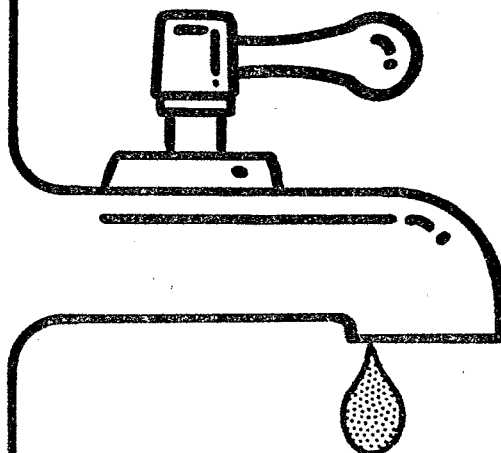


CONSUMER  
EDUCATION  
GUIDE

EPA-570-K-90-022



**ORGANIC  
CHEMICALS  
IN DRINKING  
WATER**

***Prepared By:***

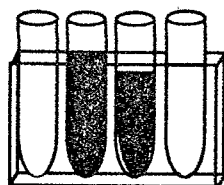
Association of State Drinking Water Administrators  
1911 North Fort Myer Drive  
Arlington, Virginia 22209

***Under Grant # X-814294-01 From:***

Environmental Protection Agency  
Office of Drinking Water  
401 M Street, SW  
Washington, DC 20460

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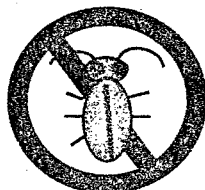
Over the past two decades, several advances have been made in the ability to detect and measure organic chemicals present at very low concentrations in air, soil, and water. This, together with advances in understanding of chemical toxicology, has led to an increased awareness of the health consequences of human exposure to organic chemicals. In particular, the potential cancer causing effects from long-term exposure to certain organic chemicals have received a high degree of attention because of the assumption that there is no threshold limit below which a cancer-causing substance does not pose some risk, however small.

## Types of Contaminants, Sources, and Health Effects

### **Pesticides and herbicides**

...are used in a wide variety of agricultural and industrial products. Drinking water may become contaminated with pesticides and herbicides

through agricultural runoff, leaching of organics through the soil, accidental spills, and incorrect disposal. In general, health effects associated with these contaminants include liver, kidney, and nervous system effects and several may be carcinogenic.



INSECTS



WEEDS

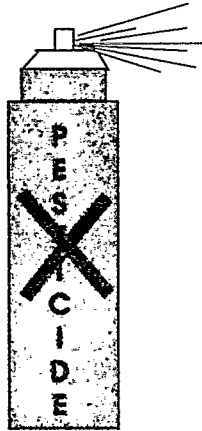
### **Polychlorinated biphenyls**

...are stable materials of low flammability, which contain from 12 to 68 percent chlorine. PCBs are generally found in electrical transformers and capacitors as well as fluids in vacuum pumps and compressors although their use in new products has now been banned. They are very stable in the environment and as a class of chemicals have been found to be carcinogenic.

## Introduction

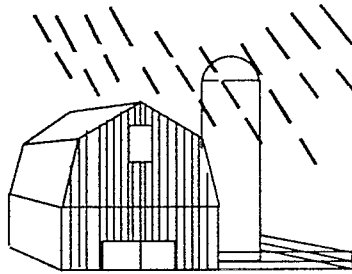
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Organic chemicals generally fall into four main categories: pesticides and herbicides (often called synthetic organic chemicals), disinfection by-products, polychlorinated biphenyls (PCBs), and industrial/commercial organics (often called volatile organic chemicals).



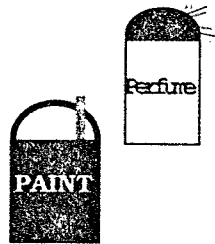
Consumers are exposed to organic chemicals through food, air, water, and home usage of pesticides and herbicides. Since the 1970s, these organic compounds have been increasingly detected in drinking water supplies.

Organic chemicals can contaminate drinking water in a number of ways. Some industries may dispose of organic wastes through such practices as land dumping or the disposal of untreated industrial waste into septic systems, storm drains, sewer pipes, or natural bodies of water. Although storm drains and sewer pipes lead to municipal wastewater treatment facilities, many municipal plants have only limited ability to remove organic chemicals.



Household wastewater may also contribute up to 12% of drinking water contamination since cleaners, detergents, and drain openers are commonly washed down household drains into septic systems and sewers. Pesticides used in agriculture, lawn care, and home pest control may permeate soils and enter groundwater aquifers or be carried through runoff to aquifer recharge areas or surface waters. In addition, organic contaminants may be formed as by-products of the disinfection process used in water treatment.

