whole looks like from a slice." Bromberg said that when the model is further advanced, it will offer his center, and others, chances to collaborate. "We work to understand how human cells react to toxicity. That's an important piece of the picture function we all are trying to reach."

Contaminants in Fish

From the icy waters of Boston Harbor to the warm waves of San Diego Bay, bottom-dwelling fish suffer liver damage caused by chemical contaminants, according to researchers at the National Oceanic and Atmospheric Administration.

But seafood lovers need not panic, because damaged specimens were captured primarily in urban waters where commercial fishing is prohibited, said Lynda L. Johnson of NOAA's Northwest Fisheries Science Center in Seattle, Washington.

"This is not a situation where the general public needs to be really worried about the fish they buy in the supermarket," Johnson said, adding that most people don't eat fish livers anyway. "But I wouldn't go out and catch bottom fish in contaminated parts of Boston Harbor and eat them."

In a study of winter flounder collected from 22 sites along the Northeast Coast, Johnson found that liver damage was "significantly elevated" in fish from contaminated urban waters such as Boston Harbor, Massachusetts, and Raritan Bay, New York. Biological damage was attributed to polycyclic aromatic hydrocarbons (PAHs), DDT, and chlorodanes. Yet, polychlorinated biphenyls (PCBs) were "not significant risk factors for any of the lesions observed," Johnson wrote in the December 1993 issue of Environmental Science & Technology. Oily street runoff and industrial processes add PAHs to urban waters. DDT, chlorodanes, and other ecologically persistent pesticides remain in water despite bans and restrictions on their use.

Older fish are most likely to be affected by such contaminants, Johnson said. Female specimens captured during the spawning season seemed less vulnerable to contaminants, but Johnson cautioned that this finding has not yet been confirmed. (Spawning fish may have migrated to urban bays from less contaminated waters.)

A second NOAA study prepared by Johnson's colleague Mark S. Myers revealed that ocean sole, starry flounder, and white croaker captured from 27 sites along the West Coast, from Alaska to southern California, were also affected by chemical contaminants. Liver damage and cancers were prevalent in fish collected from urban waters surrounding Los Angeles, as well as Puget Sound, San Francisco Bay, and San Diego Bay. Myers reported in the February 1994 issue of EHP: Lesions were linked to PAHs, DDT, and its derivatives, chlorodanes, dieldrin (an insecticide), aromatic hydrocarbons, and PCBs. Like Johnson, Myers detected more liver damage in older fish. Yet, he reported that gender of fish was not a consistent risk factor.

Faced with conflicting information on PCBs, Johnson and Myers can only speculate that these contaminants may work with other chemicals to promote liver damage. "What we think might be happening is that the primary carcinogens, the ones that cause DNA damage or mutations, are the PAHs, while the PCBs are promoters," Johnson said. "Once DNA damage or mutagenic effects have occurred, PCBs may promote the growth of those damaged cells." Chlorodane and aromatic hydrocarbons may also require further study. Johnson linked an abnormality known as "hydropic vacuolation" with exposure to PAHs and chlorodane. But in previous research by M.J. Moore of the Woods Hole Oceanographic Institute, winter flounder exhibited no such response to these contaminants. Yet, Moore supports the NOAA findings and says his "exposure protocol" probably didn't reflect natural conditions. "I would not interpret negative results to confound the good statistical work" of the NOAA team, Moore said.

While researchers continue to investigate the biological effects of various contaminants, consumers should simply avoid eating fish livers, said Chester Zawacki of New York's Department of Environmental Conservation. "The liver is an organ that has been referred to jokingly as the oil filter of the body," he noted. Because pollutants accumulate in fatty tissues, heavily fatted fish such as striped bass are most vulnerable to contamination. "Winter flounder, cod, and other low-fat fish generally show very little contamination of their edible tissues," Zawacki said.

While the verdict may be out on the effects of eating contaminated fish, the Department of Health and Human Services has moved to err on the side of caution. On January 21, Secretary Donna Shalala announced new rules for seafood handling that will require seafood processors to prove that their seafood has not been exposed to unacceptable levels of water pollution such as bacterial contamination or toxins. The new system of controls, known as Hazard Analysis Critical Control Points, will take effect a year from the end of a 90-day public comment period.

Plutonium Problems

The Department of Energy's recent discovery of approximately 1900 pounds of plutonium in a dump at the Idaho National Engineering Laboratory (INEL) underscores concerns about the impact of nuclear facilities on surrounding communities.

In December 1993, the Department of Energy estimated that between 1320 and 1980 pounds of plutonium waste were sent to INEL from the Rocky Flats nuclear weapons plant near Denver, in addition to 807 pounds that DOE previously said had been shipped to Idaho. The wastes are buried in a landfill that sits atop a widely used aquifer.

Idaho officials do not yet know whether the additional wastes increase health risks to area residents, according to Terry Smith, spokesman for the state's INEL monitoring program, though no plutonium has been found in the aquifer, he said.
Drinking Water Guidelines

As the U.S. Congress begins reauthorization of the Safe Drinking Water Act, a group of international organizations is releasing guidelines for water quality around the world. The “Guidelines for Drinking-Water Quality,” which are being published in three volumes during 1993–1994, are the result of efforts by the International Programme on Chemical Safety (IPCS), a joint venture of the United Nations Environment Programme, the International Labour Organization, and the World Health Organization, and more than 200 experts from 40 developed and developing countries.

More than half the world’s population is exposed to water contaminated with pathogenic organisms, and thousands of chemicals have been found in drinking water supplies around the world. The guidelines recommend acceptable levels of exposure for a variety of bacterial organisms, such as those that cause cholera, dysentery, guinea worm infection, and hepatitis, and for 95 chemical contaminants including benzenes and ethylenes, chlorinated alkanes, aromatic hydrocarbons, disinfectants, inorganic chemicals, and radiological contaminants, according to the November issue of the IPCS News.

The current guidelines were developed in a series of planning and review meetings that convened to evaluate health risks and set recommendations for exposures. To prevent exposure to microbiological contaminants, the guidelines recommend drinking only water in which indicator organisms Escherichia coli or heat-tolerant coliform bacteria are not present in any 100-milliliter sample and that all water sources be protected against contamination, especially from human or animal wastes. To develop recommendations for chemical contaminants, review group meetings examined chemicals in the framework of two dose–response models: those that exhibit a threshold level for adverse effects and those for which there is a probability of toxic effects at any level.

Guideline values (acceptable levels of exposure) are recommended for threshold-type chemicals by identifying a no-observable-adverse-effect level and for nonlinear types by using mathematical extrapolation models to calculate guideline values. The review groups relied heavily on previous chemical risk assessments by the IPCS in the Environmental Health Criteria monographs, the Joint FAO/WHO Meeting on Pesticide Residues, the Joint FAO/WHO Expert Committee on Food Additives, and the International Agency for Research on Cancer, according to the IPCS News.

The most recent guidelines are the latest in a long history of WHO involvement in setting water standards. In 1958, WHO published its “International Standards for Drinking-Water,” followed by several updates over the years, including a name change to “Guidelines for Drinking-Water Quality” to reflect the advisory nature of the guidelines. The guidelines do not carry the authority of legal water quality standards, which national authorities are responsible for setting. However, scientists hope the guidelines will help governments set standards where they do not yet exist or update the ones they have. In addition, the guidelines also call for local health risk assessments, monitoring, and preventive and remedial measures to ensure water quality.