ON THE SIGNIFICANCE OF THE CONTRIBUTION MADE BY STACK FUMES FROM A STEEL PLANT OF REPUBLIC STEEL CORPORATION TO THE LEAD CONTENT OF THE ATMOSPHERE IN THE VICINITY OF THE PLANT.

The hypothesis that there is any significant association between lead poisoning among children, in South Chicago or elsewhere, and the inhalation of lead from the ambient air under ordinary conditions or under those related to the lead in the plume of smoke and fume from the plant of Republic Steel, (as indicated by the available data), is wholly unrealistic, and is, in fact, absurd.

The sources of the lead which causes lead poisoning in children are not mysterious. It is well known that these children have ingested lead in large quantities, derived for the most part, from objects in their homes coated with lead-containing paint, or that they, along with other members of their household, have been subjected to high concentrations of air-borne lead as the result of the use of highly contaminated, scavenged waste materials (chiefly, battery boxes) impregnated with lead, and burned in a stove or fireplace within their homes. There have been a few exceptions to this rule in specific instances, but the investigations of many years have served to pinpoint the problem of lead poisoning among small children, so far as the sources of lead are concerned. The contribution made by the inhalation of low concentrations of lead in the air (of the order of magnitude under consideration here), is insignificant.

It may be of incidental importance to point out that there is no reason to believe that children develop lead intoxication more readily, in the basic physiologic sense, than do adults. The threshold

level of lead in the blood, which is necessary to give origin to symptoms of lead intoxication in the adult, is the same for the child. In many years of experience, we have never seen a case of lead poisoning in the child, at the onset of illness, in which there was less than 0.08 mg. (80 micrograms) of lead per 100 grams of whole blood. This is the threshold for industrial lead poisoning in the adult. It is possible, of course and even likely, that the child absorbs lead more rapidly than does the adult, under equivalent conditions, but this, if true, does not alter the relationships between toxicity and concentration within the tissues.

From the examination of the results of the joint air-sampling survey made by the Chicago Department of Air Pollution Control and Republic Steel Corporation, over a period of ten days, it is evident that no hazard to human health is posed by the lead which is discharged into the atmosphere from the plant's No.1 Open Hearth Stack. The concentration of lead in the plume of smoke and fume downwind from the plant averages 14 micrograms per cubic meter of air, at the point where the plume reaches the level of the ground. The range of concentration observed is of about the order of magnitude that occurs in smoke or fume resulting from the combustion (or heating to high temperature) of materials which contain some lead as an incidental or extraneous material. Considering this fact, together with the intermittency of the flow of the plume (approximately 6 hours per day on certain days, dependent upon the direction and intensity of the wind), it is evident that the potential exposure to lead of persons who may work or reside in an area near the point at which the plume from the plant comes to earth is negligible.

It is important to recognize the fact that the absorption of small quantities of lead by human beings is a regular and normal occurrence.

The ingestion of lead in food and beverages by the average American adult is of the order of 0.33 mg. per day, of which from 8 to 10 percent is absorbed under average conditions. Much of the lead in food and beverages is natural in origin, and additional minute quantities are added in processing foods and preparing them for consumption.

The concentration of lead in the general ambient air of a number of American cities has been found to be of the average order of 1 to 5 micrograms per cubic meter, dependent upon geographic and meteorologic factors, coupled with a variety of sources of finely divided lead for dispersion into the air. The common sources of such lead are (a) the combustion of gasoline containing tetraethyllead, whereby inorganic compounds of lead are discharged from the tailpipes of automobiles; (b) the combustion of other fuels or waste materials such as coal, wood, vegetable or (certain) mineral products; (c) the effluent materials from industrial stacks, whether combustion products or fumes; (d) the dust from the surface of the earth dispersed by moving vehicles or air currents which pass over dry soils, highways and streets. The combined quantities from these sources, as a rule, are small, and as indicated above, are generally of the order of a few micrograms per cubic meter. The quantities of lead inhaled and retained in the lungs of persons in the general population are small, and (aside from occupational exposure in the lead-using industries) are hygienically and physiologically insignificant, at the present time. Indeed, they are smaller than those associated with the consumption of food and beverages.

Taken all in all, the situation presented by the data obtained in the survey referred to herein, from the aspect of lead in the atmosphere, is not attended by any hazard to human health.

Robert A. Kehoe, M.D., Director
The Kettering Laboratory

Date: April 24, 1962

Material: Samples of air-borne particulate matter collected on millipore filter media.

