0.3 ml of 0.5% in PEG solvent. |
| | | | 10/30 | 0.3 ml of 0.5% in PEG/3 times at 24 hr interval/30 wks. |
| | | | +/20 | 12.5 μgm in 0.25 ml PEG once. |
| | | | +/20 | 50 μgm in 0.25 ml PEG once. |
| | | | +/20 | 200 μgm in 0.25 ml PEG once. |
| | | | +/20 | 12.5 μgm in 0.25 ml PEG once. |

* PEG - polyethylene glycol

TABLE V (CONT.) - CARCINOGENICITY OF ORGANIC POLLUTANTS FOUND IN WATER

| Ref | Agent | Species | Tumor | Dose |
|---|---|---|---|---|
| | | | ORGANIC ACIDS | |
| 148 | CHRYSENE | rat | Negative | 0.3% in diet/30 days. |
| 148 | 1,2,5,6-DIBENZANTHRACENE | mouse | 3/10 | 10 mg (total dose) in diet/7 mos. |
| | | | 2/10 | 19 mg (total dose) in diet/5 mos. |
| 148 | PENTACHLOROPHENOL | rat | 0/20 | 3.9 or 5 mg in food daily/26-28 wks. |
| | | cat | 0/4 | 1.25 or 2.8 mg/kg in diet/10 wks. |
| 148 | PENTACHLOROPHENATE, Na | rabbit | 0/5 | 35-600 mg/kg in water for 34 days. |
| | | | AROMATIC DERIVATIVES | |
| | HALOGENATED | | | |
| 368 | DDD | mouse | Negative | 0.1% in diet up to 6 wks. |
| 167 | | | *Potential | 100 mg/kg/d. from 7-28 days of age (P.O. stomach tube), then 300 ppm/d. in diet (0.5% gelatin) for 18 mos. |
| 402 | DDT | mouse | 196/683 | Five generations of mice fed DDT at 2.8-3.0 ppm of the diet for 6 mos. |
| 167 | | | Positive | 46.4 mg/kg/d. from 7-28 days of age (P.O. stomach tube), then 140 ppm/d. in diet (0.5% gelatin) for 18 mos. |
| 100 | | rat | Positive | 200-800 ppm in diet for near-life span. |
| | | fish, trout | Positive | 75 ppm. |
| 107 | | rat | 15/75 | 100, 200, 400 and 800 ppm in diet for 18 mos. |

* Requires additional evaluation.

TABLE V (CONT.) - CARCINOGENICITY OF ORGANIC POLLUTANTS FOUND IN WATER

| Ref | Agent | Species | Tumor | Dose |
|---|---|---|---|---|
| | | | MERCAPTANS AND OTHER SULFUR ORGANICS | |
| 167 | TEDION (TETRAFIDON) | mouse | Negative | 100 mg/kg/d. from 7-28 days of age (P.O. stomach tube), then 260 ppm/d. in diet (0.5% gelatin) for 18 mos. |

## TABLE Va - CARCINOGENICITY IN MAMMALS OF POTENTIAL ORGANIC POLLUTANTS FOUND IN FRESH WATER IN HUMANS, ANIMALS, AND PLANTS

This table presents available information on the carcinogenicity of chemicals found in water which were not examined by the oral route of administration.

TABLE Va - CARCINOGENICITY IN MAMMALS OF ORGANIC POLLUTANTS FOUND IN FRESH WATER EXAMINED BY ROUTES OF ADMINISTRATION OTHER THAN ORAL

| Ref | Agent | Species | Tumor | Dose |
|---|---|---|---|---|
| | | | AMINES | |
| | ALIPHATIC | | | |
| 367 | ETHYLAMINE | rabbit | 0/6 | 50 and 100 ppm 7 hrs./day, 5 day/week, for 6 weeks. (Inhalation) |
| | | | ORGANIC ACIDS | |
| 148 | FLUORANTHENE | mouse | 0/10 | 0.3% in benzene twice weekly. (Skin) |
| 368 | PYRENE | mouse | +/150 | 3 drops 3% in acetone once weekly (followed by 1 drop 5% croton oil in mineral oil once weekly). (Skin) |
| | | | 6/20 | 10 thrice weekly applications of 8.3% solution in acetone (total dose - 0.25 g). (Skin) |
| | | | PHENOLS and QUINONES | |
| 148 | ρ-CRESOL | mouse | Negative | 3% in alcohol 3 times weekly. (Skin) |
| | | rat | Negative | 3% in alcohol 3 times weekly. (Skin) |

TABLE VI - CARCINOGENICITY IN MAMMALS OF POTENTIAL ORGANIC POLLUTANTS OF FRESH WATER EXAMINED BY THE ORAL ROUTE OF ADMINISTRATION

This table presents available information on carcinogenicity of chemicals which are considered to be potential pollutants of fresh water and any statements that could be made about this table are the same as those presented for Table V.

TABLE VI - CARCINOGENICITY IN MAMMALS OF POTENTIAL ORGANIC POLLUTANTS OF FRESH WATER EXAMINED BY THE ORAL ROUTE OF ADMINISTRATION

| Ref | Agent | Species | Tumor | Dose |
|---|---|---|---|---|
| | | | **ALKANES AND ALKENES** | |
| | **HALOGENATED** | | | |
| 368* | CARBON TETRA-CHLORIDE | dog | 0/8 | 0.125-0.5 ml/kg 3 x wk in a 1:1 soln and corn oil. |
| | | mouse | +/37 | 0.2 ml of 2% olive oil soln. 2 x wk interval, 3% soln. given wkly for 17 wks. |
| | | | Positive | 0.1 ml of 40% soln. in olive oil, 3 x wk for 45-66 doses/13 1/2 wks. |
| 148 | CHLOROFORM | mouse | 7/20 | 8 x $10^{-4}$ and 4 x $10^{-4}$ ml dose in olive oil every 4 days, 30 times. |
| 165 | | | 0/40 | 2% in diet/13 mos. |
| 167 | MIREX | mouse | Positive | 10 mg/kg/d. for 7-28 days of age (P.O. stomach tube), then 26 ppm/d. (0.5% gelatin) in diet for 18 mos. |
| 167 | STROBANE | mouse | Positive | 4.64 mg/kg/d. for 7-28 days of age (P.O. stomach tube), then 11 ppm/d. for 18 mos (in diet 0.5% gelatin). |
| 367 | TETRACHLORO-ETHYLENE | rat | 0/18 | 0.33 mg/kg, 8 doses at 4 d. interval. |
| 148 | TETRACHLORO-ETHANE | dog | 0/1 | 1 ml 150 times. |

* Additional data in 148 and 367.

TABLE VI (CONT.) - CARCINOGENICITY OF POTENTIAL ORGANIC POLLUTANTS

| Ref | Agent | Species | Tumor | Dose |
|---|---|---|---|---|
| | | | ALCOHOLS | |
| 148 | AMYL ALCOHOL | rat | Negative | In food. |
| 368 | t-BUTYL ALCOHOL | rat | 0/4 | 10% in basal diet for 30 d., 20% for 30 more days. |
| 368 | DIETHYLENE GLYCOL | rat | 0/24 | 1% and 2% in drinking water/13 1/2 wks. |
| 368 | ETHYL ALCOHOL | rat | 0/10 | 40 ml at 40° added to 100 gm of diet at 15° as drinking water/152 days. |
| | | rat | 0/60 | 15% in drinking water/226 days. |
| 148 | ETHYLENE GLYCOL | rat | 0/30 | 50% in water, 2 ml/kg body wt. every other day for 8-79 days. |
| 148 | ETHYLENE GLYCOL MONO-η-BUTYL ETHER | rat | 0/40 | 0.03%, 0.125%, 0.5% or 2.0% incorporated in diet (total of 0.018 g/kg/d.) for 90 days. |
| 148 | ETHYLENE GLYCOL MONOETHYL ETHER | rat | 0/20 | 1.45% in food/2 yrs. |
| 368 | PROPYL ALCOHOL | rat | 0/4 | 10% in diet for 30 d.; 20% in diet for 30 more days. |
| | | | AMINES | |
| 367 | HEXAMETHYLENE-DIAMINE | guinea pig | 0/6 | 0.02 g daily/98 days. |
| | QUATERNARY | | | |
| 367 | ALKYL DIMETHYL BENZYL AMMONIUM CHLORIDE | rat | 0/168 | 0.015-0.5% in diet/2 yrs. |

TABLE VI (CONT.) - CARCINOGENICITY OF POTENTIAL ORGANIC POLLUTANTS

| Ref | Agent | Species | Tumor | Dose |
|---|---|---|---|---|
| | | | AMINES | |
| 367 | CETYL DIMETHYL ETHYL AMMONIUM BROMIDE | mouse | 0/10 | 0.060 gm/kg daily, 6 d./wk/30 days. |
| | HETEROCYCLICS | | | |
| 167 | AMITROLE | mouse | Positive | 1000 mg/kg/d. for 28 d. (P.O. stomach tube) then 2192 ppm (0.5% gelatin) in diet for 18 mos. |
| 167 | ATRAZINE | mouse | Negative | 21.5 mg/kg/d. for 7-28 days of age (P.O. stomach tube) then 82 ppm/d. in diet (0.5% gelatin) for 18 mos. |
| 167 | SIMAZINE | mouse | Negative | 215 mg/kg/d. for 7-28 days of age (P.O. stomach tube), then 603 ppm/d. in diet (0.5% gelatin) for 18 mos total. |
| | | | ORGANIC ACIDS | |
| | CARBOXYLIC | | | |
| 148 | CAPROIC ACID | rat | 0/2 | 10% in food/110 days. |
| 367 | LACTIC ACID | rabbit | 0/5 | 0.1-0.7 gm/kg dissolved in 50-100 ml water, twice daily for 16 mos (13 mos actual treatment). |
| 368 | TANNIC ACID | rabbit | 0/4 | 1 g/kg body weight daily/40 days. |

TABLE VI (CONT.) - CARCINOGENICITY OF POTENTIAL ORGANIC POLLUTANTS

| Ref | Agent | Species | Tumor | Dose |
|---|---|---|---|---|
| | | | ORGANIC ACIDS | |
| | SULFONICS | | | |
| 367 | DECYLBENZENE SULFONATE, Na | mouse | 0/10 | 0-210 gm/kg daily, 6d./wk/30 days. |
| 368 | DODECYLBENZENE SULFONATE, Na | rat | 0/20 | 2000 ppm in diet/104 wks. |
| 367 | ISOPROPYLNAPHTHALENE SULFONATE, Na | mouse | 0/10 | 0.19 gm/kg daily, 6 d./wk/30 days. |
| | | | ESTERS | |
| 167 | ARAMITE | mouse | Positive | 464 mg/kg/d. for 7-28 d. of age (P.O. stomach tube), then 1112 ppm/d. (0.5% gelatin) in diet for 18 mos. |
| 100 | | rat | Positive | 200-400 ppm. |
| | | dog | Positive | 500-1400 ppm. |
| 390 | | dog | Positive | 500-1429 ppm/d./3 1/2 yrs in diet. |
| 301 | | rat | +/1500 | 200-400 ppm in diet for 2 yrs. |
| | | mouse | +/1000 | 200-400 ppm in diet for 2 yrs. |
| | | dog | +/36 | 500-1400 ppm in diet for 3.5 yrs. |
| 318 | | rat | +/300 | 200-400 ppm in diet for 2 yrs. |
| 367 | DIBUTYLPHTHALATE | rat | 0/40 | 0.01-1.25% in diet/1 yr. |
| 148 | ETHYL ACETATE | rat | Negative | In diet/≥300 days. |

TABLE VI (CONT.) - CARCINOGENICITY OF POTENTIAL ORGANIC POLLUTANTS

| Ref | Agent | Species | Tumor | Dose |
|---|---|---|---|---|
| | | | ESTERS | |
| 167 | OVEX | mouse | Negative | 464 mg/kg/d. for 7-28 days of age (P.O. stomach tube), then 1019 ppm/d. in diet (0.5% gelatin) for 18 mos. |
| 167 | η-PROPYL ISOME | mouse | Negative | 2000 μg/kg/d. from 7-28 days of age (P.O. stomach tube), then 6000 ppm/d. in diet (0.5% gelatin) for 18 mos. |
| 337 | PYRETHRINS | rat | *Potential | |
| | | | AMINE DERIVATIVES | |
| | AMIDES | | | |
| 148 | CAPROLACTAM | rat | 0/6 | Avg. of 0.667 g/kg/d. in drinking water/70 days. |
| 167 | CAPTAN | mouse | Negative | 215 mg/kg/d. for 7-28 days of age (P.O. stomach tube), then 560 ppm/d. in diet (0.5% gelatin) for 18 mos. |
| 367 | SULFAGUANIDINE | rat | 0/24 | 1% in diet/70 d., 12 with Vitamin E rich diet. |
| 368 | SULFANILAMIDE | rat | 0/12 | Rat cube diet containing sulphanilamide at levels of 0.04%/450 days. |
| | CARBAMATES | | | |
| 167 | CARBARYL | mouse | Negative | 4.64 mg/kg/d. for 7-28 days of age (P.O. stomach tube), then 14 ppm/d. in diet (0.5% gelatin) for 18 mos. |
| 49 | | rat | Negative | 0.04, .02, .01, and .005% in diet for 2 yrs. |

* Requires additional evaluation

TABLE VI (CONT.) - CARCINOGENICITY OF POTENTIAL ORGANIC POLLUTANTS

| Ref | Agent | Species | Tumor | Dose |
|---|---|---|---|---|
| | | | AMINE DERIVATIVES | |
| 49 | CARBARYL (continued) | dog | Negative | 414, 95, and 24 ppm in diet for 1 yr. |
| 222 | CHLOROPROPHAM | rat | Negative | 2.0% in diet for 2 yrs. |
| | | dog | Negative | 2.0% in diet for 1 yr. |
| 167 | IPC | mouse | Negative | 215 mg/kg/d. for 7-28 days of age (P.O. stomach tube), then 560 ppm in diet (0.5% gelatin) for 18 mos. |
| 164 | | rat | Negative | 2% in diet for 18 mos. |
| | | mouse | Negative | 2% in diet for 18 mos. |
| 167 | ISOLAN | mouse | Negative | 0.0215 mg/kg/d. from 7-28 days of age (P.O. stomach tube), then 0.0603 ppm/d. in distilled water for 18 mos. |
| 167 | ZECTRAN | mouse | *Potential | 4.64 mg/kg/d. from 7-28 days of age (P.O. stomach tube), then 11 ppm/d. in diet (0.5% gelatin) for 18 mos. |
| | THIOCARBAMATES | | | |
| 167 | FERBAM | mouse | Negative | 10 mg/kg/d. from 7-28 days of age (P.O. stomach tube), then 32 ppm/d. in diet (0.5% gelatin) for 18 mos. |
| 159 | | rat | Negative | .0025, .025, and .25% in diet/2 yrs. |
| 167 | NABAM | mouse | Negative | 21.5 mg/kg/d. from 7-28 days of age (P.O. stomach tube), then 73 ppm in distilled water for 18 mos. |

* Require additional evaluation.

TABLE VI (CONT.) - CARCINOGENICITY OF POTENTIAL ORGANIC POLLUTANTS

| Ref | Agent | Species | Tumor | Dose |
|---|---|---|---|---|
| | | | AMINE DERIVATIVES | |
| 167 | THIRAM | mouse | Negative | 10 mg/kg/d. from 7-28 days of age (P.O. stomach tube), then 26 ppm/d. in diet (0.5% gelatin) for 18 mos. |
| 100 | | rat | Positive | |
| 167 | ZIRAM | mouse | Negative | 4.6 mg/kg/d. from 7-28 days of age (P.O. stomach tube), then 15 ppm/d. in diet (0.5% gelatin) for 18 mos. |
| 159 | | rat | Negative | 0.0025, .025, and .25% in diet/2 yrs. |
| 167 | ZINEB | mouse | *Potential | 464 mg/kg/d. from 7-28 days of age (P.O. stomach tube), then 1298 ppm/d. in diet (0.5% gelatin) for 18 mos. |
| | UREAS | | | |
| 167 | DIURON | mouse | Negative | 464 mg/kg/d. from 7-28 days of age (P.O. stomach tube), then 1000 ppm/d. in diet (0.5% gelatin) for 18 mos. |
| 167 | MONURON | mouse | *Potential | 215 mg/kg/d. from 7-28 days of age (P.O. stomach tube), then 517 ppm/d. in diet (0.5% gelatin) for 18 mos. |
| | | | PHOSPHATE ESTERS | |
| 367 | MALATHION | rat | Negative | 5000 ppm in diet as 65, 90, or 99% technical product for 2 yrs. |

*Requires additional evaluation.

TABLE VI (CONT.) - CARCINOGENICITY OF POTENTIAL ORGANIC POLLUTANTS

| Ref | Agent | Species | Tumor | Dose |
|---|---|---|---|---|
| | | | ALDEHYDES AND KETONES | |
| 148 | ACETALDEHYDE | rat | Negative | In diet/300 days. |
| 148 | METHYL ETHYL KETONE | rat | Negative | In food/300 days. |
| | | | ETHERS | |
| 148 | DIOXANE | rat | 0/2 | 1% in water/110 days; 3% in water/48 days. |
| 167 | PIPERONYL BUTOXIDE | mouse | *0 | 100 mg/kg/d. from 7-28 days of age (P.O. stomach tube), then 300 ppm/d. in diet (0.5% gelatin) for 18 mos. |
| 147 | ROTENONE | rat | Negative | 5-15 mg/kg body weight daily/37 days. |
| 167 | | mouse | Negative | 1 mg/kg/d. from 7-28 days of age (P.O. stomach tube), then 3 ppm/d. in diet (0.5% gelatin) for 18 mos. |
| | | | UNSUBSTITUTED AROMATICS | |
| 368 | NAPHTHALENE | rat | Negative | In oil (in synthetic diet) 6 times a week, 10-20 mg until dose of 10 g/rat in food. |
| | | | PHENOLS AND QUINONES | |
| 367 | 2,4-DINOTROPHENOL | rat | Negative | 0.01-0.10 in diet/179 days. |
| 367 | β-NAPHTHOL | rat | 0/5 | 2% in diet/2 mos. |

* Requires additional evaluation.

TABLE VI (CONT.) - CARCINOGENICITY OF POTENTIAL ORGANIC POLLUTANTS

| Ref | Agent | Species | Tumor | Dose |
|---|---|---|---|---|
| | | | AROMATIC DERIVATIVES | |
| | HALOGENATED | | | |
| 368 | ρ-DICHLOROBENZENE | rabbit | 0/7 | 500 mg/kg fed 5 d./wk for a total of 263 doses. |
| 100 | METHOXYCHLOR | rat | Positive | 2000 ppm for 18 mos. |
| 158 | | rat | +/13 | 0.0025% in diet/18 mos. |
| | | | +/10 | .02% in diet/18 mos. |
| | | | +/16 | .16% in diet/18 mos. |
| 167 | PERTHANE | mouse | *Potential | 215 mg/kg/d. from 7-28 days of age (P.O. stomach tube), then 815 ppm/d. in diet (0.5% gelatin) for 18 mos. |
| | ARYLALKANES | | | |
| 368 | TOLUENE | rat | Negative | 118, 354, or 590 mg/kg/d. in 2-3 ml olive oil soln. emulsified and 5-10% aqueous soln. of acacia for 138 feedings. |

* Requires additional evaluation.

TABLE VIa - CARCINOGENICITY IN MAMMALS OF POTENTIAL ORGANIC POLLUTANTS OF FRESH WATER EXAMINED ONLY BY ROUTES OF ADMINISTRATION OTHER THAN ORAL

This table presents available information on carcinogenicity of chemicals which are potential pollutants of fresh water and which were not examined by the oral route of administration.

TABLE VIa - CARCINOGENICITY IN MAMMALS OF POTENTIAL ORGANIC POLLUTANTS OF FRESH WATER EXAMINED ONLY BY ROUTES OF ADMINISTRATION OTHER THAN ORAL

| Ref | Agent | Species | Tumor | Dose |
|---|---|---|---|---|
| | | | **ALKANES AND ALKENES** | |
| | **HALOGENATED** | | | |
| 148 | DICHLOROMETHANE | animal[1] | Negative | 34 mg (10,000 ppm) 5 x wk., 4 hr. exposure. (Inhalation) |
| 148 | ETHYLENE DIBROMIDE | rat | Negative | 50 ppm air, up to 63 seven hr. exposures daily. (Inhalation) |
| 368 | TRICHLORETHYLENE | cat | Negative | 20 ppm, 75 min. daily. (Inhalation) |
| | | | **ALCOHOLS** | |
| 367 | 2-ETHYL HEXANEDIOL-1,3 | animal[1] | Negative | Undiluted daily/90 d. (Skin) |
| 367 | STREPTOMYCIN | guinea pig | Negative | 13.7-55.8 gm/kg body weight (total dose). (I.M.)* |
| | | | **AMINES** | |
| | **ALIPHATIC** | | | |
| 367 | DIETHYLAMINE | rabbit | Negative | 50 and 100 ppm 7 hrs/d./wk./16 weeks. (Inhalation) |
| 367 | PHENYLHYDRAZINE | rabbit | 0/2 | 40 mg (S.C.).* |
| | **HETEROCYCLICS** | | | |
| 148 | ACRIDINE | mouse | 0/100 | 1% in "90% benzol"/9 mos. (Skin) |
| 368 | NICOTINE | rat | 0/16 | 2.5 mg (as the bitartrate) for 10 doses, 4 mg every work day for 4 mos., then 2 mg every work day until 6-1/2 mos. (S.C.) |

*I.M. - intramuscular
S.C. - subcutaneous

TABLE VIa (CONT.) - CARCINOGENICITY OF POTENTIAL ORGANIC POLLUTANTS

| Ref | Agent | Species | Tumor | Dose |
|---|---|---|---|---|
| | | | ORGANIC ACIDS | |
| | CARBOXYLIC | | | |
| 148 | BENZOIC ACID | rabbit | Negative | Daily/40 days. (S.C. or I.V.)* |
| 148 | PHTHALIC ACID | rabbit | Negative | Daily/40 days. (S.C. or I.V.) |
| 148 | TRICHLOROACETIC ACID | mouse | Negative | In acetone, weekly, 3 applications. (Skin) |
| | | | ALKEHYDES AND KETONES | |
| 368 | ACETONE | mouse | Negative | 0.2 ml of 100% 3 x week/1 year. (Skin) |
| 148 | ACETOPHENONE | rabbit | Negative | Daily/40 days. (S.C. or I.V.) |
| 368 | ACROLEIN | mouse | 2/15 | 10 weekly applications of 0.5% solution in acetone (total dose - 12.6 mg) (weekly application of croton oil in acetone begun 25 day post-treatment 2 of 0.08% solution and 16 of 0.17% solution, alternating with test substance at 3-4 day intervals). (Skin) |
| 367 | CYCLOHEXANONE | guinea pig | Negative | 10 mg/20 days, 50 mg/40 days, and 100 mg/20-40 days. (S.C.) |
| 368 | FORMALDEHYDE | rat | 4/10 | 1 cc of a 0.4% aqueous solution, weekly/15 mos. (S.C.) |
| | | | UNSUBSTITUTED AROMATICS | |
| 368 | BENZENE | mouse | +/21 | Twice weekly. (Skin) |
| | | | +/36 | 25 μl 2 x wk/24 weeks. (Skin) |
| | | | +/40 | Painted 2 x week/40 weeks. (Skin) |
| | | | Negative | Once a week/4 mos., thrice weekly thereafter for 108 applications in 12 mos. (total dose - 8.9 gm). (Skin) |

* I.V. intravenous

TABLE VIa (CONT.) - CARCINOGENICITY OF POTENTIAL ORGANIC POLLUTANTS

| Ref | Agent | Species | Tumor | Dose |
|---|---|---|---|---|
| | | | UNSUBSTITUTED AROMATICS | |
| 368 | PHENANTHRENE | mouse | +/100 | 3 drops 3% in acetone once weekly followed by 1 drop 5% croton oil in mineral oil once wkly. |
| | | | 5/20 | 10 thrice weekly applications of 18.0% solution in acetone (total dose - 0.54 g). (Skin) |
| | | | PHENOLS AND QUINONES | |
| 148 | CATECHOL | rabbit | Negative | Daily for 40 days. (S.C. or I.V.) |
| 367 | GUAIACOL | rat | Negative | 1-4% in olive oil, 26 inj. (S.C.) |
| 148 | α-NAPHTHOL | mouse | Negative | 5% in lard (0.25 ml, repeated inj.). (S.C.) |
| 148 | PYROGALLOL | mouse, rabbit | Negative | 5-20% in acetone weekly. (Skin) |
| | | | AROMATIC DERIVATIVES | |
| | NITRO COMPOUNDS | | | |
| 148 | XYLENE | mouse | Negative | Weekly application. (Skin) |
| | | | SULFUR ORGANICS | |
| 367 | MUSTARD GAS | mouse | Negative | 250 μg/ml in acetone, 0.05 ml, 5 times weekly. (Skin) |

## TABLE VII - MUTAGENICITY AND TERATOGENICITY OF ORGANIC POLLUTANTS FOUND IN FRESH WATER IN HUMANS, ANIMALS, AND PLANTS

AND

## TABLE VIII - MUTAGENICITY AND TERATOGENICITY OF POTENTIAL ORGANIC POLLUTANTS OF FRESH WATER IN HUMANS, ANIMALS, AND PLANTS

These tables contain available information with more or less pertinence to mutagenicity and teratogenicity on chemicals found in water. In considering presumptive tests for mutagenicity, caution is necessary for interpreting the results. It can be seen from the tables that a variety of test systems have been employed and it should be remembered that most are of little reliability in terms of extrapolating to man. Further reservations with respect to pesticides are needed because no pesticides now in wide use have been demonstrated to be mutagenic and the overwhelming majority has not been adequately tested. The majority of data in this table relates to mutagenicity or chromosomal effects obtained on plants or fungi. The teratogenicity information showed positive results on 29 of 32 chemicals and one of these was obtained on humans (methyl mercuric chloride). The data on the chick needs to be qualified since it is considered by some to be an overly sensitive system.

