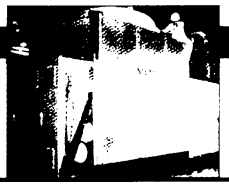
1949
Clinical medicine's new overseer

LEAD STORY 1950
Q&A with China's president



1955
Fuel cells advance

pable of developing nuclear-tipped missiles to be unable to deploy effective decoys. NMD is "a system in search of a cooperative enemy," says Representative Rush Holt (D–NJ), formerly a physicist at Princeton University.

Both NMD opponents and supporters agree that the technical dispute has further inflamed an international diplomatic debate over whether the United States should deploy the system. Russia and many U.S. allies oppose deployment on the grounds that it would require rewriting a 1972 treaty limiting such defenses. Such a step, they say, would increase the global risk of nuclear attack. Pointing to the system's technical problems and rising costs, even some senior Democrats are trying to persuade Clinton to leave the decision to the next president. If the system can't tell "a phony [missile] from a real one," says the Senate's top Democrat, South Dakota's Tom Daschle, "I don't know that we're ready to commit resources." That kind of uncertainty is music to the ears of the researchers who gathered here this week.

–DAVID MALAKOFF AND ADRIAN CHO

PUBLIC HEALTH

Deaths Among Heroin Users Present a Puzzle

The first symptom is an abscess where the needle broke the skin. Next, inflammation tears through the body, triggering a steep drop in blood pressure. The number of white blood cells skyrockets. Within hours, the victim's organs shut off one by one. More than 30 heroin users in Scotland and Ireland have died this dreadful way in the past 6 weeks, and health officials had reason to suspect that they were looking at the handiwork of a pathogen whose occasional appearance invariably is cause for alarm: anthrax, the notorious biological warfare agent.

The suspicions aroused a lightning-fast response from microbe hunters on both sides of the Atlantic. Their analyses, first posted on 1 June on *Eurosurveillance Weekly*—an Internet site that tracks infectious diseases in Europe—and in more detail in last week's *Morbidity and Mortality Weekly Report*, offer a somewhat reassuring conclusion: Anthrax did not kill the heroin users. It's unclear what did, but a new suspect has emerged.

"Drug addicts die all the time," says Syed Ahmed of the Greater Glasgow Health Board in Scotland. Even so, when Glasgow-area hospitals realized in early May that heroin users were succumbing to a mysterious malady, it was obvious that the cases painted "a very different picture" from an overdose, Ahmed says. Rather, a pathogen appeared to be responsible. Then on 6 May, Per Lausund of the Norwegian Army Medical School in Oslo posted a notice on ProMED, an Internet forum for infectious disease specialists. It described the case of a heroin addict in Norway who had died of anthrax the week before. Lausund had not yet heard about the Scottish victims.

Researchers suspected that a batch of heroin of unknown origin had been contaminated, knowingly or otherwise, with the anthrax bacillus, the spores of which can lie dormant in harsh conditions for years. Although anthrax is not transmitted from person to person, the possibility of any commodity being spiked with the bacillus raised red flags. Springing to action was the U.K. Department of Health's Centre for Applied Microbiology and Research (CAMR) in Porton Down, a lab that keeps samples of many exotic diseases. "Anthrax is one of our specialties," says CAMR microbiologist Phil Luton. Its investigation drew intense public interest in the wake of news reports speculating about a budding anthrax epidemic.

Since the U.K. Department of Health issued a Europe-wide alert on 19 May, the death tally among heroin users has climbed to 18 in Scotland, seven in Ireland, and seven in England and Wales. In a conference call on 30 May, U.K. and Irish health officials concluded that they were "dealing with the same phenomenon," says Joe Barry of Ireland's Eastern Regional Health Authority in Dublin. The authority, like its Scottish counterpart, shipped samples from patients to the U.S. Centers for Disease Control and Prevention (CDC) in Atlanta for analysis.

The CDC and the CAMR returned good news: no anthrax. But the mystery deepened. The only bacteria the labs isolated are common ones unlikely to trigger such severe symptoms, says Ahmed. Although the outbreak appears to be subsiding, he says, "we still don't know what [the drug users] are dying of." The Norwegian death appears to be unrelated, he adds.

