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PWSP Alert

Bio-Laboratories in the U.S. Under the Microscope

January 2008



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NEWSFOCUS



BIO SAFETY BREACHES

Accidents Spur a Closer Look at Risks at Biodefense Labs

Failure to report a *Brucella* infection and other problems at a Texas microbiologists searching for ways to ensure safety and public trust

An unreported infection with a dangerous pathogen and other biosafety breaches at a Texas university are fueling an already heated debate about safety at U.S. biodefense labs. The problems at Texas A&M University in College Station, which led federal officials to shut down the university's biodefense research this summer, follow a spate of accidents at other U.S. labs in the past few years. They also coincide with the accidental release of foot-and-mouth virus from a research facility in the United Kingdom that has shown the potential economic devastation that can result if a pathogen escapes. These events are bringing new urgency to a question raised soon after the United States began pouring money into biodefense research after the 2001 anthrax attacks: Are the nation's biodefense labs safe enough?

"Proponents insist there is a clean safety record. That is simply wrong. With some agents, it could have catastrophic consequences," says microbiologist Richard Ebright of Rutgers University in Piscataway, New Jersey, a critic of the biodefense expansion. Although other scientists and biosafety experts say the extensive breakdown in procedures at Texas A&M is probably exceptional, they too worry that many incidents are going unreported. Next week, a congressional committee will examine the

the biodefense buildup.

The scrutiny is sending university administrators and the public health community, which is to both ensure safety and trust. One idea under discussion would enable institutions to learn from another's mistakes.

Warming public concern will examine whether several labs being built in Boston operate at biosafety

CDC. About 14,000 people at 400 labs now have select-agent authorization.

To date, the most serious biosafety breaches have occurred outside the United States, such as several SARS infections in Asia in 2003 and 2004 that killed one researcher and infected several people outside the lab and the death of a Russian lab worker from Ebola in 2004. And some potential exposures—such as animal bites, needle sticks, and glove tears—are inevitable, U.S. biosafety experts say. One of the worst recent accidents occurred at the U.S. Army Medical Research Institute of Infectious Diseases in Fort Detrick, Maryland, where a worker was exposed to the Ebola virus but didn't become infected. Others (see table, p. 1852) involved shipments of pathogens labeled nonpathogenic that turned out to be virulent. That happened with tularemia in Boston University in 2004, where three workers were infected. The incident was reported to local authorities and made public only after delays, adding to criticism of the proposed Boston BSL-4 lab (*Science*, 28 January 2005, p. 501).

The problems at Texas A&M, however, may be the most egregious to date. They first emerged in April when the school belatedly reported to CDC that in February 2006, a worker was infected with *Brucella* bacteria, a pathogen common in livestock that causes fever and fatigue in humans but is rarely fatal. This incident, like many others, was brought to light through public records requests by Edward Hammond of the Sunshine Project, a watchdog group in Austin, Texas. In June, after the Sunshine Project reported that the two workers

had tested positive for antibodies to the Q fever pathogen, CDC shut down all of Texas A&M's select-agent work. In an August investigation, CDC inspectors found a dozen serious violations, including unapproved experiments, lost samples, improper safety training, and lab workers without select-agent authorization (*Science*, 14 September, p. 1487).

Some observers suggest the Q fever antibody tests were not a major issue; none of the workers became ill, and two were apparently exposed before they joined the lab. But the *Brucella* case, which happened when a worker leaned into an aerosol chamber to clean it, is a clear violation of safe practices: The chamber should have been decontaminated with gas first, says Jonathan Richmond, a consultant in Southport, North Car-

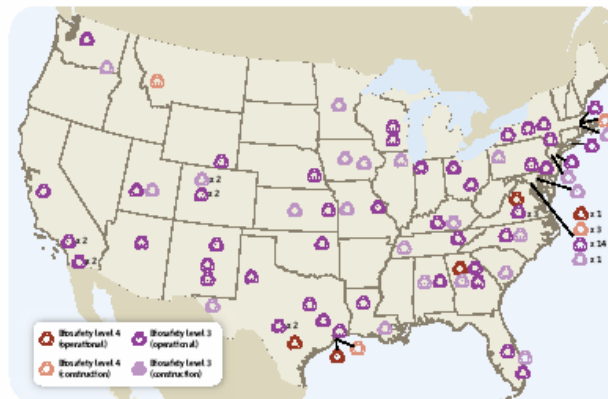
olina, who oversaw biosafety at CDC in the 1990s. It has added to speculation that more incidents aren't being reported. Hammond has used open-records requests to dig up examples of exposures, equipment failures, and other near-misses at various labs that weren't publicly disclosed. He says they suggest other significant mishaps are hidden.

