

Cadmium alert: Risk highest to mothers

Tests on mice indicate that pregnant and nursing women accumulate cadmium — a toxic heavy metal — at a rate two to three times higher, per unit exposure, than do other segments of the population. This could point to a potential, delayed health hazard for mothers and explain why past studies of human adults reported small but statistically significant higher levels of cadmium in women than in men.

The study, conducted by Maryka H. Bhattacharyya and Bartlett D. Whelton at Argonne National Laboratory near Chicago, exposed female mice to cadmium in drinking water at concentrations near those found occurring naturally (generally less than one part per billion). Absorption and distribution of the element were measured in pregnant females, lactating females, females exposed both during pregnancy and lactation, and two groups of nonpregnant mice.

Compared with nonpregnant mice, cadmium uptake was two times higher in the pregnant group and three times higher in both the lactating and combined pregnancy/lactating groups. For all three groups experiencing elevated uptake, cadmium levels in the kidneys and in the upper section of the small intestine were three times higher than in the control groups. Mammary tissue exhibited a five-fold increase during lactation. Inter-

estingly, however, Bhattacharyya said a protective barrier in breast tissue screens out nearly all cadmium from milk going to the baby so that the risk of toxicity is restricted to the mother. Details of the study were reported in Anaheim, Calif., last week at a meeting of the Federation of American Societies for Experimental Biology.

Providing nourishment for their babies, pregnant and nursing mothers generally develop a calcium or iron deficiency. Previous studies have shown that the body compensates for these dietary deficiencies with metabolic changes in the gastrointestinal tract, Bhattacharyya told SCIENCE NEWS, increasing the body's efficiency to take in those metals. She said that she and Whelton (now at Eastern Washington University) looked at cadmium under the assumption that the increased uptake of iron and calcium during pregnancy may be indicative of a phenomenon involving other metals.

Cadmium's slow rate of excretion leads to a gradual body buildup over time peaking between the ages of 30 and 50, she said. There have been severe poisonings, though most cases of toxicity result from chronic, low-level occupational exposures to the metal. Symptoms of cadmium poisoning include chronic bronchitis, emphysema and kidney problems.

Next, Bhattacharyya plans to see whether uptake of cadmium during pregnancy results in toxicity at lower levels of exposure. It's possible, she says, that cadmium taken in during this special period binds to the body in a nontoxic form. □

Sex change: Good for some

Sex changes, to state the obvious, are not for everyone. But are they for anyone? A Johns Hopkins University follow up of 32 transsexuals reported two years ago that after an initial two- to five-year period of elation following the operation, most such persons experience a painful reemergence of preexisting emotional and personality problems. "It is highly questionable whether sex reassignment per se could be considered personally and socioeconomically rehabilitative," said the study's author, psychiatrist John Meyer (SN: 5/14/77, p. 312). At least partially as a result of Meyer's findings, Johns Hopkins subsequently ceased performing sex-change surgery.

Now an eight-year follow up of 17 male-to-female transsexuals appears to conflict with the results obtained at Hopkins and elsewhere by suggesting that sex-change operations may actually be beneficial, on a long-term basis, for appropriate individuals. "For a select group, surgery is still the best means of coping with transsexualism . . ." report University of Washington psychiatrists D. Daniel Hunt and John L. Hampson in the April AMERICAN JOURNAL OF PSYCHIATRY.

The 17 males who underwent the operations were selected from more than 250 applicants to the University of Washington's Gender Dysphoria Clinic, which operated from 1968 to 1972, when its surgeon "moved out of state," according to Hunt and Hampson. In the stringent selection process, persons were chosen who exhibited:

- Cross-gender identification of long-standing duration — as determined by psychiatric evaluation — otherwise irreversible, and not associated with a psychotic state.
- Physical appearance, demeanor and behavior convincing enough to allow the person to fulfill the role as a member of the opposite sex in society. The person was required, in fact, to have demonstrated this ability by having lived for at least six months in the new sex role.
- Intelligence sufficient to understand the limitations and possible hazards of the operation, "as well as its inevitable consequences (e.g., infertility)."

