Biomedicine

Hazardous gas strikes hockey rink

Flying pucks are not the only potential hazards of indoor ice hockey. A research team has found that many players and fans suffered acute respiratory illness during or soon after two high school ice hockey games played at the same indoor rink. The culprit: too much nitrogen dioxide in the air due to a malfunctioning ice resurfacer.

A high school coach alerted state public health officials after players and spectators complained of respiratory distress following two games played in February 1987 at an ice arena in a suburb of St. Paul, Minn. Researchers led by Katrina Hedberg of the Centers for Disease Control in Atlanta and Kristine L. MacDonald of the Minnesota Department of Health in Minneapolis investigated the case, interviewing 167 players, cheerleaders and band members who attended the games in question. They found 116 cases of respiratory illness that resembled the health problems seen in people exposed to nitrogen dioxide, a respiratory irritant sometimes emitted by out-of-tune engines such as those that power ice resurfacers.

Students interviewed by the research team said they had trouble driving home after the game due to severe coughing and chest pain. Most symptoms disappeared after several days, Hedberg and her co-workers report in the Dec. 1 JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION.

Arena mechanics told investigators the resurfacer had been malfunctioning for six months prior to the outbreak. Workers did not measure nitrogen dioxide levels during the games in question. However, measurements taken two days after the second game revealed a nitrogen dioxide level eight times higher than that considered safe by Minnesota health officials.

The investigators say they believe students were exposed to enough nitrogen dioxide to produce acute symptoms but not enough to permanently damage their lungs. Two months after the games, the scientists tested pulmonary function in 59 of the players and compared the results with those of a control group of 24 healthy high school basketball players. They found no overall difference in lung function.

Although few such outbreaks have been reported in the past, Hedberg says the problem may be larger than previously suspected – especially in states that do not require ice arena operators to periodically measure air quality. Minnesota is one of three states with such a requirement.

AZT causes cancer in lab animals

Investigators last week reported finding vaginal cancer in mice and rats given high doses of zidovudine (AZT), the only federally approved drug that attacks the AIDS virus directly. But U.S. public health officials urge doctors to interpret those results cautiously.

"The Public Health Service still strongly recommends that AIDS patients and others for whom the drug is approved continue their zidovudine therapy under consultation with their physician," says James O. Mason, assistant secretary for health at the Department of Health and Human Services. He adds that many toxic drugs cause cancer in animals when given in high doses over long periods. The new results do not necessarily suggest a cancer risk for people taking AZT, he says.

In the laboratories of zidovudine manufacturer Burroughs Wellcome Co. in Research Triangle Park, N.C., researchers examined 960 rodents that had received high, moderate or low daily doses of AZT for 22 months. They found a total of five cancerous vaginal tumors in a group of 60 mice given the highest daily dose – much higher in biological equivalence than AIDS patients get – and two cancerous vaginal tumors among 60 rats given the highest dose. Three noncancerous tumors developed in mice given either the high or moderate daily dose.

Earth Sciences

Richard Monastersky reports from San Francisco at the fall meeting of the American Geophysical Union

High-rises rock to shuttle shock

When the space shuttle Columbia flew over the Los Angeles area en route to a landing at Edwards Air Force Base on Aug. 13, its sonic boom caused a minor stir among seismologists. Not surprisingly, sensitive seismometers in Pasadena recorded the shuttle's atmospheric shock wave. Yet they also picked up waves of ground vibrations a full 12.5 seconds before the shock wave hit. For two weeks, these early waves puzzled Hiroo Kanamori and his colleagues at the California Institute of Technology and the U.S. Geological Survey in Pasadena. How, they wondered, could shock waves in the air transfer energy into the earth to generate waves of ground motion? One clue: The waves appeared to originate in downtown Los Angeles, 9 miles southwest of Pasadena.

Kanamori and his co-workers now believe they have an answer. According to their scenario, as the atmospheric shock waves passed over the downtown area, they shook its 400-plus high-rise buildings all at the same time. The collective motion of the buildings vibrated sediments filling the Los Angeles basin, sending long-period waves speeding toward Pasadena. The seismometers recorded ground motion before the sonic booms because seismic waves travel faster than sound waves.

Kanamori says such a process would not damage the tall buildings. But it could help engineers understand how buildings may behave when a quake sends seismic waves rippling through the basin, he says. Sedimentary basins can greatly amplify ground motion, causing catastrophic damage during a quake – a fact dramatically demonstrated during the 1985 Mexico City quake.

Birth of a subduction zone

A massive earthquake that struck the seafloor south of New Zealand in May appears to have signaled the very early stages of subduction there – the same process that long ago created deep ocean trenches around the Pacific. Subduction occurs when two crustal plates collide and one dives below the other.

The magnitude 8.2 shock, the world's largest in 12 years (SN: 6/3/89, p.340), occurred at the Macquarie ridge, a chain of mountains and troughs that runs south from New Zealand and forms the boundary between the Pacific and Australian plates. This and other local ruptures over the past century illuminate the complex dance between the plates in the area. Like passing trains headed in opposite directions, the Australian plate is moving northwest in relation to the Pacific plate. The large quakes that struck in 1981 and 1989 reflect this motion because the ruptures occurred along vertical faults that allow the plates to slip past each other.

Yet the Macquarie ridge also generates smaller quakes along dipping fault planes. Quakes of this type indicate the two plates are pressing together as they slide past each other, as if the trains moved closer together as they passed.

These smaller, compressional earthquakes suggest subduction is just beginning along the Macquarie ridge, says Susan L. Beck of the Lawrence Livermore (Calif.) National Laboratory, who investigated the ruptures with Larry J. Ruff and Bart W. Tichelaar of the University of Michigan at Ann Arbor. She notes that the underwater ridge has not spawned extremely large compressional earthquakes during the last century. This suggests that many separate dipping faults lace the area and have not yet connected to form one large fault plane – a necessary step in subduction.

Beck cautions, however, that historical records of quakes in this remote region span only a relatively recent period. If huge compressional quakes have ruptured the area in centuries past, subduction could be much farther along, she says. Earthquakes in coming decades will help scientists pin down the progression.