EPIDEMIOLOGY

New Radon Study: No Smoking Gun

Radioactive radon gas seeps into every building in the world, but does it cause cancer at levels likely to be found in homes? Last week, a well-publicized report from Swedish researchers suggested that the answer is yes: The risk of lung cancer appears to climb with increasing exposures to radon in indoor air. But many epidemiologists aren't convinced. They say the real answer won't be available until the results of several other studies now under way are analyzed, and they don't expect all the results to be positive. A Canadian study in press, for example, has found no correlation between residential exposure and lung cancer rates.

Why can't scientists be more definitive? The problem is that radon, although certainly a danger to uranium miners and others exposed to high doses, is probably only a minor cause of lung cancer in the general population, its effects swamped by those of tobacco. That means just a handful of cases of radon-induced cancers can make the difference between a positive link and no effect.

The debate is not just academic: Differing scientific viewpoints about the dangers of radon have resulted in divergent policies. In the United States and Sweden, for example, officials urge homeowners to reduce their radon exposure if levels average greater than 4 picoCuries per liter in new homes (pCi/l), about three times the average indoor-air level. Canada, meanwhile, sets its standard at roughly 20 pCi/l.

The Swedish findings (*New England Journal of Medicine*, 20 January, p. 159) support the cautious U.S. and Swedish approaches. Led by Karolinska Institute epidemiologist Göran Pershagen, the team measured radon levels in all homes (about 9000) occupied in Sweden since 1947 by 1360 lung cancer victims and 2847 controls. The researchers found that people exposed to between 3.8 and 10.8 pCi/l of radon had a 30% greater risk of lung cancer than people exposed to less than 3.8 pCi/l; the risk rose to 80% in those exposed to levels greater than 10.8 pCi/l. Moreover, the researchers found that radon and cigarette smoking appeared to act synergistically: Smokers in the highest exposure group were 25 to 30 times more likely to develop lung cancer than nonsmokers in the lowest exposure group, a risk much greater than simply adding the risks of radon and cigarette smoke.

But the results of such studies can easily be affected by the methodology used, says Jay Lubin, a National Cancer Institute (NCI) health statistician. Take, for instance, a smaller, 1992 study that found an elevated risk of lung cancer in Stockholm women exposed to radon. "The dose-response trend disappeared," Lubin says, after the data were reanalyzed to account for both the actual time victims spent indoors as well as for recent exposures considered more significant to tumor development. Pershagen says the Stockholm study is not comparable for two reasons: It used a different analysis and the dose-response trend "became weaker" but did not disappear.

In contrast to the Swedish study, the Canadian study, which will appear later this year in the *American Journal of Epidemiology*, suggests that Canada's laxer regulations may be justified. A research team from Health and Welfare Canada, a government agency, measured radon in some 4450 homes occupied by 738 lung cancer victims and an equal number of controls. The researchers focused on Winnipeg, Manitoba, which had the highest radon levels of 18 Canadian cities surveyed. The team found no link between radon levels and lung cancer.

Researchers on both teams acknowledge the studies did not measure radon levels during the development of the lung cancers, and that their measurements are only estimates of historical radon levels. "The extent to which we can measure risk is certainly hindered by our inability to adequately measure exposure," says biostatistician Daniel Krewski of the Canadian team.

"Where does this leave us?" asks Jonathan Samet, a University of New Mexico epidemiologist who has studied lung cancer in uranium miners exposed to radon gas. Epidemiologists don't have an answer, but they offer two suggestions to reduce the uncertainties: Pool data from several large international epidemiological studies now under way, and analyze special populations where the risk of lung cancer from radon may be higher than in the general population. Molecular biologists may also help. Earlier this month, a group led by molecular biologist Jack Taylor of the National Institute of Environmental Health Sciences reported that radon appears to cause a unique mutation in the *p53* tumor suppressor gene (*Lancet*, 8 January, p. 86).

Whatever is done, epidemiologists say their goal is to stop the pendulum swing of conflicting findings. "We need to get away from the tendency to say, 'This week radon is bad, and the next week it's not,'" says Samet.

–Richard Stone

GERMANY

Expected Increase Becomes a Cut

BONN—Germany's scientists must have been musing last week on the truth of the adage that you should never trust a politician. Last year Chancellor Helmut Kohl pledged to increase science funding in 1994, but last week, the cabinet cut the budget for the Ministry of Science and Technology (BMFT) by DM250 million ($142 million). "We are not enthusiastic about this," says science and technology minister Paul Krüger with a touch of understatement. "We came away with a black eye."

In the Bundestag, indignation among members of the parliamentary committee for science, known as the research commission, cut straight across party lines. "The commission condemns the reduction. The government is called upon to cancel the decision," commission members said in a statement last week. And the government is clearly rattled by such vehement opposition. "We are observing with great interest the shaping of opinions," government spokesperson Dieter Vogel declared the next day. But so far there are no signs that the decision will be reversed, says Wolf-Michael Catenhusen, head of the research commission.

The cuts are part of an austerity package put together by finance secretary Theo Waigel to help pay the heavy costs of reunification and recession. Waigel prescribed cuts for most ministries totaling 5 billion marks for this year's budget. Spread evenly, this would amount to an average reduction of 1%, but the BMFT appears to be shouldering an unfair share of the burden with a cut of 2.64%. The ministry's budget ($5.39 billion) has not grown since 1991.

The government has not yet announced which of the BMFT's activities will bear the brunt of the cuts, but the 16 national laboratories, judged by many in recent years to be overfunded and overstaffed (*Science*, 21 January, p. 316), are getting nervous. "We feel like fish out of water," says Eberhard Gockel, spokesperson for the Association of National Laboratories (AGF). Even without the latest cuts, up to 2000 of the 16,500 jobs at the national labs will go in the next 5 years. AGF chairman Joachim Treusch says the scientific community was "extremely puzzled" to learn that the BMFT was not exempt from the cuts, contrary to earlier announcements.

Michael Globig, speaking for the Max Planck Society, says it is too early to comment on possible consequences for his organization, which receives a large fraction of its funds from the BMFT. Germany's main research council, the DFG, whose research money goes mainly into universities, is in a better position: It is financed by the ministry of education.

–Michael Simm

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