

# Apocalypse... Still?

## Trichothecene mycotoxins

Trichothecenes are a large family of chemically-related mycotoxins produced by various species of fungi, most notably *Fusarium* species but also species of *Stachybotrys*, *Trichoderma*, and *Trichothecium*. A poisonous mushroom in Japan and China, *Podostroma cornu-damae*, produces six trichothecenes: satratoxin H, roridin E, verrucarol and others (see FUNGI vol. 4, no. 5). Trichothecene mycotoxin poisonings are mostly food borne and can be very dangerous to humans and other animals. They are most commonly found in spoiled or molded grain like wheat, oats, barley, or maize (corn). The most common fungi suspected are *Fusarium graminearum* (the asexual form of *Gibberella zeae*), *F. sporotrichioides*, *F. poae* and *F. equiseti*. In North America, livestock are affected annually; globally, humans occasionally are afflicted from trichothecene-contaminated food. The most famous case involving humans occurred shortly after World War II in the Soviet Union, and it is believed 100,000 people may have been killed by grain contaminated with T-2 toxin.

**Deadly mycotoxins were blamed as the source of Southeast Asia "Yellow Rain" by CIA—30 years later and we still do not know the truth**

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Anyone cognizant of world news in the early 1980s, will remember the conflict in Southeast Asia. This period of the Vietnam War was well after the USA was defeated and sent back home (in a similar fashion to previous colonial powers there: Great Britain, France, etc.). Communism spread through the region like mycelia across a Petri plate, as predicted (remember the "Domino Theory"?). After victory in South Vietnam, a unified Communist Vietnam was attacked by the paranoid Communist Khmer Rouge of Cambodia. (The Khmer Rouge, led by "Brother Number One" Pol Pot, were actually backed by the USA early on, until they realized the Khmer Rouge leaders were totally insane.) The Khmer Rouge fell to the Vietnamese; those still in Cambodia who had sided with the USA had to go into hiding to avoid persecution. Communism also took hold in Laos; ethnic Hmong people, who had fought on the side of the USA during the war, fled to the hills, the jungle, and the Thai border to escape persecution by the Lao communists (Pathet Lao). During the summer of 1975, reports began trickling out of Laos that government forces were using Soviet-supplied chemical weapons to terrorize the Hmong and drive them from their mountain sanctuaries. Refugees described a variety of toxic agents delivered by low-flying aircraft; about 70 percent of the reports

involved an oily yellow liquid that made a sound like rain when it struck leaves or roofs, causing the Hmong to call it "Yellow Rain." Eyewitnesses claimed that Yellow Rain smelled like gunpowder and left a residue of sticky yellow spots on leaves, rocks, and rooftops. Exposure to high doses reportedly caused heavy bleeding from the nose and gums, blindness, tremors, seizures, other neurological symptoms, and death. Similar incidents were reported in Democratic Kampuchea (Cambodia) in 1978 after the Vietnamese take-over there. The victims, both injured and killed, were reported to be in the thousands. Chemical and biological weapons were suspected.

The wave of conservatism that would later sweep Ronald Reagan into office was turning up the rhetoric that the Soviet Union was violating arms control treaties. And in particular, violations of treaties that banned the use of chemical and biological weapons. Many newspaper editorials, namely *The Wall Street Journal*, led the charge. A November 1981 editorial in *WSJ* condemned: "Except to the willingly obtuse, the evidence is conclusive. The Soviets have long been engaged in the development and production of chemical and biological weapons. They have used these weapons in Yemen in the 1960s, and now in Cambodia, Laos, and Afghanistan." The *WSJ* in this and future editorials kept up the pressure, even



criticizing skeptics for giving the Soviets “the benefit of every conceivable doubt.”

### **Making a case for biowarfare: the mycotoxins**

Initially, chemical warfare experts in the USA were mystified by the alleged attacks in Southeast Asia because the symptoms described by refugees did not match the effects of any known chemical or biological agents. In July 1981, however, US Army toxicologist Dr. Sharon Watson noted a striking similarity between the reported symptoms and those resulting from exposure to fungal poisons called trichothecene mycotoxins (poisonous compounds made by molds that infest grain, see box). Samples of Yellow Rain from an alleged attack site in Laos were secretly collected by the CIA and analyzed by a laboratory at the University of Minnesota. Three different trichothecenes were detected in concentrations and mixtures not known to occur in nature. Another piece of circumstantial evidence was the fact that consumption of trichothecene-contaminated grain had long been a serious public health problem in the Soviet Union, leading to intensive research on mycotoxin poisoning. The US intelligence community speculated that this research had caused the Soviets to recognize the military potential of trichothecenes and to develop them as a weapon. (We do know that the Soviet Union had a large-scale chemical and biological weapons research program, as did the USA. Since the end of the Cold War a number of documentary films have made on the topic.)

