Home Radon Hazards: All Too Real

More than 230 researchers gathered last week in Richland, Wash., to analyze whether "myth" or "reality" best characterizes the purported hazard posed by indoor radon. Their consensus was that radon risks are "indeed reality," says conference chairman Fredrick T. Cross, a radiation biologist at Battelle Pacific Northwest Laboratories in Richland.

Chief among the studies supporting this conclusion was a new analysis of year-long radon measurements from the homes of more than 800 New Jersey women, half with lung cancer.

Past studies have indicted high radon levels for an excess of lung cancers among underground hard-rock miners, but many radiation researchers wondered whether the far smaller exposures typical in millions of U.S. homes might be too low to cause much if any cancer. Now, a team led by Janet B. Schoenberg at the New Jersey Department of Health in Trenton reports an apparent dose-related increased risk of lung cancer in women who live in homes with only 2 to 11 picocuries (pCi) of radon per liter of air.

Though the survey showed only a weak link, "the New Jersey study is absolutely the best" supporting a low-dose radon risk, says Naomi Harley, a radiation oncologist from New York University Medical Center. It not only involved more people than most earlier studies, but also accounted for more potentially confounding variables, she says.

Schoenberg's team piggybacked its radon survey to a study of other cancer risk factors in women, such as diet and smoking history. The researchers restricted the radon study to women who had lived in the same homes for at least 10 years. Some 433 lung-cancer victims and 402 matched controls qualified.

Compared with women from homes with less than 1 pCi/liter of radon in the air, women whose homes averaged from 2 to 3.9 pCi/liter experienced a 30 percent higher lung-cancer incidence, and women from homes with levels ranging from 4 to 11.3 pCi/liter had a 300 percent greater incidence, the team reports in the Oct. 15 CANCER RESEARCH.

The highest exposure categories (homes above 2 pCi/liter) included only 24 women — too few to allow statistically significant risk estimates. However, Schoenberg says, the analysis of the observed trend — increasing cancer risk with increasing home radon levels — was statistically significant. Overall, she concludes, the data "certainly suggest" that extrapolating home radon risks from the miner studies "is reasonable."

Harley says a weak radon-cancer link was the best one could expect from a study that small. Indeed, she notes, when researchers at an Energy Department meeting this summer assessed 24 such studies underway at the time, including Schoenberg's, they concluded that any radon-cancer link would probably remain indiscernible without a pooling of the studies' data.

EPA advises homeowners to reduce their radon exposure, especially in buildings with levels greater than 4 pCi/liter. One preferred strategy is to draw air out from under the concrete foundation of a house. This "typically will achieve a 90 to 99 percent [radon] reduction," says Jed Harrison, chief of EPA's radon mitigation branch in Washington, D.C.

Where massive reductions are unnecessary, Army Maj. Carl A. Curling and his co-workers at the Harvard School of Public Health in Boston offer an alternative strategy: Ignore the radon and instead filter out most of its toxic decay products, or "daughters," from room air. In the September HEALTH PHYSICS, they describe such filters for use with fans that recirculate room air.

Their best filter/fan combo would halve the potential radiation dose to room occupants. Curling says he could probably boost the reduction to 78 percent. This would likely involve placing a single layer of open-weave, fine-wire screening over an old-fashioned box fan, says Curling, now at an Army lab in Springfield, Va. But he suggests that a ceiling fan with a wire plate suspended above the blades might achieve comparable filtering. The trick to reducing doses, he notes, is not to focus on daughters bound to dust, but to remove the unattached daughters, which provide up to 90 percent of the radiation dose to humans.

Harrison agrees that such filters might provide a cost-effective stopgap for reducing radiation in homes with relatively low radon levels. He argues, however, that all such filtering devices pose a currently intractable problem: verification. Low-cost radon monitors measure only radon. To verify that filters perform as promised, researchers will have to develop low-cost monitors for radon's daughters, especially the unattached ones. And that's a tall order, Harrison says. — *J. Raloff*

Probing a universe of bubbles and voids

The distribution of galaxies in the universe appears far from uniform. Astronomers see large numbers of galaxies concentrated in superclusters and in sheets, or "walls," accompanied by neighboring "voids" holding significantly smaller galactic populations. Researchers now have amassed additional evidence that the universe may have a bubbly or sponge-like structure, featuring clumps of galaxies typically separated by distances on the order of 400 million light-years.

Alexander S. Szalay of Johns Hopkins University in Baltimore and his collaborators initially determined the positions of galaxies along a long, narrow line of sight — a pencil beam — in the direction of the Milky Way's north and south galactic poles. The pencil-beam survey suggested that over a distance of 7 billion light-years, galaxies appear in clumps spaced about 420 million light-years apart (SN: 5/5/90, p.287).

To check this surprising result, the team measured the distances to galaxies along two additional lines of sight at 45° to the original direction. Again they detected concentrations of galaxies separated by distances of roughly 400 million light-years. Preliminary, partial results from pencil-beam surveys in other directions show similar galaxy distributions.

"Galaxies come in fairly obvious clumps," Szalay says. He described his group's findings last week at an astrophysics meeting in College Park, Md., titled "After the First Three Minutes."

At the same time, the new results fail to support initial indications that walls of galaxies may fall into a regular pattern. Instead, the positions and spacing of clumps vary from one line of sight to another. "One can see walls, but they're not evenly spaced," Szalay says.

The pencil-beam surveys probe deeper into the universe than any other survey of galaxy positions. Along the way, they pick up known concentrations of galaxies, including several local superclusters and a sheet of galaxies now termed the "Great Wall" (SN: 11/25/89, p.340).

"This is an exciting result," says Neta Bahcall of Princeton (N.J.) University. "So far, the pencil-beam surveys and supercluster catalogs fit together very well."

However, the surveys of galaxy positions completed so far haven't completely ruled out the possibility that astronomers may yet identify coherent patterns and structures in the distribution of galaxies on considerably larger scales. — *I. Peterson*