Suspicion now centers on Clostridia, a family of more than 30 species including the bacteria that cause botulism, tetanus, and gas gangrene. Like anthrax, Clostridia form spores hardy enough to survive the high temperatures reached when heroin is dissolved before injection. And some Clostridia are hard to culture, which may explain why pathogenic strains have not yet been detected conclusively in tissue samples from the heroin users.

But the circumstantial evidence is mounting. Most of the victims had dissolved the heroin in citric acid before injecting it into their muscles. Citric acid damages tissue, perhaps providing a hospitable oxygen-starved environment for Clostridia spores to flourish, says Ahmed. What's more, toxins

One-way trip. A mystery pathogen is killing heroin users in the U.K. and Ireland.

churned out by many Clostridia species would account for the rapid progression of symptoms and death. "Once the toxin is produced, an antibiotic treatment is too late," says Brian Duerden of the Public Health Laboratory Service in London, the British version of the CDC.

Researchers haven't ruled out other possibilities, however. "It may be a new pathogen or something that makes you slap your head and say 'Gee, why haven't I thought of that before,' " says Martin Hugh-Jones of Louisiana State University in Baton Rouge. With roughly half of powder sold as heroin cut with filler, he says, "there's a lot of space to let you inject God knows what." And whatever that might be is likely to kill again.

–MICHAEL HAGMANN

TOXICOLOGY

Just How Bad Is Dioxin?

The verdict is in—again: Dioxin is even worse for human health than previously believed. But, as has been true with earlier pronouncements on dioxin's risks, that judgment is controversial and may be appealed.

This latest assessment comes in an eagerly awaited draft report from the U.S. En-

vironmental Protection Agency (EPA), which concludes that many Americans may have enough dioxin in their bodies to trigger such subtle harmful effects as developmental delays and hormonal changes in men. But the draft's most explosive finding is that the risk of getting cancer from dioxin is 10 times higher than previously estimated—a conclusion based largely on new data linking dioxin to cancer in workers.

That conclusion has flabbergasted many outside researchers, who first heard about it when the report was leaked to the press last month (*Science*, 26 May, p. 1313). A few told *Science* that they are concerned that EPA scientists may have fumbled again—when this was their chance to finally get it right. Indeed, agency scientists have spent the past 6 years revising the dioxin report, analyzing new data and reassessing earlier data after portions of their last draft were blasted by outside reviewers. "After all this time, if it doesn't fly, it will be an embarrassment to the agency," says environmental scientist Morton Lippmann of New York University, who chaired the earlier review panel and will lead the new one.

Dioxins are chlorinated chemicals produced mainly by incinerators and paper bleaching. They accumulate in the food chain, winding up in body fat when people eat animal products. In the 1980s, EPA concluded there was no safe level of dioxin—even the lowest exposure was hazardous. Then in the late 1980s, molecular biologists suggested that more than one dioxin molecule, perhaps considerably more, have to latch onto the cell receptor for dioxin to trigger toxic effects. Dioxin experts thought EPA may have overestimated the risk, so the agency set out to reassess it again in 1991.

Cutting the fat. EPA's report may boost concerns about fattening livestock with animal products.

CREDITS: (LEFT TO RIGHT) YVES LOGGHE/AP; ROBERT F. BUKATY/AP

Instead of downgrading the risk, agency scientists came back in 1994 with a draft report that supported EPA's earlier conclusion that there is no exposure threshold below which dioxin is harmless. But EPA's Science Advisory Board (SAB), while praising much of the reassessment, sent two key chapters back for revision, charging that agency scientists mixed science and policy and failed to mention alternate hypotheses and data that contradicted their conclusions (*Science*, 26 May 1995, p. 1124).

As requested, EPA has now rewritten the report's summary based on new dose-response modeling. It also added a new chapter to clarify how agency scientists reached their conclusions about the cumulative risks from dioxin-like chemicals by assigning each a "toxicity equivalency factor" and adding up their effects. The agency has "significantly updated" the report, says William Farland, chief of risk assessment in EPA's Office of Research and Development. "We have quite a bit of new information"—for example, from a study of Dutch infants exposed to polychlorinated biphenyls and dioxins—that even at background levels, dioxin may cause subtle neurobehavioral and immune effects.

