

Maximum Containment:
The Most Controversial Labs in the World

By

Alison K. Bruzek

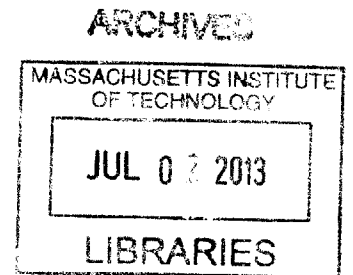
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ABSTRACT

In 2002, following the September 11th attacks and the anthrax letters, the United States allocated money to build two maximum containment biology labs. Called Biosafety Level 4 (BSL-4) facilities, these labs were built to research new vaccines, diagnostics, and treatments for emerging infectious diseases, potential biological weapons, and to contribute to the nation's biodefense. These labs were not the first dramatic reaction to the threat of biowarfare and are in fact, one product of a long history of the country's contentious relationship with biological weapons.

Of the two labs created, Boston University Medical Center's National Infectious and Emerging Disease Laboratories (NEIDL) has remained the more controversial given the urban community it resides in. However, increasingly the mandate of these labs has been expanded from biodefense to all infectious disease, regardless of their potential probability for use as a weapon. These include looking at pathogens that could potentially cause a pandemic like SARS, ebola, or smallpox. The repurposing of these labs could make them an invaluable contributor to the United States public health system.

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Maximum Containment

The Most Controversial Labs in the World

By Alison Bruzek

The streets of Roxbury, Massachusetts don't look like a warzone. They aren't littered with burnt shells and they don't thunder with angry bootprints. But there is a standoff; There are two sides who have less than a geographical mile between them, but more than a century of ideology and distrust.

In the middle of January, the heart of Boston winter, I gathered with the underdog, a group of community protestors, at a local one-stop shop called Mr. G's Plaza. With its bright blue awning and friendly white lettering, Mr. G's is unmissable, just off one of the few cobblestone streets left in the neighborhood. I pulled into a nearby empty parking lot and the car shuddered off, chill already beginning to creep in the door cracks. Car horns and headlights whizzed by on Melnea Cass Avenue, interrupted occasionally by the shadow of a bus as it rumbled into the organized sprawl of Dudley Station. Just to the northwest loomed the Goliath adversary, Boston University Medical Center, tall medical laboratories and gleaming clinics barely visible.

I was invited to Mr. G's by community organizer and self-proclaimed "homeless mother, welfare advocate, homeless advocate," Klare Allen. A woman of many trades, for the past decade, Allen has taken on the role of leader of a scrappy, fiercely-committed, strikingly well-informed community group called Coalition Against The Bio-Lab.



Coalition Against the Bio-Lab

The biolab in question is Boston University Medical Center's National Emerging Infectious Diseases Laboratories, called the NEIDL (pronounced NEE-del), a research building erected in 2008. It's one of two recently dedicated spaces in the United States for maximum containment or level 4 work - a rare designation necessary to work with highly regulated, often incurable diseases (e.g. the plague). Funded with \$141 million from the National Institutes of Health and a little less than half that from the university, the elegantly swooped architecture of the blue building is tucked neatly in the eastern corner of the Medical Center campus. Protected by glass, gates, and guards, it's irony incarnate: the building that ended a nation's fear and began a community's.

The fight, while seemingly over safety, illuminates a broader problem in U.S. biodefense tactics – a *Jenga* tower built on politicking, disorganization, and fears of terrorism. The biolab is one block of the tipping tower and pulling it out slowly – through lawsuits, historical precedents, modern-day protests - reveals a crumbling foundation of logic for how we got here in the first place and why Boston is now left with the effects.

I zipped my coat closer before pushing my way through the storefront doors to meet the group (who correspond through the listserv, kickBSL4ass). Mr. G himself led us to an unheated second floor room where we gathered mismatched chairs in an oblong circle to make introductions: a professor emeritus of biology at Harvard University, a woman from the nursing association, a senior science fellow at the Center for Arms Control and Non-Proliferation, and concerned environmental justice advocates. Just less than twenty were gathered to discuss the upcoming Massachusetts Environmental Protection Agency approval for the biolab.

Midway through a discussion of the agenda, Klare Allen arrived and was greeted warmly with big smiles and a smattering of applause. Clad in an oversized red jumpsuit, timberlands, and a grey and white checked hat, her entrance spurred the group to action. Two women sitting near the door jumped up and began putting up giant self-stick sheets around the room – cleanly scrawled notes with the group's

mission, sympathetic politicians, and who to write to and when to object.

