Lung cancer risks from radon exposure

Living in a home with high concentrations of radon gas can significantly increase an individual's risk of developing lung cancer, but that risk will decrease if the radon exposure is curtailed, according to a report released last week by the National Academy of Sciences. The report, called the most comprehensive to date on the health risks of radon, also found that long-term exposure to this odorless, colorless gas hurts smokers most of all.

"There's a major difference between smokers and nonsmokers. It is truly, to me, the most compelling issue of the whole radon story, especially in males," says Jacob I. Fabrikant of the University of California at Berkeley, who chaired the committee drafting the report.

Radon is produced by the radioactive decay of radium, which is itself an indirect "daughter" of the uranium in rocks. The gas seeps into buildings through foundation cracks and other openings, and can accumulate in poorly ventilated areas. When radon decays, it creates daughters that emit alpha particles. In the lungs these particles can cause the cell damage that eventually leads to tumor growth (SN: 8/15/87, p.105).

As the focus of their three-year epidemiologic study, the academy committee combined data on radon exposure and lung cancer from four separate studies of underground miners in Ontario, Saskatchewan, Sweden and the Colorado Plateau. New statistical techniques enabled the researchers to include such variables as the cancer risk for different age groups and the time lapse after exposure ended. However, because the study was based on data from male miners, there is some uncertainty about extrapolating the risk estimates to the home environment and to women and children.

The researchers found that lung cancer risk increases with the duration of exposure, but once exposure is cut, the risk begins to drop after about 15 years. For smokers, the effect of exposure does not merely add to their already high risk of dying from lung cancer; it *multiplies* the risk, says Fabrikant.

Richard Guimond, head of the Environmental Protection Agency's radon division, says the report confirms the significance of the radon problem: "They are basically saying that radon causes serious risks at levels that we've seen in the environment, levels that we've measured in homes throughout America." The agency has estimated that up to 10 percent of U.S. homes have radon concentrations above the maximum recommended value. — *R. Monastersky*

Water contents hard to swallow?

The oil spill now creeping down the Ohio River provides an unpalatable lesson in how vulnerable the U.S. water supply is to pollutants. But even "normal" tapwater can contain organic contaminants from oil leakages and industrial wastes, according to a new report.

In the most comprehensive compilation of water-quality surveys undertaken since the passage of the Safe Drinking Water Act in 1974, the Center for Study of Responsive Law reported last week that some 2,100 compounds, mostly organic, have been detected in U.S. drinking water. Of these, about 190 are known or suspected to be dangerous, says the Center, and the health effects of the rest have not been adequately studied. The Washington, D.C.-based public interest group also found that 19 percent of the 18,157 water systems tested to date for unregulated compounds are contaminated by at least one organic chemical.

The ability to eradicate cholera and other water-borne diseases that killed thousands last century "has lulled [U.S.] regulatory authorities and the public alike into a false sense of well-being regarding [this century's] growing threat of toxic organic chemicals," write Duff Conacher and his colleagues.

The analysts charge that the Environmental Protection Agency (EPA) has not exercised its full authority under the water act. They say the agency should require local monitoring of a wider range of pollutants, since the lack of such data has stalled health-effect studies needed for setting standards.

The group also argues that EPA should require some local water authorities to use treatments, such as granular activated carbon (GAC), that remove toxic organic chemicals much more effectively than standard techniques. According to Conacher, only 50 of the 60,000 public systems use the improved treatments.

Larry J. Jensen, EPA's assistant administrator for water, asserts that EPA has scrutinized the organics data and has developed "a very deliberate strategy [to regulate] those chemicals of greatest concern to human health." Jensen argues that most of the Center's 2,100 compounds occur naturally and that the 190 potentially dangerous chemicals are typically detected at insignificant levels. And while GAC is effective, he says, it is not a panacea; for example, it cannot remove vinyl chloride, one of the most toxic and ubiquitous organics. — *S. Weisburd*

Hemoglobin may be common in plants

Researchers in Australia reported this week the discovery of hemoglobin in the roots of a plant in the elm family. The finding represents the first time hemoglobin has been found in a plant lacking specially adapted "root nodules," and leads the researchers to suggest that hemoglobin genes might be present in all plants.

Scientists have for years been puzzled by the presence of hemoglobin, the oxygen-carrying component in blood, in some plants. It exists in single-unit monomers in plants, while in humans it combines into four-unit tetramers. Mysteriously, it has been found solely in the root nodules of a specialized class of plants that associate with nitrogen-fixing bacteria — microorganisms capable of capturing atmospheric nitrogen and making it available to plants. It is not obvious, however, why hemoglobin would appear only in such plants. In light of this narrow plant-host range, some researchers have proposed that the gene for hemoglobin might have been transferred from an animal, such as an insect, early in the evolution of those particular plants.

W. James Peacock and his colleagues at the Commonwealth Scientific and Industrial Research Organization in Canberra used DNA probes to identify the hemoglobin gene in the non-nodulating plant, and confirmed by the presence of messenger RNA and protein that the hemoglobin gene was indeed active. Their research appears in the Jan. 14 NATURE.

"All of this is building up to a concept that the hemoglobin gene is a regular part of the plant genome," Peacock says. If the gene can be found in a variety of other plants, such as cereals, ferns and pines, he says, "it would indicate that very likely all plants have it and that probably the organism that gave rise to both the animal kingdom and the plant kingdom had this hemoglobin gene." Such a theory would eliminate the need for an animal vector.

It's not clear what role hemoglobin might play in plants. "It seems unlikely to us that it has a function in facilitating oxygen diffusion, because there just isn't enough of it there," Peacock says. But it's possible, he theorizes, that hemoglobin may be involved in detecting the amount of oxygen available to the roots. Oxygen levels can get very low after heavy rain or flooding, he says, triggering a plant's roots to undergo a major change of metabolism.

"Hemoglobin might be involved in the cascade of signals that say, 'Hey, there's low oxygen here, so switch off oxidative metabolism and switch on the anaerobic-response gene.'" — *R. Weiss*