

## LEAD INDUSTRIES ASSOCIATION, INC.

302 MADISON AVENUE

NEW YORK, N. Y. 10017

TELEPHONE - AREA CODE 212

OR 2-6086

September 9, 1964

Re: LEAD - THE POISON ALL AROUND US

To All Members of the Health and Safety Committee:

The attached article is being sent to you as an instance of the garbage that comes into this office in large numbers. This is a particularly obnoxious piece. I think it is interesting to note the fact that the circulation of this journal is 350,000 by paid subscription only.

See you next month.

Very truly yours,

Don G. Fowler  
SecretaryDGF:md  
Enc.  
Lead Around with Lead

*Pollution of air, water and food by gasoline additives keeps increasing, while authorities look the other way.*

## Lead - The Poison All Around Us

"LEAD is poisonous in all forms. It is one of the most hazardous of the toxic metals because the poison is cumulative and the toxic effects are many and severe," we are told in *Clinical Toxicology of Commercial Products* (The Williams and Wilkins Co., 1963).

This toxic metal is "raining" into the oceans of the northern hemisphere at about 50 times the rate prevalent before automobiles were common, say two California researchers, Dr. Tsiabwa J. Chow, of the Scripps Institution of Oceanography, University of California, and Dr. C.C. Patterson, geologist at California Institute of Technology. They have tested layers of ocean water and found that the seas around our northern countries receive about 500,000 tons of lead annually, compared with only 10,000 tons in the southern hemisphere. They attribute this difference almost entirely to exhaust fumes from our motor vehicles, according to *Science News Letter* (December 23, 1963). They also found 10,000 times more lead in snow samples from California's Lassen Volcanic National Park than would be expected to accumulate from normal soil sources.

Along our super highways, vegetables grown in the polluted atmosphere have been found to contain 50 times more lead than the amount considered tolerable in foods (*New Scientist*, December 5, 1963).

Although we are constantly being warned about air pollution, and motor vehicle exhaust fumes are now regarded as the major source of smog in urban centers, we seldom see a

mention of lead as a dangerous component of the air. In fact, the amount of tetraethyl lead permitted in motor fuel was recently increased from 3 cubic centimeters per gallon to 4, which may increase the atmospheric content of the deadly poison by as much as 30%. At about that same time a group of doctors for reasons best known to themselves went to a great deal of trouble to furnish "scientific evidence" that lead in the air poses no threat to anyone's health, thereby justifying the increase. The whitewashing was done under the auspices of the Kettering Laboratory of the University of Cincinnati's College of Medicine, which presented a Symposium on Lead from February 25-27, 1963, to "bring together certain . . . facets of the hygienic problem raised many years ago by the introduction of tetraethyl lead as an antiknock additive into automotive fuel." Managing to overlook mountains of incriminating evidence, the symposium found lead harmless to health. The papers were published as a special issue of the *Archives of Environmental Health* (February 1964), and dedicated in memory of Dr. Frank Princi, who besides being Associate Director of the Kettering Laboratory, had been Medical Director of the Ethyl Corporation, a maker of tetraethyl lead.

### GROWING AIR POLLUTION

Ethyl Corporation introduced tetraethyl lead into American gasoline in 1923. By the next year, Public Health Service figures show 700,000

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pounds being used. In 1936 the figure had grown to 510,000,000 pounds, 15% of all lead used in this country. At present the petroleum industry is the second largest user of lead in the United States, much of it ending up as an air pollutant, and making its way into food, water and our lungs.

(Although most gasolines now contain it, adding tetraethyl lead is not the only way to increase a fuel's anti-knock properties. Better refining methods will produce anti-knock gasoline without lead, but at a higher cost because of the additional facilities required.)

In 1928 Ethyl Corporation set the limit of 3 cc's of lead per gallon, not for any reason of health, a company statement said, but just because it was the highest amount considered necessary at the time. Better engine technology in later years created increased compression ratios and a need for improved anti-knock properties in gasoline.

Therefore in 1958 makers of TEL proposed that their product's limit in fuel be raised from 3 to 4 cc's per gallon, citing "definite economic advantages . . . to the nation, and to the motoring public . . . the nation's crude oil resources would be conserved."