TABLE VII - MUTAGENICITY AND TERATOGENICITY OF ORGANIC POLLUTANTS FOUND IN FRESH WATER IN HUMANS, ANIMALS AND PLANTS

| | MUTAGENICITY | | | | TERATOGENICITY | | | |
|---|---|---|---|---|---|---|---|---|
| Agent | Species | Dose | Effect | Ref | Species | Dose | Effect | Ref |
| | | | ALKANES AND ALKENES | | | | | |
| HALOGENATED | | | | | | | | |
| DIELDRIN | Plant sprout | 10% soln. | C-mitosis | 337 | | | | |
| ENDRIN | Barley | 1000 ppm for 12 hrs. | Point mutations | 453 | | | | |
| LINDANE | Onion root tip | | Chromosome breaks | 337 | Chick | 5 mg/egg | Negative | 244 |
| | | 0.00125% | Aneuploidy and chromosome fragmentation | 337 | | | | |
| | " | 0.0006-2.0% | C-mitosis | 337 | | | | |
| | Other plant root tip | solid particles | Chromosome aberrations | 337 | | | | |

TABLE VII (CONT.) - MUTAGENICITY AND TERATOGENICITY OF ORGANIC POLLUTANTS

| | MUTAGENICITY | | | | TERATOGENICITY | | | |
|---|---|---|---|---|---|---|---|---|
| Agent | Species | Dose | Effect | Ref | Species | Dose | Effect | Ref |
| | | | ORGANIC ACIDS | | | | | |
| CARBOXYLIC | | | | | | | | |
| 2,4-D | Narcissus root tip | 0.01-0.1% | C-mitosis | 337 | Mouse | 98 mg/kg | Eye anomalies | 337 |
| | Cotton | | Effect on nucleic acid synthesis | 25 | Mouse | 98-100 mg/kg | Negative | 337 |
| | | | | | Mouse | 46-150 mg/kg S.C. day 6-14 | Eye anomalies, agnathia | 95 |
| | Onion root tip | 0.01-0.1% | C-mitosis chromosome aberrations | 337 | | | | |
| | Vicia faba root tip | 0.001-0.1% | Abnormal mitosis | 337 | | | | |
| | Onion root tip | 25-500 ppm | Chromosome aberrations | 337 | | | | |
| | Tradescantia | 0.001-0.1% | Abnormal mitosis | 356 | | | | |
| 2,4,5-T | Apricot | 100 mg/1 sprayed | Slight anti-mitotic effect | 36 | Mouse | 113 mg/kg | Cleft palate Cystic kidney | 337 |
| | Onion root tip | 25-500 ppm | Chromosome aberrations | 337 | Mouse | 150 mg/kg | Cleft palate | 95 |
| | | | | | Chick | | Cleft plate Beak deformities | 76 |

TABLE VII (CONT.) - MUTAGENICITY AND TERATOGENICITY OF ORGANIC POLLUTANTS

| | MUTAGENICITY | | | | TERATOGENICITY | | | |
|---|---|---|---|---|---|---|---|---|
| Agent | Species | Dose | Effect | Ref | Species | Dose | Effect | Ref |
| | | | UNSUBSTITUTED AROMATICS | | | | | |
| BENZOPYRENE | Mouse | 750 mg/kg I.P. single dose | Induction of dominant lethals | 96 | | | | |
| 1,2,5,6-DIBENZ-ANTHRACENE | Fungus | | Positive | 21 | | | | |
| | | | PHENOLS AND QUINONES | | | | | |
| PENTACHLORO-PHENOL | Plant cells | | Positive | 11 | | | | |
| | | | AROMATIC DERIVATIVES | | | | | |
| HALOGENATED | | | | | | | | |
| DDD | | | | | Mouse | 46.4 mg/kg | Negative | 337 |
| DDT | Mouse | 105 mg/kg | Negative | 96 | Chick | | Negative | 244 |
| | Plant | saturated solution | C- Mitosis Chromosome breaks | 337 | | | | |
| | | | MERCAPTANS AND OTHER SULFUR ORGANICS | | | | | |
| TEDION | | | | | Mouse | 217 mg/kg | Negative | 337 |

TABLE VII (CONT.) - MUTAGENICITY AND TERATOGENICITY OF ORGANIC POLLUTANTS

| | MUTAGENICITY | | | | TERATOGENICITY | | | |
|---|---|---|---|---|---|---|---|---|
| Agent | Species | Dose | Effect | Ref | Species | Dose | Effect | Ref |
| | | | ORGANOMETALICS | | | | | |
| METHYL MERCURY | Fruit fly | 0.25 ppm in food | Offspring with extra chromosome | 1 | Human | From fish | Congenital cases born | 169 |

TABLE VIII - MUTAGENICITY AND TERATOGENICITY OF POTENTIAL ORGANIC POLLUTANTS OF FRESH WATER IN HUMANS, ANIMALS AND PLANTS

| | MUTAGENICITY | | | | TERATOGENICITY | | | |
|---|---|---|---|---|---|---|---|---|
| Agent | Species | Dose | Effect | Ref | Species | Dose | Effect | Ref |
| | | | ALKANES AND ALKENES | | | | | |
| HALOGENATED | | | | | | | | |
| CHLOROFORM | Onion | | Positive | 389 | | | | |
| ETHYLENE DIBROMIDE | Bull testis | | Positive | 12 | | | | |
| | | | AMINES | | | | | |
| HETEROCYCLIC | | | | | | | | |
| ATRAZINE | Barley anther | 1000 ppm for 12 hrs | On meiosis | 453 | Mouse | | Negative | 337 |
| SIMAZINE | Barley anther | 1000 ppm for 12 hrs | On meiosis | 453 | | | | |
| | | | ORGANIC ACIDS | | | | | |
| CARBOXYLIC | | | | | | | | |
| ENDOTHALL | Plant cell | | Chromosome aberrations | 337 | | | | |
| | | | ESTERS | | | | | |
| OVEX | | | | | Mouse | | Negative | 337 |

| Agent | MUTAGENICITY | | | | TERATOGENICITY | | | |
|---|---|---|---|---|---|---|---|---|
| | Species | Dose | Effect | Ref | Species | Dose | Effect | Ref |
| | | | | AMINE DERIVATIVES | | | | |
| AMIDES | | | | | | | | |
| CAPTAN | Human | 0.010 mg/1 in culture | Inhibition of DNA synthesis | 225 | Mouse | | Negative | 337 |
| | Mouse | 9 & 500 mg/kg | Negative | 96 | Chick | 18-20 ppm | Cleft palate<br>Eye anomalies<br>Bone anomalies | 421 |
| | Kangaroo rat | 1.25 & 5.0 mg/1 in culture | Chromosome aberrations | 225 | | | Congenital malformations | 244 |
| | | | | | Rabbit | | Negative | 183, 187 |
| | | | | | Rat | 50-2000 mg/kg P.O. | Negative | 183 |
| | | | | | Hamster | 125-1000 mg/kg P.O. | Negative | 183 |
| METEPA | | | Point mutations<br>Chromosome alterations | 337 | Rat | | Ectrodactyly<br>Multiple mal-formations | 187 |
| | Mouse | 40 mg/kg | Induction of dominant lethals | 96 | | | | |
| TEPA | | | Point Mutations<br>Chromosome alterations | 337 | | | | |
| | | | Positive | 51 | | | | |

TABLE VIII (CONT.) - MUTAGENICITY AND TERATOGENICITY OF POTENTIAL ORGANIC POLLUTANTS

| Agent | MUTAGENICITY Species | Dose | Effect | Ref | TERATOGENICITY Species | Dose | Effect | Ref |
|---|---|---|---|---|---|---|---|---|
| **AMINE DERIVATIVES** | | | | | | | | |
| TEPA (cont.) | | | Positive | 52 | | | | |
| | Mouse | 7 mg/kg I.P. | Induction of dominant lethals | 96 | | | | |
| **CARBAMATES** | | | | | | | | |
| CARBARYL | Barley anther | 500 & 1000 ppm 12 hrs | Abnormal meiosis | 453 | Mouse | 100 mg/kg | Hydrocephaly, skeletal | 337 |
| | Plant root tip | 0.5 & 0.25 saturated | Chromosome aberrations | 10 | Guinea pig | 300 mg/ kg P.O. during organogenesis | Bone defects Lack of kidneys and genital organs | 339 |
| | | | | | | 350 mg/kg | Congenital malformations | 187 |
| | | | | | Hamster | 125 & 150 mg/kg P.O. | Negative | 339 |
| | | | | | Chick | 1 mg/egg | Congenital malformations | 244 |
| | | | | | | 75 ppm/day | Congenital malformations | 187 |
| | | | | | Dog | 6.25-50 mg/kg/day | Skeletal anomalies Failure in organ development | 374 |

TABLE VIII (CONT.) - MUTAGENICITY AND TERATOGENICITY OF POTENTIAL ORGANIC POLLUTANTS

| | MUTAGENICITY | | | | TERATOGENICITY | | | |
|---|---|---|---|---|---|---|---|---|
| Agent | Species | Dose | Effect | Ref | Species | Dose | Effect | Ref |
| | | | AMINE DERIVATIVES | | | | | |
| CIPC | Plant cell | 2.5,5,10,20, 40,80 ppm up to 8 hrs | C-Mitotic effect Nuclear disintegration | 242 | | | | |
| IPC | Avena root and stem tip | 0.1-o.5 ppm | Mitotic aberrations | 337 | Mouse | 850 mg/kg | Eye anomalies | 337 |
| | Plant cells | 2.5,5,10,20, 40,80 ppm up to 8 hrs | C-Mitotic effect Nuclear disintegration | 242 | | | | |
| ZECTRAN | | | | | Mouse | | Negative | 337 |
| THIOCARBAMATES | | | | | | | | |
| FERBAM | Aspergillus niger spores | 1000 ppm | Morphological mutants and reverse mutations | 337 | Mouse | | Negative | 337 |
| | Onion root tip | 240 ppm | Chromosome aberrations | 337 | | | | |
| NABAM | | | | | Mouse | | Negative | 337 |
| THIRAM | | | | | Mouse | | Negative | 337 |
| | | | | | | 250 mg/kg P.O. during organogenesis | Bone & heart anomalies | 339 |

TABLE VIII (CONT.) - MUTAGENICITY AND TERATOGENICITY OF POTENTIAL ORGANIC POLLUTANTS

| | MUTAGENICITY | | | | TERATOGENICITY | | | |
|---|---|---|---|---|---|---|---|---|
| Agent | Species | Dose | Effect | Ref | Species | Dose | Effect | Ref |
| | | | AMINE DERIVATIVES | | | | | |
| THIRAM (cont.) | | | | | Hamster | | Congenital malformations | 187 |
| | | | | | Rat | 100 ppm | Negative | 187 |
| UREAS | | | | | | | | |
| DIURON | | | | | Mouse | | Negative | 337 |
| MONURON | Barley anther | 500 & 1000 ppm for 12 hrs | Abnormal meiosis | 453 | Mouse | | Negative | 337 |
| | | | PHOSPHATE ESTERS | | | | | |
| ABATE | | | | | Lamb | | Negative | 299 |
| BIDRIN | | | | | Chick | | Bone anomalies Parrot beak | 187 |
| DEMETON | | | | | Chick | | Congenital malformations | 244 |
| DIAZINON | Human lymphocytes | 0.5 mg/1 | Chromosome aberrations | 411 | Rabbit | 7 or 30 mg/kg P.O. | Negative | 339 |
| | | | | | Hamster | 0.125 or 0.25 mg/kg | Negative | 339 |
| | | | | | Chick | | Congenital malformations | 187 |

TABLE VIII (CONT.) - MUTAGENICITY AND TERATOGENICITY OF POTENTIAL ORGANIC POLLUTANTS

| | MUTAGENICITY | | | | TERATOGENICITY | | | |
|---|---|---|---|---|---|---|---|---|
| Agent | Species | Dose | Effect | Ref | Species | Dose | Effect | Ref |
| | | | PHOSPHATE ESTERS | | | | | |
| DICAPTHION | Onion root tip | 0.5-6.0 sq. cm. | Chromosome breaks | 337 | | | | |
| DICHLORVOS | Onion root tip | 0.5-6.0 sq. cm. | Chromosome breaks | 337 | | | | |
| EPN | | | | | Chick | | Congenital malformations | 187 |
| GUTHION | | | | | Chick | | Congenital malformations | 187 |
| IMIDAN | | | | | Rabbit | | Negative | 187 |
| MALATHION | | | | | Chick | 75 ppm/day | Congenital malformations | 187 |
| METHYL DEMETON | | | | | Chick | | Congenital malformations | 244 |
| METHYL PARATHION | | | | | Mouse | | Cleft palate | 187 |
| PARATHION | Onion root tip | 0.01,0.005, 0.0075% | C-Mitosis | 337 | Chick | 0.1 mg/egg | Congenital malformations | 187 |
| PHOSPHAMIDON | Barley anther | 1000 & 500 ppm for 12 hrs | Slight effect on meiosis | 453 | | | | |
| TRITHION | | | | | Mouse | | Cleft palate | 187 |

TABLE VIII (CONT.) - MUTAGENICITY AND TERATOGENICITY OF POTENTIAL ORGANIC POLLUTANTS

| | MUTAGENICITY | | | | TERATOGENICITY | | | |
|---|---|---|---|---|---|---|---|---|
| Agent | Species | Dose | Effect | Ref | Species | Dose | Effect | Ref |
| | | | ALDEHYDES AND KETONES | | | | | |
| FORMALDEHYDE | Mouse | 20 mg/kg I.P. | Negative | 96 | | | | |
| | | | PHENOLS AND QUINONES | | | | | |
| NAPHTHOL | | | | | Mouse | 10 mg/kg | Eye anomalies | 337 |
| | | | ORGANOMETALS | | | | | |
| ETHYLMERCURY CHLORIDE | Triticum root tip | 0.5-1.0% | Mitotic aberrations | 337 | | | | |

TABLE IX - SOURCES OF ORGANIC POLLUTANTS FOUND IN FRESH WATER

AND

TABLE X - SOURCES OF POTENTIAL ORGANIC POLLUTANS OF FRESH WATER

These tables contain chemicals which have been found in water (Table IX) and chemicals which could potentially be found in water (Table X) according to sources given in the literature. The sources are ranked in accordance with a number of chemicals originating from each source and are categorized into the three groups: industrial, agricultural and domestic. Industrial sources which did not specify the industry are listed separately. Taking the two tables together we find that chemical plants contribute the highest number of chemicals which either have been found or could potentially be found in fresh water. The agricultural source of pollution is one of pesticides and the domestic source of pollution consists of detergents. In terms of numbers of chemicals as well as classes of compounds, industrial sources contribute to fresh water pollution to a greater extent than agricultural or domestic sources.

TABLE IX - SOURCES OF ORGANIC POLLUTANTS FOUND IN FRESH WATER

## INDUSTRIAL

**Pesticide Formulating Plants:**

| | | |
|---|---|---|
| Aldrin | Dieldrin | Heptachor |
| Chlordane | Diethylamine | Heptachloronorbornene |
| DDD | Dimethylamine | Hexachloronorbornadiene |
| DDE | Endrin | Isodrin |
| DDT | Ethylamine | Methylamine |

**Chemical Plants:**

| | | |
|---|---|---|
| Acetic acid | Def | Propionic acid |
| Aniline | Formic acid | Pyrocatechol |
| Butyric acid | Methane | |

**Dye and Pigment Factories:**

| | | |
|---|---|---|
| Aniline | Formic acid | Phenol |
| Benzidine | Naphthylamine | Propionic acid |

**Synthetic Rubber Plants:**

| | | |
|---|---|---|
| Diethylamine | Ethylamine | Methylamine |
| Dimethylamine | | |

**Coal Tar Products Plants:**

| | | |
|---|---|---|
| Benzopyrene | Cresol | Pyrocatechol |
| 3,4-Benzopyrene | | |

**Gas Plants:**

| | | |
|---|---|---|
| Aniline | Methane | Pyridine |
| Benzopyrene | | |

TABLE IX (CONT.) - SOURCES OF POLLUTANTS FOUND IN WATER

| | | |
|---|---|---|
| **Coke Chemical Plants:** | | |
| Benzopyrene | 3,4-Benzopyrene | Pyridine |
| **Petroleum Refineries:** | | |
| 3,4-Benzopyrene | 1,2,5,6-Dibenzanthracene | Methane |
| **Shale Refineries:** | | |
| Benzopyrene | 3,4-Benzopyrene | Phenol |
| **Cosmetic Plants (soaps and perfumes):** | | |
| Phenyl ether | Propionic acid | |
| **Wood Distillation Plants:** | | |
| Acetic acid | Pyrocatechol | |
| **Rubber Plants:** | | |
| Aniline | Formic acid | |
| **Sugar Factory (beet):** | | |
| Acetic acid | | |
| **Acetaldehyde Plant:** | | |
| Methylmercuric chloride | | |
| **Varnish Manufacturing:** | | |
| Butyric acid | | |
| **Textile Mills:** | | |
| Acetic acid | | |
| **Winery:** | | |
| Acetic acid | | |

Pyrolyzate Washing (effluent):

Pyrocatechol

Industrial (unspecified):

| | | |
|---|---|---|
| ABS | 11,12-Benzfluoranthene | Indeno (1,2,3-cd) pyrene |
| 1,2-Benzanthracene | 1,12-Benzperylene | Methylmercuric chloride |
| 3,4-Benzfluoranthene | 3,4-Benzpyrene | Phenol |
| 10,11-Benzfluoranthene | Fluoranthene | Pyrene |

## AGRICULTURAL

| | | |
|---|---|---|
| Aldrin | 2,4-D | Heptachlor epoxide |
| Benzene hexachloride | 2,6-Dichlorobenzonitrile | Isodrin |
| Chlordane | Endrin | Lindane |
| DDD | Endosulfan | Ronnell |
| DDE | Fenac | Silvex |
| DDT | Heptachlor | Toxaphene |
| Dieldrin | | |

## DOMESTIC

Detergents:

| | |
|---|---|
| ABS | LAS |

Waste Processing Plants:

| | |
|---|---|
| ABS | Phenol |

TABLE X - SOURCES OF POTENTIAL ORGANIC POLLUTANTS OF FRESH WATER

## INDUSTRIAL

### Chemical Plants:

- Acetone
- Amyl alcohol
- Butyl alcohol
- Carbon tetrachloride
- Chloroform
- Chloroaniline
- Cyclohexane
- Cyclohexene
- Dibromo-heptafluoroisobutyl methyl ether
- Diethylmercury
- Diisopropylamine
- Dimethylformamide
- Dimethylphenylcarbinol
- Dimethyl sulfide
- Epichlorhydrin
- Ethylene
- Furfural
- Maleic acid
- Methyl alcohol
- Methylethyl ketone
- Methyl hexafluro-2-bromobutyrate
- Methyltetrafluoropropionate
- MGK 264
- Monoethanolamine
- Nitrobenzene
- Octafluoroisobutyl methyl ether
- Phenylhydrazine
- Propylene
- Propylisome
- Saponin
- Sesame Oil
- Sulfoxide
- Tetrachloroethylene
- Tetrachloroheptane
- Tetrachlorononane
- Trichloroethylene
- Xylene

### Petroleum Plants:

- Acetonitrile
- Actusol
- Adiponitrile
- Benzonitrile
- Butyl mercaptan
- Chevron NI-O
- Chloronitrosocyclohexane
- Chlorophenol
- Corexit 7664
- Cyclohexane
- Cyclohexanol
- Cyclohexanone
- Cyclohexene
- E-314
- F.O. 300B
- Heptane
- Holl-Chem 622
- Jan-Solv-60
- Lactonitrile
- Oxydipropionitrile
- Petrolite W-1439
- Seasweep
- Spill-X
- Tetraethyl lead

<u>Plastic Manufacturing:</u>

| | | |
|---|---|---|
| Butyl acetate | Formaldehyde | Perfluoroisobutenyl ethyl ether |
| Dichloromethane | Furfural | Phenylhydrazine |
| Diethylene glycol | Hexachlorocyclopentadiene | Tetrachloroethane |
| Ethylene | Hexachloroethane | Trichlorobenzene |

<u>Tar and Gas Plants:</u>

| | | |
|---|---|---|
| Acridine | Guaiacol | Rosolic acid |
| Amyline | Naphthalene | Thiophene |
| Benzene | Quinaldine | Toluene |
| Benzoic acid | Quinoline | |

<u>Rubber Plants:</u>

| | | |
|---|---|---|
| 1,4-Butanediol | 1,2-Dichlorohexafluorocyclo-pentene-1 | Isoprene |
| Butylene | Dichloromethane | Phenylhydrazine |
| Carbon tetrachloride | Isobutylene | Triethanolamine |
| Dichlorobutane | | |

<u>Dye and Tanning Plants:</u>

| | | |
|---|---|---|
| Dimethylresorcinols | β-Naphthol | Ursol |
| Formaldehyde | Pyrogallol | Xylene |
| α-Naphthol | Quinone | |

<u>Ore Processing Plants:</u>

| | | |
|---|---|---|
| Acetamide | Diisopropyl dithiophosphate | Pine Oil |
| Butyl xanthogenate | Octylphenol EO | Terpineol |
| Cresyl dithiophosphate | Oleoylmethyl tauride | |

<u>Textile Plants:</u>

| | | |
|---|---|---|
| Benzene | Chloropelargonic acid | Naphthalene |
| Chlorenanthic acid | Chloroundecanoic acid | |

Photographic Wastes:

| | | |
|---|---|---|
| Butyl acetate | Pyrogallol | Quinone |
| Hydroquinone | | |

Nylon Manufacturing:

| | | |
|---|---|---|
| Adiponitrile | Hexamethylenediamine | Hexamethylenediamine adipate |

Pulp Mill:

| | | |
|---|---|---|
| Methyl mercaptan | 4-(ρ-Tolyl)-1-pentanol | Tetrachlorocatechol |

Organic Synthesis Plants:

| | |
|---|---|
| Formaldehyde | Phenylhydrazine |

Pharmaceutical Manufacturing:

| | |
|---|---|
| Monoethanolamine | Streptomycin |

General Industry (unspecified):

| | | |
|---|---|---|
| Acetone | Citric acid | Methoxy polypropylene glycol |
| Alkyldimethyl benzylammonium chloride | Cresyl dithiophosphate | Morpholine |
| Alkyldimethyl chlorobenzyl-ammonium chloride | Diethylene glycol | Phenylhydrazine |
| 4-Amino-m-toluene-sulfonic acid | Dinitrotoluene | Picoline |
| Butyl xanthogenate | Ethyl alcohol | Propyl alcohol |
| 1,4-Butynediol | Ethylene | Propylene |
| Cetyldimethylethylammonium bromide | Furan | Tetrahydrofurfuryl alcohol |
| | Isobutyl alcohol | Vetluzhsk Oil |
| | Lactic acid | |

## AGRICULTURAL

Abate
Acrolein
Acrylonitrile
Algibiol
Alkydimethyl benzylammonium chloride
Alkydimethyl chlorobenzyl ammonium chloride
Amitrole
Anisole
Apholate
Aramite
Atrazine
Azodrin
Baygon
Bayluscide
Benzethonium chloride
Bidrin
Binapacryl
Bromophos
Butane
Butoxy polypropene glycol
Butyl mesityl oxide oxalate
C 56
Captan
Carbaryl
Carbathion
Carbophenothion
Cetyldimethylethylammonium bromide
Chloroaniline
Chlorobenzilate
Chlorpropham
Chlorthion
Ciodrin
Coumaphos
Dalapon
Dasanit
Dazomet
2,4-DB
DCU
Delrad
Demeton
2,4-DEP
Diazinon
Dicapthon
Dichlone
Dichlorobenzene
Dichlorvos
Dicofol
Diethyl dithiophosphoric acid
Diethyl maleate
Diethyl toluamide
Dilan
Dimethrin
Dimethyl carbate
Dimetilan
Dinitrocresol
2,4-Dinitrophenol
Dinobuton
Dinoseb
Dioxathion
Diphacinone
Diquat
Disulfoton
Diuron
Drione
Endothall
EPN
Ethion
Ethyl hexanediol
Fenthion
Fenuron
Ferbam
Folex
Furfural
Gardona
Guthion
Hempa
Hercules 9699
Hexachlorobutadiene
Hexachloroethane
Imidan
IPC
Isolan
Isopropylamine
Kepone
Lethane 384
Malathion
Matacil
MCPB
Menazon
β-Mercaptodiethylamine
Mesurol
Metepa
Metham
Methoxychlor
S-Methyl-N-(methylcarbamoyloxy) thioacetamidate
Methyl parathion
Methyl trithion
Mevinphos
MGK Repellent 11

## AGRICULTURAL
(continued)

| | | |
|---|---|---|
| MGK Repellent 326 | Phostex | Tabutrex |
| Mirex | Pinene | 2,3,5-TBA |
| Mobam | Piperonyl butoxide | 2,3,6-TBA |
| Monuron | Pival | Temik |
| Nabam | Pyrethrins | Tepa |
| Naled | Rotenone | TEPP |
| α-Naphthol | Ruelene | Tetrachlorobenzene |
| β-Naphthol | Sarin | Tetrachloroethane |
| Nemagon | Schradan | Thionazin |
| Neotran | SD 7438 | Thiram |
| Nicotine | SD 8530 | Tranid |
| Ovex | Sesone | Triaram |
| Oxydemetonmethyl | Shell D50 | Trichlorfon |
| Paraoxon | Simazine | Trichloronate |
| Paraquat | Soricide tetraminol | Warfarin |
| Perthane | Strobane | Zectran |
| Phorate | Strychnine | Zineb |
| Phosphamidon | Sumithion | Ziram |

## DOMESTIC

| | | |
|---|---|---|
| Alkyldimethyl benzylammonium chloride | 7-Ethyl-2-methyl-undecyl-4-sulfate | Monoethanolamine |
| Alkyldimethyl chlorobenzyl ammonium chloride | Ethyl phenylphenol sulfate | Nonyl Phenol EO |
| Blast | Fatty sorbitan | Oleyl alcohol EO |
| Butylbiphenyl sulfonate | Isorpopylnaphthalene sulfonate | Phenylhydrazine |
| Cetyldimethylethylammonium bromide | Lauric diethanolamide sulfonate | Polyethyleneglycolalkylphenol esters |
| Decylbenzene sulfonate | Lauryl alcohol EO | Quaternary ammonium chloride |
| 3,9-Diethyl-tridecyl-6-sulfonate | Lauryl alcohol sulfate EO | Quaternary pyridinium |
| Dodecylbenzene sulfonate | Lauryl glyceryl ether sulfonate | Stearoyl EO |
| | Lauryl imidazoline | Sterinol |
| | Lauryl sulfate | Sterox |

## TABLE XI - REPORTED MAXIMUM CONCENTRATION OF ORGANIC CHEMICALS FOUND IN FRESH WATER PRODUCING NO EFFECT IN MAMMALS WHEN ADMINISTERED ON A CHRONIC BASIS OR TESTED FOR ORGANOLEPTIC EFFECTS IN MAN

This table presents the reported maximum no-effect concentrations of organic chemicals when administered chronically to mammals or when tested for organoleptic effects in man. Except in a few instances, the sources for the information are from the Russian literature. Approximately 80% of the data is derived from organoleptic effects using human subjects.

