ENVIRONMENTAL
HEALTH
ABSTRACTS

focus:

LEAD POISONING PREVENTION

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE - PUBLIC HEALTH SERVICE
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FOREWORD

Environmental Health Abstracts presents a survey of recently published literature in the field. Effort is made to keep the abstracts as current as possible and sufficiently informative to enable the reader to decide whether the original article would be of interest to him or her. For the benefit of the reader, where possible the address of the first author is included with each abstract. Some future issues will be devoted to urban rat control, youth camp safety, and other environmental health topics.

In compiling these abstracts we utilize MEDLINE, the National Library of Medicine's remote-access retrieval service. Under this system, 3,000 foreign and domestic biomedical periodicals are searched for material dealing with or related to environmental health. We also utilize the libraries of Emory University, the Center for Disease Control and other federal agencies.

Individuals desiring to be placed on the mailing key to receive Environmental Health Abstracts as published should write to the Center for Disease Control, Attention: Technical Information Services, Bureau of State Services, Atlanta, Georgia 30333.

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ABSTRACTS

AN INVESTIGATION OF HEAVY METAL CONTAMINATION OF DRINKING WATER IN THE CITY OF TRONDHEIM, NORWAY. Kaare Stegavik -- Institute of Physics, University of Trondheim, 7000 Trondheim, Norway. BULL ENVIRON CONTAM TOXICOL 14(01):57-60, July 1975.

To determine if the municipal water supply of Trondheim, Norway, contained high levels of heavy metals, investigators collected 600 samples of water in 18 selected parts of the city. Three samples were taken from each house or apartment: one from the hot water heater, one from cold water stored in the tap for several hours, and one from running cold water. Each sample was analyzed for the amounts of copper, zinc, cadmium, and lead present; analyses were performed on the same day samples were collected. An atomic absorption spectrophotometer supplied with a carbon rod atomizer to increase the sensitivity was used to analyze the samples.

Overall results showed that concentrations of Zn, Cd, Cu, and Pb in domestic water are relatively small and apparently constitute no reason for concern. Water from old houses with old water heaters did have a higher concentration of lead: 33 ppb compared with 0.12 ppb in running cold water from the same houses.

CHRONIC PLUMBISM IN RABBITS: A COMPARISON OF THREE DIAGNOSTIC TESTS. D.E. Roscoe, S.W. Nielsen, H.D. Eaton, and J.E. Rousseau, Jr. -- Department of Pathobiology, University of Connecticut, Storrs, CT 06268. AM J VET RES 36(08):1225-1229, August 1975.

From authors' summary: Three groups of rabbits were fed a lead supplement of 25, 50, and 100 mg of Pb/kg of live weight/day for 87 days to compare the efficacies of 3 diagnostic tests--whole blood lead concentration, urinary δ-aminolevulinic acid (UALA), and fluorescent erythrocyte test (FET)--and to determine the clinicopathologic changes of experimentally induced lead poisoning in rabbits.

All rabbits given lead had whole-blood lead concentrations greater than the maximum value indicating that this measurement is a reliable indicator of lead ingestion.

All rabbits given lead had erythrocytes which fluoresced red when exposed to light rays with wavelengths from 320 to 400 nm; fluorescence was not observed in erythrocytes of control rabbits. The FET appears to be a convenient and reliable diagnostic test for lead ingestion.

In groups B and C, clinical signs of lead poisoning were mild, nonpersistent anemia characterized by the presence of poikilocytes, hypochromic erythrocytes, target cells, erythroblasts, erythrocytes with punctate basophilic stippling, reduced mean corpuscular hemoglobin concentrations, and relative lymphocytosis, neutropenia, and eosinopenia. One rabbit from the group fed the largest dose displayed partial anorexia.

ENVIRONMENTAL LEAD EXPOSURE IN CHRISTCHURCH CHILDREN: SOIL LEAD A POTENTIAL HAZARD. I.D. Shellshear, L.D. Jordan, D.J. Hogan, and F.T. Shannon -- Senior Paediatric Registrar, Christchurch Hospital, Christchurch, New Zealand. NZ MED J 81(538):382-386, April 23, 1975.

From arthurs' conclusion: A study of childhood blood levels [34 children] and of soil lead levels [136 children] has been carried out in Christchurch.

It has been shown that an unsuspected but significant health hazard exists in the city of Christchurch. A pilot programme has had worthwhile results in identifying a source of increased environmental lead.

In this possibly preventable and treatable disease, it has been shown that there is a necessity for surveillance of the population at risk, and the identification of environmental hazards.