They reviewed the previous rounds of conflict with Boston University, the majority of which fall around a report the National Institutes of Health released about the biolab. Chock full of statistics about the environmental risks, its calculations about the dangers can be summed up simply: near non-existent. But what should've been a knockout for the university instead became a rallying point - the coalition argues such a claim is impossible and wildly inaccurate. And to some extent, reviewing the numbers used by scientific experts and the claims for a city of Boston's size, they're right. "They used to say it was zero risk," said Allen, skeptical, "So, you mean if ebola got out, there is zero risk that nobody nobody nobody nobody would get affected? Like, you know that for sure?"

Sitting close to Allen was Vicky Steinitz, the founder of United for Justice with Peace, which coordinates the Bio-Lab coalition in Cambridge. She was the clear organizational center of the meeting, assigning tasks to each member before we finished. "It's not a NIMBY [Not In My Backyard] issue of 'not here' but not anywhere," she said later on the phone. Boston City Council hasn't taken up Roxbury's fight against the biolab and the neighborhood believes this is at least partially due to its poorer community and higher percentage of low-income housing, making the argument not only about safety, but environmental justice. Cities within walking radius like Arlington, Brookline, and Cambridge have already issued moratoriums on similar labs. "If Cambridge is saying, with all the knowledge that they have, if they're saying 'Hell no,' then what are we doing?" asked Allen.

The coalition argues the biolab isn't the only place a virus could escape from – there's transportation to the lab by air, land, and sea. Laughing grimly, Allen recounted the holiday FedEx packages she'd received that weren't hers – a deadly mistake if they were meant for the biolab - and how she couldn't even tape up her windows to protect from SARS. (SARS can be an airborne virus – but it's mostly spread through close person-to-person contact.) "When you do research and find out where these [germs]

are coming from, they're released from laboratories," she said.

While there have been releases, none (to our knowledge) have reached the public. In February 2002, a study in the revered *Journal of the American Medical Association* reported that microbiologists working with meningitis strains in Alabama and Michigan had died after being improperly exposed. The study also concluded that these lab scientists were sixty-five times more likely to contract a disease like meningitis during their life than the general population. In April 2002, the United States Army Medical Research Institute of Infectious Diseases, the Army biolab, reported that two of its workers tested positive for exposure to anthrax when spores were released into a hallway and office adjacent to a working lab. And closer to home, between May and September of 2004, three scientists at the Boston University Medical Center were inadvertently infected with a sample of rabbit fever and dozens others at the university were exposed. This incident went unreported to federal authorities for half a year, prompting conspiracy claims when it was discovered the time overlapped with when the campus was undergoing review approval for the biolab.

Her rasping tones fluctuating as she spoke, Allen recalled her first nickname for the biolab, the National Research Bioweapons Lab. "This was gonna be the national headquarters for bioweapons research," she commented. Of course, the lab isn't actually involved in bioweapons research, but she cited the lab's connection to biodefense, including its initial funding, and the shadows the government has thrown over bioresearch in the past. As another protestor explained to the *Daily Free Press* at Boston University, "What really struck us was the caliber of the scientists who came out against this — two Nobel laureates spoke against it... What one of them said was that this lab could be used to create instruments of death."

The argument isn't uncommon, referring to the fine line walked by scientists that can slide (and very occasionally has) from the helpful biological countermeasures to the deceitful biological weapons. The creation of the latter while claiming the former is known as dual use research. In the 1950s, scientists were accused of this behavior

when they developed a novel version of the polio virus, used to create the polio vaccine. Critics argued the release of this virus could decimate an unprepared population while the scientists tried to reassure them it was only for the beneficial cause of a miracle treatment.

“You can’t prepare for malicious intent. How do you prepare for that?” asked Allen, voice rising in disbelief. She stated a hypothetical case in which one worker becomes depressed, loses interest in work, and goes crazy. This character might then steal a sample in a tube or release it from the lab or worse, their home, white picket fence surrounded by innocent victims who were never more dismayed to have guessed the right conclusion. “As scientists... [we] know that we’re not attempting to do anything bad, we’re trying to do good things. And yet there may be one among us, one in 100,000 or one in a million who want to do bad things and they look just like us,” said David Franz, former Commander of the Army biolab.

Near the end of the meeting, Allen and others listed politicians who were for or against the biolab, those willing to fight for the community and those stumbling over ignorant rhetoric in the dark. In the latter category she listed Boston’s beloved Mayor, Thomas Menino and the other group members nodded their heads in assent. In 2004, the coalition wrote him an open letter entitled “No Place To Hide” stating their fears and asking him to reconsider allowing the university to build the lab. If not a complete shutdown, then a moratorium on the most dangerous level 4 research. The letter also proposed an alternative vision, arguing the facility would, “better serve public health, both locally and overall, if it focused its research on prevalent natural infectious diseases,” like malaria or AIDS rather than the rare diseases currently on the table. That alternative vision is now key in the argument against the labs and what could be the labs’ turning point.