Submitted: April 11 and 13, 1962 by Department of Air Pollution Control, City of Chicago, 320 North Clark Street, Chicago 10, Illinois for Republic Steel Corporation, 116th Street and Burley Avenue, Chicago 17, Illinois

Required: Concentration of lead

Results

Analysis Number	Republic Steel Number	Milligrams of Lead in Sample	
		By Dithizone Procedure	By Spectrographic Procedure
62A-2399	53	5.880	5.750
62A-2400	Blank	0.114	0.115
62A-2446	56	0.975	0.940
62A-2447	69	0.730	0.640

From The Kettering Laboratory in the Department of Preventive Medicine and Industrial Health, College of Medicine, University of Cincinnati, Cincinnati, Ohio

Signed: J. Cholak

J. Cholak
Director, Division of
Industrial Hygiene Technology

Date: April 23, 1962

KE 0018645

N19710.01

Material: Seven samples of powdered materials

Submitted: April 23, 1962 by Mr. R. H. Ferguson, Assistant Director of Industrial Relations, Republic Steel Corporation, Cleveland 1, Ohio

Required: Per cent lead

Results

Analysis Number	Powder Sample Number	Per Cent Lead	
		Spectrograph	Dithizone
62A-2677	1	0.020	0.017
62A-2678	2	0.040	0.033
62A-2679	3	0.060	0.055
62A-2680	4	0.440	0.474
62A-2681	5	0.900	0.950
62A-2682	6	0.110	0.125
62A-2683	7	0.220	0.238

From The Kettering Laboratory in the Department of Preventive Medicine and Industrial Health, College of Medicine, University of Cincinnati, Cincinnati, Ohio

Signed: J. Cholak

J. Cholak
Director, Division of
Industrial Hygiene Technology

Date: April 30, 1962

Material: Samples of air-borne particulate matter collected on millipore filter media.

Submitted: April 3, 1962 by W. E. Sebesta, Industrial Hygienist, Republic Steel Corporation, 116th Street and Burley Avenue, Chicago 17, Illinois

Required: Concentration of lead

Results

Analysis Number	Republic Steel Number	Micrograms of Lead in Sample	
		By Dithizone Procedure	By Spectrographic Procedure
62A-2187	92XA	<0.5	0.8
62A-2188	92YB	2.9	2.0
62A-2189	92XC	<0.5	0.6
62A-2190	92YD	0.6	0.8
62A-2191	92YF	1.4	2.0
62A-2192	BL Control	0.0	-

Note: Forty per cent of each sample was used for the analysis by the dithizone method. The sensitivity of this method is approximately 0.3 micrograms per sample. Sixty per cent of the sample was used for the spectrographic analysis. All of the lead was concentrated into a volume of 1 ml. The sensitivity of detection is 0.02 micrograms/ml. All concentrations were at levels where the accuracy of analysis by spectrochemical procedures varies from ± 20% to ± 100%.

From The Kettering Laboratory in the Department of Preventive Medicine and Industrial Health, College of Medicine, University of Cincinnati, Cincinnati, Ohio

Approved: Robert A. Kehoe

Robert A. Kehoe, M.D.
Director

Date: April 6, 1962

KE 0018647

Material: Samples of air-borne particulate matter collected on millipore filter media.

Submitted: April 6, 1962 by Department of Air Pollution Control, City of Chicago, 320 North Clark Street, Chicago 10, Illinois for Republic Steel Corporation, 116th Street and Burley Avenue, Chicago 17, Illinois

Required: Concentration of lead

Results

Analysis Number	Republic Steel Number	Micrograms of Lead in Sample	
		By Dithizone Procedure	By Spectrographic Procedure
62A-2243	94TC	<0.5	<0.5
62A-2244	94YB	4.65	3.8
62A-2245	94TA	<0.5	1.1
62A-2248	93YA	<0.5	1.1
62A-2249	93TB	0.7	0.8
62A-2250	93YC	0.7	1.4
62A-2251	93TD	0.5	<0.5
62A-2252	93YE	1.0	1.1
62A-2253	93TF	<0.5	<0.5

Note: Forty per cent of each sample was used for the analysis by the dithizone method. The sensitivity of this method is approximately 0.3 micrograms per sample. Sixty per cent of the sample was used for the spectrographic analysis. All of the lead was concentrated into a volume of 1 ml. The sensitivity of detection is 0.02 micrograms/ml. All concentrations were at levels where the accuracy of analysis by spectrochemical procedures varies from ± 20% to ± 100%.

From The Kettering Laboratory in the Department of Preventive Medicine and Industrial Health, College of Medicine, University of Cincinnati, Cincinnati, Ohio

Signed: _____
Harold Imbus, M.D.

Date: April 12, 1962

KE 0018648

Material: Samples of air-borne particulate matter collected on millipore filter media.

