EPA-600/1-78-002
January 1978

Environmental Health Effects Research Series

BIOLOGICAL SIGNIFICANCE OF SOME METALS AS AIR POLLUTANTS. PART II: MERCURY

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BIOLOGICAL SIGNIFICANCE OF SOME METALS AS AIR POLLUTANTS PART II: MERCURY

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Special Foreign Currency Program
Agreement Number 02-302-3

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DISCLAIMER

ACKNOWLEDGEMENTS

Air Pollution Technology, Inc., wishes to express its appreciation to Dr. Leslie E. Sparks, E.P.A., Project Officer, and Mr. James Abbott, E.P.A. for excellent technical coordination and for very helpful assistance in support of our technical effort.

ABSTRACT

The objective of this study was to shed more light on the relationship between the concentration of a metal in air and in blood of the exposed persons and biological effects which may be attributed to the exposure to a given metal.

The study was carried out at four levels of exposure to mercury in air. The four population groups were: occupationally exposed workers, and inhabitants of industrial, urban, and rural areas.

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SECTION I

INTRODUCTION

Little is known about the behavior and levels of mercury in the atmosphere, and even less about possible effects of these low-level exposures on the human organism. It is for this reason that the present study was undertaken in order to elucidate the association between low atmospheric mercury levels and changes in some biological parameters likely to react to such exposure.

POPULATIONS STUDIED

The study covered four population groups believed to be exposed to four different levels of atmospheric mercury:

Rural Inhabitants

This population group consisted of inhabitants of a rural area with no known sources of mercury emission. Only male inhabitants of two villages situated 60 kilometers north of Zagreb were studied.

Town Dwellers

This second group was composed of inhabitants of a town with no specific, identified sources of mercury emission. Some exposure to higher mercury levels was expected, however, from burning of fossil fuel, industrial waste containing small amounts of mercury, and other miscellaneous sources. Male inhabitants of the City of Zagreb, the capital of the State of Croatia, were selected.

Inhabitants of a Mercury Mining and Smelting Area

This group consisted of the general population of the mercury mining and smelting town of Idrija, excluding those occupationally exposed. The town of Idrija, where the second largest mercury mine in Europe is situated, is in the western part of Yugoslavia, in the State of Slovenia.

Workers Occupationally Exposed to Mercury

This last group was made up of mercury miners and smelters of Idrija who are exposed to mercury in their jobs and also exposed to the generally higher atmospheric mercury levels in the town of Idrija.

HYPOTHESES

In spite of the abundant research material accumulated on the toxicology of mercury and, particularly, on biochemical changes caused by mercury absorption, it has not as yet been possible to define main biochemical or physiological lesions associated with it.

We set forth two working hypotheses:

1. Delta-aminolevulinic acid dehydratase (ALAD), containing sulfydril groups, is likely to be influenced by a metal such as mercury which has such a strong affinity for these groups. In the case of a changed ALAD activity, protoporphyrin synthesis should be affected, and this effect should be reflected in a changed coproporphyrin excretion rate.

2. Activities of other sulfur-containing enzymes are altered, and the concentration of some biologically important sulfur-containing compounds is changed under the mercury absorption exceeding the basic one.

In addition, we followed changes in some other biological parameters which have been reported in the literature to react to higher mercury absorption. The following biological parameters were studied:

1. Coproporphyrin (Co)
2. Coproporphyrin I and III ratio
3. Glutathione (GHS)
4. Alkaline Phosphatase (Alk.Ph.)
5. Cholesterol (Chol.)
6. Cholinesterase (ChE)
7. Delta-amino levulinic acid dehydratase (ALAD)
8. Glutamic-oxalacetic transaminase (GOT)
9. Glutamic-pyruvic transaminase (GPT)
10. Glucose-6-phosphate dehydrogenase (G-6-PD)

The analyses of coproporphyrin I and III isomers, the estimation of the activities of cholinesterase and delta-amino levulinic acid dehydratase, and the determination of cholesterol were not part of the Contract, but these analyses were considered to be of interest and were therefore included in the study.

SECTION 2

INVESTIGATION SCHEDULE

The first two years of the project were used for the introduction, development, and evaluation of analytical methods.[1,2] Sampling and measurements were performed in the course of the second, third, and fourth years and were completed in the fifth year. The results were processed and statistically evaluated in the fifth year of the project.

SECTION 3

METHODS

DETERMINATION OF MERCURY IN BLOOD

In preliminary stages of the project, mercury in the blood was determined by the Magos and Cernic method,[3] but it was later replaced by the method described by Linstedt and Skare[4] and Skare.[5] In the method by Magos and Cernik, the liberation of mercury takes place from undigested material; the H-gC bonds are not destroyed and, consequently, only inorganic mercury is determined. By the Lindstedt and Skare method, blood is digested by a mixture of perchloric and nitric acid at 70°-75° so that all the mercury bonds are destroyed and total mercury in blood can be determined. Mercury is reduced with stannous chloride ($SnCl_2$), removed from blood by aeration, passed through the gas cell of the Perkin Elmer Atomic Absorption Spectrophotometer (Model 305 A), and cold vapor atomic absorption of the 253.7 nm mercury emission line is measured. Blood samples of 1 or 2 ml were used. The sensitivity of the method is 25 ng/2 ml blood. The recovery was determined at 99.2%±4.6%.

DETERMINATION OF MERCURY IN AIR

Mercury exposure was assessed by collecting mercury vapor and aerosols with stationary and personal samplers. Stationary samplers consisted of a filter holder followed by a water-containing impinger and by a fritted glass bubbler with acid potassium permanganate. The filter paper (membrane filter, Sartorious SM 11304, 8 µm) with collected particles is extracted with the acid potassium permanganate solution, and solid mercury compounds are dissolved in this way. The trapping bubbler is preceded by the water-containing impinger in order to humidify the air and reduce evaporation of the trapping liquid.

For dynamic sampling, Casella personal samplers, Model C, were used; they consisted of a filter followed by an Arnold sampler containing permanganate solution, and a nickle-cadmium battery-driven diaphragm pump.

The determination of mercury in air was carried out in the same way as in blood. Mercury ions were reduced with $SnCl_2$ and removed from the solution with an air current. Cold vapor atomic absorption of the 253.7 nm mercury emission line was measured with the Perkin-Elmer Atomic Absorption Spectrophotometer, Model 305 A.

The trapping efficiency of the sampling system for mercury vapor was determined with the known concentrations of mercury vapor in air produced by a dynamic method. Trapping efficiency was found to be 100.8%±7.6%.

DELTA-AMINO LEVULINIC ACID DEHYDRATASE ACTIVITY

For the determination of delta-amino levulinic acid dehydratase activity (ALAD) in blood, the method of Bonsignore et al.[6] was used. The principle of the method is the spectrophotometric measurement of porphobilinogen formed as a product of the enzyme action upon substrate, to which a known concentration of delta-amino levulinic acid is added. The activity was expressed in units/ml red blood cells (E). One enzyme unit was defined as the difference in the optical density between the experimental and control test tubes, corrected according to the hematocrit value and sample dilution.

Eight ALAD tests run simultaneously by two analysts yielded a range of 177 to 191 units with a mean of 183 units and standard deviation of 3.36 units. The coefficient of variation was 1.84%.

It has been proved that the results were affected by the time that elapsed between blood drawing and analysis. The average decrease in the activity of samples stored for 6 hours at 4° was 4.62% (an absolute decrease of 5.0 units/ml E) and for samples stored 24 hours, 23.15% (an absolute decrease of 25.0 units/ml E). Most ALAD analyses were performed within 6 hours.

COPROPORPHYRINS

Total Coproporphyrins

Total coproporphyrins were determined fluorimetrically by the method described by Schwartz et al.[7] According to the original method, the urine sample, acidified by buffered asectic acid, is extracted with ethyl acetate; the extract is washed with a sodium acetate solution to remove uroporphyrins, coproporphyrin precursors are oxidized with iodine, and, finally, coproporphyrins are extracted with several portions of hydrochloric acid.

The sensitivity of the method is 1 μg/100 ml urine. As in Zieve et al.,[8] the mean coproporphyrin value in normal male populations, obtained by the method of Schwartz et al., is 163±53 μg/day. Using the same method for our normal male population, we obtained the value of 12.5±5.8 μg/100 mg urine, which corresponds to the aforementioned values if an average daily diuresis of 1.2-1.5 litres is assumed.

Coproporphyrin I and III Isomers

Coproporphyrin isomers were determined by a modification of the Koskelo and Toivonen method.[9] In the method used by Koskelo and Toivonen coproporphyrins are extracted from urine with ether. A hydrochloric acid extract of coproporphyrins is purified by passing through an aluminum oxide column, a method that allows the majority of impurities to pass through, while the coproporphyrins are retained. The coproporphyrins are eluted with ammonium hydroxide and reextracted with ether at pH 3.5. Ether is evaporated, and the dry residue--redissolved in the mixture of acetic acid, water, and ammonium hydroxide--is applied to silica gel G on thin-layer chromatography plates. The sample is developed in a mixture of 2.6 lutidine and water in an ammonium atmosphere. The stains of separated coproporphyrins are eluted with hydrochloric acid.

Because of difficulties in the supply of 2.6 lutidine, this method was modified by using 2.4 lutidine for the separation of isomers. In addition, the chromatography chamber was saturated with ammonia to a higher degree than in the original method. It was found that the two most critical factors for achieving a quantitative separation of two isomers were the concentration of ammonia in the chromatography chamber and the relationship between lutidine and water.

The modified procedure, unlike the original procedure, did not elute isomer stains. The fluorescence intensity of dry stains was measured directly on a Perkin-Elmer MPF-2 Spectrofluorimeter with a special accessory for measuring fluorescence on thin-layer chromatography plates. The excitation wavelength was 405 nm, and the emission wavelength was 598 nm.

Normal values of coproporphyrin I and III proportion vary with the analytical method applied. Koskelo and Toivonen[9] have found approximately 25% isomer I in their normal population. Other authors consider the normal range to be 35%-40% coproporphyrin I.[10,11] The mean coproporphyrin I proportion obtained in our normal population was 43.3%±10.4%.

ALKALINE PHOSPHATASE

Measurement of alkaline phosphatase activity was based on the method of Bessey et al.[12] using the standard procedure with "Biochemica Test Combination" set of Boehringer Co.[13]

GLUTAMICOXALACETIC TRANSAMINASE (GOT) AND GLUTAMIC-PYRUVIC TRANSAMINASE (GPT)

Activity of GOT and GPT was assessed on the basis of the colorimetric method by Reitman and Frankel[14] using the standard procedure with "Biochemica Test Combination" set of Boehringer Co.[15]

GLUTATHIONE

The method of Beutler et al. was used to determine glutathione (GSH) in whole blood,[16] a method based on the development of a relatively stable yellow color when 5,5'-dithiobis-(2-nitrobenzoic acid) (DTNB) is added to glutathione. The maximum absorption for the reduced DTNB in the visible part of the spectrum has proved to be 412 nm.

GSH was bound to be very stable. The maximum decrease of GSH concentration in blood samples after 24-hour storage at 4°C was 0.20 mg/100 ml.

The normal concentration in a group of healthy adults (N = 30) was 35.7±6.3 mg/100 ml blood (range: 26.1-49.5 mg/100 ml blood).

GLUCOSE-6-PHOSPHATE DEHYDROGENASE ACTIVITY

Glucose-6-phosphate dehydrogenase (G-6-PD) activity was measured by the method of Zinkham et al,[17] which is based on direct spectrophotometric determination of reduced triphosphopyridine nucleotide in the ultraviolet region (340 nm). The activity is expressed in G-6-PD units/100 ml E. One unit of enzyme is defined as the amount which produces at 340 nm an optical density change of 2.07 per minute in 3.0 ml of reaction mixture.

Normal values determined in a group of 50 healthy male adults were 182±28.3 units/100 ml E (range: 153.8-210.2 units/100 ml E).

Seven G-6-PD tests run simultaneously on one blood sample by an analyst yielded a range from 178.3 to 217.1 units. The coefficient of variation was 7.5%.

The stability test run at 4°C showed that G-6-PD activity decreased with the time of blood storage. After five hours the average decrease in activity was 1.5% (an absolute decrease of 2.5 units/100 ml E) and after 24 hours, 5.2% (an absolute decrease of 8.7 units/100 ml E). The analyses were performed, as a rule, within 5 hours.

CHOLINESTERASE

Activity of cholinesterase in blood and in plasma was measured with the micromodification[18] of the method by Ellman et al.[19] Thiocholine formed by enzymatic hydrolysis reacts with dithio-bis-nitrobenzoic acid forming a yellow product, the absorbance of which was measured at 412 nm. The Spectrophotometer Unicam SP600 was used.

Normal values[20] for whole blood were found to be 15.0-30.0 ΔE/min/ml, and for plasma, normal values were 2.5-8.6 ΔE/min/ml.

CHOLESTEROL

The method by Levine et al.[21] was used for the determination of total cholesterol in serum using the Autoanalyzer Technicon. With the anhydride of acetic acid and the concentrated sulfuric acid (Liebermann-Burchardt reagent), cholesterol reacts by developing a green product, the absorbance of which was measured at 625 nm.

SECTION 4

RESULTS

ASSESSMENT OF MERCURY EXPOSURE

Table 1 gives summarized data on sampling sites, methods of sampling and analysis, and sampling frequency and duration.

Exposure of Rural Inhabitants

Twenty-four-hour, low-volume atmospheric samples (1.8-3.0 m^3/24 hours) were collected in two villages with no known mercury sources for 2 weeks every month, including Saturdays and Sundays, for 1 year (December 1972 through November 1973). The individual 24-hour concentrations obtained at two locations, with the monthly means and maximal and minimal values, are presented in the Appendix (Tables A-1 through A-12). In Tables 2-5 the mercury vapor concentrations are presented separately for winter, spring, summer, and autumn, expressed as seasonal arithmetic means with the standard deviation and as geometric means with the standard geometric deviation. Minimal and maximal values, as well as the concentration which is exceeded by only 5% of the results, are also included in the tables. Seasonal cumulative frequency distributions of atmospheric mercury concentrations in the two rural locations, from which the geometric mean concentrations and standard geometric deviations were calculated, are shown in the Appendix (Figures A-1 and A-2). Monthly mean concentrations of mercury in the air of the two rural areas are presented in Figure 1. Mean seasonal concentrations at the two locations are shown in Figure 2.

As expected, the mercury concentrations in rural areas are low. The seasonal mean concentrations do not differ much. The inhabitants of the rural areas are exposed to a rather stable mercury-in-air concentration.

Exposure of Town Dwellers

Twenty-four-hour, low-volume samples were collected in the territory of the City of Zagreb 2 weeks per month at the following four locations: I - a suburban residential area to the north, II - a midtown residential and commercial area, III - a residential area in the east, and IV - an industrial and residential area to the west. As shown in previous progress reports, mercury in the form of aerosols contributed to the total concentration so insignificantly that it was ignored and is therefore omitted from the tables. The obtained 24-hour concentrations with their monthly means and maximal and minimal values are shown in the Appendix (Tables A-13 through A-24). In Tables 6-9, the results obtained in each season of the year are presented as

TABLE 1. MERCURY AIR MEASUREMENT: METHODS OF SAMPLING AND ANALYSIS BY AREA

Area	Characterization	Frequency and duration of sampling	Method of sampling and analysis
Rural Zlatar Bedekovcina	Farming	2 weeks per month Dec. 1972-Nov. 1973	24-hour, low-volume samples - AAS
Urban Zagreb	I. Suburban - residential (North) II. Center of Town - old residential and commercial III. Residential (East) IV. Industrial and residential (West)	2 weeks per month Dec. 1972-Nov. 1973	24-hour, low-volume samples - AAS
Idrija town - vicinity of mercury mine and smelter	I. Old residential - close to smelter II. Center of town III. New residential IV. Periphery of town	2 weeks per month Dec. 1971-Nov. 1973 Dec. 1971-Nov. 1973 Dec. 1971-Nov. 1972 Feb. 1972-Nov. 1972	24-hour, low-volume samples - AAS
Mercury mine and smelter	Mining in Strata with metallic mercury content Mining in Strata with low metallic mercury content Smelting Auxiliary activities	133 continuous personal Samples over the whole shift	Personal sampling AAS

TABLE 2. ATMOSPHERIC MERCURY VAPOR CONCENTRATION IN RURAL AREA, $\mu g/m^3$ (WINTER)*

Concentration	Location	
	I	II
$\bar{X}$	0.014	0.015
S	0.008	0.009
Max.	0.031	0.041
Min.	0.002	0.002
$\bar{X}g$	0.012	0.013
σg	1.800	1.769
Exceeded by only 5%	0.030	0.034

*Dec. 1972, Jan. and Feb. 1973.

TABLE 3. ATMOSPHERIC MERCURY VAPOR CONCENTRATION IN RURAL AREA, $\mu g/m^3$ (SPRING)*

Concentration	Location	
	I	II
$\overline{X}$	0.010	0.012
S	0.006	0.005
Max.	0.026	0.025
Min.	0.001	0.003
$\overline{X}g$	0.008	0.010
σg	1.857	1.600
Exceeded by only 5%	0.023	0.022

*March, April, and May 1973.

TABLE 4. ATMOSPHERIC MERCURY VAPOR CONCENTRATION IN RURAL AREA, $\mu g/m^3$ (SUMMER)*

Concentration	Location	
	I	II
$\overline{X}$	0.014	0.014
S	0.008	0.006
Max.	0.040	0.032
Min.	0.004	0.005
$\overline{X}g$	0.011	0.011
σg	1.891	1.682
Exceeded by only 5%	0.032	0.027

*June, July, and Aug. 1973.

TABLE 5. ATMOSPHERIC MERCURY VAPOR CONCENTRATION IN RURAL AREA, $\mu g/m^3$ (AUTUMN)*

Concentration	Location	
	I	II
$\overline{X}$	0.014	0.015
S	0.010	0.009
Max.	0.046	0.042
Min.	0.004	0.006
$\overline{X}g$	0.012	0.013
σg	1.967	1.813
Exceeded by only 5%	0.036	0.034

*Sept., Oct., and Nov. 1973.

TABLE 6. ATMOSPHERIC MERCURY VAPOR CONCENTRATION IN ZAGREB, $\mu g/m^3$ (WINTER)*

Concentration	Location			
	I	II	III	IV
$\bar{X}$	0.018	0.015	0.028	0.017
S	0.009	0.015	0.024	0.013
Max.	0.041	0.065	0.130	0.064
Min.	0.001	0.001	0.001	0.001
$\bar{X}$	0.015	0.009	0.022	0.012
σg	1.800	3.043	2.093	2.263
Exceeded by only 5%	0.039	0.058	0.074	0.045

* Dec. 1972, Jan. and Feb. 1973.

TABLE 7. ATMOSPHERIC MERCURY VAPOR CONCENTRATION IN ZAGREB, $\mu g/m^3$ (SPRING)*

Concentration	Location			
	I	II	III	IV
$\overline{X}$	0.042	0.011	0.015	0.010
S	0.046	0.006	0.014	0.003
Max.	0.172	0.032	0.093	0.019
Min.	0.007	0.001	0.001	0.001
$\overline{X}g$	0.026	0.008	0.013	†
σg	2.923	2.293	1.938	†
Exceeded by only 5%	0.154	0.028	0.038	0.015

* March, April, and May 1973.

† Normal distribution.

TABLE 8. ATMOSPHERIC MERCURY VAPOR CONCENTRATION IN ZAGREB, $\mu g/m^3$ (SUMMER)*

Concentration	Location			
	I	II	III	IV
$\overline{X}$	0.113	0.014	0.012	0.010
S	0.085	0.008	0.004	0.003
Max.	0.367	0.031	0.030	0.018
Min.	0.017	0.001	0.002	0.001
$\overline{X}g$	0.078	0.012	0.009	†
σg	1.910	1.733	1.900	†
Exceeded by only 5%	0.233	0.028	0.026	0.018

* June, July, and Aug. 1973.

† Normal distribution.

TABLE 9. ATMOSPHERIC MERCURY VAPOR CONCENTRATION IN ZAGREB, $\mu g/m^3$ (AUTUMN)*

Concentration	Location			
	I	II	III	IV
$\bar{X}$	0.032	0.027	0.025	0.010
S	0.026	0.009	0.010	0.007
Max.	0.134	0.049	0.050	0.030
Min.	0.010	0.001	0.001	0.001
$\bar{X}g$	0.021	0.010	0.011	0.008
σg	2.571	1.813	2.089	2.039
Exceeded by only 5%	0.098	0.026	0.038	0.026

*Sept., Oct., and Nov. 1973.

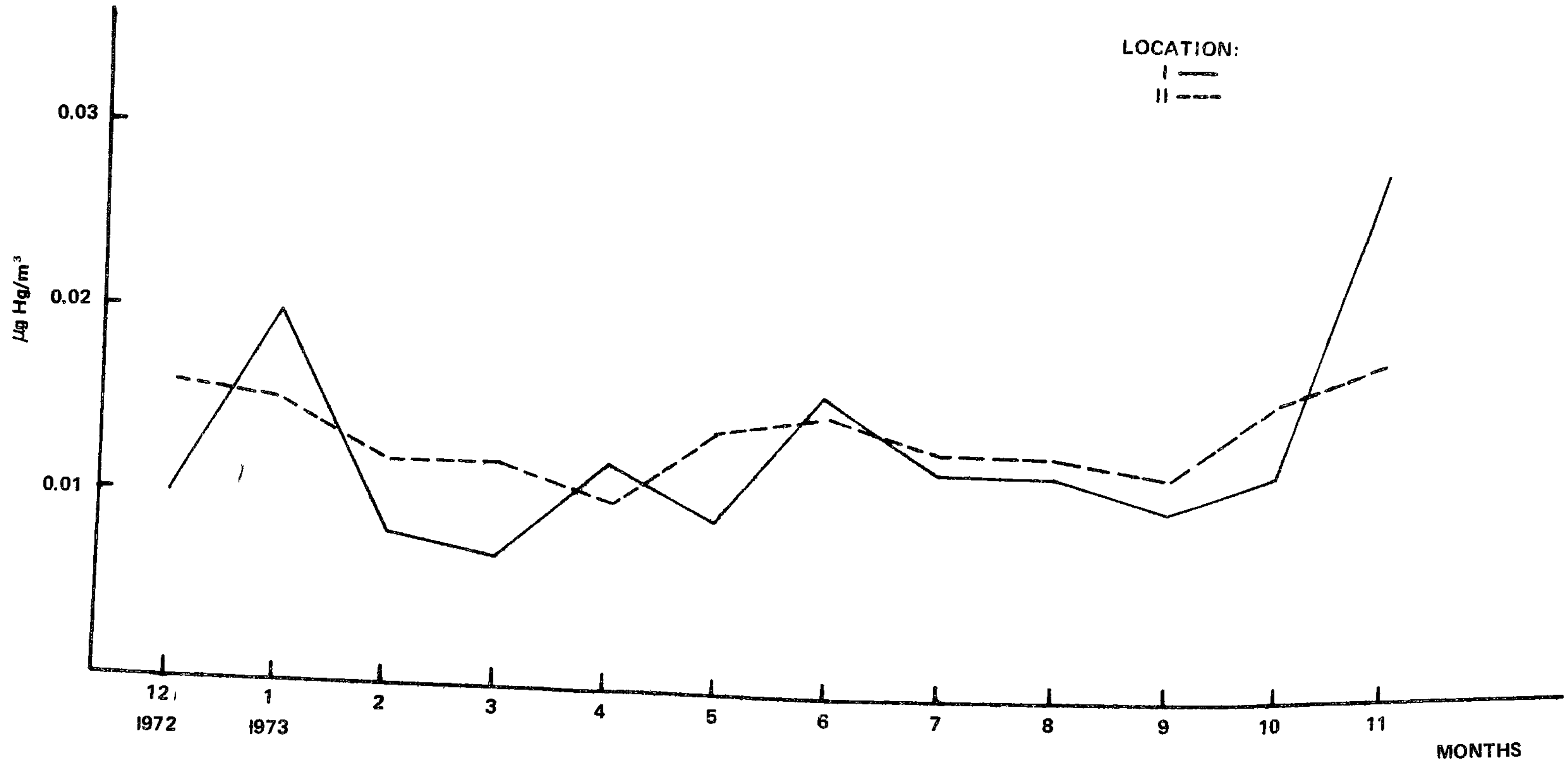

Figure 1. Mean monthly concentrations of mercury in air - rural area.

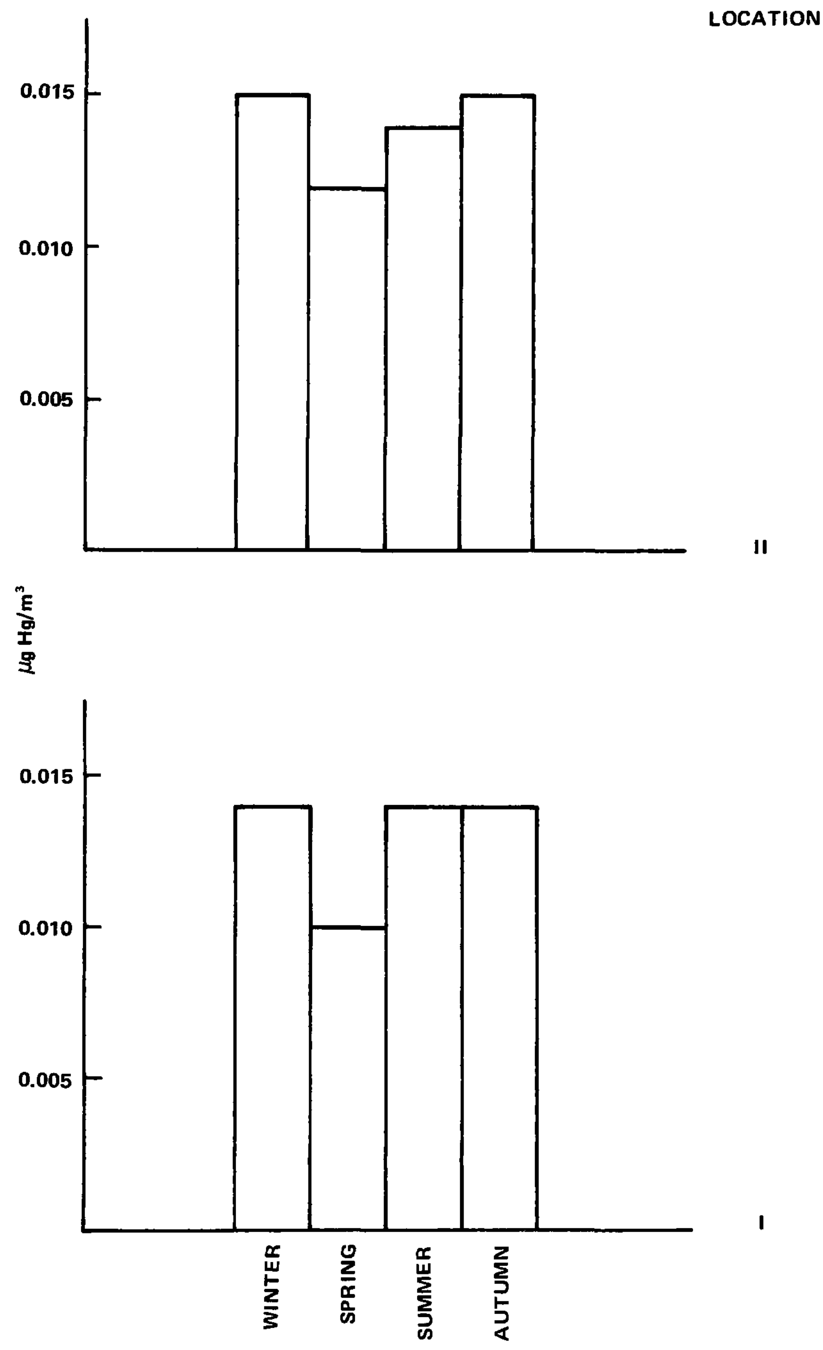

Figure 2. Mean seasonal concentrations of mercury in air - rural area.

seasonal arithmetic means with the standard deviation and as geometric means with the standard geometric deviation. Minimal and maximal values, and concentrations which were exceeded by only 5% of results, are also included in the tables. The seasonal cumulative frequency distribution of atmospheric mercury at the four locations, from which the geometric mean concentrations and the standard geometric deviations were calculated, are shown in the Appendix (Figures A-3 through A-7). Monthly mean concentrations of mercury in air of the four urban locations through a yearly cycle are presented in Figure 3, and mean seasonal concentrations at the four locations are shown in Figure 4.

The urban atmospheric mercury concentrations in the City of Zagreb, although higher than those found in the rural areas, are also low. The only difference is the summer concentration measured at location I where a sudden unexpected rise of the concentration occurred between May and September. Searching for the source of this intense mercury emission, researchers discovered that a large quantity of metallic mercury was discharged from a laboratory at the immediate vicinity of the sampling train. The increase in mercury vapor pressure with the increasing temperature in the summer months is likely to have been the reason of the high concentrations which remained until the metallic mercury pool was completely evaporated, whereupon the concentrations returned to normal. The results obtained at location I should not, therefore, be considered typical of the area. At other sampling sites the concentrations did not vary considerably between individual months.

Exposure of Inhabitants of a Mercury Mining and Smelting Area

Twenty-four-hour, low-volume samples were collected in the mercury mining and smelting area of Idrija at four locations through at least 2 weeks per month, and occasionally for a longer period, over a yearly cycle. As the concentrations measured at locations II, III, and IV were similar, the measurements were continued at only two locations (I and II) over another yearly cycle. Location I was in the old residential area close to the smelter; location II was in the center of the town; location III was in the new residential area, and location IV, at the periphery of the town. The obtained 24-hour concentrations with their monthly means and maximal and minimal values are shown in the Appendix (Tables A-24 through A-60). In Tables 10-17 the obtained seasonal mercury vapor concentrations over two yearly cycles are presented as seasonal arithmetic means with the standard deviation and as geometric means with the standard geometric deviation. Minimal and maximal values, as well as the concentrations that are exceeded by only 5% of the results, are also included in the tables. In addition, the tables also give percentages of samples with the mercury concentration above 0.3 $\mu g/m^3$, 2 $\mu g/m^3$, and 5 μ/m^3. The concentration of 0.3 $\mu g/m^3$ is the maximum allowable concentration of mercury vapor accepted in the USSR on the basis of animal experiments showing that concentrations below this limit produce no funtional changes in the brain cortex.[22] The concentration of 2 $\mu g/m^3$ was found to be the lower limit of the mercury concentration inducing significant changes in the higher nervous activity.[23] The concentration of 5 $\mu g/m^3$ is one-tenth of the threshold concentration (50 $\mu g/m^3$) for the working environment set forth by the International Symposium on MAC values in 1968.[24] The seasonal cumulative frequency distribution of atmospheric

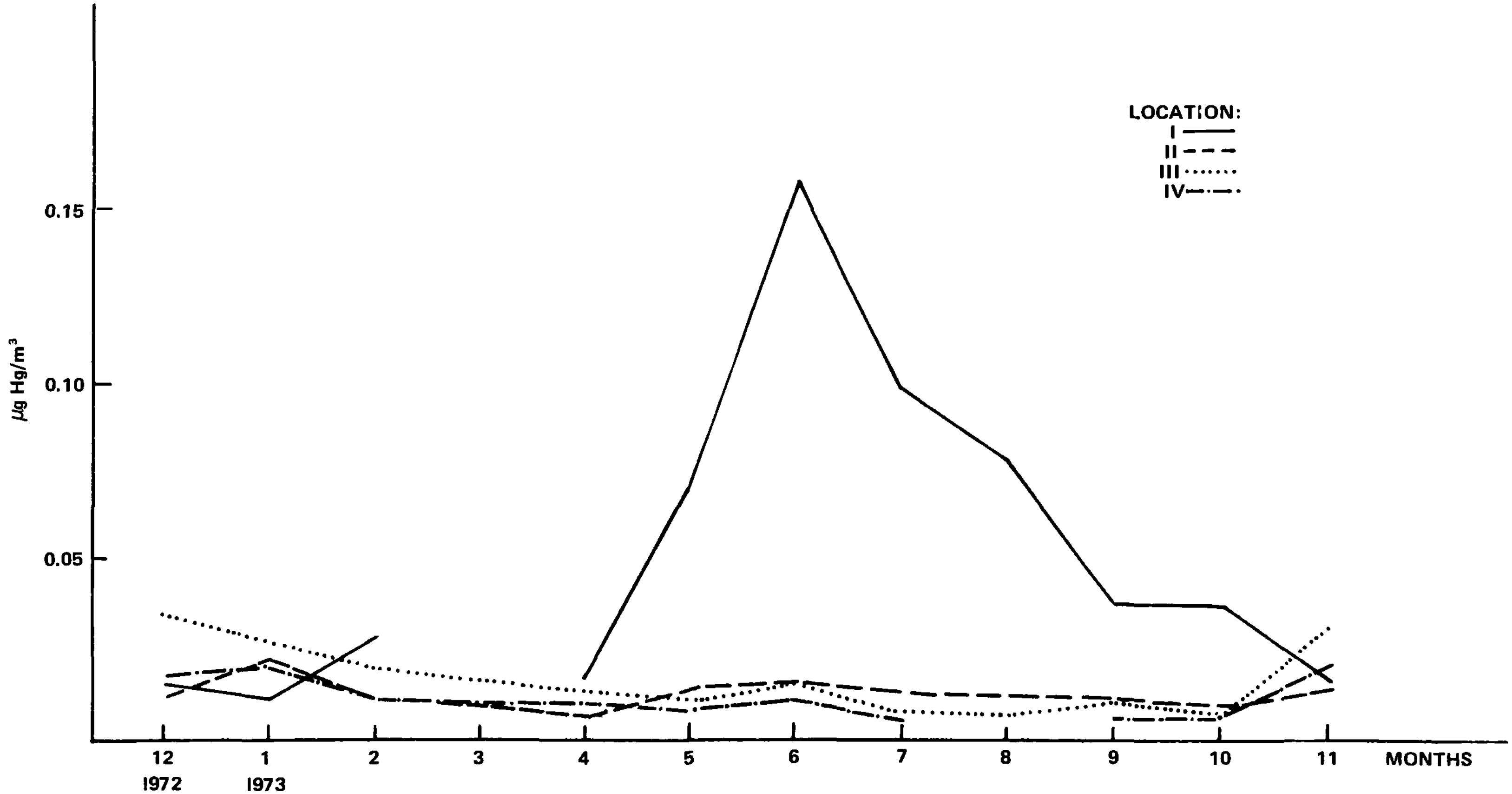

Figure 3. Mean monthly concentrations of mercury in air - Zagreb area.

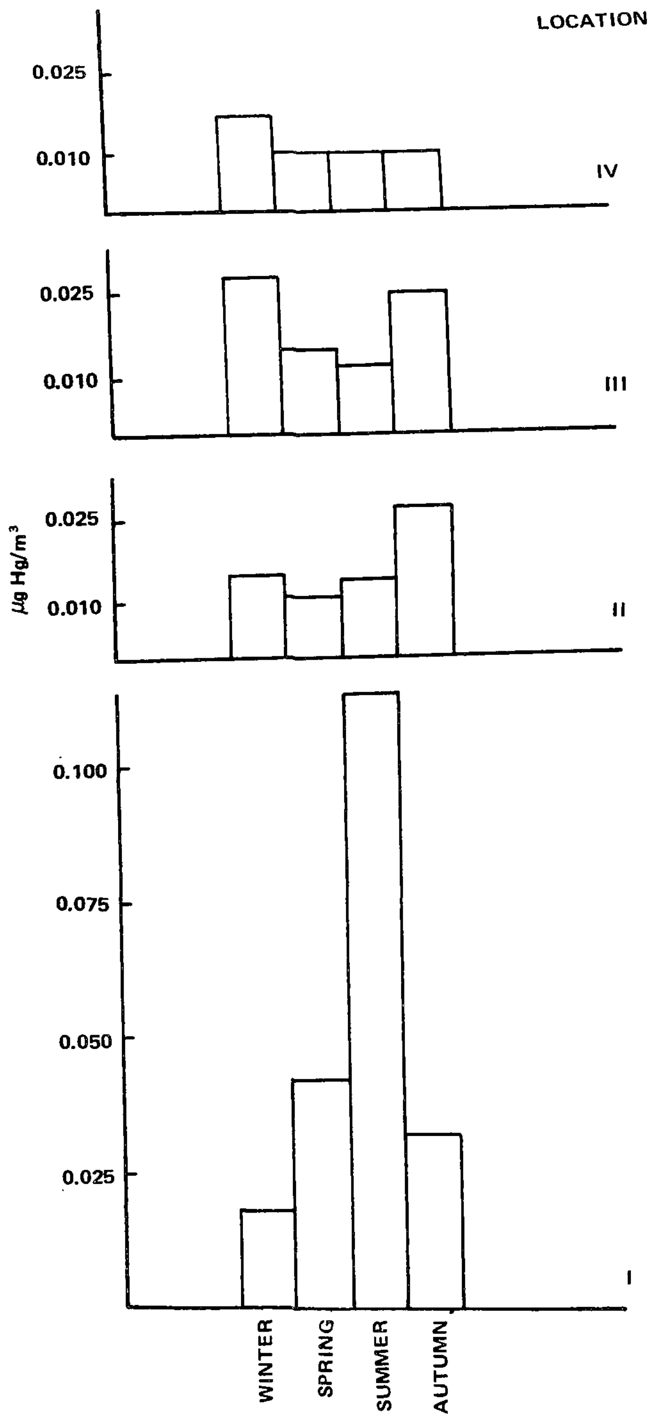

Figure 4. Mean seasonal concentrations of mercury in air - Zagreb area.