## Industrial/ commercial organics



...are organic chemicals used as degreasing agents, varnishes, paint thinners, and pesticides. A number of these organic chemicals are common in cleaning agents, moth balls, air deodorizers, perfumes, paints, and dyes. Laboratory data suggest that these chemicals are more likely to be persistent in groundwater supplies since the cool, dark, low-bacteria environment of groundwater does not promote the decomposition or evaporation of these organic chemicals. Consequently, once they are present in groundwater, they tend to persist for a long time until proper treatment for their removal is applied.

In general, health effects associated with industrial and commercial organic chemicals include liver, kidney, and nervous system effects. Many of these chemicals are also considered possible carcinogens.

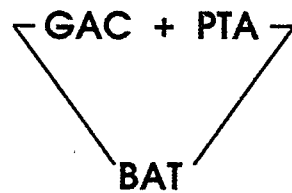
## Disinfection by-products



...are a special class of organic contaminants produced as by-products of chlorination and disinfection in the water treatment process. The formation of these contaminants is more often associated with surface water treatment plants due to high levels of organics found in surface water. These organics combine with chlorine and other disinfectants, thereby producing by-products which may be present in drinking water.

One of the most common by-products of chlorination is a trihalomethane compound known as chloroform. Chloroform as well as other disinfection by-products are potentially carcinogenic.

## Treatment Techniques



**T**he EPA currently recognizes granular activated carbon (GAC) and packed tower aeration (PTA) as the best available technologies (BAT) for the removal of organic contaminants from drinking water.

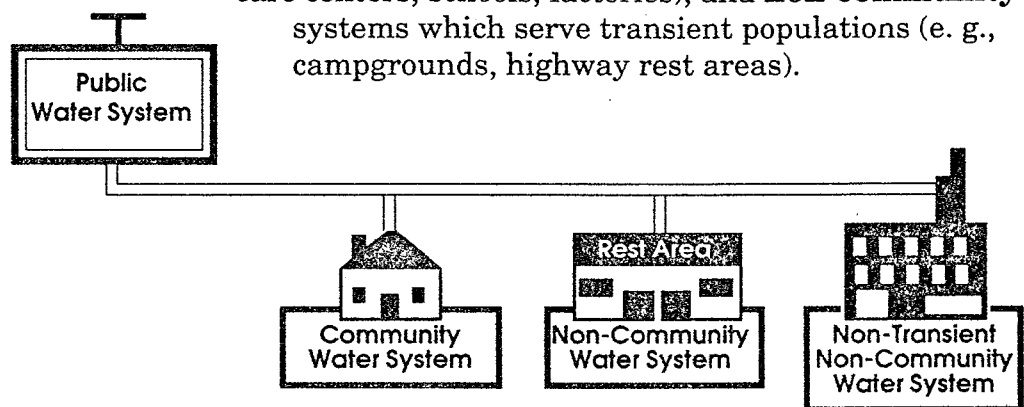
GAC is recommended for removal of pesticides and herbicides while PTA is generally used for removal of industrial/commercial organics. Disinfection by-products may be reduced by changing the point of chlorination at the treatment plant and utilizing a variety of chemicals to reduce organic matter in the water prior to disinfection. Alternative actions such as reconstructing wells in deeper, uncontaminated aquifers, and drilling new wells in an uncontaminated area may also solve contamination problems. These actions do not, however, specifically address the source of contamination. Utilities with organic chemical contamination problems will be required to install BAT for removal of organics in the future.

## Regulation of Organic Contaminants

**O**rganic contaminants are regulated under a number of Federal environmental laws including the Clean Water Act, the Federal Insecticide, Fungicide, and Rodenticide Act, and the Resource Conservation and Recovery Act. While these statutes control the release of organics into the environment, organic contaminants in public drinking water (supplies serving more than 25 people or 15 service connections) are regulated under the Safe Drinking Water Act (SDWA).

Under the SDWA, the U.S. Environmental Protection Agency (EPA) is given authority to develop a national drinking water protection program and establish national standards (acceptable or "safe" levels) for known or suspected drinking water contaminants. Currently, the SDWA regulates six pesticides and herbicides, eight industrial/commercial organics, and four disinfection by-products. Monitoring requirements are also in effect for 51 other industrial/commercial organics. SDWA regulations which have recently been proposed will require the regulation of an additional 26 organic chemicals and establish monitoring requirements for nearly 100 others.

