Water pollutants—exposure by skin

Assessments of the hazards posed by toxic chemicals in drinking water have been based largely on estimates of what one might encounter through drinking. But a new study by three researchers with the Massachusetts Department of Environmental Quality Engineering in Boston suggests that the body's absorption of water pollutants through the skin — by washing, showering, bathing or swimming — has been seriously underestimated. Also, and more importantly, the report posits that skin absorption of organic chemicals may frequently constitute the primary route of human exposure to these toxic pollutants in water.

Depending both on the compound involved and the body region exposed, skin can act as a fairly strong barrier to chemical entry or as no barrier at all. In the May AMERICAN JOURNAL OF PUBLIC HEALTH, Halina Szejnwald Brown, Donna Bishop and Carol Rowan contrast their estimates of skin versus ingestion exposures for three toxic chemicals — toluene, ethylbenzene and styrene. Their analyses were based on data published for the hand, one of the body's better dermal barriers.

They estimated absorption levels for an adult taking a 15-minute bath and drinking two liters of water, an infant bathed 15 minutes and fed one liter of water, and a 48-pound child swimming one hour and drinking a liter of water. Concentrations of each chemical were varied from 0.005 milligrams (mg) per liter(l) of water to 0.5 mg/l.

Their most surprising finding was that for the swimmer, a minimum of 83 percent and possibly 91 percent of the chemicals entering the body came through the skin. Ironically, they report, highest doses resulted from water with the smallest concentration of the pollutant. In fact, dilute concentrations enter the skin far more easily than a pure chemical will, Bishop notes, because most organics dehydrate skin, making it less porous.

In the bathing-versus-drinking analyses, from 29 to 46 percent of the exposure — depending on the chemical and concentration — would occur through the skin in children, and 50 to 75 percent through skin in adults. And because they modeled dermal porosity using data from studies with pure chemicals and exposures involving the relatively nonporous hand, Bishop says their numbers might underestimate by at least one order of magnitude the true absorption likely under the conditions they cite. —*J. Raloff*

Violent history of El Chichón

Just two years ago, in March and April 1982, El Chichón, an obscure volcano in Mexico, erupted three times, violently sending 10 million to 20 million tons of dust and gas particles high into the stratosphere. This was one of the largest eruptions of the century, and was the worst volcanic disaster ever known in Mexico. Nearly everyone was caught by surprise. Recent studies, though, reveal that El Chichón has had an eventful past.

In late 1980 and early 1981, two geologists working in the summit area felt earthquakes and heard loud noises. The following September, they completed a report in which they suggested that these observations were related to "subsurface magmatic activity and/or tectonic movements," and warned of a "high volcanic risk." The warning went unheeded, and the eruption seven months later claimed at least 2,000 human lives (SN: 8/21/82, p. 120). Recent investigations now show that El Chichón has been active frequently during the last few thousand years, with known eruptions 600, 1,250 and 1,700 years ago. The most recent event, scientists report, was small compared to previous violent eruptions. The findings are published in the May 18 SCIENCE by Robert I. Tilling and Meyer Rubin of the United States Geological Survey (USGS) in Reston, Va., and colleagues from the University of Rhode Island in Kingston, USGS in Flagstaff, Ariz., and Michigan Technological University in Houghton.

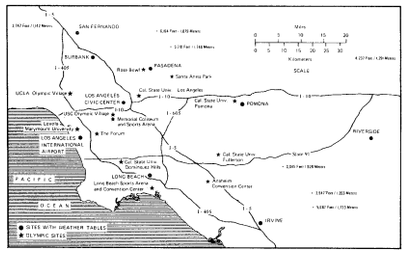
The researchers report that geologic data and radiometric analyses of volcanic debris show that major eruptions occur at El Chichón at intervals ranging from 350 years to 650 years, with a "crude" average recurrence interval of 600 years (±200 years) during the last 2,000 years.

Wendell Duffield of USGS in Flagstaff visited the volcano after the recent eruption. He describes the SCIENCE report as "only a little bit of the story." He and other U.S. scientists are helping Mexican scientists obtain and set up the proper equipment needed to monitor the volcano in much the way that scientists keep track of Kilauea and Mt. St. Helens.

One of the puzzles of El Chichón is that unlike most continental volcanoes, it is alone, the nearest volcano being located 300 kilometers to the southwest. But throughout its history, clearly, it has exerted a powerful effect on the surrounding countryside, and possibly on global climate. Scientists still are tracking the sulfur-rich debris injected into the atmosphere during the 1982 eruption to measure the decrease in solar radiation reaching the earth through the aerosol filter. The researchers believe that previous eruptions emitted even greater amounts of particles, and speculate that "frost events" recorded in tree rings may be correlated with El Chichón's last two major eruptive episodes. —*C. Simon*

Weather forecasts on an Olympic scale

Fewer athletes than originally planned may compete in the 1984 Summer Olympic Games, but those who do will enjoy the most comprehensive fine-scale weather forecasts ever provided to the Los Angeles area. The host country is obligated to provide weather support during the Games, scheduled this year for July 28 through Aug. 12. The National Oceanic and Atmospheric Administration (NOAA), with abundant cooperation from the National Center for Atmospheric Research in Boulder, Colo., has built a sophisticated weather reporting network, using state-of-the-art equipment, to gather information from 65 sites in the Los Angeles Basin. NOAA's National Weather Service Forecast office in west Los Angeles will issue about 20 forecasts each day, including specific reports for the 15 outdoor games, tailored to each sport.



NOAA

The Los Angeles Basin will host the largest operational fine-scale weather monitoring and forecast network ever provided during the Olympic Games. Twenty new forecasts will be broadcast in French and English each day during the two-week event.

The task is complicated because the weather in the Los Angeles Basin, bordered by mountains on the inland side and the Pacific on the southwest, varies widely from site to site. For instance, the average daily high temperature at the Los Angeles International Airport in August is 76°F, while at Burbank, 18 miles inland, the average high temperature in August is 87°F. In the afternoon, average August humidity differs as well, from 69 percent at the airport to 48 percent at Burbank.

The effect of Los Angeles's notorious smog on the performance and well-being of athletes is a special concern. Many athletes operate at such high levels of exertion that they are especially vulnerable to atmospheric ozone and carbon monoxide, both of which are known to inhibit lung function and thereby decrease performance. The men's marathon, for example, is scheduled to begin at noon, and will continue through the time when both temperature and pollution levels are highest. The public too may experience some discomfort and risk to health during the Games if air quality levels are poor, NOAA officials say. —*C. Simon*