TABLE 10. ATMOSPHERIC MERCURY VAPOR AND AEROSOL CONCENTRATIONS IN IDRIJA, μg/m³ (WINTER)*

Mercury vapor

Concentration	Location			
	I	II	III	IV†
$\overline{X}$	2.033	0.827	0.669	1.087
S	2.282	0.938	0.803	1.146
Max.	8.788	3.930	2.897	4.150
Min.	0.077	0.074	0.051	0.104
$\overline{X}g$	1.600	0.640	0.425	0.950
σg	2.450	2.423	3.205	2.316
Exceeded by only 5%	7.040	2.800	2.750	3.800
% results above 0.3 $\mu g/m^3$	74	59	49	68
% results above 2 $\mu g/m^3$	36	13	10	26
% results above 5 $\mu g/m^3$	13	0	0	0

Mercury aerosols

Concentration	Location			
	I	II	III	IV†
$\overline{X}$	0.013	0.012	0.009	0.012
Max.	0.063	0.138	0.038	0.065
Min.	0.001	0.001	0.002	0.001

* Dec. 1971, Jan. and Feb. 1972.

† Feb. only.

TABLE 11. ATMOSPHERIC MERCURY VAPOR AND AEROSOL CONCENTRATIONS IN IDRIJA, μg/m³ (SPRING)*

Mercury vapor

Concentration	Location I	Location II	Location III	Location IV
$\overline{X}$	1.671	0.339	0.217	0.353
S	1.137	0.165	0.110	0.268
Max.	5.724	0.801	0.589	1.212
Min.	0.103	0.041	0.006	0.033
$\overline{X}g$	1.300	0.330	0.190	0.310
σg	1.923	1.576	1.632	1.839
Exceeded by only 5%	3.800	0.690	0.420	0.840
% results above 0.3 $\mu g/m^3$	91	50	13	41
% results above 2 $\mu g/m^3$	31	0	0	0
% results above 5 $\mu g/m^3$	3	0	0	0

Mercury aerosols

Concentration	Location I	Location II	Location III	Location IV
$\overline{X}$	0.022	0.013	0.006	0.008
Max.	0.046	0.080	0.012	0.023
Min.	0.010	0.003	0.002	0.002

* March, April, and May 1972.

TABLE 12. ATMOSPHERIC MERCURY VAPOR AND AEROSOL CONCENTRATIONS IN IDRIJA, μg/m^3 (SUMMER)*

Mercury vapor

Concentration	Location			
	I	II	III	IV
$\overline{X}$	3.116	0.574	0.273	1.052
S	1.394	0.368	0.291	0.790
Max.	6.581	1.772	1.916	4.237
Min.	0.568	0.128	0.027	0.238
$\overline{X}g$	†	0.504	0.225	0.690
σg	†	1.756	1.644	2.000
Exceeded by only 5%	5.850	1.410	0.520	2.100
% results above 0.3 μg/m^3	100	74	30	91
% results above 2 μg/m^3	74	0	0	9
% results above 5 μg/m^3	5	0	0	0

Mercury aerosols

Concentration	Location			
	I	II	III	IV
$\overline{X}$	0.019	0.004	0.004	0.008
Max.	0.048	0.006	0.008	0.028
Min.	0.007	0.001	0.001	0.002

* June, July, and Aug. 1972.

† Normal distribution.

TABLE 13. ATMOSPHERIC MERCURY VAPOR AND AEROSOL CONCENTRATIONS IN IDRIJA, μg/m^3 (AUTUMN)*

Mercury vapor

Concentration	Location			
	I	II	III	IV
$\overline{X}$	1.816	0.424	0.245	0.530
S	1.081	0.258	0.154	0.448
Max.	5.043	1.079	0.649	1.886
Min.	0.231	0.094	0.062	0.079
$\overline{X}g$	1.500	0.352	0.212	0.405
σg	1.750	1.815	1.825	2.185
Exceeded by only 5%	4.200	1.020	0.625	1.620
% results above 0.3 μg/m^3	97	69	23	65
% results above 2 μg/m^3	36	0	0	0
% results above 5 μg/m^3	3	0	0	0

Mercury aerosols

Concentration	Location			
	I	II	III	IV
$\overline{X}$	0.018	0.003	0.002	0.002
Max.	0.040	0.006	0.004	0.004
Min.	0.006	0.001	0.001	0.001

*Sept., Oct., and Nov. 1972.

TABLE 14. ATMOSPHERIC MERCURY AND AEROSOL CONCENTRATIONS IN IDRIJA, μg/m³ (WINTER)*

Mercury vapor

Concentration	Location	
	I	II
$\overline{X}$	2.011	0.445
S	2.036	0.728
Max.	9.567	4.145
Min.	0.001	0.017
$\overline{X}g$	1.530	0.320
σg	2.390	2.380
Exceeded by only 5%	7.020	1.290
% results above 0.3 μg/m³	85	31
% results above 2 μg/m³	43	2
% results above 5 μg/m³	8	0

Mercury aerosols

Concentration	Location	
	I	II
$\overline{X}$	0.015	0.003
Max.	0.037	0.005
Min.	0.003	0.001

* Dec. 1972, Jan. and Feb. 1973.

TABLE 15. ATMOSPHERIC MERCURY VAPOR AND AEROSOL CONCENTRATIONS IN IDRIJA, μg/m³ (SPRING)*

Mercury vapor

Concentration	Location	
	I	II
$\overline{X}$	1.758	0.309
S	0.755	0.266
Max.	3.631	1.389
Min.	0.307	0.065
$\overline{X}g$	†	0.225
σg	†	2.267
Exceeded by only 5%	3.100	0.900
% results above 0.3 μg/m³	100	38
% results above 2 μg/m³	38	0
% results above 5 μg/m³	0	0

Mercury aerosols

Concentration	Location	
	I	II
$\overline{X}$	0.015	0.003
Max.	0.024	0.009
Min.	0.005	0.001

*March, April, and May 1973.

†Normal Distribution.

TABLE 16. ATMOSPHERIC MERCURY VAPOR AND AEROSOL CONCENTRATIONS IN IDRIJA, μg/m^3 (SUMMER)*

Mercury vapor		
Concentration	Location	
	I	II
$\bar{X}$	2.096	0.444
S	1.546	0.349
Max.	8.082	1.465
Min.	0.686	0.080
$\bar{X}g$	1.150	0.338
σg	2.348	2.352
Exceeded by only 5%	4.875	1.358
% results above 0.3 μg/m^3	100	62
% results above 2 μg/m^3	36	0
% results above 5 μg/m^3	6	0

Mercury aerosols		
Concentration	Location	
	I	II
$\bar{X}$	0.005	0.001
Max.	0.027	0.010
Min.	0.009	0.002

*June, July, and Aug. 1973 .

TABLE 17. ATMOSPHERIC MERCURY VAPOR AND AEROSOL CONCENTRATIONS IN IDRIJA, $\mu g/m^3$ (AUTUMN)*

Mercury vapor		
Concentration	Location	
	I	II
$\overline{X}$	2.101	0.518
S	1.695	0.622
Max.	7.083	2.871
Min.	0.294	0.068
$\overline{X}g$	1.600	0.348
σg	2.188	2.644
Exceeded by only 5%	5.900	1.720
% results above 0.3 $\mu g/m^3$	97	44
% results above 2 $\mu g/m^3$	43	2
% results above 5 $\mu g/m^3$	8	0

Mercury aerosols		
Concentration	Location	
	I	II
$\overline{X}$	0.017	0.008
Max.	0.034	0.011
Min.	0.003	0.001

* Sept., Oct., and Nov. 1973.

mercury at the four locations from which the geometric mean concentrations and standard geometric deviations were calculated, are shown in the Appendix (Figures A-8 through A-11).

In addition to the concentration of mercury vapor, the results of the determination of mercury aerosols are also presented in the same tables as means and maximal and minimal values (Tables A-25 through A-60 in the Appendix and Tables 10-17 in the text). Aerosols contribute negligibly to the total atmospheric mercury concentration.

Figure 5 presents the monthly mean concentrations of atmospheric mercury vapor at locations III and IV through one yearly cycle (December 1971-November 1972) and at locations I and II through two yearly cycles (December 1971-November 1973.) Figure 6 gives mean seasonal concentrations of mercury vapor at the four locations. The figures show that considerably higher concentrations were measured at location I, situated in the immediate vicinity of the smelting plant, than at the other three locations. The concentrations were highest in the winter and summer seasons, while the spring and autumn concentrations appeared to be approximately the same. The average annual concentrations in the four districts of Idrija are presented in Table 18.

TABLE 18. MEAN ANNUAL MERCURY VAPOR CONCENTRATIONS

District	I	II	III	IV
Concentration, $\mu g/m^3$	2.106	0.489	0.365	0.758

Weighted weekly exposures of the Idrija inhabitants were calculated on the basis of the analysis of habits of a population sample consisting of 62 men. The weighted weekly exposures were then calculated on the assumption of a 42-hour working week, with 105 hours weekly spent at or around home, 14 hours weekly spent in the center of the town (2 hours daily) where shops and restaurants are situated, and 7 hours weekly spent on recreation.

For defining the exposure at the place of work, the outdoor annual average concentration of the corresponding district was used; (only subjects with no occupational exposure to mercury were included.) This method was considered justifiable because the analysis of the 97 pairs of samples taken simultaneously indoors and outdoors at the same locations in January, May, August, and October 1973 showed no consistent difference between indoor and outdoor concentrations. The indoor/outdoor concentration ratios obtained are shown in Table 19, which reveals that the ratios fluctuate around the value of 1.00, thus justifying the assumption that at the locations studied, indoor concentrations are not significantly different from outdoor concentrations. It is worth mentioning that some of our analyses showed lower indoor values in winter months, particularly in bedrooms. It seems, however, that in offices and other places of work with no indoor mercury sources, the windows are opened frequently enough to allow the equalization of the indoor and outdoor mercury concentrations.

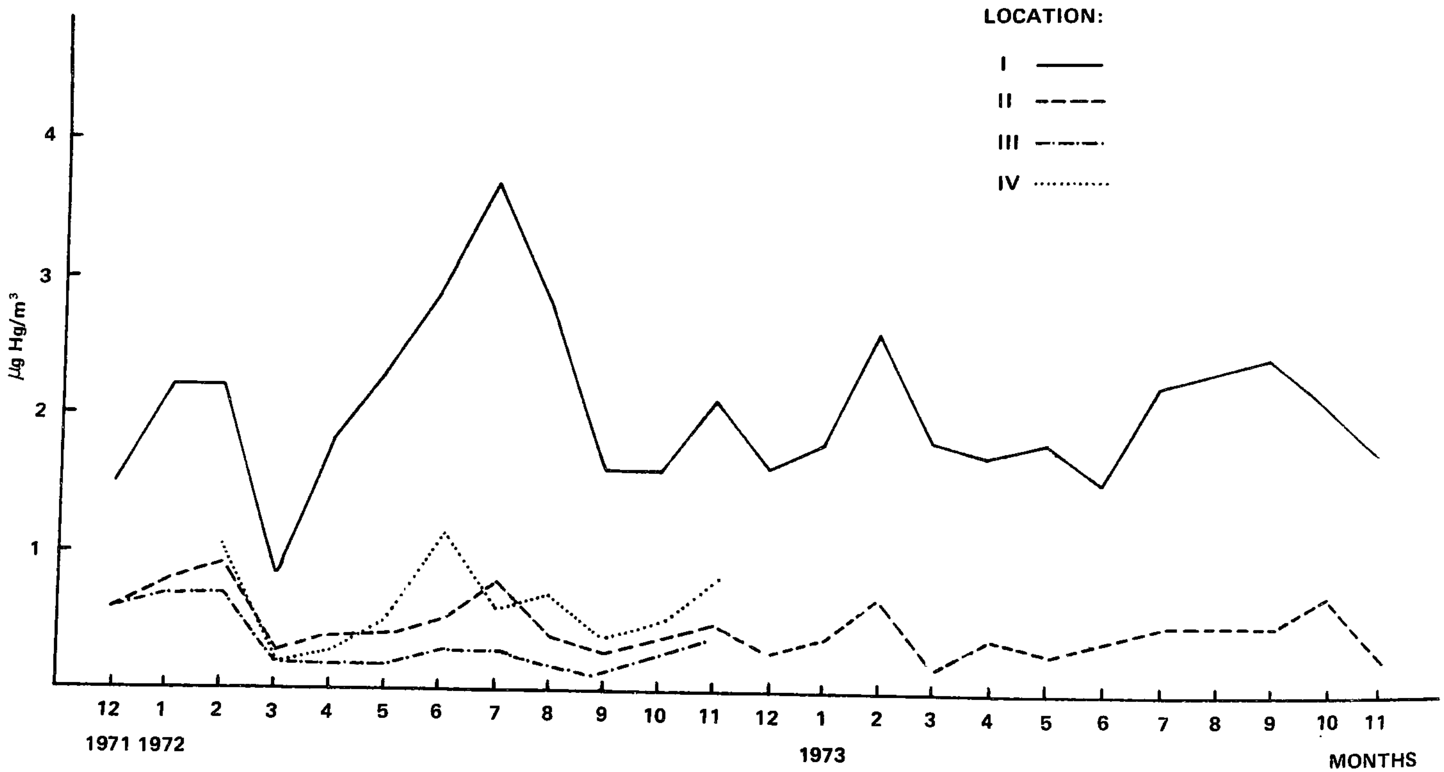

Figure 5. Mean monthly concentrations of mercury in air - Idrija area.

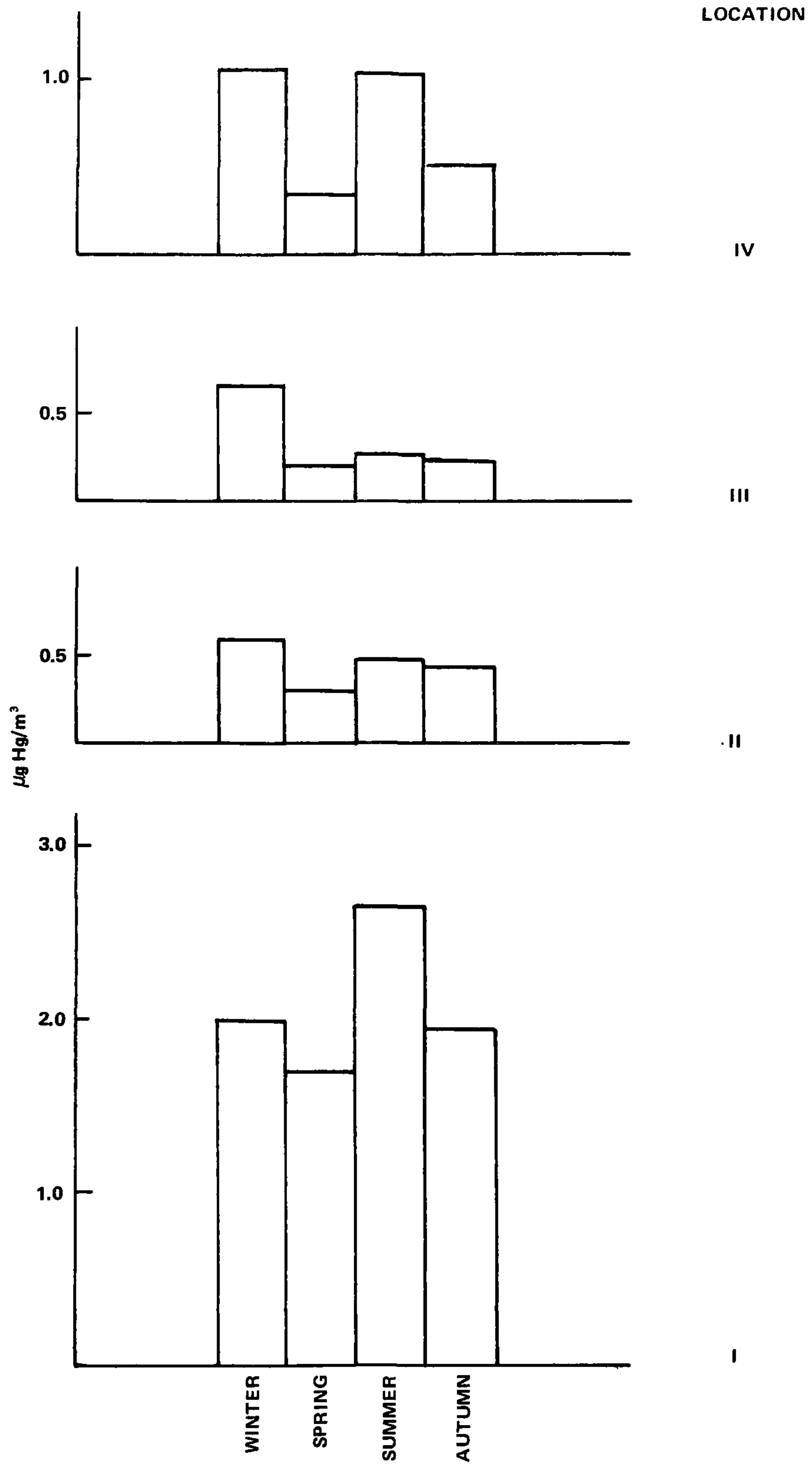

Figure 6. Mean seasonal concentrations of mercury in air - Idrija area.

TABLE 19. INDOOR-OUTDOOR MERCURY CONCENTRATION RATIO

Month		Location I	II	III	IV
Jan.		0.912	0.848	1.070	0.875
		0.845	0.916	0.884	0.879
		1.064	0.904	0.933	0.923
		0.724	0.727	1.045	1.080
		0.682	1.112	0.902	0.754
	Mean	0.845	0.901	0.967	0.902
May		1.077	1.295	1.039	1.468
		0.708	0.989	1.278	0.972
		0.929	0.671	1.260	1.214
		0.581	1.787	1.220	1.094
		0.704	0.701	0.460	1.087
		1.120	1.879	0.387	1.157
					0.915
	Mean	0.853	1.220	0.941	1.130
Aug.		0.838	0.746	1.135	1.822
		1.097	1.290	0.926	0.942
		1.102	1.164	0.757	0.010
		0.960	1.192	1.268	0.960
		1.282	0.997	1.242	1.067
		1.513	0.622	1.687	0.905
			0.571		1.045
	Mean	1.132	0.940	1.169	1.107
Oct.		1.821	0.686	0.694	1.539
		1.683	1.092	1.180	1.167
		1.848	0.903	0.356	0.935
		2.187	0.958	0.463	0.872
		2.633	0.780	0.798	0.746
			0.945	1.151	0.959
			0.965	0.721	1.027
	Mean	2.034	0.904	0.766	1.035
Overall mean		1.196	0.990	0.952	1.054

In order to simplify the calculations and to reduce the number of groups of inhabitants with different weighted exposures, districts II and III, which did not differ considerably in their annual mean mercury concentrations, were combined, and their mean annual concentration of 0.427 $\mu g/m^3$ was used.

The concentrations in nearby mountains (recreation areas) in the environs of the town were not measured. They were assumed to be approximately equal to the concentrations measured in the rural areas. The value of 0.014 $\mu g/m^3$ was therefore used.

Different combinations of exposure levels at home and work divided the Idrija inhabitants into seven different groups as to the weighted average weekly exposure. Table 20 shows how the weighted weekly exposures were calculated and gives the results obtained.

In some groups there were only a few inhabitants. We combined therefore the first and second, the third and fourth, and the fifth and sixth groups, thus obtaining four groups of Idrija inhabitants assumed to have the following four weighted average weighted weekly exposures:

Group 1 - 0.397 $\mu g/m^3$
Group 2 - 0.822 $\mu g/m^3$
Group 3 - 1.142 $\mu g/m^3$
Group 4 - 1.879 $\mu g/m^3$

As mentioned earlier, the contribution of mercury-containing aerosols was so small that it was considered negligible and was therefore not taken into account in the calculation of the weighted average weekly exposures.

Exposure of Miners and Smelters

Four groups of workers occupationally exposed to airborne mercury were selected: (1) miners working in parts of the mercury mine containing metallic mercury, (2) miners working in parts of the mine with a very low metallic mercury content, (3) smelters, and (4) auxiliary workers. These categories are based on differences in exposure levels.

In order to assess the average occupational exposure level, four or five workers were selected from each group, and their total mercury exposure was measured over seven or eight working shifts by means of personal samplers. The results obtained are shown in Table 21 for smelters and auxiliary workers and in Table 22 for miners. It is obvious from the results obtained that the miners working in the strata with the metallic mercury content had by far the highest mercury exposure. The second-highest exposure was found in the smelters, who were followed by miners working in strata with a low metallic mercury content. The lowest level was found in the auxiliary workers.

As described under "Methods," mercury sampling was performed with personal samplers consisting of a filter, a bubbler containing the acid-permanganate solution, and a battery-driven diaphragm pump. Mercury-containing particles were thus retained on the filter, while mercury vapor passed through the filter and was trapped in the acid-permanganate solution. Only mercury trapped in the solution was considered in the calculation of the average shift exposure.

TABLE 20. CALCULATION OF WEIGHTED AVERAGE WEEKLY EXPOSURE OF IDRIJA INHABITANTS

Location		Concentration x time, $\mu gHg/m^3$ x hours/week				Total concentration x time	Weighted average weekly exposure
Work	Home	Work	Home	Town	Recreation		
II/III	II/III	0.427x42	0.427x105	0.427x14	0.014x7	66.845	0.410
IV	II/III	0.758x42	0.427x105	0.427x14	0.014x7	82.747	0.493
IV	IV	0.758x42	0.758x105	0.427x14	0.014x7	117.502	0.699
I	II/III	2.106x42	0.427x105	0.427x14	0.014x7	139.363	0.830
I	IV	2.106x42	0.758x105	0.427x14	0.014x7	174.118	1.036
II/III	I	0.427x42	2.106x105	0.427x14	0.014x7	245.140	1.459
I	I	2.106x42	2.106x105	0.427x14	0.014x7	315.658	1.879

TABLE 21. OCCUPATIONAL EXPOSURE--PERSONAL SAMPLING, μg Hg/m^3

Activity	Worker's code No.	Shift exposure								Average shift exposure
Smelting	28	461	441	391	379	424	448	372		
	122	487	533	421	406	491	496	525		
	165	540	585	479	451	497	524	484		484
	190	436	431	479	521	574	490	518		
	93	488	527	563	453	536	499	574		
Auxiliary activities	32	147	124	134	151	165	138	125	146	
	67	161	176	153	176	158	181	170	179	162
	170	156	138	139	164	165	162	149	168	
	138	201	166	191	171	174	194	176	178	

TABLE 22. OCCUPATIONAL EXPOSURE--PERSONAL SAMPLING, $\mu g\ Hg/m^3$

Activity	Worker's code No.	Shift exposure								Average shift exposure
Mining in strata with low metallic mercury content	14	301	276	294	266	270	287	313	297	313
	78	366	350	305	332	334	314	279	297	
	139	297	269	362	334	286	273	309	366	
	186	306	351	312	387	352	313	371	326	
	107	341	257	-	282	306	324	312	269	
Mining in strata with metallic mercury content	153	933	668	1054	803	693	1088	937		807
	63	554	675	771	861	583	804	629		
	189	-	994	691	624	820	654	983		
	94	950	686	1080	699	646	1089	826		

It was assumed that by far the greatest proportion of particulate mercury was in the form of sulfide, since cinnabar (HgS) and metallic mercury are practically the only sources of mercury in Idrija. Because mercury sulfide is practically insoluble, it is considered unlikely to be resorbed in the body if inhaled. The filter in the sampling train was therefore used to exclude mercury-containing particles from the analysis of average occupational exposure to mercury.

The weekly average weighted exposures were then calculated in the same way as the weighted exposures of Idrija inhabitants, taking into account the average occupational exposure, the exposure at and around home, the exposure in the town, and the exposure during recreational activities. It was found, however, that the occupational exposure levels were so much higher than the total exposure in the course of the remaining 17 hours daily that the latter can be safely disregarded.

Two calculation examples are presented in Table 23. The first is the calculation of the weighted weekly exposure of a miner with the highest average occupational exposure (807 $\mu g/m^3$) living in district I (with the highest environmental mercury level of Idrija). The weighted weekly exposure was 203.1 $\mu g/m^3$. If all other exposure sources are ignored and if only the occupational exposure is taken into account, his weekly weighted exposure is 201.8 $\mu g/m^3$, the difference being only 0.6%--thus undoubtedly negligible. The other example selected is that of a worker with the lowest occupational mercury exposure, living in the district with the highest ambient mercury level. As Table 23 shows, his weekly weighted exposure is 41.9 $\mu g/m^3$, while his weighted weekly exposure, disregarding all other exposure sources but the occupational one, is 40.5 $\mu g/m^3$. The difference of 3.5% is still negligible considering the variation of the exposures.

Considering it justifiable to disregard mercury exposure received by occupationally exposed subjects away from work, we have used the weekly weighted exposures which were calculated only on average occupational exposure as the average exposure of these subjects. Using this method, the weighted weekly exposures of the four groups were as follows:

Group 1 - 201.8 $\mu g/m^3$
Group 2 - 78.3 $\mu g/m^3$
Group 3 - 121.0 $\mu g/m^3$
Group 4 - 40.5 $\mu g/m^3$

BIOLOGICAL PARAMETERS

The results of the determination of all biological parameters in each examinee are presented in Tables B-1 through B-4 in the Appendix. Each examinee has an assigned value of his estimated weekly weighted exposure to atmospheric mercury. In the case of the inhabitants of the rural areas and the city of Zagreb, the average environmental exposure level is used as the weekly exposure. The inhabitants of Idrija without occupational exposure to mercury are divided into four groups on the basis of their real calculated weighted weekly exposures as described in the previous discussion of the exposure of the inhabitants of Idrija. The subjects with occupational

TABLE 23. EXAMPLES OF THE CALCULATION OF WEIGHTED WEEKLY EXPOSURE

Subject	Work	Concentration, μgHg/m³ Home	Town	Recreation
1 Miner	807	2.106	0.427	0.014
2 Auxiliary Worker	162	2.106	0.427	0.014

$$WWE_1{}^* = \frac{807x42+2.106x105-0.427x14+0.014x7}{168} = 203.1$$

$$WWE_2 = \frac{162x42+2.106x105+0.427x14+0.014x7}{168} = 41.9$$

Weighted weekly exposure considering occupational exposure only:

$$WWE_1 = \frac{807 \text{ x } 42}{168} = 201.8$$

$$WWE_2 = \frac{162 \text{ x } 42}{168} = 40.5$$

*WWE - weighted weekly exposure.

exposure to mercury are divided into four groups of weighted weekly exposures calculated only on the basis of their occupational exposure as described in the discussion of the exposure of miners and smelters.

The results of the analyses of blood, serum, and urine are given separately. Cholinesterase activity was determined only in a selected number of blood and plasma samples from the inhabitants of Zagreb and Idrija and from occupationally exposed examinees, while no estimation of this enzyme was performed in rural inhabitants.

In 26 Idrija inhabitants it was impossible to calculate a meaningful weighted weekly exposure because they changed their places of work and/or places of residence several times in the course of the study.

Correlation Between Mercury in Blood and Other Biological Parameters

The correlation coefficient $\underline{R}$ was calculated between the mercury in blood concentration and the values of each of the measured biological parameters. The calculation was performed with direct data, but a number of transformations were also performed in the attempt to linearize the relationships. Logarithmic transformation was made of the mercury concentration, of other biological parameters, and of both variables. The inverse values of the mercury concentration were also considered. In the majority of cases, we failed to linearize the relationship. Tables 24-27 show the results of the calculation of the correlation coefficients on the basis of direct and logarithmically transformed variables along with the values of the results of the analyses of variance (F-test) to test the significance of the linear relationship.

As can be seen from Table 24, in the group with occupational exposure to mercury all the correlation coefficients obtained are very low. Within the occupationally exposed group there seems to be no correlation between the content of mercury in blood and the values of other biological parameters.

Table 25 gives the results of the calculation of the coefficients of correlation on data obtained in the inhabitants of Idrija who had no occupational exposure to mercury. The results are presented in the same way as those in Table 24. The conclusions are practically the same. The correlations between mercury in blood and values of other biological parameters are low.

The results of the same analyses obtained in the group of Zagreb inhabitants, shown in Table 26, are practically the same except for the values of the correlation coefficient between plasma cholinesterase and mercury in blood. The values of this coefficient are between -0.369 and -0.417.

The results obtained in the rural population, presented in Table 27, show very low values of the coefficient of correlation.

There was no justification for calculating the correlation coefficients on the basis of all the data because the group means were different. We have, therefore, calculated the combined coefficients of correlation.[25] These calculated values of the combined coefficient of correlation of all the direct

TABLE 24. COEFFICIENTS OF CORRELATION AND ANALYSIS OF VARIANCE FOR GROUP WITH OCCUPATIONAL EXPOSURE

	Hg-blood	F	Hg-blood (log)	F
ALAD	-0.064	0.752	-0.059	0.626
ALAD (log)	-0.027	0.129	-0.025	0.114
G-6-PD	0.020	0.089	0.033	0.232
G-6-PD (log)	0.026	0.143	0.038	0.310
GSH	0.099	2.192	0.099	2.242
GSH (log)	0.099	2.202	0.098	2.145
Alk. Ph.	-0.072	1.231	-0.104	2.585
Alk. Ph. (log)	-0.064	0.963	-0.095	2.133
GOT	-0.055	0.693	-0.088	1.835
GOT (log)	-0.106	2.648	-0.138	4.556
GPT	0.008	0.014	-0.028	0.180
GPT (log)	-0.029	0.182	-0.074	1.292
Chol.	0.161	4.699	0.112	2.236
Chol. (log)	0.168	5.131	0.118	2.477
Co tot	-0.043	0.429	-0.001	0.0002
Co tot (log)	-0.020	0.089	-0.023	0.119
Co I	-0.066	0.994	-0.111	2.809
Co I (log)	-0.069	1.108	-0.105	2.511
Ch-Bl	-0.033	0.033	-0.108	0.354
Ch-Bl (log)	-0.019	0.011	-0.097	0.285
Ch-Pl	-0.149	0.703	-0.190	1.162
Ch-Pl (log)	-0.149	0.704	-0.188	1.140

TABLE 25. COEFFICIENTS OF CORRELATION AND ANALYSIS OF VARIANCE FOR INHABITANTS OF IDRIJA

	Hg-blood	F	Hg-blood (log)	F
ALAD	-0.131	1.895	-0.104	1.183
ALAD (log)	-0.101	1.113	-0.091	0.894
G-6-PD	-0.121	2.055	-0.153	3.336
G-6-PD (log)	-0.120	2.020	-0.152	3.287
GSH	0.090	1.150	0.047	0.304
GSH (log)	0.099	1.408	0.055	0.427
Alk. Ph.	0.110	1.679	0.059	0.476
Alk. Ph. (log)	0.116	1.846	0.055	0.414
GOT	0.280	11.814	0.256	9.731
GOT (log)	0.236	8.206	0.215	6.769
GPT	0.240	8.487	0.209	6.345
GPT (log)	0.241	8.548	0.213	6.621
Chol.	0.084	0.983	0.106	1.581
Chol. (log)	0.087	1.063	0.107	1.602
Co tot	0.114	2.887	0.135	2.540
Co tot (log)	0.176	4.341	0.161	3.628
Co I	-0.223	6.965	-0.250	8.872
Co I (log)	-0.231	7.526	-0.248	8.735
Ch-B1	0.236	2.292	0.130	0.674
Ch-B1 (log)	0.244	2.479	0.148	0.744
Ch-P1	0.048	0.087	-0.101	0.392
Ch-P1 (log)	0.047	0.085	-0.090	0.312

TABLE 26. COEFFICIENTS OF CORRELATION AND ANALYSIS OF VARIANCE FOR URBAN POPULATION

	Hg-blood	F	Hg-blood (log)	F
ALAD	-0.231	3.651	-0.213	3.075
ALAD (log)	-0.187	2.239	-0.175	2.054
G-6-PD	-0.049	0.251	-0.134	1.906
G-6-PD (log)	-0.029	0.088	-0.113	1.363
GSH	0.023	0.054	0.008	0.007
GSH (log)	0.008	0.006	-0.008	0.007
Alk. Ph.	-0.006	0.004	0.051	0.295
Alk. Ph. (log)	-0.024	0.061	0.040	0.184
GOT	-0.007	0.006	0.017	0.035
GOT (log)	-0.032	0.118	0.002	0.0006
GPT	0.039	0.173	0.055	0.357
GPT (log)	-0.012	0.0169	0.018	0.038
Chol.	-0.125	1.852	-0.153	2.798
Chol. (log)	-0.135	2.224	-0.164	3.201
Co tot	-0.099	1.052	-0.048	0.248
Co tot (log)	-0.080	0.691	-0.045	0.218
Co I	0.061	0.400	0.073	0.560
Co I (log)	0.054	0.312	0.062	0.410
Ch-Bl	-0.129	0.460	-0.191	1.023
Ch-Bl (log)	-0.130	0.467	-0.190	1.015
Ch-Pl	-0.378	4.507	-0.417	5.696
Ch-Pl (log)	-0.369	4.254	-0.405	5.284

TABLE 27. COEFFICIENTS OF CORRELATION AND ANALYSES OF VARIANCE FOR RURAL POPULATION

	Hg-blood	F	Hg-blood (log)	F
ALAD	0.108	1.710	0.071	0.727
ALAD (log)	0.095	1.324	0.046	0.302
G-6-PD	0.220	7.397	0.192	5.543
G-6-PD (log)	0.210	6.681	0.183	5.024
GSH	-0.078	0.885	-0.118	2.049
GSH (log)	-0.063	0.583	-0.095	1.312
ALK.Ph.	0.181	4.809	0.159	3.671
Alk.Ph. (log)	0.171	4.297	0.149	3.227
GOT	-0.134	2.552	-0.169	3.826
GOT (log)	-0.200	5.784	-0.220	7.062
GPT	-0.114	1.872	-0.152	3.403
GPT (log)	-0.123	2.183	-0.161	3.826
Chol.	-0.161	3.754	-0.148	3.146
Chol. (log)	-0.148	3.155	-0.135	2.609
Co tot	0.107	1.513	0.154	3.174
Co tot (log)	0.129	2.230	0.167	3.770
Co I	0.236	7.843	0.206	5.898
Co I (log)	0.217	6.575	0.185	4.706

TABLE 28. COMBINED COEFFICIENTS OF CORRELATION--ALL DATA

	Hg-blood	Hg-blood (log)
ALAD	-0.049	-0.058
ALAD (log)	-0.025	-0.039
G-6-PD	0.014	0.020
G-6-PD (log)	0.019	0.024
GSH	0.053	-0.011
GSH (log)	0.051	-0.007
Alk.Ph.	-0.021	0.025
Alk.Ph. (log)	-0.026	0.010
GOT	-0.017	-0.016
GOT (log)	-0.062	-0.066
GPT	0.014	0.001
GPT (log)	-0.004	-0.024
Chol.	0.060	-0.016
Chol. (log)	0.065	-0.013
Co tot	-0.019	0.048
Co tot (log)	0.007	0.083
Co I	-0.001	-0.009
Co I (log)	-0.017	-0.023
Ch-Bl	0.029	-0.036
Ch-Bl (log)	0.037	-0.029
Ch-Pl	-0.105	-0.223
Ch-Pl (log)	-0.098	-0.219

and logarithmically transformed results are presented in Table 28. The correlation between the levels of mercury in blood and the levels of all the other biological parameters calculated in this way are also very low.

Rank Correlation Between Mercury in Blood and Other Biological Parameters

Since the analyses of variance of linear regression of the values of biological parameters on blood mercury concentrations have shown that in a considerable proportion of pairs of variables the relationship was not linear, nonparametric statistics were used and Spearman's coefficient of rank correlation was calculated. The obtained values of the coefficient of rank correlation (R) are presented in Table 29.

The correlations were low again with only a few pairs of variables having a coefficient above 0.2, while only in one case was the coefficient near 0.4 (mercury in blood and cholinesterase in blood).