It is suggested that further work is necessary to assess the significance of contaminated soil, a predictable, yet largely neglected sequelae to peeling paint.

It seems possible that other New Zealand cities will have a similar pattern of soil leads and children living in older wooden dwellings will have a probable exposure to soil leads of greater than 100 mg/kg. If these children also have pica for soil they are at considerable risk from lead poisoning.

LEAD CONTENT OF PET FOODS. L. Hankin, G.H. Heichel, and R.A. Botsford -- Departments of Biochemistry, Ecology and Analytical Chemistry, The Connecticut Agricultural Experiment Station, P.O. Box 1106, New Haven, CT 06504. BULL ENVIRON CONTAM TOXICOL 13(5):630-632, May 1975.

Animals that are fed lead in test diets accumulate this element in their organs. Beef cattle fed waste paper containing lead accumulate measurable quantities in the liver and kidneys, but not in edible muscle tissue. Because these organ meats are used in pet foods, the authors examined canned dog and cat food for the lead content.

Pet foods purchased from local food markets were analyzed for lead, utilizing a Perkin Elmer Model 303 Atomic Absorption Spectrophotometer. The authors found lead concentrations to range from 0.9 to 7.0 ppm. Amounts of food consumed per day were estimated at 6 ounces (170 g) for the cat and 15 ounces (425 g) for the dog; the daily consumption of lead for a cat would range between 0.15 to 1.2 mg and consumption for a dog from 0.43 to 2.4 mg per day. Assuming that the potentially toxic level of lead for a cat or dog is similar to that for a child, pets are ingesting 0.15 to 2.4 mg per day, 0.5 to 8 times the potential toxicity level suggested for children.

Arthors conclude, "...the potential risk to pets ingesting low levels of lead from pet foods merits further attention. These results may also have relevance to human nutrition because of the recent report that pet foods are allegedly consumed by people...."

EDITORIAL: LEAD POISONING AND FECUNDITY IN MAN. H.H. Hussey -- Editor, 535 N Dearborn St., Chicago, IL 60610. JAMA 233(7):767, August 18, 1975.

A report from Switzerland by Lancranjan et al indicates serious gonadal impairment in men exposed to lead in a storage battery factory. The effects were direct in that tests for hypothalamopituitary influence were negative.

Of the 150 workmen studied, semen analysis demonstrated hypofertility in lead-poisoned workers as well as in those who had a moderately increased absorption of lead.

Authors suggested several avenues to protect fertility in workmen exposed to lead for long periods: temporarily interrupting workers' exposures; regular clinical and toxicological checkups; chelate therapy for workers showing moderately increased lead absorption; and maintaining concentrations not to exceed minimum permissible levels of lead at the working sites.

LEAD IN HAIR OF URBAN AND RURAL SMALL MAMMALS. R.B. Raymond, and R.B. Forbes -- Department of Biology, Portland State University, Portland, OR 97207. BULL ENVIRON CONTAM TOXICOL 13(5):551-553, May 1975.

To investigate the effects of increased risk of exposure to high lead levels for roadside organisms, the amounts of lead in the hair of small mammals from urban and rural populations in Oregon were measured.

Authors found that members of roadside small mammal populations had significantly higher levels of lead in their hair than did members of either urban parkland or wilderness populations and that these levels "may be great enough to affect detrimentally their health and longevity." In contrast to a study by WEISS et al (1972) on human hair, authors found no significant difference between lead content in the hair of mammals trapped in 1972 and those trapped in similar habitats 60 years ago.

LEAD IN HUMAN TISSUES. S.B. Gross, E.A. Pfitzer, D.W. Yeager, and R.A. Kehoe -- Department of Environmental Health, University of Cincinnati, Cincinnati, OH 45267. TOXICOL APPL PHARMACOL 32(3):638-651, June 1975.

Tissues from 46 white males from the Cincinnati area have been analyzed for lead content. Tissue sections and procedures were standardized and detailed information was obtained in order to account for variables such as age, postmortem changes, type of death and pathological conditions. This report focuses on the lead concentrations found in 29 tissues from each person deceased, including their changes with age, and compares the results with those found in the literature. Although lead concentrations in calcified tissues increased with age, in several tissues the lead concentrations decreased. Some of these decreases were associated with aging and pathological

changes. Dense bone lead content increased steadily with age, while spongy bone lead leveled off or decreased in later years. The apparent body burden of lead of this population sample was less than that reported by others. Many of these individuals (70% or more) seemed to be in lead balance with their environment.