Meeting these strict criteria, according to Hampson and Hunt, is the key to success in sex-change operations. "It should not be enough that individuals seeking surgery and capable of putting up with a year's trial [in the new sex role] should automatically be eligible for surgery," they advise. "The treatment team should continue to exercise discretion in selecting groups for whom the best prognosis is possible."

Their confidence in the selection procedure stems from the follow-up results

What you don't digest can't hurt you

A new concept in edibles will reach the Food and Drug Administration this week — additives that never get into the body beyond the digestive tract. Dynapol, a Palo Alto firm, has been working for years to perfect preservatives, colors and sweeteners that serve a desired function in food or in the mouth but never are absorbed from the intestines (SN: 3/26/77, p. 198). Dynapol's lead-off additive is a preservative it calls anoxomer. Later in the year Dynapol expects to complete safety testing on a set of food colorings.

Anoxomer was selected from about 150 new compounds tested by Dynapol scientists, says Steven Goldby, president of the company. The compound prevents oxidation of food, and thus rancidity, as effectively as the currently used preservative BHT, but it is too large to cross the intestinal lining into the body, Goldby says. Preservatives now on the market are worrisome because they cause animal livers to enlarge in laboratory tests. In contrast, Goldby says, they have seen no biologically significant effects of anoxomer at any dose in any animal.

The new preservative has been through five years of safety testing at Dynapol. Investigators have found that it is not ab-

sorbed from the intestines by humans, rats, mice, guinea pigs or rabbits. Anoxomer has been tested for acute, chronic and lifetime toxicity, as well as for birth defects and reproductive effects in a variety of laboratory animals. It has also passed four types of short-term mutagenicity tests.

Dynapol plans to ask that the FDA grant the new "fast track" review status to anoxomer, because of the projected safety advantages of anoxomer over additives now in use.

Anoxomer derives its activity from hindered phenolic groups, the same chemical groups that make BHT active. But being a branched polymer, anoxomer is quite different chemically from BHT. The distribution of molecular weights for the polymer is 500 to 50,000 daltons. The large size of the molecules prevents them from entering the body's metabolism. Goldby says in addition there is no breakdown problem. Scientists have heated the preservative to 390°C and it remained intact.

While the company is not releasing any cost estimates, there is "no question about feasibility," Goldby says. He points out that an antioxidant is used in only small amounts, parts per million, in food. □

with the 17-member group. "Although the group was quite diverse, it would appear that on the whole they fared well," the researchers report. "Prediction of psychosis and high suicide rates for transsexuals in the earlier literature are certainly not borne out." Meyer of Johns Hopkins declined to comment on the study.

The study found that between 60 and 70 percent of the transsexuals either improved or stayed at a high level of psychological functioning. "While there were gains in the areas of sexual adjustment and family acceptance, there were only modest gains in the ability to be self-sufficient financially and establish closer interpersonal relationships," they report. In addition, Minnesota Multiphasic Personality Inventory scores indicate that "the overall personality styles of these individuals have not changed.... One of the first, and perhaps most remarkable impressions drawn from comparing these testings, separated by more than 8 years, is how similar they are."

Although the transsexuals were "struggling with intimacy and economic problems and exhibited few changes in degree of psychopathology" eight years after their surgery, they "were very satisfied with their decision to have surgery and with their course following surgery," the researchers report. "If one were to judge solely by the patients' own opinions, the overwhelming conclusion would be that surgery is an extremely beneficial procedure. In spite of the considerable pain, expense and delay, they would all choose the same course." Hunt and Hampson reiterate that "in our judgment, one can increase the likelihood of a favorable outcome for the surgically reassigned transsexual by selecting candidates on the basis of their presurgical ego strengths and their adjustment during the pre-surgery period while living in their new gender/sex role." □

Magnesium and heart deaths

A link between soft drinking water and cardiovascular deaths was made several years ago (SN: 9/11/71, p. 175). And it has become apparent since then that the culprit is not some element in soft water, but rather an element in which soft water is deficient — magnesium. Now the latest piece of evidence linking magnesium deficiency in soft water with heart deaths is reported in the April 11 SCIENCE by Prasad D.M.V. Turlapaty and Burton M. Altura of the State University of New York Downstate Medical Center in Brooklyn.