TABLE 29. SPEARMAN'S COEFFICIENT OF RANK CORRELATION BLOOD MERCURY - BIOLOGICAL PARAMETERS

	R
ALAD	- 0.084
G-6-PD	- 0.202
GSH	0.220
ALK.Ph.	- 0.239
GOT	- 0.017
GPT	0.076
Chol.	- 0.061
Co tot	0.291
Co I	0.266
Ch-Bl	0.382
Ch-Pl	0.212

Kruskal-Wallis Statistic

The nonparametric Kruskal-Wallis one-way anova test was used to compare the biological variables of the four population groups according to their different exposure levels to atmospheric mercury. The four groups were assigned scores of 1, 2, 3, and 4. In Table 30, the values of the Kruskal-Wallis Test H are given along with the values of the coefficient of rank correlation R.

The Kruskal-Wallis test is highly significant ($P<0.01$) for all the variables, which was to be expected. The obtained values of R are very low except for cholinesterase (the coefficient was calculated for three exposure levels only because cholinesterase activity was not assessed in the rural population), and for total coproporphyrin. A high value of the coefficient was obtained for mercury in blood, an obvious consequence of the expected association between the exposure level to mercury and mercury absorption.

TABLE 30. KRUSKAL-WALLIS TEST (H) AND RANK CORRELATION (R) FOR COMPARISON OF THE MERCURY EXPOSURE LEVELS AND BIOLOGICAL VARIATES

	H	R
Hg tot	439.37	0.793
ALAD	13.81	0.025
G-6-PD	106.48	- 0.319
GSH	35.56	0.113
Alk.Ph.	60.85	- 0.031
GOT	14.49	- 0.065
GPT	36.93	0.105
Chol.	53.65	- 0.069
Co tot	125.20	0.414
Co I	44.53	- 0.229
Ch-B1	27.61	0.527
Ch-P1	11.01	0.323

In order to get a better insight into the differences in biological parameters between individual population groups, the Kruskal-Wallis statistics were carried out to test the differences. The calculated values of the Kruskal-Wallis test $\underline{H}$ are shown in Table 31. The values indicating insignificant differences are marked by asterisks.

In the majority of cases, the population groups reveal different levels of the same biological parameter. This difference is particularly pronounced when comparing the parameters between the group sustaining occupational exposure to mercury with any of the other groups. The least expressed differences are between the urban and rural inhabitants and between urban and Idrija inhabitants. Taking into consideration the differences in the exposure level to mercury of the four population groups, these results are not surprising.

SECTION 5

DISCUSSION

The present study was undertaken to enlarge the limited amount of data currently available on the health effects of low-level mercury exposure. The lack of information in this field has resulted in different threshold limit values (TLV) being assigned in various countries for occupational mercury exposure and no recommended standards being promulgated for threshold limits in the ambient air. A great number of industrialized countries still take 100 $\mu g/m^3$ as the threshold limit value for occupational exposure to mercury (Great Britain, Germany, and Yugoslavia), while Eastern European countries have lower values; the mercury TLV in Czechoslovakia is 50 $\mu g/m^3$; in Hungary it is 20 $\mu g/m^3$, while Poland and the USSR have a TLV as low as 10 $\mu g/m^3$. As mercury is a cumulative poison, its TLV is usually expressed as a time-weighted average. In the USSR, however, it is expressed as a ceiling value. The new TLV suggested by the U.S. National Institute of Occupational Safety and Health,[26] as well as the TLV suggested by the International MAC Committee in 1969,[24] is 50 $\mu g/m^3$ for occupational exposure to metallic mercury vapor and 100 $\mu g/m^3$ for inorganic mercury.

A significant increase in the frequency of objective tremors was noted at air levels above 10 $\mu g/m^3$.[27,28] An increase of nonspecific signs and symptoms such as loss of appetite, loss of weight, and shyness was reported at concentrations of 60-100 $\mu g/m^3$. Psychological disturbances are observed at air concentrations below 100 $\mu g/m^3$.[29,30] Kurnosov[23] claimed to have detected behavioral changes in rats at concentrations as low as 2-5 $\mu g/m^3$, while Armstrong et al.[31] found irreversible behavioral changes in pigeons only at exposures well above 100 $\mu g/m^3$. Classical symptoms of metallic mercury vapor poisoning (objective tremor, psychophysiological disturbances, gingivitis) were reported to be the consequence of the chronic exposure of workers to concentrations above 100 $\mu g/m^3$.[32,33]

In order to contribute to the assessment of health effects of low-level exposures to mercury, four groups of subjects were selected: one group was a sample of the rural population expected to be exposed to very low background mercury levels; a second group was a sample of the urban population assumed to be exposed to somewhat higher mercury levels; a third group consisted of inhabitants of a mercury mining and smelting area with known sources of mercury and, consequently, still higher ambient mercury levels; and, finally, a fourth group was composed of mercury miners and smelters with known occupational exposure to mercury vapor and aerosols who also lived in the same mining area as the third group. The study was meant to cover four separate groups, each with a different daily intake of mercury. The rural population was selected among nonfisheaters so as to avoid a higher intake of methyl mercurials from fish.

The four groups proved to be well selected as to their weekly weighted average exposures to mercury. The weighted weekly average mercury exposure of the rural group was 0.014 μg/m^3; that of the urban group was 0.022 μg/m^3; the weighted exposures of the third group (Idrija inhabitants without occupational mercury exposure) were 0.397-1.879 μg/m^3; and the weighted weekly exposures of the fourth group (with occupational exposure) were 40.500-201.800 μg/m^3. The correlation of the exposures of the rural and urban populations were in good agreement with the few reports obtained on similar measurements in some other countries. Stock and Cucuel,[34] as early as 1934, reported an average concentration of 0.020 μg/m^3 in the general atmosphere. Similar results were reported in 1967 by Ericksson in Sweden;[35] Sergejev found 0.010 μg/m^3 in the USSR;[36] and Fujimura[37] recorded concentrations of 0-0.014 μg/m^3 in nonindustrial areas in Japan. McCarthy reported concentrations of 0.002-0.005 μg/m^3 in Denver, USA, in 1968,[38] and Williston[39] recorded 0.0005-0.050 μg/m^3 around San Francisco in the same year.

In 1970, McCarthy[40] measured ambient mercury concentrations of 0.60-1.50 μg/m^3 in areas near mercury mines and refineries, which is a little lower than the concentrations we measured in the mercury mining area of Idrija. Our mean annual vapor concentrations were 2.106, 0.489, 0.365, 0.758 μg/m^3 at the four sampling sites, respectively (Table 18). Only Fernandez et al.[41] in 1966 reported almost unbelievably high mercury levels of up to 800 μg/m^3 in the ambient air at Almaden, Spain, the location of Europe's largest mercury mine.

The correlations between the levels of mercury in the blood and the eleven biological parameters considered were found to be low regardless of whether all the individual data or whether data within separate groups were examined. The correlations were low regardless of the method used for assessing the correlation level (coefficient of correlation: Tables 24 to 28, nonparametric Spearman's coefficient of rank correlation: Tables 29 and 30). The differences of almost all the values of biological parameters between individuals were found significant when the group with occupational exposure to mercury was compared with any of the other groups (Kruskal-Wallis statistics, Table 31). The differences between other groups were less apparent.

All the examinees were divided into 10 groups on the basis of their calculated average weighted weekly exposure to mercury vapor. The contribution of particle-bound mercury to the exposure of the general population was on the average 1.1%, and it was therefore disregarded. The low contribution of particulate mercury to the total mercury exposure is in agreement with the results reported by Heindryckx[42] giving evidence that particle-bound mercury accounts for not more than 5% of total mercury. The contribution of particulate mercury was also disregarded in the calculation of the average weighted exposure of the occupationally exposed group. In this case, although the miners are indeed exposed to significant concentrations of particulate mercury, because the mercury is in the form of highly insoluble cinnabar (HgS), it has been assumed to be no health hazard. The mean values of all of the biological parameters of the 10 population groups are presented in Table 32 along with the average weighted weekly exposure of each group to mercury.

TABLE 31. KRUSKAL-WALLIS TEST FOR TESTING DIFFERENCES OF BIOLOGICAL PARAMETERS BETWEEN INDIVIDUAL POPULATION GROUPS

	R - U	R -I	R - O	U -I	U - O	I - O *
Hg-blood	19,682	53.666	262.430	8.816	220.010	231.000
ALAD	1.621†	10.738	0.095†	3.037†	1.113†	10.201
G-6-PD	26.192	4.434	40.032	42.210	83.888	15.881
GSH	2.372†	7.407	4.535	0.943†	15.991	32.872
Alk.Ph.	4.645	16.785	50.720	3.111†	20.920	14.633
GOT	2.987†	4.058	0.532†	15.530	6.026	2.538†
GPT	1.345†	6.252	7.979	15.739	3.206†	34.826
Chol.	38.513†	2.320†	14.737	35.222	15.212	7.137
Co tot	45.421	57.776	110.340	0.296†	14.776	13.962
Co I	1.096†	0.013†	20.770	1.261†	33.673	21.284
Ch-Bl	-	-	-	10.058	25.403	7.571
Ch-Pl	-	-	-	6.831	9.459	0.838†

* R - rural inhabitants.

U - urban inhabitants.

I - Idrija inhabitants with no occupational exposure.

† Not significant.

TABLE 32. RELATIONSHIP BETWEEN WEIGHTED WEEKLY EXPOSURES (μg Hg/m^3) AND BIOLOGICAL PARAMETERS

Hg-atm	Hg-blood	ALAD	G-6-PD	GSH	Alk.Ph.	GOT	GPT	Chol.	Co tot	Co I	Ch-Bl	Ch-Pl
0.014	1.22	59	176.2	36	44.0	14.7	5.9	230	8	42	-	-
0.022	1.55	64	193.5	35	37.8	13.0	5.3	198	12	43	22.8	6.1
0.397	2.17	66	164.0	34	38.7	12.9	4.6	234	11	44	27.5	7.5
0.822	1.78	99	177.0	35	35.0	10.4	4.2	221	14	43	25.1	6.9
1.142	1.69	107	173.7	35	36.2	8.2	2.8	220	11	42	23.8	6.5
1.879	1.80	64	167.1	34	34.9	9.8	3.0	213	14	39	25.7	7.4
40.500	6.04	71	166.1	38	34.5	12.6	6.5	209	18	37	27.4	7.8
78.300	5.97	63	166.3	38	31.2	10.6	5.2	212	17	36	26.1	7.0
121.000	8.39	51	167.9	38	30.8	11.2	5.4	213	15	37	28.8	7.6
201.800	12.21	57	163.5	39	28.4	12.9	6.9	217	14	38	25.9	7.1

For quick reference the mean values of the biological parameters in the 10 groups are presented in Figures 7 and 8. It should be emphasized that the abscissas do not represent the calculated weighted exposures but are equidistantly arranged for the rural, the urban, the four subgroups of Idrija general population, and the four subgroups of workers with occupational exposure to mercury. Only a few of the examined biological parameters show a somewhat defined relationship with the level of mercury exposure. There is an expected increase of mercury in the blood with increasing mercury exposure, a general increase of cholinesterase both in the blood and plasma, an increase of total coproporphyrin excretion in urine, and a decrease of alkaline phosphatase and glucose-6-phosphate dehydrogenase. Table 33 gives the values of the nonparametric Spearman's coefficient of correlation calculated between the weighted average weekly exposure to mercury and the mean values of biological parameters in the 10 groups. As expected, a high positive correlation was obtained between the exposure level and the level of mercury in blood. Comparatively high positive coefficients were also obtained with GSH, total coproporphyrin, and cholinesterase, while comparatively high negative coefficients were obtained with alkaline phosphatase, the coproporphyrin I proportion, and G-6-PD.

Table 34 presents means and standard deviations of biological parameters in the rural population, the urban population, Idrija general inhabitants, and the group with occupational exposure. For quick reference the mean values of all biological parameters in the four population groups of different mercury exposure levels are shown in Figures 9 and 10. The abscissas do not represent exposure levels quantitatively; they show only their ranks. There is a logical rise of mercury in the blood with the increased exposure level, and an increase of total coproporphyrin and cholinesterase activity both in the blood and plasma. Alkaline phosphatase activity decreases with the increasing mercury exposure level, and so do the concentrations of G-6-PD and, generally, cholesterol. GOT, GPT, and GSH show almost identical trends, decreasing from the rural over the urban to the Idrija population but increasing in the occupationally exposed group.

As it was difficult to draw definite conclusions as to the changes of the biological parameters studied in mercury exposure, we have compared the means of all the biological parameters in the 20% of the subjects having lowest blood mercury concentrations with the 20% of the subjects having the highest. The results are shown in Table 35. G-6-PD, alkaline phosphatase, and the coproporphyrin I proportion are reduced in the group with the higher blood mercury at the 99% significance level ($P<0.01$), while total coproporphyrin is increased at the same significance level. GSH and blood cholinesterase are increased and GOT decreased in the group with the high mercury level ($P<0.05$).

Table 36 presents the means of biological parameters in the rural population and in the two groups with the highest weighted weekly occupational exposures to mercury. The results of the testing of significance of differences are practically identical with those obtained in the two groups with the lowest and the highest blood mercury concentrations. G-6-PD, alkaline phosphatase, and the coproporphyrin I proportion are reduced in the groups with

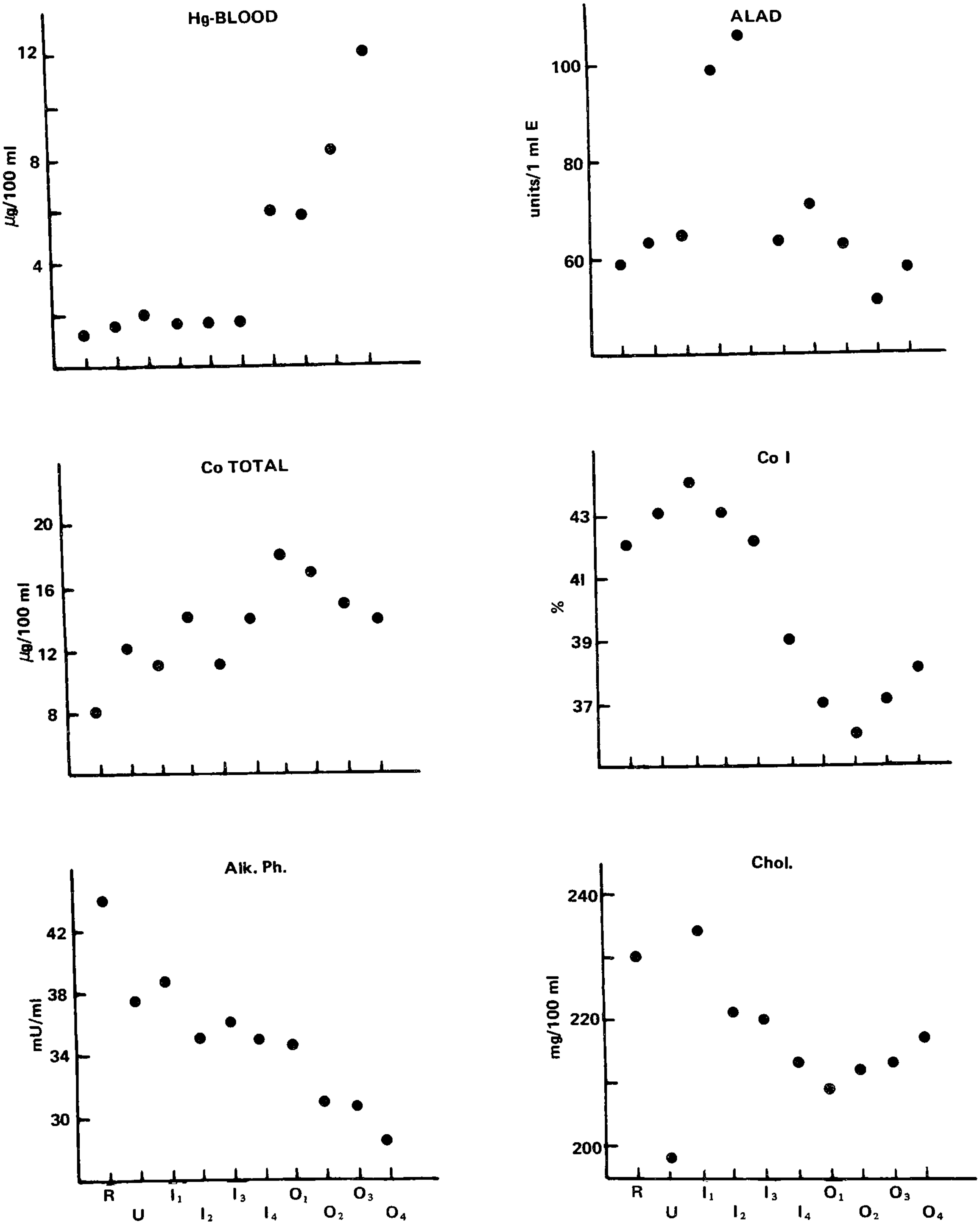

Figure 7. Values of biological parameters in the ten population groups.

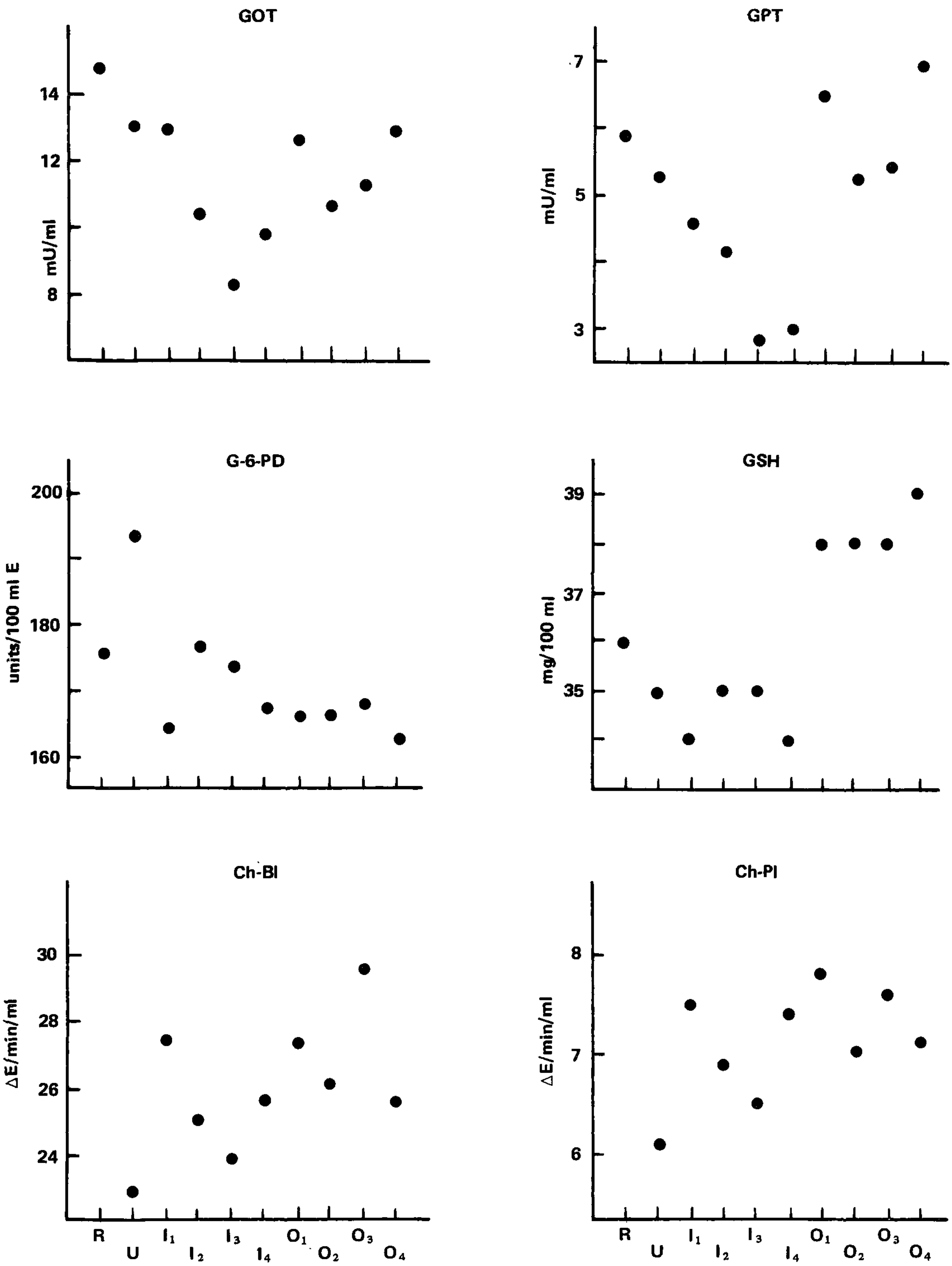

Figure 8. Values of biological parameters in the ten population groups.

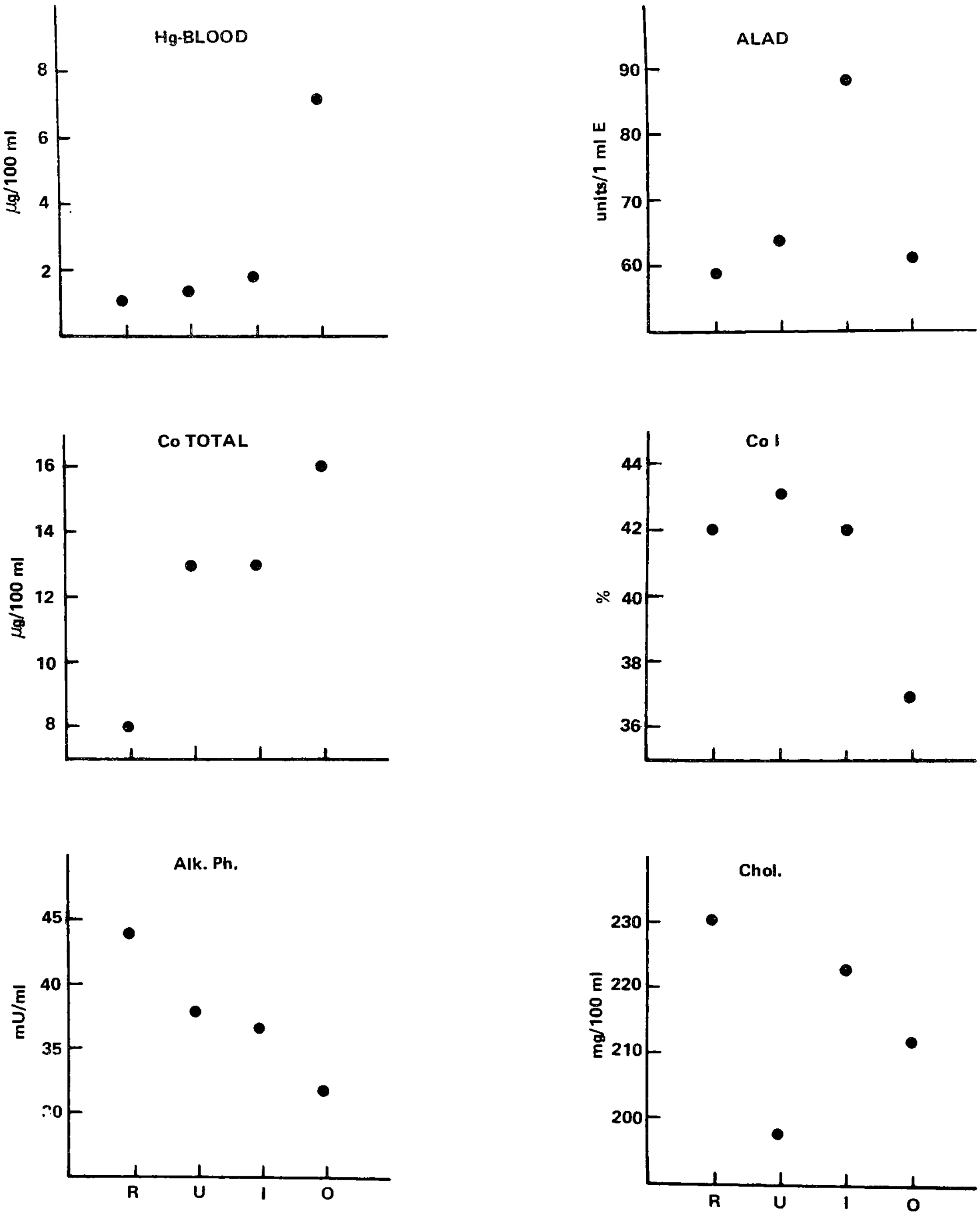

Figure 9. Values of biological parameters in the four population groups.

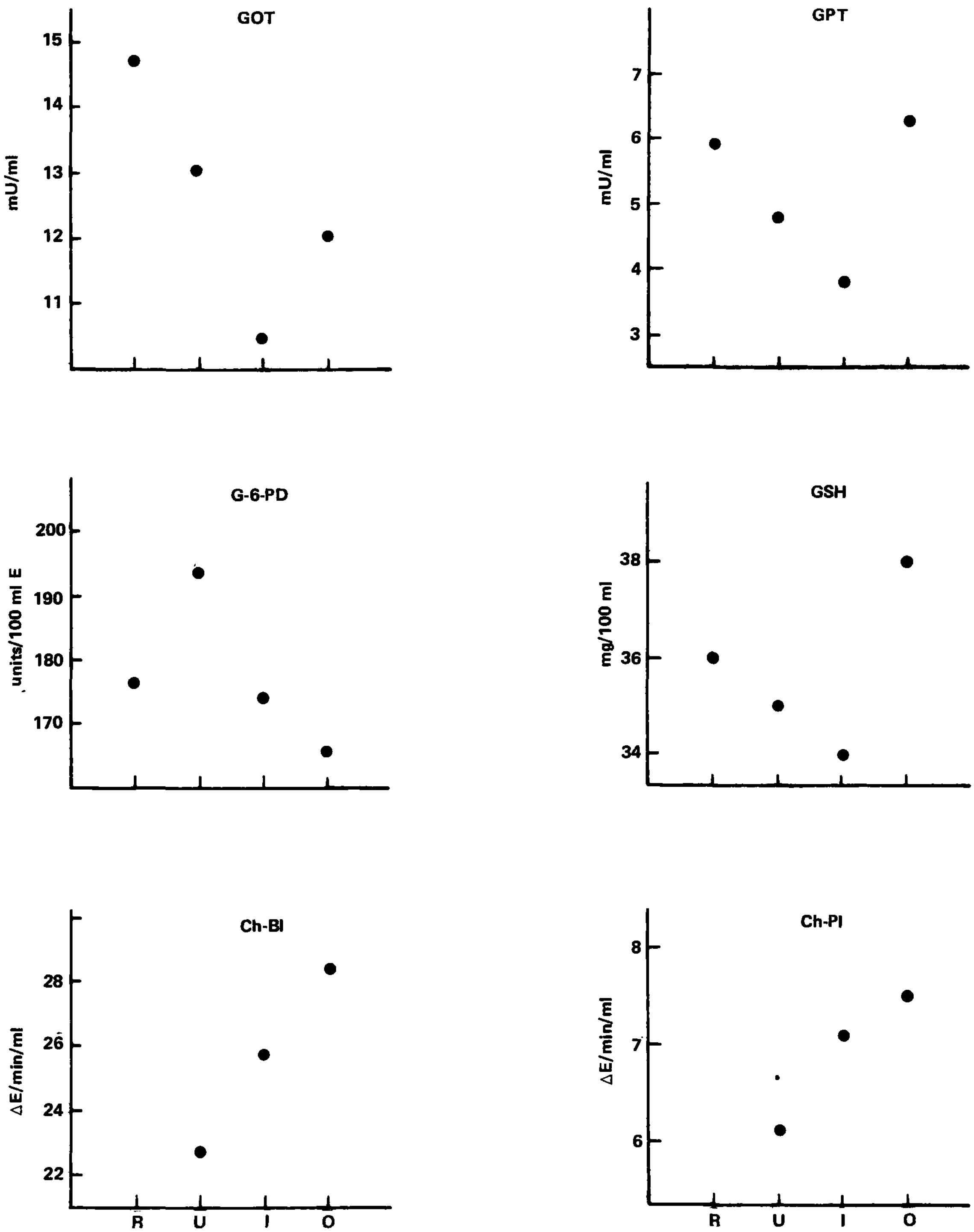

Figure 10. Values of biological parameters in the four population groups.

TABLE 33. COEFFICIENTS OF RANK CORRELATION BETWEEN WEIGHTED WEEKLY EXPOSURES AND GROUP MEANS OF BIOLOGICAL PARAMETERS IN POPULATION GROUPS EXPOSED TO TEN DIFFERENT MERCURY EXPOSURE LEVELS

Biological parameter	Spearman's coefficient
Hg-blood	0.915
ALAD	-0.274
G-6-P D	-0.612
GSH	0.639
Alk.Ph.	-0.976
GOT	-0.353
GPT	0.297
Chol.	-0.353
Co tot	0.533
Co I	-0.789
Ch-Bl	0.500
Ch-Pl	0.467

TABLE 34. MEANS AND STANDARD DEVIATIONS OF BIOLOGICAL PARAMETERS IN FOUR POPULATION GROUPS OF DIFFERENT EXPOSURE LEVELS

Bilogical parameter	Rural population $\overline{X}$	s	N	Urban population $\overline{X}$	s	N	Idrija inhabitants $\overline{X}$	s	N	Subjects with occupational exposure $\overline{X}$	s	N
Hg-blood	1.20	0.80	141	1.55	0.75	118	2.00	1.31	142	7.34	4.07	237
ALAD	59	31	140	64	30	68	68	66	117	61	32	183
G-6-PH	176.22	23.3	142	193.5	25.7	108	174.5	20.6	150	166.1	21.4	223
GSH	36	9	142	35	6	108	34	6	150	38	6	227
Alk.Ph.	44.0	8.6	138	37.8	14.3	118	36.7	16.1	148	37.7	11.5	237
GOT	14.7	13.4	142	13.0	7.0	118	10.4	6.3	148	12.0	8.6	237
GPT	5.9	8.5	142	5.3	6.0	118	3.8	4.2	148	6.2	6.5	237
Chol.	230	46	140	198	32	118	223	33	141	212	31	179
Co tot	8	4	131	13	6	110	13	9	150	16	8	234
Co I	42	12	131	43	10	107	42	11	145	37	10	231
Ch-Bl				22.8	3.4	30	25.9	3.5	41	28.3	3.5	32
Ch-Pl				6.1	1.9	30	7.1	1.4	40	7.5	1.6	33

TABLE 35. DIFFERENCE BETWEEN MEANS OF BIOLOGICAL PARAMETERS IN SUBJECTS WITH THE 20% LOWEST AND 20% HIGHEST BLOOD MERCURY CONCENTRATIONS

Biological parameter		Low exposure	High exposure	t	P
Hg-blood	$\bar{X}$	0.71	9.87	23.87	< 0.01
	s	0.22	4.32		
ALAD	$\bar{X}$	64	60	0.85	> 0.05
	s	37	32		
G-6-PD	$\bar{X}$	182.2	166.8	5.50	< 0.01
	s	24.2	19.1		
GSH	$\bar{X}$	37	39	2.38	< 0.05
	s	7	6		
Alk.Ph.	$\bar{X}$	39.9	30.5	5.59	< 0.01
	s	15.4	11.0		
GOT	$\bar{X}$	13.3	10.9	2.31	< 0.05
	s	9.3	7.1		
GPT	$\bar{X}$	4.9	5.7	1.14	> 0.05
	s	5.6	5.6		
Chol.	$\bar{X}$	221	212	1.84	> 0.05
	s	42	32		
Co tot	$\bar{X}$	10	16	7.14	< 0.01
	s	6	7		
Co I	$\bar{X}$	41	36	4.22	< 0.01
	s	11	11		
Ch-Bl	$\bar{X}$	24.6	28.1	2.64	< 0.05
	s	3.6	2.7		
Ch-Pl	$\bar{X}$	7.4	8.1	1.01	> 0.05
	s	1.8	1.6		

TABLE 36. DIFFERENCE BETWEEN MEANS OF BIOLOGICAL PARAMETERS IN RURAL POPULATION AND TWO GROUPS WITH HIGHEST WEIGHTED WEEKLY EXPOSURES TO MERCURY

Biological parameter		Rural population	Highest WWE	t	P
Hg-blood	$\bar{X}$	1.22	9.91	87.45	< 0.01
	s	0.77	5.07		
ALAD	$\bar{X}$	59	54	1.14	> 0.05
	s	31	26		
G-6-PD	$\bar{X}$	176.2	166.2	3.12	< 0.01
	s	23.3	19.3		
GSH	$\bar{X}$	36	38	1.96	> 0.05
	s	9	6		
Alk.Ph.	$\bar{X}$	44.0	29.9	7.30	< 0.01
	s	18.6	10.1		
GOT	$\bar{X}$	14.7	11.8	1.99	< 0.05
	s	13.9	8.0		
GPT	$\bar{X}$	5.9	6.0	0.10	> 0.05
	s	8.5	6.0		
Chol.	$\bar{X}$	230	215	2.69	< 0.01
	s	46	31		
Co tot	$\bar{X}$	8	15	9.35	< 0.01
	s	4	6		
Co I	$\bar{X}$	42	37	3.04	< 0.01
	s	12	11		

the higher mercury exposure at the 99% significance level, while GOT is decreased at the 95% significance level. Total coproporphyrin is significantly increased ($P<0.01$). In this case, cholesterol is decreased ($P<0.01$) in the group with the high mercury exposure.

It is difficult to draw definite conclusions from the obtained results. In the range of exposure levels and in the range of consequent blood mercury levels, no convincing correlation could be established between mercury exposure and/or absorption and any of the biological parameters studied, at least on an individual basis. Correlations are more convincing on the group basis as can be seen, for instance, from Table 33. The hypothesis that mercury may deactivate the activity of delta-amino levulinic acid dehydratase with consequent higher coproporphyrin excretion does not seem to have been proved. No meaningful relationship between the exposure level to mercury or mercury blood level and activity of delta-amino levulinic acid dehydratase was observed.

High lipid solubility of mercury vapor causes a high rate of absorption in the alveolar region of the lung, as reported by several authors.[43-46] Nordberg and Skerfving[47] calculated that the distribution of mercury vapor between air and body tissues is 1:20. On this basis one would expect a practically total retention of inhaled mercury. Considering the physiological dead space, 20% of the inhaled vapor would be exhaled which would give a final retention of 80% of the total amount of inhaled mercury vapor. This was confirmed by experiments of Teisinger and Fischerova-Bergerova[48] and Kudsk.[49] Adverse effects of occupational mercury exposure can be expected at indoor concentrations above 50 $\mu g/m^3$. Assuming an average pulmonary ventilation at work of 10 m^3/day and 225 working shifts per year, one can calculate an average daily intake of 246.4 μg/day ($50 \times 10 \times 0.8 \times 225 \div 365 = 246.4$). Approximately the same daily intake of mercury would be the consequence of the exposure of an average subject without occupational exposure to mercury who would be exposed to an average ambient mercury concentration of 15 $\mu g/m^3$ under the assumption that his average pulmonary ventilation is 20 m^3/day ($15 \times 20 \times 0.8 = 240$). There is practically no information on the pulmonary retention of mercury aerosols. Morrow et al.[50] performed experiments on dogs but only with very small particles of mercuric oxides. No information is available on the pulmonary retention of highly insoluble sulfides.

The exposure level of our rural and urban population, as well as that of the Idrija inhabitants without occupational exposure, were well below the concentration of 15 $\mu g/m^3$ (Table 32). The highest weighted weekly exposure was 1.879 $\mu g/m^3$ in the fourth subgroup of Idrija inhabitants. Much higher exposure levels were those of the occupationally exposed subjects of whom three subgroups had weighted weekly exposures above 50 $\mu g/m^3$. Surprisingly enough, the blood mercury levels in all our groups were low, particularly so compared with the 60 μg/100 ml mercury content of the blood of Swedish fisheaters reported by Skerfving[51] or even with the levels of fishermen from Samoa island for whom Clarkson et al. reported mercury blood contents up to 15 μg/100 ml.[52] In neither of the two fisheating population groups were signs or symptoms of even mild mercury intoxication or any psychological or neurological disturbances recorded. The highest mean mercury level in the blood of our examinees was 12.21 μg/100 ml in the group with the highest occupational exposure to mercury. Out of a total of 638 examinees only 39% had blood levels above 3 μg/100 ml, which was suggested as the maximum normal limit by the International Study Group on Normal Values of Some Metals in 1965,[53] while only 1.1% had blood levels above 15 μg/100 ml. In the group with occupational exposure, however, 96.2% of results were above 3 μg/100 ml blood, and 3.0% were above 15 μg/100 ml.

Summarizing the results of all the statistical tests performed on our findings, it may be tentatively concluded that mercury exposure is likely to induce changes in the activity of cholinesterase, alkaline phosphatase, and glucose-6-phosphate dehydrogenase and also to cause changes in the concentration of coproporphyrin and probably glutathione.