TABLE XI - REPORTED MAXIMUM CONCENTRATION OF ORGANIC CHEMICALS FOUND IN FRESH WATER PRODUCING NO EFFECT IN MAMMALS WHEN ADMINISTERED ON A CHRONIC BASIS OR TESTED FOR ORGANOLEPTIC EFFECTS IN MAN

ALKANES AND ALKENES

| Reference | Agent | mg/l | Location | Limiting Index |
|---|---|---|---|---|
| | Unsubstituted | | | |
| 13 | butylene | 0.2 | reservoir water | |
| 354 | cyclohexane | 0.1 | well water | sanitary-toxicological |
| 355 | cyclohexene | 0.2 | " | " |
| 355 | ethylene | 0.2 | " | " |
| 13 | isobutylene | 0.5 | reservoir water | |
| 194,190, 228,191 | isoprene | 0.005 | " | organoleptic |
| 13 | propylene | 0.5 | " | |
| | Halogenated | | | |
| 429,430, 431 | aldrin | 0.002 | reservoir water | sanitary-toxicological |
| 214,438, 459 | | 0.017* | surface water for public water supplies | |
| 48 | | <1.0 | reservoir water | organoleptic |
| 357 | | 0.00025* | finished water | |
| 178,179 | allyl chloride | 0.31 | reservoir water | organoleptic |
| 274,275 | butane, poly-chloro | 0.01-0.02 | " | " |
| 219,252 | carbon tetra-chloride | 0.3 | " | sanitary-toxicological |
| 228 | | 5.0 | " | organoleptic |
| 438 | chlordane | 0.003 | surface water for public water supplies | |
| 357 | | 0.00025 | finished water | |
| 228,185 | chloroprene | 0.1 | reservoir water | organoleptic |
| 300 | chlorocyclo-hexane | 0.05 | " | sanitary-toxicological |

* From American Maximum permissible concentration data.

TABLE XI (CONT.) - REPORTED MAXIMUM CONCENTRATION OF ORGANIC CHEMICALS FOUND IN FRESH WATER PRODUCING NO EFFECT IN MAMMALS WHEN ADMINISTERED ON A CHRONIC BASIS OR TESTED FOR ORGANOLEPTIC EFFECTS IN MAN

ALKANES AND ALKENES

| Reference | Agent | mg/l | Location | Limiting Index |
|---|---|---|---|---|
| | Halogenated | | | |
| 132,228 | dichlorobutane | 0.05 | reservoir water | organoleptic |
| 184 | dichlorobutene | 0.05 | " | " |
| 206,207, 228,230 | dichlorocyclo- hexane | 0.02 | " | " |
| 380 | 1,2-dichloro- hexafluoro- 1-cyclohexene | 0.4 | " | sanitary-toxicological |
| 381 | 1,2-dichloro- hexafluoro- cyclopentene-1 | 0.4 | " | " |
| 414 | dichloromethane | 7.5 | " | organoleptic |
| 214,438 | dieldrin | 0.017* | surface water for public water supply | |
| 214,438 | endrin | 0.001*<br>0.0001* | "<br>finished water | |
| 357 | freon 253 | 0.1 | reservoir water | sanitary-toxicological |
| 214,438 | heptachlor | 0.018* | surface water for public water supply | |
| 214,438 | heptachlor epoxide | 0.018* | " | |
| 274,275 | hexachlorobuta- diene | 0.01 | reservoir water | organoleptic |
| 284 | hexachloropenta- diene | 0.001 | " | " |
| 415,438 | hexachloroethane | 0.01 | " | " |
| 214,438 | lindane | 0.056* | surface water for public water supplies | |
| 357 | | 0.005* | finished water | |

* From American maximum permissible concentration data.

TABLE XI (CONT.) - REPORTED MAXIMUM CONCENTRATION OF ORGANIC CHEMICALS FOUND IN FRESH WATER PRODUCING NO EFFECT IN MAMMALS WHEN ADMINISTERED ON A CHRONIC BASIS OR TESTED FOR ORGANOLEPTIC EFFECTS IN MAN

ALKANES AND ALKENES

| Reference | Agent | mg/1 | Location | Limiting Index |
|---|---|---|---|---|
| | Halogenated | | | |
| 213 | pinene, polychloro | 0.2 | reservoir water | sanitary-toxicological |
| 415<br>228 | tetrachloroethane | 0.01<br>0.2 | "<br>" | organoleptic<br>" |
| 359 | tetrachloroheptane | 0.0025 | " | " |
| 359 | tetrachlorononane | 0.003 | " | " |
| 359 | tetrachloropentane | 0.005 | " | " |
| 359 | tetrachloropropane | 0.01 | " | " |
| 359 | tetrachloroundecane | 0.007 | " | " |
| 214,438 | toxaphene | 0.005* | surface water for public water supply | |
| 357 | | 0.0025* | finished water | |
| 264,228 | trichloroethylene | 0.5 | reservoir water | organoleptic |
| | Nitro Compounds | | | |
| 206,207, 228,230 | chloronitrosocyclohexane | 0.005 | reservoir water | organoleptic |
| 352,228 | nitrocyclohexane | 0.1 | " | " |
| 393 | nitromethane | 0.005 | " | based on possibility of forming chloropicrin |

ALCOHOLS

| Reference | Agent | mg/1 | Location | Limiting Index |
|---|---|---|---|---|
| 178,179 | allyl alcohol | 0.1 | reservoir water | organoleptic |
| 227,228, 286 | butyl alcohol | 1.0 | " | " |

* From American maximum permissible concentration data.

TABLE XI (CONT.) - REPORTED MAXIMUM CONCENTRATION OF ORGANIC CHEMICALS FOUND IN FRESH WATER PRODUCING NO EFFECT IN MAMMALS WHEN ADMINISTERED ON A CHRONIC BASIS OR TESTED FOR ORGANOLEPTIC EFFECTS IN MAN

## ALCOHOLS

| Reference | Agent | mg/l | Location | Limiting Index |
|---|---|---|---|---|
| 197 | 1,4-butanediol | 5.0 | reservoir water | sanitary-toxicological |
| 197 | 1,4-butynediol | 1.0 | " | " |
| 228,353 | cyclohexanol | 0.5 | " | " |
| 210 | dichlorohydrin | 1.0 | " | organoleptic |
| 313 | diethylene glycol | 1.0 | " | sanitary-toxicological |
| 376 | dimethylphenyl-carbinol | 0.05 | " | " |
| 313 | ethylene glycol | 1.0 | " | " |
| 466 | ethylene glycol monoethyl ether | 1.0 | " | " |
| 256,257 | heptyl alcohol | 0.005 | " | " |
| 227,228 286 | isobutyl alcohol | 1.0 | " | dissolved $O_2$ and BOD |
| 227,228 | methyl alcohol | | " | organic matter content, BOD, & dissolved $O_2$ |
| 210 | monochlorohydrin | 0.7 | " | organoleptic |
| 205,256 | nonyl alcohol | 0.01 | " | sanitary-toxicological |
| 233 | pine oil | 0.2 | " | organoleptic |
| 262 | streptomycin | 0.1 | " | sanitary-toxicological |
| 233 | terpineol | 0.05 | " | organoleptic |
| 321,322, | tetrahydro-furfuryl alcohol | 1.0 | " | sanitary-toxicological |
| 320 | | 0.5 | -- | |

## AMINES

### Aliphatic

| Reference | Agent | mg/l | Location | Limiting Index |
|---|---|---|---|---|
| 462 | diazobutylamine | 0.07 | reservoir water | sanitary-toxicological |
| 85 | diethylanolamine | 1.0 | " | BOD |
| 86 | | 0.8 | " | organoleptic |

TABLE XI (CONT.) - REPORTED MAXIMUM CONCENTRATION OF ORGANIC CHEMICALS FOUND IN FRESH WATER PRODUCING NO EFFECT IN MAMMALS WHEN ADMINISTERED ON A CHRONIC BASIS OR TESTED FOR ORGANOLEPTIC EFFECTS IN MAN

AMINES

| Reference | Agent | mg/l | Location | Limiting Index |
|---|---|---|---|---|
| 176 | diethylamine | 2.0 | reservoir water | sanitary-toxicological |
| 122 | diisopropylamine | 0.5 | " | " |
| 88,89 | dimethylamine | 0.1 | " | " |
| 117 | ethylamine | 0.5 | " | organoleptic |
| 43 | hexamethylene-diamine | 0.01 | " | sanitary-toxicological |
| 44 | hexamethylene-diamine adipate | 1.0 | " | " |
| 93 | hydrazine hydrate | 0.01 | " | " |
| 116 | isopropylamine | 2.0 | " | organoleptic |
| 328 | methylamine | 1.0 | " | sanitary-toxicological |
| 114 | β-mercaptodi-ethylamine | 0.1 | " | organoleptic |
| 92,93 | phenylhydrazine | 0.01 | " | sanitary-toxicological |
| 85 | triethanolamine | 5.0 | " | BOD |
| 227,228, 461 | ursol | 0.1 | " | organoleptic |
| | Aromatic | | | |
| 217,455 | aniline | 0.1 | reservoir water | sanitary toxicological |
| 347 | dichloroaniline | 0.05 | " | organoleptic |
| | Quarternary | | | |
| 138 | alkyldimethyl-benzylammonium chloride | 0.5 | drinking water | organoleptic |
| 467 | quarternary ammonium chloride | 0.05 | reservoir water | sanitary-toxicological |

TABLE XI (CONT.) - REPORTED MAXIMUM CONCENTRATION OF ORGANIC CHEMICALS FOUND IN FRESH WATER PRODUCING NO EFFECT IN MAMMALS WHEN ADMINISTERED ON A CHRONIC BASIS OR TESTED FOR ORGANOLEPTIC EFFECTS IN MAN

AMINES

| Reference | Agent | mg/1 | Location | Limiting Index |
|---|---|---|---|---|
| | Nitriles | | | |
| 365 | acetone cyano-hydrin | 0.001 | reservoir water | sanitary toxicological |
| 454 | acrylonitrile | 2.0 | " | " |
| 196 | adiponitrile | 0.1 | " | " |
| | Heterocyclic | | | |
| 249 | cyanuric acid | 6.0 | reservoir water | organoleptic |
| 214,438 | 2,5-lutidine | 0.056 | " | sanitary-toxicological |
| 423 | picoline | 0.05 | " | " |
| 227,464 | pyridine | 0.2 | " | " |

ORGANIC ACIDS

| Reference | Agent | mg/1 | Location | Limiting Index |
|---|---|---|---|---|
| | Carboxylic | | | |
| 228 | acetic acid | based on organic matter content, BOD, & dissolved $O_2$ | reservoir water | general sanitary |
| 195 | acrylic acid | 0.5 | " | |
| 228 | benzoic acid | based on organic matter content, BOD, & dissolved $O_2$ | " | general sanitary |
| 228 | butyric acid | " | " | " |
| 214,438 | 2,4-D | 0.1* | surface water for public water supply | |
| 272 | | 1.0 | reservoir water | organoleptic |
| 303 | | 3.0 | " | " |
| 198,199 | dalapon | 2.0 | " | " |
| 129 | 2,4-DB | 1.0 | " | sanitary-toxicological |

* From American maximum permissible concentration data.

TABLE XI (CONT.) - REPORTED MAXIMUM CONCENTRATION OF ORGANIC CHEMICALS FOUND IN FRESH WATER PRODUCING NO EFFECT IN MAMMALS WHEN ADMINISTERED ON A CHRONIC BASIS OR TESTED FOR ORGANOLEPTIC EFFECTS IN MAN

## ORGANIC ACIDS

| Reference | Agent | mg/1 | Location | Limiting Index |
|---|---|---|---|---|
| 227,228 | formic acid | based on organic matter content, BOD, & dissolved $O_2$ | reservoir water | general sanitary |
| 227,228 | lactic acid | " | " | " |
| 229 | maleic acid | 1.0 | " | organoleptic |
| 232 | maleic anhydride | 1.0 | " | " |
| 254,258 | phthalic acid | 0.5 | " | sanitary-toxicological |
| 214-438 | 2,4,5-T | 0.1* | surface water for public water supply | |
| | **Sulfonics** | | | |
| 168 | alkyl benzene sulfonate | 0.5 | reservoir water | sanitary-toxicological |
| 282 | p-chlorobenzene sulfonate, Na | 5.0 | " | organoleptic |
| 281,292 | chlorophenyl chlorobenzene sulfonate | 0.2 | " | " |

## ESTERS

| Reference | Agent | mg/1 | Location | Limiting Index |
|---|---|---|---|---|
| 46 | butyl acetate | 0.3 | reservoir water | organoleptic |
| 346 | diethyl maleate | 1.0 | " | conjunctival irritation tests |
| 325 | dimethylterephthalate | 1.81 | " | " |
| 245 | dioctylphthalate | 2.0 | " | " |
| 27 | methyl benzoate | 0.001 | inland waters | " |
| 134,135 | vinyl acetate | 0.2-0.25 | reservoir water | sanitary-toxicological-organoleptic |

* From American maximum permissible concentration data

TABLE XI (CONT.) - REPORTED MAXIMUM CONCENTRATION OF ORGANIC CHEMICALS FOUND IN FRESH WATER PRODUCING NO EFFECT IN MAMMALS WHEN ADMINISTERED ON A CHRONIC BASIS OR TESTED FOR ORGANOLEPTIC EFFECTS IN MAN

AMINE DERIVATIVES

| Reference | Agent | mg/l | Location | Limiting Index |
|---|---|---|---|---|
| | Amides | | | |
| 227,350 | caprolactam | 1-2 | -- | depends on watercourse |
| 121 | dicyanodiamide | 10.0 | reservoir water | organoleptic |
| 456 | dimethylformamide | 10.0 | " | sanitary-toxicological |
| 392 | methacrylamide | 0.1 | " | " |
| 99 | sulfadimesine | 1.0 | " | organoleptic |
| 99 | sulfaguanidine | 0.01 | " | sanitary-toxicological |
| 99 | sulfanilamide | 0.5 | " | organoleptic |
| 94 | sulfathiazole | 0.1 | " | sanitary-toxicological |
| | Carbamates | | | |
| 123 | carbaryl | 0.1 | reservoir water | organoleptic |
| 5 | chloropropham | 1.0 | " | " |
| 5 | IPC | 0.2 | " | " |
| | Thiocarbamates | | | |
| 278 | carbathion | 0.0256 | reservoir water | -- |
| 276 | | 0.02 | " | -- |
| 277 | | 0.026 | " | -- |
| 278 | dimethyldithio-carbamate, $NH_4$ | 0.1 | " | -- |
| | Ureas | | | |
| 13 | urea | 10.0 | reservoir water | organoleptic |

TABLE XI (CONT.) - REPORTED MAXIMUM CONCENTRATION OF ORGANIC CHEMICALS FOUND IN FRESH WATER PRODUCING NO EFFECT IN MAMMALS WHEN ADMINISTERED ON A CHRONIC BASIS OR TESTED FOR ORGANOLEPTIC EFFECTS IN MAN

PHOSPHATE ESTERS

| Reference | Agent | mg/1 | Location | Limiting Index |
|---|---|---|---|---|
| 202 | acetophos | 0.03 | reservoir water | organoleptic |
| 344 | chlorophos | 0.05 | " | " |
| 233,234 | cresyl dithio-phosphate | 0.001 | " | |
| 223,227 | demeton | 0.01 | " | organoleptic |
| 218 | diethylchloro-thiophos | 0.02 | " | " |
| 119 | diethyldithio-phosphoric acid | 0.2 | " | " |
| 118 | diisopropyl di-thio phosphate, K | 0.02 | " | " |
| 7 | dimethoate | 0.03 | " | sanitary-toxicological |
| 113 | dimethyldithio-phosphoric acid | 0.01 | " | organoleptic |
| 112,227, 228 | malathion | 0.05 | " | " |
| 202 | methylacetophos | 0.03 | " | " |
| 6,101, 228 | methyl-demeton | 0.01 | " | " |
| 101 | methyl parathion | 0.02 | " | " |
| 227,239 | parathion | 0.003 | " | sanitary-toxicological |
| 469 | tributylphosphate | 0.01 | " | organoleptic |

ALDEHYDES AND KETONES

| Reference | Agent | mg/1 | Location | Limiting Index |
|---|---|---|---|---|
| 15 | acetaldehyde | 0.2 | reservoir water | organoleptic |
| 227,228 | acetone | based on content of organic matter, BOD, & dissolved $O_2$ | " | general sanitary |

TABLE XI (CONT.) - REPORTED MAXIMUM CONCENTRATION OF ORGANIC CHEMICALS FOUND IN FRESH WATER PRODUCING NO EFFECT IN MAMMALS WHEN ADMINISTERED ON A CHRONIC BASIS OR TESTED FOR ORGANOLEPTIC EFFECTS IN MAN

ALDEHYDES AND KETONES

| Reference | Agent | mg/l | Location | Limiting Index |
|---|---|---|---|---|
| 377 | acetophenone | 0.1 | reservoir water | sanitary-toxicological |
| 136 | acrolein | 0.01 | " | self-clarification processes |
| 292 | cyclohexanone | 0.2 | " | sanitary-toxicological |
| 422 | | 1.0 | " | organoleptic |
| 227,228, 287 | formaldehyde | 0.5 | " | sanitary-toxicological |
| 220 | furfural | 1.0 | " | organoleptic |
| 227,422 | methylethylketone | 1.0 | " | " |

ETHERS

| Reference | Agent | mg/l | Location | Limiting Index |
|---|---|---|---|---|
| 283 | anisole | 0.05 | reservoir water | organoleptic |
| 245 | dibutyl phthalate | 2.0 | " | sanitary-toxicological |
| 14 | diethyl ether | 0.3 | " | " |
| 192,193, 252 | dimethyldioxane | 0.005 | " | " |
| 343 | furan | 0.2 | " | " |
| 37,364 | perfluoroiso-butenyl ethyl ether | 0.3 | " | " |
| | polyethylene-glycolalkyl-phenyl ethers | | | |
| 132,228 | OP-7 | 0.4 | " | organoleptic |
| 132,228 | OP-10 | 1.5 | " | " |
| 216,227, 228 | saponin | 0.2 | " | sanitary-toxicological |
| 319,320 | tetrahydrofuran | 0.5 | " | " |

TABLE XI (CONT.) - REPORTED MAXIMUM CONCENTRATION OF ORGANIC CHEMICALS FOUND IN FRESH WATER PRODUCING NO EFFECT IN MAMMALS WHEN ADMINISTERED ON A CHRONIC BASIS OR TESTED FOR ORGANOLEPTIC EFFECTS IN MAN

UNSUBSTITUTED AROMATICS

| Reference | Agent | mg/1 | Location | Limiting Index |
|---|---|---|---|---|
| 307 | benzene | 0.25 | reservoir water | sanitary-toxicological |
| 227,228 | | 0.5 | " | " |
| 455 | naphthalene | 0.05 | | |
| 333 | phenanthrene | 0.4 | reservoir water | organoleptic |
| 333 | pyrene | 0.4 | " | " |

PHENOLS AND QUINONES

| Reference | Agent | mg/1 | Location | Limiting Index |
|---|---|---|---|---|
| 410 | o-aminophenol | 0.01 | reservoir water | sanitary-toxicological |
| 410 | p-aminophenol | 0.05 | " | " |
| 45 | benzoquinone dioxime | 0.1 | " | organoleptic |
| 211,228 | Cheremkhovsk tar | 0.002 | " | " |
| 120 | dichlorophenol | 0.002 | " | " |
| 420 | dimethyl-resorcinols | 0.07 | " | " |
| 316,317 | 2,4-dinitrophenol | 0.03 | " | sanitary-toxicological |
| 104 | diphenylolpropane | 0.01 | " | organoleptic |
| 271 | hydroquinone | 0.2-0.4 | " | " |
| 455 | α-naphthol | 1.0 | " | |
| 455 | β-naphthol | 0.5 | " | |
| 401 | 1.4-naphthoquinone | 0.1 | " | organoleptic |
| 204 | nitrotoluol | 0.01-0.2 | " | " |
| 103,227 | phenol | 0.001 | " | " |
| 460,461 | quinone | 0.2 | " | " |
| 111,228 | Vetluzhsk oil | 0.02 | " | " |

TABLE XI (CONT.) - REPORTED MAXIMUM CONCENTRATION OF ORGANIC CHEMICALS FOUND IN FRESH WATER PRODUCING NO EFFECT IN MAMMALS WHEN ADMINISTERED ON A CHRONIC BASIS OR TESTED FOR ORGANOLEPTIC EFFECTS IN MAN

AROMATIC DERIVATIVES

| Reference | Agent | mg/l | Location | Limiting Index |
|---|---|---|---|---|
| | Halogenated | | | |
| 186 | m-chloroaniline | 0.2 | reservoir water | sanitary-toxicological |
| 237,238 | | 1.0 | " | organoleptic |
| 186,237 | p-chloroaniline | 0.2 | " | sanitary-toxicological |
| 418 | chlorobenzene | 0.02 | " | " |
| 214,438 | DDT | 0.042* | surface water for public water supply | |
| 227,228 | | 0.2 | reservoir water | organoleptic-toxicological |
| 357 | | 0.5* | finished water | |
| 347 | dichloroaniline | 0.05 | reservoir water | organoleptic-toxicological |
| 418 | dichlorobenzene | 0.002 | " | organoleptic |
| 143 | | 0.03 | " | " |
| 143,228 | hexachloro-benzene | 0.05 | " | sanitary-toxicological |
| 214,438 | methoxychlor | 0.035* | surface water for public water supply | |
| 101 | | 0.05 | reservoir water | sanitary-toxicological |
| 98 | | 20.0 | streams | |
| 75 | nitrochloro-benzene | 0.03 | reservoir water | organoleptic |
| 108 | tetrachloro-benzene | 0.02 | " | sanitary-toxicological |
| 143 | | 0.03 | " | organoleptic |
| 143,227 | trichloro-benzene | 0.03 | " | " |
| | Nitro compounds | | | |
| 9 | nitrobenzene | 0.2 | reservoir water | organoleptic |
| 435 | xylene | 0.05 | " | " |

* From American maximum permissible concentration data.

TABLE XI (CONT.) - REPORTED MAXIMUM CONCENTRATION OF ORGANIC CHEMICALS FOUND IN FRESH WATER PRODUCING NO EFFECT IN MAMMALS WHEN ADMINISTERED ON A CHRONIC BASIS OR TESTED FOR ORGANOLEPTIC EFFECTS IN MAN

## AROMATIC DERIVATIVES

| Reference | Agent | mg/l | Location | Limiting Index |
|---|---|---|---|---|
| | Aryl alkanes | | | |
| 463 | ethylbenzene | 0.01 | reservoir water | organoleptic |
| 296 | methylstyrene | 0.1 | " | " |
| 375 | propylbenzene | 0.2 | " | " |
| 2 | toluene | 1.0 | " | " |
| 3,228 | | 0.5 | " | " |

## MERCAPTANS AND OTHER SULFUR ORGANICS

| Reference | Agent | mg/l | Location | Limiting Index |
|---|---|---|---|---|
| 233,234 | butyl xanthogenate | 0.0001 | reservoir water | organoleptic |
| 227,228, 424 | carbon disulfide | 1.0 | " | " |
| 201 | dimethyl sulfide | 0.03 | " | " |
| 343 | thiophene | 2.0 | " | " |

## ORGANOMETALS

| Reference | Agent | mg/l | Location | Limiting Index |
|---|---|---|---|---|
| 458 | diethylmercury | 0.0001 | reservoir water | sanitary-toxicological |
| 458 | ethylmercuric chloride | 0.0001 | " | " |
| 227,228 | tetraethyl lead | 0.0 | " | " |
| 371 | tetraethyl tin | 0.0002 | " | " |

## POLYMERS

| Reference | Agent | mg/l | Location | Limiting Index |
|---|---|---|---|---|
| 308 | butoxy propylene glycol | 2.0 | reservoir water | organoleptic |
| 308 | methoxy polypropylene glycol | 0.5 | " | sanitary-toxicological |

TABLE XI (CONT.) - REPORTED MAXIMUM CONCENTRATION OF ORGANIC CHEMICALS FOUND IN FRESH WATER PRODUCING NO EFFECT IN MAMMALS WHEN ADMINISTERED ON A CHRONIC BASIS OR TESTED FOR ORGANOLEPTIC EFFECTS IN MAN

POLYMERS

| Reference | Agent | mg/l | Location | Limiting Index |
|---|---|---|---|---|
| 212 | methyl-siliconate, Na | 1.5 | reservoir water | organoleptic |
| 209 | poly(ethylhydro-siloxane) | 8.0 | " | " |
| 408 | polymethacrylate | 2.0 | potable water | sanitary-toxicological |
| 425 | polystyrene, cationic | 0.5 | " | " |

## TABLE XII - ACUTE TOXICITY RANKING OF ORGANIC CHEMICALS FOUND IN FRESH WATER AS DETERMINED BY $LD_{50}$ IN MAMMALS USING ORAL ADMINISTRATION

This table ranks acute toxicity of organic chemicals found in water based on $LD_{50}$ data to show relative acute toxic effects. Chlorinated hydrocarbons show intense acute toxicity and all can be considered to be derivatives of norbornene. With the exception of methyl mercuric chloride they are the most toxic compounds now found in fresh water. Heptachlor and Chlordane also have the same chlorinated norbornene nucleus but are not as toxic. Apart from these compounds, the other most highly acute toxic compounds do not share common structural features but most of them contain chlorine atoms. (See pages 44 to 46 for a more detailed discussion of this table.)

TABLE XII - ACUTE TOXICITY RANKING OF ORGANIC CHEMICALS FOUND IN FRESH WATER AS DETERMINED BY $LD_{50}$ IN MAMMALS USING ORAL ADMINISTRATION

<u>0-99 mg/kg</u>

1. Endrin
2. Methyl mercuric chloride
3. Isodrin
4. Aldrin
5. Endosulfan
6. Toxaphene

<u>100-199 mg/kg</u>

7. Lindane
8. Pentachlorophenol
9. Heptachlor
10. Sodium pentachlorophenate
11. Methyl mercuric chloride

<u>200-299 mg/kg</u>

12. DDT
13. Dimethylamine
14. 2,6-Dichlorobenzonitrile
15. Def
16. 2,4,5-T

<u>300-399 mg/kg</u>

17. 2,4-D
18. β-Isomer BHC
19. Chlordane
20. Benzene hexachloride
21. Ethylamine
22. DDD

<u>400-499 mg/kg</u>

23. o-Aniline
24. Aniline
25. Silvex

<u>500-599 mg/kg</u>

26. tp-ABS
27. Nitrochlorobenzene
28. Diethylamine

TABLE XII (CONT.) - ACUTE TOXICITY RANKING OF ORGANIC CHEMICALS FOUND IN FRESH WATER AS DETERMINED BY $LD_{50}$ IN MAMMALS USING ORAL ADMINISTRATION

600-799 mg/kg

29. Ronnell
30. ABS Linear

800-999 mg/kg

31. DDE

1000-2499 mg/kg

32. ABS
33. o-Cresol
34. Fenac
35. p-Cresol

2500-5000 mg/kg

36. Acetic acid
37. Pyrocatechol
37. Formic acid

>5000 mg/kg

38. Butyric acid
39. Pyrene

TABLE XIII - ACUTE TOXICITY RANKING OF POTENTIAL ORGANIC POLLUTANTS OF WATER AS DETERMINED BY $LD_{50}$ IN MAMMALS USING ORAL ADMINISTRATION

This table ranks the acute toxicity of organic compounds which are considered to be potential pollutants of fresh water. Of the most toxic compounds, 15 out of 23 are phosphate esters. The remaining 8 compounds are substituted pyridines (nicotine and picoline), carbamates (Isolan and Temik), an anticoagulant (diphacinone), acrolein, the organometallic tetraethyltin, and cyanohydrin. Among the remaining more toxic compounds (1 to 100 mg/kg), the organophosphorus compounds make up the largest grouping with 20 pesticides falling within this category.

