

MEMORANDUM

ON THE CONCENTRATION OF LEAD WHICH SHOULD BE MAINTAINED IN THE AIR AT GROUND LEVEL, AT AND BEYOND THE BOUNDARIES OF AN INDUSTRIAL ESTABLISHMENT FROM THE VENTS AND STACKS OF WHICH LEAD COMPOUNDS, AS VAPORS OR PARTICULATE SOLIDS, ARE BEING EMITTED

1. Introductory Comments

Ideally, the metallic lead or lead compounds emitted from the vents, open operations and stacks of industrial plants in which various lead-containing materials are handled, employed as raw materials, or fabricated into finished products, should be captured and confined entirely within the premises of the plant. Only by such means could claims of damage made by individuals, groups or organizations residing or operating in the vicinity of the plant, be combatted successfully in all instances. So long as the quantity of lead which contaminates the atmosphere or other parts of the environment outside the plant is unknown in its distribution and effects, and especially so long as lay ignorance and professional controversy prevail, with respect to the quantitative relationships between lead compounds and their ability to inflict damage of one kind or another, such claims are likely to arise, and their outcome in the courts will be doubtful.

Since, however, the complete capture of such vaporized or dispersed, solid, lead-containing materials is not feasible, even in modern industry, for both economic and technical reasons, a reasonable and effective compromise, based upon the accumulation of technical and toxicological information, has of necessity been made and is now, with some notable exceptions, accepted as a practical, conventional arrangement for the conduct of life in modern industrial communities. This practical compromise, which is based on a valid physiological principle, holds that lead and its compounds, along with many other substances and types of energy (as atomic radiation, for example), exert various types and degrees of deleterious effects (as on human health, on vegetation and animal life, and on property) at or above certain reasonably well-defined levels of concentration within the appropriate medium, and

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not otherwise. With this principle in mind, a standard for the permissible concentration of lead in air, water or food can be established for each of these sources of human exposure to lead, each in relation to the others, following the acquisition of suitable information.

In the realm of human health, there is not, at the moment, an authenticated and generally accepted threshold level of lead concentration in the surrounding atmosphere breathed by human populations regularly, i.e., over prolonged indefinite periods up to a lifetime, for 24 hours per day on 7 days per week. There is an approximated level or range, however, and an acceptance of the principle, among informed professional personnel in the field of environmental health, that such a standard can be, and is on the point of being, arrived at. Actually, the time is near at hand when official standards of this type will come into a general, legal status in many countries and regions.

In the realm of damage to vegetation and crops available for food for animals and man, through the fall-out of particulate lead compounds thereon, there is sound, but limited information on which certain standards could be set, and the outcome of litigation might reasonably be predicted under ordinary circumstances.

It should be recognized, however, in relation to hazards of this type, that there is very little precedent in the courts for the just and proper adjudication of claims for damages alleged to have arisen from pollution of the atmosphere with lead (and many other chemical substances) in any other than gross amounts, and that the establishment of the significance of quantitative relationships of this type must depend upon the use of well authenticated and intelligently applied procedures of sampling and analysis of the contents of the atmosphere complained of, as well as upon soundly based knowledge of the vulnerability of exposed persons, animals and other property to damage. The manner of collecting, assembling and presenting all such information, in connection with legal actions, is the key to adequate defense if attacks should come about. The thorough quality and the comprehensive scope of

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the available information are also most important factors in discouraging attack.

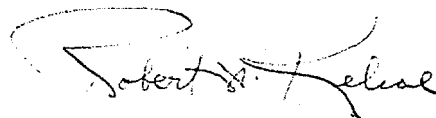
2. The Present Situation

The theoretical considerations with respect to stack height, as to the predictable levels of concentration of heavy vapors (or of particulate materials of variable composition, dimensions and mass) which will prevail at various distances from the stack are not within the province of this memorandum. Nevertheless, it may be useful to mention the fact that the concentration of lead at any point, or in any area, will vary with meteorological factors, and that the tolerable level of the concentration of lead in the environment of any person or group of persons (or of property subject to damage) can only be expressed in terms of the average level over a period of time which will include the principal sources of the variability, as, for example, variable winds, variable ambient temperatures, aqueous precipitation, increases and decreases in the emissions in relation to operations, and certain other temporal variables as night and day, and general seasonal conditions. The total response of the human population to lead in the environment, including that in the ambient air, in terms of the extent of the accumulation of lead in the body over any considerable period of time (successive years, over, perhaps, an entire lifetime) will depend upon the average level of the concentration of lead in the air over the entire period of time, provided the concentration of lead in the air has never, during such a period, reached a level sufficiently high and of sufficient duration as, of itself, to be dangerous to the population. There will, in all likelihood, be periods during which the output of lead from the body is not as great as the intake, and other periods during which the reverse will be true, dependent not only upon variations in the total intake of lead from food and beverages and from the respired air, but also upon other environmental factors. In North Central U.S.A., for example, it has been observed that the output of lead

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by normal, healthy individuals, under ordinary conditions of life, increases, relative to intake, during the late spring and summer months, thereby inducing a negative balance in the body. There is little doubt that this fundamental physiological reaction occurs elsewhere under comparable environmental conditions.

The issue that presents itself, as to lead in the ambient air, in the general human environment, may be defined as being the level of the average (overall) concentration of respirable lead (vapors and a specific range in the dimensions of dispersed particles) which, when combined with that derived from other ordinary environmental sources (principally by the ingestion of food and beverages), is balanced by the physiological capacities of the body to eliminate lead (almost entirely in the feces and urine, except in those situations in which the loss of lead through the skin in the form of sensible perspiration - outpouring of liquid sweat - constitutes a significant proportion of the output). Present evidence, from experiments in progress but not yet complete, indicates that this level for normal, healthy individuals is not far from 10 micrograms per cubic meter. In consideration of the unavoidable variations which will occur at ground level in the concentration of lead emitted from an industrial stack - variations which, for the most part, can confidently be expected to reduce the levels calculated in still air on theoretical grounds -, there should be an appreciable factor of safety in taking this level as a basis for the calculation of the height of a stack sufficient to eliminate the risk of lead absorption on the part of the population of the neighborhood.



Signed: Robert A. Kehoe, M.D.

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