The relationships are not well defined on the basis of individual results. On a group basis, there is a trend toward a higher coproporphyrin excretion (more pronounced in coproporphyrin III) and a higher activity of cholinesterase both in whole blood and plasma with increasing mercury levels. There is a definite trend toward a decreased activity of alkaline phosphatase and glucose-6-phosphate dehydrogenase with the increasing mercury level. It must be emphasized, however, that in spite of these changes found in groups with a higher mercury level, practically all biological parameters still remained within normal limits.

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APPENDIX A

DATA ON MERCURY IN AIR

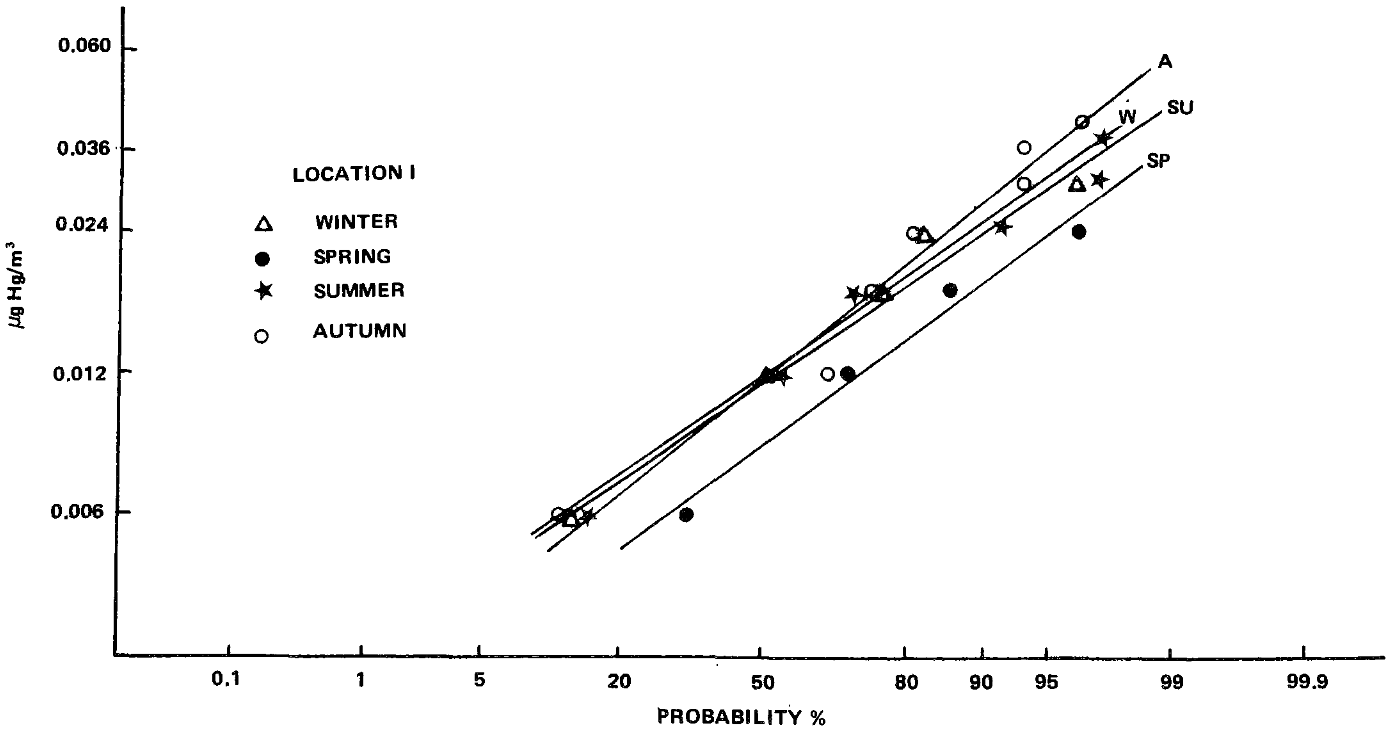

Figure A-1. Seasonal cumulative frequency distribution of mercury in air - rural area.

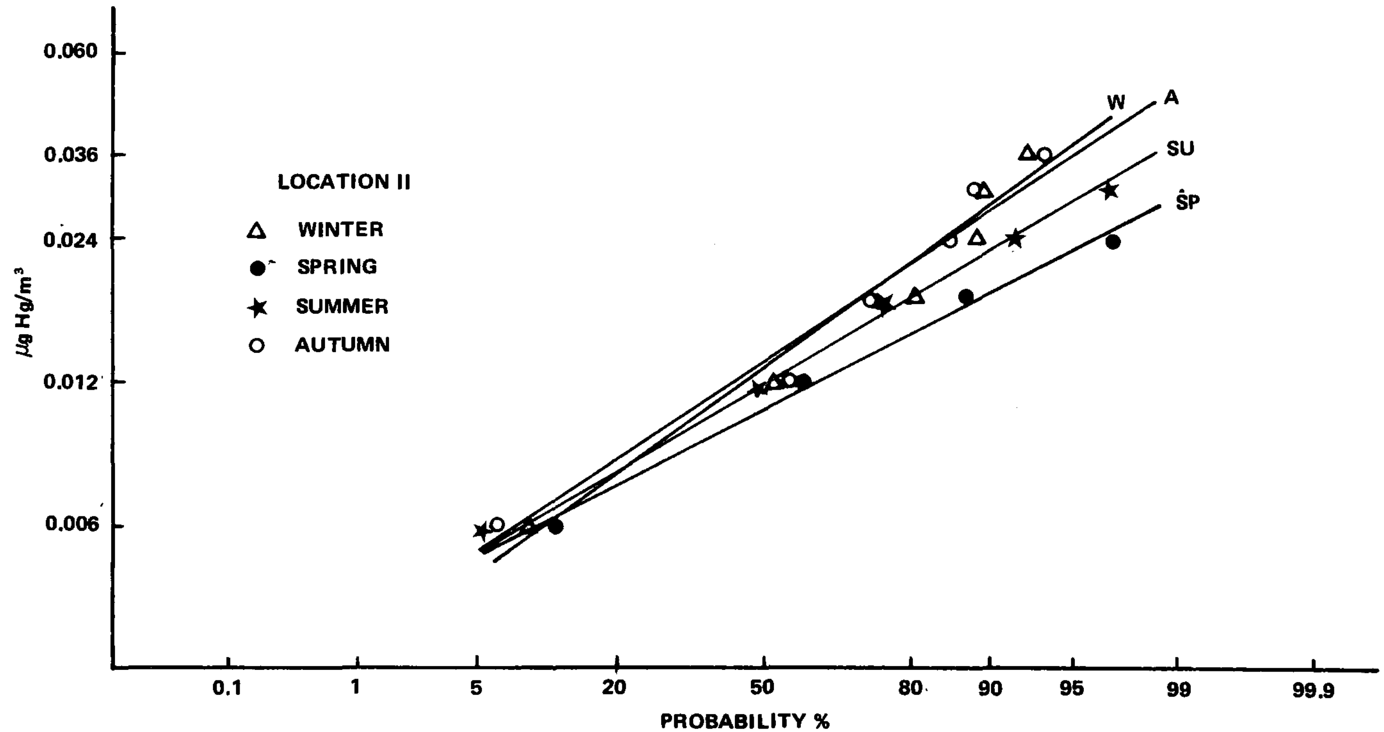

Figure A-2. Seasonal cumulative frequency distribution of mercury in air - rural area.

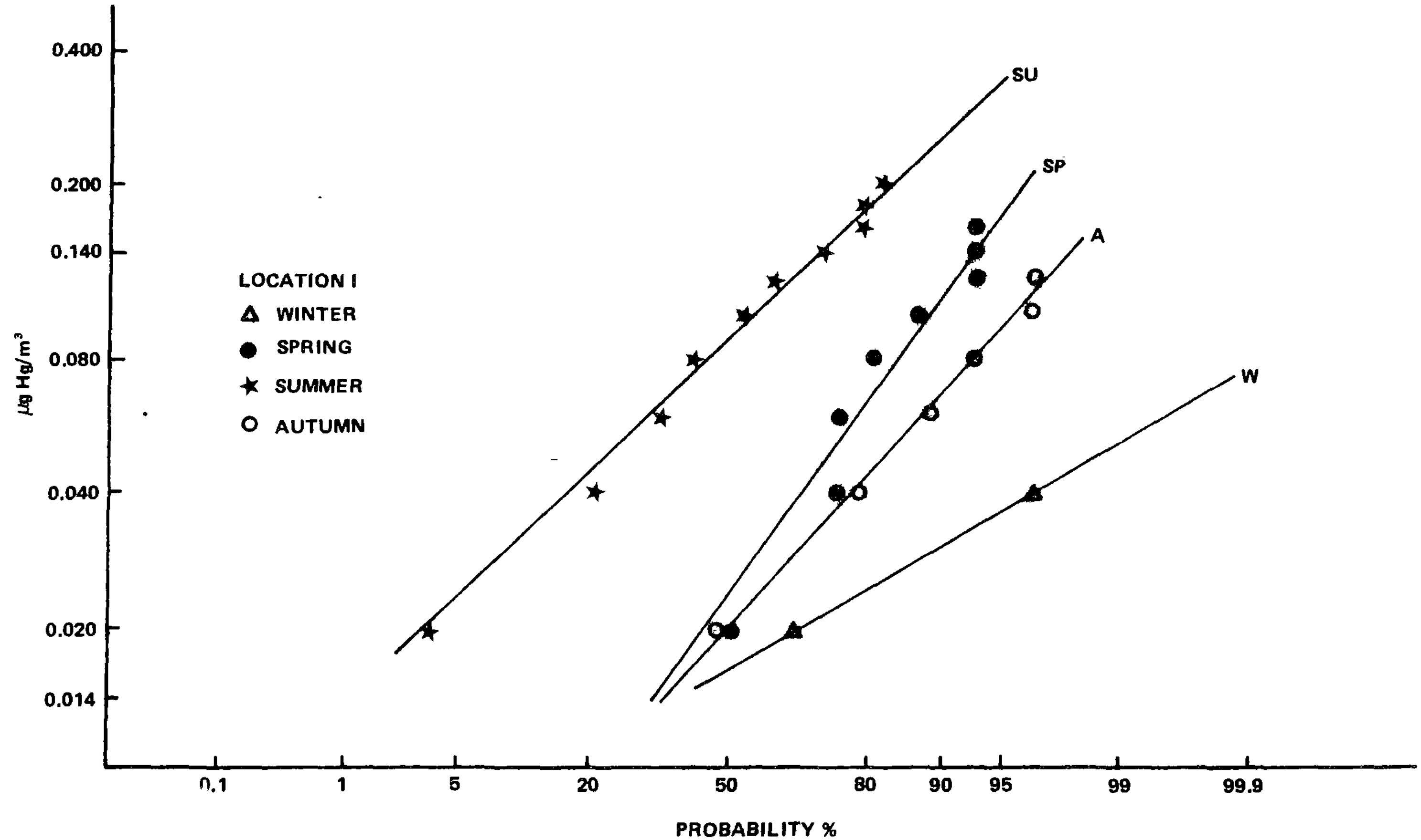

Figure A-3. Seasonal cumulative frequency distribution of mercury in air - Zagreb area.

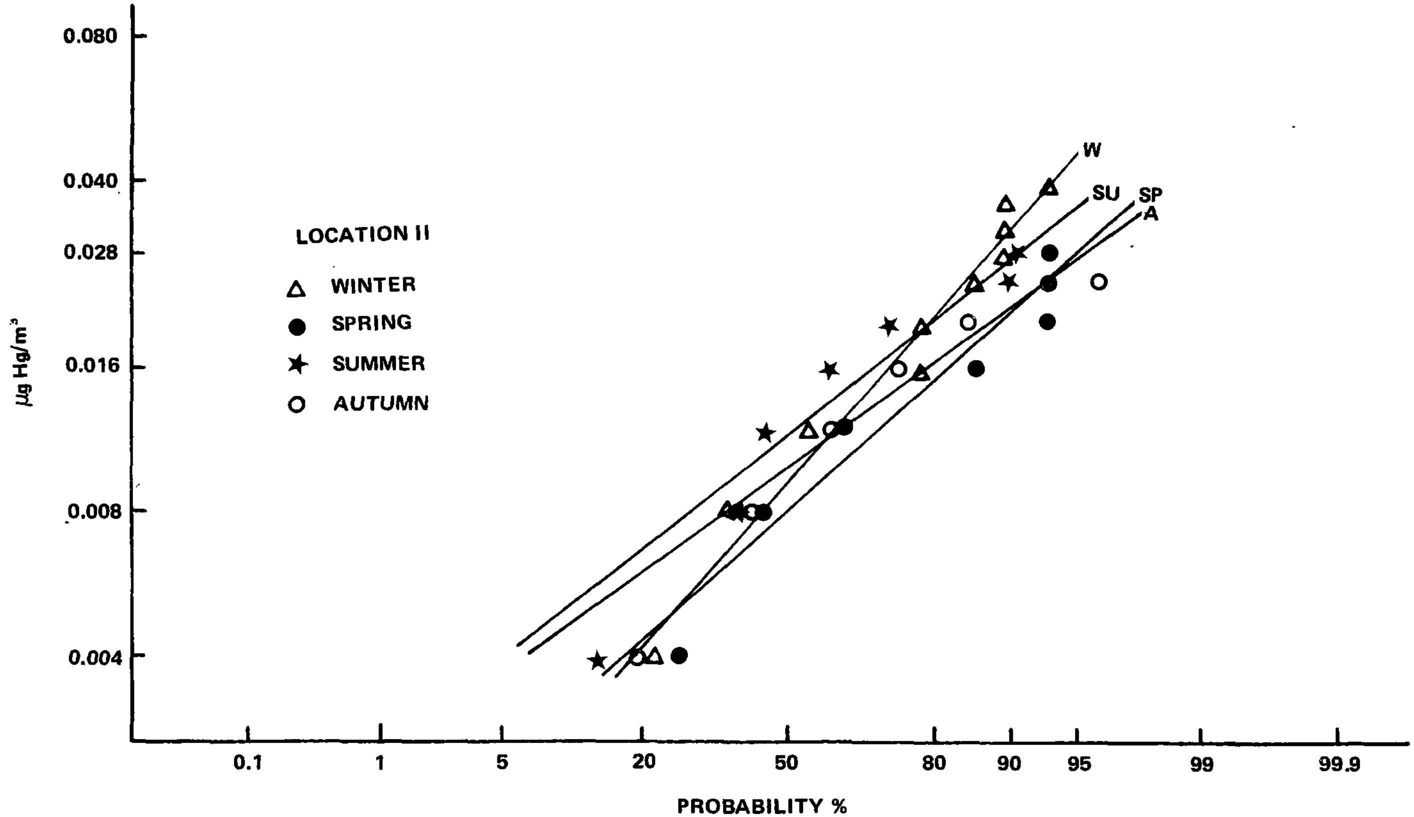

Figure A-4. Seasonal cumulative frequency distribution of mercury in air - Zagreb area.

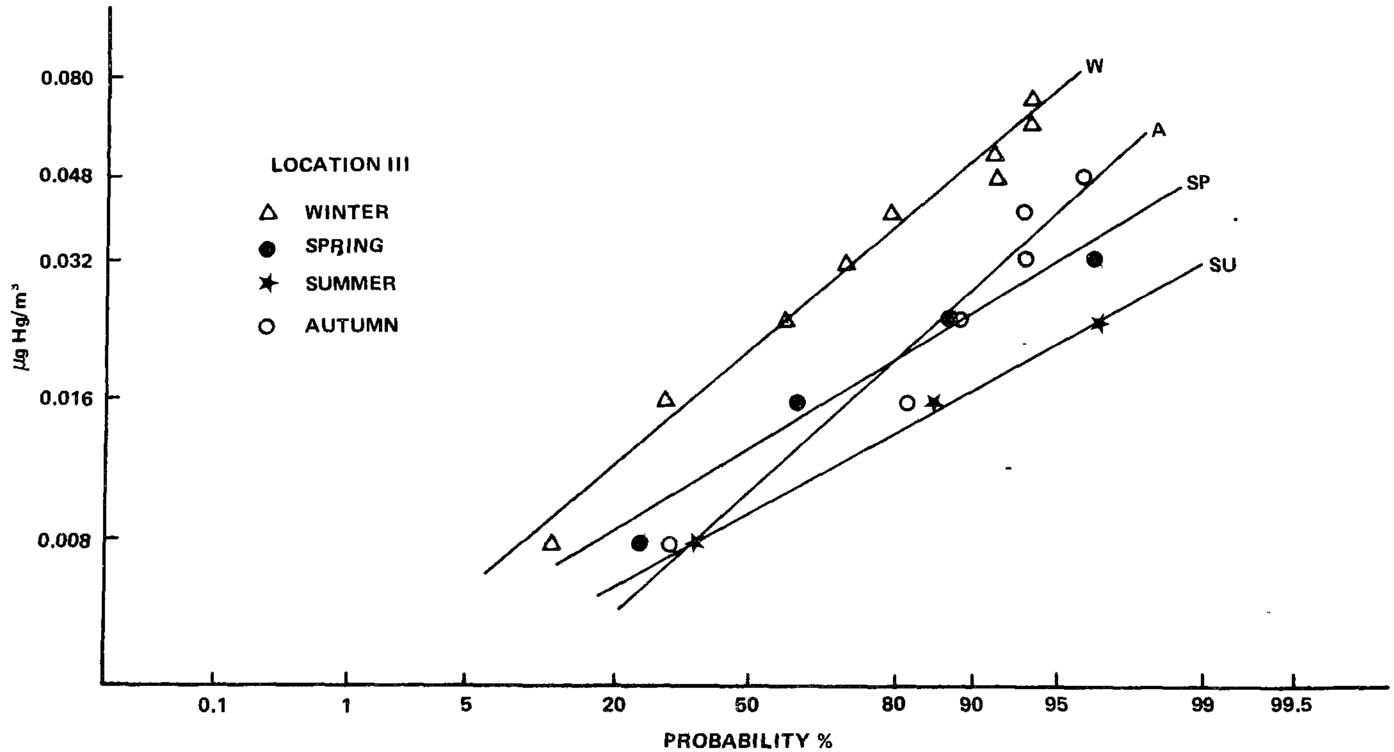

Figure A-5. Seasonal cumulative frequency distribution of mercury in air - Zagreb area.

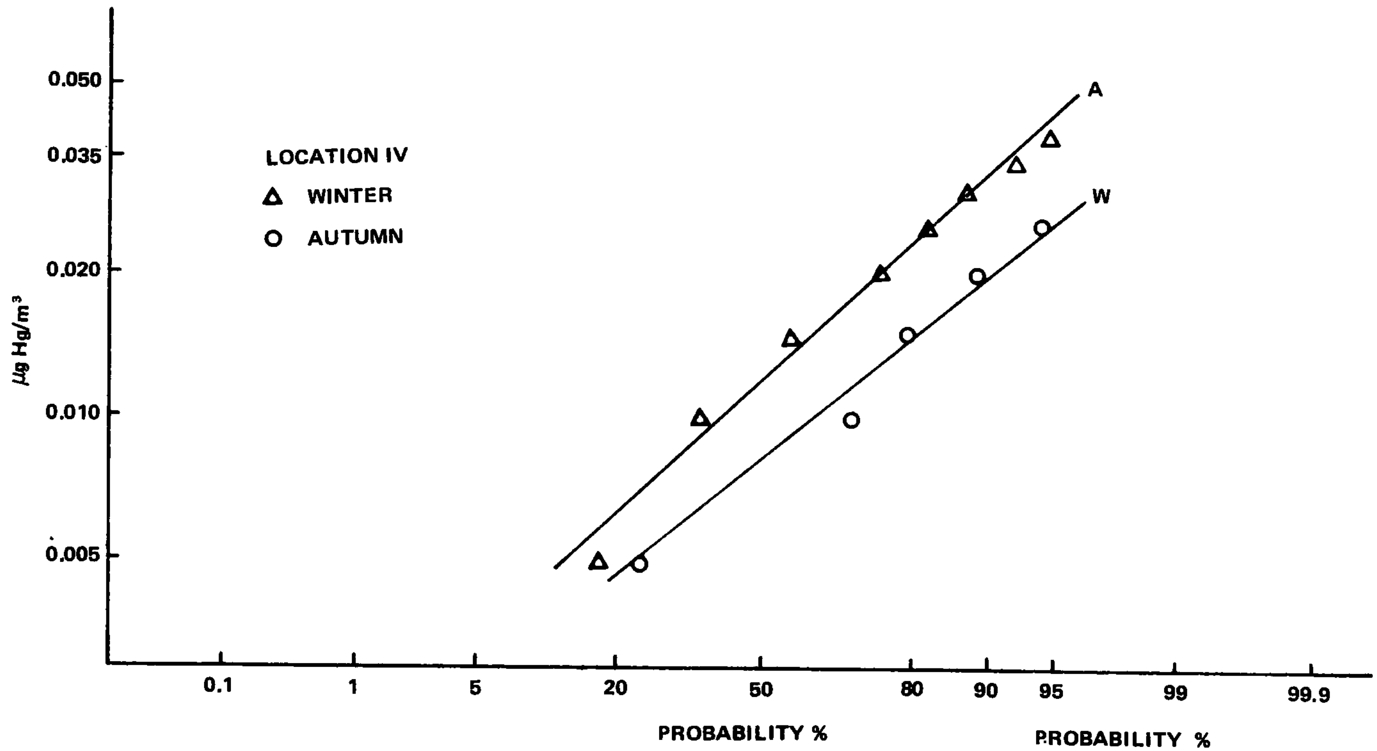

Figure A-6. Seasonal cumulative frequency distribution of mercury in air - Zagreb area.

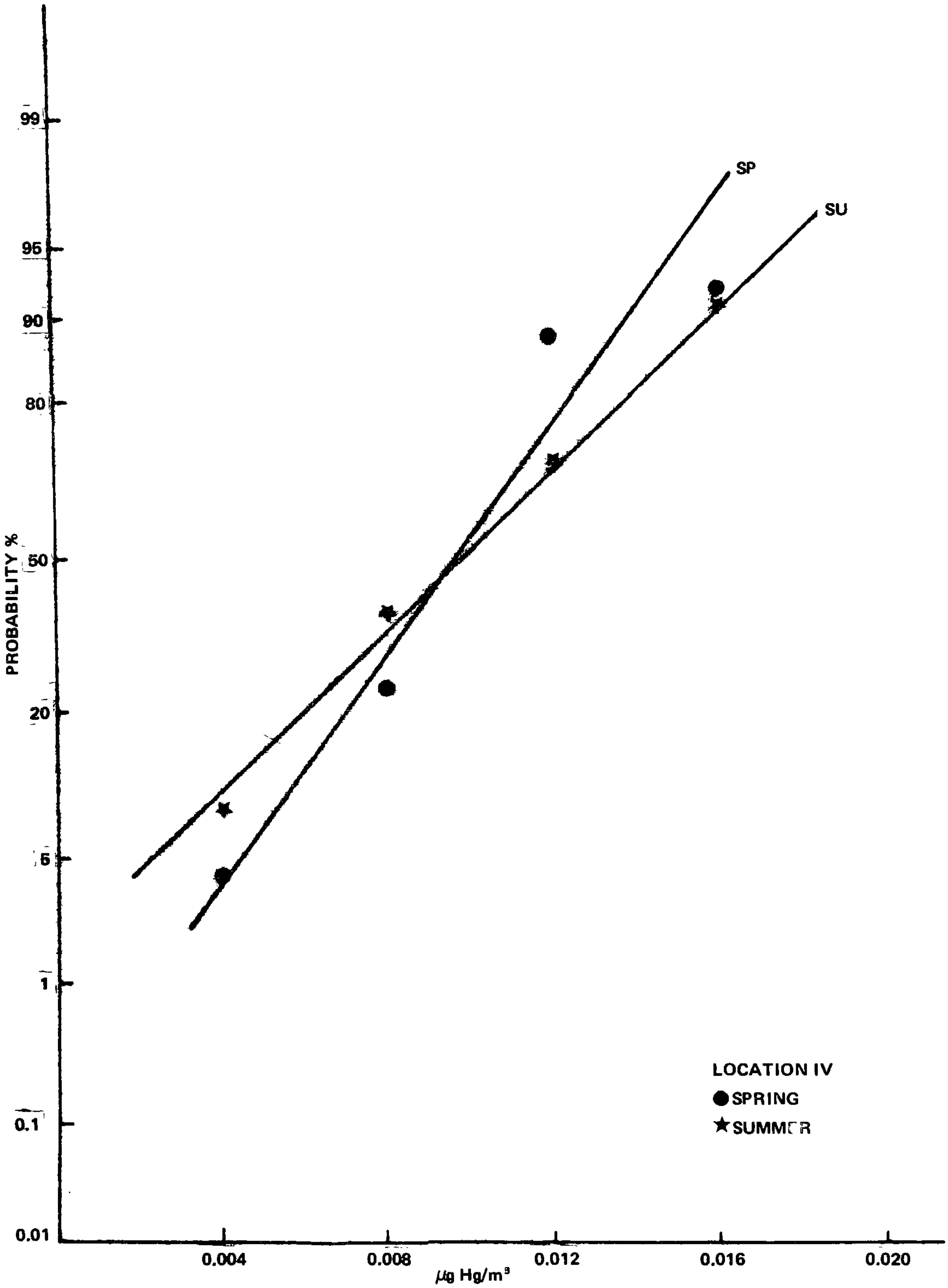

Figure A-7. Seasonal cumulative frequency distribution of mercury in air - Zagreb area.

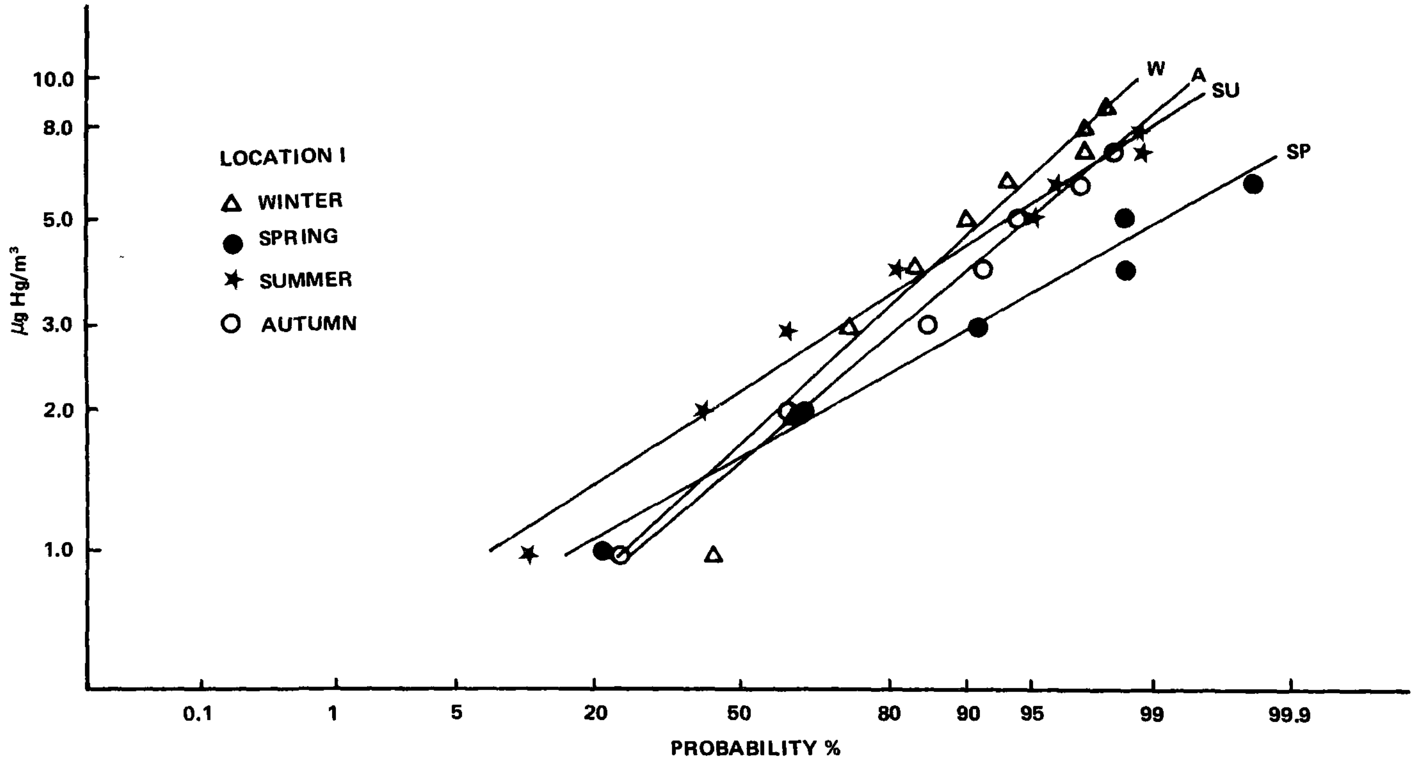

Figure A-8. Seasonal cumulative frequency distribution of mercury in air - Idrija area.

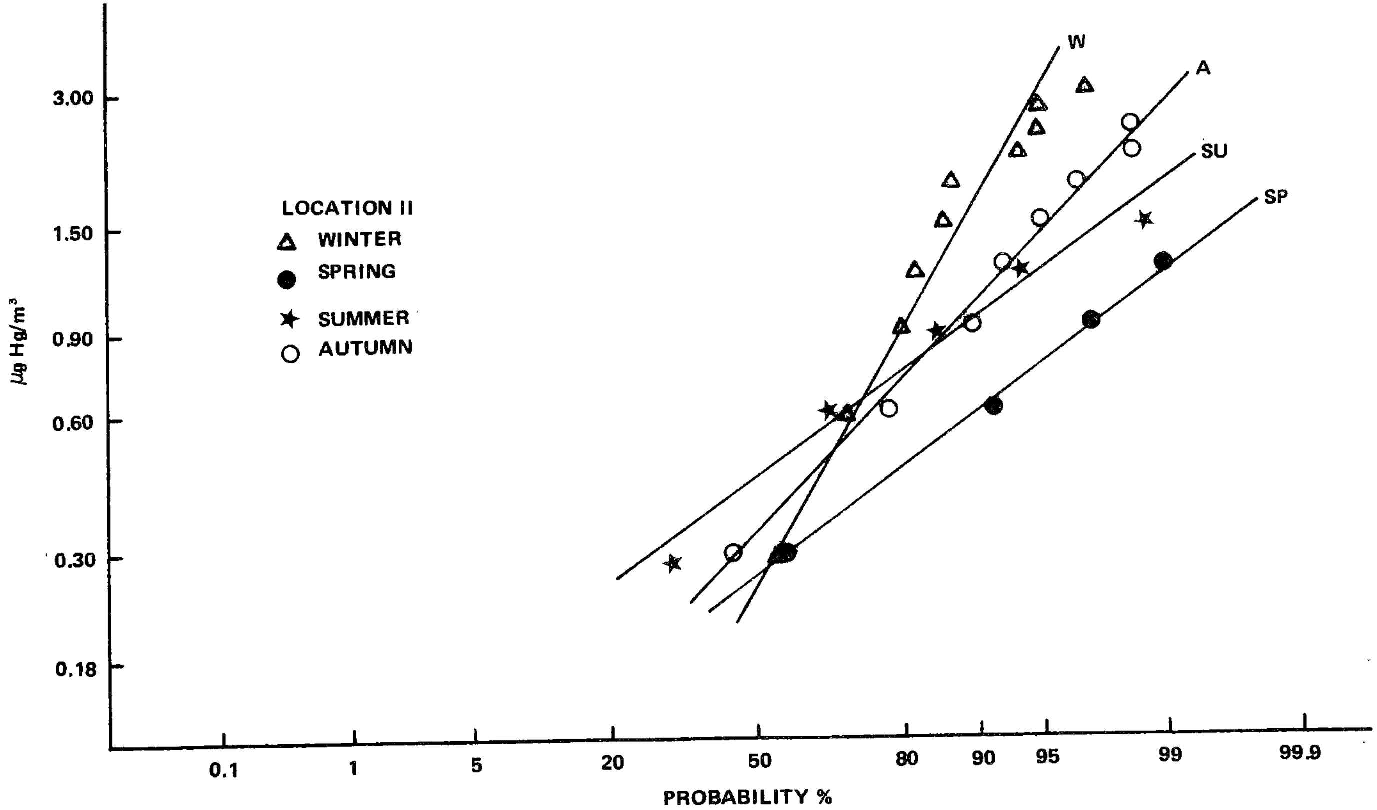

Figure A-9. Seasonal cumulative frequency distribution of mercury in air - Idrija area.

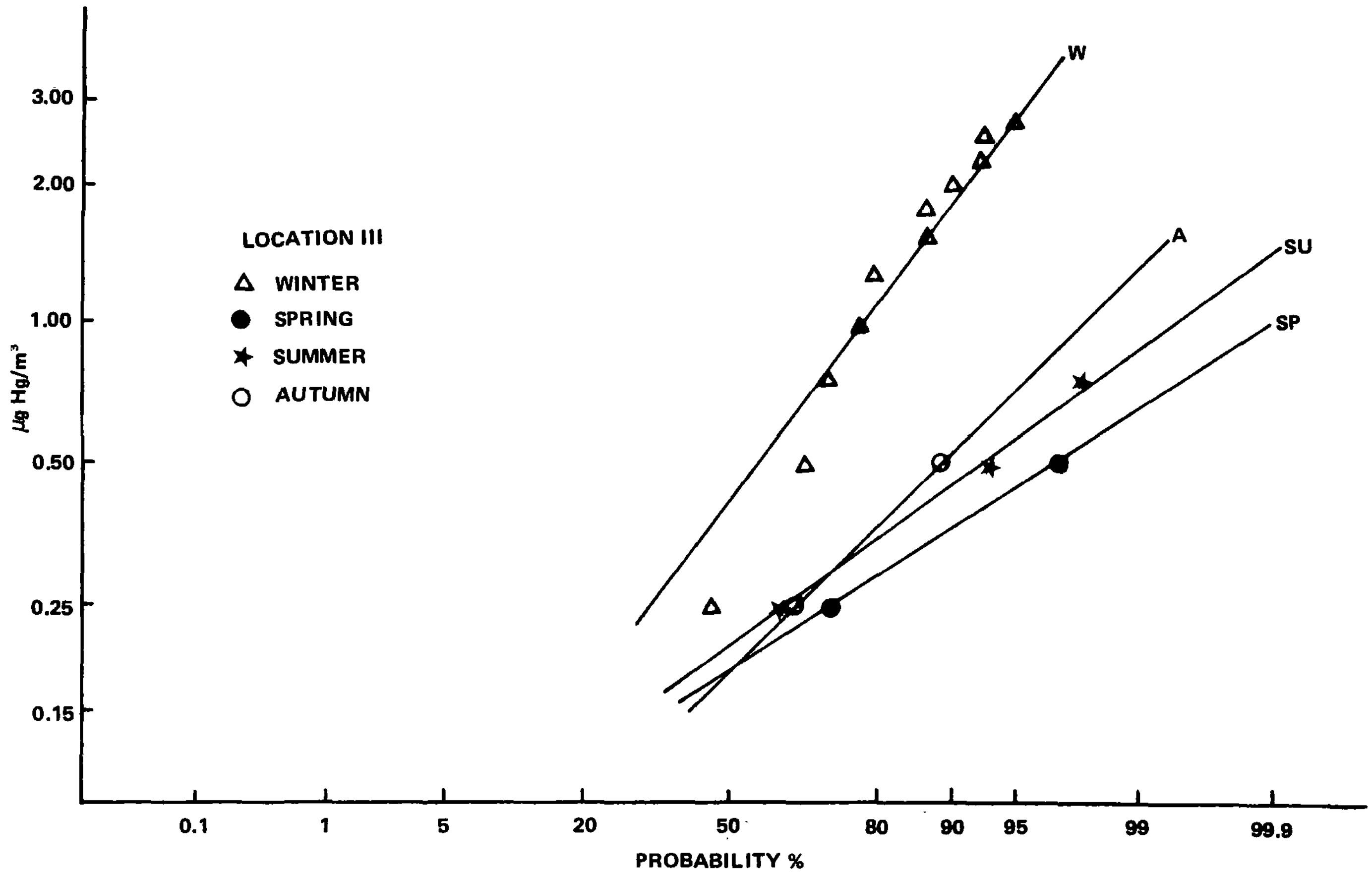

Figure A-10. Seasonal cumulative frequency distribution of mercury in air - Idrija area.

