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## Germ warfare: New threat from terrorists

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Imagine a weapon so stealthy it's invisible to spy technology, a weapon that detonates without a sound and begins piling up casualties days before anyone notices something is amiss.

No, this isn't the latest version of Star Wars—it's germ warfare. Though banned by federal law and international treaty, biological weapons pose a new threat, scientists say—this time from terrorists emboldened by the breakdown of international order and the rise of extremism.

"Events in the last few years have eradicated taboos against biological warfare. Once it was thought to be too horrific, now it's just a tool of the trade," says Kyle B. Olson of the Arms Control and Proliferation Analysis Center in Arlington, Va.

"The threat of biological warfare is growing because it is so easy, because it can kill so many people, and because an infectious disease can have a long-lasting impact," asserts Kathleen C. Bailey of the Lawrence Livermore (Calif.) National Laboratory.

Building a nuclear capability would cost \$1 billion or more, require 1,300 engineers, and take years. Developing biological weapons could cost less than \$100,000, require five biologists, and take just a few weeks, using equipment that is readily available almost anywhere in the world.

Moreover, the secrets of cultivating germs are not secret at all—they are described in scientific literature, Bailey said at a meeting this week on the threat of infectious disease.

Extremists have already obtained the tools of biological warfare. Last year, an Ohio militia enthusiast was arrested after he sent away for and received plague virus from the American Type Culture Collection in Rockville, Md. In Japan, Aum Shinrikyo—the cult that spewed poison gas into Tokyo subway stations—built a germ warfare lab and tried to get Ebola virus.

A germ warfare lab is difficult to detect, Bailey said at the meeting, sponsored by the nonprofit National Consortium for Genomic Resources Management and Services in McLean, Va. Through 25 United Nations inspections, Iraq successfully hid five labs that made thousands of liters of the germs that cause anthrax, botulism, and gas gangrene. Finally, a defector-inspired raid on an Iraqi farm in 1995 unearthed incriminating documents.

Western nations probably face the greatest risk of germ warfare because their populations are extremely mobile. "You don't know you've been struck until the blow is 2 or 3 days old," says Olson. —S. Sternberg

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## Science fair winners taking home the gold

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Students will be traveling the globe and traveling to college with scholarships won at the 47th International Science and Engineering Fair, held in Tucson last week.

The 665 winners were selected from 1,071 high school students representing more than 40 countries. They took home prizes totaling over \$1 million. The four top awards were overseas trips. Students also won first- through fourth-place awards, sponsored by six corporations, of up to \$5,000 in 16 different categories. Science Service, Inc., publisher of SCIENCE NEWS, organizes the annual fair.

Two students won the Glenn T. Seaborg Nobel Prize Visit Award and plan to travel to Stockholm in December to observe the 1996 Nobel ceremonies. Naomi Sue Bates, 18, of Franklin (W.Va.) High School, used a 140-foot telescope to detect high-velocity gas in galaxies where none had been seen before. She hopes her work will shed further light on star and galaxy formation. Bates was also a Westinghouse Science Talent Search scholarship winner (SN: 3/16/96, p. 167).

Cowinner John Paul Tassinari, 17, of Braintree (Mass.) High School designed an airfoil that minimizes drag from air

pressure, while increasing lift. A higher lift-to-drag ratio improves an aircraft's takeoff on short runways, climbing rate, and fuel efficiency. He tested his design at the Massachusetts Institute of Technology's wind tunnel.

The team of Mark Mason Esformes, 18, and Jason Adam Gerstenberger, 17, of Manatee High School in Bradenton, Fla., won a trip to the 11th International Fair of South America in Novo Hamburgo, Brazil. The students designed a computer program that attempted to simulate the activity of viruses and their interaction with immune cells.

For its research on kayak design, a team from Hawaii won a trip to the European Union Contest for Young Scientists in Helsinki. Team members are David James Matsumoto, 16, Marvin Taichi Kawabata, 18, and Christopher Chi Yuen To, 16, all of Saint Louis School in Honolulu.

Research on the behavioral and physiological responses of earthworms, fruit flies, and fire ants to high concentrations of pesticides won Katherin Marie Slimak, 17, of West Springfield (Va.) High School a scholarship to the Bessie Lawrence International Summer Science Institute at the Weizmann Institute of Science in Rehovot, Israel. —T. Adler

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## Radicals linked to aging via the brain

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The rate at which bodily functions decline naturally with age can vary dramatically. Even within an individual, different systems may age at their own pace, with memory going first in one person, mobility losing out in another.

Now, an animal study suggests that the vulnerability of proteins in the brain to attacks by highly reactive, oxygen-based free radicals appears to determine where and how quickly many of the ravages of age begin.

The same oxygen that suffuses the body with life can quickly assume a rebellious nature, altering or destroying cells. Indeed, the body harnesses oxygen free radicals to eliminate invaders and unwanted tissue.

Animals possess defenses that enable them to weather the unavoidable ravages of free radicals and to quench excess radicals. Over time, however, these defenses themselves fall prey to attacks by radicals. When that happens, proteins may succumb to a disabling oxidation. Having somewhat weaker antioxidant defenses than many other tissues, the brain provides an especially vulnerable target.

Michael J. Forster of the University of North Texas Health Science Center in Fort Worth and his colleagues now report in the May 14 PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES that the brains of old mice possess many more oxygen-damaged proteins, known as protein carbonyls, than do those of youthful mice.

In healthy young animals, the body rids itself of carbonyls about as fast as they form. So the team's observation of carbonyl buildups in the brains of older animals indicates that, at least regionally, protein oxidation had begun outpacing the body's ability to manage it, Forster explains.

In any given mouse, moreover, the carbonyls tended to have accumulated selectively within the brain structures responsible for controlling those activities most impaired in the particular old animal. In one case it might be balance, in another, memory.

"This is the first really good indication that loss of a particular function in the brain, as a result of age, is associated with oxidative damage to that part of the brain," observes Earl R. Stadtman of the National Heart, Lung, and Blood Institute in Bethesda, Md.

Adds John M. Carney of the University of Kentucky School of Medicine in Lexington, autopsy data indicate that, with age, "the level of carbonyls rises exponentially in the human brain. So the same thing that we see in the animal happens in humans." —J. Raloff