“I don’t know; it’s just too deadly. It’s too deadly. There’s no cure,” said Allen of the labs and their bugs. She grinned as the meeting closed, asking me how it went.



National Emerging Infectious Diseases Laboratories

“People need to hear both sides of the story and they need to understand what these things are.”

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To get to the fourth floor of the Boston biolab is a process. Starting with the gatehouse just outside the main building, I was frisked of all electronics (minus a digital recorder) and watched my bag go through the airport-like metal scanner. An escort walked me from the gatehouse to the actual lab where a card key waved us through the glass turnstiles, past a guard, and up a locked elevator. A retinal scan let us in the hallway doors and a counter clicked silently, registering my piggyback on a secure employee. Each obstacle seemed to say, we keep the bugs in and the intruders out.

On the fourth floor lies the challenger to Allen’s claims, supported by historic government initiatives and an insatiable scientific curiosity. John “Jack” Murphy is the interim director of the biolab. A well-dressed cherubic-looking man with piercing blue eyes and white hair, we met in his corner office that looks out over an empty parking lot. Empty because the building is mostly vacant, given that it doesn’t yet have the approvals in place to work with diseases that attract enough funding to support staff salaries. Sixteen percent of the lab’s total 192,000 feet are designated for level 4 work.

He apologized during our introductions for the cold he had, clearing his throat periodically as we chatted. I smiled at the irony: the man fighting infectious diseases was quite literally, fighting one off himself. In his soft tones, he explained that his lab is an invaluable tool to help cure disease, though currently through so-called basic research that examines the bugs, as opposed to clinical research, which produces the real treasure of working treatments. He shrugged off the claim about bioweapons and counter-bioterrorism work, emphasizing repeatedly that the lab is for “new vaccines, new diagnostics, new therapeutics,” all for emerging infectious diseases. Emerging infectious diseases, not to be confused with general infectious diseases, tend to appear

in tropical, undeveloped areas and infect very few people per year but with high mortality rates.

“You spoke to Klare Allen?” he asked, acknowledging the coalition. When I said yes, he smiled, “Good.” Murphy understands the fears of the community and how they affect scientific research all too well, but he finds them frustrating and nonsensical. When he was a younger scientist in the 1980s, he became famous, then infamous for creating a new toxin in the lab. In a biolab, he worked to “deliberately construct the first brand new toxin in the world,” he explained, “A toxin that was 2/3 diphtheria toxin and 1/3 human protein.” Diphtheria is a bacterial infection in the lungs, often vaccinated for in combination with tetanus and pertussis (called the DTaP).

The press got wind of the story and blew it up in true sensationalist fashion in the *Washington Post* and *Vanity Fair*, claiming his work would lead to “the death of every mammal on the planet.” Murphy’s research was stopped for five years. After the scandal died down, Murphy resumed his tests, using the toxin to create one of the first successful therapies for T-cell lymphoma, a type of cancer, and has prolonged the life of many. “How many thousands of patients could have been treated in those 5 years if we had made the same rate of progress?” he asked. How many could the work at the biolab help? And isn’t that worth any risk?

Answering the claim Allen posed that viruses might escape from the lab he replied, “If you believe the modeling that was done [in the controversial report] then it tells you BSL-4 laboratories are the safest laboratories to work, bar none, across the world.” Referring to the lab’s tightly sealed doors and high security, he called the biolab a, “submarine in a bank vault.” While the statistical reports and anecdotal tales do support that level 4s are the safest in the world, it’s not the everyday that worries the coalition, it’s the accidents.

He stated there have been far more accidents at level 3 facilities - a step below level 4, requiring less protective measures and using less dangerous viruses. “People

that come to work in a [biosafety level 4] laboratory don't come into the lab each day saying I'm going to die today," said Murphy, referring to the precautions taken to prevent diseases picked up in labs by scientists or other personnel. These include extensive body suits, secure doors, and the chain of supervised entry I'd witnessed.

It's a privilege to have such a lab in Boston, he explained, and with a level 4 training lab (all the bells and whistles with none of the deadly diseases), they have the potential to educate other countries like Japan who is planning on building a new biolab - limiting the effects of emerging infectious diseases worldwide. As Murphy said, "I regard this facility as a local, national, and global resource in order to conduct research in a safe responsible way."