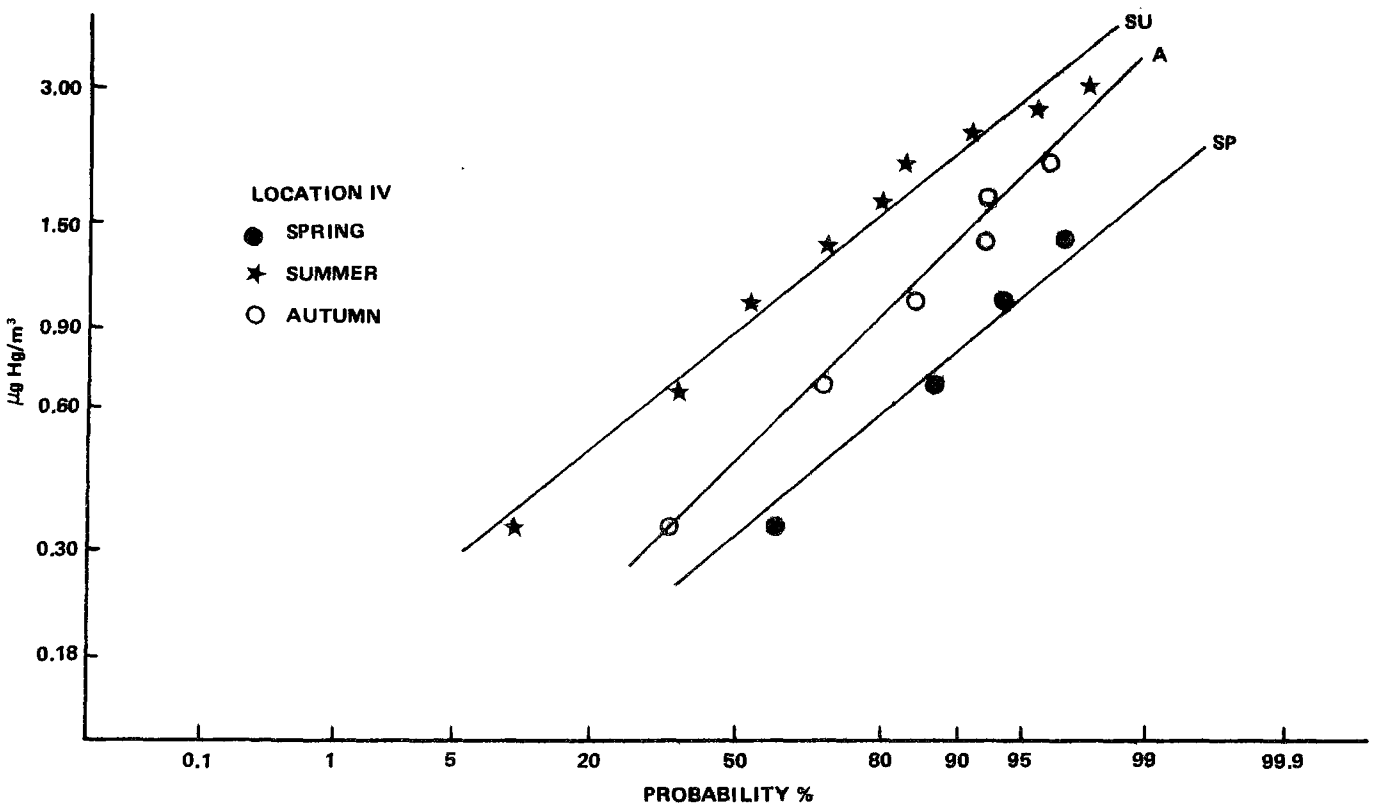

Figure A-11. Seasonal cumulative frequency distribution of mercury in air - Idrija area.

TABLE A-1. ATMOSPHERIC MERCURY VAPOR CONCENTRATION IN RURAL AREA, $\mu g/m^3$

Date	Location	
Dec. 1972	I	II
5/6	0.018	0.019
6/7	0.004	0.018
7/8	0.008	0.023
8/9	0.019	0.019
9/10	0.014	0.031
10/11	0.012	0.017
18/19	0.005	0.012
19/20	0.013	0.008
20/21	0.007	0.010
22/23	0.011	0.011
23/24	0.009	0.016
24/25	0.011	0.009
Mean	0.010	0.016
Max.	0.019	0.031
Min.	0.004	0.008

TABLE A-2. ATMOSPHERIC MERCURY VAPOR CONCENTRATION IN RURAL AREA, $\mu g/m^3$

Date	Location	
Jan. 1973	I	II
1/2	0.022	0.041
2/3	0.012	0.040
3/4	0.013	0.034
4/5	0.014	0.038
5/6		0.018
6/7	0.009	0.002
7/8	0.012	0.003
17/18	0.026	0.009
18/19	0.031	0.009
19/20	0.026	0.013
20/21	0.027	0.015
21/22	0.028	0.011
22/23		0.008
23/24		0.010
24/25		0.010
25/26		0.007
26/27		0.006
27/28		0.007
28/29		0.010
Mean	0.020	0.015
Max.	0.031	0.041
Min.	0.009	0.002

TABLE A-3. ATMOSPHERIC MERCURY VAPOR CONCENTRATION IN RURAL AREA, μg/m^3

Date	Location	
Feb. 1973	I	II
5/6	0.014	0.020
6/7	0.002	0.016
7/8	0.002	0.010
8/9	0.014	0.010
9/10	0.011	0.008
10/11	0.009	0.007
11/12		0.011
20/21		0.014
21/22		0.014
22/23		0.017
23/24		0.013
24/25		0.015
25/26		0.008
26/27		0.006
Mean	0.008	0.012
Max.	0.014	0.020
Min.	0.002	0.006

TABLE A-4. ATMOSPHERIC MERCURY VAPOR CONCENTRATION IN RURAL AREA, $\mu g/m^3$

Date	Location	
Mar. 1973	I	II
5/6	0.008	0.010
6/7	0.009	0.013
7/8	0.010	0.021
8/9	0.003	0.014
9/10	0.003	0.012
10/11	0.006	0.011
11/12	0.010	0.016
20/21		0.018
21/22		0.012
22/23		0.010
23/24		0.007
25/26		0.008
26/27		0.009
Mean	0.007	0.012
Max.	0.010	0.021
Min.	0.003	0.007

TABLE A-5. ATMOSPHERIC MERCURY VAPOR CONCENTRATION IN RURAL AREA, μg/m³

<table>
<tr><th>Date</th><th colspan="2">Location</th></tr>
<tr><th>Apr. 1973</th><th>I</th><th>II</th></tr>
<tr><td>3/4</td><td>0.012</td><td>0.008</td></tr>
<tr><td>4/5</td><td>0.019</td><td>0.014</td></tr>
<tr><td>5/6</td><td>0.004</td><td>0.003</td></tr>
<tr><td>6/7</td><td rowspan="2">0.021</td><td>0.005</td></tr>
<tr><td>7/8</td><td>0.009</td></tr>
<tr><td>8/9</td><td>0.009</td><td>0.014</td></tr>
<tr><td>16/17</td><td>0.011</td><td rowspan="2">0.017</td></tr>
<tr><td>17/18</td><td>0.017</td></tr>
<tr><td>18/19</td><td>0.014</td><td>0.015</td></tr>
<tr><td>19/20</td><td>0.008</td><td>0.012</td></tr>
<tr><td>20/21</td><td>0.008</td><td>0.010</td></tr>
<tr><td>21/22</td><td>0.010</td><td>0.006</td></tr>
<tr><td>22/23</td><td>0.013</td><td>0.007</td></tr>
<tr><td>Mean</td><td>0.012</td><td>0.010</td></tr>
<tr><td>Max.</td><td>0.021</td><td>0.017</td></tr>
<tr><td>Min.</td><td>0.004</td><td>0.003</td></tr>
</table>

TABLE A-6. ATMOSPHERIC MERCURY VAPOR CONCENTRATION IN RURAL AREA, $\mu g/m^3$

Date	Location	
May 1973	I	II
8/9	0.026	0.022
9/10	0.019	0.018
10/11	0.014	0.016
11/12	0.007	0.019
12/13	0.013	0.025
13/14		0.022
22/23	0.003	0.009
23/24	0.006	0.006
24/25	0.004	0.011
25/26	0.001	0.008
26/27	0.006	0.009
27/28	0.003	0.013
28/29		0.010
Mean	0.009	0.014
Max.	0.026	0.025
Min.	0.001	0.006

TABLE A-7. ATMOSPHERIC MERCURY VAPOR CONCENTRATION IN RURAL AREA, μg/m^3

Date	Location	
June 1973	I	II
6/7	0.025	0.032
7/8	0.017	0.027
8/9		
9/10	0.012	0.019
10/11		0.012
11/12	0.013	0.011
18/19	0.010	0.007
19/20	0.014	0.015
20/21	0.007	0.011
21/22	0.040	0.010
22/23	0.013	0.013
23/24	0.011	0.009
24/25	0.019	0.010
Mean	0.016	0.015
Max.	0.040	0.032
Min.	0.007	0.007

TABLE A-8. ATMOSPHERIC MERCURY VAPOR CONCENTRATION IN RURAL AREA, $\mu g/m^3$

<table>
<tr><th>Date</th><th colspan="2">Location</th></tr>
<tr><th>July 1973</th><th>I</th><th>II</th></tr>
<tr><td>2/3</td><td>0.011</td><td></td></tr>
<tr><td>3/4</td><td>0.007</td><td>0.007</td></tr>
<tr><td>4/5</td><td>0.014</td><td>0.008</td></tr>
<tr><td>5/6</td><td>0.008</td><td>0.014</td></tr>
<tr><td>6/7</td><td>0.022</td><td>0.014</td></tr>
<tr><td>7/8</td><td>0.007</td><td>0.019</td></tr>
<tr><td>8/9</td><td>0.007</td><td>0.015</td></tr>
<tr><td>17/18</td><td>0.008</td><td>0.020</td></tr>
<tr><td>18/19</td><td>0.005</td><td>0.025</td></tr>
<tr><td>19/20</td><td>0.020</td><td>0.014</td></tr>
<tr><td>20/21</td><td>0.021</td><td>0.009</td></tr>
<tr><td>21/22</td><td rowspan="2">0.018</td><td>0.008</td></tr>
<tr><td>22/23</td><td>0.005</td></tr>
<tr><td>Mean</td><td>0.012</td><td>0.013</td></tr>
<tr><td>Max.</td><td>0.022</td><td>0.025</td></tr>
<tr><td>Min.</td><td>0.005</td><td>0.005</td></tr>
</table>

TABLE A-9. ATMOSPHERIC MERCURY VAPOR CONCENTRATION IN RURAL AREA, μg/m^3

Date	Location	
Aug. 1973	I	II
7/8	0.006	0.005
8/9	0.012	0.008
9/10	0.008	0.009
10/11	0.004	0.007
11/12	0.020	0.016
12/13	0.013	0.019
21/22	0.022	0.023
22/23	0.019	0.022
23/24	0.004	0.015
24/25	0.007	0.014
25/26	0.006	0.012
26/27	0.026	0.008
Mean	0.012	0.013
Max.	0.026	0.023
Min.	0.004	0.005

TABLE A-10. ATMOSPHERIC MERCURY VAPOR CONCENTRATION IN RURAL AREA, $\mu g/m^3$

Date	Location	
Sept. 1973	I	II
3/4	0.010	
4/5	0.008	0.006
5/6	0.008	0.008
6/7	0.007	0.008
7/8	0.013	0.018
8/9	0.009	0.020
9/10	0.016	0.021
17/18	0.014	0.014
18/19		0.011
19/20	0.008	0.007
20/21	0.009	0.018
21/22	0.012	0.009
22/23	0.009	
23/24	0.009	0.006
Mean	0.010	0.012
Max.	0.016	0.021
Min.	0.007	0.006

TABLE A-11. ATMOSPHERIC MERCURY VAPOR CONCENTRATION IN RURAL AREA, $\mu g/m^3$

Date	Location	
Oct. 1973	I	II
30/1	0.041	
1/2	0.011	0.033
2/3	0.026	0.040
3/4	0.009	0.026
4/5	0.010	0.017
5/6	0.004	0.012
6/7	0.009	0.009
10/11	0.007	
11/12	0.009	0.008
12/13	0.005	0.012
13/14	0.008	0.010
14/15	0.012	0.009
15/16	0.005	0.007
16/17	0.006	0.010
Mean	0.012	0.016
Max.	0.041	0.040
Min.	0.004	0.007

TABLE A-12. ATMOSPHERIC MERCURY VAPOR CONCENTRATION IN RURAL AREA, $\mu g/m^3$

Date	Location	
Nov. 1973	I	II
7/8		0.011
8/9		0.008
9/10		0.015
10/11		0.013
11/12		0.009
12/13		0.012
20/21	0.026	0.019
21/22	0.023	0.024
22/23	0.020	0.031
23/24	0.027	0.042
24/25	0.028	
25/26	0.046	
Mean	0.028	0.018
Max.	0.046	0.042
Min.	0.020	0.008

TABLE A-13. ATMOSPHERIC MERCURY VAPOR CONCENTRATION IN ZAGREB, $\mu g/m^3$

<table>
<tr><th>Date</th><th colspan="4">Location</th></tr>
<tr><th>Dec. 1972</th><th>I</th><th>I</th><th>III</th><th>IV</th></tr>
<tr><td>5/6</td><td>0.018</td><td>0.011</td><td>0.130</td><td>0.013</td></tr>
<tr><td>6/7</td><td>0.012</td><td>0.001</td><td>0.082</td><td>0.021</td></tr>
<tr><td>7/8</td><td>0.018</td><td>0.039</td><td>0.018</td><td>0.064</td></tr>
<tr><td>8/9</td><td>0.011</td><td></td><td>0.048</td><td>0.017</td></tr>
<tr><td>9/10</td><td rowspan="2">0.007</td><td>0.016</td><td>0.034</td><td>0.012</td></tr>
<tr><td>10/11</td><td></td><td>0.047</td><td>0.012</td></tr>
<tr><td>19/20</td><td>0.026</td><td>0.003</td><td>0.016</td><td>0.015</td></tr>
<tr><td>20/21</td><td>0.023</td><td>0.014</td><td>0.005</td><td>0.005</td></tr>
<tr><td>21/22</td><td>0.011</td><td>0.001</td><td>0.012</td><td>0.005</td></tr>
<tr><td>22/23</td><td>0.007</td><td></td><td>0.024</td><td>0.014</td></tr>
<tr><td>23/24</td><td rowspan="2">0.008</td><td>0.011</td><td>0.025</td><td>0.003</td></tr>
<tr><td>24/25</td><td></td><td>0.011</td><td>0.007</td></tr>
<tr><td>25/26</td><td>0.013</td><td>0.021</td><td>0.014</td><td>0.038</td></tr>
<tr><td>Mean</td><td>0.014</td><td>0.013</td><td>0.035</td><td>0.017</td></tr>
<tr><td>Max.</td><td>0.026</td><td>0.039</td><td>0.130</td><td>0.064</td></tr>
<tr><td>Min.</td><td>0.007</td><td>0.001</td><td>0.005</td><td>0.003</td></tr>
</table>

TABLE A-14. ATMOSPHERIC MERCURY VAPOR CONCENTRATION IN ZAGREB, $\mu g/m^3$

Date	Location			
Jan. 1973	I	II	III	IV
2/4			0.010	0.008
3/4	0.012	0.016	0.013	0.011
4/5	0.012	0.002	0.002	0.001
5/6			0.019	0.012
6/7	0.010	0.013	0.058	-
7/8			0.022	0.008
8/9	0.007	0.011	0.019	0.005
16/17	-	0.008	0.030	0.021
17/18	0.010	0.004		0.058
18/19	0.014	0.057	0.024	0.032
19/20			0.048	0.035
20/21	0.016	0.065	0.028	0.017
21/22			0.027	0.026
22/23	0.012	-	0.040	0.026
Mean	0.011	0.022	0.026	0.020
Max.	0.016	0.065	0.058	0.058
Min.	0.007	0.002	0.002	0.001

TABLE A-15. ATMOSPHERIC MERCURY VAPOR CONCENTRATION IN ZAGREB. µg/m³

Date	Location			
Feb. 1973	I	II	III	IV
6/7	0.025	0.006	0.039	0.023
7/8	0.041	0.005	0.046	0.013
8/9	0.030	0.008	0.019	0.014
9/10			0.018	0.010
10/11	0.036	0.013	0.018	0.010
11/12			0.018	0.012
12/13	0.033	0.023	0.026	0.011
20/21	0.001	0.001	0.001	0.011
21/22	0.033	0.027	0.043	0.010
22/23	0.030	0.015	0.018	0.004
23/24			0.009	0.010
24/25	0.014	0.010	0.008	0.016
25/26				0.009
26/27	0.023	0.012	0.007	-
Mean.	0.027	0.012	0.020	0.011
Max.	0.041	0.027	0.046	0.023
Min.	0.001	0.001	0.001	0.004

TABLE A-16. ATMOSPHERIC MERCURY VAPOR CONCENTRATION IN ZAGREB, $\mu g/m^3$

Date	Location			
Mar. 1973	I	II	III	IV
6/7		0.003	0.009	0.010
7/8		0.010	0.006	0.012
8/9		0.011	0.009	0.010
9/10			0.010	0.018
10/11		0.007	0.015	
11/12			0.013	0.001
12/13		0.015	0.018	0.011
20/21		0.004	0.093	
21/22		0.002	0.024	
22/23		0.020	0.002	
23/24			0.019	
24/25		0.009	0.015	
25/26			0.019	
26/27		0.013	0.013	
Mean.		0.009	0.018	0.010
Max.		0.020	0.093	0.018
Min.		0.002	0.002	0.001

TABLE A-17. ATMOSPHERIC MERCURY VAPOR CONCENTRATION IN ZAGREB, $\mu g/m^3$

<table>
<tr><th>Date</th><th colspan="4">Location</th></tr>
<tr><th>Apr. 1973</th><th>I</th><th>II</th><th>III</th><th>IV</th></tr>
<tr><td>3/4</td><td>0.017</td><td rowspan="2">0.004</td><td>0.022</td><td>0.019</td></tr>
<tr><td>4/5</td><td>0.020</td><td>0.001</td><td>0.007</td></tr>
<tr><td>5/6</td><td>0.019</td><td>0.006</td><td>0.019</td><td>0.010</td></tr>
<tr><td>6/7</td><td></td><td></td><td>0.012</td><td>0.011</td></tr>
<tr><td>7/8</td><td>0.013</td><td>0.008</td><td>0.016</td><td rowspan="2">0.005</td></tr>
<tr><td>8/9</td><td></td><td></td><td>0.019</td></tr>
<tr><td>9/10</td><td>0.026</td><td>0.013</td><td>0.019</td><td>0.008</td></tr>
<tr><td>17/18</td><td>0.019</td><td>0.003</td><td>0.027</td><td>0.010</td></tr>
<tr><td>18/19</td><td rowspan="2">0.008</td><td>0.013</td><td>0.019</td><td>0.011</td></tr>
<tr><td>19/20</td><td>0.001</td><td>0.007</td><td>0.007</td></tr>
<tr><td>20/21</td><td></td><td></td><td>0.014</td><td>0.012</td></tr>
<tr><td>21/22</td><td>0.007</td><td>0.012</td><td>0.013</td><td>0.015</td></tr>
<tr><td>22/23</td><td></td><td></td><td>0.021</td><td>0.012</td></tr>
<tr><td>23/24</td><td>0.028</td><td>0.012</td><td>0.007</td><td>0.010</td></tr>
<tr><td>Mean</td><td>0.017</td><td>0.008</td><td>0.015</td><td>0.010</td></tr>
<tr><td>Max.</td><td>0.028</td><td>0.013</td><td>0.027</td><td>0.019</td></tr>
<tr><td>Min.</td><td>0.007</td><td>0.001</td><td>0.001</td><td>0.005</td></tr>
</table>

TABLE A-18. ATMOSPHERIC MERCURY VAPOR CONCENTRATION IN ZAGREB, $\mu g/m^3$

Date	Location			
May 1973	I	II	III	IV
7/8		-	-	-
8/9	0.089	0.003	0.004	0.008
9/10	0.172	0.029	0.014	0.009
10/11	0.115	0.007	0.002	0.009
11/12			0.002	0.010
12/13	0.037	0.004		
13/14	-		0.028	0.010
14/15	-	0.017	0.013	0.011
22/23	-	0.032	0.025	-
23/24	0.030	0.013	0.010	-
24/25		0.009	0.019	-
25/26			0.001	-
26/27	0.015	0.014	0.007	-
27/28			0.006	-
28/29	0.062	0.013	0.026	-
Mean	0.074	0.014	0.012	0.009
Max.	0.172	0.032	0.028	0.011
Min.	0.015	0.003	0.001	0.008

TABLE A-19. ATMOSPHERIC MERCURY VAPOR CONCENTRATION IN ZAGREB, μg/m^3

Date	Location			
June 1973	I	II	III	IV
5/6	0.240	0.024	0.023	0.018
6/7	0.156	0.014	0.020	0.009
7/8	0.249	0.021	0.015	0.014
8/9			0.018	0.015
9/10	0.071	0.010	0.017	0.016
10/11			0.022	
11/12	0.135	0.031	0.017	0.012
19/20	0.240	0.003	0.009	0.014
20/21	0.239	0.020	0.012	0.016
21/22	0.102	0.008	0.013	0.008
22/23			0.012	0.010
23/24	0.047	0.007	0.021	0.010
24/25			0.013	0.011
25/26	0.099	0.020	0.014	0.017
Mean	0.158	0.016	0.016	0.013
Max.	0.249	0.031	0.023	0.018
Min.	0.047	0.003	0.009	0.008

TABLE A-20. ATMOSPHERIC MERCURY VAPOR CONCENTRATION IN ZAGREB, $\mu g/m^3$

<table>
<tr><th>Date</th><th colspan="4">Location</th></tr>
<tr><th>July 1973</th><th>I</th><th>II</th><th>III</th><th>IV</th></tr>
<tr><td>3/4</td><td rowspan="2">0.367</td><td rowspan="2">0.022</td><td>0.008</td><td>0.001</td></tr>
<tr><td>4/5</td><td>0.008</td><td>0.009</td></tr>
<tr><td>5/6</td><td>0.186</td><td>0.002</td><td>0.005</td><td>0.008</td></tr>
<tr><td>6/7</td><td></td><td></td><td>0.006</td><td></td></tr>
<tr><td>7/8</td><td>0.052</td><td>0.018</td><td>0.008</td><td>0.001</td></tr>
<tr><td>8/9</td><td></td><td></td><td>0.014</td><td></td></tr>
<tr><td>9/10</td><td>0.120</td><td>0.006</td><td>0.007</td><td>0.007</td></tr>
<tr><td>17/18</td><td>0.043</td><td>0.029</td><td>0.018</td><td>-</td></tr>
<tr><td>18/19</td><td>0.030</td><td>0.008</td><td>0.012</td><td>0.007</td></tr>
<tr><td>19/20</td><td>0.017</td><td>0.013</td><td>0.011</td><td>0.007</td></tr>
<tr><td>20/21</td><td></td><td></td><td>0.012</td><td>0.006</td></tr>
<tr><td>21/22</td><td>0.029</td><td>0.018</td><td>0.014</td><td rowspan="2">0.008</td></tr>
<tr><td>22/23</td><td></td><td></td><td>0.003</td></tr>
<tr><td>23/24</td><td>0.047</td><td>0.014</td><td>0.012</td><td>0.012</td></tr>
<tr><td>Mean</td><td>0.099</td><td>0.014</td><td>0.010</td><td>0.007</td></tr>
<tr><td>Max.</td><td>0.367</td><td>0.029</td><td>0.018</td><td>0.012</td></tr>
<tr><td>Min.</td><td>0.017</td><td>0.002</td><td>0.003</td><td>0.001</td></tr>
</table>

TABLE A-21. ATMOSPHERIC MERCURY VAPOR CONCENTRATION IN ZAGREB, μg/m^3

Date	Location			
Aug. 1973	I	II	III	IV
7/8	0.113	0.001	0.014	
8/9	0.081	0.008	0.006	
9/10	0.037	0.013	0.007	
10/11			0.002	
11/12	0.115	0.023	0.006	
12/13			0.008	
13/14	0.087	0.007	0.006	
21/22	0.069	0.012	0.002	
22/23	0.134	0.003	0.009	
23/24	0.092	0.008	0.012	
24/25			0.012	
25/26	0.037	0.030	0.011	
26/27			0.007	
27/28	0.026	0.024	0.005	
Mean	0.079	0.013	0.008	
Max.	0.134	0.030	0.014	
Min.	0.026	0.001	0.002	

TABLE A-22. ATMOSPHERIC MERCURY VAPOR CONCENTRATION IN ZAGREB, μg/m^3

Date	Location			
Sept. 1973	I	II	III	IV
4/5	0.043	0.003	0.012	0.001
5/6	0.035	0.001	0.011	0.008
6/7	0.047	0.001	0.013	0.001
7/8			0.014	0.001
8/9	0.035	0.023	0.009	0.010
9/10			0.016	0.005
10/11	0.134	0.009	0.008	0.007
18/19	0.021	0.013	0.012	0.009
19/20	0.020	0.010	0.011	0.002
20/21	0.016	0.018	0.012	0.010
21/22			0.007	0.015
22/23	0.016	0.024	0.008	0.016
23/24			0.010	0.010
24/25	0.022	0.018	0.011	0.010
Mean	0.039	0.012	0.011	0.007
Max.	0.134	0.024	0.016	0.016
Min.	0.016	0.001	0.007	0.001

TABLE A-23. ATMOSPHERIC MERCURY VAPOR CONCENTRATION IN ZAGREB, $\mu g/m^3$

<table>
<tr><th>Date</th><th colspan="4">Location</th></tr>
<tr><th>Oct. 1973</th><th>I</th><th>II</th><th>III</th><th>IV</th></tr>
<tr><td>1/2</td><td rowspan="2">0.033</td><td>0.008</td><td>0.009</td><td>0.001</td></tr>
<tr><td>2/3</td><td>0.002</td><td>0.016</td><td>0.006</td></tr>
<tr><td>3/4</td><td>0.019</td><td>0.009</td><td>0.007</td><td>0.006</td></tr>
<tr><td>4/5</td><td>0.029</td><td>0.011</td><td>0.007</td><td>0.006</td></tr>
<tr><td>5/6</td><td></td><td></td><td>0.009</td><td>0.001</td></tr>
<tr><td>6/7</td><td>0.020</td><td>0.013</td><td>0.009</td><td>0.007</td></tr>
<tr><td>7/8</td><td></td><td></td><td>0.009</td><td>0.014</td></tr>
<tr><td>11/12</td><td>0.093</td><td>0.022</td><td>0.013</td><td>0.010</td></tr>
<tr><td>12/13</td><td></td><td></td><td>0.006</td><td>0.005</td></tr>
<tr><td>13/14</td><td>0.018</td><td>0.008</td><td>0.001</td><td rowspan="2">0.017</td></tr>
<tr><td>14/15</td><td></td><td></td><td>0.003</td></tr>
<tr><td>15/16</td><td>0.045</td><td>0.001</td><td>0.002</td><td>0.009</td></tr>
<tr><td>16/17</td><td>0.062</td><td>0.014</td><td>0.003</td><td>0.012</td></tr>
<tr><td>17/18</td><td>0.034</td><td>0.010</td><td>0.007</td><td>0.007</td></tr>
<tr><td>Mean</td><td>0.039</td><td>0.010</td><td>0.007</td><td>0.008</td></tr>
<tr><td>Max.</td><td>0.093</td><td>0.022</td><td>0.016</td><td>0.017</td></tr>
<tr><td>Min.</td><td>0.018</td><td>0.001</td><td>0.001</td><td>0.001</td></tr>
</table>

TABLE A-24. ATMOSPHERIC MERCURY VAPOR CONCENTRATION IN ZAGREB, $\mu g/m^3$

<table>
<tr><th>Date</th><th colspan="4">Location</th></tr>
<tr><th>Nov. 1973</th><th>I</th><th>II</th><th>III</th><th>IV</th></tr>
<tr><td>7/8</td><td>0.035</td><td>0.017</td><td></td><td></td></tr>
<tr><td>8/9</td><td>0.018</td><td></td><td></td><td></td></tr>
<tr><td>9/10</td><td>0.020</td><td>0.008</td><td></td><td></td></tr>
<tr><td>10/11</td><td>0.019</td><td></td><td></td><td></td></tr>
<tr><td>11/12</td><td rowspan="2">0.016</td><td></td><td></td><td></td></tr>
<tr><td>12/13</td><td></td><td></td><td></td></tr>
<tr><td>21/22</td><td>0.021</td><td>0.005</td><td>0.021</td><td>0.006</td></tr>
<tr><td>22/23</td><td>0.020</td><td>0.049</td><td>0.050</td><td>0.024</td></tr>
<tr><td>23/24</td><td>0.011</td><td>0.008</td><td>0.041</td><td>0.027</td></tr>
<tr><td>24/25</td><td>0.014</td><td></td><td>0.029</td><td>0.024</td></tr>
<tr><td>25/26</td><td rowspan="2">0.010</td><td>0.012</td><td>0.028</td><td>0.018</td></tr>
<tr><td>26/27</td><td></td><td>0.023</td><td>0.030</td></tr>
<tr><td>Mean</td><td>0.018</td><td>0.017</td><td>0.032</td><td>0.021</td></tr>
<tr><td>Max.</td><td>0.035</td><td>0.049</td><td>0.050</td><td>0.030</td></tr>
<tr><td>Min.</td><td>0.010</td><td>0.005</td><td>0.021</td><td>0.006</td></tr>
</table>

TABLE A-25. ATMOSPHERIC MERCURY VAPOR CONCENTRATION IN IDRIJA, $\mu g/m^3$

Date	Location		
Dec. 1971	I	II	III
2/3	0.187	0.369	0.287
3/4	0.268	0.444	0.424
4/5	0.750	0.387	0.600
5/6	2.337	1.019	0.484
6/7	0.341	0.126	0.396
16/17	0.315	0.290	0.113
17/18	0.183	0.185	0.221
18/19	0.316	0.215	0.195
19/20	6.655	2.081	1.865
20/21	3.787	1.238	1.266
Mean	1.514	0.635	0.585
Max.	6.655	2.081	1.865
Min.	0.187	0.126	0.113

TABLE A-26. ATMOSPHERIC MERCURY AEROSOL CONCENTRATION IN IDRIJA, µg/m^3

Date	Location		
Dec. 1971	I	II	III
2/3	0.013	0.011	0.005
3/4	0.017	0.007	0.022
4/5	0.016	0.013	0.006
5/6	0.026	0.011	0.010
6/7	0.012	-	0.038
16/17	0.006	0.001	0.007
17/18	0.002	0.002	0.004
18/19	0.011	0.001	0.006
19/20	0.063	0.015	0.024
20/21	0.016	0.138	0.008
Mean	0.018	0.022	0.013
Max.	0.063	0.138	0.038
Min.	0.002	0.001	0.004

TABLE A-27. ATMOSPHERIC MERCURY VAPOR CONCENTRATION IN IDRIJA, $\mu g/m^3$

Date	Location		
Jan. 1972	I	II	III
6/7	0.551	0.163	0.138
7/8	1.457	0.604	0.240
8/9	3.367	0.761	0.661
9/10	8.788	2.732	2.547
10/11	6.537	2.946	2.837
20/21	0.128	0.109	0.086
21/22	0.161	0.114	0.074
22/23	1.091	0.398	0.115
23/24	0.077	0.093	0.051
24/25	0.092	0.074	0.068
Mean	2.224	0.799	0.681
Max.	8.788	2.946	2.837
Min.	0.077	0.074	0.051

TABLE A-28. ATMOSPHERIC MERCURY AEROSOL CONCENTRATION IN IDRIJA, $\mu g/m^3$

Date	Location		
Jan. 1972	I	II	III
6/7	0.038	0.002	-
7/8	0.005	0.002	0.003
8/9	0.010	0.016	0.003
9/10	0.034	0.021	0.027
10/11	0.017	0.024	0.019
20/21	0.007	0.023	0.012
21/22	0.010	0.005	0.009
22/23	0.009	0.006	0.006
23/24	0.005	0.009	0.007
24/25	0.008	0.002	0.006
Mean.	0.014	0.011	0.010
Max.	0.038	0.024	0.027
Min.	0.005	0.002	0.003

TABLE A-29. ATMOSPHERIC MERCURY VAPOR CONCENTRATION IN IDRIJA, μg/m^3

Date	Location			
Feb. 1972	I	II	III	IV
2/3	0.093	0.105	0.092	0.104
3/4	0.108	0.092	0.092	0.107
4/5	0.125	0.169	0.102	0.104
5/6	1.040	0.166	0.121	0.149
6/7	5.881	3.930	2.897	4.150
7/8	4.826	1.933	1.441	2.659
8/9	5.089	1.838	1.481	2.318
9/10	0.377	0.283	0.197	0.447
10/11	1.980	1.396	0.967	1.539
11/12	2.204	1.535	1.006	2.144
12/13	0.988	0.679	0.476	0.391
13/14	0.878	0.296	0.173	0.261
14/15	4.928	0.354	0.214	0.496
15/16	2.386	0.191	0.171	0.260
16/17	2.302	0.706	0.350	1.084
17/18	4.777	2.362	2.116	2.326
18/19	1.688	1.047	0.938	1.319
19/20	1.136	0.506	0.315	0.453
20/21	1.109	0.326	0.274	0.334
Mean	2.206	0.943	0.706	1.087
Max.	5.881	3.930	2.897	4.150
Min.	0.093	0.092	0.092	0.104

TABLE A-30. ATMOSPHERIC MERCURY AEROSOL CONCENTRATION IN IDRIJA, $\mu g/m^3$

Date	Location			
Feb. 1972	I	II	III	IV
2/3	0.003	0.004	0.002	-
3/4	0.004	-	-	0.003
4/5	0.008	-	0.003	0.065
5/6	0.006	-	0.005	0.001
6/7	0.026	0.014	0.013	0.052
7/8	0.004	0.007	0.009	0.009
8/9	0.015	0.007	0.009	0.006
9/10	0.001	0.002	-	0.001
10/11	0.028	0.013	0.009	0.007
11/12	0.019	0.010	0.011	0.023
12/13	0.006	0.005	0.004	0.003
13/14	0.005	0.005	0.002	0.002
14/15	0.010	0.006	0.004	0.006
15/16	0.012	0.004	0.002	0.003
16/17	0.005	0.005	0.005	0.007
17/18	0.020	0.010	0.010	0.010
18/19	0.005	0.004	0.002	0.013
19/20	0.003	0.001	0.002	0.002
20/21	0.002	0.005	0.002	0.002
Mean	0.010	0.006	0.006	0.012
Max.	0.028	0.014	0.013	0.065
Min.	0.001	0.001	0.002	0.001

TABLE A-31. ATMOSPHERIC MERCURY VAPOR CONCENTRATION IN IDRIJA, $\mu g/m^3$

Date	Location			
Mar. 1972	I	II	III	IV
8/9	0.740	0.538	0.402	0.289
9/10	1.225	0.433	0.589	0.580
10/11	1.074	0.221	0.182	0.486
11/12	0.126	0.041	0.006	0.042
12/13	0.278	0.042	0.039	0.033
22/23	0.701	0.215	0.168	0.153
23/24	0.731	0.236	0.181	0.107
24/25	0.697	0.165	0.152	0.098
25/26	0.954	0.248	0.189	0.126
26/27	1.689	0.477	0.150	0.222
Mean	0.821	0.261	0.205	0.213
Max.	1.689	0.538	0.589	0.580
Min.	0.126	0.041	0.006	0.033

TABLE A-32. ATMOSPHERIC MERCURY AEROSOL CONCENTRATION IN IDRIJA, μg/m³

Date	Location			
Mar. 1972	I	II	III	IV
8/9	0.020	0.010	0.011	0.006
9/10	0.017	0.004	0.011	0.007
10/11	0.010	0.008	0.006	0.007
11/12	0.011	0.003	0.002	0.003
12/13	0.015	0.004	0.004	0.003
22/23	0.024	0.010	0.005	0.008
23/24	0.038	0.009	0.002	0.004
24/25	0.031	0.011	0.007	0.003
25/26	0.027	0.007	0.006	0.003
26/27	0.025	0.004	0.002	-
Mean.	0.022	0.007	0.006	0.005
Max.	0.038	0.011	0.011	0.008
Min.	0.010	0.003	0.002	0.003

TABLE A-33. ATMOSPHERIC MERCURY VAPOR CONCENTRATION IN IDRIJA, μg/m^3

Date	Location			
Apr. 1972	I	II	III	IV
5/6	1.152	0.198	0.192	0.112
6/7	1.574	0.401	0.230	0.158
7/8	1.837	0.460	0.220	0.267
8/9	2.387	0.220	0.263	0.207
9/10	0.103	0.351	0.105	0.055
19/20	1.184	0.300	0.260	0.300
20/21	2.250	0.523	0.284	0.572
21/22	1.802	0.284	0.142	0.222
22/23	2.751	0.472	0.420	0.484
23/24	2.983	0.392	0.333	0.751
Mean	1.800	0.360	0.244	0.312
Max.	2.983	0.523	0.420	0.751
Min.	0.103	0.283	0.105	0.055

TABLE A-34. ATMOSPHERIC MERCURY AEROSOL CONCENTRATION IN IDRIJA, μg/m^3

Date	Location			
Apr. 1972	I	II	III	IV
5/6	0.018	0.010	0.008	0.002
6/7	0.019	0.011	0.002	0.002
7/8	0.046	0.010	0.005	0.004
8/9	0.032	0.005	0.008	0.003
9/10	0.010	0.012	0.003	-
19/20	0.020	0.015	0.006	0.009
20/21	0.028	0.020	0.008	0.013
21/22	0.016	0.010	0.010	0.008
22/23	0.018	0.080	0.012	0.023
23/24	0.032	0.019	0.007	0.019
Mean	0.024	0.019	0.007	0.009
Max.	0.046	0.080	0.012	0.023
Min.	0.010	0.005	0.002	0.002

TABLE A-35. ATMOSPHERIC MERCURY VAPOR CONCENTRATION IN IDRIJA, μg/m³

Date	Location			
May 1972	I	II	III	IV
3/4	3.127	0.812	0.205	0.637
4/5	2.715	0.655	0.083	0.442
5/6	2.410	0.461	0.184	0.494
6/7	1.833	0.312	0.196	0.431
7/8	0.986	0.257	0.232	0.218
8/9	0.789	0.188	0.147	0.193
17/18	1.245	0.245	1.179	0.237
18/19	2.056	0.287	0.258	0.276
19/20	1.354	0.243	0.246	0.448
20/21	1.715	0.314	0.169	0.535
21/22	3.237	0.378	0.245	0.914
22/23	5.724	0.491	0.279	1.212
Mean	2.270	0.387	0.202	0.503
Max.	5.724	0.812	0.279	1.212
Min.	0.789	0.188	0.083	0.193

TABLE A-36. ATMOSPHERIC MERCURY AEROSOL CONCENTRATION IN IDRIJA, $\mu g/m^3$

Date	Location			
May 1972	I	II	III	IV
3/4				
4/5				
5/6				
6/7	0.012	0.009	0.007	0.001
7/8				
8/9				
17/18				
18/19				
19/20				
20/21	0.021	0.008	0.007	0.013
21/22				
22/23				

TABLE A-37. ATMOSPHERIC MERCURY VAPOR CONCENTRATION IN IDRIJA, $\mu g/m^3$

Date	Location			
June 1972	I	II	III	IV
7/8	6.581	0.966	0.090	2.617
8/9	4.884	0.142	0.087	0.864
9/10	1.041	0.128	0.102	0.515
10/11	3.200	0.606	0.218	2.225
11/12	4.562	1.772	1.916	4.237
12/13	3.147	1.066	0.596	1.984
13/14	2.547	0.728	0.489	1.857
14/15	2.732	0.546	0.328	1.101
15/16	3.475	0.353	0.216	-
16/17	0.918	0.179	0.126	0.363
17/18	1.358	0.193	-	1.000
18/19	2.286	0.633	0.335	0.729
19/20	1.615	0.165	0.069	0.238
20/21	2.705	0.182	0.177	0.360
21/22	4.122	0.637	0.034	0.917
22/23	2.468	0.550	0.196	0.837
23/24	4.248	0.221	0.102	0.784
24/25	3.440	0.221	0.132	0.405
25/26	-	0.748	0.394	1.253
26/27	2.509	-	0.030	-
27/28	2.027	0.429	0.218	0.413
28/29	3.003	0.659	0.361	0.450
29/30	1.831	0.366	0.254	0.678
Mean	2.940	0.522	0.294	1.134
Max.	6.581	1.772	1.916	4.237
Min.	0.918	0.128	0.034	0.237

TABLE A-38. ATMOSPHERIC MERCURY AEROSOL CONCENTRATION IN IDRIJA, $\mu g/m^3$

Date	Location			
June 1972	I	II	III	IV
7/8				
8/9				
9/10	0.017	0.004	0.002	0.006
10/11				
11/12				
12/13				
13/14				
14/15	0.023	0.006	0.005	0.028
15/16				
16/17				
17/18				
18/19	0.033	0.001	0.002	0.006
19/20				
20/21				
21/22				
22/23				
23/24	0.018	0.004	0.001	0.008
24/25				
25/26				
26/27				
27/28				
28/29	0.007	0.002	0.006	-
29/30				
Mean.	0.020	0.003	0.002	0.012
Max.	0.033	0.006	0.005	0.028
Min.	0.007	0.001	0.001	0.006

TABLE A-39. ATMOSPHERIC MERCURY VAPOR CONCENTRATION IN IDRIJA, μg/m^3

Date	Location			
July 1972	I	II	III	IV
3/4	1.900	0.259	0.155	0.512*
4.5	-	0.261	0.121	0.254†
5/6	3.714	0.422	0.215	0.595
6/7	3.491	0.560	0.197	1.248
7/8	3.619	0.712	0.027	1.194
8/9	3.851	0.742	0.260	1.040
9/10	4.640	1.475	0.464	1.871
14/15	4.730	1.120	0.521	0.970
15/16	3.652	0.700	0.482	1.632
16/17	3.220	0.682	0.214	1.171
17/18	4.571	0.963	0.350	2.351
18/19	3.862	1.273	0.284	1.454
Mean	3.750	0.764	0.274	1.191
Max.	4.730	1.475	0.521	2.351
Min.	1.900	0.261	0.027	0.254

* 2-day sample: June 30/July 1.