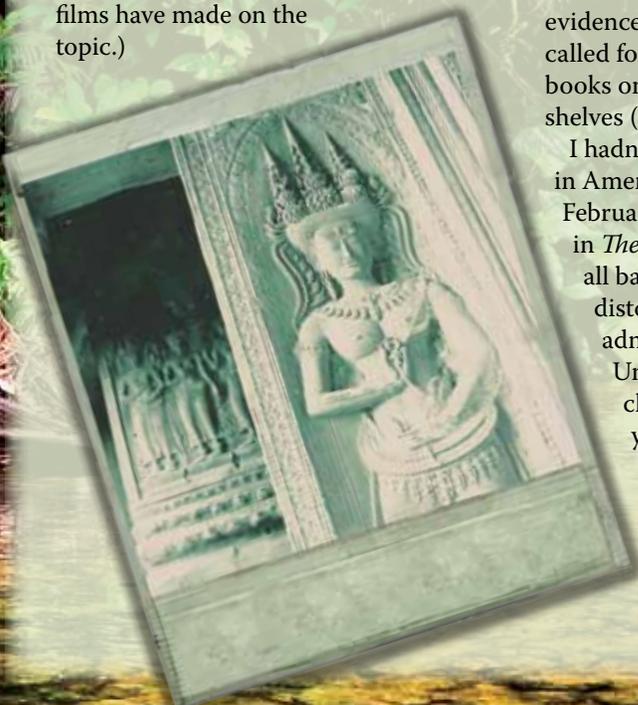
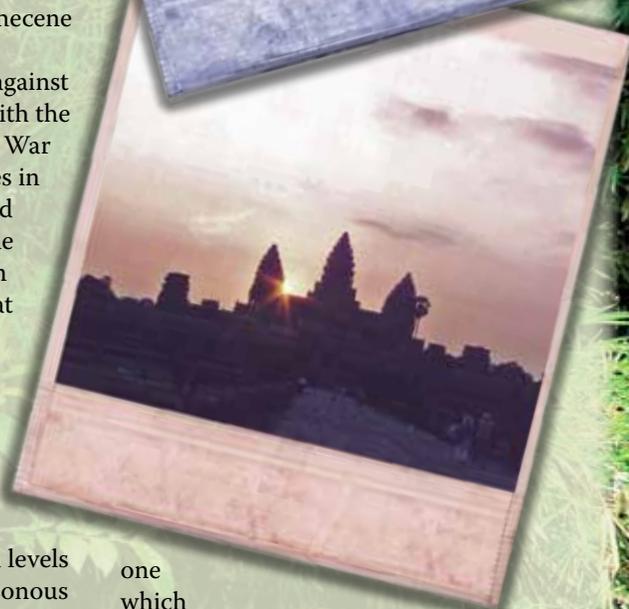
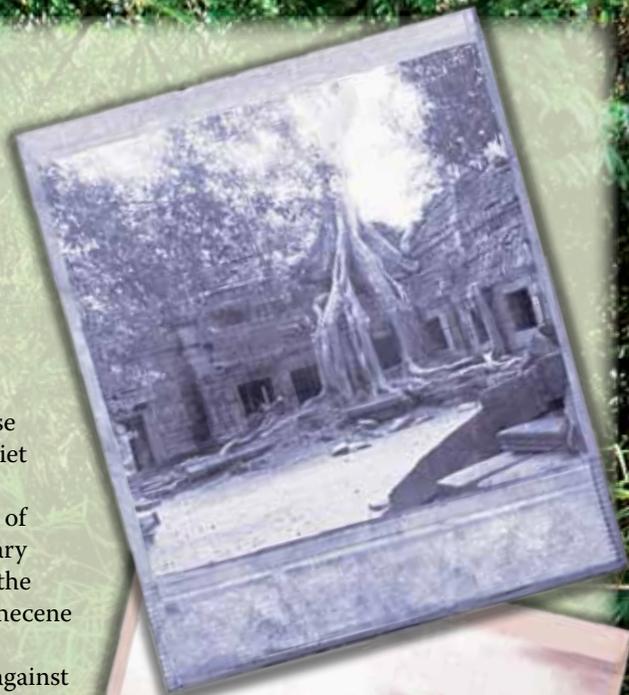
Since the Yellow Rain was now clearly a chemical weapon, who was making it? Obviously not the Vietnamese, they were unable to make the conventional weapons they were using. It had to be a Communist ally, and one with the sophistication to build chemical and biological weapons. China was ruled out as they were not on friendly terms with the Vietnamese (to say the least). That left the Soviet Union. On September 13, 1981, based on the preliminary findings of the US scientists, then-US Secretary of State Alexander Haig, accused the Soviet Union of supplying trichothecene mycotoxins to its Vietnamese and Laotian allies to use as a weapon against Hmong villagers who had sided with the United States during the Vietnam War and against anti-Vietnamese forces in Cambodia. Secretary Haig charged publically, “For some time now, the international community has been alarmed by continuing reports that the Soviet Union and its allies have been using lethal chemical weapons in Laos, Kampuchea [Cambodia], and Afghanistan. We have now found physical evidence from Southeast Asia, which has been analyzed and found to contain abnormally high levels of three potent mycotoxins—poisonous substances not indigenous to the region and which are highly toxic to man and animals.” The Reagan administration continued its charges against the Soviet Union throughout the early 80s as evidence mounted. Newspaper editorials called for the Soviets to be reined in; books on the topic flew off bookstore shelves (Evans, 1983).