Public water supplies fall under three major categories: **community** water supplies which serve the same population on a year round basis (e.g., cities, villages, mobile home parks), **non-transient non-community** systems which supply water to the same individuals at least six months of the year (e. g., day-care centers, schools, factories), and **non-community** systems which serve transient populations (e. g., campgrounds, highway rest areas).



Public water supplies are required to sample and analyze for drinking water contaminants on a regular basis based on the public water supply classification (e.g., community) and the source of drinking water (i.e., surface water or groundwater).



Public water supplies are required by law to notify the public of any monitoring failure or when any drinking water standard has been exceeded. This notification may be made by newspaper, radio or TV, hand-delivered notice to all residents, mailing in monthly or quarterly utility bills, or by posting in specified locations. The method of public notification is dependent on the type and severity of the violation and type of public water supply.

The federal government and the states are also authorized to initiate enforcement action against public water supplies which violate requirements of the SDWA. The primary goal of enforcement is to achieve compliance with the SDWA and to ensure future compliance.

## Facts the Consumer Should Know

1

None of the organic contaminants found in drinking water are pervasive. Whether they are in your water depends on the geographic location, the source of the water, the treatment it receives, and the effectiveness of the treatment.

2

Health risks are dependent on a number of factors including the nature of the contaminant, the level of the contaminant in drinking water, the susceptibility of the person consuming the water, and the period (i.e., days, months, years) over which a person drinks water from the same supply. In general, EPA regulates drinking water contaminants which may cause cancer based on a risk of 1 in 10,000 to 1 in 1,000,000. A risk of 1 in 1,000,000 for a lifetime indicates that one person in every 1,000,000 people exposed to the causative agent can be expected to contract a specified disease.



3

All consumers of water provided by public water supplies should be aware of the source, quality, monitoring requirements, and violations associated with their water supply. Consumers should contact their state public health or environmental office, or local water department for this information.

4

Treatment for organic contamination is generally most economical and effective at the water treatment plant. Since the SDWA requires that water plants supply water to their consumers which meet specified standards, the use of point-of-use (single tap) or point-of-entry (whole house) devices such as carbon units to remove potential organics from public water supplies is generally unnecessary. If consumers are interested in home treatment units they should first find out about the quality of their water to determine if such units are necessary, then research the units thoroughly.

5

In late 1987, EPA's Offices of Pesticides Programs and Drinking Water initiated a national survey of pesticide contamination in drinking water wells. The two year survey, scheduled for completion in 1990, will sample a total of 1350 private and community water system wells in all 50 states. Over 100 pesticides and pesticide by-products will be analyzed for each well. The survey results will make it possible for the first time to characterize the national levels and extent of occurrence of pesticides in drinking water wells.

## Summary

**E**ven though the vast majority of drinking water systems provide a safe supply of drinking water, EPA and states have taken great strides in passing laws and regulations designed to protect consumers from potential drinking water contaminants. Today, laws exist to regulate organic, inorganic, and radionuclide contaminants as well as microbiological and parasitic organisms. Surface water systems are required to filter and disinfect their water and soon groundwater systems will be required to disinfect. All these laws are designed to protect the consumer.

Public health officials should not, however, be complacent in their regulation of drinking water. It must be recognized by all parties, that water is a precious commodity and that its protection requires diligence, commitment, and a willingness by consumers to pay the full costs of a safe, potable water supply.

## **For More Information**

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**American Water Works Association**

(Water utility information)

(303) 794-7711

**Association of State Drinking Water**

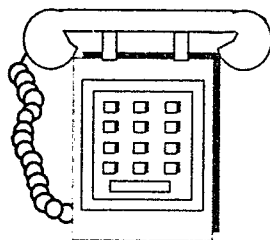
**Administrators** (State drinking water

information, consumer education guides) (703) 524-2428

**EPA Safe Drinking Water Hotline**

(Publications on lead, pesticides,  
radon, etc.)

(800) 426-4791



**International Bottled Water Association**

(Bottled water information)

(703) 683-5213

**Local Water Utilities**

(Water quality information)

Local Directory

**National Rural Water Association**

(Small water utility information)

(405) 252-0629

**National Sanitation Foundation**

(Water treatment units, bottled  
water information)

(313) 769-8010

**State Drinking Water Programs**

(Water quality information)

Local Directory

**State or Local Health Departments**

(Water quality information)

Local Directory

**Water Quality Association**

(Water treatment units)

(708) 505-0160