TABLE XIII - ACUTE TOXICITY RANKING OF POTENTIAL ORGANIC POLLUTANTS AS DETERMINED BY $LD_{50}$ IN MAMMALS USING ORAL ADMINISTRATION

0-49 mg/kg

1. Tepp
2. Temik
3. Phorate
4. Picoline
5. Dasanit
6. Diphacinone
7. Nicotine
8. Disulfoton
9. Demeton
10. Acetone cyanohydrin
11. Parathion
12. Paraoxon
13. Warfarin
14. Mevinphos
15. Thionazin
16. Schradan
17. Isolan
18. Carbophenothion
19. EPN
20. Guthion
21. Tetraethyl tin
22. Acrolein
23. 2,4-DEP
24. Phosphamidon
25. Methyl parathion
26. Chlorfenvinfos
27. Malaoxon
28. Coumaphos
29. Ethion
30. Dichlorvos
31. Bidrin
32. Azodrin
33. Tranid
34. Adiponitrile
35. Dioxathion
36. Mustard Gas
37. Dinitrocresol
38. Zectran
39. Pyrogallol
40. Dimetilan
41. Acetophos
42. Dimethoate
43. p-Dinitrobenzene
44. Matacil
45. Methylamine
46. 2,4-Dinitrophenol
47. Malathion
48. Trichloronate
49. Endothall
50. Tepa
51. Methylacetophos
52. Oxydemetonmethyl

TABLE XIII (CONT.) - ACUTE TOXICITY RANKING OF POTENTIAL ORGANIC POLLUTANTS AS DETERMINED BY $LD_{50}$ IN MAMMALS USING ORAL ADMINISTRATION

50-99 mg/kg

53. Methyl demeton
54. Dinoseb
55. Diethyl mercury
56. Binapacryl
57. Cetyldimethyethylammonium bromide
58. Mesurol
59. Hercules 9699
60. Freon 253
61. Allyl Alcohol
62. Ciodrin
63. Streptomycin
64. Diazinon
65. Phenylhydrazine
66. Acrylonitrile
67. Dursban
68. Baygon
69. Hexachlorobutadiene
70. β-Naphthol
71. Paraquat
72. Lethane
73. Dichlorohydrin
74. Kepone
75. Apholate

100-199 mg/kg

76. 1,4-Butynediol
77. Ethylene dibromide
78. Imidan
79. Mobam
80. Carbaryl
81. Furfural
82. Quinone
83. Rotenone
84. α-Naphthol
85. Carbon Disulfide
86. Monochlorohydrin
87. Metepa
88. Epichlorhydrin
89. Perfluoroisobutenyl ethyl ether
90. Fenthion

200-299 mg/kg

91. HRS-1422
92. Pyrethrins
93. Quarternary pyridinium
94. Strobane
95. SD-8530
96. Ethyl mercuric chloride
97. Methyl perfluoromethylacrylate
98. Dimethylamine
99. Sterinol
100. Acrylic acid
101. Omite
102. Naled
103. Sumithion
104. m-Chloroaniline
105. Phostex
106. Carbathion
107. 1,2-Dichlorohexafluoro-cyclopentene-1
108. Pival
109. Dicapthon
110. Metham

TABLE XIII (CONT.) - ACUTE TOXICITY RANKING OF POTENTIAL ORGANIC POLLUTANTS AS DETERMINED BY $LD_{50}$ IN MAMMALS USING ORAL ADMINISTRATION

300-399 mg/kg

111. p-Chloroaniline
112. Methyl hexafluoroisobutyrate
113. 2,3,5-TBA
114. Mirex
115. Methylomethacrylamide
116. Dazomet
117. Hydroquinone
118. Nitrophenol
119. Nitrotoluol
120. Alkydimethylbenzyl ammonium chloride
121. β-Mercaptodiethylamine
122. Thiram
123. Pinene, polychloro
124. Chloronitrosocyclohexane
125. 2-Ethylbutylamine

400-499 mg/kg

126. Ethylamine
127. Diquat
128. Trichlorfon
129. 3,9-Diethyltridecyl-6-sulfate
130. Tetrachloropentane
131. m-Nitroaniline
132. p-Nitroaniline
133. Triethylamine
134. Ruelene
135. Methacrylamide
136. Dilan
137. Tetrachloroheptane
138. Dichlorocyclohexane

500-599 mg/kg

139. Dichlorobenzene
140. Sulfoxide
141. Diethylamine
142. Dibutylamine
143. Diisopropylamine
144. Chlorthion
145. Dimethyldithiocarbamate

600-699 mg/kg

146. Hexachlorocyclopentadiene
147. Tetrachloropropane
148. Isopropylamine
149. DDA
150. Butyl xanthogenate
151. Vetuzhsk Oil
152. Sesone
153. 7-Ethyl-2-methylundecil-4 sulfate
154. Ethylene dichloride
155. 3,4-Dichloroaniline
156. MCPB

TABLE XIII (CONT.) - ACUTE TOXICITY RANKING OF POTENTIAL ORGANIC POLLUTANTS AS DETERMINED BY $LD_{50}$ IN MAMMALS USING ORAL ADMINISTRATION

700-799 mg/kg

157. Phenanthrene
158. Nitrobenzene
159. Dodecyldiphenyl ether sulfonate
160. Tetrachloroethane
161. Quaternary ammonium chloride
162. Dichloroethane

800-899 mg/kg

163. Formaldehyde
164. Delrad
165. Nitroethane

900-999 mg/kg

166. Nitromethane
167. Folex
168. Tetrachlorononane
169. Butane
170. Methylhexafluoro-2-bromobutyrate

1000-2499 mg/kg

171. Diethyldithiophosphoric acid
172. Dimethyl resorcinols
173. Lauryl sulfate
174. IPC
175. Zineb
176. Abate
177. Octafluoroisobutyl methyl ether
178. Menazon
179. Tetrachlorobenzene
180. Chlorobenzilate
181. Morpholine
182. Heptafluoroisobutylene methyl ether
183. Phthalic acid
184. Morestan
185. Amitrole
186. Gardona
187. Dimethyl carbate
188. Anisole
189. Dibromoheptafluoroisobutyl methyl ether
190. Ethylenediamine
191. Lauryl alcohol EO
192. Lauryl alcohol sulfate EO
193. Tributyl phosphate
194. Dibutyl phthalate
195. 1,4-Butanediol
196. Quinaldine
197. Cyclohexanol
198. o-Nitroaniline
199. Diethyl maleate
200. Cheremichousk Tar
201. Diethanolamine
202. Dichlone
203. Polystyrene, cationic
204. Chloropropham
205. 2,3,6-TBA
206. Monoethanolamine
207. 2-Ethylhexyl sulfate
208. Thanite
209. Bromophos
210. Nonyl phenol EO

TABLE XIII (CONT.) - ACUTE TOXICITY RANKING OF POTENTIAL ORGANIC POLLUTANTS AS DETERMINED BY $LD_{50}$ IN MAMMALS USING ORAL ADMINISTRATION

1000-2499 mg/kg
continued

211. Vinyl acetate
212. Dimethylphenyl carbinol
213. Chloroform
214. Octylphenol EO
215. Chlorenanthic acid
216. Lauryl glyceryl ether sulfonate
217. Dioctyl succinate sulfonate
218. Isopropyl naphthalene sulfonate
219. Diethyltoluamide
220. Ethylphenylphenol sulfonate
221. Ovex
222. Sesame Oil
223. Alkyldimethylchlorobenzyl ammonium chloride
224. Decylbenzene sulfonate
225. Atrazine
226. Prometryne
227. Butylphenylphenol sulfonate
228. Naphthalene
229. Dodecylbenzene sulfonate
230. Aramite

2500-5000 mg/kg

231. MGK Repellent 11
232. 2,5-Dichloroaniline
233. Ethyl hexanediol
234. Hempa
235. Oleyl alcohol
236. Alkyl sulfonate
237. Lauric diethanolamide sulfonate
238. Butyl Alcohol
239. MGK 264
240. Chloropelargonic acid
241. Methyl benzoate
242. Hexachloroethane
243. Captan
244. Butyl acetate
245. Lauryl imidazoline
246. Dimethyl sulfide
247. Propyl alcohol
248. Butybiphenyl sulfonate
249. Diuron
250. Monuron
251. Methyl siliconate
252. Methyl ethyl ketone
253. Ferbam
254. Perthane
255. Dalapon
256. Oleoylmethyl tauride
257. Xylene
258. Cyclohexane
259. DCU
260. Propylisome
261. Methylstyrene
262. Simazine
263. Ethyl Acetate
264. Dimethrin
265. Methyl tetrafluoropropionate
266. Methoxychlor

TABLE XIII (CONT.) - ACUTE TOXICITY RANKING OF POTENTIAL ORGANIC POLLUTANTS DETERMINED BY $LD_{50}$ IN MAMMALS USING ORAL ADMINISTRATION

<u>>5000 mg/kg</u>

267. Ethylene gylcol
268. MGK Repellent 326
269. Benzene
270. Dichloromethane
271. Carbon tetrachloride
272. Neotran
273. Trichloroethylene
274. Chloroundecanoic acid
275. Sulfanilamide
276. Piperonyl butoxide
277. Fenuron
278. Toluene
279. Butyl mesityl oxide
280. Tabutrex
281. Triethanolamine
282. Stearoyl EO
283. Urea
284. Dimethylsulfoxide
285. Butoxy polypropylene glycol
286. Fatty acyl sorbitan EO
287. Hexafluoropropylmethyl ether

## TABLE XIV - RANKING OF REPORTED THRESHOLD DOSES OBTAINED BY CHRONIC ADMINISTRATION IN RATS

This table presents ranking of reported threshold doses which happen to have been obtained in rats as reported in the Russian literature. The small size of this table indicates that little has been published on chronic threshold doses of compounds which may appear in fresh water. There is a notable absence of pesticides except for carbathion and simazine which have a low ranking. Most of the other compounds in the table are common organics which share little in terms of structural similarity. A noteworthy feature is the presence of the three organometallic compounds: tetraethyltin, ethyl mercuric chloride and diethyl mercury at the top of the listing. The next compound listed has a 50-fold higher threshold dose in the listing of toxicity of these compounds. Alcohols, diols and chlorinated compounds are scattered throughout the list, as are aliphatic and aromatic amines. Threshold dose from chronic toxicity studies is an important means for arriving at quality criteria for chemicals in fresh water, the apparent incompleteness of this table indicates that efforts have not been particularly directed towards obtaining this information.

TABLE XIV - RANKING OF REPORTED THRESHOLD DOSES OBTAINED BY CHRONIC ADMINISTRATION IN RATS

| | mg/kg | mg/l |
|---|---|---|
| Tetraethyl tin | 0.00001 | 0.0002 |
| Ethylmercuric chloride | 0.00005 | 0.001 |
| Diethyl mercury | 0.00005 | 0.001 |
| Dimethylphenylcarbinol | 0.0025 | 0.05 |
| Heptyl alcohol | 0.0025 | 0.05 |
| Nonyl alcohol | 0.005 | 0.1 |
| Cyclohexane | 0.005 | 0.1 |
| Epichlorhydrin | 0.005 | 0.1 |
| Tetrachlorobenzene | 0.005 | 0.1 |
| Dimethylamine | 0.007 | 0.14 |
| Diisopropylamine | 0.025 | 0.5 |
| Monoethanolamine | 0.025 | 0.5 |
| 2,4-Dinitrophenol | 0.031 | 0.6 |
| Hexachlorobutadiene | 0.04 | 0.8 |
| Freon 253 | 0.05 | 1.0 |
| Ursol | 0.05 | 1.0 |
| Chloronitrosocyclohexane | 0.1 | 2.0 |
| Methylamine | 0.1 | 2.0 |
| Furan | 0.1 | 2.0 |
| Saponin | 0.1 | 2.0 |
| Carbon tetrachloride | 0.15 | 3.0 |
| Perfluorobutenyl ethyl ether | 0.15 | 3.0 |
| 1,4-Butynediol | 0.2 | 4.0 |
| Cyclohexanol | 0.2 | 4.0 |
| β-Naphthol | 0.2 | 4.0 |
| 2,5-Dichloraniline | 0.2 | 4.0 |
| 3,4-Dichloraniline | 0.2 | 4.0 |
| 1,2-Dichlorohexafluorocyclopentene-1 | 0.25 | 5.0 |
| Methoxypolypropylene | 0.25 | 5.0 |
| m-Chloroaniline | 0.25 | 5.0 |
| Isoprene | 0.25 | 5.0 |
| Diethylene glycol | 0.5 | 10.0 |
| Ethylene glycol | 0.5 | 10.0 |
| Carbathion | 0.5 | 10.0 |

TABLE XIV (CONT.) - RANKING OF THRESHOLD DOSES

| | mg/kg | mg/1 |
|---|---|---|
| Pinene, polychloro | 1.0 | 20.0 |
| Dimethyldithiocarbamate | 1.0 | 20.0 |
| 1,4-Butanediol | 3.0 | 60.0 |
| Isopropylamine | 6.0 | 120.0 |
| Vetluzhsk Oil | 10.0 | 200.0 |
| Simazine | 20.0 | 400.0 |
| 2-Hydroxysimazine | 50.0 | 1000.0 |
| Dimethylformamide | 50.0 | 1000.0 |

## REFERENCES


1. Abelson, P.H. Methyl mercury. *Science, 169(3942):*1, 1970.

2. Abramovich, G.A., R.S. Belova, L.V. Galuzova, I.V. Pal'mova, and V.P. Rassolova. Biological basis for the maximum permissible concentration of toluene in water. *Tr. Sarativsk. Inst. Gig. i Profpatol. 5:*37-42, 1959.

3. Abramovich, G.A., R.S. Belova, L.V. Galuzova, E.V. Pal'mova, and V.P. Rassolova. Limit of allowable toluol concentration in water. In: *U.S.S.R. Literature on Water Supply and Pollution Control* (Editor: B.S. Levine) *3:*52-57. Washington, D.C., U.S. Dept. of Commerce, 1962.

4. ABS (Alkylbenzenesulfonate) in drinking water in the United States. *J. Am. Water Works Assoc. 53:*297-300, 1961.

5. Aksenova, V.B. Comparative hygienic and sanitary-toxicological studies of herbicides (IPC and chloro-IPC) (isopropylphenylcarbamate and isopropyl N-(3-chlorophenyl)carbamate) in relation to their decomposition in reservoir waters. *Prom. Zagryazneniya Vodoemov. No. 9:*56-66, 1969.

6. Akulov, K.I. The maximum allowable concentration of methyl systox in reservoirs. *Sanit. Okhrana Voduemov ot Zagryazneniya Prom. Stochnymi Vodami No. 5:*107-128, 1962.

7. Akulov, K.I. and V.T. Manzaev. Experimental basis for the determination of maximal allowable phosphamide concentration in water bodies. In: *U.S.S.R. Literature on Water Supply and Pollution Control* (Editor: B.S. Levine) *9:*56-65. Washington, D.C., U.S. Dept. of Commerce, 1966.

8. Akulov, K.I. and V.T. Mazeav. Experimental basis for permissible concentrations of the organophosphorus compounds, bimethyl dichlorovinyl phosphate and trichlorometaphos-3 in reservoir waters. *Prom. Zagryazneniya Vodoemov No. 8:*21-32, 1967.

9. Alekseeva, N.P. Hygienic standardization of nitrobenzene in bodies of water. *Tr. Nauchn. Konf. Aspirantov i Ordinatorov*, pp.73-76, 1964.

10. Amer, S. Cytological effects of pesticides. I. mitotic effects of N-methyl-1-naphthyl carbamate "Sevin". *Cytologia (Tokyo) 30:*175-181, 1965.

11. Amer. S.M. and E.M. Ali. Cytological effects of pesticides. II. meiotic effects of some phenols. *Cytologic (Tokyo) 33:*21-33, 1968.

12. Amir, D. and R. Volcani. The effect of dietary ethylene dibromide on the testes of bulls. *Fertility and Sterility 18:*144-147, 1967.

13. Amirkhanova, G.F., Z.V. Latypova, and R.B. Tupeeva. Experimentally determined permissible concentration for ethylene propylene, butylene, and isobutylene in water bodies. *Sanit. Okhrana Vodoemov ot Zagryazneniya Prom. Stochnymi Vodami No. 7:*28-40, 1965.

14. Amirkhanova, G.F. and Z.V. Latypova. Experimental basis for the maximum permissible concentration of diethyl ether in reservoir waters. *Prom. Zagryazneniya Vodoemov No. 9:*148-157, 1969.

15. Amirkhanova, G.F. and Z.V. Latypova. Experimental basis for the maximum permissible concentration of acetaldehyde in reservoir waters. *Prom. Zagryazneniya Vodoemov No. 9:*137-147, 1969.

16. Ancusa, M. and A. Roscovanu. Some aspects of the pollution of surface waters with phenols and oil residues. *Igiena 15(12):*741-746, 1966.

17. Anderson, R.B. and H.W. Everhart. Concentration of DDT in landlocked salmon (salmo salar) at Sebago Lake, Maine. *Trans. Am. Fisheries Soc. 95(2):*160-164, 1966.

18. Aubin, A.E. The effect of an acute DDT exposure on the spontaneous electrical activity of goldfish cerebellum. *Can. J. Zool. 47(2):* 163-166, 1969.

19. Avraman, F.V. Experimental substantiation of the maximum permissible concentration of prometryn in water reservoirs. *Gigiena i Sanit. 33(2):*12-16, 1968.

20. Banerju, S.K. (reviewer). Detergents. *J. Water Pollution Control Federation 462(6):*939-948, 1968.

21. Barratt, R.W. and E.L. Tatum. Carcinogenic mutagens. *Ann. N. Y. Acad. Sci. 71:*1072-1084, 1958.

22. Bartha, R. Pesticide interaction creates hybrid residue. *Science 166:*1299-1300, 1969.

23. Barthel, W.F., D.A. Parsons, I.I. McDowell, and R.H. Crissinger. Surface hydrology and pesticides. A preliminary report on the analysis of sediments of the lower Mississippi River. In: *Symposium on Pesticides and Their Effect on Soil and Water,* pp.128-144. Columbus, Ohio, 1965.

24. Barthel, W.F., J.C. Hawthorne, J.H. Ford, G.C. Bolton, L.L. McDowell, E.H. Grissinger, and D.A. Parsons. Pesticides in water: Pesticide residues in sediments of the lower Mississippi River and its tributaries. *Pesticides Monitoring J. 3(1):*8-67, 1969.

25. Basler, E. and K. Nakazawa. Effects of 2,4-D on nucleic acids of cotton cotyledon tissue. *Botan. Gaz. 122:*228, 1961.

26. Beilikhis, G.A., N.P. Labisova, and A.M. Parshina. Waste water containing tetraethyl lead. In: *U.S.S.R. Literature on Water Supply and Pollution Control* (Editor: B.S. Levine) *1:*191-197. Washington, D.C., U.S. Dept. of Commerce, 1962.

27. Bekker, A.K. Information for the establishment of hygienic norms for potassium benzoate and methyl benzoate in inland waters. *Biol. Abstr. 49:*11271, 1968.

28. Belyaeva, N.G. Hygienic standardization of mezidine as an industrial contaminant of bodies of water. *Gigiena i Sanit. 34(1):*11-17, 1969.

29. Benville, P.E., Jr., C.E. Smith, and W.E. Shanks. Toxic effects of dinethyl sulfoxide on salmon and trout. *Toxicol. Appl. Pharmacol. 12:* 156-178, 1968.

30. Bitman, J., H.C. Cecil, S.J. Harris and G.F. Fries. DDT induces a decrease in eggshell calcium. *Nature 224:*44-46, 1969.

31. Black, A.P. and R.F. Christman. Chemical characteristics of fulvic acids. *J. Am. Water Works Assoc. 55(7):*897-912, 1963.

32. Bliokh, S.S. The pollution of water by carcinogenic substances. *Gigiena i Sanit. 30(4-6):*100-104, 1965.

33. Bonser, G.M., D.B. Clayson, and J.W. Jull. Experimental induction of bladder tumors. *Brit. Med. Bull. 14(2):*146-152, 1958.

34. Borneff, J. and R. Fischer. Carcinogenic substances in water and soil. XII. Polycyclic, aromatic hydrocarbons in surface water. *Arch. Hyg. Bakteriol. 146:*572-585, 1963.

35. Borneff, J. and H. Kunte. Kanzerogene substanzen in wasser und boden. *Arch. Hyg. Bakteriol. 148:*226-243, 1965.

36. Bradley, M.B. and J.C. Crane. The effect of 2,4,5-trichloropehnoxyacetic acid on the cell and nuclear size and endopolyploidy in parachyma of apricots. *Am. J. Botany 42:*273-281, 1955.

37. Breidenbach, A.W., C.G. Gunnerson, F.K. Kawahara, J.J. Lichtenberg, and R.S. Green. Chlorinated hydrocarbon pesticides in major river basins, 1957-1965. *Public Health Rept. 82(2):*139-156, 1967.

38. Breidenbach, A.W. and J.J. Lichtenberg. DDT and dieldrin in rivers: A report of the national water quality network. *Science 141(9):*899-901, 1963.

39. Brenner, T.E. Biodegradable detergents and water pollution. In: *Advances in Environmental Science* (Editors: J.N. Pitts and R.L. Metcalf), pp.151-196. Wiley-Interscience, New York, 1969.

40. Bridges, W.R. Effects of time and temperature on the toxicity of heptachlor and kepone to redear sunfish. *Paper Presented at Biological Problems In Water Pollution, Third Seminar, Robert A. Taft Sanitary Engineering Center, Cincinnati.* Environmental Health Series, pp.247-249. U.S. Dept. of Health Education and Welfare publication, 1962.

41. Brook, E.S., N.V. Klimkina, and V.A. Savelova. Experimental basis for the determination of AG-salt concentration in water bodies. In: *U.S.S.R. Literature on Water Pollution Control* (Editor: B.S. Levine), *9:*37-45. Washington, D.C., U.S. Dept. of Commerce, 1966.

42. Brown, E. and Y.A. Nishioka. Pesticides in water. *Pesticides Monitoring J. 1(2):*38-46, 1967.

43. Bruk, E.S., N.V. Klimkina, and V.A. Savelova. Permissible concentration of hexamethylenediamine in water bodies. *Sanit. Okhrana. Vodoemov ot Zagryaznenlya Prom. Stochnymi Vodami No. 7:*69-83, 1965.

44. Bruk, E.S., N.V. Klimkina, and V.A. Savelove. Permissible concentration of hexamethylenediamine adipate in water bodies. *Sanit Okhrana Vodoemov ot Zagraznenlya Prom. Stochnymi Vodami No. 7:*56-68, 1965.

45. Budeev, I.A. Maximum permissible concentration of p-benzoquinone dioxime in reservoir water. *Gigiena i Sanit. 29(10):*15-20, 1964.

46. Bul'bin, L.A. Maximum permissible concentration of butyl acetate in water. *Gigiena i. Sanit. 33(4-6):*23-27, 1968.

47. Cabejazek, I., M. Rybak, and S. Szulinski. Effects in warmblooded animals of thiometon (2-ethylthioethyl o,o-dimethyl-thiophosphate) ingested in drinking water. *Roczn. Zak. Hig. 18(3):*257-265, 1967.

48. Cabejszek, I., M. Rybak, B. Styczynski, and J. Wojak. Permissible concentration of aldrin in water. *Roxzniki Panstwowege Zakladu Hig. 15(5):* 503-512, 1964.

49. Carpenter, C.P., C.S. Weil, P.E. Palm, M.W. Woodside, J.H. Nair, III, and H.F. Smyth, Jr. Mamalian toxicity of 1-naphthyl-N-methylcarbamate (Sevin insecticide). *J. Agricultural and Food Chemistry 9(1):*30-39, 1961.

50. Casarett, L.J., G.C. Fryer, W.L. Yauger, and H.W. Klemmer. Organochlorine pesticide residues in human tissue--Hawaii. *Arch. Environ. Health 17(3):*306-311, 1968.

51. Chang, C.S. and A.B. Borkovec. Quantitative effects of TEPA, METEPA, and apholate on sterilization of male house flies. *J. Econ. Ent. 57:*480-490, 1964.

52. Chang, T.H. and W. Klassen. Comparative effects of tretamine, TEPA, apholate and their structural analogs on human chromosomes *in vitro*. *Chromosoma 24:*314-323, 1968.

53. Chapman, J.B. and P. Robson. Pentachlorophenol poisoning from bath water. *Lancet*, pp.1266-1267, 1965.

54. Chekal, V.N. Determination of the maximal permissible concentration of heptachlor in surface waters. *Gigiena i Sanit. 30(1-3):*334-338, 1965.

55. Cherkinskii, S.N. Principles for determination of maximal allowable concentrations. In: *U.S.S.R. Literature on Water Supply and Pollution Control* (Editor: B.S. Levine), *6:*131-144. Washington, D.C., U.S. Dept. of Commerce, 1964.

56. Cherkinskii, S.N., P.P. Dikun, and G.P. Yakoleva. Carcinogenic substances in the waste waters of industrial plants. *Gigiena i Sanit. 24(9):* 11-14, 1959.

57. Cherkinskii, S.N. and E.V. Faidysh. Comparative evaluation of the sensitivity of methods of finished and unfinished phagocytosis during the hygienic normalization of harmful substances in reservoir waters. *Prom. Zagryazneniya Vodoemov No. 9:*260-267, 1969.

58. Cherkinskii, S.N., E.V. Faidysh, and S.G. Davydova. Evaluation of the sensitivity of immunological tests for hygienic normalization of harmful substances in reservoir waters. *Prom. Zagryazneniya Vodoemov No. 8:*295-300, 1967.

