

November 3, 1972

Dr. Michael Dolan
9806 Singleton Drive
Bethesda, Maryland 20024

Dear Doctor Dolan:

Thanks very much for your letter of October 9th, to which I've been slow in replying because of a desk full of accumulations, during a period of absence.

The questions which you raise are good ones, relating to the question as to what tissues most likely to be injured when the concentration of lead in the body (of man) increases to a potentially dangerous level.

It is not easy to answer your question in any but a pragmatic manner. Presumably, the likelihood of damage depends much upon the selective localization of lead in the body. While the pattern of such localization depends ultimately upon the chemical composition of specific tissue - that is, upon the opportunities for binding lead offered by the composition of the tissues, the ease with which specific tissues are injured is an important consideration. The bones, for example, capture most of the lead of the body ultimately, and in so doing, the dense bone, in particular, as distinguished from the trabecular or cancellous bone, tends to remove the lead from more vulnerable tissues. The skeleton may contain 90 to 98% of all the lead. Yet one would not say that injury, therefore, is most likely to involve the bone. The contrary fact, i.e., that the bone suffers no evil consequences, as a rule, is true. No! Susceptibility to injury, as you think of it, and speak of it, is not a matter of lead content but of the character of the tissue involved. The brain, because of its nature, is more likely to be injured or abnormal. Lead colic, very common is, almost certainly, a matter of stimulation of nerves or ganglia in the alimentary tract. Certainly, the nerves are involved in the paralytic lesions and the brain is affected in the most serious of all effects (encephalopathy). The liver, which is high in its lead content in lead poisoning, is not often damaged seriously. The other "susceptible" tissue is the blood, specifically the hemoglobin synthesis, seemingly because of the interference of lead with the enzymes involved in the manufacture of hemoglobin. Thus you see, the problem of susceptibility is a complex one, involving, as it does, the physiological functions of the body.

Your other question relative to the lead content of the bone can be answered categorically. The bone may be high in lead without illness and without any organic injury, and, indeed, without the slightest injury to the bone itself.

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For example, a workman long heavily exposed to lead (slow absorption) may have ten times the usual (normal) quantity of lead in his bones, years later, without any indication of illness. Conversely, in rapid absorption, the bones may be relatively low in lead while the patient may be sick enough to die.

The problem, here, is to understand the metabolism of lead and its distribution in the body of man, under a variety of circumstances and then for diagnostic purposes, know enough about its distribution in the individual case (whether from clinical information - history, etc.) and by analyses of materials taken from the living body (blood, urine), to interpret the situation.

As to pure gonadal effects, I suspect that this can occur without other lesions, but I have never seen this situation.

Yours truly,

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Occupational Medicine

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