As for cancer effects, the report upgrades dioxin from a "probable" to a "known" human carcinogen. For the most exposed people, such as those eating a diet high in animal fat, EPA puts the risk of developing cancer at between 1 in 1000 and 1 in 100. Farland says this controversial number comes from two changes in EPA's analysis. First, when scientists extrapolated results from rats to humans, they used a new metric that factors in dioxin's far longer half-life in human tissue than in rats. Second, EPA drew on new studies of three worker populations exposed to dioxin in the United States, Germany, and Holland. Those studies include information on the levels of dioxin to which workers were exposed, enabling experts to calculate how cancer risk rises with a given dose. That analysis, which "overlaps" with dose-response estimates from animal studies, results in a dioxin cancer potency that is 30 times higher than the 1985 estimate, Farland says. The agency factors in the threefold drop in dioxin exposure since the mid-1980s to conclude that the cancer risk today is 10 times higher.

Farland acknowledges that this number can be confusing to the public, explaining that this is the highest possible risk for the most exposed individuals, but for most people the risk will likely be lower or even zero. Even so, Farland says the report's new findings that dioxin in soil, water, and sediments may be a major source of exposure could warrant new measures to protect the food

ScienceScope

Environmental Science The Environmental Protection Agency (EPA) needs a new science czar to give researchers a greater voice in agency decisions, according to a National Academy of Sciences report released this week. EPA has long been under assault for the questionable quality of the science underlying its regulation of everything from air pollution to dioxin (see p. 1941). The agency "has made significant improvements" to its research program since a critical 1992 study, according to "Strengthening Science at the U.S. EPA," released this week. But "there is a continuing basis for many of the scientific concerns" raised by previous reports, it concludes. In particular, the agency's current science chief—the head of the Office of Research and Development (ORD)—lacks clout in how regulatory offices use research findings, says panel chair Paul Risser, an ecologist and president of Oregon State University in Corvallis.

To elevate science, the report urges Congress to create a new senior position: deputy administrator for science and technology. It also recommends a fixed 6-year term for ORD chiefs and attracting more top-notch academic scientists to EPA labs. Congress's first reaction to the report may come at a Senate environment committee hearing this summer.

Resistance Was Futile National Institutes of Health (NIH) officials have decided to create a Center for Health Disparities Research on their own, instead of waiting for Congress to force it on them. The new center will coordinate research across NIH and make grants to investigate such questions as why the cancer death rate of African Americans is twice that of other groups. Representative Jesse Jackson Jr. (D–IL), who has been pressing legislation to create the center, this week hailed NIH's decision as "a tremendous step forward."

Former NIH director Harold Varmus resisted the idea last year, reasoning that, with 25 separate institutes and centers, NIH is already too Balkanized. He also worried that establishing the center would allow the agency's other arms to ignore health disparities issues. But Acting NIH Director Ruth Kirschstein says that won't happen; there are enough research questions to go around. And "the reality," says Acting Deputy Director Yvonne Maddox, is that if NIH didn't act now, Congress would force "the same discussion" next year.

Contributors: Jocelyn Kaiser, Bruce Agnew

supply, for example, by cutting back on feeding lard and fish meal to cattle and pigs.

Whether such steps are reasonable will depend on whether the report passes muster with skeptical outside scientists. Several who spoke with *Science* asserted that the new worker studies of cancer effects are inconclusive. Even to those who have closely watched EPA's new analysis, the 10-fold increase "is a lot more than anybody expected," says Dennis Paustenbach, a risk assessment consultant with Exponent in Menlo Park, California. "It's going to require a lot of discussion before there's widespread acceptance."

That scrutiny will come in the form of public comments, a review by an outside science panel in late July, and another review by the SAB in September. Farland is urging scientists to take a close look at the report and the new data before passing judgment: "We'll have to see what they think after they've read the document." **–JOCELYN KAISER**

CANADA

New Virtual Institutes For Biomed Research

OTTAWA—A prominent Canadian cancer researcher has taken on the job of leading a new biomedical research institution that is modeled after the U.S. National Institutes of Health—but which reflects 21st century practices and priorities.

