

and handle. Sandia scientists are assisting a company called Nomadics in Stillwater, Okla., in developing a chemical sniffer. Trying to emulate what dogs do when they inhale and exhale near the ground, the sniffer stirs up dirt particles, sucks them in, and electrostatically traps them. Traces of explosives that stick to the particles can then be identified.

"By far the largest percentage [of explosives] is adsorbed to soil particles," says Woodfin. "Only minor fractions are found in vapor." Soil concentrates the substances so that they can be analyzed more easily.

Organisms that can be added to soil also play a part in explosives detection. At Oak Ridge, researchers have genetically engineered bacteria to light up in the presence of TNT.

When certain bacteria ingest organic molecules, they turn on the production of regulatory proteins. By inserting a gene for a luminescent or fluorescent protein next to the gene for the regulatory protein, the researchers can induce the bacteria to produce both proteins whenever they come into contact with organic molecules (SN: 6/4/94, p. 358). In this way, glowing bacteria signal the presence of

the explosive in the environment.

Robert S. Burlage and his colleagues at Oak Ridge have engineered several strains of the bacterium *Pseudomonas putida* to glow with visible or fluorescent light when they scavenge TNT and dinitrotoluene, a related chemical (SN: 11/9/96, p. 150). Burlage is presenting the results of this project at the Third International Symposium on Technology and the Mine Problem to be held at the Naval Postgraduate School in Monterey, Calif., next week.

Later this year, the group will test the bacteria on a small simulated minefield, spraying the plot of land with the bacteria and waiting 3 hours for them to produce the glowing proteins. Luminescent bacterial strains should be visible to the naked eye, whereas fluorescent ones will require ultraviolet light in order to be seen.

Burlage expects eventually to apply the technique to real minefields, using a crop duster to shower an area with the engineered bacteria. Where the bacteria contact explosives, they will give off light that can be mapped from the air or viewed on the ground.

Burlage's team had previously engineered bacteria to report the presence of several environmental pollutants: toluene, naphthalene, and mercury. In 1996, the

Environmental Protection Agency approved the use of these organisms for cleaning up polluted areas.

Mines lie buried in so many different environments that no single method can deal with them all. Researchers are therefore developing a variety of technologies. In some places, deminers may need to apply a combination of techniques, each based on a different physical principle, in order to reveal a minefield's secrets. Discovering how to use advanced data analysis to combine these disparate lines of information adds another layer of complexity to the challenge.

Some land mines create a shorter-term hazard than others. So-called smart mines self-destruct after a set period of time. The United States makes an effort to use only smart mines, says Bottoms. However, a country like China, which has a stockpile of 50 million conventional mines, probably won't replace them in the near future.

At the upcoming conference, a representative from the U.S. Army has been invited to speak on the Army's efforts to find alternatives to antipersonnel land mines, Bottoms says. "Offhand," he adds, "I can't think of what those would be." □

Biomedicine

An enzymatic sex difference

Why do so many men suffer from heart attacks earlier in life than women do? A new report hints that an enzyme in the blood may help explain the difference.

John E. Hokanson of the University of Washington, Seattle and his colleagues studied 25 men and 39 women, all of whom had normal concentrations of cholesterol—including low-density lipoprotein (LDL), the so-called bad cholesterol—in their blood. The researchers took samples of the volunteers' blood and measured the activity of an enzyme called hepatic lipase. They discovered that hepatic lipase activity was just over 50 percent higher in men than in women.

The researchers also found that the men had significantly lower concentrations of high-density lipoprotein, or good cholesterol, as well as more of a particular type of bad cholesterol—the small, dense LDL thought to be the worst of the bad cholesterol.

Hokanson and his colleagues believe that higher concentrations of hepatic lipase lead to the unfavorable lipid profile seen more commonly in men. Estrogen, the primary female sex hormone, appears to regulate hepatic lipase, leading the researchers to speculate that estrogen keeps concentrations of hepatic lipase low in premenopausal women.

After menopause, a woman's risk of heart disease starts to rise. Hokanson suggests that this risk is related to the increase in hepatic lipase enzyme. Hokanson presented the team's findings on March 20 at a meeting of the American Heart Association in Santa Fe, N.M. —K.F.

Cigars linked to disease of heart

Many cigar smokers believe they are protected from tobacco's nasty health effects because they don't inhale as much as cigarette smokers do. A new study dispels that myth.

Carlos Iribarren of the Kaiser Permanente Medical Care Pro-

gram's research division in Oakland, Calif., and his colleagues studied the number of deaths among 225 men who smoked only cigars and compared them to deaths among 14,200 men who had never smoked any form of tobacco.

The researchers found that regular cigar smokers had a 25 percent higher death rate overall than the nonsmokers. In addition, the cigar puffers faced twice the risk of dying from all forms of cancer and from certain diseases of the circulatory system, such as cardiomyopathy, a disorder of the heart muscle. Iribarren described the group's results last week at an American Heart Association meeting in Santa Fe, N.M.

Iribarren speculates that toxic chemicals in cigar smoke may pass through the lining of the inner mouth and into the bloodstream. There, the toxins may damage the blood vessels or the heart. While other studies have linked cigar smoking to cancer, this is one of the first to link stogies and cardiovascular disease. "This finding needs to be confirmed," Iribarren notes. —K.F.

Migraine's link to heart problems?

People who suffer from chest pain are more likely to experience migraine headaches, according to a study presented last week at the American Heart Association's meeting in Santa Fe, N.M.

Kathryn M. Rose of the University of North Carolina at Chapel Hill and her colleagues studied 12,466 men and women and found that people who reported at least two attacks of angina were more likely to have suffered from migraine headaches. Angina is the pain that results when the arteries supplying the heart with blood constrict or are blocked. Migraines are caused by the narrowing of blood vessels leading to the brain.

The researchers don't know whether the link occurs by coincidence or whether the conditions stem from similar causes, says Rose. —K.F.