Submitted: April 9, 1962 by Department of Air Pollution Control, City of Chicago, 320 North Clark Street, Chicago 10, Illinois for Republic Steel Corporation, 116th Street and Burley Avenue, Chicago 17, Illinois

Required: Concentration of lead

Results

Analysis Number	Republic Steel Number	Micrograms of Lead in Sample By Dithizone Procedure	Micrograms of Lead in Sample By Spectrographic Procedure
62A-2306	95YA	3.2	4.0
62A-2307	95TB	<0.5	0.5
62A-2308	95YC	<0.5	1.0
62A-2309	95TD	<0.5	0.8
62A-2310	95YE	<0.5	1.0
62A-2311	95TF	<0.5	1.0
62A-2312	96YB	0.6	1.0
62A-2313	96YD	<0.5	1.0
62A-2314	96YF	<0.5	0.8

From The Kettering Laboratory in the Department of Preventive Medicine and Industrial Health, College of Medicine, University of Cincinnati, Cincinnati, Ohio

Signed: J. Cholak

J. Cholak
Director, Division of
Industrial Hygiene Technology

Date: April 13, 1962

KE 0018649

Material: Samples of air-borne particulate matter collected on millipore filter media.

Submitted: April 11, 1962 by Department of Air Pollution Control, City of Chicago, 320 North Clark Street, Chicago 10, Illinois for Republic Steel Corporation, 116th Street and Burley Avenue, Chicago 17, Illinois

Required: Concentration of lead

Results

Analysis Number	Republic Steel Number	Micrograms of Lead in Sample By Dithizone Procedure	Micrograms of Lead in Sample By Spectrographic Procedure
62A-2393	99YA	6.8	5.0
62A-2394	99YB	0.5	0.9
62A-2395	99YC	10.0	7.5
62A-2396	99YF	0.6	0.8
62A-2397	99YF	7.5	6.5
62A-2398	99YG	0.5	0.8

From The Kettering Laboratory in the Department of Preventive Medicine and Industrial Health, College of Medicine, University of Cincinnati, Cincinnati, Ohio

Signed: J. Cholak

J. Cholak
Director, Division of
Industrial Hygiene Technology

Date: April 13, 1962

KE 0018650

Material: Samples of air-borne particulate matter collected on millipore filter media.

Submitted: April 12, 1962 by Department of Air Pollution Control, City of Chicago, 320 North Clark Street, Chicago 10, Illinois, for Republic Steel Corporation, 116th Street and Burley Avenue, Chicago 17, Illinois

Required: Concentration of lead

Results

Analysis Number	Republic Steel Number	Micrograms of Lead in Sample	
		By Dithizone Procedure	By Spectrographic Procedure
62A-2401	100TA	0.85	1.0
62A-2402	100GC	1.1	1.6
62A-2403	100TC	0.2	0.9
62A-2404	100GE	6.5	5.5
62A-2405	100TE	0.2	0.9
62A-2406	100GG	10.5	8.8

From The Kettering Laboratory in the Department of Preventive Medicine and Industrial Health, College of Medicine, University of Cincinnati, Cincinnati, Ohio

Signed: J. Cholak

J. Cholak
Director
Division of Industrial Hygiene Technology

Date: April 16, 1962

KE 0018651

Material: Samples of air-borne particulate matter collected on millipore filter media.

Submitted: April 16, 1962 by Department of Air Pollution Control, City of Chicago, 320 North Clark Street, Chicago 10, Illinois, for Republic Steel Corporation, 116th Street and Burley Avenue, Chicago 17, Illinois

Required: Concentration of lead

Results

Analysis Number	Republic Steel Number	Micrograms of Lead in Sample By Dithizone Procedure	Micrograms of Lead in Sample By Spectrographic Procedure
62A-2469	103TA	0.3	0.4
62A-2470	103QB	17.9	16.7
62A-2471	103TC	1.0	1.5
62A-2472	103QD	2.7	3.1
62A-2473	103TE	0.2	1.8
62A-2474	103QF	2.5	2.8

From The Kettering Laboratory in the Department of Preventive Medicine and Industrial Health, College of Medicine, University of Cincinnati, Cincinnati, Ohio

Signed: J. Cholak

J. Cholak
Director, Division of
Industrial Hygiene Technology

Date: April 19, 1962

KE 0018652

Material: Samples of air-borne particulate matter collected on millipore filter media.

Submitted: April 13, 1962 by Department of Air Pollution Control, City of Chicago, 320 North Clark Street, Chicago 10, Illinois, for Republic Steel Corporation, 116th Street and Burley Avenue, Chicago 17, Illinois

Required: Concentration of lead

Results

Analysis Number	Republic Steel Number	Micrograms of Lead in Sample By Dithizone Procedure	Micrograms of Lead in Sample By Spectrographic Procedure
62A-2441	101TB	10.0	10.3
62A-2442	101TD	1.7	1.8
62A-2443	101YA	2.2	1.4
62A-2444	101YC	0.7	0.8
62A-2458	102TA	2.7	1.9
62A-2459	102GC	0.0	0.0
62A-2460	Blank	0.0	0.0

From The Kettering Laboratory in the Department of Preventive Medicine and Industrial Health, College of Medicine, University of Cincinnati, Cincinnati, Ohio

Signed: J. Cholak

J. Cholak
Director, Division of
Industrial Hygiene Technology

Date: April 18, 1962

KE 0018653