

Toxic sniffer warns of harmful whiffs



Argonne Natl. Lab

Soon there may be a portable, mechanical "sniffer" available to not only identify but also quantify potential chemical hazards — and do it in terms of the risks they pose to human health. Being developed at Argonne National Laboratory, outside Chicago, a 15-pound microprocessor-based analyzer is currently able to identify any of the following, which might be present in a vaporous phase in only parts-per-million concentrations: benzene, acrylonitrile, carbon monoxide, carbon tetrachloride, chlorine, cyclohexane, hydrogen cyanide, nitric oxide, nitrogen dioxide, nitromethane, pyridine, tetrachloroethylene, hydrogen sulfide and sulfur dioxide. The goal is to be able to identify any of 100 or more commonly used toxic chemicals — even in mixtures — though today the device is limited to identification of compounds that occur singly.

Explains Joseph Stetter, the system's principal developer, the device's sensors analyze a compound's electrochemical and combustion characteristics in search of its distinctive signature. If the signature it reads from these data matches one programmed into the device's memory, it prints out the chemical's name on a liquid-crystal display — including its concentration, and what percent that constitutes of the currently accepted human-hazard level. If that constitutes an imminent lethal hazard, an alarm also sounds. An experimental model (shown) was developed for Coast Guard emergency-response teams.

EPA limits use of wood preservatives

Almost six years ago the Environmental Protection Agency (EPA) initiated a special review of the major wood preservatives — creosote, inorganic arsenicals and pentachlorophenol and its salts. It essentially questioned whether the growing body of data that suggested they posed serious health hazards warranted a revocation of their status as approved pesticides. Last week EPA issued its verdict: Consumer sales of these chemicals will be phased out between November 1984 and February 1985; commercial and industrial use of them may continue, but only under the direction of registered applicators; and new warnings will be required offering protective measures to be taken.

These preservatives, which account for more than 97 percent of the chemicals used to resist wood decay, typically extend the service life of wood products fivefold or more by protecting them from damage by fungi, insects, bacteria and marine borers. Overall, they account for roughly one-third of the pesticides used in the United States. Not only are these materials used to brush or spray onto indoor and outdoor structures, but they also are used in the formation of pressure-treated lumber.

Initially spurring EPA's review was the finding that all three classes of preservatives have been linked to tumor production in exposed animals. What's more, creosote and the arsenic-based compounds have been associated with genetic changes, and the pentachlorophenol and arsenicals with birth defects in offspring of exposed animals.

In general, EPA says, these chemicals pose the greatest health risks to those who apply them. However, because there is concern over potential dermal uptake through touching treated wood with bare skin, the agency suggests sealing over (with varnish or shellac) treated materials — such as decks and outdoor furniture — that might be in frequent contact with skin.

Joanne Silbener reports from Quebec City at the 7th International Congress of Endocrinology

Sexual aggression, hormones and brains

The relationship between biochemistry and aggression may be a hot debate within the judicial system, but scientific studies lag behind (SN: 9/10/83, p. 173). In an effort to shed light on the relationship between hormone levels, brain changes and acts of sexual aggression, researchers at Clarke Institute of Psychiatry and Mt. Sinai Hospital, both in Toronto, took brain scans and measured hormone levels of 20 men convicted of rape or attempted rape and of 20 non-rapists.

The scientists found an elevation in the level of a precursor to the male hormone testosterone among the sexually aggressive men; they also found in five of nine "sadists" among the rapists a right temporal lobe structure that is normal in people in their 50s but unusual in the subjects, whose average age was 27.

"Some men who exhibit sexually aggressive behavior may have organic brain pathology," they note. Says Jerald Bain of Mt. Sinai, "There may be a biological basis to their behavior pattern, or a correlate. If there's something biological, at least we might have a handle on who these guys are, or once they've committed an offense at least we might have a handle on predicting whether they will repeat the offense." Another potential benefit of the work: Hormone changes may provide a measure of the effectiveness of psychiatric treatment of these men, Bain notes.

Contraception: Antibodies an answer?

We have vaccines available for most childhood diseases, so why not a vaccine against children — or, more precisely, conception?

The zona pellucida is a glob of glycoproteins (carbohydrates conjugated to proteins) that blanket unfertilized eggs. The glycoproteins provide protection; a hook for sperm to latch onto; and, conveniently for contraceptive purposes, a target for antibodies.

R. J. Aitken and colleagues at the Medical Research Council's Unit of Reproductive Biology in Edinburgh, Scotland, are one of several groups researching such a vaccine. In rodents and primates, Aitken reports "the generation of infertility without any overt adverse side effects."

Aitken says, "The mechanism seems to be steric hindrance" — antibodies to the zona pellucida physically get in the way of the sperm. He doesn't expect that this auto-immunization will cause problems. "The antigen [the glycoprotein being vaccinated against] doesn't get into the circulation so immune complex disease shouldn't be a problem," he says.

He and his colleagues immunized rats by injecting them with zona pellucida glycoproteins from rabbits, which sensitized the rat's own immune system. Ten to 15 weeks of infertility were induced. The process is not perfect — the researchers prevented fertilization in 90 percent, rather than 100 percent, of eggs in 55 rats tested. But all the fertilized eggs, which microscopic evaluation indicated had parts of their zona pellucidas damaged or destroyed, lacked "integrity" and died.

Marmoset monkeys also were successfully immunized with a glycoprotein isolated from a cow's zona pellucida. The monkeys went through their normal estrous cycles and mating patterns, and the vaccinations lasted about 48 weeks. A monkey that conceived after that bore normal healthy twins, Aitken reports.

One animal showed a disruption in progesterone levels, but the researchers were able to eliminate the problem by changing the solution in which the glycoprotein was immersed for injection.

Not to neglect the other party responsible for conception, the male system has been tested as well. That work is more preliminary than the egg work, Aitken reports. Currently, they are selecting antibody targets, with an equatorial band around the center of sperm looking most promising. "The whole field is in a very exciting stage," he says.