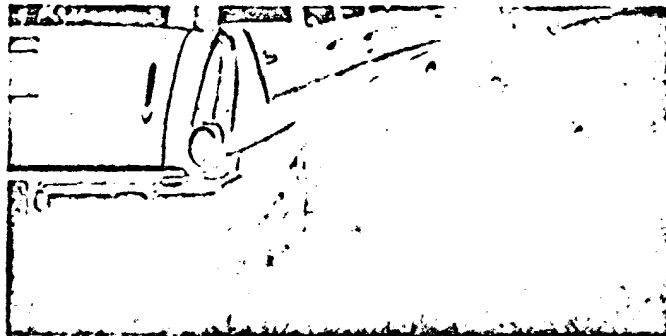
Public Health Service, committed

to fighting pollution, got off the spot by appointing an advisory committee of doctors, who reported that "a conclusive answer is impossible at the present time because of the lack of medical data." A 1955 committee had recommended that study of the health aspects be continued. The 1959 committee said it was "regrettable" PHHS had not done so. The outcome was essentially that because of lack of evidence against lead, no action was taken and the increase was not opposed. As in the case of pesticides, PHHS prefers to close its eyes to the danger until the harm is proven. These events were described in a series in the *Richmond Times-Dispatch*, June 4-10, 1961, later reprinted in booklet form by the Department of Health, Education, and Welfare.

#### HAZARDS OF LEAD

Here are some well-established medical facts we can offer the Public Health Service.

Lead can be taken into the body in three ways—through the digestive system, the respiratory system, and the skin. We ingest the greater part of our lead intake through the digestive system, since lead is found in some of the additives in our foods, is picked up from polluted soil by growing plants, and sometimes is in



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the water where lead pipes are used. Very little enters our bodies through the skin, for only the volatile organic compounds such as tetraethyl lead, before combustion, enter readily in that way. The lead in vehicle exhausts is mostly in inorganic form, comparable to that in our foods, since it is a product of combustion.

When we take in lead through the digestive system, much of it is quickly concentrated in the liver and excreted. Until it is, there may be acute lead poisoning, with symptoms such as vomiting, diarrhea, weakness, appetite loss, and dehydration, terminating in convulsions and collapse.

In chronic lead poisoning, even more symptoms appear. The lead is circulated in the blood stream and eventually much of it is deposited in the bones. The capillary walls of the blood-and-fluid barrier which protects the brain and spinal cord are finally damaged so that the lead can affect those organs also. Victims appear pale and anemic, and feel gradually weaker, with increasing abdominal pain which develops into the notorious "lead colic." Constipation, vomiting, insomnia, dizziness, and headache all increase, and when the nervous system is affected, paralysis may occur along with mental changes, and eyesight and hearing may be impaired. In these cases diagnosis is difficult because the symptoms are typical of many different causes.

When lead enters the body through the respiratory system or skin, it bypasses the liver and enters the circulation directly, so that proportionately this smaller amount of lead is available to do more damage (Schmidt, Seiser, and Litner, *Lead Poisoning*, Berlin, 1930).

There are a few scientists who are beginning to relate a relatively high lead intake to diseases showing symptoms similar to lead poisoning. Professor Harry V. Warren, geologist at

the University of British Columbia, told the Geological Society of America last October that digestive disorders known in England as "Derbyshire tummy" and "Devonshire colic" are now known to occur where the soil is high in lead.

Because chronic lead poisoning attacks the central nervous system, Professor Warren is also interested in the relationship of lead to diseases of the central nervous system such as multiple sclerosis, whose cause is still considered unknown. In 1957 he took part in a study of 24 localities having a high incidence of the disease, and found that in every case the rocks or soils were relatively high in lead. In similar geographical areas having less multiple sclerosis than the average, there was also less lead than the average content in rocks and soils. The geographical distribution of MS also coincides with areas where there is peat in the soil, because peat contains acids which concentrate elements such as lead (*Toronto Globe and Mail*, October 18, 1963).