59. Cherkinskii, S.N., S.N. Krasovskii, and V.N. Tugarinova. Sanitary-toxicological research for hygienic normalization of harmful compounds in reservoir waters. In: *U.S.S.R. Literature on Water Supply and Pollution Control* (Editor: B.S. Levine), *8:*172-178. Washington, D.C., U.S. Dept. of Commerce, 1964.

60. Cherkinskii, S.N., V.E. Miklashevskii, and F.G. Murzakaev. Ability to form new temporary associations as a test of chronic sanitary-toxicological experiment. *Sanit Okhrana Vodoemov ot Zagryazneniya Prom. Stochnymi Vodami No. 6:*323-340, 1964.

61. Cherkinskii, S.N., V.N. Tugarinova, and V.E. Miklashevskii. Functional tests in studies of sanitary-toxicological standardization. In: *U.S.S.R. Literature on Water Supply and Pollution Control* (Editor: B.S. Levine), *9:*190-196. Washington, D.C., U.S. Dept. of Commerce, 1966.

62. Chiu, Y.C., A. Hassan, F.E. Guthrie, and W.C. Dauterman. Studies on a series of branched-chain analogs of diethyl malathion and malaoxon with regard to toxicity and *in vitro* enzymatic reactions. *Toxicol. Appl. Pharmacol. 12:*219-228, 1968.

63. Cleaning our environment--the chemical basis for action. *Subcommittee on Environmental Inprovement, Committee on Chemistry and Public Affairs.* Washington, D.C., American Chemical Society, 1969.

64. Cleveland, F.P. A summary of work on aldrin and dieldrin toxicity at the Kettering Laboratory. *Arch. Environ. Health 13:*195-198, 1966.

65. Cohen, E.N., H.W. Brewer, J.W. Bellville, and R. Sher. The chemistry and toxicology of dichlorohexafluorobutene. *Anesthesiology 26:*140-153, 1965.

66. Cole, H., A. Bradford, D. Barry, P. Baumgarner, and D.E.H. Frear. Pesticides in hatchery trout--differences between species and residue levels occurring in commercial fish food. *Pesticides Monitoring J. 1(12):*35-37, 1967.

67. Colvin, H.J. and A.T. Phillips. Inhibition of electron transport enzymes and cholinesterases by endrin. *Bull. Environ. Contam. Toxicol. 3(2):*106-115, 1968.

68. Conzelman, G.M., Jr., et.al. Major urinary metabolites of 2-naphthylamine in dogs, monkeys, and mice. *Am. J. Vet. Res. 30(12):*2083-2090, 1969.

69. Cottam, C. Pesticides and water pollution. In: *Proceedings of the National Conference on Water Pollution,* pp.222-235. U.S. Dept. of Health Education and Welfare, Public Health Service, 1961.

70. Coulter, J.B. Water quality standards-salvation or curse. *Water Wastes Eng. 7:*12, 1970.

71. Croswell, H., W.L. Johnson, and A. Inglis. Organochlorine insecticide residues in fish (National Pesticide Monitoring Program). *Pesticides Monitoring J. 3(3):*145-171, 1969.

72. Curley, A. and R. Kimbrough. Chlorinated hydrocarbon insecticides in plasma and milk of pregnant and lactating women. *Arch. Environ. Health 18(2):*156-164, 1969.

73. Davies, J.E., W.F. Edmundson, N.J. Schneider, and J.C. Cassady. Pesticides in people--problems of prevalence of pesticide residues in humans. *Pesticides Monitoring J. 2(2):*805, 1968.

74. Davis, K.J. and O.G. Fitzhugh. Tumorigenic potential of aldrin and dieldrin in mice. *Toxicol. Appl. Pharmacol. 4:*187-189, 1962.

75. Davydova, S.G. Comparative hygienic and sanitation toxicological features of nitrochlorobenzene isomers for determination of their hygienic standard levels in water reservoirs. *Gigiena i Sanit. 32(8):*7-11, 1967.

76. Defoliants deformities: What risk? *Med. World News 15:*7, 1970.

77. Deichmann, W.B. and H.W. Gerarde. *Toxicology of Drugs and Chemicals.* Academic Press, New York and London, 1969.

78. Detergents as a health hazard. *Can. Med. Assoc. J. 90:*1089, 1964.

79. Dikun, P.P. and A.I. Makhinenko. Detection of 3,4-benzopyrene in the "Shist" plant resins, in its effluents and in water. *Gigiena i Sanit. 1:*10-12, 1963.

80. Dowden, B.F. and H.J. Bennett. Toxicity of selected chemicals to certain animals. *J. Water Pollution Control Federation 37(9):*1308-1316, 1965.

81. Drachev, S.M., A.A. Bylinkina, and V.F. Garshenina. The character and significance of surface-active agents in water. *Vysoke, Skoly. Chem-Technol. Praze. Technol. Vody 8(1):*161-166, 1965.

82. Drinking water standards, 1961. *J. Am. Water Works Assoc. 53(8):*935-945, 1961.

83. Durham, W.F. Pesticide exposure levels in man and animals. *Arch. Environ. Health 10:*842-846, 1965.

84. Durham, W.F. Body burden of pesticides in man. In: *Biological Effects of Pesticides in Mammalian Systems. Ann. N.Y. Acad. of Sci. 160:*183-195, 1969.

85. D'yachkov, V.I. Experimental data to substantiate the hygienic standard levels of diethanolamine and triethanolamine in water bodies. *Gigiena i Sanit. 29(11):*25-31, 1964.

86. D'yachkov, V.I. Comparative hygienic and sanitary-toxicological studies of di- and triethanolamines in relation to their normalization in reservoir waters. *Prom. Zagryazneniya Vodoemov No. 9:*105-118, 1960.

87. Dyatlovitskaya, F.G. Determination of pyridine bases in industrial sewage. In: *U.S.S.R. Literature on Water Supply and Water Pollution Control* (Editor: B.S. Levine), *2:*118-122. Washington, D.C., U.S. Dept. of Commerce, 1962.

88. Dzhanashvili, G.D. Hygienic substantiation of the maximum permissible content of dimethylamine in water reservoirs. *Gigiena i Sanit. 32(6):* 12-18, 1967.

89. Dzhanashvili, G.D. Maximum permissible concentration of dimethylamine in water bodies. *Gigiena i Sanit. 32(4-6):*329-335, 1967.

90. Ecological effects of pesticides assessed. *Environ. Currents 3(7):*619-621, 1969.

91. Edmundson, W.F., J.E. Davies, and W. Hull. Dieldrin storage levels in necropsy adipose tissue from a South Florida population. *Pesticides Monitoring J. 2(2):*86-92, 1968.

92. Ekshtat, B.Ya. Maximum permissible concentrations of hydrazine hydrate and phenylhydrazine in water bodies. *Gigiena i Sanit. 30(7-9):*191-197, 1965.

93. Ekshtat, B.Ya. Experimental basis for the maximum permissible concentrations of hydrazine hydrate and phenylhydrazine in reservoir waters. *Prom. Zagryazneniya Vodoemov No. 9:*186-200, 1969.

94. Elozarova, O.N., A.I. Kuper, L.V. Zhidkova, A.A. Khutoriansii, and K.O. Lastochkina. Experimental basis for the permissible concentration of norsulfazole in reservoir waters. *Prom. Zagryazneniya Vodoemov No. 8:* 219-232, 1967.

95. Epstein, S.S. A family likeness. *Environment 12(6):*16-25, 1970.

96. Epstein, S.S. and H. Shafner. Chemical mutagens in the human environment. *Nature 219:*385-387, 1968.

97. Ershova, K.P. Carcinogenic pollution of water by effluents from petroleum refineries. *Gigiena i Sanit. 33(1-3):*268-270, 1968.

98. Ettinger, M.B. and D.I. Mount. A wild fish should be safe to eat. *Environ. Sci. Tech 3(12):*203-205, 1967.

99. Ezrokh, T.I. Experimental data for basing the maximum permissible concentration of sulfanilamide preparations in water basins. *Gigiena i Sanit. 31(3):*11-15, 1966.

100. Falk, H.L., S.J. Thompson, and P. Kotin. Carcinogenic potential of pesticides. *Arch. Environ. Health 10:*847-858, 1965.

101. Faust, S.D. Pollution of the water environment by organic pesticides. *Clin. Pharmacol. Therap. 5(6):*677-686, 1964.

102. Faust, S.D. and O.M. Aly. Water pollution by organic pesticides. *J. Am. Water Works Assoc. 56(3):*267-279, 1964.

103. Faust, S.D. and P.W. Anderson. Factors influencing the condensation of 4-aminoantipyrine with derivatives of hydroxybenzene. III. A study of phenol content in surface waters. *Water Res. 2(9):*515-525, 1968.

104. Fedyanina, V.N. Sanitary toxicological investigations of diphenylolpropane; standarization of its content in water. *Gigiena i Sanit. 33(7):*25-30, 1968.

105. Fedyanina, V.N. Sanitary toxicological investigations of epichlorhydrin as a basis for the establishment of its standard concentration in bodies of water. *Gigiena i Sanit. 33(1-3):*52-57, 1968.

106. Fischer, H.D. and H. Walther. Acute toxicity of some aliphatic fluorine compounds. *Toxicol. Appl. Pharmacol. 14(1):*114-117, 1969.

107. Fitzhugh, O.G. and A.A. Nelson. The chronic oral toxicity of DDT (2,2-bis(p-chlorophenyl-1.1.1-trichloroethane). *J. Pharmacol. Exp. Therap. 89:*18-30, 1947.

108. Fomenko, V.N. Determination of the maximal permissible concentration of tetrachlorobenzene in water basins. *Gigiena i Sanit. 30(1-3):*8-15, 1965.

109. vonFrank, A.J. Where are water quality standard heading? *Water Wastes Eng. 6:*16-18, 1969.

110. Frank, P.A., R.H. Hodgson, and R.D. Comes. Residues of two herbicides in water in irrigation canals. *Weeds 15(4):*353-355, 1967.

111. Fridlyand, S.A. and G.H. Krasovskii. Experimental determination of allowable Veluzhsk Oil concentration in water basins. In: *U.S.S.R. Literature on Water Supply and Pollution Control* (Editor: B.S. Levine) *5:*129-136. Washington, D.C., U.S. Dept. of Commerce, 1962.

112. Gabrilevskaya, L.N. Maximum allowable concentration of karbofos in reservoirs. *Sanit. Okhana Vodoemov ot Zagryazneniya Prom. Stochnymi Vodami No. 4:*208-217, 1960.

113. Gabrilevskaya, L.N. and V.P. Laskina. The maximum allowable concentration of dimethyl dithiophosphoric acid in reservoir water. *Sanit. Okhrana Vodoemov ot Zagryazneniya Prom. Stochnymi Vodami No. 5:*187-200, 1962.

114. Gabrilevskaya, L.N. and V.P. Laskina. Maximal permissible β-Mercapto-diethylamine concentration in natural water bodies. In: *U.S.S.R. Literature on Water Supply and Pollution Control* (Editor: B.S. Levine) *8:*100-107. Washington, D.C., U.S. Dept. of Commerce, 1966.

115. Gabrilevskaya, L.N. and V.P. Laskina. Maximum permissible concentration of pentachlorophenol and sodium pentachlorophenolate in water reservoirs. *Sanit. Okhrana Vodoemov ot Zagryazneniya Prom. Stochnymi Vodami No. 7:* 129-142, 1965.

116. Gabrilevskaya, L.N. and V.P. Laskina. Experimental basis for the permissible concentration of isopropylamine in reservoir waters. *Prom. Zagryazneniya Vodoemov No. 8:*46-60, 1967.

117. Gabrilevskaya, L.N. and V.P. Laskina. Experimental determination of permissible concentration of monoethylamine in water bodies. *Sanit. Okhrana Vodeomov ot Zagryazneniya Prom. Stochnymi Vodami No. 7:*99-112, 1965.

118. Gabrilevskaya, L.N. and V.P. Laskina. The maximum allowable concentration of potassium diisopropyl dithiophosphate in the water of reservoirs. *Sanit. Okhrana Vodoemov ot Zagryazneniya Prom. Stochnymi Vodami No. 5:*219-232, 1962.

119. Gabrilevskaya, L.N. and V.P. Laskina. The maximum allowable concentration of diethyl dithiophosphorix acid and its potassium salt in reservoirs. *Sanit. Okhrana Vodoemov ot Zagryazneniya Prom. Stochnymi Vodami No. 5:*201-218, 1962.

120. Gabrilevskaya, L.N. and V.P. Laskina. Experimental basis for the maximum permissible concentrations of di- and trichlorophenol in reservoir waters. *Prom. Zagryazneniya Vodoemov No. 9:*128-136, 1969.

121. Gabrilevskaya, L.N., V.P. Laskina, and E.V. Faidysh. Experimental basis for the maximum permissible concentration of dicyandiamide in reservoir waters. *Prom. Zagryazneniya Vodoemov No. 9:*96-104, 1969.

122. Gabrilevskaya, L.N., V.P. Laskina, and E.V. Faidysh. Experimental basis for permissible concentration of hydroquinone in bodies of water. *Sanit. Okhrana Vodoemov ot Zagryazneniya Prom. Stochnymi Vodami No. 7:*129-142, 1965.

123. Gabrilevskaya, L.N., V.P. Laskina, and E.V. Faidysh. Experimental basis for the permissible concentration of sevin in reservoir waters. *Prom. Zagryazneniya Vodoemov No. 8:*33-45, 1967.

124. Gaines, T.B. Acute Toxicity of pesticides. *Toxicol. Appl. Pharmacol. 14(3):*515-555, 1969.

125. Gakstatter, J.H. The uptake from water by several species of fresh-water fish of p,p'-DDT, dieldrin and lindane; their tissue distribution and elimination rate. *Diss. Abstr. 27(11):*3820B, 1967.

126. Galuzova, L.V. Hygienic basis for determination of the limit allowable concentration of dinitrotoluol in water bodies. *Gigiena i Sanit. 28:* 35-40, 1963.

127. Garshenin, V.F. Admissible threshold concentrations of alkylbenzenesulfonate and alkanesulfonate in water bodies. *Maslob. Zhir. Prom. 29(10):* 20-23, 1963.

128. Gaufin, A.R., L. Jensen, and T. Nelson. Bioassays determine pesticide toxicity to aquatic invertebrates. *Water Sewage Works 108(9):*355-359, 1961.

129. Gavrilova, L.I. Experimental substantiation of the permissible concentration of 2,4-dichlorophenoxygamma-butyric (db) acid in water bodies. *Gigiena i Sanit. 29:*11-16, 1964.

130. Gebhardt, D.O.E. and M.J. vanLogten. The chick embryo test as used in the study of the toxicity of certain dithiocarbamates. *Toxicol. Appl. Pharmacol. 15(3):*316-324, 1969.

131. vanGendersen, H. and G.J. vanEsch. Toxicity of the herbicide dichlobenil (2,6-dichlorobenzonitrile) and its main metabolites. *Food Cosmet. Toxicol. 6:*261-269, 1968.

132. Goeva, O.E. Experimental determination of maximal allowable concentrations of surface active substances OP-7 and OP-10 in natural water basins. In: *U.S.S.R. Literature on Water Supply and Pollution Control* (Editor: B.S. Levine) *5:*119-128. Washington, D.C., U.S. Dept. of Commerce, 1962.

133. Goeva, O.E. Maximum permissible concentration of vinyl acetate in water basins. *Gigiena i Sanit. 31(8):*209-214, 1969.

134. Goeva, O.E. Hygienic foundations for a norm for vinyl acetate concentrations in water basins. *Materialy Resp. Itog. Nauchn. Konf. p.o. Gig.:* 44-45, 1963.

135. Goeva, O.E. Data to substantiate the maximum permissible concentration of vinyl acetate in water bodies. *Gigiena i Sanit. 31(8):*19-24, 1966.

136. Goeva, O.E. Permissible concentration of acrolein in bodies of water. *Tr. Leningrad. Sanit. Gig. Med. Inst. 81(58):*63, 1965.

137. Gorecik, B. Phenols in tannery sewage. *Przegl. Skorzany 4:*86-90, 1964.

138. Goryainova, T.S. Harmful properties of synthetic surfactants. *Gigiena i Sanit. 33(1-3):*81-85, 1968.

139. Green, R.S., C.G. Gunnerson, and J.J. Lichtenberg. Pesticides in our national waters. In: *Agriculture and the Quality of Our Environment* (Editor: N.C. Brady) pp.137-156. AAAS Publ. 85, 1966.

140. Greichus, Y.A., A Greichus, and E.G. Reider. Residues in fish, wildlife, and estuaries. *Pesticide Monitoring J. 2(2):*90-92, 1968.

141. Gross, H. Increase in phenol concentration of the bank-filtered water of the Rhein at Ludwigshaven. *Gas-Wasserfach 104(30):*850, 1963.

142. Gruchow, N. Curbs of 2,4,5-T use imposed. *Science 168:*413, 1970.

143. Gurfein, L.N. and Z.K. Pavlova. Limits of allowable concentrations of chlorinated benzenes in water basins. In: *U.S.S.R. Literature on Water Pollution Control* (Editor: B.S. Levine) *3:*58-65. Washington, D.C., U.S. Dept. of Commerce, 1962.

144. Gurfein, L.M., Z.K. Pavlova, S.S. Iofan, and T.A. Bashmakova. The limit of allowable nitrochlorobenzene concentration in water basins. In: *U.S.S.R. Literature on Water Supply and Pollution Control* (Editor: B.S. Levine) *3:*65-72. Washington, D.C., U.S. Dept. of Commerce, 1962.

145. Hansen, C.A. Standards for drinking water and direct reuse. *Water and Wastes Eng. 6:*44-45, 1969.

146. Harmeson, R.H. and T.E. Larson. Quality of surface water in Illinois. *U.S. Clearinghouse Fed. Sci. Tech. Inform. PB-185847,* 1969.

147. Hartung, H.O., H.A. Faber, H.E. Hudson, P.W. Kabler, W.W. Sanderson, D. Williams, and R.L. Woodward. Physiologic and health aspects of water quality. *J. Am. Water Works Assoc. 53:*1354-1360, 1961.

148. Hartwell, J.L. Survey of compounds which have been tested for carcinogenic activity. *Washington, D.C., U.S. Government Printing Office, PHS NO. 149,* 1951.

149. Hashimoto, Y. and J. Fukami. Toxicity of orally and topically applied pesticide ingredients to carp. *Bochu-Kagaku 34(2):*63-66, 1969.

150. Hassan, A. and W.C. Dauterman. Studies on the optically active isomers of 0,0-diethyl malathion and 0,0-diethyl maloxon. *Biochem. Pharmacol. 17:* 1431-1439, 1968.

151. Hayes, W. and W.E. Dale. Storage of insecticides in French people. *Nature 199:*1189-1191, 1963.

152. Heath, R.G., S.W. Spann, and J.F. Kreitzer. Marked DDE impairment of mallard repreduction in controlled studies. *Nature 224:*47-48, 1969.

153. Heinz, H.J. and W.K. Fischer. Detergent in water and sewage. *Fette, Seif Anstrichmittel 64:*270-279, 1962.

154. Henderson, C., Q.H. Pickering, and J.M. Cohen. The toxicity of synthetic detergents and soaps to fish. *Sewage and Ind. Wastes 31(3):*295-306, 1959.

155. Henderson, G.I. and D.E. Wooley. Studies on the relative insensitivity of the immature rat to the neurotoxic effects of 1,1-trichloro-2,2-bis (p-chlorophenyl)ethane (DDT). *J. Pharmacol. Exp. Therap. 170(1):*173-180, 1969.

156. Herman, S.G., R.L. Garrett, and R.L. Rudd. Pesticides and the western grebe. In: *Chemical Fallout* (Editors: M.W. Miller and G.G. Berg) pp.24-53. Charles C. Thomas, Springfield, Illinois, 1968.

157. Hobbie, J.E. Glucose and acetate in fresh water; concentrations and turnover rates. In: *Proceedings of IPB (Int. Biol. Programme) Symp. on Chemical Environment of the Aquatic Habitat* (Editor: H.L. Golterman) pp.245-251. Uitgevers Maatschappij, Amsterdam, 1966.

158. Hodge, H.C., E.A. Maynard, and H.J. Blanchet. Chronic oral toxicity tests of methoxychlor (2,2-di-(p-methoxyphenyl)-1,1,1-trichloroethane) in rats and dogs. *J. Pharmacol. Exp. Therap. 104:*60-66, 1952.

159. Hodge, H.C., E.A. Maynard, W.L. Downs, R.C. Coyle, Jr., and L.T. Steadman. Chronic oral toxicity of ferric dimethyldithiocarbamate (Ferbam) and zinc dimethyldithiocarbamate (Ziram). *J. Pharm. Exp. Therap. 118:*174-181, 1956.

160. Hoffman, W.S., H. Adler, W.I. Fishbein and F.C. Bauer. Relation of pesticide concentrations in fat to pathological changes in tissues. *Arch. Environ. Health 15(6):*758-765, 1967.

161. Hokanson, K.E.F. The effects of synthetic detergents on the early life history of the bluegill *Lepomis Macrochirus* (Rafinesque), in the upper Mississippi River. *Dissert. Abstracts 29B(3):*1212B, 1968.

162. Hopkins, O.C. Attitude of U.S. Public Health Service in development of drinking water standards, 1961. *J. Am. Water Works Assoc. 53:*946-950, 1961.

163. Hopkins, O.C. and O. Gullans. Water quality standards. *J. Am. Water Works Assoc. 52:*1159-1168, 1960.

164. Hueper, W.C. Carcinogenic studies on isopropyl-N-phenyl-carbamate. *Ind. Med. Surg. 21:*71-74, 1952.

165. Hueper, W.C. and W.W. Payne. Carcinogenic effects of adsorbates of raw and finished water supplies. *Am. J. Clin. Pathol. 39:*475-481, 1963.

166. Il'nitskii, A.P. and S.N. Varshavskaya. Water as a factor in spreading carcinogens in the environment. *Gigiena i Sanit. 29(9):*88-94, 1964.

167. Innes, J.R.M., B.M. Ulland, M.G. Valerio, L. Petrucelli, L. Fishbein, E.R. Hart, A.J. Pallotta, R.R. Bates, H.L. Falk, J.J. Gart, M. Klein, I. Mitchell, and J. Peters. Bioassay of pesticides and industrial chemicals for tumorigenicity in mice: A preliminary note. *J. Nat. Cancr. Inst. 42:*1101-1114, 1969.

168. *International Standards for Drinking Water, Second Edition.* World Health Organization, Geneva, 1963.

169. Irukayama, K. The pollution of Minamata Bay and Minamata disease. In: *Advances in Water Pollution Research*, J.P. Maroto and F. Josa (Co-Chairmen) pp.153-180. Washington, D.C., Water Pollution Control Federation, 1967.

170. James, G.V. *Water Treatment: A Guide to the Treatment of Water and Effluent Purification*, pp.177-194. The Technical Press, Ltd., London, 1965.

171. Johnson, C.C. USPHS potable water survey. *Water Wastes Eng. 7:*56, 1970.

172. Johnson, C.C. The PHS position on public water supply. *Water Wastes Eng. 6:*45-50, 1969.

173. Jones, K.H., D.M. Sanderson, and D.N. Noakes. Acute toxicity data for for pesticides. *World Reveiw of Pest Control 7(3):*135-143, 1968.

174. Jones, J.R.E. *Fish and River Pollution*, pp.118-153. Butterworths, London, 1964.

175. Kachatryan, M.K. Experimental determination of limit of allowable concentration of dichlorbutane in natural water basin. In: *U.S.S.R. Literature on Water Supply and Pollution Control* (Editor: B.S. Levine) *5:*22-30. Washington, D.C., U.S. Dept. of Commerce, 1962.

176. Kagan, G.Z. The determination of the maximum permissible concentrations of diethylamine and triethylamine in bodies of water. *Gigiena i Sanit. 30 (7-9):*351-356, 1965.

177. Kagan, G.Z. Use of an electroencephalographic method in a long-term sanitary toxicological experiment. *Prom. Zagryazneniya Vodoemov No. 9:* 233-245, 1969.

178. Karmazin, V.E. Effect of allyl alcohol and allyl chloride on the general sanitary system of reservoirs and on animals. *Vopp. Kommunal Gig. No. 6:* 108-111, 1966.

179. Karamazin, V.E. Establishing hygienic norms for allyl alcohol and allyl chloride in inland waters. *Biol. Abstr. 49:*11271-11272, 1968.

180. Kazakova, M.I., M.S. Chizhevskaya, and G.A. Kalashnikova. Contents of certain trace elements and toxic substances in the water of the Kana River in the region of Perm. *Tr. Perm. Med. Inst. 61:*210-216, 1965.

181. Kelus, J. Removal of phenol and cresol from water by permanganate. *Roczniki Panstwowege Zaklady Hig. 19(5):*525-530, 1968.

182. Kenaga, E. Tordon herbicides - evaluation of safety to fish and birds. *Down Earth 25(1):*5-9, 1969.

183. Kennedy, G., O.E. Fancher, and J.C. Calandra. An investigation of the teratogenic potential of captan, folpet, and difolatan. *Toxicol. Appl. Pharmacol. 13:*420-430, 1968.

184. Khachatryan, M.K. The maximum allowable concentration of dichlorobutene in reservoir waters. *Sanit. Okhrana Vodoemov ot Zagryazneniya Prom. Stochnymi Vodami No. 5:*44-62, 1962.

185. Khachatryan, M.K. and T.A. Asmangulyan. Maximum allowable concentration of chloroprene in reservoirs. *Sanit. Okhrana Vodoemov ot Zagryazneniya Prom. Stochnymi Vodami No. 4:*169-176, 1960.

186. Khamuev, G.D. The maximum permissible concentration of p-chloroaniline and m-chloroaniline in water bodies. *Gigiena i Sanit. 32(1-3):*15-20, 1967.

187. Khera, K.S. and L.L. Whitta. Perinatal toxicity of pesticides. *Can. Med. Assoc. J. 100:*167-172, 1969.

188. Kitamoto, O., et.al. Diseases due to environmental disturbances chemicals. *Naika 21:*933-950, 1968.

189. Kleinert, S.J., P.E. Degurse, and T.L. Wirth. Occurrence and significance of DDT and dieldrin residues in Wisconsin fish. *Wis. Dep. Natur. Resour. Tech. Bull. 41:*1-44, 1968.

190. Klimkina, N.V. Hygienic standards for harmful waste products of the synthetic isoprene rubber industry contained in water basins. In: *U.S.S.R. Literature on Water Supply and Pollution Control* (Editor: B.S. Levine) *1:* 182-191. Washington, D.C., U.S. Dept. of Commerce, 1961.

191. Klimkina, N.V. Experimental determination of limit of allowable concentration of isoprene in natural basin water. In: *U.S.S.R. Literature on Water Supply and Pollution Control* (Editor: B.S. Levine) *5:*13-22. Washington, D.C., U.S. Dept. of Commerce, 1962.