NEONATAL LEAD EXPOSURE IN THE RAT: DECREASED LEARNING AS A FUNCTION OF AGE AND BLOOD LEAD CONCENTRATIONS. D.R. Brown -- Department of Pharmacology and Toxicology, University of Maryland School of Pharmacy, Baltimore, MD 21201. TOXICOL APPL PHARMACOL 32(3):628-637, June 1975.

From author's abstract: Suckling rats were treated with lead both through the milk of lead-treated dams and direct injection ip. Lead was administered daily to three age groups: group 1 from Days 1-10; group 2 from Days 11-20; group 3 from Days 1-20; and learning was measured by use of the T-maze in all groups at 8-10 weeks of age. Organ weights, body weights, and blood lead concentrations were determined in suckling, weanling, and 10-wk-old rats. None of the doses used produced overt signs of lead toxicity, altered growth rate, or altered organ-to-body-weight ratios in either the pups or the dams. Blood lead concentrations were increased in the pup at 11 days but not at 21 days or 10 wk. These results show that the brain of the 1- to 10-day-old suckling rat pup is particularly sensitive to lead exposure with residual effects produced on learning present in the 8- to 10-wk-old adult after blood lead concentrations have returned to control values.

LETTER: PLUMBISM--PEOPLE AND PETS? P.L. Madan -- Boston Hospital for Women, Boston, MA. JAMA 233(7):767, August 18, 1975.

Dr. Madan does not agree with those who believe that many persons are consuming pet foods and that they are ingesting high levels of lead by consuming canned pet foods. Dr. Madan notes, "first, there is a lack of evidence that people are resorting to pet-food diets. Second, extensive records of kennels of pet-food manufacturers show no indication of lead poisoning in test animals." Dr. Madan concurs with HANKIN et al (1975) who recently reported that colored portions of wrappers from bakery confections, lollypops, chewing gum, and frozen confections tested ranged from 8 to 10,100 ppm of lead. Children may ingest lead by chewing or licking the wrappers to remove any edible material.

PORTABLE X-RAY FLUORESCENCE INSTRUMENTS FOR THE ANALYSIS OF LEAD IN PAINTS. E.H. Kaplan, M.D. Lilley, R.F. Schaefer, B. Cade, A. Desai, A. Pavda, and H.G. Orbach -- Chicago Board of Health, Room LL 33, Chicago Civic Center, Chicago, IL 60602. PUBLIC HEALTH REP 90(3):223-230, May - June 1975.

From authors' synopsis: In a study in the laboratories of the Chicago Board of Health, the results from determination of lead in paint films by X-ray fluorescence were compared with results from determination by atomic absorption.

Portable instruments of three suppliers were used for X-ray fluorescence measurements. An improved version of one of these instruments was also tested.

The results of X-ray fluorescence readings on painted card stock panels with one of these instruments compared satisfactorily with the results as determined by the atomic absorption method at levels below 10 mg of lead per square centimeter. Readings on multiple layers of these panels were additive and independent of the order of these panels. All four instruments were tested in the laboratory on painted surfaces from the walls of condemned buildings. The most recent version of each instrument gave a correlation coefficient of 0.96 or better for the linear regression of lead values in milligrams per square centimeter by atomic absorption against instrument readings.

Portable X-ray fluorescence instruments can be used in situ to determine whether the walls of a building give readings for lead above the range of 0 to 3.2. Walls with readings above this range can be considered to have 1 mg or more of lead per square centimeter and would not be in conformance with the code of the City of Chicago. Samples would need to be taken for analysis in the laboratory by atomic absorption only from those walls with readings within the range of 0 to 3.2.

SUBCLINICAL LEAD POISONING: A PREVENTABLE DISEASE. H.A. Waldron -- Department of Social Medicine, The Medical School, Birmingham B15 2TJ, England. PREV MED 4(2):135-153, June 1975.

From author's summary: Subclinical lead poisoning has been demonstrated to take several forms both in experimental animals and in humans. The most serious effects appear to be the production of hyperactivity in children and possibly in some adult delinquents. These effects are produced when the blood lead concentration is considerably lower than those which have formerly been associated with clinical poisoning and have hitherto been regarded as safe.

The best means of preventing subclinical lead poisoning is by minimizing the release of lead into the environment since this will result in a reduction in the degree of absorption. Lead is a ubiquitous component of the environment, so preventive measures would need to include the provision and enforcement of adequate lead-in-food regulations; replacing lead as a component of domestic water systems; removing lead in paint and, finally, removing lead from petrol.