Last week Alan Bernstein, 52, was named president of the Canadian Institutes of Health Research (CIHR). The new entity, which officially opened its doors on 7 June, replaces the Medical Research Council as the country's primary source of extramural grants for basic biomedical, clinical, population-based, and health systems research. It's been given a $39 million budget increase, to $330 million, for the fiscal year beginning in April, and the promise of $72 million more in 2001–02 (*Science*, 26 February 1999, p. 1241). But instead of presiding over a leafy campus and a massive infrastructure, Bernstein will be midwife to a national network of a dozen or so "virtual" research institutes, grouped by scientific theme, that will weave together work in each field. He must also decide the proper scope of the CIHR, working in tandem with a 19-member governing council of senior academics and health care officials also appointed last week.

A real leader. Alan Bernstein will add flesh and blood to the virtual nature of the new institutes.

"This is a great challenge and a great opportunity," says Bernstein, who this week sat down here with 40 of the country's leading scientists to gather suggestions for the council's first meeting later this month. "It's really a bold and unique vision for funding, organizing, and stimulating health research." The appointment of Bernstein, who since 1994 has been director of the Samuel Lunenfeld Research Institute at the University of Toronto's Mount Sinai Hospital, is seen by scientists as a sign of the government's commitment to basic biomedical research.

The structure of CIHR is expected to closely follow the recommendations of an interim council, which released its final report last week. The group strongly suggested forming institutes in eight areas: cell function and cancer; aboriginal and indigenous people's health; immunity and infection; musculoskeletal health and fitness; nutrition, hormones, and metabolic health; cardiovascular and respiratory health; mental health, addiction, and the brain; and health systems: care, healing, and recovery. The council debated but didn't reach a conclusion on whether to create as many as four institutes to handle work in two other areas—the social, environmental, and genetic influences on health; and human development and health throughout life. Although the final roster is up to the new council, Bernstein says that he hopes the debate doesn't steal time from getting CIHR up and running: "We have to operationalize this bold vision, not go back and start from scratch."

Each institute will be headed by a scientific director and an independent advisory board that will oversee a pot of money to support networking initiatives, training grants, workshops, and what one official calls "cutting-edge thinking." Scientists will continue to apply to the CIHR itself, which will operate a centralized review system, but they will be asked to designate the institute with which they wish to affiliate.

Still unresolved is the management of $105 million worth of health research programs administered by two existing granting councils in the natural and social sciences. Bernstein says that he doesn't favor a hostile takeover of the health components of the two granting councils, although the CIHR has already swallowed Health Canada's $40 million national health R&D program. "I want researchers now served by other agencies to feel at home in the CIHR," he says. "But I would encourage those communities to adopt CIHR as their first home, because we have the broadest mandate."

Bernstein plans to take a practical approach to resolving the issue. "My guideline is: Does this make sense? Is it the best way to organize science and get the best science done for the least amount of bucks?" The answer, he adds, should also help the country meet Prime Minister Jean Chretien's vow, in announcing the CIHR, to make Canada "the place to be in the 21st century." **–WAYNE KONDRO**

Wayne Kondro writes from Ottawa.

ASTRONOMY

Test Flight Added for Future Space Telescope

ROCHESTER, NEW YORK—Last month, a national panel of astronomers picked the proposed Next Generation Space Telescope (NGST) as the field's top priority during the next 10 years (*Science*, 26 May, p. 1310). Now, it appears that researchers will have to wait nearly the full decade for the Hubble Space Telescope's successor to take wing. NASA officials have decided to test NGST's demanding technology in a small-scale version, described here last week at a meeting of the American Astronomical Society, before forging ahead with the real thing. The technological delays that led to the shakedown mission will push the launch of the full telescope back another year to 2009 at the earliest.

Astronomers believe that NGST will extend their vision to the era when galaxies first formed and will expose new details of how stars and planets arise in our own galaxy. Its mirror will be about 8 meters across, more than three times as wide as Hubble's and rivaling the largest optical telescopes on Earth. Such a mirror is too big and heavy to launch in one piece, so engineers must devise a way to deploy a segmented mirror in space. Moreover, NGST will orbit around a gravitationally stable point in space about a million kilometers from Earth, beyond the reach of space-shuttle repair missions. Teams from Lockheed Martin and TRW/Ball Aerospace are developing competing plans for the telescope, and NASA will select the winning design by the end of 2001.

The contractor will then have 3 years to prepare a $200 million prototype called "Nexus," which will fly to the distant orbit