† 5-day sample: July 1/5.

TABLE A-40. ATMOSPHERIC MERCURY AEROSOL CONCENTRATION IN IDRIJA, μg/m^3

Date	Location			
July 1972	I	II	III	IV
3/4				
4/5	0.007	0.003	0.005	0.002
5/6				
6/7				
7/8				
8/9	0.013	0.003	0.003	0.003
9/10				
14/15				
15/16				
16/17	0.012	0.005	0.005	0.004
17/18				
18/19				

TABLE A-41. ATMOSPHERIC MERCURY VAPOR CONCENTRATION IN IDRIJA, $\mu g/m^3$

Date	Location			
Aug. 1972	I	II	III	IV
18/19	1.448	0.397	0.220	0.503
19/20	2.276	0.329	0.188	0.509
20/21	6.104	0.466	0.255	0.817
21/22	4.797	0.704	0.440	1.667
22/23	1.844	0.322	0.186	0.786
23/24	1.029	0.246	0.447	0.242
24/25	1.728	0.414	0.154	0.466
25/26	3.916	0.411	0.159	1.359
26/27	0.568	-	0.093	0.271
27/28	4.324	0.714	0.129	0.504
Mean	2.803	0.400	0.227	0.712
Max.	6.104	0.714	0.447	1.667
Min.	0.568	0.246	0.093	0.271

TABLE A-42. ATMOSPHERIC MERCURY AEROSOL CONCENTRATION IN IDRIJA, μg/m^3

Date	Location			
Aug. 1972	I	II	III	IV
18/19				
19/20				
20/21	0.007	0.002	0.008	0.002
21/22				
22/23				
23/24				
24/25				
25/26	0.048	0.006	0.005	0.015
26/27				
27/28				

TABLE A-43. ATMOSPHERIC MERCURY VAPOR CONCENTRATION IN IDRIJA, μg/m^3

Date	Location			
Sept. 1972	I	II	III	IV
13/14	1.187	0.094	0.062	0.157
14/15	2.506	0.558	0.185	0.237
15/16	1.781	0.183	0.135	0.355
16/17	0.654	0.118	0.084	0.183
17/18	0.372	0.143	0.092	0.079
23/24	0.702	0.220	0.120	0.135
24/25	1.150	0.316	0.169	0.390
25/26	1.403	0.339	0.193	0.364
26/27	5.043	0.816	0.247	1.560
27/28	1.269	0.380	0.225	0.364
Mean	1.606	0.322	0.151	0.382
Max.	5.043	0.816	0.247	1.560
Min.	0.372	0.094	0.062	0.079

TABLE A-44. ATMOSPHERIC MERCURY AEROSOL CONCENTRATION IN IDRIJA, $\mu g/m^3$

Date	Location			
Sept. 1972	I	II	III	IV
13/14				
14/15				
15/16	0.008	0.001	0.001	0.001
16/17				
17/18				
23/24				
24/25				
25/26	0.012	0.003	0.002	0.004
26/27				
27/28				

TABLE A-45. ATMOSPHERIC MERCURY VAPOR CONCENTRATION IN IDRIJA, $\mu g/m^3$

Date	Location			
Oct. 1972	I	II	III	IV
1/2	1.308	-	0.195	0.363
2/3	0.465	0.158	0.104	0.147
3/4	2.020	0.361	0.246	0.139
4/5	1.522	0.308	0.150	0.201
5/6	0.575	0.243	0.166	0.198
19/20	1.914	0.357	0.261	0.428
20/21	1.547	0.404	0.293	0.538
21/22	1.266	0.209	0.140	0.275
22/23	1.727	0.543	0.336	0.554
23/24	3.606	1.079	0.611	1.886
Mean	1.595	0.407	0.250	0.491
Max.	3.606	1.079	0.611	1.886
Min.	0.465	0.158	0.104	0.147

TABLE A-46. ATMOSPHERIC MERCURY AEROSOL CONCENTRATION IN IDRIJA, μg/m^3

Date	Location			
Oct. 1972	I	II	III	IV
1/2				
2/3				
3/4	0.007	0.001	0.001	0.002
4/5				
5/6				
19/20				
20/21				
21/22	0.006	0.003	0.004	0.001
22/23				
23/24				
Mean	0.007	0.002	0.003	0.002
Max.	0.007	0.003	0.004	0.002
Min.	0.007	0.003	0.004	0.002

TABLE A-47. ATMOSPHERIC MERCURY VAPOR CONCENTRATION IN IDRIJA, μg/m^3

Date	Location			
Nov. 1972	I	II	III	IV
4/5	2.195	0.453	0.296	0.807
5/6	2.899	0.542	0.308	1.011
6/7	1.403	0.428	0.382	0.848
7/8	3.738	0.640	0.543	1.141
9/10	2.463	0.690	0.694	0.615
16/17	3.667	0.890		
17/18	2.046	0.337		
18/19	0.231	0.125		
19/20	1.207	0.394		
20/21	2.064	1.040		
21/22	2.819	0.534		
22/23	1.495	0.437		
Mean	2.147	0.518	0.394	0.839
Max.	3.738	1.040	0.649	1.141
Min.	0.231	0.125	0.186	0.612

TABLE A-48. ATMOSPHERIC MERCURY AEROSOL CONCENTRATION IN IDRIJA, $\mu g/m^3$

Date	Location			
Nov. 1972	I	II	III	IV
4/5				
5/6				
6/7				
7/8	0.030	0.002	0.002	0.002
8/9				
9/10				
16/17				
17/18				
18/19	0.026	0.004		
18/19				
19/20				
20/21				
21/22	0.040	0.006		
22/23				
Mean	0.032	0.004	0.002	0.002
Max.	0.040	0.006	0.002	0.002
Min.	0.026	0.002	0.002	0.002

TABLE A-49. ATMOSPHERIC MERCURY VAPOR (a) and AEROSOL (b) CONCENTRATIONS IN IDRIJA, μg/m³

Date	Location			
	I		II	
Dec. 1972	a	b	a	b
8/9	3.178		1.857	
9/10			0.377	
10/11	5.487	0.013	0.241	0.004
11/12	1.157		0.184	
12/13	0.684		0.076	
13/14	0.205	0.004	0.071	0.001
14/15	0.388		0.017	
19/20	2.512		0.147	
20/21	2.486		0.086	
21/22	0.402	0.007	0.038	0.002
22/23	0.359		0.127	
23/24	1.293		0.117	
24/25	0.524	0.005	0.312	
25/26	2.043		0.647	0.004
26/27	-			
Mean	1.594		0.307	
Max.	5.487		1.857	
Min.	0.205		0.017	

TABLE A-50. ATMOSPHERIC MERCURY VAPOR (a) and AEROSOL (b) CONCENTRATIONS IN IDRIJA, $\mu g/m^3$

Date	Location			
	I		II	
Jan. 1973	a	b	a	b
4/5	1.924		0.248	
5/6	6.782		0.102	
6/7	0.722	0.015	0.122	0.001
7/8	0.324		0.258	
8/9	0.198		0.027	
9/10	0.181	0.003	0.051	0.001
10/11	0.291		0.057	
20/21	3.438		1.945	
21/22	3.289		1.318	
22/23	1.019	0.028	0.268	0.004
23/24	2.582		0.290	
24/25	0.359		0.092	
25/26	4.476	0.007	0.198	0.001
26/27	0.273		0.048	
Mean	1.847		0.359	
Max.	6.782		1.945	
Min.	0.181		0.027	

TABLE A-51. ATMOSPHERIC MERCURY VAPOR (a) and AEROSOL (b) CONCENTRATIONS IN IDRIJA, $\mu g/m^3$

Date	Location			
	I		II	
Feb. 1973	a	b	a	b
8/9	4.166		0.685	
9/10	3.362		0.291	
10/11	3.041	0.016	0.538	0.003
11/12	0.958		0.476	
12/13	2.192		0.729	
13/14	-	0.036	0.763	0.005
14/15	9.567		4.145	
21/22	2.189		0.540	
22/23	0.734		0.263	
23/24	0.751	0.007	0.187	0.004
24/25	1.057		0.138	
25/26			0.151	
26/27	1.942		0.193	0.005
27/28	3.914	0.037	0.261	
Mean	2.606		0.669	
Max.	9.567		4.145	
Min.	0.001		0.138	

TABLE A-52. ATMOSPHERIC MERCURY VAPOR (a) and AEROSOL (b) CONCENTRATIONS IN IDRIJA, μg/m^3

Date	Location			
	I		II	
Mar. 1973	a	b	a	b
6/7	1.569		0.255	
7/8	1.746			
8/9	1.815	0.024	0.118	0.001
9/10	1.685		0.237	
10/11	1.359		0.065	
11/12	2.272	0.014	0.334	0.004
12/13	2.226		0.183	
21/22	1.158		0.118	
22/23	2.081		0.312	
23/24	1.854		0.400	0.006
24/25	2.604	0.013	0.412	
25/26			0.325	
26/27	0.632		0.119	0.002
27/28	2.015		0.210	
Mean	1.770		0.238	
Max.	2.604		0.412	
Min.	0.632		0.065	

TABLE A-53. ATMOSPHERIC MERCURY VAPOR (a) and AEROSOL (b) CONCENTRATIONS IN IDRIJA, $\mu g/m^3$

Date	Location			
	I		II	
Apr. 1973	a	b	a	b
5/6	0.307		0.136	
6/7	1.695		0.479	0.009
7/8	2.025			
8/9	3.143	0.023	1.389	
9/10	2.650		0.129	
10/11	-		0.259	0.002
11/12	-		0.365	
18/19			0.192	
19/20	1.246		0.077	
20/21	1.173	0.011	0.124	0.001
21/22	1.690		0.243	
22/23	1.580		0.251	
23/24	2.046	0.012	0.115	0.001
24/25	1.142		0.131	
Mean	1.700		0.376	
Max.	3.143		1.389	
Min.	0.307		0.077	

TABLE A-54. ATMOSPHERIC MERCURY VAPOR (a) and AEROSOL (b) CONCENTRATIONS IN IDRIJA, μg/m³

Date	Location			
	I		II	
May 1973	a	b	a	b
3/4	2.399		0.408	
4/5			0.659	
5/6	3.631	0.015	0.688	0.002
6/7	2.539		0.374	
7/8	1.159		0.273	
8/9	0.703	0.005	0.078	0.001
9/10	0.649		0.179	
17/18	0.504		0.146	
18/19	3.162		0.495	
19/20	1.576	0.009	0.258	0.002
20/21	2.140		0.172	
21/22	2.067		0.362	
22/23	1.320	0.022	0.108	0.004
23/24	1.499		0.214	
Mean	1.796		0.315	
Max.	3.631		0.688	
Min.	0.504		0.078	

TABLE A-55. ATMOSPHERIC MERCURY VAPOR (a) and AEROSOL (b) CONCENTRATIONS IN IDRIJA, $\mu g/m^3$

Date	Location			
	I		II	
June 1973	a	b	a	b
6/7	2.290		0.192	
7/8	1.239		0.142	
8/9	0.967	0.012	0.142	0.003
9/10	3.197		0.301	
10/11	1.392		0.225	
11/12	0.943	0.012	0.092	0.004
12/13	0.686		0.091	
20/21			1.118	
21/22			0.356	
22/23			0.337	0.003
23/24			0.394	
24/25			0.462	
25/26			0.224	0.005
26/27			1.196	
Mean	1.530		0.376	
Max.	3.197		1.196	
Min.	0.686		0.091	

TABLE A-56. ATMOSPHERIC MERCURY VAPOR (a) and AEROSOL (b) CONCENTRATIONS IN IDRIJA, $\mu g/m^3$

Date	Location			
	I		II	
July 1973	a	b	a	b
6/7	5.498		1.465	
7/8	2.518	0.019	0.620	0.004
8/9			0.328	
9/10	1.334		0.436	
10/11	1.135		0.528	
11/12	2.512	0.027	0.660	0.010
12/13	1.503		0.175	
18/19	1.574		0.090	
19/20	1.677		0.206	
20/21	3.796	0.023	0.576	0.003
21/22	2.446		0.857	
22/23	1.305		0.080	
23/24	1.949	0.018	0.418	0.005
24/25	1.937		0.594	
Mean	2.245		0.502	
Max.	5.498		1.465	
Min.	1.135		0.080	

TABLE A-57. ATMOSPHERIC MERCURY VAPOR (a) and AEROSOL (b) CONCENTRATIONS IN IDRIJA, $\mu g/m^3$

Date	Location			
	I		II	
Aug. 1973	a	b	a	b
9/10	0.940		0.427	
10/11	0.788		0.187	
11/12	1.302	0.018	0.140	-
12/13	1.029		0.266	
13/14	1.514		0.243	
14/15	0.998	0.009	0.340	0.010
15/16	1.001		0.416	
24/25	8.082		1.439	
25/26	2.206		0.392	
26/27	3.756	0.027	0.721	0.006
27/28	4.208		0.901	
28/29	2.260		0.317	
29/30		0.013	0.249	0.002
30/31	1.198		0.301	
Mean	2.252		0.453	
Max.	8.082		0.439	
Min.	0.788		0.140	

TABLE A-58. ATMOSPHERIC MERCURY VAPOR (a) and AEROSOL (b) CONCENTRATIONS IN IDRIJA, $\mu g/m^3$

Date	Location			
	I		II	
Sept. 1973	a	b	a	b
7/8	2.090		0.435	
8/9	4.741			
9/10	4.018	0.011	1.506	0.005
10/11	2.285		0.314	
11/12	1.369		0.225	
12/13	0.051	-		0.010
13/14	1.194		0.150	
19/20	1.427		0.184	
20/21	3.059		0.706	
21/22	2.090	0.011	0.245	0.002
22/23	0.778		0.109	
23/24	2.046		0.637	
24/25	7.083	0.034	1.456	0.004
25/26	0.362		0.068	
Mean	2.385		0.503	
Max.	7.083		1.506	
Min.	0.362		0.068	

TABLE A-59. ATMOSPHERIC MERCURY VAPOR (a) and AEROSOL (b) CONCENTRATIONS IN IDRIJA, μg/m³

Date	Location			
	I		II	
Oct. 1973	a	b	a	b
9/10	0.447		0.231	
10/11	1.757		0.583	
11/12	5.980	0.022	1.968	0.009
12/13	2.403		0.178	
13/14	0.316		0.093	
14/15	2.986	0.033	1.629	0.010
15/16	6.760		2.871	
23/24	0.998		0.328	
24/25	1.619		0.152	
25/26	1.433	0.017	0.248	0.002
26/27	1.181		0.239	
27/28			0.328	
28/29	0.635	0.004	0.183	0.001
29/30	0.716		0.259	
Mean	2.095		0.664	
Max.	6.760		2.871	
Min.	0.316		0.093	

TABLE A-60. ATMOSPHERIC MERCURY VAPOR (a) and AEROSOL (b) CONCENTRATIONS IN IDRIJA, μg/m³

Date	Location			
	I		II	
Nov. 1973	a	b	a	b
6/7	0.961		0.116	
7/8	1.271		0.402	
8/9	2.805	0.003	0.879	0.001
9/10	2.716		0.684	
10/11	1.378		0.199	
20/21	1.888		0.477	
21/22	2.029		0.082	
22/23	0.986	0.015	0.072	0.004
23/24	2.792		0.218	
24/25	0.294		0.190	
Mean	1.712		0.332	
Max.	2.805		0.879	
Min.	0.294		0.072	

APPENDIX B

AVERAGE EXPOSURES AND BIOLOGICAL PARAMETERS

TABLE B-1. AVERAGE EXPOSURE AND BIOLOGICAL PARAMETERS OF INDIVIDUALS IN RURAL AREA (GROUP I)

		Air	Blood							Serum				Urine	
No.	Sub-ject code no.	μg Hg/m³ Annual average exposure	Mercury μg/100 ml Inorg.	Total	ALAD units/ 1 ml E	G-6-PD units 100 ml E	GSH mg/ 100 ml	Cholin-esterase ΔE/min/ml Blood	Plasma	Alk. Ph. milliunits/ml	GOT	GPT	Cholest. mg/100 ml	Coproporph. Total μg/100 ml	I %
1	401	0.014	0.12	1.23	24	177.0	23			26.6	17.5	5.0	230	15	41
2	402	'	0.35	2.13	31	154.1	28			35.4	12.6	2.7	258	3	61
3	403	"	0.31	0.57	45	180.8	29			22.4	9.5	1.5	258	7	36
4	404	"	0.20	0.86	65	214.4	24			28.4	16.3	4.5	266	6	48
5	405	"	0.35	0.92	42	180.9	35			51.6	62.0		303	8	58
6	406	"	0.31	0.57	8	191.0	18			35.6	30.0	4.8	270	9	54
7	407	"	0.23	0.48	50	184.0	42			40.8		18.5	312	3	37
8	408	'	0.11	2.07	24	165.1	38			37.8	16.3	5.4	264	4	50
9	409	'	0.31	0.80	31	171.5	40			32.6	15.0	5.6	324	10	43
10	410	"	2.27	1.09	36	188.1	40			29.4	48.0	28.0	260	20	27
11	411	"	0.42	1.88	49	163.0	32			47.2	18.9	3.5	232	20	31
12	412	"	0.35	1.55	52	160.1	33			38.2	28.7	9.5	314	24	21
13	413	"	0.23	0.91	50	188.0	26			13.8	19.6	20.5	244	6	25
14	414	"	0.53	0.97	31	183.5	31			29.0	12.8	1.0	208	3	34
15	415	"	0.16	0.86	55	184.2	37			34.0	13.2	1.0	230	5	46
16	416	'	0.10	1.21	40	179.6	21			26.4	22.0	3.5	250	5	31
17	417	'	0.24	0.97	12	181.1	36			52.6	4.0	1.0	290	7	30
18	418	'	0.42	0.91	87	185.2	33			45.0	11.4	1.0	280	9	36

(continued)

TABLE B-1. (continued)

No.	Sub-ject code no.	Air: µg Hg/m^3 Annual average exposure	Blood: Mercury µg/100 ml Inorg.	Blood: Mercury µg/100 ml Total	Blood: ALAD units/1 ml E	Blood: G-6-PD units 100 ml E	Blood: GSH mg/100 ml	Blood: Cholinesterase ΔE/min/ml Blood	Blood: Cholinesterase ΔE/min/ml Plasma	Serum: Alk. Ph. milliunits/ml	Serum: GOT milliunits/ml	Serum: GPT	Serum: Cholest. mg/100 ml	Urine: Coproporph. Total µg/100 ml	Urine: Coproporph. I %
19	419	0.014	0.23	0.69	57	171.2	30			26.2	8.4	2.0	258	13	41
20	420	"	0.1	0.29	59	188.6	29			64.0	16.7	9.9	278	5	44
21	421	"	0.31	1.61	36	196.0	22			27.2	10.2	3.5	282	14	46
22	422	"	0.1	1.09	34	159.6	25			27.0	6.5	1.9	256	12	41
23	423	"	0.16	0.52	51	178.2	29			45.2	12.8	3.3	229	6	42
24	424	"	0.35	1.09	47	177.5	38			29.8	19.9	6.8	248	5	31
25	425	"	0.35	1.49	40	179.8	33			41.4	22.3	7.0		3	42
26	426	"	0.20	1.26	18	176.0	35			20.6	17.7	7.1	262	4	43
27	427	"	0.16	0.91	17	178.2	23			21.2	15.0	4.0	248	12	29
28	428	"	0.23	0.80	25	150.2	36			34.4	16.1	4.4	274	13	37
29	429	"	0.38	1.15	35	166.8	25			39.6	54.0	33.2		11	39
30	430	"	0.23	0.57	35	176.0	36			54.6	21.1	7.6	259	4	40
31	431	"	0.42	3.57	63	165.6	26			30.4	16.5	4.3	246	6	53
32	432	"	0.16	0.80	13	169.5	33			30.2	52.5	15.6	252		
33	433	"	0.20	0.75	55	171.5	33			43.2	17.2	8.5	252	8	29
34	434	"	0.23	1.32	76	172.3	34			44.8	8.0	6.3	278	8	38
35	435	"	0.12	0.69	86	187.3	29			34.8	9.0	4.0	264	4	45
36	436	"	0.10	1.09	95	190.4	35			36.2	13.9	5.5	256	5	40

(continued)

TABLE B-1. (continued)

No.	Subject code no.	Air: μg Hg/m^3 Annual average exposure	Blood: Mercury μg/100 ml Inorg.	Blood: Mercury μg/100 ml Total	Blood: ALAD units/1 ml E	Blood: G-6-PD units 100 ml E	Blood: GSH mg/100 ml	Blood: Cholinesterase ΔE/min/ml Blood	Blood: Cholinesterase ΔE/min/ml Plasma	Serum: Alk. Ph. milliunits/ml	Serum: GOT milliunits/ml	Serum: GPT milliunits/ml	Serum: Cholest. mg/100 ml	Urine: Coproporph. Total μg/100 ml	Urine: Coproporph. I %
37	437	0.014	0.10	0.18	36	194.6	26			30.6	54.0	42.5	292	15	47
38	438	"	0.16	0.63	47	152.1	37			58.0	39.5	7.7	286	13	48
39	439	"	0.38	0.98	130	176.4	37			38.4	6.9	1.6	218	15	46
40	440	"	0.42	2.35	137	160.0	22			33.2	5.7	1.0	224	5	36
41	441	"			58	179.8	31			50.4	37.0	29.5	262	7	35
42	442	"	0.38	1.73	14	169.8	30			104.0	92.0	9.5	288		
43	443	"	0.12	0.57	120	167.5	34			39.4	4.2	1.0	194	11	31
44	444	"	0.31	0.57	97	172.0	27			36.0	6.9	1.0	220	8	38
45	445	"	0.10	0.46	69	178.0	23			44.0	5.5	1.0	302	10	33
46	446	"	0.14	1.03	107	144.8	31			25.6	14.7	5.5	252	6	45
47	448	"	0.26	2.53	88	231.4	42			40.4	13.4	23.0	290	8	70
48	449	"	0.10	2.07	57	200.6	29			55.0	13.4	11.1	238	19	30
49	450	"	0.10	1.61	156	200.1	36			20.4	11.9	10.9	240	5	36
50	451	"	0.28	1.15	43	171.5	39				22.8	22.0	246	20	28
51	452	"	1.32	1.72		203.8	37			17.2	11.6	7.1	264	13	40
52	453	"	0.26	1.03	8					43.4	16.3	5.4	301		
53	454	"	0.20	0.63	77	166.5	43			31.6	9.5	4.8	262		
54	455	"	0.30	0.98	19	167.0	31			58.2	6.7	2.0	171		

(continued)

TABLE B-1. (continued)

		Air	Blood								Serum				Urine	
No.	Sub-ject code no.	μg Hg/m³ Annual average exposure	Mercury μg/100 ml Inorg.	Mercury μg/100 ml Total	ALAD units/ 1 ml E	G-6-PD units 100 ml E	GSH mg/ 100 ml	Cholin-esterase ΔE/min/ml Blood	Cholin-esterase ΔE/min/ml Plasma		Alk. Ph. milliunits/ml	GOT milliunits/ml	GPT milliunits/ml	Cholest. mg/100 ml	Coproporph. Total μg/100 ml	Coproporph. I %
55	458	0.014	0.40	0.46	7	154.5	40				29.6	16.7	6.6	246		
56	460	"	0.37	0.52	14	189.6	38				32.6	34.0	24.5	282		
57	461	"	0.30	0.40	64	164.2	31				33.0	8.0	7.6	226		
58	462	"	0.26	1.04	97	177.5	37				35.0	6.5	4.8	196	15	48
59	463	"	0.10	0.52	116	181.4	30				31.8	7.8	7.0	254	9	30
60	464	"	0.84	1.15	33	165.3	30				23.2	9.3	1.7	215	5	64
61	465	"	0.35	1.26	48	159.0	34				22.0	12.1	1.0	266	3	36
62	466	"	0.38	1.27	47	164.6	42				35.4	6.7	1.0	228	5	46
63	467	"	0.27	0.34	39	168.5	53				28.6	18.4	5.9	248	3	59
64	468	"	0.24	0.46	59	172.8	46				39.4	13.0	5.8	260	7	31
65	469	"	0.20	0.69	44	174.6	39				46.4	28.0	10.3	286	4	58
66	470	"	0.49	0.92	19	150.1	43				70.6	32.5	9.2	247	2	61
67	471	"	0.38	1.90	19	170.5	54				65.0	29.0	8.4	292	4	35
68	472	"	0.12	0.46	40	156.0	46				46.8	12.8	2.3	255		35
69	473	"	0.16	0.52	33	175.1	40				32.0	17.0	6.7			
70	474	"	0.16	1.04	19	181.8	41				42.0	10.7	1.2	297	3	63
71	475	"	0.42	3.44	34	174.0	52				44.6	39.0	11.9	251	10	36
72	476	"	0.20	0.78	114	176.2	38				21.4	8.4	1.0	219	11	33

(continued)

TABLE B-1. (continued)

No.	Subject code no.	Air: µg Hg/m³ Annual average exposure	Blood: Mercury µg/100 ml Inorg.	Blood: Mercury µg/100 ml Total	Blood: ALAD units/1 ml E	Blood: G-6-PD units 100 ml E	Blood: GSH mg/100 ml	Blood: Cholinesterase ΔE/min/ml Blood	Blood: Cholinesterase ΔE/min/ml Plasma	Serum: Alk. Ph. milliunits/ml	Serum: GOT milliunits/ml	Serum: GPT milliunits/ml	Serum: Cholest. mg/100 ml	Urine: Coproporph. Total µg/100 ml	Urine: Coproporph. I %
73	477	0.014	0.23	0.40	75	164.6	44			15.6	17.2	7.0	302	3	52
74	478	'	0.20	0.86	34	171.5	38			14.6	30.1	12.3	243	6	32
75	479	"	0.38	0.78	63	165.1	42			32.4	14.3	3.9	291	3	71
76	480	'	0.16	0.24	55	166.5	41			19.4	5.7	1.0	172	5	55
77	481	"	0.12	0.64	40	164.0	42			44.6	25.0	24.3	252	12	33
78	482	"	0.64	1.25	68	218.2	33			56.0	9.7	1.0	228	10	26
79	483	"	0.16	0.71	113	195.0	36			25.0	5.7	3.7	260	5	51
80	484	"	0.19	1.17	67	186.0	41			51.8	6.9	2.4	240	6	64
81	485	'	0.41	2.10	83	156.1	29			47.4	11.0	6.4	198	7	65
82	486	"	0.33	2.32	52	184.5	42			66.8	3.0	1.0	192	9	34
83	487	'	0.49	2.03	73	160.0	39			56.4	3.0	6.4	191	18	53
84	488	'	0.60	2.03	26	213.0	40			28.8	16.1	5.5	203	6	59
85	489	"	0.33	2.46	109	206.0	29			23.4	4.2	1.9	252	8	51
86	490	"	0.29	1.23	29	168.5	30			38.8	11.2	11.7	249	9	54
87	491	'	0.60	1.30	38	193.1	30			17.2	3.0	2.4	236	17	35
88	492	"	0.11	2.68	36	204.5	31			57.0	4.4	3.7	210	7	36
89	493	"	0.10	1.81	73	166.0	37			26.8	1.0	1.1	228	9	50
90	494		0.11	1.45	78	162.0	38			34.4	1.4	1.0	205	14	46

(continued)

TABLE B-1. (continued)

No.	Sub-ject code no.	Air: µg Hg/m^3 Annual average exposure	Blood: Mercury µg/100 ml Inorg.	Blood: Mercury µg/100 ml Total	Blood: ALAD units/ 1 ml E	Blood: G-6-PD units 100 ml E	Blood: GSH mg/ 100 ml	Blood: Cholin-esterase ΔE/min/ml Blood	Blood: Cholin-esterase ΔE/min/ml Plasma	Serum: Alk. Ph. milliunits/ml	Serum: GOT milliunits/ml	Serum: GPT	Serum: Cholest. mg/100 ml	Urine: Coproporph. Total µg/100 ml	Urine: Coproporph. I %
91	495	0.014	0.22	1.02	39	182.0	45			24.0	8.4	1.6	144	16	34
92	496	"	0.19	2.03	49	185.0	37			27.4	5.7	2.1	166	6	40
93	497	"	0.15	2.03	27	185.3	42			34.4	12.1	9.5	232	11	40
94	498	"	0.19	1.38	124	185.2	38			81.8	6.5	5.5	152	10	58
95	499	"	0.33	1.60	80	170.7	35			35.4	4.9	4.1	257	11	25
96	500	"	0.36	1.45	14	191.5	21			79.2	10.5	1.0	175	6	44
97	501	"	0.47	2.25	85	162.6	33			66.2	7.8	1.2	178	9	83
98	502	"	0.47	1.45	106	185.2	30			40.4	9.3	1.9	207	4	40
99	503	"	0.33	0.72	40	214.7	22			41.8	10.5	4.1	229	10	25
100	504	"	0.26	0.43	71	185.0	22			54.2	9.9	3.0	167	11	35
101	505	"	0.22	2.25	93	182.6	36			95.0	8.8	3.2	225	4	48
102	506	"	2.75	5.15		200.9	30			77.2	21.4	3.3	187	6	51
103	507	"	0.19	1.52	42	161.3	23			59.2	10.5	2.1	244	5	46
104	508	"	0.29	1.09	88	182.6	34			53.0	11.4	5.0	186		
105	509	"	0.55	0.72	71	181.0	37			75.6	10.0	2.1	145	2	34
106	510	"	0.19	0.73	67	212.8	38			97.6	8.8	2.4	254	5	39
107	511	"	0.22	1.16	16	151.8	48			43.0	9.3	1.2	206	7	47
108	512	"	0.43	0.51	82	164.9	45				7.5	1.0	238	5	23

(continued)

TABLE B-1. (continued)

		Air	Blood							Serum				Urine	
No.	Sub-ject code no.	µg Hg/m^3 Annual average exposure	Mercury µg/100 ml Inorg.	Total	ALAD units/ 1 ml E	G-6-PD units 100 ml E	GSH mg/ 100 ml	Cholin-esterase ΔE/min/ml Blood Plasma		Alk. Ph. milliunits/ml	GOT	GPT	Cholest. mg/100 ml	Coproporph. Total µg/100 ml	I %
109	513	0.014	0.29	0.94	129	191.6	38				6.5	1.0	132	5	32
110	514	"	0.33	1.01	103	193.2	36			72.4	9.0	1.0	180	8	58
111	515	"	0.44	1.23	70	161.0	47			57.2	7.5	1.0	202	6	58
112	516	"	0.16	1.09	82	159.5	47				7.8	1.0	194	5	54
113	517	"	0.47	1.81	95	211.0	46			82.0	8.0	1.9	166	11	43
114	518	"	0.43	3.40	86	212.5	36			54.0	5.3	1.0	192	5	46
115	519	'	0.90	2.36	39	161.0	41			59.8	6.1	1.0	170	5	47
116	520	"	0.22	2.22	36	202.5	34			40.4	5.3	1.0	186	12	48
117	521	'	0.36	2.43	131	207.2	43			99.8	7.5	1.0	174	8	56
118	522	"	0.29	0.76	78	214.6	42			35.6	8.8	1.0	226	7	47
119	523	"	0.58	2.85	66	210.7	35			54.6	10.2	3.5	172	8	33
120	524	"	0.10	0.63	73	215.3	46			42.6	18.6	2.3	180	6	30
121	525	"	0.19	1.32	87	212.0	49			39.2	8.2	1.0	184	10	38
122	526	"	0.29	0.56	77	186.9	39			82.8	10.0	2.7	200	7	39
123	527	"	0.58	1.39	50	183.5	42			44.8	5.3	1.0	178	9	52
124	528	"	0.22	2.49	82	179.1	40			38.4	6.7	1.0	179	3	67
125	529	"	0.49	0.56	62	160.5	51			20.0	10.0	1.2	206	5	29
126	530	"	0.26	0.35	97	160.2	38			45.6	12.1	6.4	239	3	35

