YELLOW RAIN RIDDLE

Pieces to the puzzle stretch from the muddy banks of the Mekong River to a laboratory in Minnesota. These include volumes of reports from Southeast Asian refugees who claim that aircraft doused their hill villages with a mysterious yellow rain that left victims "drowning in their own blood." Strikingly similar reports emanate from the peaks of the Hindu Kush in Afghanistan. And there are the results of a testing laboratory's recent analysis of one leaf and stem collected in Cambodia (Kampuchea) near the Thai border. When the U. S. State Department assembles the pieces, it sees "strong and compelling but nonetheless preliminary" evidence both that lethal chemical weapons based on fungal toxins are being used in violation of the 1972 Biological Weapons Convention and that the Soviet Union may be supplying these weapons. Others maintain that it is too early to form a coherent picture, that some pieces are missing.

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Now the puzzle pieces are before a special United Nations team of medical and military experts. Created last December after the U. N. General Assembly adopted a resolution to look into allegations of chemical warfare, this team already has met twice and plans a third such session. Next month, it will present its recommended investigation strategy to the present session of the General Assembly. Meanwhile, the group is asking various governments for permission to conduct on-site investigations.

If the U. N. team is allowed to visit the various alleged targets of chemical warfare, then it should collect more samples of yellow-rain dusted foliage and question presumed witnesses to such attacks, says geneticist Matthew Meselson of Harvard University in Cambridge, Mass. "The evidence that thus far has been made publicly available is unconvincing," says Meselson, who for 10 years, beginning under then President John F. Kennedy's administration, counseled the arms control agency and the U. S. Department of Defense on matters of chemical and biological warfare.

The bulk of that available evidence was presented by Undersecretary of State Walter J. Stoessel Jr. at a Sept. 14 news conference. "Reports of the use of chemical warfare agents in Southeast Asia date back to 1976," according to a State Department fact sheet handed out at that briefing. But early attempts to obtain physical evidence of such activity proved unsuccessful — probably because analyses were geared toward searching only for the familiar first-generation chemical warfare agents used in World War I or newer, second-generation agents such as nerve gas. Earlier this year, however, when the State Department received from Kampuchea a "rain"-dusted leaf and stem (presumably found by the Pol Pot forces who claim to be targets of chemical attack), a different analysis was requested. That analysis, conducted in a Minnesota testing laboratory, revealed "high levels of mycotoxins of the trichocethene group."

Mycotoxins are poisons produced in nature by fungi. The three found in the sample foliage are nivalenol, deoxynivalenol and T2. Such mycotoxins — produced by certain species of the common fungus *Fusarium* — "are *not* native to warm climates, that is, Southeast Asia," according to the State Department. ("The Soviet Union, on the other hand, does have the necessary facilities to easily produce the quantities reported," the fact sheet goes on to say.)

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State Department officials requested the analysis for mycotoxins after being prodded by writer Sterling Seagrave, a member of the sixth generation of an American family that has lived and worked in Burma since the 1820s. The mysterious symptoms displayed by victims of yellow rain, explains the writer, simply could not be attributed to exposure to any familiar chemical weapon. Seagrave spent years interviewing such victims in Southeast Asia, Yemen and Afghanistan, along with the doctors who treated them, in order to write his book *Yellow Rain* (Evans, New York, 1981). In that book — which was released just 10 days after the State Department's Sept. 14 briefing — Seagrave presents a convincing circumstantial case for Soviet violations of the international ban on chemical warfare. The author says he maintains close contact with "two or three people in the State Department who are actively involved in trying to solve the [yellow rain] riddle." Says Seagrave, "I am aware of a great deal more evidence that cannot yet be revealed."

Seagrave has played a prominent role in the press reports of the U. S. allegations that mycotoxins have been used as chemical warfare agents in Southeast Asia. For example, when the State Department refused to specify the amount of mycotoxin found in their sample foliage, one media account used Seagrave as a source for those levels.

But, says Meselson: "We need these numbers from the U. S. government. No commentator — Sterling Seagrave included — is a substitute for the authoritative statement of the government. It would be quite improper for the statement of a great power to hinge for its support on a non-scientific journalist, no matter how studious or so on he may be."

"A matter like this which raises questions of actual treaty violations — this is not a joke," Meselson says. "This is not something that should be approached in a sophomoric manner." Instead, he says, the *U. S. government* should provide the public with the "full and proper scientific details and evidence." In addition, he says, the government should address the various questions raised by the sketchy data presented thus far.

For example, Meselson wonders

Have portions of Southeast Asia and Afghanistan been sprayed with yellow clouds of a Soviet-supplied fungal toxin weapon?