Symptoms of MS show many similarities to chronic lead poisoning — the weakness, paralysis, visual and auditory disturbances, and emotional changes all bear a resemblance. Add to these the fact that MS often appears at an early age. Mayo Clinic data show that 47% of their MS patients contract the disease before age 30. Recognized lead poisoning these days is more common among young children, who suffer more lasting effects on their immature, still developing systems. Perhaps chronic lead poisoning, begun in childhood, might do its slow damage through the years of growth, and finally appear in young adulthood in a progressively degenerative form.

#### LEAD AND THE ROMAN EMPIRE

Another researcher's interest in lead has taken him to Italy to study relics of the ancient Romans. In a letter to *Technology and Culture* (Winter

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1962), S. Colum Gillilan, Ph.D., summarizes his 27-year study of the uses of lead by the Romans, who he feels were greatly weakened by lead poisoning from their wine. All the Romans ingested much lead from their water pipes, Dr. Gillilan says, but their most important source of lead poisoning was the wine and grape syrup used by the wealthier classes. They warmed the wine in lead-lined vessels or added litharge (lead acetate) to keep it from going sour; they used a lead glaze on pottery, had pewter drinking vessels, mended their pottery with leaden clamps, and had lead parts in their grape-pressing machines. Adding water to the wine also added more lead. Eventually lead poisoning resulted in sterility among the upper classes, which explains the repeated extermination of the aristocracy and the final debilitation of the race, Dr. Gillilan feels. He is currently having bone samples of rich and poor Romans analyzed to make a comparison of their lead content. He also cites, in support of his theory, the work of K. B. Hofman (*Archiv für Geschichte der Medizin*, 1883) and R. Kobert (*Beurage aus der Geschichte der Chemie*, 1909).

#### METABOLIC BEHAVIOR

When lead is deposited in the bones, these deposits take exactly the same pattern as calcium deposits (Behrens, B., and Baumann, A., *Ztschr. f. d. ges. exper. Med.*, 92:251, 1933). If both lead and calcium are present, the bone is more likely to take up the lead, because the lead compounds occurring here are less soluble than the corresponding calcium phosphates. But if extra calcium is given before lead administration, less lead is taken up by the bones and more is found in the stomach, on its way to being excreted. This finding suggests a high calcium (bone meal) diet to prevent excessive lead absorption. One also wonders

whether lead deposits in the bones are sometimes mistaken for calcium deposits in x-rays or roentgenograms.

A Japanese researcher, Goro Obara, experimented with several treatments for tetraethyl lead poisoning (*Tohoku Journal of Experimental Medicine*, 48: 285-322, 1944). He points out that acute tetraethyl lead poisoning brings on more mental effects than does inorganic lead, perhaps because of its volatility and rapid absorption into the organism. Vitamin B<sub>1</sub> and sodium thiosulfate each helped alleviate the poisoning symptoms, he found, but large doses of vitamin C had the greatest effect by far as an antidote.

Obara also measured the lactic acid and sugar content of the blood, and found that shortly after poisoning, these values rose sharply, only to decrease and finally result in hypoglycemia. Apparently when the poison reaches the liver, its glycogen is released, causing the initial rise, but the continuing action of the lead results in the eventual lowering. Measurements showed liver and muscle glycogen to be almost entirely absent at the end of the experiment.

Further tests showed that the poisoning reduces the liver's ability to form new glycogen from added glucose, but that vitamin B<sub>1</sub>, vitamin C, and sodium thiosulfate all helped to neutralize that effect.

#### DANGERS IGNORED

It is interesting that the reports from the Kettering symposium do not cite the work of these foreign researchers. We notice that although the meeting concludes with the reassurance that we are in no danger from atmospheric lead, the texts of the reports contain some remarks whose importance the doctors apparently choose to minimize. Dr. Ronald E. Lane, from England, is speaking on industrial lead poisoning:

"I am fully aware" he says, "that

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**LEAD continued**

many writers in this country refuse to accept the connection between lead poisoning and chronic nephritis. . . . The older clinicians . . . were in no doubt. They accepted chronic nephritis as a long-term result of plumbism, and it is still accepted for the purpose of compensation in the United Kingdom . . . plumbers and painters both showed a significant excess of death from renal causes." He goes on to describe an investigation in which the causes of death among lead industry workers were compared with those in the general population. Both among pensioners and among those who died during employment, a "highly significant excess of deaths from vascular lesions affecting the central nervous system" was found among lead workers.

