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1 µg/dL have remained at that value for two years. Supported by NIEHS grant #ES04762 to C R Angle.

71 A NON HUMAN PRIMATE MODEL FOR LEAD KINETICS IN GERIATRIC HUMAN POPULATIONS

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The purpose of the investigation was to study lead (Pb) kinetics in a non human primate model of aging using K XRF measurements of Pb in bone. Rhesus monkeys (*Macaca mulatta*) were administered Pb acetate daily in drinking water for six years during adulthood; controls were given no Pb. Pb content in tibia was measured using ¹⁰⁹Cd K XRF techniques at 28 ± 2 yrs of age and again approximately 10 months later. Pb intake ended 10 years prior to the first bone measurement. Bone Pb content was significantly elevated for the Pb-treated monkeys and there were no significant changes over the repeated measurements. The accumulation rate of Pb into tibia was similar to that measured in humans, 0.1 mcg Pb/(g bone mineral)/(mcg/dl yr) in monkey and 0.05 to 0.1 in human. A half-life of Pb in a single bone compartment for the Pb treated monkeys was calculated to be 3.0 ± 1.0 years. Endogenous Pb exposure from bone was low at the time of bone Pb measurements but may have been higher from cortical than from trabecular bone. The rhesus monkey appears to be an excellent model of human bone Pb metabolism studies needed for further understanding of Pb kinetics in geriatric populations. Supported by EPA CR-817425 and CR-817156.

72 TRENDS IN BLOOD LEAD VALUES IN UNCHELATED CHILDREN WITH MODERATE LEAD POISONING

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This study determined contributions of environmental Pb exposure and Fe status to changes in BPb levels over six months in moderately Pb poisoned children (initial BPb: 25–55 µg/dL). Chelation therapy was not administered: all children had negative lead mobilization tests (Pb-MT) indicating limited response to CaNa₂EDTA. Children received these interventions: three home visits to assess lead paint hazards; notification of the D.O.H. to remediate lead hazards; educational information about the routes of lead exposure, its toxicity and treatments; Fe therapy for children with ferritin levels < 16 µg/dL; and 10 clinic visits over the six month period to reassess clinical status, reinforce educational information and obtain BPb levels. Other than a single dose on the day of a Pb-MT, no child received chelation. To quantify lead paint hazards, a visual rating of the surfaces (intact to peeling) was combined with x-ray fluorescence measurements. The sum of these assessments was termed the home environmental score (HES). Data were analyzed from 79 children. BPb levels declined by 27% over the six months. HES was correlated with BPb at enrollment but neither the initial nor later HES measurements predicted BPb. The HES was highest at enrollment and declined by 50% and 75% at the second and third home visits, respectively. Only a minority of children (20%) achieved a HES of 0, indicating no lead paint hazards. Despite some ongoing Pb exposure, a parallel fall in BPb levels was observed in subgroups of children with initially low or high HES. Fe status did not account for the change in BPb levels: Fe deficient and sufficient children had comparable rates of decline in BPb concentrations. These indicate that: 1) the HES is quantifiably related to BPb levels; 2) this correlation is significant only prior to intervention, and, 3) BPb levels decline in moderately lead poisoned children after they are enrolled in a comprehensive intervention program, even in the absence of chelation therapy and in the presence of some ongoing lead paint exposure and Fe deficiency.

73 PHARMACOKINETICS OF DRINKING WATER EXPOSURE TO SELECTED CHROMIUM (III AND VI) COMPOUNDS IN HUMAN VOLUNTEERS

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This study examines chromium uptake and excretion following ingestion of a single oral dose of three different chromium compounds in water (CrCl₃, K₂CrO₄ reduced in orange juice, and K₂CrO₄). Adult volunteers ingested a single dose of 5 mg chromium in a 0.5 liter volume. Blood and urine samples collected for up to two weeks following the dose were analyzed for total chromium. Plasma and red blood cell (RBC) chromium concentrations were transiently elevated for all three chromium compounds within 8 hours after