192. Klimkina, N.V. Experimental determination of limit of allowable dimethyldioxane concentrations in water basins. In: *U.S.S.R. Literature on Water Supply and Pollution Control* (Editor: B.S. Levine) *5:*1-12. Washington, D.C., U.S. Dept. of Commerce, 1962.

193. Klimkina, N.V. The maximum allowable concentration of dimethyldioxane in reservoir water. *Sanit. Okhrana Vodoemov ot Zagryazneniya Prom. Stochnymi Vodami No. 5:*7-27, 1962.

194. Klimkina, N.V. The maximum allowable concentration of isoprene in reservoir water. *Sanit. Okhrana Vodoemov ot Zagryazneniya Prom. Stochnymi Vodami No. 5:* 28-43, 1962.

195. Klimkina, N.V., Z.N. Boldina, and A.N. Sergeev. Experimental basis for the maximum permissible content of acrylic acid in reservoir waters. *Prom. Sagryazneniya Vodoemov No. 9:*137-147, 1969.

196. Klimkina, N.V. and E.S. Bruk. Experimental basis for the permissible concentration of adiponitrile in reservoir waters. *Prom. Zagryazneniya Vodoemov No. 8:*85-100, 1967.

197. Knyshova, S.P. Biological effect and the hygienic significance of 1,4-butynediol and 1,4-butanediol. *Gigiena i Sanit. 33(1):*37-41, 1968.

198. Kochkin, V.P. Experimental data for hygienic standardization of dalapon contents in water bodies. *Gigiena i Sanit. 32(2):*7-11, 1967.

199. Kochkin, V.P. The maximum permissible concentration of dalapon in water bodies. *Gigiena i Sanit. 32(1-3):*164-175, 1967.

200. Kokke, R. DDT: Its action and degredation in bacterial populations. *Nature 226:*977-978, 1970.

201. Koptyaev, V.G. Experimental determination of the maximum permissible concentration of dimethyl sulfide in water bodies. *Gigiena i Sanit. 32(1-3):* 15-20, 1967.

202. Korolev, A.A. Maximum permissible concentration of acetophos and methylacetophos in water bodies. *Gigiena i Sanit. 30(7):*9-14, 1965.

203. Kosachevskaya, P.I. Toxic properties of nitrotoluene as a factor of pollution of reservoirs with waste water. *Vrachebnoe Delo 2:*104-107, 1967.

204. Kosachevskaya, P.I. Hygienic norms of o-, m-, and p-nitrotoluol in reservoir waters. *Vrachebnoe Delo 3:*101-104, 1966.

205. Kostovetskii, Ya.I., K.F. Meleshchenko, I.M. Karandakova, and Z.I. Holdakova. Experimental data on the normalization of nonyl alcohol in reservoir waters. *Vop. Kommunal. Gig. 6:*66-70, 1966.

206. Kostovetskii, Ya.I., E.V. Lisovskaya, F.G. Dyatlovitskaya, and R.M. Surkina. The maximum allowable concentrations of chloronitrosocyclohexane and dichlorocyclohexane in reservoir waters. *Sanit. Okhrana Vodoemov ot Zagryazeniya Prom. Stochnymi Vodami No. 5:*94-106, 1962.

207. Kostovetskii, Ya.I. Experimental determination of limits of allowable concentrations of chloronitorsocyclohexane and dichlorocyclohexane in open basin water. In: *U.S.S.R. Literature on Water Supply and Pollution Control* (Editor: B.S. Levine) *5:*49-56. Washington, D.C., U.S. Dept. of Commerce, 1962.

208. Krasovskii, S.N. Recommended basic procedure for conducting acute experiments and methods for the evaluation of the results. In: *U.S.S.R. Literature on Water Supply and Pollution Control* (Editor: B.S. Levine) *9:* 166-171. Washington, D.C., U.S. Dept. of Commerce, 1966.

209. Krasovskii, G.N. and S.A. Fridlyand. Maximum permissible concentration of the GKZh-94 liquid in reservoir waters. *Gig. Otsenka Khim. Faktorov Vnesh Sredy* pp.10-12, 1966.

210. Krasovskii, G.N. and S.A. Fridlyand. Experimental basis for the permissible concentration of mono- and dichlorohydrin in reservoir waters. *Prom. Zagryazneniya Vodoemov No. 8:*129-139, 1967.

211. Krasovskii, G.N. and S.A. Fridlyand. Experimental determination of the maximal allowabel concentration of Cheremkhovsk Tar intermediate fraction in water basins. In: *U.S.S.R. Literature on Water Supply and Pollution Control* (Editor: B.S. Levine) *5:*137-145. Washington, D.C., U.S. Dept. of Commerce, 1962.

212. Krasovskii, G.N. and S.A. Fridlyand. The experimental basis for the maximum allowable concentration of sodium methysiliconate in inland waters. *Ref Zh Otd Vyp Farmakol Khimioter Sredstva Toksikol No. 11.54.976*, 1967.

213. Krasovskii, G.N. and S.P. Spasskii. Experimental determination of the limit of allowable polychloropinene concentration in natural water basins. In: *U.S.S.R. Literature on Water Supply and Pollution Control* (Editor: B.S. Levine) *5:*88-97. Washington, D.C., U.S. Dept. of Commerce, 1962.

214. Krishnaswami, S.K. Suggested raw water quality goals. *Water Pollution and Control 107(3):*31-35, 1969.

215. Kudrin, L.V. Experimental basis for the determination of maximal permissible omega-chlorocarboxylic acids concentration in natural water bodies. In: *U.S.S.R. Literature on Water Supply and Pollution Control* (Editor: B.S. Levine) *8:*57-59. Washington, D.C., U.S. Dept. of Commerce, 1966.

216. Kraizman, P.S. Maximum allowable concentration of saponin in reservoirs. *Sanit. Okhrana Vodoemov ot Zagryazneniya Prom. Stochnymi Vodami No. 4:* 254-263, 1960.

217. Kuper, A.I. and V.F. Ozerova. Experimental basis for the permissible concentration of aniline in reservoir waters. *Prom. Zagryazneniya Vodoemov No. 8:*156-169, 1967.

218. Kutakov, K.V. Comparative sanitary and toxicological characteristics of esters of thiophosphoric acid in connection with the sanitary control of water bodies. *Gigiena i Sanit. 33(12):*13-18, 1968.

219. Kutepov, E.N. Experimental data for the establishment of standards for carbon tetrachloride in bodies of water. *Gigiena i Sanit. 33(1-3):*35-41, 1968.

220. Kuznetsov, P.I. Hygienic substantiation of the maximum permissible concentration of furfural in reservoirs. *Gigiena i Sanit. 32(5):*7-11, 1967.

221. Kvitnitskaya, N.N., V.M. Orlovakii, and L.V. Grigor'eva. Hygienic evaluation of the ethyl acetate pollution of open reservoirs. *Vop. Kommunal Gig. 6:* 19-24, 1966.

222. Larson, P.S., E.M. Crawford, R.B. Smith, G.R. Hennegar, H.B. Haag, and J.K. Finnegan. Chronic toxicological studies on isopropyl-N-(3-chlorophenyl) carbamate (CICP). *Toxicol. Appl. Pharmacol. 2:*659-673, 1960.

223. Laskina, V.P. Limits of allowable mercaptophos concentration in water basins. In: *U.S.S.R. Literature on Water Supply and Pollution Control* (Editor: B.S. Levine) *3:*126-134. Washington, D.C., U.S. Dept. of Commerce, 1962.

224. Lauer, G.J., H.P. Nicholson, W.S. Cox, and J.I. Teasley. Pesticide contamination of surface waters by sugar cane farming in Louisiana. *Trans. Am. Fisheries Soc. 95(3):*310-316, 1966.

225. Legator, M., F.J. Kelly, S. Green, and E.J. Oswald. Mutagenicity of Captan. *Ann. N. Y. Acad. Sci. 160:*344-351, 1969.

226. Lemke, R.E. and D.I. Mount. Some effects of alkylbenzene sulfonate of the bluegill, *Lepomis Macrochirus*. *Trans. Am. Fisheries Soc. 92(4):*372-378, 1963

227. Levine, B.S. (Editor). Maximal permissible conentration of harmful substances in bodies of water used for general consumption. In: *U.S.S.R. Literature on Water Supply and Pollution Control 4:*18-20. Washington, D.C., U.S. Dept. of Commerce, 1962.

228. Limits of allowable concentrations of Harmful substances in natural water bodies used for sanitary-domestic purposes. In: *U.S.S.R. Literature on Water Supply and Pollution Control* (Editor: B.S. Levine) *8:*212-215. Washington, D.C., U.S. Dept. of Commerce, 1966.

229. Lisovskaya, E.V., F.G. Dyatlovitskaya, S.K. Potemkina, and L.A. Tomashevskaya. Experimental data for establishment of the permissible concentration of maleic acid in the water of water basins. *Sanit. Okhrana Vodoemov ot Zagryazeniya Prom. Stocknymi Vodami.* pp.346-356, 1964.

230. Lisovskaya, E.V., Ya.I. Kostovetskii, and F.G. Dyatlovitskaya. Hygienic standardization of chloronitrosocyclohexane, dichlorocyclohexane simultaneously present in water bodies. In: *U.S.S.R. Literature on Water Supply and Pollution Control* (Editor: B.S. Levine) *8:*162-166. Washington, D.C., U.S. Dept. of Commerce, 1966.

231. Lisovskaya, E.V. Limit of allowable metaphos concentration in water basins. In: *U.S.S.R. Literature on Water Supply and Pollution Control* (Editor: B.S. Levine) *3:*112-119. Washington, D.C., U.S. Dept. of Commerce, 1962.

232. Lisovskaya, E.V., F.G. Dyatlovskaya, and L.V. Tomashevskaya. Basic experimental data for the determination of maximal allowable maleic anhydride concentration in natural water reservoirs. In: *U.S.S.R. Literature on Water Supply and Pollution Control* (Editor: B.S. Levine) *7:*78-82. Washington, D.C., U.S. Dept. of Commerce, 1963.

233. Loshakov, Yu.T. Hygienic principles underlying the determination of allowable concentration limits of flotoreagents (butyl xanthogenate, cresyl dithiophosphate, pine oil and terpineol) in water basins. In: *U.S.S.R. Literature on Water Supply and Pollution Control* (Editor: B.S. Levine) *2:*160-167. Washington, D.C., U.S. Dept. of Commerce, 1962.

234. Loshakov, Yu.T. Permissible concentration for butyl xanthate and cresyl dithiophosphate in water bodies. *Sanit. Okhrana Vodoemov ot Zagryazneniya Prom. Stochnymi Vodami No. 7:*166-177, 1966.

235. Love, R.W., L.A. Young, and H.O. Hartung. Water quality in the Missouri River progress and prospects. *J. Water Pollution Control Federation 39(12):* 1986-2007, 1967.

236. Makhinya, A.P. Hygienic normalization of m-nitrophenol in reservoir waters. *Gig. Naselen. Mest.* pp.50-55, 1967.

237. Mal'kova, V.B. Experimental data to substantiate the maximum permissible concentration of m-chloroaniline in water bodies. *Gigiena i Sanit. 31(12):* 6-10, 1966.

238. Mal'kova, V.B. Maximum permissible concentration of m-chloroaniline in water basins. *Gigiena i Sanit. 31:*319-324, 1966.

239. Malov, G.A. Maximum allowable concentration of thiophos in reservoirs. *Sanit. Okhrana Vodoemov ot Zagryazneniya Prom. Stochnymi Vodami No. 4:* 187-197, 1960.

240. Manigold, D.B. and J.A. Schulze. Pesticides in water. *Pesticides Monitoring J. 3(2):*124-135, 1969.

241. Mann, H. Effect of sublethal doses of detergents on fish. *Muenchner Beitr. Abwasser-, Fisch. -Flussbiol. 9:*131-138, 1967.

242. Mann, J.D. and W.B. Storey. Rapid action of carbamate herbicides upon plant cell nuclei. *Cytologia 31(2):*203-207, 1966.

243. Marchetti, R. Sublethal effects of surfactants on fish. *Riv. Ital. Sostanze Grasse 45(1):*27-34, 1968.

244. Marliac, J.P. Toxicity and teratogenic effects of 12 pesticides in the chick embryo. *Federation Proc. 23:*105, 1965.

245. Maslenko, A.A. Hygienic evaluation of dibutylphthalate and dioctylphthalate as water pollutants. *Gigiena i Sanit. 33(6):*102-103, 1968.

246. Maslennikov, A.S. and G.N. Poryvaeva. Determination of pyrocatechol concentration in effluent from wood-chemical factories. *Gigiena i Sanit. 30(7-9):*76-80, 1965.

247. Matton, P. and Q.N. LaHam. Effect of the organophosphate dylox on rainbow trout larvae. *J. Fisheries Res. Board Can. 26(8):*2193-2200, 1969.

248. Marking, L.L. and J.W. Hogan. Toxicity of Bayer 73 to fish. *Invest. Fish Contr. 19:*13, 1967.

249. Mazaev, V.T. Experimental determination of the maximum permissible concentrations of cyanuric acid, monosodium salt of cyanuric acid, simazine, and a 2-hydroxy derivative of simazine in water reservoirs. *Sanit. Okhrana Vodoemov ot Zagryazneniya Prom. Stochnymi Vodami No. 6:*229-250, 1964.

250. Mazaev, V.T. and I.N. Skachkova. Experimental foundation for permissible urea concentration in bodies of water. *Khim. Faktory Vneshn. Sredy i ikh Gigien. Znachenie, Sb.* pp.100-102, 1965.

251. McGauhey, P.H. *Engineering Management of Water Quality.* McGraw-Hill Book Co., New York, 1968.

252. McKee, J.E. and H.W. Wolf (Editors). *Water Quality Criteria, Second Edition.* The Resources Agency of California State Water Quality Board, Sacramento, California, Pub. No. 3-A, 1963.

253. McLean, S., G.A. Starmer, and J. Thomas. Methaemoglobin formation by aromatic amines. *J. Pharm. Pharmacol. 21:*441-450, 1969.

254. Meleshchenko, K.F. Maximum permissible concentration of phthalic acid (phthalic anhydride) in water bodies. *Gigiena i Sanit. 32:*167-171, 1967.

255. Meleshchenko, K.F. Hygienic background for determining the maximum permissible concentration of trichlorobenzene in the water of reservoirs. *Gigiena i Sanit. 25(3):*13-18, 1960.

256. Meleshchenko, K.F., Ya.I. Kostovetskii, Z.I. Zholdakova, D.P. Romashko, and I.M. Karandakova. Experimental basis for the permissible concentrations of heptyl and nonyl alcohols in bodies of water. *Sanit. Okhrana Vodoemov ot Zagryazneniya Prom. Stochnymi Vodami No. 7:*152-165, 1965.

257. Meleshchenko, K.F., D.I. Kostoretskii, Z.I. Zholdakova, D.P. Romashko, and I.M. Karandakova. Data on standardization of heptyl alcohol in water bodies. *Vopr. Gigieny Naselen. Mest. 5:*22-26, 1964.

258. Meleshchenko, K.F., N.V. Mironets, and R.K. Rozhkoveiskaya. Experimental data to substantiate the maximum permissible concentration of phthalic acid (phthalic anhydride) in water reservoirs. *Gigiena i Sanit. 32(8):*12-15, 1967.

259. Metzler, D.F. Water pollution. In: Sax, N.I. *Dangerous Properties of Industrial Materials* pp.78-84. Reinhold Book Corp., New York, 1968.

260. Michael, W.R. Metabolism of linear alkylate sulfonate and alkyl benzene sulfonate in albino rats. *Toxicol. Appl. Pharmacol. 12:*473-485, 1958.

261. Middleton, F.M. and J.J. Lichtenberg. Measurement of organic contaminants in the nation's rivers. *Ind. Eng. Chem. 52:*73A-76A, 1960.

262. Mikheenkov, P.S., A.I. Sidorova, L.P. Zaitseva, and N.N. Trakhtman. Sanitary conditions for the discharge of effluent by streptomycin factories. *Gigiena i Sanit. 30(7-9):*20-24, 1965.

263. Miklashevskii, V.E., V.N Tugarinova, and N.L. Rakhmanina. Toxicity of chloroform administered perorally. *Gigiena i Sanit. 31(8):*320-323, 1966.

264. Miklashevskii, V.E., V.M. Tugarinova, G.P. Yakoveleva, N.P. Alekseeva, and N.L. Rakhmanina. The maximum allowable concentration of trichloroethylene in reservoir water. *Sanit. Okhrana Vodoemov ot Zagryazneniya Prom. Stochnymi Vodami No. 5:*308-325, 1962.

265. Mirza, M. An ecological study on the nature of pollution in Tonawanda and Ellicott Creeks on the Niagara River basin and the effects of various chemical variables on the feeding and reproduction rates of *Daphnia Magna. Dissertation Abstracts 29(7):*2683B, 1969.

266. Miura, K., Y. Suzuki, K. Tsuchikura, A. Baba, Y. Hayakawa, T. Hayashi, S. Moriyama, T. Ishiguro, and Y. Yoshida. Alkylbenzenesulphonate in the water of the Tama River. IV. *Yukagaku 17:*635-637, 1968.

267. Morgan, J.J. and R.S. Engelbrecht. Survey of phosphate and ABS concentrations in Illinois streams. *J. Am. Water Works Assoc. 52:*471-482, 1960.

268. Moskalenko, E.G. Toxicological characteristics of nitroanilines (hygienic basis for permissible concentrations of nitroamino compounds in reservoir waters). *Vopr. Kommunal. Gig. 6:*89-94, 1966.

269. Moubry, R.J., J.M. Helm, and G.R. Myrdal. Chlorinated pesticide residues in an aquatic environment located adjacent to a commercial orchard. *Pesticides Monitoring J. 1(4):*27-29, 1968.

270. Mount, D.I., L.W. Vigor, and M.L. Schafer. Endrin: Use of concentration in blood to diagnose acute toxicity to fish. *Science 152(3729):*1388-1390, 1966.

271. Mozhaev, E.A. Experimental basis for permissible concentration of hydroquinone in bodies of water. *Sanit. Okhrana Vodoemov ot Zagryazneniya Prom. Stochnymi Vodami No. 7:*194-205, 1965.

272. Mozhaev, E.A. and P.I. Vertebnaya. The maximum allowable concentration of 2,4-D in reservoir water. *Sanit. Okhrana Vodoemov ot Zagryazneniya Prom. Stochnymi Vodami No. 5:*158-166, 1962.

273. Murtaugh, J.J. and R.L. Bunch. Acid components of sewage effluents and river water. *J. Water Pollution Control Federation 37(3):*410-415, 1965.

274. Murzakaev, F.G. Hygienic standardization of hexachlorobutadiene and polychlorobutane in water bodies. In: *U.S.S.R. Literature on Water Supply and Pollution Control* (Editor: B.S. Levine) *7:*29-35. Washington, D.C., U.S. Dept. of Commerce, 1963.

275. Murzakaev, P.G. Experimental basis for the determination of maximal permissible concentrations of hexachlorobutadiene and polychlorobutadienes in natural water bodies. In: *U.S.S.R. Literature on Water Supply and Pollution Control* (Editor: B.S. Levine) *8:*108-110. Washington, D.C., U.S. Dept. of Commerce, 1964.

276. Nagornyi, S.V. The maximal permissible concentration of sodium methylthiocarbamate (carbathion) and ammonium dimethyldithiocarbamate in water bodies. *Gigiena i Sanit. 32(1-3):*169-175, 1967.

277. Nagornyi, S.V. Determination of standard levels of sodium methyldithiocarbamate (carbathion) and ammonium dimethyldithiocarbamate in water bodies. *Gigiena i Sanit. 32(2):*11-16, 1967.

278. Nagornyi, S.V. Experimental basis for the maximum permissible concentrations of sodium methyldithiocarbamate (carbathion) and ammonium dimethyldithiocarbamate in reservoir waters. *Tr. Leningrad Sanit. Gig. Med. Inst. 81:* 83-90, 1965.

279. Naishtein, S.Ya., E.E. Klebanova, L.A. Tomashevskaya, and A.I. Lur'e. Basic data for revision of the maximum permissible concentration of DDT in bodies of surface water. *Gigiena i Sanit. 33(1-3):*47-52, 1968.

280. Naishtein, S.Ya. Sanitary condition of some Ukranian water reservoirs after use of pesticides in the national economy. *Gigiena i Sanit. 34(3):* 96-97, 1969.

281. Maishtein, S.Ya., F.G. Dyatlovitskaya, E.V. Lisovskaya, Yu.L. Petrov, and R.M. Surkina. The maximum allowable concentration of chlorophenyl chlorobenzenesulfonate in the water of open reservoirs. *Sanit. Okhrana Vodoemov ot Zagryazneniya Prom. Stochnymi Vodami No. 5:*145-157, 1962.

282. Naishtein, S.Ya., F.G. Dyatlovitskaya, E.V. Lisovskaya, and R.M. Surkina. Maximum permissible concentration of sodium p-chlorobenzenesulfonate in the water of reservoirs. *Gigiena i Sanit. 27(9):*8-12, 1962.

283. Naishtein, S.Ya., F.G. Dyatlovitskaya, and Z.V. Lisovskaya. Experimental basis of permissible concentration of anisole in bodies of water. *Sanit. Okhrana Vodoemov ot Zagryazneniya Prom. Stochnymi Vodami No. 7:*143-151, 1965.

284. Maishtein, S.Ya. and E.V. Lisovskaya. Maximum permissible concentration of hexachlorocyclopentadiene in water bodies. *Gigiena i Sanit. 30:*177-182, 1965.

285. Nather, R.E. and B. Warner. Microparticulates: Isolation from water and identification of associated chlorinated pesticides. *Science 166:*897-899, 1969

286. Nazarenko, I.V. Limits of allowable concentrations of butyl and isobutyl alcohols in water basins. In: *U.S.S.R. Literature on Water Supply and Pollution Control* (Editor: B.S. Levine) *3:*22-30. Washington, D.C., U.S. Dept. of Commerce, 1962.

287. Nazarenko, I.V. Limit of allowable formaldehyde concentration in water basins. In: *U.S.S.R. Literature on Water Supply and Pollution Control* (Editor: B.S. Levine) *3:*34-40. Washington, D.C., U.S. Dept. of Commerce, 1962.

288. Nemtseva, L.I., T.S. Kishkinova, and A.D. Semenov. Gas-liquid chromatographic determination of low-molecular-weight carboxylic acids in natural water. *Gidrokhim. Mater. 41:*129-141, 1966.

289. Nicholson, H.P. Water contamination by pesticides. *J. Southeast Sect. Am. Water Works Assoc. 32(1):*8-20, 1968.

290. Nicholson, H.P. Insecticide pollution of water resources. *J. Am. Water Works Assoc.* pp.981-986.

291. Nordell, E. *Water Treatment for Industrial and Other Uses.* Reinhold Publ. Corp., New York, 1961.

292. Novogerodova, L.G., V.A. Savelova, and A.N. Sergeev. Experimental basis for the permissible concentration of cyclohexanone in reservoir waters. *Prom. Zagryazneniya Vodoemov No. 8:*101-111, 1967.

293. O'Brien, R.D. *Insecticides - Action and Metabolism.* Academic Press, New York and London, 1967.

294. vonOettingen, W.F. The aliphatic acids and their esters: Toxicity and potential dangers. *Am. Med. Assoc. Arch. Ind. Health 21(1):*40/28-77/65, 1960.

295. Oglesby, R.T. Examination of certain biochemical responses of fish to *in vivo* chlorinated hydrocarbon insecticide exposure in water. Chapel Hill, University of North Carolina, 1963.

296. Ogleznev, G.A. Experimental substantiation of the permissible concentration of alpha-methylstyrene in the water of water bodies. *Gigiena i Sanit. 29 (4):*27-33, 1964.

297. Oliver, G.E. ABS (alkylbenzenesulfonate) in Michigan supplies. *J. Am. Water Works Assoc. 53:*301-302, 1961.

298. Organochlorine pesticides (cont.). *Food Cosmet. Toxicol. 7(5):*533-539, 1969.

299. Organophosphorus round-up: Part II. *Food Cosmet. Toxicol. 7(1):*79-83, 1969.

300. Orlovskii, V.M. Effect of chlorocyclohexane of the organoleptic properties of water and the sanitation conditions of water basins. *Vopr. Gig. Naselen. Mest. 4:*199-203, 1963.

301. Oser, B.L. and M. Oser. 2-(p-tert-butylphenoxy)isopropyl 2-chloroethyl sulfite (Aramite). II. Carcinogenicity. *Toxicol. Appl. Pharmacol. 4:* 70-88, 1962.

302. Ottoboni, A. Effect of DDT on reproduction in the rat. *Toxicol. Appl. Pharmacol. 14(1):*74-81, 1969.

303. Palmova, I.V. and L.V. Galuzova. Maximal allowable concentrations of sodium salt and butilic ester of 2,4-D (herbicide) in water. In: *U.S.S.R. Literature on Water Supply and Pollution Control* (Editor: B.S. Levine) *7:*160-162. Washington, D.C., U.S. Dept. of Commerce, 1963.

304. Parke, D.V. (Editor). *The Biochemistry of Foreign Compounds* pp.195-211. Pergamon Press, Oxford, 1966.

305. Patil, K.C., F. Matsumura, and G.M. Boush. Degradation of endrin, aldrin, and DDT by soil microrganisms. *Appl. Microbiol. 19:*879-881, 1970.

306. Patty, F.A. (Editor). *Industrial Hygiene and Toxicology Vol. II.* John Wiley and Sons, New York, 1963.

307. Pavlenko, S.M. Sanitary-toxicological materials for the hygienic basis of the maximum permissible concentration of benzene in reservoir waters. *Prom. Zagryazneniya Vodoemov No. 9:*201-210, 1969.

308. Pavlenko, S.M. and V.A. Savelove. Experimental basis for the determination of maximal allowable concentrations for flotoreagents OPS-M and OPS-B in water bodies. In: *U.S.S.R. Literature on Water Supply and Pollution Control* (Editor: B.S. Levine) *9:*120-122. Washington, D.C., U.S. Dept. of Commerce, 1966.

309. Percolation and runoff - definedly and definitely, pollution was the insecticide dumped into the Rhine. *J. Am. Water Works Assoc. 61(9):*23-24, 1969.

310. Pesticide residues in fish are staggering..... *Environ. Currents 3(7):*613, 1969.

311. Pesticides turning the corner? *Food Cosmet. Toxicol. 7(2):*175-181, 1969.

312. Pickering, Q.H. Acute toxicity of alkyl benzene sulfonate and linear alkylate sulfonate to the eggs of the fathead minnow, *Pimephales Promelas. Intern. J. Air Water Pollution 10(5):*385-391, 1966.