Several scientists have noted that there are lower than normal levels of magnesium in the heart muscles of sudden heart death victims. This discovery, along with the finding that soft water is deficient in magnesium, made Turlapaty and Altura

wonder whether magnesium deficiency might cause spasm of arteries feeding blood and oxygen into the heart and leading to heart failure and sudden death.

They isolated coronary arteries from dogs, incubated the arteries in solution, then exposed them to normal, high or low concentrations of magnesium. They report that low magnesium levels increased artery tone compared with that exerted by normal magnesium levels, and high magnesium concentrations decreased artery tone. What's more, low magnesium concentrations caused the arteries to respond much more to body chemicals that constrict coronary arteries than did normal magnesium concentrations, while high magnesium levels made the arteries respond much less. "Thus our results," Turlapaty and Altura conclude, "which demonstrate that reduced magnesium in the coronary vasculature environment exerts

profound influences on coronary vascular tone and reactivity, support the hypothesis that hypomagnesemia could produce progressive vasoconstriction, resulting in coronary arterial spasm and, finally, sudden-death ischemic heart disease."

But exactly how does magnesium deficiency lead to coronary artery spasm at the cellular level? Turlapaty and Altura aren't sure, but research by other scientists suggests that extracellular calcium and intracellular concentrations of the intracellular messenger cyclic AMP may serve as go-betweens. For instance, when the influx of magnesium into artery muscle cells is lowered, it has been found to make calcium flow into the cells in abundance and to cause artery muscle contraction. Also, magnesium has been noted to activate an enzyme involved in cyclic AMP synthesis, and cyclic AMP is known to be involved in coronary artery contraction. □

Narrow window on sex



Only for 20 minutes, between dawn and sunrise, does the female praying mantis assume a mating posture. Here she hangs, abdomen curled enticingly, beneath a leaf.

When an animal's best defense is mimicking a dead leaf, vigorous though necessary activities such as mating are risky. A tropical species of praying mantis sidesteps this danger by mating early enough to beat even the early bird. Michael Robinson and Barbara Robinson of the Smithsonian Tropical Research Institute in Panama report that the mantis *Acanthops falcata* copulates only during a 20-minute period between dawn and sunrise.

Efforts to raise the tropical praying mantises in captivity had been frustrated by the insects' refusal to mate "at civilized hours of the day," Michael Robinson says. The mantises were kept apart at night to prevent cannibalism and were put together at times from 8 a.m. until late at night.

The trick to mantis-mating was found when the Robinsons' young puppy insisted on being taken for a walk early one morning. "All of a sudden, at dawn, we noticed that all the males within the large outdoor cages became unusually active," Michael Robinson says.

When the biologists introduced female

mantises into the cage, just before sunrise, the females raised their wings and curled their abdomens, exposing glands that seem to release a sex attractant. The males settled close to the females, then jumped the last few centimeters and grasped a mate with their legs. The mantises do not mate at night, although it might be safer, because the final leap of the male onto the female is mediated by sight, Michael Robinson speculates. The male must jump accurately to avoid being seized and devoured by his intended. The Robinsons, however, observed little of the expected cannibalism during copulation.

Dark-to-light transitions trigger the brief matings, the Robinsons find. When they reversed normal light and dark periods in an environmental control chamber, the insects adjusted their sexual activity within three days.

Daily "narrow time windows" of behavior may turn out to be a rather general principle of animal survival, Michael Robinson suggests. "There well may be a 'diary' of biological activity in the tropics that is largely unconsidered and certainly uninvestigated," he says. □