environment

MERCURY

Fish diet probably safe

A diet with most protein coming from fish is now probably safe from the point-of-view of mercury dosage, says Richard Ronk, guideline and compliance chief for the Food and Drug Administration's Bureau of Foods.

Ronk gave this opinion in a letter to the mother superior of a convent where the nuns consume large amounts of fish—with one caveat: avoid swordfish.

Ronk explained in an interview that although FDA seized 800,000 pounds of swordfish that exceeded the FDA limit of 0.5 part per million of mercury (SN: 1/2/71, p. 7), some of the contaminated material may have been missed because of the peculiar marketing patterns for swordfish. Occasional consumption of such swordfish probably would not harm the average citizen but could possibly be hazardous to consumers of large amounts, he said.

Clear-cut symptoms of methyl mercury poisoning show up when the blood level is at 0.2 microgram of mercury per gram. But because of the possibility of sub-acute poisoning below this level, the official guideline is set at 0.02 microgram—a tenfold safety margin.

Given the 70-day half-life of mercury in the human body, daily consumption of about 600 grams of fish at the 0.5 ppm level—an amount very few people could consume—would result in the clear-cut toxic symptoms. But consumption of only 60 grams daily, well within the amount that might be consumed by regular fish-eaters, would cause the safety level of 0.02 microgram to be exceeded.

Ronk is confident FDA action has assured that all fish other than swordfish are under the 0.5 ppm level.

EUTROPHICATION

Ammonium the limiting nutrient

Scientists, politicians, detergent companies and others argue about the role of "limiting nutrients" in the process of eutrophication. A limiting nutrient is a substance which when added to or removed from a body of water will stimulate or retard eutrophication. Detergent companies claim that the evidence increasingly shows that phosphates are not limiting. But a large body of scientists disagree (SN: 7/4/70, p. 17) saying phosphates often are.

Researchers from the Virginia Polytechnic Institute and State University have now shown that in a eutrophic lake in Antarctica, airborne ammonium from penguin guano clearly has much more influence in eutrophication than phosphates.

Working under the direction of Dr. B. C. Parker, Dr. G. L. Samsel and E. B. Wodehouse studied the effects of the ammonium in Humble and Skua Lakes during the austral summer of 1970-71 near Anvers Island, Antarctica. During an earlier study the two lakes showed strikingly different trophic rates as gauged by total chlorophyll and carbon fixation rates. Skua Lake is oligotrophic; Humble Lake, eutrophic.

The researchers first duplicated nutrient conditions of the two lakes in the laboratory. Then in the field, they placed plastic cylinders in the two lakes and added both artificial nutrient salts and penguin guano. The results of both laboratory and field tests: ammonium, the nutrient in short supply in Skua Lake and in more abundant supply in Humble Lake, accounts for the trophic levels. Phosphates have only a secondary role.

TRACE ELEMENTS

Selenium can be detoxified

Selenium is an essential nutrient for animals, but it has to be available in the right amounts: Too little causes degeneration of organ tissue; too much is highly toxic, sometimes causing death of sheep and cattle.

Earlier research indicated an amino acid, methionine, in combination with vitamin E, decreases tissue levels of selenium and thus makes it less toxic.

A team of chemists at the Agricultural Research Service in Beltsville, Md., headed by Dr. Orville A. Levander, fed rats various combinations of methionine and vitamin E, as well as other substances, to determine effects on selenium toxicity. All combinations of vitamin E and methionine protected against toxicity, but the best protection was at the highest vitamin E levels. Certain fat-soluble antioxidants, added to diet in place of vitamin E, provided protection in varying degrees. Peculiarly, these same antioxidants were previously reported to be active against liver damage in selenium-deficient rats.

FOREST CONSERVATION

Clear-cutting depletes soil

Clear-cutting of forests—the commercial cutting of all trees in a given area—has been subjected to increasing criticism (SN: 12/5/70, p. 430).

Dr. Robert R. Curry, a University of Montana environmental geologist, told a meeting of the Association of Southeastern Biologists in Richmond, Va., April 16, that the practice is depleting soils and soil nutrients far faster than they can be replaced by the geochemical weathering that takes place over periods of tens of thousands to millions of years.

Soil is what Dr. Curry terms a "dynamic biogeochemical system of nutrient and water exchange," with dying organisms giving up their nutrients to the soil, which then makes them available for living organisms.

The nutrients generally exchanged are potassium, sodium, calcium, magnesium and phosphorus, with lesser amounts of 14 micronutrients such as iron, manganese and boron. The actual structures allowing the exchange are clay minerals (as opposed to a single discrete substance called clay) and organic colloids. Over geologic time, a negatively charged complex is created that absorbs the nutrient metallic ions and keeps them from being leached away. These cations eventually become available to plants. The application of fertilizers alone cannot replace lost nutrients—because the soil must first be fit for holding the nutrients.

Besides the outright physical removal of soil by erosion from cut areas, says Dr. Curry, in at least one instance (which may be more broadly generalizable) microflora in cut-over areas convert organic nitrogen into ammonia. The ammonia is then oxidized to nitrite and hydrogen ions. The hydrogen ions displace the nutrient cations, which are then flushed from the ecosystem by the far heavier spring runoff.