June 30, 1975

Robert M. Bethea, Ph.D., P.E.
Director
Texas Tech University
Institute for Environmental Technology
P.O. Box 4676
Lubbock, Texas 79409

Dear Dr. Bethea:

Dr. Kehoe has forwarded your June 20 letter to me. I do not have a paper as such for my talk at the 1975 A.I.H.C. presentation. I spoke from slides. However, the enclosed P.R. release (which needs further editing) summarizes my talk.

Some of the material came from the enclosed reprint ("Influence of Pathological Change on Lead in Human Tissues"); some will be found in the coming June issue of Toxicology and Applied Toxicology ("Lead in Human Tissues"); and some of the material is in manuscript form.

If you need more information, please let me know. Thank you for your interest in our research.

Sincerely yours,

Stanley B. Gross, PhD
Assistant Professor of Environmental Health
(Toxicology)

SBG/sl

Enclosures (2)

cc: Dr. Robert A. Kehoe

KE 0000437

P.R. release to Mr. Ron Watt of Edward Howard, Inc. for AIHA meeting 6/9/75

LEAD IN HUMAN TISSUES

Dr. Stanley B. Gross of the University of Cincinnati's Department of Environmental Health reported on a study of lead in human tissues at the June 1975 annual meeting of the American Industrial Hygiene Association in Minneapolis. Several interesting and unique findings have come out of the study.

The purposes of the study were to examine the changes in the body's lead with age and to evaluate the many variables which might affect the concentrations of metals in human tissues. Cadmium, copper and zinc were also measured in some individuals. Also working on the project were Dr. Emil Pfitzer (now at Hoffmann-LaRoche), Mr. David Yeager and Dr. Robert A. Kehoe. Dr. Kehoe, world renowned for his research on the health effects of lead, initiated the project.

The data ~~was~~ were obtained from tissue sections from forty-six (46) white males, twenty (20) to eighty-four (84) years of age, dying of sudden traumatic, chemical or medical causes. On an overall basis, the lead content of the bones tended to increase with age while soft tissues (liver, kidney, adrenal, etc.) either remained constant or actually decreased with age. Many of the changes in both the bones and other tissues were associated with disease processes; however, there were no indications that lead was responsible for any of the diseased states. Individuals with low levels of tissue lead had the same diseases as individuals with higher concentrations of lead.

The bone sections contained one-half to one-third the concentrations of lead found in the bones of individuals from England, Japan and Australia as well as from those of other parts of this country. The skeleton contains over 90% of the lead in the body. If the subjects examined here are representative, this would indicate that individuals from the Cincinnati area have been exposed to considerably less lead during their lives than the individuals examined in the other studies.

There has been conflicting data on the changes in body lead with age. This study found that the lead burden depended on the bones examined. When examining the skull or tibia, one could conclude that there was a constant increase during life; examining the rib only, one could conclude that the body burden leveled off during the middle years; or, in the case of the vertebrae, actually decreased in the final decades of life. ~~These variations in bone data depended on~~ The data also differences in the type of bone examined and the amount of osteoporosis (bone thinning) which took place. The skull and tibia sections were comprised of dense bone and the rib and vertebrae contain spongy bone tissue which undergoes thinning during life. More accurate estimates of skeletal lead will require adequate estimates of the amount of both types of bone in the body.

Dr Gross was also able to compare collectively and quantitatively the amounts of lead in the different tissues from different individuals. He found that he could classify an individual's body burden of lead into four types depending on the duration and intensity of exposure:

(1) long-term low-level, (2) recent high-level, (3) past high-level, and (4) long-term high-level types of exposure. He also found that, although blood lead reflected well the lead in the soft tissues, it could not be relied upon to tell how much lead was in the skeleton.

Perhaps of most significance to environmental health were the observations which attempted to explain the changes in lead with age. The lead concentrations and the mineral content (% ash) of many of the glandular tissues (such as liver, kidney and pancreas) shifted with age and disease toward the direction of fat and/or scar tissues. This suggested that there occurred a loss of working cells (the parenchymal cells) in these organs with age. This observation was made by a noted researcher, Dr. Edward J. Stieglitz, in 1949 and seems to have been ignored since. Dr. Gross feels that it will be necessary and feasible to examine the metal concentrations in these working cells, apart from their supporting structures, to see if there develops with aging a critical concentration of toxic metals or a deficiency of essential metals.

The findings of these studies not only provide methods for more discriminating measurements of metals and other chemical agents in human tissues but such information will probably be necessary to measure the small changes in tissues due to long-term low-level exposures to chemicals in our environment.