Researchers and biosafety experts say serious infections would be difficult to hide from CDC. But some agree there is probably underreporting of mild infections and potential exposures. Workers who make a mistake are often embarrassed and may fear angering their supervisor, and institutions worry about the damage to their reputation, says Richmond.

2003, the HHS Inspector General has levied fines ranging from \$12,000 to \$150,000 on nine research institutions and companies for breaches such as unapproved select-agent shipments. Texas A&M is facing fines as high as \$500,000 for each violation.

No public menace

One point of agreement among most scientists is that however scary these incidents sound—the mention of Ebola virus conjures the 1995 movie *Outbreak*, for example—the risk to the public is very low for most pathogens, for two reasons. First, there have been no known environmental escapes from BSL-4 labs since the early 1980s and only two workers are known to



Proliferation. Critics are worried about the potential for infections and escapes at biosafety level 4 (BSL-4) labs (five existing, at six least planned) and 84 existing and new BSL-3 biodefense labs, as compiled here by the Sunshine Project.

"It's been a problem for a long time," he says. Supporting that suspicion, CDC, which has recorded about 20 accident reports a year since 2004, has received 32 reports since April 2007, possibly because of the publicity about Texas A&M, says a CDC spokesperson.

Although the multiple protocol violations at Texas A&M may be the exception, less extensive violations are not. A 2006 Department of Health and Human Services (HHS) Inspector General audit of security procedures found that 11 of 15 institutions had "serious weaknesses" such as unlocked doors and freezers and lax inventory records. Janet Shoemaker, public affairs director for the American Society for Microbiology in Washington, D.C., points out that schools have a strong incentive to adhere to the rules; since

have become infected in BSL-4 labs, both outside the United States. Workers have many layers of protection, including positive-pressure "space suits," and realize the hazards of working with pathogens studied in BSL-4 labs, for which, by definition, there are no treatments.

Second, even if an agent studied in a BSL-4 lab did escape, most, with the exception of smallpox (which can only be studied at CDC), are not very transmissible. Anthrax doesn't spread person to person, for example. Ebola and other hemorrhagic fevers that have killed hundreds in Africa would likely never cause an outbreak in Western countries because hygiene and medical treatments are so much better, says Peters. (He also notes that many select agents, such as anthrax and Q fever, occur commonly in nature, so people

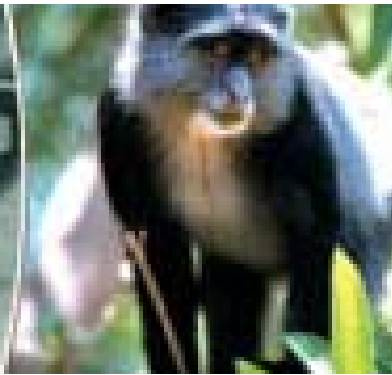
Some Recent Exposures in



- 2002, 2003: *E. coli* O157:H7 infection
- 2004: Three workers infected with tularemia
- 2004: Ebola needle stick (no infection)
- 2004: Anthrax exposure (no infection)
- 2004: Valley fever (*C. immitis*) infection
- 2005: Potential Q fever exposure, Boston
- 2006: Brucellosis infection, Texas A&M

SOURCE: THE SUNSHINE PROJECT; WWW.SUNSHINEPROJECT.ORG; CDC; FOR INFORMATION

Downloaded from www.sciencemag.org on September 30, 2007



...and ultimately becomes reality.



NEWS RELEASE

**Committee on Energy and Commerce
Rep. John D. Dingell, Chairman**

**For Immediate Release: September, 21, 2007
Contact: Jodi Seth / 202-225-5735**

Dingell, Stupak

Recent Incidents

Washington, D.C. – Reps. John D. Dingell and Bart Stupak (D-MI), Chairman of the Subcommittee will hold a hearing on Thursday on the proliferation of Biosafety Level 3 and 4 laboratories.

"It appears that there has been a surge in the number of labs being financed, at least in part, with federal money. While the number of labs being operated in the U.S. is certainly valuable, we must make sure that the labs are safe and secure."

Plans for the hearing, entitled "**Germ, Viruses, and Secrets: The Silent Proliferation of Bio-Laboratories in the United States,**" were first announced last month at the outset of the Committee's investigation of bio-research laboratories.

Biosafety Level 3 and 4 laboratories (BSL-3 and BSL-4) are designed to handle dangerous viruses and other biological agents that cause deadly diseases. BSL-3 labs handle BSL-3 agents, and BSL-4 labs handle BSL-4 agents.

"The potential human health risks involved in these biosafety labs are being designed, and there are so many labs doing this research on deadly diseases? We want to know the answers. We considered the question."

The possibility of infection by dangerous biological agents in recent weeks, investigators learned after reports of brucella, and others infected with Q fever. Texas labs had been infected with shigella in 2001 that killed five people and infected others.