When pressed on the origins of the lab, Murphy rejected statements from the NIH, other scientists, and the coalition, pushing the point that counterbioterrorism is not a major aim. Though he acknowledged the biolab's funding followed the anthrax letters, he maintained, "the infrastructure within the U.S. at that time was one in which there was a paucity of BSL-3 laboratories and all of the BSL-4 laboratories that were operating in the United States at that time had other mandates." His biolab, on the other hand, offered new solutions for emerging infectious diseases. He explained, "If we were open at biosafety level 4 now we would be able to bring to bear a magnetic resonance imaging for the first time ever in the progression of hemorrhagic fever viruses." Perhaps not what the Bioterrorism Act of 2002 would've predicted when it funded the labs.

Traveling down the murky road of conspiracy to create bioweapons, Murphy busted Allen's myth that the biolab's funding is mainly from the Department of Defense. In fact, the facility receives much of its funding from the National Institutes of Health – known as a government agency that addresses emerging infectious diseases. (Of course, bioweapons can be created from rare diseases, which is part of the shroud of confusion.)

“To think that [the biolab] was only for bioterrorist events I think would be misleading... From my perspective, I would downplay the bioterrorism aspect because I really don't think that any of these laboratories are focused even primarily on the prospect of a bioterrorist event,” he commented. Except perhaps the Army biolab, whose direction has shifted to more public health work but has the history rap sheet of a bioweapons facility. Not his lab, he said. “There is nothing that anyone could ever go to say that this is a bioweapons laboratory.”

Between coughs, Murphy booted up his computer to show me a slideshow. Clicking quickly through the history of epidemics he explained we now, with facilities like the biolab, have the power to investigate, understand, and therefore prevent the spread of disease. As Nancy Connell, another level 3 researcher in New Jersey said, “The things we now understand about pathogenesis - the pace has been thrilling.” The caveat: Murphy was focusing on emerging diseases like rabbit fever, a disease that leads to painful, bloody ulcers penetrating through broken skin, not already prevalent ones like malaria or AIDS. “I worry about the number of people who will succumb to those [emerging infectious] diseases, perhaps unnecessarily for lack of research that's been done to develop vaccines and diagnostics and therapeutics,” said Murphy.

“Should we be prepared for [the next big pandemic], that's what these facilities are about,” he continued, “In the worldwide community, the question ... that's on our mind: with each new outbreak of disease, is this the next big one?” The slides flipped by, one terrifying disease after another – tracing the path of pandemics in arrows crisscrossing the globe several times over. Murphy wondered, is this the next 1918-1919 H1N1 influenza outbreak, nicknamed the Spanish flu, that stole the lives of 50 million worldwide? Or more current, is this the next HIV/AIDS with over 30 million deaths and still counting? Is some unknown disease flying under the radar from tropical cave to couch, the next mass murderer? While there hasn't been a serious epidemic since 1977, most scientists think the clock is ticking on the next infectious disease.

Closing the computer, Murphy framed the situation another way: “What if we had

understood and had another ten years heads-up in doing research on HIV? Would the epidemic be as severe as it has been worldwide? I don't know the answer to that. I would like to think that we would've been able to do a little bit better than we've done." But what about understanding it now, I wondered. Why not devote the lab to that? It's not the mandate for his lab, Murphy repeated.

Level 4 labs, Murphy said, are particularly necessary for "gain of function" experiments, where researchers take hazardous virus strains and make them even worse - adding human to human transmission or aerosol versions. It's what got the H5N1 influenza ferret researchers in deep water and earned them a *New York Times* Op-Ed entitled, "An Engineered Doomsday." Said Murphy, "As controversial as it is it's an important area."

Of course, it also comes down to money. Why spend the money on these biolabs? As summed up by Michael Osterholm and Jim LeDuc in their Columbia University report, "History has shown us repeatedly, in terms of both human suffering and economic loss, that the costs of preparedness through vigilance are far lower than those needed to respond to unanticipated public health crises."

Murphy is optimistic about the opening of the biolab's level 4 labs – perhaps sparked in part by the sudden media frenzy in January around public fears of influenza and a coronavirus that popped up in the Middle East. Regardless of the coalition's lawsuits, he said, "I would hope by the end of the summer we'll be open at BSL-3 and we'll have select agent BSL-3 approvals." Smiling, he added, "And I hope my cough will be over then."

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This argument between Allen and Murphy, of the community and a lab, has played out elsewhere before. Proposals for biolabs were rejected in Seattle, Washington and Davis, California after facing protestors with lawsuits much like Allen's

coalition. Even The Rocky Mountain Laboratories, a functioning level 4 lab in Missoula, Montana, was forced to settle when it was taken to court by a conglomeration of three upset community groups.

Murphy's biolab is just one of fifteen containment laboratories in the United States, built in the wake of bioterrorism fears following the events of 2001. "We've got a lot of work ahead of us," said Senate Majority Leader Tom Daschle in an interview with Gwen Ifill two days after the World Trade Center fell and one month before he'd receive an anthrax-filled letter in the mail. They would be addressing the allotment of emergency funding, he said, "... it in a real way with the resources that are going to be required."

