

Research Review



Lead Presents Danger to Children



Preparing to expose some rat red cells to lead are, left to right, Mrs. Karen S. Phauben, technical assistant; Judith Ann Post, graduate student in physiology; and Dr. Milton A. Lessler, professor in the Department of Physiology.

Lead has created a health problem for mankind since early Roman times because it gets into food, water, wine, and other commonly used substances.

Working with rats to determine the levels at which lead intoxication occurs is Dr. Milton A. Lessler, professor in the Department of Physiology. He is supervisor of a project entitled "Effect of Lead on the Respiratory Activity of Erythropoietic Cells" and sponsored by the International Lead Zinc Research Organization (RF Project 2961).

"Our objective is to find out the exact level of lead that interferes with the development and normal life of the red cells," stated Dr. Lessler. Ever since early man started working with lead, he has known about lead poisoning. In modern society, where lead and lead products are widely used, everyone is exposed to lead, but low levels of lead are easily handled by the normal individual.

Exposure of infants and children to non-food substances such as lead paint during their early development presents a particular danger. The children may chew on objects and ingest (eat) enough lead to cause damage to the central nervous system and damage to the development of red cells.

"Although the important facts about lead poisoning have been known for a long time, as yet scientists are uncertain of the safe levels of lead for air, food, and water during early development," Dr. Lessler added.

There is evidence that elevated levels of lead can cause mental retardation in children. This damage is irreversible. Lead poisoning also causes damage to the blood forming system, but this is reversible," he said.

Surveys of the inner city areas of Philadelphia, New York, and Chicago

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Antiques Give Clues to Greek Music Customs

Greek musical instruments and their use is the subject of a project being conducted by Dr. Jane M. Snyder, assistant professor in the Department of Classics, and Dr. Martha C. Maas, assistant professor in the School of Music.

Their project is entitled "Ancient Greek Stringed Instruments and Their Use in the Performance of Greek Lyric Poetry." The project is sponsored by the Center for Medieval and Renaissance Studies.

"We are interested in the size and shape of musical instruments used by the ancient Greeks during the period from the 7th through the 5th Century B.C.," stated Dr. Maas, who is a native of Louisville, Kentucky.

There are several different kinds of stringed instruments, such as the kithara (origin of the words, guitar and zither), phorminx, barbiton, and chelys

(Greek for tortoise, as the instrument is made of a turtle shell)," she said.

The most important source of evidence is the pottery which often has fine paintings of these instruments on it. Museums in Europe and America have thousands of these vases.

"Not only are we interested in the size and shape of each variety of instrument but also we are interested in who

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Lead . . .

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ated that 15 to 25 percent of the area tested showed elevated lead in blood or urine and 5 to 8 percent of these children presented one or more symptoms of lead intoxication. This situation is mainly caused by pica, the tendency for children to eat objects that they pick up.

A common source of lead poisoning among inner city children is pica of the scaling lead paint in old buildings. Dr. Lessler believes that lead exposure should be kept at very low levels in children, and can be higher for adults because of their ability to secrete and store lead.

Factors which Dr. Lessler and his assistants are trying to determine are:

1. Normal body burden of lead in young and adult animals.
2. The level of lead at which intoxication begins.
3. The level of lead at which poisoning (pathological changes) occurs.

These factors are being determined in terms of what happens to red cell development (the erythropoietic system). Rats are fed a diet which contains . . . percent lead for studies of chronic lead intoxication. This amount of dietary lead does not kill the rats, but it makes them ill when they are young, and then as they mature, they no longer show symptoms of lead poisoning.

"In the early stages of development, we can detect abnormalities in bone marrow, hemoglobin formation, and in the life span of the circulating red cells," stated Dr. Lessler. These symptoms tend to disappear as the rats mature.

We isolate the red cell precursors (reticulocytes) from the lead-fed animals, determine their lead content, and measure cell respiration with an oxygen electrode. These are compared with data from normal cells exposed to known concentrations of lead. In this way we hope to find the amount of lead which inhibits cell respiration," the physiologist continued.

Dr. Lessler and his assistants also isolate mitochondria from cells of both chronic lead-exposed animals and non-lead-exposed rats. They study the interaction of lead with the mitochondria in order to pinpoint where respiratory damage to the developing red cells

Vocoder Development Assists Deaf Students

Research supervised by Herman R. Wood, professor in the Department of Electrical Engineering and Director of the Bio-Medical Engineering Center, is concerned with the development of the visual vocoder, an electronic instrument for converting speech sounds into visual patterns as an aid to speech therapy and deaf handicapped children.

The vocoder is also used in teaching and pronunciation of foreign languages and is a successful tool in bringing about a proper pronunciation either of English in speech therapy or the vocalization of foreign languages. Primarily the objective and design of the vocoder is to help the student who is unable to talk because he is deaf.

"This vocoder gives the deaf student a feedback link so he can see what the words look like," stated Professor Wood, a native of Union City, Pennsylvania.

One part of the research is being carried out under the supervision of Professor Wood by Sanford Reich, a Cleveland, Ohio, Ph.D. candidate in Bio-Medical Engineering, Department of Electrical Engineering.

"Reich is investigating the feasibility and evaluation of possible figures of merit for the recognition and understandability of visual speech patterns. He is attempting to determine what properties of visual speech patterns are vital to the understanding of a word and what the properties are of a word spoken by a man, woman, or a person with a foreign accent," said Professor Wood.

"In order to better understand lead poisoning, we would like to find how lead moves from the plasma onto the developing red cell membrane and how the lead leaves the membranes and moves to the mitochondria where it tends to inhibit energy production," the physiologist stated.

"We have determined, in our research, the level of lead that depresses the mitochondrial respiration, and have been able to show how increased phosphate can remove lead from the mitochondria, thereby improving respiration," Dr. Lessler said. The level of lead which suppresses mitochondrial respiration is considerably higher than is the average found in the population.

Wood.

"In this project Reich synthesizes the pattern of the vocoder on a digital computer. This pattern is three-dimensional, having time distribution, frequency spectrum, and energy amplitude," he continued.

"Our vocoder in its design gives certain discreet values. We synthesize a three-dimensional matrix on the computer and determine through correlation techniques the common factors involved in the recognition and other speech characteristics," he added.

"This information will mean we can feed a word such as 'encyclopedia' into the computer and we can program the computer to present in written form the information that would be presented visually to specify what properties of speech sounds are vital to recognition," concluded Professor Wood.

The visual vocoder was developed by Jerry L. Kinner, a student in Bio-Medical Engineering and an employee of the Western Electric Company. Kinner is a native of Grovesport, Ohio.

Other research in the speech field involves conversion of speech to the sense of touch and direct recognition of speech sounds by the computer. Work has been carried out on these areas by Richard Anton and Lee Ba Tsan, both Ph.D. students in Bio-Medical Engineering.

Plans Formed for Aging Workshop

Plans for an Aging Workshop to be held September 14 and 15, 1972, at The Ohio State University are being formulated.

Information on registration may be obtained by writing to Dr. Raymond W. Lang, Department of Medical Microbiology, 320 West 10th Avenue, Columbus, Ohio 43210.

Engineer Presents Paper in Ottawa

Dr. William G. Swarner, associate supervisor in the ElectroScience Laboratory, Department of Electrical Engineering, presented a paper at the Fall Meeting of the Optical Society of America, Ottawa, Ontario, Canada, October 5 to 8.

The paper is entitled "An Infrared Scanner for Atmospheric Image Restoration Experiments at 10.6 Microns."