Biomedicine

Kathy A. Fackelmann reports from Boston at the World Conference on Lung Health

The high and low of respiratory illness

The haze of wood smoke hangs over the valley. Picturesque? Maybe, but some scientists have reported wood-burning stoves foul the air with tiny particulates that may cause or exacerbate outbreaks of respiratory illness (SN: 5/6/89, p.277).

Now, a study by a team at the University of Washington in Seattle adds to the evidence linking wood-stove smoke and respiratory illness. Jane Q. Koenig and her colleagues analyzed air samples taken near two Seattle-area elementary schools, one located high on a ridge and another situated in a valley. The team found the air surrounding the ridge school cleaner than that sampled near the valley school. In addition, most of the particulate matter collected contained chemicals characteristic of wood smoke, Koenig says.

Next, the team gave 327 children attending the two schools lung function tests, which measure breathing ability, in September and again in December—a month when most wood stoves are stoked to fight the chilly Seattle air. Koenig's team found no decrease in breathing ability when they looked at test scores obtained from all 327 children. However, when the team looked at asthmatic children in their study, they found those attending school in the valley showed a 9 percent drop in their December breathing test compared to test results obtained the previous September. By contrast, asthmatic children enrolled at the ridge school showed a 2 percent increase in their breathing ability during the same time period.

Koenig says an area's topography plays a central role in the development of wood-smoke-linked respiratory problems. She says the valley in her study forms a bowl that traps wood smoke and bathes schools and homes with particulates that can trigger asthma attacks in children. By contrast, the ridge gets fresh air blown in from Puget Sound that dilutes particulates and thus reduces respiratory illness, she adds. While living in a valley near Seattle may pose a risk for asthmatic children, other parts of the country may experience similar wood-smoke smog during the winter, Koenig cautions.

Experts finger tight building syndrome

"We were called in by authorities to investigate a series of complaints at the school," says Frank E. Speizer at the Harvard School of Public Health in Boston, in what could be the opening line of a "Dragnet" television show. Unlike the cops, Speizer and his team of epidemiologists weren't looking for a criminal but for clues to explain the rash of respiratory problems reported by students at a Boston-area high school.

The scientific crew interviewed students from the "index" school and compared their rates of illness to controls at a neighboring school with no respiratory complaints. They found 23 percent of non-smoking index students reported chronic cough compared with 8 percent of non-smoking control students; 27 percent had persistent wheeze compared with 8 percent of control students; and 21 percent reported a chest illness that had kept them out of school for at least a week compared with 5 percent of control students who reported a similar sickness.

At the same time, an environmental team implicated the index school's poorly designed ventilation system as the most likely cause of the higher rate of respiratory illness. Speizer admits the results could be explained if index students simply reported more illness because of the school's "sick building" reputation. Still, the types of illnesses reported are those commonly seen when stagnant air contains high amounts of dust, carbon dioxide and chemicals that can cause health problems, Speizer says. Meanwhile, the index school authorities are revamping the ventilation system. Speizer and his team plan another study after completion of the changes to see whether the respiratory symptoms decrease.

Earth Sciences

Richard Monastersky reports from Baltimore, Md., at the Spring meeting of the American Geophysical Union

Small comet controversy flares again

Atmospheric scientists report finding further evidence supporting the controversial theory that tens of thousands of small comets bombard the Earth each day. The researchers have detected apparent signs of water vapor from the comets in an extremely dry portion of the atmosphere about 80 kilometers above the Earth.

John J. Olivero and his colleagues at the Pennsylvania State University at University Park monitored the sky with a microwave radiometer that can detect extremely weak emissions from gases high in the atmosphere. Out of more than 500 days of observations, they found 111 "bursts" of water vapor—a quick rise and fall in the amount of water vapor lasting less than 20 minutes. They suggest the water comes from small comets that enter Earth's upper atmosphere and vaporize due to air friction.

The observations bring new heat to the debate over the existence of such comets. Four years ago, physicist Louis A. Frank of the University of Iowa in Iowa City and his colleagues proposed the theory to explain spots they saw on images of the upper atmosphere taken by satellites looking down on Earth. Frank postulated that 20 of these house-sized fluffy snowballs hit the atmosphere each minute. The theory incited much criticism because if true, it would force Earth and space scientists to revamp many of their long-held notions. For one, it challenges the idea that Earth acquired its supply of water early in the planet's history. If Frank's theory is correct, tiny comets would continually add water to the Earth. While the majority of scientists have reported seeing no evidence of the comets in their data, one other research team, using an optical telescope, has spotted fast-moving objects matching the comet's description (SN: 5/28/88, p.340).

Olivero says he was originally skeptical of Frank's theory, and surprised when his team's observations matched many of the predictions made by the small comet hypothesis. Just as the theory suggests, the researchers see bursts about every four days in their small patch of the sky. They calculate each burst represents about 10^{29} to 10^{34} molecules of water, a range predicted by the comet theory.

Alex Dessler, a space scientist at Rice University in Houston, says he remains skeptical that the signals in the microwave data come from small comets. The radiometer observations do not confirm some important predictions of Frank's theory, Dessler says. In particular, the bursts do not appear to have a strong daily pattern, whereas the comet theory requires that they appear most frequently between midnight and noon because the comets must approach Earth from behind.

Dessler also says that Olivero has yet to rule out the possibility that an artifact in the instrument caused the observed bursts. He suggests that stringent tests on the radiometer could determine if the bursts are real. If so, the next step is to decipher whether they represent water vapor from comets.

Rivers in a greenhouse world

As carbon dioxide and other gases push up the Earth's surface temperature, how will the warming affect the world's major rivers? James R. Miller of Rutgers University in New Brunswick, N.J., and his colleagues have used an atmospheric general circulation model to study this question. The model predicts how changes in precipitation, evaporation, soil absorption and other factors will alter the world's 30 largest rivers. In general, the model shows rivers in the tropics might carry less water while those closer to the poles end up with more runoff, they report. For now, though, Miller says he questions the results because the model does not do a good job of predicting the current runoff values for many rivers.