I hadn't thought about this episode in American history for a long time. A February 11, 2012, editorial published in *The New York Times* brought it all back, asserting “that flawed or distorted intelligence led the Reagan administration to accuse the Soviet Union and Vietnam of using chemical weapons, known as yellow rain.” Why did *The Times* bring this up? And why now? It seems that a classified critique of the intelligence behind those charges, written many years ago for the CIA, and

one which could shed light on what happened, has been long-sought through the Freedom of Information Act. All requests were recently denied.

### **Independent scientists determine otherwise**

Even without this critical piece of potentially damning evidence, it was long ago pretty well established that the Yellow Rain was not an act of biowarfare. Over the years, skeptics — led by Harvard University scientist Dr. Matthew Meselson — have persuasively disputed most of the claims and accusations leveled at the Soviet Union and Vietnam. Meselson should be a name recognized by all biology students. He is a legendary American geneticist and molecular biologist who originally studied under the great Linus Pauling. Later, his research (along with colleague Franklin Stahl in the 1950s) was important





*Fusarium* growing on corn kernels in culture (above) and on cut tree stump (below), courtesy of G. Barron.

in showing how DNA replicates, recombines, and is repaired in cells. The two used a DNA-DNA hybridization experiment where the double-stranded DNA was “unzipped” and when the double-stranded condition was returned, it was found that the replication of DNA proceeded in a semi-conservative fashion. That is, one of the two strands is used as a template for the second strand. Until their discoveries, scientists argued over many possible ways DNA was replicated.

Skeptical of the CIA’s claims of biowarfare, Meselson led a team of researchers into the jungles of Southeast Asia to investigate Yellow Rain. The skeptics argued that trichothecene mycotoxins do occur naturally in Southeast Asia; indeed, the tropical jungles of Southeast Asia are teeming with molds and fungi of all sorts.



The scientific critics also raised doubts about the reliability of the refugee testimony, concluding instead that the alleged victims had confused chemical attacks—where poisons rained down from the sky—with harmless showers of yellow feces released by swarms of giant Asian honeybees. The independent scientific data was completely dismissed by the Reagan administration. They used the usual tactic by those without scientific facts to stand on: they labeled Meselson as a long-time leftist who was unpatriotic and wanting to undermine the US government. Indeed, Meselson, for a while was the butt of late night jokes by pundits and talk shows. Yellow Rain ... bee poo? Yes, they asserted; the yellowish drops found on foliage were most likely produced by honeybees, which often leave their nests en masse and produce showers of pollen-laced feces that can cover an acre or more with hundreds of thousands of yellow spots. They suspected (but could not prove) that the traces of poison found in some samples were false positives caused by laboratory contamination. Additional, independent laboratories in the United States, Britain, France and Sweden analyzed scores of samples and never found a trace of poison. (It should be noted that the Minnesota lab where the original CIA samples were sent, is a mycotoxin testing facility and handles tons—literally—of grain and other agricultural commodities laden with mycotoxins.)

Furthermore, the Meselson team offered the following as more specific (and more damning) evidence from the thousands of samples collected: separate “yellow rain drops” which

occurred on the same leaf, and which were accepted as authentic, consisted largely of pollen; each drop contained a different mix of pollen grains, as one would expect if they came from different bees, and the grains showed properties characteristic of pollen processed by bees (the protein inside the pollen was gone, while the outer indigestible shell remained). Further, the pollen came from plant species typical of the area where the drop was collected. The different composition was striking, as it implied that the Soviets would have had to have very sophisticated mixing apparatus that could take pollen from local Southeast Asian plants, treat it as done by bees, and then mix the pollen into different drops, such that different drops contain different pollens.