(continued)

TABLE B-1. (continued)

		Air	Blood							Serum				Urine	
No.	Sub-ject code no.	µg Hg/m³ Annual average exposure	Mercury µg/100 ml Inorg.	Total	ALAD units/ 1 ml E	G-6-PD units 100 ml E	GSH mg/ 100 ml	Cholin-esterase ΔE/min/ml Blood	Plasma	Alk. Ph. milliunits/ml	GOT	GPT	Cholest. mg/100 ml	Coproporph. Total µg/100 ml	I %
127	531	0.014	0.22	1.18	41	176.4	38			58.8	6.7	2.7	183	16	43
128	532	"	0.36	0.69	89	153.3	43			41.6	8.0	3.0	186	3	32
129	533	"	0.40	0.90	43	160.0	50			58.6	5.9	2.6	167	5	46
130	534	"	0.15	0.42	76	150.4	37			26.4	9.0	1.0	177	6	46
131	535	"	0.15	0.21	78	180.6	51			76.8	9.7	4.3	166	5	26
132	536	"	0.26	0.35	70	163.0	54			55.2	9.9	5.2	203	6	44
133	537	"	0.40	2.08	64	158.9	50			39.2	3.0	1.0	198	8	78
134	538	"	0.36	1.18		185.3	39			48.8	4.4	1.0	181	4	41
135	539	"	0.15	0.83	36	169.8	43			44.0	6.9	2.6	208	5	43
136	540	"	0.33	0.76	68	177.3	47			62.0	5.5	1.0	139	3	21
137	541	"	0.29	0.56	55	155.7	43			64.4	11.6	2.6	184	10	
138	542	"	0.22	0.49	57	170.5	57			37.2	10.2	1.5	198	6	41
139	543	"	0.36	1.25	89	179.7	48			80.4	7.1	1.3	225	4	21
140	544	"	0.33	1.32	46	168.8	36			63.6	7.5	1.0	166	9	38
141	545	"	0.22	0.56	54	163.4	51			54.4	10.5	3.1	182	3	42
142	546	"	0.36	0.83	32	157.5	46			66.8	9.3	1.0	174		

TABLE B-2. AVERAGE EXPOSURE AND BIOLOGICAL PARAMETERS OF INDIVIDUALS IN URBAN AREA (GROUP II)

		Air	Blood								Serum				Urine	
No.	Sub-ject code no.	µg Hg/m³ Annual average exposure	Mercury µg/100 ml Inorg.	Mercury µg/100 ml Total	ALAD units/ 1 ml E	G-6-PD units 100 ml E	GSH mg/ 100 ml	Cholin-esterase ΔE/min/ml Blood	Cholin-esterase ΔE/min/ml Plasma	Alk. Ph. milliunits/ml	GOT milliunits/ml	GPT milliunits/ml	Cholest. mg/100 ml	Coproporph. Total µg/100 ml	Coproporph. I %
1	601	0.022	0.28	0.65	99	227.0	37			53.8	11.6	4.8	248	13	44
2	602	"	0.28	0.87	65	229.0	31			43.2	6.3	1.0	230	7	46
3	603	"	0.34	0.87	31	231.0	31			35.6	13.9	5.5	226	11	30
4	604	"	0.10	0.10	68	231.0	32			23.8	4.6	1.0	229	12	36
5	605	'	0.34	0.65	78	276.0	30			49.8	14.5	14.9	226	6	35
6	606	"	0.36	0.98	87	226.0	42			37.4	6.3	1.0	248	14	50
7	607	"	0.33	0.44	113	242.0	40			39.6	7.5	1.9	235	11	39
8	608	"	0.54	0.98	60	203.8	27			26.0	14.7	6.0	180	12	46
9	609	"	0.58	0.76	26	223.0	46			35.2	12.6	2.1	208	8	40
10	610	"	0.55	2.29	59	265.0	21			33.6	13.2	1.6	238	8	62
11	611	"	0.86	2.72	88	224.0	26			19.6	10.0	1.2	184	12	39
12	612	"	0.49	2.40	76	232.0	25			32.8	9.9	3.3	196	8	56
13	613	'	0.17	0.98	49	227.4	36			41.6	8.6	4.1	226	24	31
14	614	'	0.44	1.74	52	219.2	29			27.4	9.3	1.0	192	11	50
15	615	"	0.34	1.63	51	207.0	24			29.8	15.0	4.1	216	10	40
16	616	"	0.22	1.52	42	226.0	28			46.8	13.0	3.5	204	6	50
17	617	"	0.17	0.54	51	230.1	39			55.8	9.9	2.4	240		
18	618	"	0.49	2.25	62	232.0	32			29.4	11.9	2.0	236	16	47

(continued)

TABLE B-2. (continued)

		Air	Blood							Serum				Urine	
No.	Sub-ject code no.	µg Hg/m[3] Annual average exposure	Mercury µg/100 ml Inorg.	Mercury µg/100 ml Total	ALAD units/ 1 ml E	G-6-PD units 100 ml E	GSH mg/ 100 ml	Cholin-esterase ΔE/min/ml Blood	Cholin-esterase ΔE/min/ml Plasma	Alk. Ph. milliunits/ml	GOT milliunits/ml	GPT milliunits/ml	Cholest. mg/100 ml	Coproporph. Total µg/100 ml	Coproporph. I %
19	619	0.022	0.28	1.31	69	200.0	25			25.4	16.1	2.4	200	10	59
20	620	"	0.46	1.09	77	203.9	22			50.0	32.0	23.5	226	9	50
21	621	"	0.83	1.20	37	196.1	48			29.4	38.0	14.0	248	7	39
22	622	"	0.49	2.28	68	203.9	43			54.6	30.5	22.5	208		
23	623	"	0.17	1.83	45	193.5	34			36.4	17.5	6.6	218	9	36
24	624	"	0.33	1.38	68	182.2	26			39.4	9.7	1.1	234	8	40
25	625	"	1.13	4.07	58	204.2	44			27.0	10.0	1.1	160	11	43
26	626	"	0.10	0.75	23	195.0	35			54.2	10.5	3.2	198	20	45
27	627	"	0.10	1.51	23	229.2	36			33.4	13.2	3.7	224	9	34
28	628	"	0.22	2.13	28	195.5	36			52.4	10.5	3.6	238	3	76
29	629	"	0.28	1.07	13	219.8	43			35.6	29.5	13.4	224	7	63
30	630	"	0.23	2.76	38	194.2	38			46.8	13.0	8.2	186		
31	631	"	0.28	0.75	17	183.1	36			26.6	16.5	4.5	200	4	42
32	632	"	0.34	1.82	28	206.1	42			65.8	12.1	1.5	240	15	40
33	633	"	0.31	1.82	32	218.0	29			51.6	8.4	3.2	220	10	43
34	634	"	0.31	3.13	15	191.8	36			40.0	11.6	2.7	206	11	51
35	635	"	0.22	1.38	42	202.4	32			32.2	9.9	2.6	192	8	43
36	636	"	0.13	2.50	16	203.2	34			45.4	42.5	7.7	206		

(continued)

TABLE B-2. (continued)

		Air	Blood						Serum				Urine	
No.	Sub-ject code no.	µg Hg/m^3 Annual average exposure	Mercury µg/100 ml Inorg.	Mercury µg/100 ml Total	ALAD units/ 1 ml E	G-6-PD units 100 ml E	GSH mg/ 100 ml	Cholin-esterase ΔE/min/ml Blood Plasma	Alk. Ph. milliunits/ml	GOT milliunits/ml	GPT milliunits/ml	Cholest. mg/100 ml	Coproporph. Total µg/100 ml	Coproporph. I %
37	637	0.022	0.17	0.82	58	170.5	40		43.2	12.8	8.7	204	10	56
38	638	'	0.11	2.07	44	169.8	36		45.8	44.5	47.5	224	7	62
39	639	'	0.56	2.25	54	180.0	30		60.7	14.3	7.0	230	16	47
40	640	"	0.45	2.57	32	171.0	44		41.2	13.9	3.3	206	13	48
41	641	"	0.12	0.57	41	170.1	37		46.4	20.1	7.0	236	9	49
42	642	'	0.15	2.63	63	206.1	24		40.6	13.2	1.2	190		
43	643	"	0.23	1.69	56	184.0	46		38.8	7.5	1.1	180	19	37
44	644	"	0.61	0.75					16.4	13.2	1.7	150	10	49
45	645	"	0.66	1.44					23.4	15.0	6.2	196	5	50
46	646	"	0.44	1.00					23.6	15.2	5.1	162	6	76
47	647	"	0.39	1.13					5.2	17.9	5.2	150	5	52
48	648	"	0.39	1.88					11.4	16.3	6.8	200	6	28
49	649	"	0.39	0.57					18.0	16.3	6.7	242		
50	650	"	0.44	3.01					15.2	20.6	7.6	150	6	66
51	651	"	0.44	1.38					25.0	17.5	7.1	150		
52	652	"	0.33	0.44					26.4	17.7	5.5	180	5	49
53	653	"	0.17	2.25					20.2	18.6	5.8	178	9	54
54	654	"	0.28	1.26		170.0	46		41.0	10.0	2.4	160	6	38

(continued)

TABLE B-2. (continued)

No.	Subject code no.	Air: µg Hg/m³ Annual average exposure	Blood: Mercury µg/100 ml Inorg.	Blood: Mercury µg/100 ml Total	Blood: ALAD units/1 ml E	Blood: G-6-PD units 100 ml E	Blood: GSH mg/100 ml	Blood: Cholinesterase ΔE/min/ml Blood	Blood: Cholinesterase ΔE/min/ml Plasma	Serum: Alk. Ph. milliunits/ml	Serum: GOT milliunits/ml	Serum: GPT milliunits/ml	Serum: Cholest. mg/100 ml	Urine: Coproporph. Total µg/100 ml	Urine: Coproporph. I %
55	655	0.022	0.28	1.61		145.9	39			57.4	9.5	1.7	161	8	44
56	656	"	0.28	1.38		184.9	47			40.6	11.2	2.0	173	10	36
57	657	"	0.22	1.38		172.0	40			57.6	8.4	1.9	159	15	43
58	658	"	0.22	0.92		169.1	52			94.4	9.5	1.1	150	6	39
59	659	"	0.28	1.27		173.8	36			37.4	12.3	3.9	184	7	46
60	660	"	0.10	0.92		185.0	32			48.8	10.5	3.3	144	12	54
61	661	"	0.28	1.09		155.1	40			37.4	11.0	7.6	174	8	35
62	662	"	0.28	1.95		184.2	34			49.8	9.5	1.9	175	11	44
63	663	"	0.70	1.61		161.2	40			53.4	11.4	5.1	178	8	35
64	664	"	0.84	1.38		180.9	36			54.6	9.5	6.0	150	20	50
65	665	"	0.51	0.63		167.6	38			43.0	10.7	10.8	160	19	48
66	666	"	0.61	2.48		179.4	30			86.8	9.0	6.2	154	17	46
67	667	"	0.80	0.92		202.0	31			57.2	6.5	6.6	184	19	49
68	668	"	0.93	1.72		161.8	38			21.4	4.9	6.3	150	12	36
69	669	"	0.50	2.53		195.1	36			28.0	7.1	5.0	188	12	42
70	670	"	0.51	3.79		174.0	34			23.8	9.3	5.5	189	8	43
71	674	"	0.58	0.98		171.0	36			43.4	9.7	2.3	180	10	40
72	675	"	0.68	2.30		183.6	39			49.4	11.9	5.0	140	22	43

(continued)

TABLE B-2. (continued)

No.	Subject code no.	Air: µg Hg/m^3 Annual average exposure	Blood: Mercury µg/100 ml Inorg.	Blood: Mercury µg/100 ml Total	Blood: ALAD units/ 1 ml E	Blood: G-6-PD units 100 ml E	Blood: GSH mg/ 100 ml	Blood: Cholinesterase ΔE/min/ml Blood	Blood: Cholinesterase ΔE/min/ml Plasma	Serum: Alk. Ph. milliunits/ml	Serum: GOT milliunits/ml	Serum: GPT	Serum: Cholest. mg/100 ml	Urine: Coproporph. Total µg/100 ml	Urine: Coproporph. I %
73	676	0.022	0.48	2.70		101.0	44			40.6	14.1	5.1	147	7	34
74	677	"	0.70	1.61		184.8	41			32.0	11.2	3.5	144	22	45
75	678	"	0.77	3.10		204.2	54			35.4	9.5	5.4	180	9	40
76	679	"	0.65	2.19		176.0	34			63.8	10.7	3.2	142	8	34
77	680	"	0.30	2.87		192.8	29			42.4	11.6	1.1	171	7	31
78	681	"	0.60	2.30		209.4	39			34.8	14.1	5.2	180	7	32
79	682	'	0.67	1.72		156.2	41			24.6	11.2	2.1	160	18	34
80	683	"	0.71	1.45		209.0	33			22.2	9.3	4.5	142	4	37
81	684	'	1.06	1.44		185.8	29			36.4	10.7	1.0	170	23	60
82	685	"	0.55	1.56		167.5	53			58.0	14.1	3.6	228	22	38
83	686	"	0.53	1.11		179.8	30			39.8	8.6	3.3	188	25	48
84	687	'	0.93	1.22		190.0	37			45.2	11.9	2.7	170	14	43
85	688	'	0.73	1.39		176.0	33			25.8	16.5	5.2	180	8	34
86	689	"	0.87	1.61		153.8	30			22.4	9.7	5.5	179	16	46
87	690	"	0.45	1.84		181.8	29			13.6	13.2	4,3	178	26	50
88	691	"	0.43	2.06		188.2	31			36.2	15.2	6.8	163	13	39
89	692	"	0.24	0.84		145.0	28	27.0	7.3	28.4	12.8	6.2	191	11	44
90	693	"	0.28	1.20		204.3	34	24.9	5.6	34.8	5.9	2.3	188	16	43

(continued)

TABLE B-2. (continued)

		Air	Blood							Serum				Urine	
No.	Sub-ject code no.	μg Hg/m³ Annual average exposure	Mercury μg/100 ml Inorg.	Mercury μg/100 ml Total	ALAD units/ 1 ml E	G-6-PD units 100 ml E	GSH mg/ 100 ml	Cholin-esterase ΔE/min/ml Blood	Cholin-esterase ΔE/min/ml Plasma	Alk. Ph. milliunits/ml	GOT milliunits/ml	GPT milliunits/ml	Cholest. mg/100 ml	Coproporph. Total μg/100 ml	Coproporph. I %
91	694	0.022	0.24	0.99		147.1	37	25.2	4.9	55.6	11.0	2.1	190		
92	695	"	0.36	0.84		159.8	35	24.4	8.3	39.2	11.4	3.2	189	15	41
93	696	"	0.28	0.58		185.4	43	29.2	11.1	17.4	17.0	5.4	206	11	26
94	697	"	0.76	1.56	66	171.5	31	28.4	7.2	43.2	14.7	2.3	240	28	39
95	698	"	0.44	0.94	102	260.0	30	22.4	7.2	30.0	21.4	11.6	189	14	16
96	699	"	0.28	0.94	82	213.0	30	21.8	5.7	47.6	12.3	3.5	202	22	35
97	700	"	0.40	0.63	74	218.0	26	27.4	7.8	34.0	15.2	2.6	191	20	31
98	701	"	0.44	0.84	74	208.2	32	19.5	7.2	40.6	14.1	2.8	191	16	41
99	702	"	0.40	1.56	92	172.2	30	24.4	8.1	42.0	15.2	11.6	247	5	52
100	703	"	0.51	1.43	58	179.2	26	25.1	8.3	48.4	20.6	27.5	219	16	28
101	704	"	0.83	1.24	125	177.8	35	22.2	2.9	22.0	19.6	13.8	188	9	34
102	705	"	1.14	1.69	117	179.8	32	23.9	7.0	9.4	9.5	1.3	187	20	34
103	706	"	0.24	0.52	116	180.5	33	22.8	5.5	22.0	18.6	4.5	221	18	41
104	707	"	0.60	0.72	161	151.6	34	21.1	5.1	19.4	16.7	6.2	191	16	50
105	708	"	0.28	0.98	96	181.2	38	20.4	5.5	35.0	30.0	4.8	189	15	46
106	709	"	0.63	1.73	87	165.0	34	21.3	2.8	30.0	4.9	1.0	235	25	34
107	710	"	0.83	1.59	67	190.4	33	18.2	4.0	36.6	6.7	1.2	246	16	22
108	711	"	0.71	1.96	64	179.1	36	25.5	4.1	48.6	7.5	2.8	290	15	24

(continued)

TABLE B-2. (continued)

		Air	Blood							Serum				Urine	
No.	Sub-ject code no.	$\mu g\ Hg/m^3$ Annual average exposure	Mercury $\mu g/100$ ml Inorg.	Mercury $\mu g/100$ ml Total	ALAD units/ 1 ml E	G-6-PD units 100 ml E	GSH mg/ 100 ml	Cholin-esterase ΔE/min/ml Blood	Cholin-esterase ΔE/min/ml Plasma	Alk. Ph. milliunits/ml	GOT milliunits/ml	GPT milliunits/ml	Cholest. mg/100 ml	Coproporph. Total $\mu g/100$ ml	Coproporph. I %
109	712	0.022	0.60	2.29	95	222.0	41	18.5	4.0	28.2	3.0	1.0	227	8	25
110	713	"	0.71	1.64	46	184.5	39	25.5	7.5	34.0	13.2	2.8	200	16	35
111	714	'	0.60	2.06	54	171.5	34	16.2	4.2	28.4	6.5	4.5	192	24	35
112	715	"	0.51	1.45	94	202.0	41	15.5	2.5	31.6	5.3	3.1	213	13	52
113	716	"	0.44	1.21	63	194.2	32	17.8	4.7	45.2	4.9	1.0	192	25	53
114	717	"	0.56	0.89	85	200.0	41	21.8	6.8	26.0	4.2	1.6	232	19	54
115	718	"	0.63	1.50	113	182.6	35	21.9	5.7	36.0	5.5	3.6	206	8	58
116	719	"	0.40	2.61	76	210.2	35	24.1	3.2	58.0	2.8	1.0	241	15	62
117	720	"	0.44	1.59	116	202.0	39	21.1	6.8	42.2	5.5	1.0	249	17	39
118	721	"	1.11	3.08	53	198.2	33	25.0	6.5	44.6	11.4	18.7	277	11	

TABLE B-3. AVERAGE EXPOSURES AND BIOLOGICAL PARAMETERS OF INDIVIDUALS IN MERCURY MINING AND SMELTING AREA, NONOCCUPATIONAL EXPOSURE (GROUP III)

		Air	Blood							Serum				Urine	
No.	Subject code no.	μg Hg/m³ Weekly weighted average exposure	Mercury μg/100 ml Inorg.	Mercury μg/100 ml Total	ALAD units/ 1 ml E	G-6-PD units 100 ml E	GSH mg/ 100 ml	Cholinesterase ΔE/min/ml Blood	Cholinesterase ΔE/min/ml Plasma	Alk. Ph. milliunits/ml	GOT milliunits/ml	GPT milliunits/ml	Cholest. mg/100 ml	Coproporph. Total μg/100 ml	Coproporph. I %
1	293	0.397	0.34	1.17	80	171.4	29			23.2	8.8	4.5	262	10	40
2	294	'	0.26	1.38	70	179.0	30			44.6	6.5	1.0	212	16	39
3	295	"	0.23	1.46	48	175.0	33			29.0	22.5	10.2	264	4	54
4	296	"	0.43	0.92	46	175.5	34			25.0	13.0	1.0	246	11	38
5	297	"	0.26	1.08	98	169.1	32			34.4	14.7	3.2	226	8	30
6	302	"	0.15	2.08	41	174.3	27			47.4	8.8	3.3	328	11	44
7	310	"	0.26	1.92	46	158.0	30			22.8	8.2	4.5	240	6	57
8	313	"	0.37	1.46	74	160.1	36			36.8	8.0	1.0	268	16	22
9	321	"	0.84	1.62	18	158.0	35	32.9	7.7	36.0	11.4	2.7	220	12	45
10	322	"	0.42	1.47	91	144.0	42	27.4	8.1	26.6	6.9	1.0	224	7	48
11	324	"	0.28	4.64	31	138.0	36	29.1	9.8	46.8	11.4	2.3	212	6	50
12	328	"	0.41	3.02	37	183.6	33	24.7	4.5	44.8	15.9	3.1	200	19	44
13	330	"	0.35	2.05	102	171.2	32	23.1	7.1	47.8	17.7	4.4	260	8	37
14	331	"	0.35	3.69	82	171.3	39	26.0	6.8	37.2	21.8	13.1	270	9	34
15	333	"	0.64	2.82	75	158.1	29	28.0	7.0	49.0	15.2	3.9	234	12	30
16	334	"	0.23	2.12	104	131.0	23	27.6	8.3	55.2	16.5	3.7	260	16	59
17	335	"	0.38	3.01	47	139.7	33	29.6	7.7	44.0	13.6	3.2	249	11	29
18	336	"	0.35	2.18	111	146.0	43	22.0	4.1	32.6	13.0	4.8	238	11	28

(continued)

TABLE B-3. (continued)

No.	Sub-ject code no.	Air: μg Hg/m^3 Weekly weighted average exposure	Blood: Mercury μg/100 ml Inorg.	Blood: Mercury μg/100 ml Total	Blood: ALAD units/1 ml E	Blood: G-6-PD units 100 ml E	Blood: GSH mg/100 ml	Blood: Cholinesterase ΔE/min/ml Blood	Blood: Cholinesterase ΔE/min/ml Plasma	Serum: Alk. Ph. milliunits/ml	Serum: GOT milliunits/ml	Serum: GPT milliunits/ml	Serum: Cholest. mg/100 ml	Urine: Coproporph. Total μg/100 ml	Urine: Coproporph. I %
19	337	0.397	0.35	1.86	128	157.9	34	27.0	5.5	29.6	10.5	3.9	240	7	42
20	339	"	0.52	2.89	47	192.1	35	25.1	7.6	37.6	14.1	3.2	244	14	35
21	340	"	0.47	1.80	146	227.0	31	26.2	6.5	35.2	13.2	8.7	204	7	66
22	341	"	0.29	3.69	25	169.9	42	25.7	7.3	28.4	11.2	3.1	224	15	45
23	343	"	0.35	1.92	12	161.0	39	24.5	8.0	55.4	11.0	3.0	224	6	66
24	350	"	0.58	1.67		151.6	24	23.6	6.8	29.4	10.5	3.3	156	12	55
25	191	"	0.42	0.74	67	162.5	38	27.9	8.9	49.2	20.6	12.5	234	9	43
26	192	"	0.58	2.08		160.0	32	34.4	11.4	37.8	11.9	8.7	202	2	43
27	193	"	0.32	1.43		148.5	33	35.6	8.0	43.4	13.0	6.3	252	9	67
28	319	"	0.28	4.86	44	161.5	44	27.3	7.9	55.4	17.0	5.9	190	21	47
29	320	"	0.42	1.77	38	161.5	30	28.8	8.6	37.4	9.5	4.0	200	17	48
30	323	0.822	0.28	1.54	59	290.0	40	31.2	6.9	49.0	21.4	6.2	222	9	33
31	325	"	0.70	4.86	45	158.0	38	24.4	6.6	54.2	35.0	27.0	240	21	36
32	347	"	0.48	2.86		173.2	25	24.1	4.1	31.0	17.5	4.3	150	8	42
33	201	"	0.84	1.57		159.2	43			45.8	4.2	1.7	225	22	39
34	202	"	0.38	2.14		171.5	39			22.0	4.2	1.0	246	13	52
35	203	"	0.84	1.00		175.9	41			22.4	5.1	1.7	254	11	43
36	204	'	0.25	1.14		173.5	41			29.2	13.2	10.3	234	30	46

(continued)

TABLE B-3. (continued)

No.	Subject code no.	Air: µg Hg/m^3 Weekly weighted average exposure	Blood: Mercury µg/100 ml Inorg.	Blood: Mercury µg/100 ml Total	Blood: ALAD units/ 1 ml E	Blood: G-6-PD units 100 ml E	Blood: GSH mg/ 100 ml	Blood: Cholinesterase ΔE/min/ml Blood	Blood: Cholinesterase ΔE/min/ml Plasma	Serum: Alk. Ph. milliunits/ml	Serum: GOT milliunits/ml	Serum: GPT milliunits/ml	Serum: Cholest. mg/100 ml	Urine: Coproporph. Total µg/100 ml	Urine: Coproporph. I %
37	205	0.822	0.72	1.43		191.0	40			44.4	10.2	4.4	274	8	47
38	207	"	0.66	2.14		181.5	38			31.0	4.6	1.0	260	11	37
39	209	"	0.66	1.71		187.6	40			19.0	5.5	1.0	192	26	41
40	210	"	0.52	1.00		211.0	42			39.0	5.5	1.0	200	24	45
41	211	"	0.57	2.00		189.2	35			119.4	6.7	2.1	216	11	43
42	212	"	0.28	0.29		200.9	36			30.0	3.4	1.5	230	10	61
43	213	"	0.38	0.57		194.1	38			39.8	4.2	1.2	175	15	47
44	217	"	0.75	3.43		156.9	34			28.6	6.7	8.7	271	16	50
45	219	"	0.66	1.86		180.5	38			32.8	1.8	1.0	184	13	58
46	227	"	1.84		191	184.8	36			24.2	17.7	4.4	252	15	40
47	228	"	1.36	2.92	190	172.0	35			23.2	2.2	1.1	202	16	52
48	229	"	1.57	2.89	88	188.0	36			34.0	4.9	1.0	193	17	36
49	230	"	0.61	2.11	139	196.5	34			32.2	1.6	1.0	188	12	29
50	233	"	0.88	1.78	70	177.0	40			31.8	3.6	1.9	224	15	
51	238	"	0.54	1.23	50	179.0	44							12	
52	240	"	0.61		167	164.8	47			32.6	1.6	1.9	202	7	30
53	241	"	0.35	0.95	228	170.0	32			30.4	9.0	9.4	246	45	78
54	244	"	0.75	1.42	230	158.0	36			22.6	8.6	2.0	183	15	43

(continued)

TABLE B-3. (continued)

		Air	Blood							Serum				Urine	
No.	Sub-ject code no.	$\mu g\ Hg/m^3$ Weekly weighted average exposure	Mercury µg/100 ml Inorg.	Total	ALAD units/ 1 ml E	G-6-PD units 100 ml E	GSH mg/ 100 ml	Cholin-esterase ΔE/min/ml Blood	Plasma	Alk. Ph. milliunits/ml	GOT	GPT	Cholest. mg/100 ml	Coproporph. Total µg/100 ml	I %
55	249	0.822	1.42	2.97	306	167.1	36			29.6	9.9	6.3	212	13	28
56	250	"	0.49	1.83	12	184.0	35			21.2	15.9	1.7	252	31	19
57	255	"	1.62	3.31	230	161.8	28			25.2	10.2	4.3	260	11	40
58	257	"	0.75	1.63	62	180.6	30			40.0	8.2	4.0	230	6	48
59	258	"	0.95	1.42	160	170.0	35			22.4	8.4	2.1	212	10	34
60	282	"	0.30	1.64	25	161.4	35			31.0	9.9	3.9	288	13	37
61	284	"	0.17	0.40	28	176.0	31			43.0	11.0	2.8	258	5	65
62	288	"	0.23	0.56	45	200.4	38			35.4	13.0	1.2	226	10	40
63	290	"	0.46	1.80	14	176.0	35			37.8	9.3	4.3	216	9	13
64	292	"	0.23	1.02	56	159.0	29			41.6	10.7	7.3	188	11	42
65	298	"	0.22	1.92	41	196.3	29			23.2	8.2	1.0	232	8	27
66	299	"	0.10	2.08	66	191.5	32			33.2	13.4	1.5	292	22	39
67	301	"	0.10	2.00	54	180.0	29			34.2	13.0	4.1	294	8	44
68	307	"	0.34	0.92	42	146.9	35			40.8	6.7	1.0	160	9	26
69	309	"	0.15	1.31	36	164.0	20			21.0	7.8	1.0	240	3	60
70	311	"	0.22	2.46	77	182.9	30			24.8	5.1	1.0	203	11	35
71	312	"	0.49	1.54	55	165.8	30			30.2	7.3	1.0	238	11	45
72	316	"	0.70	1.62	95	168.5	51	23.1	5.9	29.6	14.3	5.8	180	12	37

(continued)

TABLE B-3. (continued)

No.	Sub-ject code no.	Air: µg Hg/m³ Weekly weighted average exposure	Blood: Mercury µg/100 ml Inorg.	Blood: Mercury µg/100 ml Total	Blood: ALAD units/1 ml E	Blood: G-6-PD units 100 ml E	Blood: GSH mg/100 ml	Blood: Cholin-esterase ΔE/min/ml Blood	Blood: Cholin-esterase ΔE/min/ml Plasma	Serum: Alk. Ph. milliunits/ml	Serum: GOT milliunits/ml	Serum: GPT milliunits/ml	Serum: Cholest. mg/100 ml	Urine: Coproporph. Total µg/100 ml	Urine: Coproporph. I %
73	344	0.822	0.32	1.31		167.5	30	22.5	6.5	25.8	19.1	10.6	176	2	40
74	345	"	0.37	2.33		172.0	28	27.2	7.7	60.2	20.1	9.5	170	1	37
75	346	"	0.32	1.19		160.2	32	18.3	7.2	47.8	19.1	4.0	192	8	39
76	348	"	0.27	0.83		155.8	27	23.4	8.3	39.4	13.0	4.3	184	14	60
77	349	"	0.53	1.25		172.0	20	27.9		33.6	18.9	11.1	227	16	63
78	353	"	0.74	3.63		159.0	31	24.5	7.4	44.2	20.9	8.2	236	18	57
79	354	"	0.53	1.61		151.8	28	29.7	8.7	32.0	16.1	8.8	194	9	59
80	214	1.142	0.31	1.71		200.3	40			23.4	5.5	1.0	230	13	60
81	216	"	0.47	2.43		173.1	39			31.4	7.1	4.1	230	12	56
82	220	"	0.47	1.14		186.2	43			30.4	9.7	5.5	234	13	57
83	226	"	0.95	2.50	114	196.9	41			34.4	4.2	1.0	204	26	17
84	231	"	1.15		104	187.5	31			33.0	2.0	1.0	203	8	29
85	232	"	0.75	1.54	106	159.1	32			20.8	7.8	5.4	208	18	
86	237	"	0.75		180	245.0	43							16	27
87	242	"	0.81	1.22	226	167.9	28			98.8	8.6	1.0	216	10	53
88	245	"	0.41	1.62	277	155.5	26			25.2	3.6	1.0	158	11	48
89	247	"	1.77	2.64	122	164.9	31			37.0	11.2	6.0	226	7	29
90	286	"	0.37	0.78	38	199.0	48			29.6	8.4	1.0	184	17	45

(continued)

TABLE B-3. (continued)

		Air	Blood							Serum				Urine	
No.	Sub-ject code no.	μg Hg/m³ Weekly weighted average exposure	Mercury μg/100 ml Inorg.	Total	ALAD units/ 1 ml E	G-6-PD units 100 ml E	GSH mg/ 100 ml	Cholin-esterase ΔE/min/ml Blood	Plasma	Alk. Ph. milliunits/ml	GOT	GPT	Cholest. mg/100 ml	Coproporph. Total μg/100 ml	I %
91	291	1.142	0.43	1.17	97	169.8	29			35.8	4.4	1.0	230	8	37
92	303	'	0.11	1.38	25	161.5	34			25.2	9.0	2.4	230	2	35
93	352	"	0.89	1.67		158.8	32			40.2	12.6	3.5	202	10	42
94	280	"	0.47	1.33	65	141.5	28			50.4	12.8	7.9	270	3	56
95	300	"	0.10	2.00	74	167.9	39			25.0	5.7	1.0	214	3	46
96	306	"	0.26	1.77	65	168.0	32			44.4	2.2	1.0	198	5	31
97	332	"	0.52	2.18	71	156.5	37	24.4	5.2	40.2	17.0	2.1	250	14	43
98	342	"	0.41	1.73	36	140.5	37	23.2	7.8	27.0	15.4	5.0	274	9	42
99	206	1.879	0.66	1.57		175.0	33			16.2	7.1	1.6	211	21	51
100	215	"	0.57	1.57		179.4	41			29.4	3.4	1.0	187	27	47
101	218	"	0.28	0.86		167.0	36			33.8	12.8	11.1	209	16	48
102	234	"	1.84		114	157.0	37			27.6	4.6	1.0	234	20	26
103	236	'	1.09	2.72	110	174.0	40			33.0	8.2	5.6	268	34	19
104	239	"	0.34	2.06	74	171.4	45			25.4	7.3	1.0	250	25	28
105	243	"	0.55	1.69	132	171.9	33			26.6	9.9	1.0	196	20	37
106	246	'				173.8	29			32.0	9.5	5.6		5	15
107	251	"	0.42	0.81	78	188.8	30			34.8	4.0	1.0	228	7	29
108	252	"	0.75	1.49	277	180.0	33			33.8	16.3	8.3	216	12	44

(continued)

TABLE B-3. (continued)

No.	Subject code no.	Air: μg Hg/m^3 Weekly weighted average exposure	Blood: Mercury μg/100 ml Inorg.	Blood: Mercury μg/100 ml Total	Blood: ALAD units/1 ml E	Blood: G-6-PD units 100 ml E	Blood: GSH mg/100 ml	Blood: Cholinesterase ΔE/min/ml Blood	Blood: Cholinesterase ΔE/min/ml Plasma	Serum: Alk. Ph. milliunits/ml	Serum: GOT milliunits/ml	Serum: GPT milliunits/ml	Serum: Cholest. mg/100 ml	Urine: Coproporph. Total μg/100 ml	Urine: Coproporph. I %
109	254	1.879	0.88	1.69	20	193.8	36			23.4	13.2	2.7	263	17	33
110	281	"	0.23	1.41	10	149.0	45			54.2	17.7	6.7	226	6	59
111	283	"	0.20	1.72	14	154.8	30			53.4	9.0	1.0	202	16	40
112	285	"	0.40	1.10	19	171.9	35			34.0	8.4	1.0	186	11	40
113	287	"	0.17	1.96	26	175.0	30			44.8	10.5	1.7	230	15	43
114	289	"	0.20	2.19	12	199.0	32			20.8	2.4	1.0	190	9	41
115	304	"	0.41	1.31	52	155.4	25				8.6	1.0	211	9	31
116	305	"	0.37	1.23	72	154.8	36			34.8	7.8	1.0	178	10	50
117	308	"	0.19	2.46	35	164.4	38			24.8	9.0	1.0	174	7	43
118	315	"	0.49	1.99	43	147.0	35	22.8	8.5	38.4	10.7	3.0	190	8	42
119	317	"	0.56	0.74	38	150.0	35	27.6	7.8	30.6	15.2	5.6	182	8	41
120	327	"	0.10	3.97	70	183.0	40	31.3	7.0	42.2	12.3	2.8	189	16	37
121	329	"	0.35	2.83	17	147.2	29	22.6	6.4	46.8	10.7	1.0	264	11	41
122	338	"	0.35	2.63	71	155.5	26	24.0	6.5	34.2	11.6	2.3	200	7	48
123	351	"	0.37	0.72		156.5	33	32.2	10.3	46.6	9.9	5.0	234	15	52
124	355	"	0.48	1.67		150.0	32	19.4	5.0	49.8	15.6	2.7	196		

(continued)

TABLE B-3. (continued)