BY LINDA GARMON

"whether someone is pulling a stunt on our U. S. government" — that is, whether the vegetation was deliberately doped to generate anti-Soviet feelings. Although Seagrave's book was just published, the mycotoxin theory it discusses already has been bandied about for a year now, Meselson says. "Maybe it brewed around, and someone cooked up a scheme." He explains: Involved are "the Pol Pot forces ... pitted against the Hanoi government with quite a few onlookers — China, the United States, the Soviet Union and Thailand. All kinds of things are at stake."

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Another possibility is that mycotoxin-producing *Fusarium* contaminated the sample foliage somewhere between its harvest and analysis. "Very little information is provided on the storage of the [sample] plants," notes Colorado State University's James R. Bamburg, who studied and named T2 toxin as part of his Ph.D. work.

Both Bamburg and Meselson also question the State Department's assertion that *Fusarium* mycotoxins do not occur naturally in Southeast Asia. "There *are* reports in the literature of T2 mycotoxins from warm climates — namely, from Italy and India," says Meselson. (In the May/June 1978 JOURNAL OF AGRICULTURAL AND FOOD CHEMISTRY, for example, Cheruvanky Rukmini and Ramesh V. Bhat of the Indian Council of Medical Research in Jamai-Osmania, Hyderabad, report the occurrence of T2 toxin in *Fusarium*-infested sorghum from India.)

Meselson also challenges the State Department's list of symptoms associated with mycotoxin exposure: "rapid onset of vomiting, multiple hemorrhages of mucus membranes, bloody diarrhea, and severe itching and tingling of skin with formation of multiple small blisters, and death." It is the reported rapid onset of hemorrhaging that particularly concerns Meselson. While T2 causes some internal bleeding, he says, it probably is a misconception that mycotoxin attacks immediately can leave victims "dying in their own blood." Indeed, the well-known documented cases of mycotoxin disease — among the Russian peasants who ate moldy overwintering grain in the spring of 1944 — describe a much slower process that takes weeks to kill. (A. Z. Joffe describes the effect on humans of mycotoxin exposure in *Mycotoxins* [Elsevier Publishing Co., New York, 1975].)

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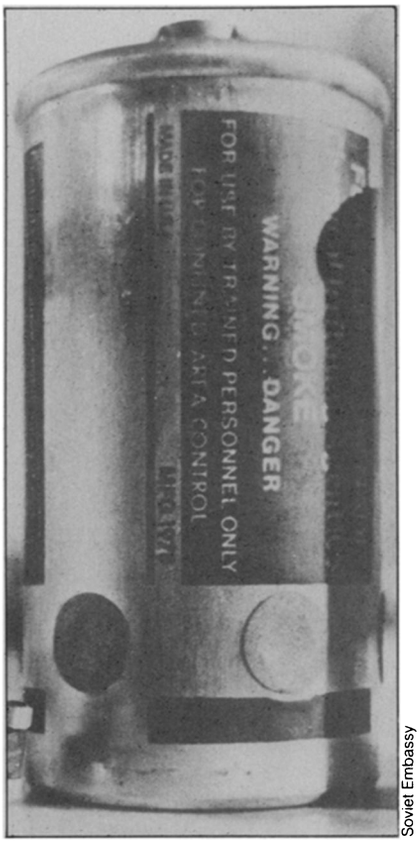
Other misconceptions, says Meselson, arise from the State Department's intimations that elaborate facilities are needed to produce mycotoxins and that such substances are third-generation, super chemical warfare agents. "You and I, if we wanted to, could make T2 toxin," Meselson says. The resulting chemical, according to animal toxicity tests, would be 10 to 100 times less toxic than nerve agents.

"T2 toxin is a very feeble poison," says Meselson. Yellow rain, he says, "could be something else." □

In response to the State Department's intimation that the Soviet Union may be providing Afghanistan and Southeast Asian countries with chemical weapons, Soviet spokesperson Vadim Gardov says, "The Reagan Administration has no evidence to support its charge. Nor can it have. The Soviet Union is a principled opponent of chemical weapons." In a statement released through the Soviet Embassy in Washington, Gardov says, "The reason behind yet another anti-Soviet lie is obvious: Washington wants to impute to others what the USA itself is doing in practice." Gardov maintains that chemicals from U.S.-made gas grenades — such as the one, pictured at right, supposedly uncovered by a unit of the "People's Armed Forces of the Democratic Republic of Afghanistan" — were responsible in spring 1980 for poisoning school girls in Kabul.

But a brigadier in the Afghani resistance group "Freedom Fighters" told SCIENCE NEWS *that no one has supplied his army with chemicals and that even if there were a supplier, his guerrilla fighters would not have the weapons necessary to deliver the canisters. The brigadier, who recently left the fighting to bring his family to the Washington area, says he believes the* Soviet Union *is responsible for the Kabul incident. "They used something that smelled like rotten apples," he said through an interpreter. "Hundreds of girls were taken to the hospital."*



Soviet Embassy