The biggest spark to the chain reaction of political fire came in 2002. Fed with fear and fanned by money, President Bush signed the Public Health Security and Bioterrorism Preparedness and Response Act. The Act authorized new funding including \$687 million to the NIH for biodefense research, part of which went to its subpart, the National Institute for Allergies and Infectious Disease (NIAID). NIAID used the money to fund the biolabs.

Even when prompted with a Freedom of Information Act request, the Centers for Disease Control and Prevention (CDC) will not publicly release how many level 4 labs there are. However, The Sunshine Project, a group dedicated to preventing biological weapons use, estimates they equal about 90 acres of floor space (or a little less than two of the U.S. Pentagons put together). Their locations include Boston, Montana, Fort Detrick in Maryland, Virginia, multiple labs in Texas, the CDC in Georgia, and soon Kansas based on pending funding (see Appendix 1 for the complete list).

Roxbury's story however, has particular national prominence given Boston's high density and the fighting spirit of the coalition, bringing light to the question: were the labs a misguided decision? Are they worth the incredible investment of time? Boston's story goes back a decade.

In 2003, Boston University Medical Center was awarded the NIAID funds for a level 4 lab. A provision of the funding (by the National Environmental Protection Agency) required the NIH to write a risk report listing the statistical probabilities of an accident at the lab and what the environmental consequences might be. This report would go on to become the single most important document determining the outcome of the biolab. Using a series of complex hypothetical scenarios, the report was published saying any release was unlikely and the chance of community members catching a disease was nearly impossible. Unconvinced, the coalition was outraged.

The coalition took the university and the NIH to state court in 2004 where the risk report was ruled incomplete. The case then went to federal court in 2006, where a U.S. District Court judge ruled the report failed to comply with the National Environmental Protection Act. The NIH appealed the decision but the State Supreme Judicial Court agreed the report was “arbitrary and capricious.” This also triggered a federal safety review from the National Research Council whose scientific panel stated in 2007 that the report lacked credibility.

While the construction was mostly complete by 2008, the biolab was still entangled in legal battles. In 2010, Boston Medical Center quietly pulled out of its investment in the lab, forcing Boston University to make up their share of the money over the next five years. On top of this, the National Research Council’s panel rejected the NIH’s updated risk report, citing failure to address fundamental safety issues. The NIH reviewed the report again and in 2011, the National Research Council came back saying it was significantly improved. Finally opened for lab work in early 2012, without an approved report, the biolab was limited to level 2 research.

In summer 2012, the National Institutes of Health issued its final risk report, over 5,000 pages including all the exhibits. After nine years of battle and now four months of review, the NIH concluded the lab posed “minimal risk to the surrounding community,” finally paving the way for level 4 work. However, their conclusion also triggered a

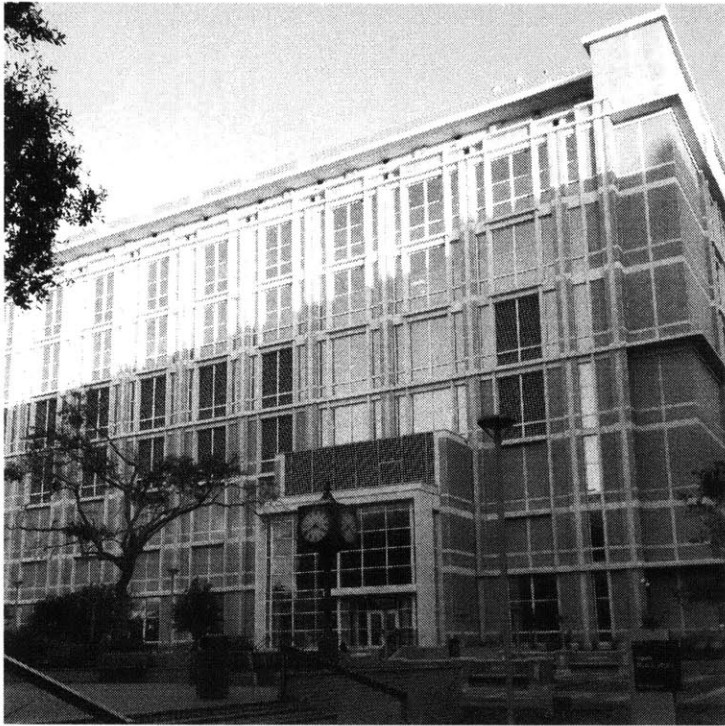
reignition of the coalition's lawsuit, claiming that the report was neither readable nor accurate.

