Breast cancer risk and DDT: No verdict yet

Results of a new study challenge the theory that DDT increases the risk of breast cancer. However, many scientists, including the study's authors, warn that it's premature to discount the link between this pesticide and the malignancy.

In a related report, investigators at the New York State Department of Health discovered an association between industrial pollution and breast cancer.

The DDT-breast cancer hypothesis gained ground last year when Mary S. Wolff of Mount Sinai School of Medicine in New York City published a study showing that women who suffer from the disease tend to exhibit more traces of DDT and its dangerous breakdown product, DDE, in their bloodstream (SN: 4/24/93, p.262). Some researchers believe that DDT and DDE mimic the action of the hormone estrogen and thus fuel the growth of certain breast tumors.

In the new study, epidemiologist Nancy Krieger of the Kaiser Foundation Research Institute in Oakland, Calif., and her colleagues homed in on 300 women who had taken a comprehensive physical examination during the late 1960s, when DDT was commonly used in the United States. The researchers studied 150 women who developed breast cancer an average of 14 years after that examination and 150 women who did not develop cancer and thus served as controls.

Krieger's group analyzed the concentrations of DDE in blood samples that had been obtained at the time of each exam and frozen for later use. In addition, they looked at concentrations of another chemical suspected of playing a role in breast cancer: polychlorinated biphenyls, or PCBs.

In the April 20 JOURNAL OF THE NATIONAL CANCER INSTITUTE, the researchers describe their surprising results. Unlike the earlier study, this one found no overall association between such pesticide residues and breast cancer.

When the researchers sorted the data by race, however, a more complicated picture emerged. Black women with high concentrations of DDE showed an increased risk of breast cancer, a finding that did not quite reach statistical significance. White women showed a hint of heightened risk at high concentrations of this pesticide. Yet among the Asian women in the study, increased concentrations of DDE actually signaled a decreased risk of breast cancer, a finding that did not reach statistical significance.

Overall, the data do not support the hypothesis that exposure to DDT boosts the chance of developing breast cancer, the authors contend. Yet Robert N. Hoover of the National Cancer Institute in Bethesda, Md., says the trend toward increased risk for black and white women merits further attention. "It's very worrisome," he says.

The broad-brush findings may have been skewed by the data collected from Asian women, he points out. These women tend to have a lower risk of breast cancer, especially if they follow a more traditional lifestyle, which includes a low-fat diet. The study didn't adequately control for factors reducing the risk of breast cancer in this group, Hoover says.

"This is an important study," says toxicologist Devra Lee Davis of the Department of Health and Human Services in Washington, D.C. She points out that sorting the findings out will require further research.

The Krieger study found no evidence of an association between concentrations of PCBs in the blood and risk of breast cancer. Indeed, the preponderance of the data from this study and other research points away from such a link, says Brian MacMahon of the Harvard School of Public Health in Boston. "The finding is reassuring," MacMahon wrote in an editorial that accompanies the study.

A second report adds to previous evidence that pollutants contribute to breast cancer risk. James M. Melius and his colleagues at the New York State Department of Health studied 1,759 women who had lived on Long Island for at least 20 consecutive years prior to 1985. The researchers started their inquiry with the knowledge that Long Island has unusually high rates of breast cancer, which scientists cannot explain.

Melius' team discovered that women who lived within 1 kilometer of a chemical plant between 1965 and 1985 were about 60 percent more likely to develop breast cancer after menopause than women who did not live near such a plant. That calculation included other risk factors for breast cancer.

The New York study doesn't link particular chemicals, such as DDT, to breast cancer. That's clearly the next step, points out New York State Health Commissioner Mark R. Chassin. "We must attempt to identify the circumstances and potential pollutants that may explain the association," he says. *– K.A. Fackelmann*

Cascades of light shine from a new laser

Lasers – those finicky light-shining devices that have yielded better long-distance communications, eye surgery, Star Wars weapons, and audio equipment – come in many forms.

Essentially, they all emit light based on the same principle. When a charged particle, such as an electron, is driven to a higher energy state and then allowed to settle back down, a photon, or particle of light, pops out along the way. A laser – or Light Amplification by Stimulated Emission of Radiation – enhances that process to produce intense light with a uniform wavelength.

The medium used to stimulate the light emission, however, can vary. There are gas lasers, liquid lasers, and semiconductor lasers, to name but a few. Now, a report in the April 22 SCIENCE heralds another type of laser. Jerome Faist and Federico Capasso, both physicists at AT&T Bell Laboratories in Murray Hill, N.J., and their colleagues describe a new variety of semiconductor laser that they call a "quantum cascade laser."

Twenty-five years in the making, since physicists Rudy Kazarinov and Robert Suris first proposed the concept, the quantum cascade laser promises to be smaller, more flexible, and less costly to make than similar lasers, the Bell Lab team says.

"It works quite differently from other semiconductor and gas lasers," Faist says. In this laser, electrons "cascade down an energy staircase."

Most gas and semiconductor lasers capture a charged particle's energy by recoupling it with an oppositely charged particle. The two annihilate each other's charge, releasing a photon in the process. In the quantum cascade laser, charged particles first move up several energy levels, then cascade down step by step, releasing photons at each plateau.

To accomplish this, Faist's group tailored a new semiconductor, a wafer-thin sandwich of 500 layers clustered in sets of 20 layers. Each set has 10 wells and 10 barriers. The light emission occurs, says Faist, as electrons move among these wells and barriers, first accumulating and then releasing energy. Metaphorically speaking, they leap up and then bump down the energy staircase.

To make the semiconductor sandwich, the scientists had to first master the technique of molecular beam epitaxy to "spray on" 500 layers, a single layer at a time.

One of this laser's unique advantages is its ability to emit light over a relatively wide range of wavelengths. The secret lies in varying the thickness of each layer in the semiconductor sandwich, Faist says. The first quantum cascade laser emits light with a 4.25 micron wavelength. But that wavelength could vary from 2 microns to 100 microns in size, he adds, using the same semiconductor material.

The new laser's compact size and flexibility suit it to a wide variety of applications, the scientists contend. It should be useful for monitoring air quality, controlling pollution, and improving collision-avoidance radar. Another possibility is better "free space" point-to-point communication – "like fiber-optic communication," Faist says, "but without all the fibers." *– R. Lipkin*