313. Plugin, V.P. Hygienic standardization of ethylene glycol and diethylene glycol content in the sanitary protection of water reservoirs. *Gigiena i Sanit. 33(3):*16-22, 1968.

314. Plugin, V.P. Hygineic standards for ethylene and diethylene glycols in water supplies. *Gigiena i Sanit. 33(1-3):*333-339, 1968.

315. Polishuk, Z.W., M. Wassermann, D. Wassermann, Y. Groner, S. Lazarovici, and L. Tomatis. Effects of pregnancy on storage of organochlorine insecticides. *Arch. Environ. Health 20(2):*215-217, 1970.

316. Popov, T.A. Maximum permissible concentration of 2,4-dinitrophenol in water basins. *Gigiena i Sanit. 31:*329-335, 1966.

317. Popov, T.A. Substantiation of the maximum permissible concentration of 2,4-dinitrophenol in waters. *Gigieni i Sanit. 31(6):*3-8, 1966.

318. Popper, H., S.S. Sternberg, B.L. Oser, and M. Oser. The carcinogenic effect of aramite in rats - a study of hepatic nodules. *Cancer 13:*1035-1046, 1960.

319. Pozdnyakova, A.G. Hygienic standardization of tetrahydrofuran in water reservoirs. *Gigiena i Sanit. 34(9):*114-115, 1969.

320. Pozdnyakova, A.G. Experimental basis for permissible concentrations of tetrahydrofuran and tetrahydrofuryl alcohol in water. *Tr. Leningrad. Sanit. Gig. Med. Inst. 81:*91-96, 1965.

321. Pozdnyakova, A.G. Data for hygienic substantiation of standard levels of tetrahydrofuryl alcohol in waters. *Gigiena i Sanit. 32(2):*99-101, 1967.

322. Pozdnyakova, A.G. The determination of the maximum permissible content of tetrahydrofuryl alcohol in water bodies. *Gigiena i Sanit. 32(1-3):* 273-276, 1967.

323. Prat, J. and A. Giraud. Toxicity of detergents to man and animals. *The Pollution of Water by Detergents, Part 3.* Organization for Economic Co-operation and Development, Paris, 1964.

324. Prows, B.L. The uptake and residuals of insecticides in the aquatic environment. *Dissert. Abstracts 29(9):*3548-B, 1969.

325. Prusakov, V.M. Hygienic basis for permissible concentration of terephthalic acid and dimethylterephthalate (from the production of Lausan fibers) in reservoir waters. *Vopr. Kommunal. Gig. 6:*94-98, 1966.

326. Public Health Service Drinking Water Standards, 1962. Washington,D.C., U.S. Government Printing Office, PHS No. 956, 1962.

327. Quality of surface waters of the United States, 1964. Washington, D.C., U.S. Government Printing Office, Geological Survey Water Supply Paper No. 1955, 1969.

328. Radionova, L.F. The maximum allowable concentration of monomethylamine in reservoirs. *Sanit. Okhrana Vodoemov ot Zagryazneniya Prom. Stochnymi Vodami No. 5:*326-340, 1962.

329. Radomski, J.L. and W.B. Deichmann. Pesticide levels in a variety of natural and experimental conditions. In: *Chemical Fallout* (Editors: M.W. Miller and G.G. Berg) pp.297-314. Charles C. Thomas, Springfield, Illinois, 1968.

330. Radomski, J.L., W.B. Deichmann, and E.E. Clizer. Pesticide concentrations in the liver, brain and adipose tissue of terminal hospital patients. *Food Cosmet. Toxicol. 6:*209-220, 1968.

331. Rakhmanin, Yu.A. The experimental determination of the maximum permissible concentration of a- and b-naphthols in bodies of water. *Gigiena i Sanit. 30:*345-351, 1965.

332. Rakhmanin, Yu.A., and T.I. Bonashevskaya. Use of histochemical methods of study during a determination of the harmful influence of chemicals on animals. *Prom. Zagryazneniya Vodoemov No. 9:*268-277, 1969.

333. Rakhmanina, N.L. Establishing standards for the phenanthrene and pyrene contents in water bodies. *Gigiena i Sanit. 29(6):*19-23, 1964.

334. Reichel, W.L., E. Cromartie, T.G. Lamont, B.M. Mulhern, and R.M. Prouty. Residues in fish, wildlife and estuaries. Pesticide residue in eagles. *Pesticides Monitoring J. 3(3):*142-144, 1969.

335. Reichenbach-Klinke, H.H. Effect of oil and tar products in water on fish. *Muenchner Beitr. Abwasser, Fisch.-Flussbiol. 9:*200-212, 1967.

336. Reichert, J.K. Carcinogenic substances in water and soil. XXI. Quantitative results on the removal of polycyclic aromatic compounds from drinking water by chlorine dioxide treatment. *Arch. Hyg. Bakteriol. 152(1):*37-44, 1968.

337. Report of the Secretary's commission on pesticides and their relationship to environmental health. Parts I and II. Washington, D.C., U.S. Department of Health, Education, and Welfare, 1969.

338. Reymonds, T.D. Pollutional effects of agricultural insecticides and synthetic detergents. *Water Sewage Works 109:*352-355, 1962.

339. Robens, J.F. Teratologic studies of carbaryl, diazinon, norea, disulfiram, and thiram in small laboratory animals. *Toxicol. Appl. Pharmacol. 15:*152-163, 1969.

340. Roberts, R.S. A review of pesticides used in environmental health activities. *J. Environ. Health 31(6):*1969.

341. Rodopnova, L.F. Experimental substantiation of the permissible monoethanolamine concentration in water bodies. *Gigiena i Sanit. 29(2):*9-19, 1964.

342. Roszkowski, A.P., G.I. Poos, and R.I. Mohybacher. Selective rat toxicant. *Science 144:*412-413, 1964.

343. Rubets, V.I. Permissible concentrations of furan and thiophene in water bodies. *Sanit. Okhrana Vodoemov ot Zagryazneniya Prom. Stochnymi Vodami No. 7:*219-231, 1965.

344. Rubleva, M.N. The maximum allowable concentration of chlorophos in reservoirs. *Sanit. Okhrana Vodoemov ot Zagryazneniya Prom. Stochnymi Vodami No. 5:*129-144, 1962.

345. Rubleva, M.N. Limit of allowable concentration of xylol in water basins. In: *U.S.S.R. Literature on Water Supply and Pollution Control* (Editor: B.S. Levine) *3:*46-52. Washington, D.C., U.S. Dept. of Commerce, 1962.

346. Rubleva, M.N. Experimental basis for the determination of maximal permissible diethyl maleate concentration in natural water bodies. In: *U.S.S.R. Literature on Water Supply and Pollution Control* (Editor: B.S. Levine) *8:*125-137. Washington, D.C., U.S. Dept. of Commerce, 1966.

347. Rusakov, N.V. Dichloroanilines, features of biological action and hygienically safe levels in water reservoirs. *Gigiena i Sanit. 33(4):*8-12, 1968.

348. Samoilovich, L.N. and Yu.R. Redkin. Contamination of the Sunzhi River with 3,4-benzpyrene from the petrroleum chemical industry of Grozny. *Gigiena i Sanit. 33(11):*6-9, 1968.

349. Sapeika, N. *Food Pharmacology* pp.127-133. Charles C. Thomas, Springfield, Illinois, 1969.

350. Savelova, V.A. Maximum allowable concentration for caprolactam in reservoirs. *Sanit. Okhrana Vodoemov ot Zagryazneniya Prom. Stochnymi Vodami No. 4:*156-168, 1960.

351. Savelova, V.A. and N.V. Klimkina. Effect of cyclohexanone oxime on the organoleptic water properties and on the sanitary regulatory regime of natural water bodies. In: *U.S.S.R. Literature on Water Supply and Pollution Control* (Editor: B.S. Levine) *8:*35-39. Washington, D.C., U.S. Dept. of Commerce, 1966.

352. Savelova, V.A. and V.V. Russkikh. Hygienic norms for nitrocyclohexane in the water of reservoirs. *Gigiena i Sanit. 26(5):*9-14, 1961.

353. Savelova, V.A., E.S. Bruk, N.V. Klimkina, and V.V. Russkikh. The maximum allowable concentration of cyclohexanol in reservoir water. *Sanit. Okhrana Vodoemov ot Zagryazneniya Prom. Stochnymi Vodami No. 5:*78-93, 1962.

354. Savelova, V.A. and N.V. Klimkina. The maximum permissible concentration of cyclohexane in well water. *Sanit. Okhrana Vodoemov ot Zagryazneniya Prom. Stochnymi Vodami No. 6:*30-45, 1964.

355. Savelova, V.A., E.S. Bruk, and N.V. Klimkina. The maximum permissible concentration of cyclohexene in well water. *Sanit. Okhrana Vodoemov ot Zagryazneniya Prom. Stochnymi Vodami No. 6:*46-63, 1964.

356. Sawamura, S. Cytological Studies on the effect of herbicides on plant cells *in vivo*. I. Hormonic herbicides. *Cytologia 29:*86-102, 1964.

357. Schafer, M.L., J.T. Peeler, W.S. Gardner, and J.E. Campbell. Pesticides in drinking water - waters from the Mississippi and Missouri Rivers. *Environ. Sci. Tech. 3(12):*1261-1269, 1969.

358. Schein, P.S., R.D. David, S. Carter, J. Newman, D.R. Schein, and D.P. Rau. The evaluation of anticancer drugs in dogs and monkeys for the prediction of qualitative toxicity in man. *Clin. Pharmacol. Therap. 11:*3-40, 1970.

359. Sedov, A.V. Experimental basis for determination of maximal permissible tetrachloroalkanes in natural water bodies. In: *U.S.S.R. Literature on Water Supply and Pollution Control* (Editor: B.S. Levine) *8:*43-57. Washington, D.C., U.S. Dept. of Commerce, 1966.

360. Selyuzhitskii, G.V. Maximum permissible concentration of trifluorochloropropane in water supplies. *Gigiena i Sanit. 28(12):*9-14, 1963.

361. Semenov, M.I. Experimental data for standardization of isopropyl amine and diazopropylamine if they are both present in water reservoirs. *Gigiena i Sanit. 34(9):*20-25, 1969.

362. Servizi, J.A., R.W. Gordon, and D.W. Martens. Toxicity of two chlorinated catechols, possible components of kraft pulp mill bleach waste. *Prog. Rep. Int. Pacif. Slm. Fish. Commn. 17:*1-42, 1968.

363. Shabad, L.M. On the distribution and the fate of the carcinogenic hydrocarbon benz(a)pyrene (3,4-benzpyrene) in the soil. *Krebsforsch 70(3):*204-210, 1968.

364. Shartsman, I.E. Data for setting up hygienic standards of perfluoroisobutenylethyl ether in water bodies. *Gigiena i Sanit. 29(5):*17-25, 1964.

365. Shkodich, P.E. Experimental substantiation of the maximum permissible concentration of acetone cyanohydrin in water bodies. *Gigiena i Sanit. 31(6):*8-12, 1966.

366. Shoemaker, T. Impetus for action. *Science News 96:*64, 1969.

367. Shubik, P. Survey of compounds which have been tested for carcinogenic activity - Supplement 1. Washington, D.C., U.S. Government Printing Office, PHS No. 149, 1957.

368. Shubik, P. and J.L. Hartwell. Survey of compounds which have been tested for carcinogenic activity - Supplement 2. Washington, D.C., U.S. Government Printing Office, PHS No. 149, 1969.

369. Shuval, H.I. The public health significance of trace chemical in waste water utilization. *Bull. World Health Organ. 27:*791-800, 1962.

370. Shvartsman, I.E. Maximum permissible concentration of perfluoroisobutylene ethyl ether in water bodies. *Gigiena i Sanit. 29(5):*13-19, 1964.

371. Skachkova, I.N. Hygienic substantiation of the maximum permissible concentration of tetraethyltin in waters. *Gigiena i Sanit. 32(4):*11-17, 1967.

372. Skerfving, S., K. Hansson, and J. Lindsten. Chronosome breakage in humans exposed to methyl mercury through fish consumption. *Arch. Environ. Health 21:*133-139, 1970.

373. Skrapek, K. Toxicity of phenols and their detection in fish. *Ustav. Vedeckotech. Inform. Min. Zemedel., Lesniho Vodniho Hospodarstvi Zivocisna Vyroba 8(8):*499-504, 1963.

374. Smalley, H.E., J.M. Curtis, and F.L. Earl. Teratogenic action of carbaryl in beagle dogs. *Toxicol. Appl. Pharmacol. 13:*392-403, 1968.

375. Smirnova, R.D. and I.M. Stepanona. Experimental basis for the permissible concentration of propylbenzene in reservoir waters. *Prom. Zagryazneniya Vodoemov No. 8:*207-218, 1967.

376. Smirnova, R.D. Experimental determination of permissible concentration of dimethylphenylcarbinol in water bodies. *Sanit. Okhrana Vodoemov ot Zagryazneniya Prom. Stochnymi Vodami No. 7:*206-218, 1965.

377. Smirnova, R.D. and G.P. Zarubin. Experimental basis for the maximum permissible concentration of acetophenone in reservoir waters. *Prom. Zagryazneniya Vodoemov No. 9:*158-170, 1969.

378. Smith, G.E. and B.G. Isom. Investigation of effects of large-scale applications of 2,4-D on aquatic fauna and water quality. *Pesticides Monitoring J. 1(3):*16-21, 1967.

379. Smith, G., B.S. Watson, and F.S. Fischer. The metabolism of ($^{14}C$) 0,0-diethyl 0-(3,5,5-trichloro-2-pyridyl)phosphorothioate (dursban) in fish. *J. Econ. Entomol. 59(6):*1464-1475, 1966.

380. Smol'skii, A.V. Experimental sanitary toxicological investigation to substantiate the maximum permissible concentration of 1,2-dichlorohexafluoro-1-cyclohexene in water basins. *Gigiena i Sanit. 30(11):*6-12, 1965.

381. Smol'skii, A.V. The experimental determination of the maximum permissible concentration of 1,2-dichlorohexafluorocyclopentene-1 in water bodies. *Gigiena i Sanit. 30(10-12):*177-183, 1965.

382. Smyth, Henry F., Jr., C.S. Weil, J.S. West, and C.P. Carpenter. An exploration of joint toxic action: Twenty-seven industrial chemicals intubated in rats in all possible pairs. *Toxicol. Appl. Pharmacol. 14(2):*340-347, 1969.

383. Solon, J.M., J.L. Lincer, and J.H. Nair. The effect of sublethal concentration of LAS on the acute toxicity of various insecticides to the fathead minnow *(Pimephales Promelas Rafinesque)*. *Water Res. 3:*767-775, 1969.

384. Song, J. and W.E. Harville. Carcinogenicity of aldrin and dieldrin on mouse and rat liver. *Federation Proc. 23(2):*366, 1964.

385. Sparr, B.I., W.B. Appleby, D.M. DeVries, J.V. Osmum, J.M. McBride, and G.L. Foster. Insecticide residues in waterways from agricultural use. In: *Organic Pesticides in the Environment* (Editor: R.F. Gould) pp.146-162. Advances in Chemistry Series, ACS 60, 1966.

386. Sprague, J.B. Avoidance reactions of salmonid fish to representative pollutants. *Water Research 2(1):*23-24, 1968.

387. Sprague, J.P. and D.W. McLeese. Toxicity of kraft pulp mill effluent for larval and adult lobsters, and juvenile salmon. *Water Res. 2(11):*753-812, 1968

388. Stavinoha, W.B., J.A. Reiger, and L.C. Ryan. The effects of chronic poisoning by organophosphorus cholinesterase inhibitors on certain brain amines. *Preprints of Papers Presented at 150th Natn'l. Meeting of ACS 5(2):*7, 1965.

389. Steinegger, E. and A. Levan. The effect of chloroform and colchicine of *Allium. Hereditas 33:*515, 1947.

390. Sternberg, S.S., H. Popper, B.L. Oser, and M. Oser. Gallbladder and bile duct adenocarcinomas in dogs after long term feeding of aramite. *Cancer 13(4):*780-789, 1960.

391. Stokinger, H.E. and R.L. Woodward. Toxicologic methods for establishing drinking water standards. *J. Am. Water Works Assoc. 50:*515-529, 1958.

392. Strizhak, E.K. Hygienic significance of methacrylamides in the problem of the sanitary protection of reservoirs. *Materialy. Nauch.-Prakt. Konf. Molodykh Gig. Sanit. Vrachei, 11th* pp.79-82, 1967.

393. Subbotin, V.G. Hygienic assessment of nitromethane and other nitroparaffins in connection with sanitary protection of water reservoirs. *Gigiena i Sanit. 32(9):*9-13, 1967.

394. Sullivan, W.T. and R.D. Swisher. MBAS and LAS surfactants in the Illinois River, 1968. *Environ. Sci. Tech. 3(5):*481-483, 1969.

395. Sullivan, W.T. and R.L. Evans. Major U.S. river reflects surfactant changes. *Environ. Sci. Tech. 2(3):*194-199, 1968.

396. Sullivan, W.T. and R.D. Swisher. Methylene blue active substances and linear alkylate sulfonate surfactants in the Illinois River. *Environ. Sci. Tech. 3(5):*481-483, 1969.

397. Swisher, R.D. Exposure levels and oral toxicity of surfactants. *Arch. Environ. Health 17:*232-246, 1968.

398. Sylvester, R.O. Water Quality Standards. *Water Wastes Eng. 7*, 1970.

399. Takenura, N., T. Akiyama, and C. Nakajima. A survey of the pollution of the Sumida River, especially on the aromatic amines in the water. *Intern. J. Air Water Pollution 9:*665-670, 1968.

400. Talakin, Yu.N. Hygienic standardization of a-naphthoquinone in bodies of water. *Vopr. Gigieny Naselen, Mest, 5:*12-17, 1964.

401. Talakin, Yu.N. Experimental investigation for substantiating the hygienic standards of 1,4-naphthoquinone in water basins. *Gigiena i Sanit. 30(11):* 12-17, 1968.

402. Tarjan, R. and T. Kemeny. Multigeneration studies on DDT in mice. *Food Cosmet. Toxicol. 7(3):*215-221; 266-267, 1969.

403. Teasley, J.I. Identification of a cholinesterase-inhibiting compound from an industrial effluent. *Environ. Sci. Tech. 1(5):*411-416, 1967.

404. Terracine, B. Evaluation of the carcinogenicity of the chlorinated hydrocarbons used as pesticides. *Tumori 53(6):*601-618, 1967.

405. Thatcher, T.O. The comparative lethal toxicity of a mixture of hard ABS detergent products to eleven species of fish. *Intern. J. Air Water Pollution 10(9):*585-590, 1966.

406. Tokuomi, H. Minimata disease. *Naika 21:*864-870, 1968.

407. Tracy, H.B., R.A. Lee, C.E. Woelke, and G. Sanbord. Relative toxicities and dispersing evaluations of eleven oil dispersing products. *J. Water Pollution Control Federation 41(12):*2062-2029, 1969.

408. Trakhtman, M.B. Hygienic assessment of the efficiency of polymethacrylate cation flocculents and their permissible residual concentrations in drinking water. *Gigiena i Sanit. 34(9):*15-20, 1969.

409. Trakhtman, N.N. and M.D. Manita. Effect of chlorination of water on pollution by 3,4-benzpyrene. *Gigiena i Sanit. 31(1-3):*316-319, 1966.

410. Trophimovich, E.M. Hygienic investigation of the means of protection of water bodies from contamination with dyes (para- and ortho-aminophenol). *Gigiena i Sanit. 33(8):*10-14, 1968.

411. Tsoneva-Maneva, M.T., F. Kaloyanova, and V. Georgieva. Mutagenic effect of diazinon on human peripheral blood lymphocytes *in vitro. Eksp. Med. Morfol. 8(3):*132-136, 1969.

412. Tsubaki, T., et.al. Clinical features of organic mercury poisoning in the Agano River area. *Advan. Neurol. Sci. 13:*85-88, 1969.

413. Tsubaki, T. Organic mercurial poisoning along the River Agano. *Naika 21:* 871-875, 1968.

414. Tugarinova, V.N., V.E. Hikiaskeskii, G.P. Yakovleva, N.L. Raklmanina, and G.B. Kagan. Experimental basis of permissible concentrations of dichloromethane in bodies of water. *Sanit. Okhrana Vodoemov ot Zagryazneniya Prom. Stochnymi Vodami No. 7:*41-55, 1965.

415. Tugarinova, V.N., V.E. Miklashevskii, N.P. Alekseeva, and G.P. Yakovleva. The maximum allowable concentration of tetrachloroethane and hexachloroethane in reservoir water. *Sanit. Okhrana Vodoemov ot Zagryazneniya Prom. Stochnymi Vodami No. 5:*285-307, 1962.

416. Usdin, V.R. and M.A. Mitz. Effects of trace amounts of toxic compounds on electric activity of fish. *Preprints of Papers Presented at 150th Natn'l. Meeting of ACS 5(2):*63-66, 1965.

417. vanValin, C.C. Persistence of 2,6-dichlorobenzeonitrile in aquatic environments. In: *Organic Pesticides in the Environment* (Editor: R.F. Gould) pp.271-279. Advances in Chemistry Series, ACS 60, 1966.

418. Varshavskaya, S.P. Comparative sanitary toxicological features of chlorbenzol and dichlorbenzol (ortho- and para-isomers) in sanitary protection of water bodies. *Gigiena i Sanit. 33(10):*15-21, 1968.

433. Vrochinskii, K.K. and A.T. Agalakova. Hygienic assessment of the use of DDT in midges control. *Gigiena i Sanit.* *34(3):*14, 1969.

434. Walker, A.I.T., C.H. Neill, D.E. Stevenson, and J. Robinson. The toxicity of dieldrin (HEOD) to Japanese quail. *Toxicol. Appl. Pharmacol. 15(1):* 69-73, 1969.

435. Wallen, J.E., W.C. Greer, and R. Lasater. Stream pollution - toxicity to *Gambusia Affinis* of certain pure chemicals in turbid waters. *Sewage Ind. Wastes 29(6):*695-711, 1957.

436. Warnick, S.L., R.F. Gaufin, and A.R. Gaufin. Concentration and effects of pesticides in aquatic environment. *J. Am. Water Works Assoc. 58(5):*601-608, 1966.

437. Wassermann, M., D. Wassermann, L. Zellermayer, and M. Gon. Pesticides in people. *Pesticides Monitoring J. 1(2):*15-20, 1967

438. Water quality criteria. Report of the National Technical Advisory Committee to the Secretary of the Interior. Washington, D.C., Federal Water Pollution Control Administration, 1968.

439. Weaver, L., C.G. Gunnerson, A.W. Breidendach, and J.J. Lichtenberg. Chlorinated hydrocarbon pesticides in major U.S. river basins. *Public Health Rept. 80(6):*431-493, 1965.

440. Weibel, S.R., R.B. Weidner, J.M. Cohen, and A.G. Christianson. Pesticides and other contaminants in rainfall and runoff. *J. Am. Water Works Assoc. 58(8):*1075-1081, 1966.

441. Weiss, C.M. Stream pollution - response of fish to sub-lethal exposures of organic phosphorus insecticides. *Sewage Ind. Wastes 31(5):*580-593, 1959.

442. Weiss, C.M. Organic pesticides and water pollution. *Public Works 95:*84-87, 1964.

443. Welch, R.M., W. Levin, and A.H. Conney. Estrogenic action of DDT and its analogs. *Toxicol. Appl. Pharmacol. 14(2):*358-367, 1969.

444. Welch, R.M., W. Levin, and A.H. Conney. Effect of chlorinated insecticides on steroid metabolism. In: *Chemical Fallout* pp.390-407. Charles C. Thomas, Springfield, Illinois, 1968.

445. Welsh, E.B. and J.C. Spindler. DDT persistence and its effects on aquatic insects and fish after an aerial application. *J. Water Pollution Control Federation 36:*1285-1292, 1964.

446. Welsh, E.B. and J.F. Thomas. Significance of chemical limits in USPHS drinking water standards. *J. Am. Water Works Assoc. 52:*289-300, 1960.

447. West, I. Pesticides as contaminants. *Arch. Environ. Health 9:*626-633, 1964.

419. Veldre, I. Comparative evaluation of the toxic effect of certain water soluble phenols. *Sb. Dokl. Nauch. Konf. Aktual. Vop Snizheniya Infek. Zabol. Gig. Probl.* pp.200-202, 1968.

420. Veldre, I. and H. Kunamagi. Standardization of raw phenols in natural waters. *Festi. NSV Teaduste Akad. Toimetised. Biol. Seer. 15(1):*122-129.

421. Verrett, M.J., M.K. Mutchler, W.F. Scott, E.F. Reynaldo, and J. McLaughlin. Teratogenic effect of captan and related compounds in the developing chicken embryo. *Ann. N. Y. Acad. Sci. 160:*334-343, 1969.

422. Vertebnaya, P.I. and E.A. Mozhaev. Limits of allowable concentrations of methylethylketone and of cyclohexanone in water basins. In: *U.S.S.R. Literature on Water Supply and Pollution Control* (Editor: B.S. Levine) *3:*30-34. Washington, D.C., U.S. Dept. of Commerce, 1962.

423. Veselov, V.G. The biological action and the hygienic significance of a picoline and 2,5-lutidine at their contamination of water bodies. *Gigiena i Sanit. 33(18-22):*12, 1968.

424. Vinogradov, P.B. New experimental data for substantiating the maximum permissible concentration of carbon disulfide in water basins. *Gigiena i Sanit. 31(1):*13-17, 1966.

425. Vitvitskaya, B.R. Permissible levels of residual amounts of new cation flocculants in drinking water. *34(5):*13-18, 1969.

426. Vivier, P. and M. Nisbet. Toxicity of some herbicides, insecticides, and industrial wastes. Paper Presented at *Biological Problems in Water Pollution, Third Seminar*, Cincinnati. U.S. Dept. of Health, Education, and Welfare, Environmental Health Series pp.167-169, 1962.

427. Vivoli, G. and C.A. Provvisionato. Quantity of anion detergents in liquid sewage and surface water of the Town of Modena. *Igiene Mod. 59(5-6):*346-362, 1966.

428. Vlieger, M., J. Robinson, M.K. Baldwin, A.N. Crabtree, and M.C. vanDijk. The organochlorine insecticide content of human tissue. *Arch. Environ. Health 17(5):*759-767, 1968.

429. Voloshechenko, O.I. Hygienic and toxicological evaluation of small doses of aldrin as a factor in the pollution of reservoir waters. *Vopr. Kommunal. Gig. 6:*99-103, 1966.

430. Voloshechenko, O.I. Experimental data for determining the hygienic standard level of aldrin in water bodies. *Gigiena i Sanit. 31(4):*13-17, 1966.

431. Voloshechenko, O.I. Data for determining permissible conentration of aldrin in bodies of water. *Vopr. Gigieny Naselen. Mest. 5:*38-42, 1965.

