Biology

The power behind the pungence

The unmistakable, nasty smell associated with skunks was the object of some recent research, and as a result, an old truism of beginning zoology and chemistry courses has been toppled. David T. Bernstein and Kenneth K. Anderson of the University of New Hampshire studied the defensive exudate of the striped skunk. Although n-butyl mercaptan has always been considered the chemical culprit, Bernstein and Anderson indicated a different substance at the American Chemical Society meeting in Atlantic City.

Mercaptans are organic compounds resembling alcohols but with a sulfur atom replacing an oxygen atom. These compounds all carry unpleasant odors but can come in different forms. The team found crotyl mercaptan to be the main constituent of the scent. They failed to find any n-butyl mercaptan at all. A review of old literature on the subject showed that the n-butyl idea may have been a misinterpretation of crotyl mercaptan evidence all along.

Knowing the real chemical structure of the skunk's favorite weapon may help chemists develop a way to de-scent dogs "who have met a skunk from the wrong end," Anderson says.

Organic mercury and the unborn rat

It has long been known that mercury compounds can be injurious to health, but studies on the effects of small doses of organic mercury, like those found in polluted streams, are still going on. It was reported recently that inorganic mercury is converted to the bioactive, methylated form by fungi and bacteria in natural aerated waterways (SN: 8/3/74, p. 73). Now, three University of Wisconsin pathologists report the effects of low levels of methylmercury on the unborn young of rats.

Richard A. Ware, Louis W. Chang and Peter M. Burkholder report in the Sept. 20 NATURE that levels of methylmercury too low to harm a pregnant rat and too low to cause teratogenic (fetus deforming) effects still can cause injury to the livers of fetal rats. They injected in a test group of pregnant rats small doses of methylmercury during early gestation, and in a control group, saline. They examined microscopically the livers of baby rats from both groups, and found in the test group evidences of cell death and the formation of clear areas (vacuoles).

The liver should be considered a target organ for methylmercury toxicity, they state, and minute amounts of the chemical should be considered a risk to the unborn fetus of the rat.

Cells, salt and safety from radiation

One of the biggest drawbacks to radiation therapy is that radiation damages surrounding healthy cells as well as malignant cells. Researchers from the University of Notre Dame have now discovered that placing bacterial cells in sodium chloride solutions protects them from radiation damage. This may have implications for safer radiation therapy.

Chemist J. Kerry Thomas found in earlier work that a stream of ions cannot penetrate an artificial membrane as well if its surface charge is changed to match the ions' charge. Thomas and microbiologist Charles F. Kulpa now find that the killing rate of radiation is decreased significantly when bacterial cells are surrounded by sodium chloride solutions. The team is now trying to determine whether the change in membrane charge or some internal alteration is protecting the live cells.

Medicine

Breast surgery controversy

It's ironic that while the First Lady recovers from radical breast surgery, the National Cancer Institute has pronounced that simple breast surgery would work just as well in over half of all women with breast cancer. The NCI's conclusion is based on a study of 1,700 breast cancer patients during the past three years. "We consider this to be one of the most important series of findings in the history of cancer research," declared NCI Director Frank J. Rauscher.

In radical breast surgery, not just the breast but the underlying chest muscle and lymph glands extending back under the armpit are removed, often resulting in lifelong pain, weakness and periodic swelling of the arm. In simple breast surgery, only the breast is removed.

Not all surgeons agree with the NCI, though. Thomas J. Anglem of the New England Baptist Hospital writes in the Oct. 7 JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION: "The damage that can be done by the uncritical acceptance of the policies proposed by advocates of simple operations for most patients with cancer of the breast is incalculable." The alternative, he says, is not a rigid, inflexible insistence on radical mastectomy for all patients, but an effort to remove all cancer in breast and lymph nodes while interfering as little as possible with the appearance and function of the patient.

How nitrogen drugs you

Air at one atmosphere of pressure (sea level) is made up of about 79 percent nitrogen and 21 percent oxygen. But at 20 atmospheres, nitrogen acts as an anesthetic, so we are, in a sense, chronically exposed to one-twentieth of a dosc of nitrogen anesthesia. Might this whopping everyday dose of nitrogen make us function at less than our peak potential? The answer is yes, Peter M. Winter, an anesthesiologist at the University of Washington School of Medicine, and David L. Bruce, an anesthesiologist at Northwestern University, reported this week at the annual meeting of the American Society of Anesthesiologists.

Winter and Bruce gave 18 healthy volunteers a time test involving their visual and auditory responses and had them practice until they reached their optimal potential. Then, without the volunteers being aware of it, helium was substituted for the nitrogen they were breathing. Sixteen of the 18 volunteers improved their visual and auditory responses by 9.3 percent when helium was substituted for nitrogen, suggesting that nitrogen keeps people from producing at their optimum.

Why you get drunk

Most people have had the dubious pleasure of getting drunk at one time or another, but have little idea of why it happens, biologically speaking. Research reported in the Sept. 20 NATURE by W. R. Klemm, a biologist at Texas A&M University, gives better insight into the state of intoxication.

Klemm carried out electroencephalographic and behavioral studies on rats that had overly imbibed. He found that a particular drug called physotigmine would block the effect of alcohol in the cortex of the rats' brains, yet would not have any effect on the animals' state of intoxication. So he concludes that alcohol probably induces intoxication by creating motor deficits in the cerebellum of the brain rather than by acting on acetylcholine and autonomic nerves in the cortex.