Witnesses for the hearing will include representatives from the Centers for Disease Control and Prevention (CDC), the Department of Health and Human Services (HHS), the Federal Bureau of Investigation (FBI), and the Department of Justice (DOJ).



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**Dingell, Stupak Announce Date for Hearing on
Biosafety Labs**

Recent Incidents Underscore Risks Associated with Labs

Plans for the hearing, entitled "**Germ, Viruses, and Secrets: The Silent Proliferation of Bio-Laboratories in the United States,**" were first announced last month at the outset of the Committee's investigation of bio-research laboratories.

Biosafety Topics to be Covered



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1. Infectious/Biohazardous Agent and Toxin Research
2. Statutory & Regulatory Development
3. Congressional Influence
4. Business and Research Compliance Issues
5. Discussion & Questions and Answers

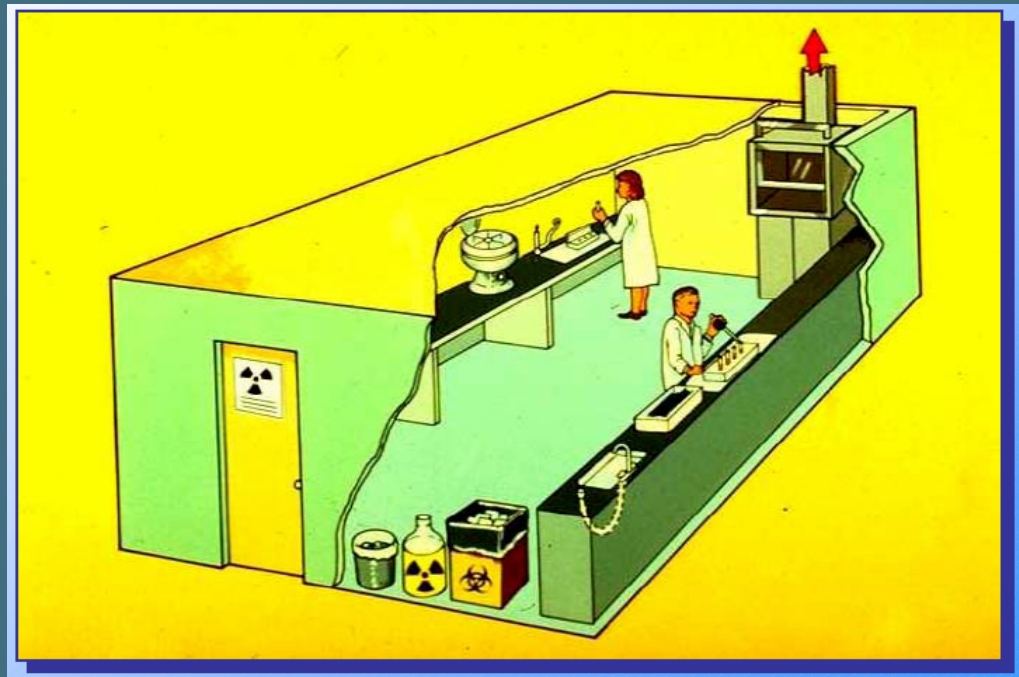
Infectious Disease/Biohazard Agent Research Labs



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What are the Biosafety Levels?

- BSL-1: agents and toxins that do not consistently cause disease in healthy humans (e.g., E. coli)
- Basic facility design, standard practices, basic protective equipment



Infectious Disease/Biohazard Agent Research Labs



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BSL-2: agents and toxins spread through puncture, absorption, ingestion; treatment available

- E.g., measles, salmonellae, hepatitis B
- Restricted access, separated from public areas



