Rodent cancer tests: Worth the expense?

Today, unless there's epidemiologic evidence that a chemical causes human cancers, the only accepted way to identify likely carcinogens is to see whether they cause cancers in two-year experiments with mice and rats. But researchers from a trio of U.S. universities believe a more cost-effective — and comparably predictive — mathematical substitute can be designed to determine the carcinogenicity of many chemicals. They describe such a controversial substitute in the Dec. 15 NATURE.

Rodent bioassays cost $1 million to $4 million per chemical, and at best are only about 70 percent accurate in predicting what would happen in humans, says Fanny Ennever, an environmental chemist and risk analyst at Case Western Reserve University in Cleveland. Moreover, she notes, societal costs of misdiagnosing a chemical's hazard can be high — in benefits lost when a useful chemical is withdrawn from commerce, or in lives lost when exposure to a dangerous chemical continues. The new carcinogenicity assessment she and her co-workers propose would consider a chemical's dollar value to society, the potential number of people who could be exposed to it, and the likelihood it is carcinogenic — based on analysis of its structure and on results from assays indicating its ability to cause genetic mutations in cells.

Where societal costs of a misdiagnosis would be high, Ennever and her colleagues suggest researchers continue to conduct rodent bioassays. But their analyses suggest this would happen in only a few percent of cases. The rest of the time, their calculations indicate, society would be equally served in terms of safety, and better served in terms of cost, by simply treating the chemical in question as a carcinogen or benign chemical, based on guidelines they propose.

Toxicologist James Huff, while finding "some merit" in this scheme, challenges its implication that anything other than rodent bioassays can reasonably "predict" carcinogenicity. A rodent-assay expert, Huff works on the National Toxicology Program in Research Triangle Park, N.C. — which probably conducts more rodent bioassays than any other organization. All too often, says Huff, chemicals that appeared benign in mutagen assays and chemical analyses turn out to be potent carcinogens. Moreover, he argues, despite the Ennever team's claim to the contrary, the best available data suggest "rodent bioassays offer 95 to 100 percent [carcinogen] predictivity."

Huff suspects the team's mathematical formula will be most useful "in helping us in the difficult task of selecting chemicals for study in rodents." — *J. Raloff*

Male teenagers at risk of steroid abuse

About 1 out of 15 male high school seniors in the United States take anabolic steroids, according to new research. "We've established for the first time on a national basis that significant numbers of high school students are using these drugs," says Charles E. Yesalis III of the Pennsylvania State University.

Yesalis, William E. Buckley and their colleagues distributed a confidential questionnaire on steroid use to seniors in 46 public and private high schools across the nation. Just over half of the 6,765 seniors agreed to participate in the study. In the Dec. 16 JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION, the researchers say 6.6 percent of 12th-grade males surveyed reported steroid use.

More than one-third of the self-professed users said they first started taking the body-building drugs at age 15 or younger. Another third said they began taking them by age 16. "These data indicate that anabolic steroids have been used at all high school grade levels and perhaps at the junior high school level as well," write the authors.

The evidence suggests some students already show patterns of long-term steroid abuse. The researchers found that 44 percent "stacked" their steroids, taking more than one type at a time. The report also notes that 38.1 percent of users took their steroids both orally and by injection.

Nearly half the steroid users said they took the drugs to boost athletic performance, but 26.7 percent said their primary motive was to improve their appearance. Indeed, the researchers found that 35.2 percent of users did not intend to participate in school athletic programs. These teens may take the drugs and then work out on body-building machines, Buckley suggests.

The price of a more muscular body may be high indeed. The researchers say adolescents who use steroids risk stunted growth, infertility and certain psychological problems.

Where does a high school student get steroids? Buckley's team found most teens obtained steroids from a coach, a private gym employee or other body builders. But one-fifth of the users said they got their supply from health-care professionals such as doctors, veterinarians or pharmacists. Steroids are legitimately prescribed for certain medical conditions such as delayed puberty, but most physicians consider it unethical to prescribe them to healthy teenagers. — *K.A. Fackelmann*

Chernobyl health effects may never be seen

Radioactive fallout from the 1986 Chernobyl accident poses virtually no lingering threat to most people in the world, a team of U.S. scientists contends. In what they call the first scientific study to estimate Chernobyl's effects on human health worldwide, the researchers say that only people within about 30 kilometers of the Soviet nuclear power plant might develop fatal cancers possibly attributable to the accident.

But even for the 115,000 people evacuated from that zone, the effects of the event may never be quantified, says Marvin Goldman of the University of California, Davis. In the Dec. 16 SCIENCE, Goldman, Lynn R. Anspaugh of Lawrence Livermore (Calif.) National Laboratory and Robert J. Catlin of the Electric Power Research Institute in Palo Alto, Calif., say epidemiologic studies may never detect any health effects of the Chernobyl accident because the radiation released will increase everyday "background" risks almost negligibly.

The risk of fatal cancers — now considered about 15 percent for any individual — may increase about 0.02 percent for the Soviet population, including people who lived near Chernobyl or worked there, the authors estimate. For non-Soviet Europeans, the risk may rise 0.01 percent, and for the Northern Hemisphere population in general, the risk may increase 0.003 percent, the scientists report.

"These are probably reasonable estimates and the best anybody can come up with at the current time," Charles W. Miller of the Illinois Department of Nuclear Safety, in Springfield, told SCIENCE NEWS. The authors themselves say the estimates may be too high and the possibility of a zero increase should not be ruled out for people beyond the 30-km zone.

Although several dozen people died shortly after short-term, close-up exposure to the Chernobyl radiation, most people near the reactor absorbed radiation gradually. The researchers consider this kind of prolonged exposure less hazardous than instantaneous absorption of a specific dose.

"Our only hope of seeing any health effects will be a follow-up study of myeloid leukemia in the 30-km population," Goldman says. Myeloid leukemia — a fatal disease afflicting some residents of Hiroshima and Nagasaki less than 10 years after atomic explosions devastated those cities in 1945 — has such a low background occurrence rate that even a very slight increase in cases might be detected, he says. — *C. Knox*