No.	Subject code no.	Air: µg Hg/m³ Weekly weighted average exposure	Blood: Mercury µg/100 ml Inorg.	Blood: Mercury µg/100 ml Total	Blood: ALAD units/1 ml E	Blood: G-6-PD units 100 ml E	Blood: GSH mg/100 ml	Blood: Cholinesterase ΔE/min/ml Blood	Blood: Cholinesterase ΔE/min/ml Plasma	Serum: Alk. Ph. milliunits/ml	Serum: GOT milliunits/ml	Serum: GPT	Serum: Cholest. mg/100 ml	Urine: Coproporph. Total µg/100 ml	Urine: Coproporph. I %
125	221	Undetermined	0.27	1.53	66	186.4	42			32.4	5.9	1.9	266	20	32
126	222	"	0.82	1.15	158	221.9	33			48.4	12.8	9.5	270	12	27
127	223	"	1.02		90	162.0	44			34.0	7.1	1.9	210	10	40
128	224	"	1.57		60	190.0	40			25.6	12.8	1.9	242	21	18
129	225	"	1.22	2.63	102	181.5	42			39.8	4.0	1.5	216	17	36
130	248	"	0.27	0.68	85	176.8	27			33.0	4.4	1.0	188	10	44
131	256	"	0.42	0.75	109	191.0	33			44.8	11.4	1.6	202	6	39
132	260	"	0.81	1.49	66	186.5	34			26.6	7.1	3.5	212	10	32
133	261	"	0.85	1.62	87	167.0	34			38.2	11.2	1.0	184	23	33
134	262	"	0.65	1.90	59	162.9	32			28.8	8.4	1.3	250	9	33
135	263	"	0.78	1.20	212	212.0	28			42.6	9.3	1.0	238	10	39
136	264	"	0.78	1.83	82	210.8	26			47.4	15.0	6.6	210	11	35
137	265	"	0.78	1.55	33	188.0	26			36.8	10.5	1.7	234	10	53
138	267	"	0.59	2.04	86	196.0	35			40.4	39.5	11.1	216	36	37
139	269	"	0.52	1.83	5	171.5	37			26.4	3.8	1.0	182	17	31
140	270	"	0.47	1.48	12	190.4	41			42.8	7.8	1.0	206	9	61
141	271	"	0.59	2.39	235	200.1	28			24.0	3.6	1.0	208	14	56
142	272	"	0.52	0.78	112	183.5	37			43.6	2.0	1.0	186	11	54

(continued)

TABLE B-3. (continued)

No.	Subject code no.	Air: µg Hg/m³ Weekly weighted average exposure	Blood: Mercury µg/100 ml Inorg.	Blood: Mercury µg/100 ml Total	Blood: ALAD units/1 ml E	Blood: G-6-PD units 100 ml E	Blood: GSH mg/100 ml	Blood: Cholinesterase ΔE/min/ml Blood	Blood: Cholinesterase ΔE/min/ml Plasma	Serum: Alk. Ph. milliunits/ml	Serum: GOT milliunits/ml	Serum: GPT milliunits/ml	Serum: Cholest. mg/100 ml	Urine: Coproporph. Total µg/100 ml	Urine: Coproporph. I %
143	273	Undetermined	0.91	1.27	113	200.7	35			31.2	3.6	1.0	200	18	45
144	274	"	0.52	2.25	152	191.5	31			33.0	6.7	1.0	254	18	45
145	275	"	1.11	1.76	256	173.2	32			31.6	9.9	6.7	226	13	50
146	276	"	0.65	0.78	185	176.0	48			34.2	5.3	2.1	282	12	49
147	277	"	0.39	1.83	160	198.5	36			43.0	8.8	3.5	312	7	41
148	279	"	0.72	1.20	165	179.1	24			29.6	8.6	1.0	202	15	48
149	318	"	5.25	6.35	50	163.0	40	32.8	8.7	50.6	14.7	3.1	198	22	38
150	259	"	2.79	6.90	72	187.5	32			29.8	13.6	4.5	240	15	20

TABLE B-4. AVERAGE EXPOSURES AND BIOLOGICAL PARAMETERS OF INDIVIDUALS IN MERCURY MINING AND SMELTING AREA, OCCUPATIONAL EXPOSURE (GROUP IV)

		Air	Blood							Serum				Urine	
	Sub-ject code	μg Hg/m³ Weekly weighted average	Mercury μg/100 ml		ALAD units/	G-6-PD units 100 ml	GSH mg/ 100	Cholin-esterase ΔE/min/ml		Alk. Ph.	GOT	GPT	Cholest. mg/100	Coproporph. Total μg/100	I
No.	no.	exposure	Inorg.	Total	1 ml E	E	ml	Blood	Plasma	milliunits/ml			ml	ml	%
1	3	40.5	1.17	7.80	123	197.2	43			27.6	14.3	5.1		18	40
2	7	"	2.99	5.88	170	148.1	41			23.8	16.5	7.6		10	41
3	10	"	1.52	4.41	208	166.0	45			14.0	9.9	8.4		10	33
4	32	"	0.32	3.22	12	178.5	40			22.4	26.5	8.2		14	59
5	40	"	2.05	4.94	44	160.2	28			34.8	31.7	13.4	250	8	40
6	42	"	3.90	6.79	29	165.1	42			26.6	7.1	7.1	222	24	34
7	45	"	0.18	3.08	64	147.5	32			32.6	5.3	5.5	138	21	23
8	48	"	3.57	6.45	47	160.0	40			24.8	14.5	8.7	203	33	22
9	50	'	4.86	7.75	74	162.0				23.4	10.7	6.7	232	17	19
10	51	"	3.57	6.45	73	152.8	33			27.8	9.9	7.3	180	18	42
11	54	"	2.19	5.10	72	186.2	30			32.6	7.5	9.9	186	10	26
12	55	"	3.57	6.45	66	164.8	38			23.6	5.9	6.0	154	25	38
13	57	"	2.19	5.08	101	168.9	32			38.2	6.5	7.7	142	20	34
14	58	"	4.86	14.92	92	161.2	40			36.0	9.7	22.3	242	25	43
15	61	'	2.25	6.10	97	147.2	45			33.2	5.7	5.2	219	13	28
16	62	"	3.02	6.78	19	163.5	46			33.0	12.1	8.7	244	23	48
17	65	'	2.04	18.65	111	198.8	47			33.6	8.4	9.1	200	21	32
18	67	"	4.07	8.58	71	145.5	37			19.6	6.9	8.0	162	22	37

(continued)

TABLE B-4. (continued)

No.	Sub-ject code no.	Air: µg Hg/m^3 Weekly weighted average exposure	Blood: Mercury µg/100 ml Inorg.	Blood: Mercury µg/100 ml Total	Blood: ALAD units/1 ml E	Blood: G-6-PD units 100 ml E	Blood: GSH mg/100 ml	Blood: Cholinesterase ΔE/min/ml Blood	Blood: Cholinesterase ΔE/min/ml Plasma	Serum: Alk. Ph. milliunits/ml	Serum: GOT milliunits/ml	Serum: GPT milliunits/ml	Serum: Cholest. mg/100 ml	Urine: Coproporph. Total µg/100 ml	Urine: Coproporph. I %
19	69	40.5	2.74	7.16	39	153.1	48			24.0	3.8	6.0	186	20	48
20	70	"	0.63		37	149.8	45			25.8	14.1	7.9	226	22	52
21	72	"	4.49		48	164.7	27			19.2	13.9	12.7	236	14	50
22	74	"	4.80	6.61	50	162.2	33			18.4	10.5	9.0	184	21	39
23	88	"	3.77	8.63		153.2	35			38.2	12.3	3.0	288	22	40
24	99	"	0.56	1.23		153.5	35			35.8	7.1	1.0	182	19	26
25	110	"	2.97	5.87		166.2	29			29.8	6.3	1.0	220	13	32
26	112	"	2.75	5.15		153.9	33			22.4	6.6	1.0	241	24	27
27	114	"	3.03	5.25		177.9	42			23.2	6.9	1.0	232	19	37
28	115	"	1.78	5.51		161.6	37			22.8	5.9	1.0	174	15	32
29	117	"	1.97	5.15		158.5	29			33.8	10.2	1.5		21	36
30	118	"	1.60	2.54		167.2	28			43.4	26.0	7.1		12	23
31	137	"	2.84	3.81	16	172.3	28			41.2	8.4	3.7	264	30	48
32	138	"	2.30	4.17	57	165.3	44			21.6	3.4	3.7	236	12	49
33	163	"	1.67	4.63	47	209.7	55			23.8	11.0	3.9	213	34	33
34	170	"	3.13	5.90	98	170.6	38			29.6	18.4	3.0	230	19	34
35	173	"	0.66	1.94	74	212.2	39			24.2	10.2	1.7	214	14	50
36	197	"	1.31	3.86		165.2	39	25.1	9.4	60.0	12.6	7.0	242	10	28

(continued)

TABLE B-4. (continued)

		Air	Blood							Serum				Urine	
No.	Sub-ject code no.	μg Hg/m^3 Weekly weighted average exposure	Mercury μg/100 ml Inorg.	Total	ALAD units/ 1 ml E	G-6-PD units 100 ml E	GSH mg/ 100 ml	Cholin-esterase ΔE/min/ml Blood	Plasma	Alk. Ph. milliunits/ml	GOT	GPT	Cholest. mg/100 ml	Coproporph. Total μg/100 ml	I %
37	820	40.5	1.75	3.97	20	144.0	36	30.2	5.2	35.4	15.9	4.1	208	10	31
38	823	"	2.68	4.31	57	158.2	33			26.4	9.7	2.4	206	16	33
39	834	"	3.13	5.52	63	172.5				27.8	6.9	2.7	213	31	29
40	818	"	3.30	4.49	45	152.0	43			62.8	24.0	14.7	222	11	43
41	839	'	3.58	5.17	26	178.8	42			49.0	31.5	19.5	210		
42	825	"	1.26	2.76	134	155.9	35			34.6	15.2	12.8	218	8	31
43	838	"	6.20	9.23	47	193.4	36			35.6	11.2	1.3	212		
44	821	"	3.47	5.69	73	172.5	44			51.4	28.0	14.9	202	37	36
45	815	"	4.03	8.96	115	199.6	40			63.0	11.6	7.0	188	24	38
46	826	"	2.96	9.23	87	161.8	37			50.2	14.7	3.6	210	8	35
47	817	"	3.86	8.10	20	165.5	40			31.4	21.1	7.6	234	24	31
48	819	"	6.93	10.87		168.4		27.0	6.6	61.0	28.0	19.5	194	7	57
49	829	"	6.42	10.34	57	166.1	46			41.8	10.5	1.0	210	18	38
50	830	"	2.02	2.42	78	153.1	37			30.8	7.8	3.9	216		
51	809	"	2.63	5.93				24.5	9.3	69.8	9.5	2.7	170	17	47
52	840	"	2.15	5.65	51	144.1	31	30.6	7.9	41.0	14.7	1.5	232	4	
53	841	"	2.23	3.71	72	199.8	36			53.4	11.4	6.6	180	14	38
54	827	"	7.07	7.94	18	174.5	43			39.8	10.0	2.1	232	2	30

(continued)

TABLE B-4. (continued)

No.	Subject code no.	Air: µg Hg/m³ Weekly weighted average exposure	Blood: Mercury µg/100 ml Inorg.	Blood: Mercury µg/100 ml Total	Blood: ALAD units/ 1 ml E	Blood: G-6-PD units 100 ml E	Blood: GSH mg/ 100 ml	Blood: Cholinesterase ΔE/min/ml Blood	Blood: Cholinesterase ΔE/min/ml Plasma	Serum: Alk. Ph. milliunits/ml	Serum: GOT milliunits/ml	Serum: GPT milliunits/ml	Serum: Cholest. mg/100 ml	Urine: Coproporph. Total µg/100 ml	Urine: Coproporph. I %
55	836	40.5	1.74	3.62	149	139.7	41			27.2	16.1	4.4	214	37	28
56	835	"	3.18	3.62	94	175.6	37			41.8	5.9	1.1	166	40	31
57	828	"	5.42	8.89		142.9	34	28.7	7.4	34.4	16.5	8.2	220	12	55
58	815	"	4.03	8.96	115	199.6	40			63.0	11.6	7.0	188	24	38
59	823	"	2.68	4.31	57	158.2	33			26.4	9.7	2.4	206	16	33
60	813	"	2.17	4.01				23.9	8.3	33.8	13.4	4.6	202	6	46
61	803	"	1.32	2.72		141.2	34	28.9	5.7	30.0	20.1	8.3	200	7	39
62	1	78.3	2.75	5.64	123	160.2	48			41.8	8.8	8.4		15	19
63	4	"	3.62	6.50	62	194.4	39			49.0	38.0	38.0		19	31
64	5	"	2.86	5.75	99	210.4	45			28.6	8.8	4.8		13	44
65	9	"	3.69	6.57	80	181.0	41			21.4	14.5	5.1		23	32
66	12	"	0.10	3.02	62	158.8	33			42.0	11.4	7.6		24	42
67	13	"	1.54	4.43		200.3	50			36.2	7.3	5.0		11	40
68	14	"	2.40	5.29	127	174.1	38			20.4	8.2	3.0		35	42
69	15	"	0.23	3.13	123	149.6	45			24.0	13.6	16.3		16	30
70	16	"	1.99	4.88	79	163.5	41			37.6	12.6	3.5		22	32
71	17	"	2.75	5.65	84	157.9	45			23.0	8.2	3.3		30	34
72	18	"	2.75	5.85	100	158.0	46			27.0	7.8	4.1		16	33

(continued)

TABLE B-4. (continued)

		Air	Blood								Serum				Urine	
No.	Sub-ject code no.	µg Hg/m³ Weekly weighted average exposure	Mercury µg/100 ml Inorg.	Total	ALAD units/ 1 ml E	G-6-PD units 100 ml E	GSH mg/ 100 ml	Cholin-esterase ΔE/min/ml Blood	Plasma	Alk. Ph. milliunits/ml	GOT	GPT	Cholest. mg/100 ml	Coproporph. Total µg/100 ml	I %
73	18	78.3	2.75	5.85	100	158.0	46			27.0	7.8	4.1		16	33
74	19	"	4.45	7.33	99	153.1	50			27.0	7.1	3.2		18	35
75	20	'	1.76	4.65	101	158.2	40			23.8	11.2	5.1		14	33
76	22	"	0.37	3.27	71	155.0	26			25.8	14.3	10.6		24	42
77	24	"	1.02	3.91	27		50			33.8	25.0	15.0		15	24
78	25	"	3.47	6.35	48					35.4	13.6	6.3		8	36
79	26	"	3.32	6.20	39	148.6	37			30.0	9.3	2.0		29	36
80	34	"	1.99	4.89	27	165.5	31			17.0	11.0	4.1		23	35
81	35	"	4.23	7.11	45	174.2	31			19.6	9.0	5.2		47	37
82	822	"	1.51	3.88	80	179.9	43			57.4	6.9	2.7	250	9	52
83	801	"	7.37	11.67		158.4	23	29.8	9.5	48.6	18.6	9.1	150	11	28
84	36	"	3.04	5.94	51	184.0	38			22.4	8.2	2.4		37	44
85	39	"	6.46	9.37	181	157.1	50			20.6	6.9	5.2	230	29	39
86	41	"	8.61	11.48	48	182.3	39			33.4	7.3	10.2	186	8	35
87	118	"	1.94	3.58		166.0	31		7.5	78.4	19.4	8.7	150	9	55
88	44	"	6.01	8.88	30	161.5	38			25.8	9.3	7.9	214	21	23
89	47	"	1.77	4.66	100	164.6	35			17.2	11.1	5.5	214	9	26
90	49	"	8.61	11.51	78	173.8	37			35.4	7.3	6.7	190	26	28

(continued)

TABLE B-4. (continued)

No.	Sub-ject code no.	Air: μg Hg/m³ Weekly weighted average exposure	Blood: Mercury μg/100 ml Inorg.	Blood: Mercury μg/100 ml Total	Blood: ALAD units/1 ml E	Blood: G-6-PD units 100 ml E	Blood: GSH mg/100 ml	Blood: Cholinesterase ΔE/min/ml Blood	Blood: Cholinesterase ΔE/min/ml Plasma	Serum: Alk. Ph. milliunits/ml	Serum: GOT milliunits/ml	Serum: GPT	Serum: Cholest. mg/100 ml	Urine: Coproporph. Total μg/100 ml	Urine: Coproporph. I %
91	52	78.3	2.32	5.21		157.1	34			46.2	13.2	11.7	199	16	42
92	56	"	8.06	10.93	66	169.8	34			37.0	3.8	5.5	174	18	27
93	59	"	2.95	4.58	67	147.2	51			24.8	6.1	6.0	188	23	48
94	60	"	2.46	4.24	38	161.5	41			26.4	5.9	5.2	168	10	58
95	64	"	3.02	6.24	102	166.2	44			19.4	2.8	4.6	174	23	26
96	68	"	2.67	6.78	94	149.5	35			18.0	5.5	6.2	222	7	45
97	71	"	0.42	1.19	31	150.1	44			13.4	15.2	9.9	224	10	53
98	75	"	5.26		88	153.9	30			20.0	7.8	7.9	212	15	49
99	78	"	1.78	6.76	58	155.2	39			50.4	18.1	11.7	175	10	32
100	81	"	2.79	5.21	80	184.0	41			27.4	13.9	5.1	226	13	27
101	82	"	1.47	4.46	38	157.8	34			39.6	9.3	1.5	232	21	31
102	86	"	2.67	5.41	71	190.5	47			32.4	3.2	1.6		21	32
103	92	"	2.73	9.59	64	171.8	43			38.4	8.4	4.5	234	22	37
104	199	"	0.97	3.64		171.1	37	22.8	7.4	46.4	18.1	9.9	180	6	43
105	806	"	1.95	5.00		190.1	30	28.5	8.0	54.6			243	11	32
106	102	"	1.36	2.61		166.0	40			26.2	5.1	2.4		25	31
107	105	"	1.09	4.57		200.7	33			20.8	6.3	1.0	200	10	30
108	108	"	2.63	6.09		191.2	39			36.6	12.8	2.6	264	6	17

(continued)

TABLE B-4. (continued)

No.	Sub-ject code no.	Air: µg Hg/m³ Weekly weighted average exposure	Blood: Mercury µg/100 ml Inorg.	Blood: Mercury µg/100 ml Total	Blood: ALAD units/1 ml E	Blood: G-6-PD units 100 ml E	Blood: GSH mg/100 ml	Blood: Cholin-esterase ΔE/min/ml Blood Plasma	Serum: Alk. Ph. milliunits/ml	Serum: GOT milliunits/ml	Serum: GPT	Serum: Cholest. mg/100 ml	Urine: Coproporph. Total µg/100 ml	Urine: Coproporph. I %
109	111	78.3	8.74	12.90		149.3	26		29.4	8.4	4.5	278	8	37
110	116	"	3.37	11.16		161.8	34		30.0	6.7	1.0	204	21	30
111	123	"	4.05	5.15	59	23.2	45		23.0	6.7	1.5	194	19	23
112	125	"	3.24	5.90	53	166.9	42		38.4	3.8	1.1	188	6	39
113	132	"	4.38	5.30	20	140.0	41		31.0	1.0	1.0	188	13	36
114	139	"	3.57	6.35	7	152.0	56		25.6	25.5	7.6	248	7	57
115	140	"	5.33	7.20	53	200.3	42		27.8	3.0	1.0	188	13	40
116	141	"	5.20	5.69	37	230.5	33		25.4	5.5	1.0	150	14	42
117	142	"	6.85	7.40	16	205.2	36		31.2	4.0	1.6	188	17	40
118	143	"	4.85	5.00	30	148.6	42		15.8	5.9	3.1	234	12	51
119	144	"	4.38	5.28	49				30.0	1.0	1.0	209	9	35
120	145	"	4.00	5.07	61	136.7	37		19.6	4.4	2.1	202	10	27
121	146	"	3.30	5.07	31	215.4	37		26.8	4.2	1.0	228	40	27
122	150	"	5.20	5.83	23	245.4	35		34.0	1.0	1.0	180	22	47
123	151	"	4.30	5.14	58	170.3	32		22.2	8.6	12.0	268	16	70
124	154	"	5.64	6.71	41	172.0	50		31.2	1.0	2.0	230	13	58
125	161	"	3.26	5.52	88	137.4	39		25.8	8.4	2.6	226	11	30
126	168	"	1.86	4.56	35	170.2	49		23.8	17.0	5.0	283	5	39

(continued)

TABLE B-4. (continued)

		Air	Blood							Serum				Urine	
No.	Subject code no.	μg Hg/m^3 Weekly weighted average exposure	Mercury μg/100 ml Inorg.	Mercury μg/100 ml Total	ALAD units/1 ml E	G-6-PD units 100 ml E	GSH mg/100 ml	Cholinesterase ΔE/min/ml Blood	Cholinesterase ΔE/min/ml Plasma	Alk. Ph. milliunits/ml	GOT milliunits/ml	GPT milliunits/ml	Cholest. mg/100 ml	Coproporph. Total μg/100 ml	Coproporph. I %
127	169	78.3	1.80	5.07	42	166.3	38			24.8	23.0	11.7	222	8	36
128	172	"	4.26	5.82	71	162.1	28			27.0	14.1	4.1	218	6	51
129	186	"	4.45	5.90	26	158.5	21			17.6	20.1	9.6		15	
130	187	"	1.98	4.31	41	168.3	30			10.0	12.1	3.3		19	20
131	253	"	2.65	3.78	15	192.0	36			29.2	15.0	8.3	258	13	41
132	259	"	2.71	6.90	72	187.5	32			29.8	13.6	4.5	240	15	20
133	29	"	2.63	5.52	61	171.2	50			23.6	15.2	5.1		20	33
134	31	"	1.80	4.69	61	186.0	32			48.2	9.9	3.7	184	11	33
135	33	"	4.92	7.82	38	154.8	30			18.0	9.3	2.1		20	38
136	38	"	5.74	8.61	66		46			25.8	9.7	1.7		21	24
137	79	"	2.29	7.30	78	164.0	39			31.4	9.0	3.1	174	16	24
138	89	"	1.91	5.27	69	161.2	35			24.8	7.8	2.7	214	21	29
139	90	"	2.41	5.14	53	172.0	47			37.0	20.6	5.8	186	23	34
140	91	"	4.63	9.87	81	182.9	28			23.2	7.8	5.2		15	29
141	104	"	1.97	5.22		165.6	30			29.4	3.2	1.0	258	10	24
142	107	"	4.54	7.40		153.8	38			26.4	5.9	1.0	172	14	50
143	109	"	2.58	4.45		175.0	35			52.8	6.1	2.6	255	16	37
144	807	"	4.34	4.51			42	23.0	5.2	54.4	16.1		218	4	43

(continued)

TABLE B-4. (continued)

No.	Subject code no.	Air: µg Hg/m^3 Weekly weighted average exposure	Blood: Mercury µg/100 ml Inorg.	Blood: Mercury µg/100 ml Total	Blood: ALAD units/ 1 ml E	Blood: G-6-PD units 100 ml E	Blood: GSH mg/ 100 ml	Blood: Cholinesterase ΔE/min/ml Blood	Blood: Cholinesterase ΔE/min/ml Plasma	Serum: Alk. Ph. milliunits/ml	Serum: GOT milliunits/ml	Serum: GPT	Serum: Cholest. mg/100 ml	Urine: Coproporph. Total µg/100 ml	Urine: Coproporph. I %
145	134	78.3	2.90	4.92	12	164.0	43			39.2	2.4	2.0	315	20	21
146	135	"	5.47	5.60	26	154.6	44			52.0	20.1	4.4	248	9	25
147	175	'	2.26	4.63	82	123.1	42			30.0	15.2	3.0	172	33	31
148	176	'	5.73	7.16	94	132.5	37			27.2	18.6	5.0	232	6	33
149	98	"	3.09	9.93		160.0	36			28.0	18.4	5.0	234	20	29
150	802	"	1.95	3.83		158.0	33	28.6	5.5	35.4	16.5	6.3	150	11	28
151	2	121.0	4.92	7.80	73	212.0	38			37.2	11.0	5.9		12	47
152	6	"	2.05	4.94	77	195.6	49			34.8	8.6	5.1		26	41
153	8	"	2.99	6.46	35		28			27.4	8.2	4.6		24	40
154	11	"	1.40	4.29	35	228.6	40			41.2	12.6	7.1		14	38
155	21	"	1.94	4.83	33		43			29.8	10.7	10.2		17	38
156	23	"	4.02	6.90	43	165.1	30			33.0	9.9	4.0		10	42
157	27	"	2.40	5.29	80	156.8	46			43.2	10.7	2.7		15	46
158	28	"	6.09	8.96	29	162.1	30			25.4	12.1	4.6		8	37
159	30	"	2.81	5.80	90	160.2	31			19.0	14.7	5.5		14	49
160	37	'	1.99	4.88	31	156.1	40			31.0	27.0	17.5		26	46
161	46	"	4.65	7.54	73	164.0	26			28.2	8.4	6.7	146	19	32
162	53	'	6.84	9.71	31	159.2	38			32.0	47.0	31.7	234	20	30

(continued)

TABLE B-4. (continued)

No.	Subject code no.	Air: μg Hg/m³ Weekly weighted average exposure	Blood: Mercury μg/100 ml Inorg.	Blood: Mercury μg/100 ml Total	Blood: ALAD units/1 ml E	Blood: G-6-PD units 100 ml E	Blood: GSH mg/100 ml	Blood: Cholinesterase ΔE/min/ml Blood	Blood: Cholinesterase ΔE/min/ml Plasma	Serum: Alk. Ph. milliunits/ml	Serum: GOT milliunits/ml	Serum: GPT	Serum: Cholest. mg/100 ml	Urine: Coproporph. Total μg/100 ml	Urine: Coproporph. I %
163	66	121.1	3.09	10.00	35	186.5	33			22.0	6.7	7.3	208	13	42
164	73	"	1.90	6.78	110	153.5	41			18.8	8.0	4.8	204	14	44
165	76	"	3.60	6.95	42	165.2	36			23.0	7.5	4.1	176	33	41
166	87	"	6.08	12.03	134	167.9	29			30.6	8.2	1.6	210		
167	97	"	4.12	10.73		162.8	34			30.8	8.8	1.3	186	16	35
168	100	"	1.69	3.78		160.0	35			27.2	2.4	1.0		16	31
169	121	"	6.88	9.03	44	161.6	40			14.2	2.8	1.1	189	14	31
170	122	"	10.73	15.97	31	159.1	39			31.0	4.2	2.6	219	14	23
171	127	"	3.64	5.97	14	201.1	34			39.0	15.2	1.7	290	11	25
172	128	"	9.58	13.88	18	147.5	45			47.6	3.8	1.2	278	9	16
173	129	"	14.23	18.14	24	162.1	57			50.4	1.0	2.6	268	6	25
174	130	"	8.57	11.20	32	170.1	38			23.8	1.0	1.3	256	5	26
175	133	"	6.21	8.74	7	153.5	47			41.8	4.4	1.0	252	8	42
176	136	"	12.07	12.39	38	168.5	50			31.0	9.5	1.0	220	13	31
177	155	"	10.58	10.62	47	147.6	34			16.8	4.0	2.1	202	19	43
178	156	"	7.48	7.88	23	189.6	39			26.0	1.0	1.0	201	17	46
179	157	"	4.25	5.00	43	185.5	37			22.8	4.0	2.1	188	9	44
180	158	"	4.44	6.63	33	201.4	41			29.2	4.0	1.7	186	16	30

(continued)

TABLE B-4. (continued)

		Air	Blood							Serum				Urine	
No.	Subject code no.	μg Hg/m³ Weekly weighted average exposure	Mercury μg/100 ml Inorg.	Mercury μg/100 ml Total	ALAD units/1 ml E	G-6-PD units 100 ml E	GSH mg/100 ml	Cholinesterase ΔE/min/ml Blood	Cholinesterase ΔE/min/ml Plasma	Alk. Ph. milliunits/ml	GOT milliunits/ml	GPT milliunits/ml	Cholest. mg/100 ml	Coproporph. Total μg/100 ml	Coproporph. I %
181	159	121.0	5.93	8.36	64	178.7	37			18.4	11.2	6.2	200	9	
182	160	"	5.79	8.76	55	159.1	49			18.4	12.8	3.0	258	21	38
183	162	"	2.99	6.65	56	163.2	39			20.2	8.6	1.0	184	12	28
184	164	"	6.79	11.05	77	166.6	45			29.8	14.1	4.5	266	9	45
185	165	"	6.79	9.35	65					36.8	13.9	3.3	194	9	47
186	178	"	17.21	21.04	71	153.5	36			26.6	12.8	2.4		19	42
187	190	"	8.13	10.14	50	184.1	45			14.0	14.5	4.8		20	32
188	195	"	2.51	4.57		163.8	29	25.1	6.5	41.2	17.5	9.5	232	12	47
189	196	"	4.45	6.05		161.3	42	25.6	8.7	52.0	16.3	9.5	231	10	27
190	43	"	9.71	12.61	74	148.8	39			26.4	10.7	9.1	180	27	28
191	101	"	5.27	10.21		185.1	32			26.2	10.5	1.0		24	21
192	800	"	1.37	4.20		150.2	29	30.1	8.4	33.4	17.5	10.2	220	10	39
193	804	"	2.63	4.88		171.0	26	34.5	7.5	47.8	20.6	9.5	206	9	31
194	93	"	6.46	10.27						14.8	1.2	3.0		26	31
195	113	"	8.35	17.54		166.7	45			24.6	14.7	2.0	238	16	37
196	808	"	1.66	3.52			33	26.0	8.3	47.0	16.7	9.0	160	11	44
197	810	"	3.14	6.73				32.0	10.5	43.6	15.4	11.9	174	12	67
198	811	"	1.03	4.70				29.7	5.7	25.6	26.5	9.5	216	11	48

(continued)

TABLE B-4. (continued)

		Air	Blood							Serum				Urine	
No.	Sub-ject code no.	µg Hg/m³ Weekly weighted average exposure	Mercury µg/100 ml Inorg.	Mercury µg/100 ml Total	ALAD units/ 1 ml E	G-6-PD units 100 ml E	GSH mg/ 100 ml	Cholin-esterase ΔE/min/ml Blood	Cholin-esterase ΔE/min/ml Plasma	Alk. Ph. milliunits/ml	GOT milliunits/ml	GPT milliunits/ml	Cholest. mg/100 ml	Coproporph. Total µg/100 ml	Coproporph. I %
199	812	121.0	1.89	3.46				28.6	7.4	27.2	14.3	7.4	204	5	41
200	814	"	2.23	3.89				29.1	6.1	28.4	13.9	9.2	210	27	33
201	843	"	8.19	10.30	84	114.5	32	27.2	6.7	42.8	10.7	5.9	184	10	23
202	842	"	2.52	4.66	53	149.0	39			48.0	9.7	3.2	218	13	39
203	63	201.8	5.97	10.40	68	153.1	32			26.6	2.0	6.0	174	19	44
204	77	"	1.26	5.81	53	161.5	43			31.4	9.3	8.8	238	26	34
205	83	"	3.81	8.24	12	156.9	39			35.4	15.2	5.2	214	12	26
206	94	"	2.16	8.99	70	171.4	35			28.2	2.4	4.4	198	14	38
207	103	"	16.13	20.56		169.0	42			40.0	20.9	8.4		22	13
208	119	"	15.64	18.88	33	177.0	43			22.4	10.8	14.3	228	7	24
209	120	"	13.63	15.08	29	160.3	40			16.6	12.0	2.8	221	9	30
210	124	"	12.34	15.37	47	166.9	37			22.2	3.6	1.3	226	22	34
211	126	"	7.15	11.87	53	198.4	43			31.2	4.4	1.5	189	18	34
212	131	"	11.33	12.62	35	185.4	48			29.2	3.8	1.0	242	14	28
213	147	"	12.55	12.69	39	160.3	40			30.8	15.2	19.0	223	20	26
214	148	"	7.32	7.67	36	156.8	42			42.8	2.2	1.5	230	8	22
215	149	"	18.57	22.54	47	208.6	44			24.6	9.9	10.3	218	14	77
216	152	"	22.51	23.84	62	147.1	35			23.0	2.2	2.7	246	17	59

(continued)

No.	Subject code no.	Air: μg Hg/m³ Weekly weighted average exposure	Blood: Mercury μg/100 ml Inorg.	Blood: Mercury μg/100 ml Total	Blood: ALAD units/1 ml E	Blood: G-6-PD units 100 ml E	Blood: GSH mg/100 ml	Blood: Cholinesterase ΔE/min/ml Blood	Blood: Cholinesterase ΔE/min/ml Plasma	Serum: Alk. Ph. milliunits/ml	Serum: GOT milliunits/ml	Serum: GPT milliunits/ml	Serum: Cholest. mg/100 ml	Urine: Coproporph. Total μg/100 ml	Urine: Coproporph. I %
217	153	201.8	17.28	17.47	32	150.9	38			22.0	5.7	1.9	220	12	41
218	166	"	3.66	6.05	70	154.5	43			17.2	17.2	2.0	180	14	43
219	167	"	5.53	8.14	96	156.2	38			14.8	10.7	3.3	251	22	34
220	171	"	10.79	14.26	74	196.1	40			28.0	9.9	2.0	230	7	27
221	174	"	9.32	10.75	68	172.2	42			22.2	17.5	2.3	208	11	40
222	177	'	8.52	11.64	96	154.5	47			36.8	12.3	6.4	268	13	50
223	179	"	11.41	14.23	49	154.3	41			18.0	11.2	2.1		6	44
224	180	"	22.75	25.70	39	173.6	36			47.0	23.8	19.3		15	36
225	326	"		2.95	77	178.0	38	24.6	7.4	43.2	40.0	32.0	236	6	30
226	182	'	3.77	7.57	94	144.1	33			21.6	13.0	1.9		17	43
227	183	"	3.97	6.60	33	152.1	37			10.8	15.4	8.0		14	42
228	185		7.57	11.39	61		34			13.8	14.7	6.2		5	48
229	188	"	7.17	9.93	61	154.5	39			33.6	11.2	1.9		12	46
230	189	"	8.40	11.11	107	163.4	36			19.8	13.9	5.6		13	42
231	194	"	3.54	7.35		168.0	33			37.6	20.6	9.8	156	11	34
232	805	'	3.48	6.24		127.2	35	26.5	8.5	45.6	29.5	18.0	202	6	61
233	833	"	4.29	12.50	57	134.0	42	26.5	5.2	46.2	20.1	4.0	200	26	27
234	208	"	0.62	10.86		163.2	41			26.0	1.6	1.0	226	19	53

(continued)

TABLE B-4. (continued)

No.	Subject code no.	Air: μg Hg/m^3 Weekly weighted average exposure	Blood: Mercury μg/100 ml Inorg.	Blood: Mercury μg/100 ml Total	Blood: ALAD units/1 ml E	Blood: G-6-PD units 100 ml E	Blood: GSH mg/100 ml	Blood: Cholinesterase ΔE/min/ml Blood	Blood: Cholinesterase ΔE/min/ml Plasma	Serum: Alk. Ph. milliunits/ml	Serum: GOT	Serum: GPT	Serum: Cholest. mg/100 ml	Urine: Coproporph. Total μg/100 ml	Urine: Coproporph. I %
235	831	78.3	3.07	4.74	49	150.3	43			43.8	9.7	2.1	220	43	26
236	837	"	2.85	5.18	49	136.6	32			24.0	9.9	1.0	170	23	32
237	832	"	1.71	4.57		153.0	32	24.1	5.9	50.8	18.1	8.3	224	23	29

TECHNICAL REPORT DATA

(Please read Instructions on the reverse before completing)

1. REPORT NO.	2.	3. RECIPIENT'S ACCESSION NO.
EPA-600/1-78-002		

4. TITLE AND SUBTITLE	5. REPORT DATE
Biological Significance of Some Metals as Air Pollutants. Part II: Mercury	January 1978
	6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S)	8. PERFORMING ORGANIZATION REPORT NO.
Mirka Fugas, M.Sc. and Prof. Fedor Valic, Ph.D.	
9. PERFORMING ORGANIZATION NAME AND ADDRESS	10. PROGRAM ELEMENT NO.
Institute for Medical Research and Occupational Health Yugoslav Academy of Science and Arts Zagrev, Yugoslavia	1AA601
	11. CONTRACT/GRANT NO.
	SFCP-02-302-3
12. SPONSORING AGENCY NAME AND ADDRESS	13. TYPE OF REPORT AND PERIOD COVERED
Health Effects Research Laboratory RTP,NC Office of Research and Development U.S. Environmental Protection Agency Research Triangle Park, N.C. 27711	Final - Jan. 1969/Jan. 1974
	14. SPONSORING AGENCY CODE
	EPA-600/11

15. SUPPLEMENTARY NOTES

16. ABSTRACT

The study was undertaken in order to elucidate the association between low atmospheric mercury levels and changes in some biological parameters likely to react to such exposures. The study covered four populations believed to be exposed to four different levels of atmospheric mercury; rural inhabitants, town dwellers, population from a mercury mining and smelting town, and workers occupationally exposed to mercury.

The study concludes tentatively that mercury exposure is likely to induce changes in the activity of cholinesterase, alkaline phosphatase, and glucose-6-phosphate dehydrogenase and also to cause changes in the concentration of coproporphyrin and probably glutathione.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Mercury (metal) Blood Exposure	Yugoslavia	06 A, C, F

18. DISTRIBUTION STATEMENT	19. SECURITY CLASS *(This Report)*	21. NO. OF PAGES
RELEASE TO PUBLIC	UNCLASSIFIED	190
	20. SECURITY CLASS *(This page)*	22. PRICE
	UNCLASSIFIED	

EPA Form 2220-1 (9 73)