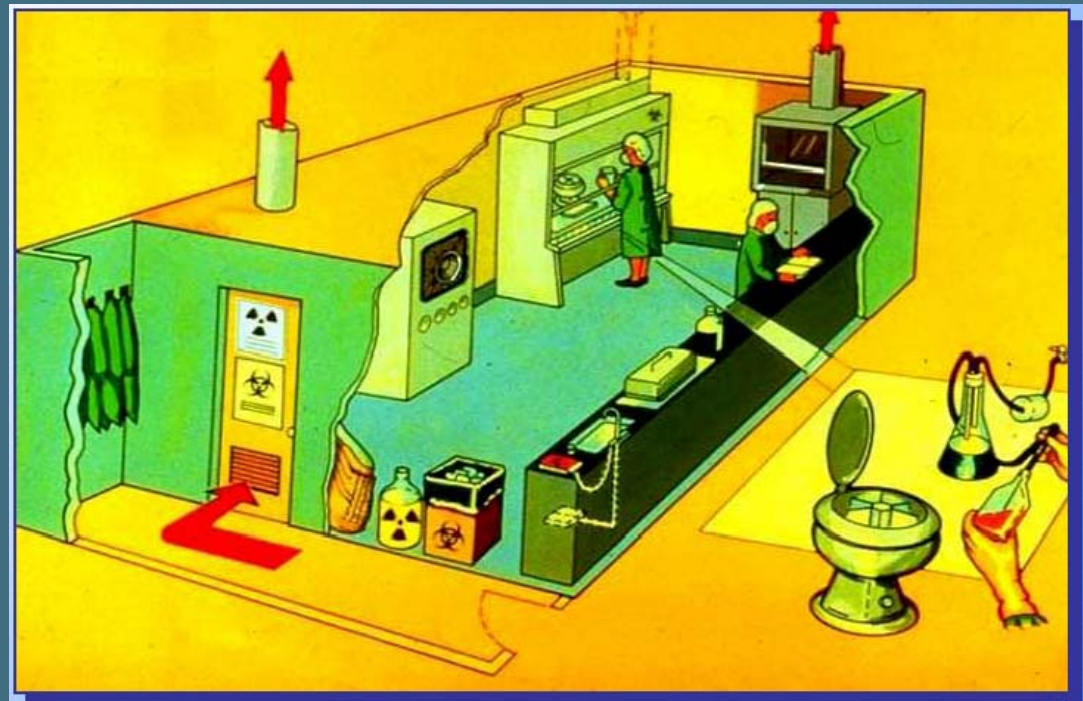
Infectious Disease/Biohazard Agent Research Labs



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BSL-3: agents and toxins that have potential for aerosol transmission and may cause serious/lethal infection

- E.g., Q fever, St. Louis encephalitis
- Separate building or isolated zone; double-door entry



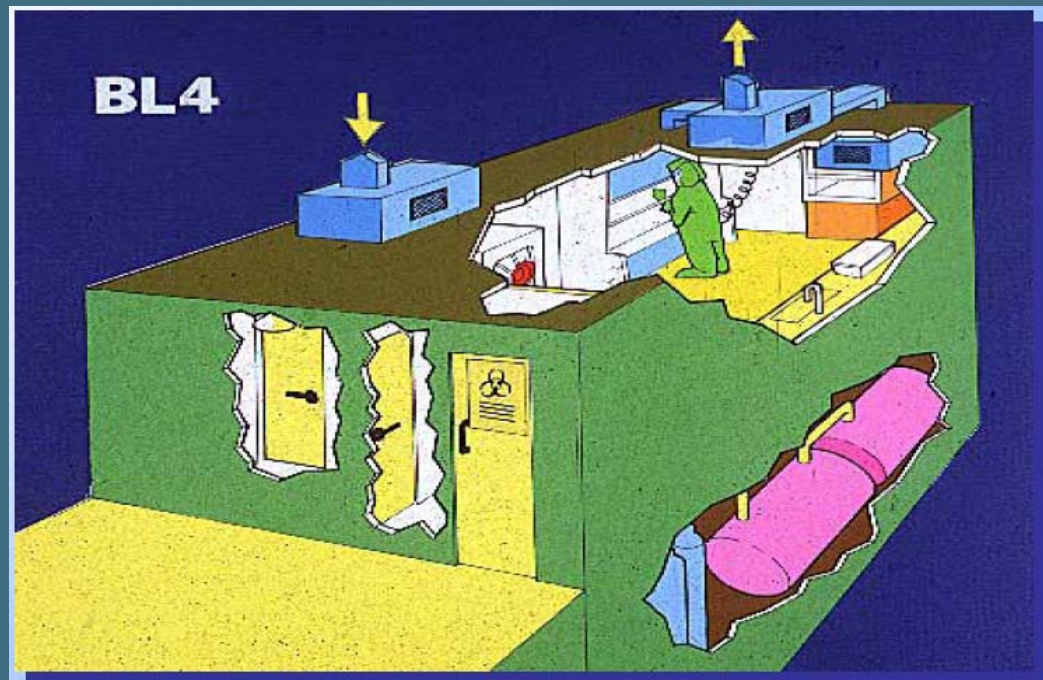
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BSL-4: agents and toxins that post a high individual risk of life-threatening disease; no vaccine or therapy

- E.g., Ebola, rift valley fever
- Dedicated air, exhaust, vacuum, and decon systems; total room seal; positive pressure personnel suit



Infectious Disease/Biohazard Agent Research Labs



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Proliferation of labs seeking BSL-3 and 4 status

- From 1950-1990, only two BSL-4 sites
- Before 2001 anthrax scare, only 5 BSL-4 labs (one college, one private, three government)
- Billions in congressional appropriations for biodefense
 - e.g., National Institute of Allergy & Infectious Disease research money: from \$187 million in 2002 to \$1.6 billion in 2006
- Now 15 BSL-4 labs; 2 more planned for UTMB and BU
- BSL-3 labs multiplied even faster, though no exact count: as many as 1400, including over 140 private labs

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