Despite this, the biolab filed and received a certificate from the Massachusetts Environmental Protection Agency for work with level 3 viruses in March 2013. The final hurdles include approval from the Boston Public Health Commission, the Institutional Biosafety Committee, and the CDC. The coalition will continue to throw punches – keeping the lab a ghost town of scientific dreams.

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To understand the crux of the Boston controversy and find out what type of research goes on in a biolab I fly to Galveston, Texas, home of the first level 4 biolab built post-9/11. To drive across the bridge from the Texas mainland into Galveston is to drive into a postcard. A vacation destination, Galveston occupies an island about the size of Manhattan that sits just south of Houston, home to the University of Texas' biomedical campus and the Galveston National Lab. As I wandered directionless around the university's campus, my phone wasn't much help. *Biolab*, it highlighted in red, did I mean *violas*?

A professorial looking gentleman offered to help me find my way. When I told him I was looking for the lab he chuckled about the precautions to even get in the door, "They'll have to make sure you aren't al-Qaeda first." A joke based in reality. Labs like Galveston and the Boston biolab are registered with the CDC, along with 345 others, because they work with select agents, the most highly regulated germs, often due to their use in biological warfare. It wasn't until as recently as 1997 that Senator Dianne Feinstein introduced a bill to tighten the loose restrictions, visited again in 2010 with an Executive Order for further improved measures. The laundry list of controlled germs includes a host of shiver-inducing names: *Yersinia pestis* (the plague), the graphic "lumpy skin disease virus," and tetrodotoxin, responsible for the 1996 headlines on the poisoning of three Californian chefs. (The men had the grave misfortune to consume



Galveston National Lab

puffer fish brought back by a co-worker from Japan.)

Galveston lab, for all the ugly viruses inside, is beautiful. Bottle blue glass broken into symmetrical panes by sandy brick are framed against the tropical trees. Images of level 4 labs have appeared in movies like *Contagion* that are more likely to showcase the necessary full-body suits, nicknamed “spacesuits” for their bulky similarity to astronaut gear. The suits are made of special latex and plastic, designed to ensure no skin or air comes in contact with the germs being handled. I saw several suits myself while walking the halls of the lab, blue and white masses half-hung, half-piled like deflated life-size balloons. (One female researcher lovingly described her custom suit from France.) But level 4 is just one of the four flavors of safety for biology labs, designated as BioSafety Level-1, 2, 3, or 4.

A walk through a high school biology class gives an idea of level 1 – an assortment of benches, sinks, and petri dishes. Viruses like herpes or the smallpox vaccine require level 2. Biohazard warning signs grace the walls of level 2s and powdered latex gloves and coats form a frontline against infection. Level 3s require the occasional full-body suits as *Chlamydia trachomatis* (yes, *that* chlamydia), SARS, HIV, and rabies virus are all common visitors. Level 4s, maximum containment, house the deadliest viruses that are transmitted by a breath, a hand hold, or mere contact. They also require specialized ventilation and waste management. Many of the bugs housed are hemorrhagic fevers, a terrifying umbrella name for viruses that mutilate the organs until the host is dead. But there’s another twist that distinguishes the levels too.

“The agents themselves are not what really determines the biosafety level, it’s actually the research activities that you are doing with the particular agent,” explained Michael Kurilla. Kurilla directs the area of NIAID that funded the creation of level 4 labs post-9/11. He clarified that there is a misconception by the public about how the labs are classified and regulated. Two labs may both be working with anthrax, but depending on what type of research they’re doing, one may require level 2 work, while

another may need level 3. If you infect a rat with anthrax, you're safe at level 2. Create high volume of the spore or think about aerosolizing the germ and you've earned yourself a level 3. These rules are decided by the CDC and the U.S. Department of Agriculture.

Box 1. Common Biosafety Level 4 Select Agents.

Select Agents	Disease and/or Symptoms
Lassa Fever	Mucosal bleeding, neurological problems, encephalitis
<i>Variola major</i>	Smallpox, scabbing, rash
<i>Yersinia pestis</i>	Plague
Marburg virus	Hemorrhagic fever, internal bleeding, coma, seizure
Lujo virus	Hemorrhagic fever, internal bleeding, coma, seizure
Nipah virus	Encephalitis, respiratory disease
Foot-and-mouth disease	Sores, rash

It's precautions for aerosolized and animal tests that force the Galveston lab to alternate its high-ceilinged floors between sealed working labs where people do research and the restricted-use floors with a tangled forest of industrial-looking mechanical equipment and pipes. The mechanical floors are dedicated to the complex logistics required to keep rooms airtight and most critically, germtight.