One of the symposium papers dealt with laboratory studies of tetraethyl and tetramethyl lead, which is also a possible gasoline additive. Results

showed that, while a lethal dose of tetramethyl lead must be higher than that of the tetraethyl, given enough quantity its effects could be more severe. The study also brought these admissions from the author, Dr. C. W. H. Schepers: ". . . administration of multiple doses, equivalent cumulatively to a single dose, proved to be more injurious. This information may have pragmatic significance since human exposure is more likely to be repetitive than massive.

"A feature for comment is the apparent contradiction between the general condition of the rats and the severity and prevalence of organic lesions. Thus, lack of loss of weight and absence of symptoms were no guarantees that lead had not been causing subtle mischief in important organs . . . persistent tachycardia and hypertension, originating in neurological or endocrine disturbance, may cause derangements of cardiovascular functioning . . .

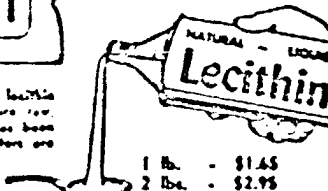
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The evident lack of accumulation or retention of lead in the nervous system contrasts with the prominence of neurological symptoms and the demonstrable evidence of neuronal and neuroglial injury." Dr. Schepers also suggests a relationship to hypoglycemia and possible benefits from glucose therapy. In this respect the Japanese researchers would appear to have been 20 years ahead of him.

#### EXTENT OF POLLUTION

Symposium tables show that U. S. cities up to a population of two million had a mean concentration of 1.47 to 1.99 micrograms of lead per cubic meter of air in 1961, and larger cities had more, with Los Angeles leading the list at 6.3 micrograms. (An average adult is estimated to inhale 30-40 micrograms per day, of which perhaps half is absorbed.)

The American Conference of Governmental Industrial Hygienists has set the limit for lead in the air of industrial establishments at 200 micrograms per cubic meter. Though this concentration is admittedly not recommended for community air, it is the standard used in the symposium for comparison. USSR air standards for community air quality are approximately 1% of the ACGIH values for many pollutants, admits Ralph L. Larsen, Ph.D., in his paper, but he avoids mentioning the Soviet recommendations for lead.

"Soviet philosophy in setting air quality standards is that the maximum permissible concentration should be set lower than that at which the most sensitive test shows human response," quotes Dr. Larsen from an air pollution book. "... Soviet standards often appear extremely stringent to those who require the appearance of sequelae before admitting to damage to an organism."

Dr. ROBERT A. KESOE of the Kettering Laboratory, whose work dom-

inated the symposium, sets the danger threshold for lead as excreted in the urine at .15 milligrams per liter. This limit, of course, includes lead from all sources. On another page, he tells us that urine samples from normal healthy persons show lead concentrations up to 0.14 mg per liter, which is very close to his own danger threshold. Yet in his closing remarks, Dr. Kesoe reiterates that "there is no present hazard to the health of the public from the lead content of the ambient atmosphere." He justifies this statement by reminding us that air is not our principal source of lead, and provides data showing that the greater portion of ingested lead is eventually excreted.

But why should the fact that the lead is largely excreted prove that it does not pose a hazard? There is a constant stream of lead always passing through our bodies, with a small gradual buildup throughout the years. The lead deposited in the bones also is capable of re-entering the blood stream and circulating back and forth between the blood vessels and the bony depots. Dr. Schepers' experiment showed that lesions appear even when no symptoms are noticed. After years of irritation by an admittedly poisonous substance unnecessary to the body, some damage might be expected to occur. In recognized lead poisoning symptoms appear wherever the lead is found. Might not its presence in the blood stream eventually weaken the blood vessels? Might not its effect on carbohydrate metabolism eventually change the blood sugar level? Since the liver is so important in lead excretion, might it not predispose to diseases of that organ? While our doctors, with their shortsighted viewpoint, are claiming "no evidence" that there is a health hazard from atmospheric lead, degenerative, nervous and mental diseases are increasing as fast as the increase of poisonous lead polluting our air from motor vehicle exhausts. ■

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