CHEMISTRY

Yellow rain riddle: Another clue?

Evidence that the Soviet-backed Kampuchea government is using fungal toxin weapons may be evident in blood samples drawn from alleged victims of such attacks, U.S. State Department officials recently announced. Fred Celec, of the department's political-military affairs division, says that blood samples were drawn from nine individuals supposedly exposed to a "yellow rain" gas attack in the fall of 1981 (SN: 10/17/81, p. 250; 11/21/81, p. 327). Those samples, and blood from four control individuals, were sent to Chester Mirocha of the University of Minnesota for analysis. Mirocha "was able to tentatively identify" HT_2, a metabolite of the trichothecene mycotoxin T_2, in samples from only two of the alleged gas victims.

That HT_2 could be detected in any of the samples weeks after an alleged attack is "surprising," State Department officials admit. "In animal studies, radiolabelled T_2 and its metabolites were rapidly excreted from the body with approximately 80 percent of the radioactivity excreted by 48 hours after exposure." On the basis of these studies, it is believed unlikely that HT_2 could be detected in blood beyond 72 to 96 hours after an attack.

Beware chemistry class

Secondary school laboratories stock many potentially dangerous chemicals, according to a recently released Consumer Product Safety Commission survey. The limited survey, reports CPSC's Abbie I. Gerber and colleagues, involved 22 schools in 11 states. Responses indicated that 312 different chemicals are available in the school laboratories. According to various sources of toxicological information, including *Dangerous Properties of Industrial Materials* by N. Irving Sax (Van Nostrand Reinhold, 1979), 42 of those chemicals are recognized or suspected carcinogens and/or teratogens. About 90 chemicals, some of which are the suspected carcinogens and teratogens, are "capable of causing death or permanent injury due to the exposures of normal use." Whether classes actually are using the chemicals cannot be determined from the survey — the responses indicate only that the chemicals are available for use. Nonetheless, the next step for Gerber and associates is to "develop a network to get this information, along with a list of appropriate substitutes, out to secondary schools."

CPSC's list of potentially hazardous school stock chemicals

C = recognized or suspected carcinogens
T = suspected teratogens

Acetamide — **C**	Formaldehyde — **C**
Isoamyl alcohol — **C**	Isobutyl alcohol — **C**
Aniline hydrochloride — **C**	Kerosine — **C**
Benzene — **C**	Lead acetate — **C, T**
Benzidine reagent — **C**	Lead chloride — **T**
Benzoic acid — **C**	Lead nitrate — **T**
Cadmium chloride — **C, T**	Lithium chloride — **T**
Cadmium nitrate — **C**	Methylene chloride — **C**
Carbolic acid — **C**	Methyl ethyl ketone — **T**
Carbon tetrachloride — **C, T**	Nickelous ammonium sulfate — **C**
Chloroform — **C**	Nickelous chloride — **C**
Chromium acetate — **C**	Nickelous nitrate — **C**
Chromium nitrate — **C**	Phenol — **C**
Chromium potassium sulfate — **C**	Propanol — **C**
Chromium trioxide — **C**	Pyrogallic acid — **C**
Colchicine — **C, T**	Salicylamide — **T**
Dichloromethane — **C**	Sodium chromate — **C**
Dichlorophenol — **C**	Sodium dichromate — **C**
Diphenylamine — **C, T**	Tannic acid — **C**
Ethylene dichloride — **C, T**	Thioacetamide — **C**
Ferric oxide — **C**	Trichlorotrifluoroethane — **C**

BIOLOGY

Frogs that can be frozen

It is well known among biologists that certain insects and polar fish have adapted to the cold by producing chemicals that lower the freezing point of their body fluids — a kind of natural antifreeze. But William Schmid, a zoologist at the University of Minnesota, has discovered terrestrial frogs that actually do freeze and survive the chilly ordeal with no sign of physical damage.

Schmid, whose results appear in the Feb. 5 SCIENCE, studied tolerance in three cold-resistant species: the gray tree frog *(Hyla versicolor),* the spring peeper *(H. crucifer)* and the wood frog *(Rana sylvatica).* In winter these frogs hibernate beneath leaf litter where temperatures can fall below freezing if there is little snow. Schmid collected specimens in late fall and winter, took them back to the lab, and gradually cooled them. He expected to find that they could keep their body fluids liquid when he lowered water temperature below freezing. Instead, he was surprised to learn that 35 percent of the frogs' body fluids, probably extracellular liquids, froze.

Schmid kept the frogs between $-4°C$ and $-9°C$ for five to seven days and then thawed them out. Although some signs of normal activity, such as limb movement, did not return immediately, all were back to normal within two to four days.

When investigating the reasons why these species may be able to survive freezing, Schmid found that they accumulate glycerol, a polyhydric alcohol, but only in the winter. In spring, the same frogs contain no glycerol and lose their tolerance to freezing as well. Cold weather probably triggers glycerol formation in body fluids each year.

It may lower the frogs' freezing temperature a little too. Schmid's animals froze a few degrees lower than what would be expected with no antifreeze. But this is "common," he told SCIENCE NEWS. "It's the tolerance — the protection against damage from ice formation — that's significant."

. . . More on frog evolution

What Warren Burggren of the University of Massachusetts really wants to know is just how our aquatic ancestors millions of years ago made the final transition from water to land — that is, how they developed an air-breathing capability. But for now he must be satisfied with putting together small pieces of that larger puzzle. The problem with trying to solve a mystery like this, says Burggren, an evolutionary biologist, is that fossils preserve bones but not physiological processes.

Burggren is studying a number of living organisms he calls "modern day models" that may shed some light on how lungs of animals before the Devonian period worked and changed over time. Some turtles, for example, stopped evolving 100 million years ago, and their lungs provide clues to those of their contemporaries that later became something else.

Most promising of the models may be the amphibians because these animals make the transition from water to land in just one lifetime, possibly mimicking some of the evolutionary stages of others that left for good. Burggren has taken bullfrog tadpoles and placed them in oxygen-limited situations. In response, they developed larger gills and lungs. This flexibility is important to the frogs because they reproduce at a time of year when oxygen is most scarce.

It is also important to Burggren's larger research project: "Our present model is based on oxygen acting as the selection pressure for movement to the land," he says. Understanding the plasticity in today's amphibians — living in water with a chemical composition similar to hundreds of millions of years ago — will contribute to understanding of those first transitions from water to land as well.