

From the Director of Health and Safety
Lead Industries Association, Inc.
292 Madison Ave.
New York 17, N. Y.



Look Ahead with Lead

February 13, 1964

To All Members of the Lead Industries Association, Inc.:

LEAD IN THE OCEAN: CALTECH REPORTS

So many of you have called and sent copies of news clippings that I am taking this opportunity to apprise you of developments that have occurred since the news release sent out by the California Institute of Technology reporting on the geochemical survey of Dr. C. C. Patterson (et al) on lead contained in oceanic waters. A copy of the original release is attached for your information.

This report has been widely picked up in newspapers and other media usually with scare headlines exaggerating implications of the original Caltech study. To some of these we have responded directly. For example, we have written to and talked with Joseph R. Elixon, Science Editor of the New York Herald Tribune, whose column in the December 23 edition carried the headline "An Unnatural Tragedy--Lethal Lead Rains on Land and Sea". Other personal contacts with major science editors will be pursued as part of our new Health Information Program. Objectives of these contacts is, essentially, to promulgate relative studies by Dr. Kahoe and others as well as our own work with health officials and our own air pollution studies. Such contact is intended to advance the knowledge of these specific audiences and is not per se directed against Dr. Patterson.

It should also be reported that direct personal contact has been made with Dr. Patterson both by the writer and Donald Diggs of duPont, on January 13 and January 16 respectively. While these visits to Caltech did open up a line of communication and an agreement to exchange new pertinent information, the net result, however, is little or no modifications of Patterson's central conclusion: "The immediate prohibition of the use of leaded automotive fuels seems called for." This conclusion has been repeated and reaffirmed by Patterson in a personal letter to members of the science community dated January 13, 1964.

On January 29 at Dr. Kahoe's office in Cincinnati we met with representatives of the lead alkyl manufacturers to discuss the "Patterson Case". The primary purpose of the meeting was to discuss Patterson's theories, report on our meetings with him and determine a course of action. There was and is no question of Dr. Patterson's competence as a nuclear physicist; the issue is the untenable extrapolation of his data into the area of public health. It was the consensus of the meeting that Dr. Kahoe should meet and discuss with Dr. Patterson his conclusions in this light. Since Dr. Patterson has already expressed his interest in meeting Dr. Kahoe the date should not be difficult to set up. Dr. Kahoe has agreed to make arrangements for an early meeting and report back to us.

DDP:md
Enc.

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Pasadena, Calif. -- Lead, apparently transported by the atmosphere from the exhausts of gasoline engines, is "raining" into the oceans of the Northern Hemisphere at 50 times the rate that nature introduced it into these oceans in the past, geochemists reported today.

The evidence is that most of the lead in oceanic surface waters has been introduced by man and this may be seriously disturbing the marine geochemical cycle in lead, said the researchers who carried out their investigations at the California Institute of Technology.

They are Dr. Tsaihua J. Chow, now at the University of California's Scripps Institution of Oceanography; Dr. M. Tatemoto of the U. S. Geological Survey, Denver, and Dr. C. C. Patterson of the Caltech Division of Geological Sciences. Their work has been supported by the American Petroleum Institute, Atomic Energy Commission, National Science Foundation and U. S. Public Health Service.

They cited the possible benefit of using such lead contaminations as tracers to study the circulation patterns of currents in the oceans.

The geochemists calculated that at present nearly 500,000 tons of lead are going into the oceans in the Northern Hemisphere every year. They also pointed out that of this amount, 275,000 tons are from rain and some 200,000 tons are from rivers. Centuries ago lead was naturally introduced into the oceans in the Northern Hemisphere at the rate of only 10,000 tons per year. The amount of lead entering the Southern Hemisphere oceans has increased very little over the 10,000 tons per year that they received in the past.

It is believed that all of the lead brought out of the atmosphere by rain is from auto and truck exhaust fumes, the geochemists said. In the past 30 years the burning of lead in premium and regular gasolines has increased from near zero to about 175,000 tons a year in the United States alone. The lead escapes from motor vehicle exhausts as small particles of lead oxide which can be carried by the atmosphere for hundreds of miles.

In urban areas where exhaust fumes are not dissipated rapidly, the scientists said, measured lead concentrations in the atmosphere are very high and may constitute a serious health hazard.

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-2-

Part of the lead fed into the oceans by rivers also is from this source. In addition, rivers transport lead from industrial chemicals, such as paints and insecticides, and from the weathering of rock.

Widely distributed over the earth as the decay end-product of radioactive minerals, lead normally is one of the rarest elements in the ocean water, occurring only in extremely minute concentrations. It forms chemical compounds that precipitate from ocean water onto the ocean floors.

In their studies of how fast lead is being introduced into the oceans, Dr. Patterson and his colleagues determined the average rate at which it is accumulating at the bottom of the oceans. Also available to them was information as to the rate at which lead is entering the oceans via the rivers.

They sampled waters of the Pacific and Atlantic oceans and the Mediterranean Sea at various depths from the surface down to more than 15,000 feet. The samples were collected in lead-free containers and small known amounts of a special kind (isotope) of lead were added as tracers. The lead in the water, mixed with the tracer (lead 206), was removed chemically by a very precise method known as isotope dilution. The resulting lead residues then were analyzed by a mass spectrometer which separated the various isotopes of lead and disclosed the proportion of special tracer lead to sea water lead in each sample.

Results of the Pacific and Mediterranean samples were quite similar. They showed that the heaviest concentrations of lead were at the water's surface and that the concentrations decreased rapidly with depth until about 1,000 feet was reached. Thereafter, the smaller concentrations remained rather constant for the remaining thousands of feet of ocean depths.

This finding was interpreted to mean that lead was being introduced into the ocean much more rapidly now than 30 years ago, even faster than plankton and larger varieties of sea life can gobble it up.

Adding weight to this interpretation is the fact that barium and radium, which are similar chemically to lead but have not been added to the oceans by man, show no such decrease in concentration with depth, but instead show an actual increase with depth.

In the young surface waters of the oceans, lead was found to occur in concentrations of some two parts per ten billion parts of sea water. Although this is a small figure, it is still some 20 times larger than the concentration found in the ancient deep waters of the oceans.

As further evidence that tetraethyl lead aerosols are transported by the atmosphere, the geochemists found 10,000 times more lead in snow samples from California's Lassen Volcanic National

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-3-

Park than would be expected from ordinary soil dust, and in amounts that would easily account for the excess lead found in the oceans.

To further refine the figures on the amount of lead being transported in the atmosphere, Dr. Patterson wants to sample "fossil" snow in Greenland. He plans to tunnel into Greenland's upper few hundred feet of snow layers and compare the lead concentrations in the recent snows with those all the way back to 1900. Ordinary coring techniques cannot be used because very large samples of snow are required.