432. Vrochinsii, K.K. and S.S. Grebenyuk. Pesticide contamination of bodies of water and water supply sources. *Gigiena i Sanit. 33(11):*69-72, 1968.

448. Westlake, W.E. and F.A. Gunther. Occurrence and mode of introduction of pesticides in the environment. In: *Organic Pesticides in the Environment* (Editor: R.F. Gould) pp.110-121. Advances in Chemistry Series, ACS 60, 1966.

449. Wilber, C.G. *The Biological Aspects of Water Pollution.* Charles C. Thomas, Springfield, Illinois, 1969.

450. Wiman, R.E. Isolation and identification of certain toxic compounds in a fraction of kraft mill waste. *Dissert. Abstracts 22:*3414-3415, 1962.

451. Wirth, W., G. Hecht, and C. Gloxhuber. *Toxikologie-Fibel* pp.353-355. George Thieme Verlag, Stuttgart, 1967.

452. Woodward, R.L., H.E. Stockinger, and D.L. Birmingham. Health effects of detergents in water. *Arch. Environ. Health 8:*584-588, 1964.

453. Wuu, K.D. and W.F. Grant. Chromosomal abberations induced by pesticides in meiotic cells of barley. *Cytologia 32:*31-41, 1967.

454. Zabezhinskaya, N.A., E.S. Bruk, V.F. Ozerova, and A.I. Gutkovskaya. The limit of allowable acrylonitrile (CH CHCN) concentration in water basins. In: *U.S.S.R. Literature on Water Supply and Pollution Control* (Editor: B.S. Levine) *3:*78-83. Washington, D.C., U.S. Dept. of Commerce, 1962.

455. Zabezhinskaya, N.A., E.S. Bruk, A.I. Kuper, V.F. Ozerova, and O.I. Vasil'ova. Normalization of the content of aniline, naphthalene, and their derivatives in reservoirs. *Vestn. Tekhn. i Ekon. Inform. Nauchn.-Issled. Inst. 10:*21-22, 1964.

456. Zamislova, S.D. and R.D. Smirnova. Limit of allowable dimethylformamide in water basins. In: *U.S.S.R. Literature on Water Supply and Pollution Control* (Editor: B.S. Levine) *3:*98-105. Washington, D.C., U.S. Dept. of Commerce, 1962.

457. Zamyslova, S.D. and R.D. Smirnova. Maximum allowable concentration of dimethylformamide in reservoirs. *Sanit. Okhrana Vodoemov ot Zagryazneniya Prom. Stochnymi Vodami No. 4:*177-186, 1960.

458. Zamyslova, S.D., N.M. Stepanova, N.P. Ashmarina, N.V. Meshkov, P.V. Panov, N.N. Pushkina, and A.M. Tambovtseva. Permissible concentrations of ethylmercuric chloride and diethylmercury in water bodies. *Sanit. Okhrana Vodoemov ot Zagryazneniya Prom. Stochnymi Vodami No. 7:*113-128, 1965.

459. Zeller, Howard D. Stream standards and water supplies. *J. Southeastern Section Am. Water Works Assoc. 32(1):*28-36, 1968.

460. Zhakov, Yu.A. Limit of allowable ursol and quinone concentrations in water basins. In: *U.S.S.R. Literature on Water Supply and Pollution Control* (Editor: B.S. Levine) *3:*134-146. Washington, D.C., U.S. Dept. of Commerce, 1962.

461. Zhakov, Yu.A. Maximum allowable concentration of ursol (p-phenylenediamine), Bandrowski's base, and quinone in reservoirs. *Sanit. Okhrana Vodoemov ot Zagryazneniya Prom. Stochnymi Vodami No. 4:*230-246, 1960.

462. Ziabarova, S.Ia. and M.N. Kuklina. Hygienic evaluation of diazobutyl amine concerning sanitary protection of water reservoirs. *Gigiena i Sanit. 34(9):*115-117, 1969.

463. Zubritskii, K.V. The maximum allowable concentration of ethylbenzene in reservoirs. *Sanit. Okhrana Vodoemov ot Zagryazneniya Prom. Stochnymi Vodami No. 5:*62-77, 1962.

464. Zyabbarova, S.A. Limit of allowable pyridine concentration in water basins. In: *U.S.S.R. Literature on Water Supply and Pollution Control* (Editor: B.S. Levine) *3:*72-78. Washington, D.C., Dept. of Commerce, 1962.

465. Zyabbarova, S.A. Discharge into water bodies of sewage containing monoethyl ether of ethylene glycol. *Gigiena i Sanit. 31(11):*3-5, 1966.

466. Zyabbarova, S.A. Cellosolve as a factor in water pollution. *Tr. Leningrad. Sanit. Gig. Med. Inst. 81:*70-74, 1965.

467. Zyabbarova, S.A., M.N. Kuklina, and E.V. Teplyakova. Hygienic and toxicological characteristics of quaternary ammonium chloride. *Gigiena i Sanit. 33(4-5):*155-159, 1968.

468. Zyabbarova, S.A., and E.V. Teplyakova. Data for establishing the permissible concentrations of chlorine chloride in bodies of water. *Tr. Leningrad. Sanit. Gig. Med. Inst. 81:*75-78, 1965.

469. Zyabbarova, S.A. and E.V. Teplyakova. Health problems of tributyl phosphate. *Gigiena i Sanit. 33(7):*100-102, 1968.

ADDITIONAL REFERENCES


1. Alabaster, S. J. Testing the toxicity of effluents to fish. *Chem. Ind. 24:*759-64, 1970.

2. Alderson, T. H. Mechanism of formaldehyde-induced mutagenesis. The monohydroxylmethylation reaction of formaldehyde with adenylic acid as the necessary and sufficient condition for the mediation of the mutagenic activity of formaldehyde. *Mutat. Res. 1:*77-85, 1964.

3. Alderson, T. H. Mechanisms of mutagenesis induced by formaldehyde. The essential role of the 6-amino group of adenylic acid in the mediation of the mutagenic activity of formaldehyde. *Nature 191:* 251-253, 1961.

4. Amer, S. M. Cytological effects of pesticides. I. Mitotic effects of N-methyl-l-naphthyl carbamate "Sevin." *Cytologia (Tokyo) 30:* 175-181, 1965.

5. Avar, P. and G. Czegledi-Janko. Occuptational exposure to aldrin: clinical and laboratory findings. *Brit. J. Ind. Med. 27:*279-82, 1970.

6. Bailey, G. W. Entry of biocides into watercources. In: *Proceedings of the Symposium on Agricultural Waste Waters, Report No. 10,* 94-103. University of California, Water Resources Center, 1966.

7. Bars, E. A. and S. S. Kogan. Organic substances entering water from petroleum and petroleum products. *Gidrokhim. Mater. 50:*121-6, 1969.

8. Benson, W. W., T. A. Marr and J. Gabica. An apparent case of pesticide poisoning. *Public Health Rept. 85:*600-602, 1970.

9. Biggar, J. W. Factors affecting the appearance of pesticide in drainage water. In: *Proceedings of the Symposium on Agricultural Waste Waters, Report No. 10,* 104-11. University of California, Water Resources Center, 1966.

10. Blackwell-Smith, R., J. K. Finnegan, P. S. Larson, P. F. Sahyoun, M. L. Dreyfuss and H. B. Haab. Toxicologic studies on zinc and disodium ethylene bisdithiocarbamates. *J. Pharm. Exp. Therap. 109:*159-66, 1953.

11. Bloom, S. C. and S. E. Degler. Pesticides and pollution. *BNA's Environmental Management Series,* 1969.

12. Boyd, E. M. and C. J. Krijnen. Toxicity of captan and protein-deficient diets. *J. Clin. Pharm. 8:*1225-234, 1968.

13. Breidenbach, A. W. Pesticide residues in air and water. *Arch. Environ. Health 10:*827-830, 1965.

14. Bulay, O. M. and L. W. Wattenberg. Effects of administration of polycyclic hydrocarbon carcinogens during pregnancy on the progeny. University of Minnesota Medical School, dissertation #53455, Minneapolis, Minnesota.

15. Butler, P. A. Monitoring pesticide pollution. *BioScience 19(29):* 889-91, 1969.

16. Buzzell, J. C., Jr., R. H. F. Young and D. W. Ryckman. Behavior of organic chemicals in the aquatic environment. Part II-Behavior in dilute systems. Manufacturing Chemists Association, Washington, D. C., 1968.

17. Cairns, J. and A. Scheier. A comparison of the toxicity of some common industrial waste components tested individually and combined. *Progve. Fish Cult. 30:*3-8, 1968.

18. Cairns, J., Jr., A. Scheier and N. E. Hess. The effects of alkyl benzene sulfonate on aquatic organisms. *Ind. Water Wastes 9(1):* 22-8, 1964.

19. Carpenter, C. P., C. S. Weil and H. F. Smyth. Toxicity of an imidazoline (or glyoxalidine) fungicide. *Am. Med. Assoc. Arch. Ind. Health 4:*494-503, 1951.

20. Cope, O. B. Some responses of freshwater fish to herbicides. *Proc. Southern Weed Conf. 18:*439-45, 1965.

21. Cope, O. B. Contamination of the freshwater ecosystem by pesticides. *J. Appl. Ecol. (Brit.) 3:*33, 1966.

22. Ruiz-Cruz, J. Pollution of water by synthetic detergents. II. Effects and problems resulting from the use of these substances. *Inform. Grasas Aueites 7(2):*48-59, 1969.

23. Curley, A. and R. Kimbrough. Chlorinated hydrocarbon insecticides in plasma and milk of pregnant lactating women. *Arch. Environ. Health 18:*156-164, 1969.

24. Curtis, E. J. C. and D. W. Harrington. Effects of organic wastes on rivers. *Process Biochem. 5:*44-6, 1970.

25. Cytological and genetic effects of the defoliant endothall. *J. Heredity 47:*151-155, 1956.

26. Czegledi-Janko, G. and P. Avar. Occupational exposure to lindane: clinical and laboratory findings. *Brit. J. Ind. Med. 27:*283-6, 1970.

27. Dittmer, D. S. (ed.). *Handbook of Toxicology, Vol. III Insecticides.* Philadelphia and London; W. B. Saunders Company, 1959.

28. Dittmer, D. S. (ed.). *Handbook of Toxicology, Vol. V Fungicides.* Philadelphia and London; W. B. Saunders Company, 1959.

29. DuBois, K. P. Insecticides, rodenticides, herbicides: household hazards. *Postgrad. Med. 24:*278-288, 1958.

30. Dugan, P. R. Influence of chronic exposure to anionic detergents on subsequent toxicity of dieldrin and dichlorodiphenyltrichloromethane (DDT) to goldfish. *Preprints of papers presented at 150th National Meeting of ACS 5(2):*67-70, 1965.

31. Dugan, P. R. Influence of chronic exposure to anionic detergents on toxicity of pesticides to goldfish. *J. Water Pollution Control Federation 39:*63-71, 1967.

32. Enderson, J. H. and D. D. Berger. Pesticides: eggshell thinning and lowered production of young in prairie falcons. *BioScience 20(8):*355-56, 1970.

33. Edmundson, W. F., J. E. Davies and M. Cranmer. DDT and DDE in blood and DDA in urine of men exposed to 3 percent DDT aerosol. *Public Health Rept. 85:*457-63, 1970.

34. Finnegan, J. K., H. B. Haag and P. S. Larson. Tissue distribution and elimination of DDD and DDT following oral administration to dogs and rats. *Proc. Soc. Exp. Biol. Med. 72:*357-60, 1949.

35. Fitzhugh, O. G., A. A. Nelson and J. P. Frawley. The chronic toxicities of technical grade benzene hexachloride and its alpha, beta, and gamma isomers. *J. Pharm. Exp. Thera. 100:*59-66, 1950.

36. Fitzhugh, O. G., A. A. Nelson and M. L. Quaife. Chronic oral toxicity of aldrin and dieldrin in rats and dogs. *Food Cosmet. Toxicol. 2:*551-62, 1964.

37. Food and Agriculture Organization of the United Nations World Health Organization. Evaluation of some pesticide residues in food. *WHO Tech. Rept. Ser. 370:*7-16, 1967.

38. Fujita, T. and M. Nakajima. Correlation between physiological activity and physiochemical property of substituted phenols. *Residue Rev. 25:*319-26, 1969.

39. Ghadiri, M. Malformations and toxic effects of two organic phosphates and a carbamate on the chicken embryo and the adult chicken. *Dissertation Abstracts 29:*1314-B, 1968.

40. Gofmekler, V. A., N. N. Pushkina and G. N. Klevtsova. Some biochemical aspects of the embryotropic effect of benzene and formaldehyde. *Gigiena i Sanit. 33:*113-5, 1968.

41. Goncharuk, G. A. Effect of mercuran and mercurhexane on the offspring of albino rats. *Gigiena i Sanit. 33:*427-9, 1968.

42. Hansen, W. H., K. J. Davis and O. G. Fitzhugh. Chronic toxicity of cube. *Toxicol. Appl. Pharmacol. 7:*535-42, 1965.

43. Hayes, W. J., Jr. Pesticides and human toxicity. In: *Biological Effects of Pesticides in Mammalian Systems. Annals of the N. Y. Academy of Sciences 160 (Art. 1):*40-54, June 23, 1969.

44. Heinisch, E. Possibility of contaminating waters with pesticides. *Fortschr. Wasserchemi Ihrer Grezgeb. 11:*9-42, 1969.

45. Hennigan, R. D. Water pollution. *BioScience 19(11):*976-78, 1969.

46. Heuper, W. C. Cancer hazards from natural and artificial water-pollutants. In: *Proceedings Conference on Physiological Aspects of Water Quality,* 181-193. Washington D. C., 1960.

47. Hodge, H. C., E. A. Maynard and H. J. Blanchet. Chronic oral toxicity tests of methoxychlor (2,2-di-(p-Methoxyphenyl)-1,1,1-trichloro-ethane) in rats and dogs. *J. Pharm. Exp. Thera. 104:*60-66, 1952.

48. Hrutfiord, B. F. Organic material in pulp and paper mill effluent. *College of Forest Resources, Dissertation No. 98105.* University of Washington, Seattle, Washington.

49. Hunt, E. G. The impact on fish and wildlife of pesticides in agricultural waste waters. In: *Proceedings of the Symposium on Agricultural Waste Waters, Report No. 10,* 170-8. University of California, Water Resources Center, 1966.

50. Hunter, C. G. and J. Robinson. Aldrin, dieldrin and man. *Food and Cosmet. Toxicol. 6:*253-69, 1968.

51. Hypersensitivity to mercury. *Science 169:*811, 1970.

52. Insecticides in Lake Michigan. *Lake Michigan Enforcement Conference, Nov. 1968, Report by Pesticides Committee.* U. S. Department of the Interior, Federal Pollution Control Administration, Great Lakes Region, Chicago, Illinois.

53. Iverson, L. C. K. Monitoring pesticide content in water in selected areas of the United States. In: *Agriculture and the Quality of our Environment,* p.157-62. AAAS Publ. 85, 1967.

54. Jager, K. W., D. V. Roberts and A. Wilson. Neuromuscular function in pesticide workers. *Brit. J. Ind. Med. 27:*273-78, 1970.

55. Kampmeier, C. and H. B. Haag. Toxicological considerations in use of dithiocarbamates. *Agriculture Chemicals 27:*49-51, 1954.

56. Kanygina, A. V. and I. L. Rodziller. Effect of chemical industry waste water on open water bodies. *Vodosnabzhenie i Sanit. Tek. No. 4:*25-28, 1957.

57. Kay, K. Effect of organic pesticides on enzyme systems in mammals. *Preprints of papers presented at 150th National Meeting of ACS 5(2):*5, 1965.

58. Keane, W. T. and M. R. Zavon. The total body burden of dieldrin. *Bull. Environ. Contam. Toxicol. 4:*1-16, 1969.

59. Kimbrough, R., T. B. Gaines, and J. D. Sherman. Nutritional factors, longterm DDT intake and chloroleukemia in rats. *J. Nat. Cancer Inst. 33:*215-25, 1964.

60. Konar, S. K. Toxicity of heptachlor to aquatic life. *J. Water Pollution Control Federation 42(pt. 2):*299-303, 1970.

61. Krishnaswami, S. K. and W. M. Walkinshaw. A review of Canadian drinking water standards and objectives. *Can. J. Public Health 60:*198-202, 1969.

62. Kruse, H. Carcinogens in drinking water supply. *Gas-Wasserfach 106 (12):*318-25, 1965.

63. Leuschner, F., R. Poche, and C. Gloxhuber. Toxicological examination of a dish-washing agent. *Fette, Seifen, Anstrichmittel 71(7):*570-80, 1969.

64. Lichtenstein, E. P. Pesticide residues in soils, water, and crops. In: *Biological Effects of Pesticides in Mammalian Systems. Annals of the N. Y. Acad. Sci. 160, Art. 1:*155-61, June 23, 1969.

65. Liebmann, H. and A. Stammer. Toxicology of waste waters. III. Organic poisons. In: *Liebmann, H. (ed.), Handbuch der Frischwasser-und Adwasser-Biologie;* 827-74. Munchen, R. Oldenbourg, 1960.

66. Linn, J. D. and R. L. Standey. TDE residues in Clear Lake animals. *Calif. Fish Game 55(3):*164-78, 1969.

6'. Mann, J. D. and W. B. Storey. Rapid action of carbamate herbicides upon plant cell nuclei. *Cytologia 31:*203-207, 1966.

68. Maximum allowable concentrations of mercury compounds. Report of an International Committee. *Arch. Environ. Health 19(6):*891-905, 1969.

69. Miller, M. W. and G. Berb (ed.). *Chemical Fallout. Current Research on Persistent Pesticides.* Springfield, Illinois, Charles C. Thomas Inc., 1970.

70. Moats, S. A. and W. A. Moats. Toward safer use of pesticides. *BioScience 20(4):*459-63, 1970.

71. Mount, D. I. Report on insecticides in Lake Michigan. *Lake Michigan Enforcement Conference, Pesticides Committee.* Water Pollution Control Administration.

72. Nicholson, H. P., A. R. Grzenda and J. I. Teasley. Water pollution by insecticides: a six and one-half year study of a watershed. In: *Proceedings of the Symposium on Agricultural Waste Waters, Report No. 10,* 132-41. University of California, Water Resources Center, 1966.

73. Ottoboni, A. Evaluation of hazard. In: *Proceedings of the Symposium on Agricultural Waste Waters, Report No. 10,* 141-50. University of California, Water Resources Center, 1966.

74. Ottoboni, A. and J. I. Ferguson. Evidence for conversion of DDT to TDE in rat liver: I. Liver/body fat ratios of TDE. *Bull. Environ. Contamin. Toxicol. 3(5):*296-301, 1968.

75. Patterson, S. J., K. B. E. Tucker and C. C. Scott. Nonionic detergents and related substances in British waters. *Advan. Water Pollution Res. 2:*103-16, 1967.

76. Pickering, Q. H., C. Henderson and A. E. Lemke. The toxicity of organic phosphorus insecticides to different species of warm-water fishes. *Trans. Am. Fisheries Soc 91:*175-84, 1962.

77. Phosphates on the spot. *Science News 96:*591-2, 1969.

78. Pozdnyakova, A. G. Experimental basis for determining the maximum permissible concentration of isopropyloctadcylamine in bodies of water. *Gigiena i Sanit. 34(1):*105-7, 1969.

79. Proceedings: conference on physiological aspects of water quality. Washington, D. C., 1960.

80. Proffitt, M. A. Some factors affecting the toxicity of aldrin to fishes. *Proceedings Indiana Acad. Sci. 75:*325, 1965.

81. Quentin, K. A. and E. Huschenbeth. Pesticides as actual problem in water analysis and treatment. *Vom Wasser 35:*76-94, 1968.

82. Rahn, E. M. Are herbicides contaminating surface and ground waters in Delaware? *Del. Med. J. 41:*319-20, Oct. 1969.

83. Reinert, R. E. Pesticides in Lake Michigan fish. *Abstr. of Papers, 158th National Meeting of ACS,* Sept. 12, 1969.

84. Review of the 1969 literature on wastewater and water pollution control. *J. Water Pollution Control Federation 42:*863-1235, 1970.

85. Robinson, J. and M. Roberts. Estimation of the exposure of the general population to dieldrin (HEOD). *Food Cosmet. Toxicol. 7:*501-14, 1969.

86. Robson, T. O. Persistence of 2,4-D in natural surface waters in Britain. *Proceedings Brit. Weed Control Conf. (8th) 2:*594-7, 1966.

87. Roger, J. C., D. G. Upshall and J. E. Casida. Structure-activity and metabolism studies on organophosphate teratogens and their alleviating agents in developing hen eggs with special emphasis on bidrin. *Biochem. Pharmacol. 18:*373-92, 1969.

88. Rose, J. (ed.). *Technological Injury,* New York: Gordon and Breach, 1969.

89. Ryckman, D. W., A. V. S. Rao and J. C. Buzzell, Jr. Behavior of organic chemicals in the aquatic environment. A literature critique. Manufacturing Chemists Association, Washington, D. C., 1966.

90. Saffrotti, U., P. Shubik and D. L. Opdylre. Carcinogenic tests on alkylbenzenes and alkylbenzene sulfonates. *Toxicol. Appl. Pharmacol. 4:*763-769, 1962.

91. Sanders, H. O. Toxicities of some herbicides to six species of freshwater crustaceans. *J. Water Pollution Control Federation 42:* 1544-1550, 1970.

92. Sanderson, D. M. and E. F. Edson. Toxicological properties of the organophosphorus insecticide dimethoate. *Brit. J. Ind. Med. 21:* 52-64, 1964.

93. Schafer, M. L. Distribution of pesticide residues in the human body. *Preprints of papers presented at 150th National Meeting of ACS 5(2): 8:*1965.

94. Schenk, C. F. Pesticides and water quality. *Ontario Soil Crop Impr. Ass. Addresses Proc., 26th Annual Meeting* 85-9, 1965.

95. Smith, J. W. and S. G. Grigoropoulos. Toxic effects of trace organics on fish. *J. Am. Water Works Assoc. 62:*499-506, 1970.

96. Sparr, B. I. Residues in water ways from farm use of pesticides. In: *Proceedings of the Symposium on Agricultural Waste Waters, Report No. 10,* 83-89. University of California, Water Resources Center, 1966.

97. Sprague, J. B. Measurement of pollutant toxicity to fish. II. Utilizing and applying bioassay results. *Water Res. 4:*3-31, 1970.

98. Sreenivasan, A. and R. S. Raj. Toxicity of malathion and parathion to fish. *Pesticide Symp. 1964* 316-8, 1968.

99. Tarjan, R. and T. Kemeny. Multigeneration studies on DDT in mice. *Food Cosmet. Toxicol. 7:*215-222, 1969.

100. Tarrant, R. F. Pesticides in forest waters;symptom of a growing problem. *Soc. Am. Forest Proc. 1966:*159-73, 1967.

101. Tokunaga, S. Metabolism of pentachlorophenol in fish and mammals. I. Distribution of pentachlorophenol in fish. *Kagaku Keisatsu Kenkyusho Hokoku 21(2):*126-30, 1968.

102. Treon, J. F. and E. P. Cleveland. Toxicity of certain chlorinated hydrocarbon insecticides for laboratory animals, with special reference to aldrin and dieldrin. *J. Agr. and Food Chem. 3:*402-408, 1955.

103. Upholt, W. M. and H. F. Kraybill. Ecological effects of pesticides. In: *Biological Effects of Pesticides in Mamalian Systems, Annals of the N. Y. Academy of Sciences 160 (Art. 1):*55-60, June 23, 1969.

104. Walpole, A. L., D. C. Roberts, F. L. Rose, J. A. Hendry and R. F. Homer. Cytotoxic agents: IV, the carcinogenic actions of some monofunctional ethyleneimine derivatives. *Brit. J. Pharmacol. 9:*306-323, 1954.

105. Weaver, P. J. Phospates in surface waters and detergents. *J. Water Pollution Control Federation 41(9):*1647-53, 1969.

106. Westlake, W. E. Pesticides as contaminants of agricultural waste waters. In: *Proceedings of the Symposium on Agricultural Waste Waters, Report No. 10,* 90-93. University of California, Water Resources Center, 1966.

107. Wuu, K. D. and W. F. Grant. Chromosomal aberations induced by pesticides in meiotic cells of barley. *Cytologia 32:*31-41, 1967.

108. Zavon, M. R. Ineractions. *BioScience 19(10):*892-95, 1969.

A



B

C

E

N



O



P

| 1 Accession Number | 2 Subject Field & Group | |
|---|---|---|
| W | | **SELECTED WATER RESOURCES ABSTRACTS**<br>**INPUT TRANSACTION FORM** |

**5 Organization**

Arthur D. Little, Inc., Cambridge, Massachusetts
Life Sciences Division

**6 Title**

Water Quality Criteria Data Book, Vol. 1 - Organic Chemical Pollution of Freshwater

**10 Author(s)**

Davis, Thomas R. A. M.D.
Burg, Alan W. PhD.
Neumeyer, John L. PhD.
Butters, Kathleen M. A.B.
Wadler, Bella D. M.S.

**16 Project Designation**

18010DPV

**21 Note**

**22 Citation**

December, 1970. 379 pp., 16 tab, 577 ref.

**23 Descriptors (Starred First)**

*Organic Compounds, *Fresh Water, *Water Pollution Sources, *Water Quality, *Toxicity, Human Pathology, Animal Pathology, Public Health, Water Pollution Effects

**25 Identifiers (Starred First)**

*Acute Toxicity, *Chronic Toxicity, *Carcinogenicity, Mutagenicity, Teratogenicity, Tissue Concentrations

**27 Abstract**

Four hundred ninety six organic chemicals have been reported to be found or are suspected to be in fresh water. Of these, sixty six have been identified. As might be expected, evidence which directly relates the presence of organic chemicals in fresh water with human health is generally lacking.

Industrial sources were responsible for the largest number and variety of structural types of organic chemical pollutants. Reported agricultural sources of pollutants were all pesticides and domestic sources were all detergents. Animal toxicity consisted mainly of acute toxicity data. Pesticides were shown to be the most acutely toxic organic chemicals in water and only methyl mercuric chloride was found to be more toxic. Although the information on chronic threshold doses was insufficient for meaningful interpretation, the organometallics ranked high in chronic toxicity effects.

Of one hundred twenty compounds examined for carcinogenicity in animals, 22.5 percent were positive. Of thirty two compounds examined for teratogenicity in animals, 62.5 percent were positive. Although there is no proven chemical mutagen for man, all showed some effects on genetic material.

Factual information upon which quality criteria of water can be rationally based is generally lacking.

Abstractor: Thomas R. A. Davis, M.D. | Institution: Arthur D. Little, Inc.