January 11, 1965

Hugo D. Smith, M.D.
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Dear Hugo:

I have made a series of calculations from the analytical data gathered from about 24 fatal cases of lead poisoning among children ranging from 16 months to 5 years of age (the large proportion of these cases were about 2 years of age). The variation in the total body burden of lead in these cases was considerable, as were also the levels of concentration in the soft tissues. For example, under varying conditions and rates of absorption the concentration of lead in the liver ranged from 1.8 to 9.8 mg. per 100 grams. In some instances the skeletal concentration was considerably higher than is usual (longer than usual period of exposure) while in others the levels of concentration in the liver, kidneys and even the striated muscle were disproportionately high (relatively brief, severe exposure). The type of distribution is, therefore, as important a factor in the outcome of the case, as is the total "body burden." The latter, therefore, may be somewhat misleading, as an expression of the over-all risk of acute fatal illness. However, be these matters as they may the "body burden" is important, and in most of our cases, since 75 to 80 per cent of the lead is found in the skeleton, the concentration in the skeletal tissues is the principal feature of the calculation of the body burden.

I am enclosing herewith a list of the average weights of certain organs and tissues that make up the composite weight of children up to 4 years of age. From this, with the analytical findings in various tissues one can approximate the amounts in the several organs and tissues, and make reasonable estimates of the body burden.

I have also listed the actual weights of the tissues of a child analyzed in toto, with the quantities of lead found and the concentrations in milligrams per 100 grams, this being a child devoid of exposure to lead except in the ordinary manner.

In contrast, I have listed the estimated amounts of lead (based on calculations from the data) found in that fatal case of lead poisoning in a child in which the skeleton contained the highest concentration of lead in any of our series thus far. Here the concentration of lead was 26.80 mg. per 100 grams in the flat bone, and 13.15 mg. per 100 grams in the long bones. (We have had 6 cases in which the concentration in the flat bones was in excess of 17 mg. per 100 grams, so that you can recognize the fact that the top-most in our series is not completely divergent from others, but is simply the highest of a high group.) In this instance the levels of concentration in the liver, kidney, spleen and brain were not at the maximum. These, in individual cases in our series, have been found to be at the following high levels, liver, 10 mg. per 100 grams, kidney, 6+ mg. per 100 grams, spleen, 4.0 mg. per 100 grams,

brain, 0.6 mg. per 100 grams, and muscle, 0.1 mg. per 100 grams.

My point is, of course, that one can find a relatively low body burden, with a disproportionate distribution of lead into the soft tissues, in association with brief massive exposure and a fatal outcome; in contrast, one can find a very high body burden, with an exceedingly high concentration of lead in the skeleton, and a fairly low concentration in the soft tissues, in association with prolonged exposure of moderate intensity. One must not, therefore, put undue stress on body burden despite its obvious importance as a measure of the overall exposure.

I hope this provides you with the information which you require, sufficiently documented by analytical data to stand up under critical scrutiny.

Sincerely yours,

Robert A. Kehoe, M.D.

RAK:vr

Encl.