On the floors with scientists in level 4 labs, high-efficiency particulate air (HEPA) filters screen the air and a pressure gradient, from high outside the lab to low inside, is maintained to ensure agents don't escape. Super hot ovens used for sterilizing equipment and burning samples, called autoclaves, are stationed nearby, each cheekily named after members of The Little Rascals. Hallways with glass windows allow guests, who've been cleared via social security number, to peer into the work being done. We stop and watch a woman through a thick glass porthole, her suit hooked up to a bungee-looking green airline that follows her around the room, tethering her to a tiny radius. To reach another part of the room requires her to unhook her airline with her big orange gloves and screw into another, repeating the process each time. The floors are

designed so the highest containment labs are located in the center, limiting potential exposure. Showers are required for those who work in the lab so like a heavily-guarded macho gym, there are locker rooms and chambers to take on and off the bulky suits.

While the labs themselves are often what impress the public (and the press), I gaped at the precision of Galveston's logistical floors. Miles of white, gray, and blue pipes with yellow labels and dizzying directional arrows indicating flow direction snaked across the ceiling and the floor. Periodically interrupting them were boxes with controllers that regulate the flow down through the floor and into the labs below. A broken red arrow guided a path through the maze.

Among the jungle of pipes were tall cabinets with a series of colored wires feeding in and out. A computer operates all the ventilation and in case of a loss of power, generators kick in. These also maintain the exhaust fans, which keep the labs at negative pressure to minimize static. Thick white cylinders keep 3500 pounds per square inch of air and compressors make it positive before feeding it down to the lab. These are re-pressurized regularly. Should the power go out and the generators fail, the air stored in the tanks will give thirty-seven people at least forty-five minutes to clear out of the lab.

I peered down at the generators from a raised concrete landing. After Hurricane Katrina, which struck in 2005, the generators were elevated above the 500-year flood plain. They're tested on a weekly basis and require 10-15 seconds to spin up and begin transferring electricity. While the University of Texas' campus has lost power several times before, the Galveston Lab hasn't, due to a different routing of electricity.

Of course, all the intricate planning, building, and mechanical fixes require constant vigilance and explain the huge price tag on such facilities. But most would argue you can't put a price on fear. As NIAID's Kurilla said, "Whether [a level 4 germ release] is intentional, accidental ... the impact to public health and to society as a whole is pretty much indistinguishable once it happens."

Leaving the building I drop off my credentials at the front desk and wonder if Boston will ever look like this. In the end, it isn't the risks that will determine the fate of the biolab; it's the fear in a community and the fear in the nation that wants them. The pyramid of panic has an unshakable foundation supporting it -- a disconcerting past with an unclear future -- bioterrorism.

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The precedent for Boston's fright and mistrust of government intentions was bred in the history of biowarfare. Our reactions have funneled money into the kitchen sink of biology - first to fund more weapons, and now to fund their treatments. The county's love/hate relationship with biowarfare includes wining and dining the practice, creating weapons of our own while denouncing them for our enemies, giving groups like the coalition fuel for skepticism. Biowarfare and germ production also elucidate why biolabs exist in the first place - the product of the U.S. government's knee-jerk reaction to biological threat.

Jeanne Guillemin, in her book *Biological Weapons*, indicates the history of biological programs can be described in three general phases, including an offensive phase where biological weapons are produced, a phase of treaty norms where the weapons are prohibited, and a phase much like the one we're currently undergoing with "much tension between national and international security objectives and with great issues emerging concerning public trust in government." Our rut in the third phase, the inciting issue being the level 4 labs, can be explained by our experiences with the first two.

Biological weapons' first appearance traces back a seedy road to a misfortune turned opportunity. During the 1346 siege of a Genoa port by the Tartars (a central Asia group who invaded western Asia and eastern Europe), the Tartar force was stricken with the plague. A stringy, worm-like bacterium, the plague's route of

devastation normally runs from infected fleas to rats to vulnerable humans. When the flea makes its fatal bite, regurgitated infected blood is passed to its host and the bacteria begins to swim through the arteries and veins, provoking swellings called buboes, reminiscent of particularly nasty insect bites. These also give the disease its darkly familiar name: the bubonic plague. The inventive, but macabre Tartar soldiers capitalized on the disease of their comrades and catapulted the corpses of their fellow soldiers over the walls of the besieged to infect the townspeople hiding inside. The plague, now spread by humans, eventually forced a retreat of the Genoese forces.

Smallpox, too, made a weaponized appearance relatively early in the history of war when, in 1763, British officer Sir Jeffery Amherst gave smallpox infected blankets to Indians on the Pennsylvania border and cast suspicion on the British for outbreaks that occurred later at crucial points in the American Revolutionary War. A Kentucky physician sold scab-contaminated clothing to Union troops. Ordinary smallpox is deadly in thirty percent of cases of infection – the soldiers developed lesions then tissue debris-filled bumps, leaking fluid and scabbing, yet not as gross as the resulting angry sheets of rashes. With the global eradication of smallpox in the late 1970s, all known strains of the diseases were locked up either at the CDC in Atlanta or in a Soviet facility in Moscow, which was later, under the Russian government, moved to Siberia.