And what about the testimonies of scores of Hmong refugees; claims of skin lesions, burns, gastric upset, diarrhea, and flu-like symptoms? Pretty much all these testimonies usually fell apart in follow-up interviews. Of the few documented cases of illness, the illnesses were repeatedly shown to be due to natural causes. Many of the testimonies were based on responses by “victims” who did not actually understand the questions asked them by the interviewers. Many experts felt the mass hysteria surrounding the Yellow Rain seemed part of uncontrolled rumors that spread throughout the land. This is not hard to believe; US sympathizers really were driven from their homes, persecuted and even killed (and the persecution continues to this day in some regions). Likewise, the “victims” sided with the USA and no doubt would have believed their allegations might benefit them later.

No chemical munitions have ever been found, and none of the hundreds of Vietnamese soldiers who were debriefed provided a shred of information that suggested the use of a weapon remotely resembling Yellow Rain. I remember this period well. A number of agencies and even pro-military magazines offered huge rewards to any Vietnamese pilot who defected with Soviet chemical warfare apparatus on his jet (including, famously, \$100,000 offered by *Soldier of Fortune* magazine).

### **Recent “Yellow Rain” episodes**

Back in the 80s, when I first heard

the claims that what was obviously (to me and most others) a chemical weapons attack, in reality, was a natural phenomenon (a mass flight of defecating bees), I have to admit that it sounded implausible. I likely laughed right along with the late night comedians. This was because I'd neither seen nor heard of such a phenomenon before. Nowadays, I have friends who tend bees and entirely all of them have conferred that, oh yes, the phenomenon is well known in the bee community, but when it occurs in North America it's on a much smaller scale. And usually in agricultural areas far from any witnesses.

The scientific critics' view of Yellow Rain-is-bee-poo has been receiving additional support from nature recently, from parts of Asia as disparate as India and Japan. In June 2002, a yellow-green rain fell from the sky on the town of Sangrampur, near Calcutta, India. Rumors spread that the rain might be contaminated with toxins or chemical warfare agents. Shortly after the "attack," however, Deepak Chakraborty, chief pollution scientist for the Indian state of West Bengal, reported that the yellow-green droplets were in fact bee feces containing pollen from local mangoes and coconuts. He concluded that the colored rain may have been caused by the migration of a giant swarm of Asian honeybees, which are known to produce "golden showers" (see Pearce, 2002).

### ***The risks of failed "intelligence"***

Despite the best efforts of those in the "intelligence community" (to use the parlance of late), sometimes our political leaders make hasty decisions or crime investigations get botched. The mysterious Yellow Rain episode is just one example. Another was a misguided

**"...intelligence analysis is an uncertain game, all too vulnerable to error and politically-motivated distortion. That experience has done little to change the intelligence community's passion for secrets, whether or not they need to be kept."  
*The New York Times*, editorial, February 11, 2012**

war in Iraq (based almost entirely on claims of weapons of mass destruction by a single informant code named, curiously, "Screwball"). Two separate bipartisan commissions have weighed in and found there was no actual evidence for weapons of mass destruction in Iraq. And who could forget the famous 2001 Anthrax attacks and equally famous botched investigation? (It seems unlikely that anyone other than the single suspect under investigation could have done it, but we will never know, as he committed suicide.) Incidentally, there is a recently-published book on the Anthrax attacks investigation (see below) by Jeanne Guillemin, an expert on chemical and biological weapons. (She is also the wife of the aforementioned Matthew Meselson.)

Although we may never know what happened in the Anthrax attacks, it seems that the mystery surrounding the Yellow Rain attacks could be resolved if all known documents and evidence were made public. The classified report that Dr. Meselson is seeking was done by a former covert operative and contract historian, and examined how the intelligence community came up with its finding that Yellow Rain was a chemical weapon. The CIA is, of course, "claiming that releasing the report would reveal sensitive information about intelligence sources and methods, as well as the organization and function of the CIA." *The Times* editor suggested otherwise: "Thirty years later, that is preposterous. A better guess is that the agency is worried about being embarrassed by what the report says about how the intelligence community did its work" (*The New York Times*, editorial, February 11, 2012).

### ***Further Reading***

Evans, G. 1983. *The Yellow Rainmakers: Are Chemical Weapons Being Used in Southeast Asia?* Verso Editions, London; ISBN: 0860910687.

Guillemin, J. 2011. *American Anthrax: Fear, Crime, and the Investigation of the Nation's Deadliest Bioterror Attack.* Times Books, New York, 336 pp.

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*The New York Times*. 2011. Editorial: Still secret after 30 years? <http://www.nytimes.com/2012/02/12/opinion/sunday/still-secret-after-30-years.html>

Tucker, J.B. 2001. The "Yellow Rain" controversy: Lessons for arms control compliance. *Nonproliferation Review* 8



*Fusarium* conidia, courtesy of G. Barron.