the dose. Total urinary chromium excretion within 4 days after the dose was less than 1% of the dose for CrCl₃ and K₂CrO₄ reduced in orange juice, but was considerably higher for the same dose of K₂CrO₄ in water. Despite the greater systemic chromium uptake and excretion following ingestion of K₂CrO₄ in water, no sustained elevation of chromium was observed in red blood cells — a marker for systemic uptake of the hexavalent form. The data suggest that ingestion of trivalent chromium as CrCl₃ or as a probable organic complex in orange juice leads to low level systemic uptake, indicated by transient elevations in RBC chromium content and slightly increased urinary chromium excretion. The magnitude of total chromium uptake is increased when K₂CrO₄ is administered in water, but the absence of any sustained elevation of RBC chromium levels indicates reduction intragastrically followed by systemic absorption of the trivalent form.

74 DERMAL UPTAKE OF HEXAVALENT CHROMIUM IN HUMAN VOLUNTEERS MEASURES OF SYSTEMIC UPTAKE FROM IMMERSION IN WATER AT 22 PPM

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This study examines the systemic uptake of chromium in four human volunteers following 3 hours of contact with water containing hexavalent chromium [Cr(VI)] at a concentration of 22 ppm (mg/L). Volunteers were immersed below the shoulders (about 13,000 cm²) in the water at 91 ± 2.5° F. On the day prior to the experiment and for six days afterwards, samples of urine, plasma, and red blood cells were collected and analyzed for total chromium. Red blood cell chromium concentrations were used as a specific biomarker for systemic uptake of hexavalent chromium. No sustained elevation of chromium concentrations was observed in red blood cells of the volunteers tested; thus, no appreciable Cr(VI) was systemically absorbed. Small increases were observed in the concentration of chromium in urine within 48 hours of exposure, indicating some Cr(III) may have penetrated the skin at a rate of about 3.5 × 10⁻⁵ to 5.2 × 10⁻⁴ µg/cm²-hr. In short, dermal exposure of humans for 3 hours at 22 ppm Cr(VI) did not result in systemic uptake of measurable amounts of Cr(VI), but a very small quantity of chromium may have penetrated the skin where it was subsequently reduced to Cr(III) before systemic uptake and distribution.

75 HANDDUST LEAD LOADING (µg/m²) AS AN IMPROVED PREDICTOR OF CHILDHOOD BLOOD LEAD (PbB) IN LONGITUDINAL STUDIES

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Handwipe lead (PbHW) is often evaluated as an exposure index reflecting the exchange between soil and dust lead and childhood blood lead (PbB). Since PbHW, usually obtained by 2 wipes of both sides of both hands, increases with surface area (SA), PbHW/5% body SA (PbHWSA µg/m²) may better reflect Pb loading in longitudinal studies of growing children. Circulating PbB (8% wt kg × PbB) similarly reflects the effect of growth on body burden: while PbB declines with age, PbBcirc may be stable or increase. In the 12 month Omaha Study of 21 urban children, 2–3 y.o., PbHW was 5.6 µg ± 4.5 (SD); PbHWSA was 3.4 µg/m² ± 2.9 (n = 244); PbB was 6.4 ± 3.1 µg/dL; PbBcirc was 73.2 ± 35.1 µg (n = 82). Although the prediction of PbB by PbHW and age (ANOVA correlated for repeat measures) was not statistically significant, PbBcirc was significantly predicted by PbHWSA: p = .011, SEE 0.6. Physiologic models may provide more valid correlates of environmental exposure than the use of age as a predictive covariable in multiple regression analyses, particularly in longitudinal studies of environmental lead and the body burden of childhood lead. Supported by NIEHS #ES04762.

76 TESTING FOR DNA-PROTEIN CROSSLINKING AFTER DRINKING WATER EXPOSURE TO CHROMIUM (III AND VI) IN HUMAN VOLUNTEERS

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Increased DNA-protein crosslinking (DPX) in circulating lymphocytes has been proposed as a potential biomarker for exposure and potential genotoxic