World War I was a turning point in the history of biological weapons as multiple countries began to suspect that Germany was harboring an ambitious plan for germ warfare. The German army had shown its hand by attempting to infect pack animals en route to the Allies with deathly anthrax. Bad for the mules as well as the men, anthrax infections on the skin leave itchy bumps that turn into quarter-sized ulcers with the telltale black center of dying skin cells. Though Germany denied all allegations of biological bombs, its history of inventing and using chemical weapons in World War I made it suspect. In 1925, we began what Guillemin would classify as phase two (though we'd soon slide back to one – production), when concerned nations gathered in Geneva to draft a plan to contain the spread of both chemical and bacteriological weapons. The Protocol for the Prohibition of the Use in War of Asphyxiating, Poisonous

or Other Gases, and of Bacteriological Methods of Warfare, known simply as The Geneva Protocol, was enacted in 1928, prohibiting the signees from using chemical or biological weapons.

One hundred eight nations ratified the protocol, but the United States wasn't one of them: a conservative senate balked at participating. Yet, it's hard to say if our absence mattered because even those who did sign – Japan, Great Britain, Canada, France, the Soviet Union – began developing biological weapons before the ink had even dried. The world had reacted to its fears with a binding piece of paper, but the agreement contained a clause that allowed countries to prepare for retaliation in kind - a loophole. Called unethical and inhumane, biological weapons were condemned by all for their targeting of vulnerable civilians and the heavy moral penalty of drawn out and painful death, yet they were continually developed by major state powers (ironically, with the exception of Nazi Germany) for both defensive and offensive contingencies.

Yet, germ warfare was not considered a particularly successful endeavor. Biological warfare's perceived advantage, as written in Judith Miller's *Germs*, was that it could leave property intact after a mass attack on the enemy. However, through contagion or aerosol dispersion, it could also annihilate the attacker's own troops. By the mid-1940s and World War II, weaponized anthrax, plague, and typhoid had appeared again when a Japanese military unit was accused of using the aerosolized version to kill thousands of Chinese. The U.S. was horrified and even though germs were considered a failed experiment, we were soon to begin a program of our own.

The U.S.'s ambivalence about the Geneva Protocol kicked open the door for fourteen years later when President Franklin Roosevelt, he of the campaign theme "Happy Days Are Here Again," authorized the creation of the United States bioweapons program in 1942. Tumbling back to what Guillemin would classify as phase one of biological weapons programs, a commission led by George W. Merck of the pharmaceutical company reported to President Roosevelt that Tokyo and Berlin were creating germ warfare programs. In order to fight them Merck said, we'd have to make

some ourselves. Even as Roosevelt declared bioweapons “terrible and inhumane”, he gave Merck approval to move forward. A year later, Merck became head of bioweapons research at Fort Detrick in Frederick, Maryland, a facility transformed from its airfield origins.

In 1944, still spurred by fears of attack, the U.S. created a germ weapons testing facility out in the deserts of Utah. This coincided with the peak of bioweapon creation – nearly 3,000 military and civilians were working for the cause. We investigated our options for aerosols delivered by plane. We successfully weaponized anthrax spores and freeze-dried bacteria that cause rabbit fever. The latter was considered a bioweapon darling for scientists’ ability to change how fast it disappeared into the air – ensuring long-lasting impact. Another production facility was created in Indiana to make anthrax bombs which began production as the second World War came to a close. The terrifying, if not misguided, prevailing thought after World War II was summed up by former U.S. bioweaponeer William C. Patrick III, “I think one of the best defenses that this country can have is to have an offensive capability so that if someone uses bioweapons on us, that we can return in kind.” A secret report in 1949 created by federal officials and experts also argued that bioweapons were still valuable for their potential mass attack capability, even while scientists like Theodor Rosebury (an inventor of the U.S. wartime bioweapons program) argued they were immoral and impractical in his now famous book *Peace or Pestilence*.

After World War II, Fort Detrick was nearly shut down but the Cold War revived it as the place where germ weapons might be developed with strategic force equal to that of nuclear weapons. Or at least, that was the thinking of bioweapons advocates. By 1950, Fort Detrick was again the center for the American bioweapons program. It was expanded by 1969 to include what is now the Army biolab, still accused of bioweapons intentions today. The Korean conflict sparked our vestigial anxieties and during the 1960s, the U.S. Army briefly considered deploying anticrop diseases as a weapon against the North Vietnamese. However, we were stopped by the fear of retaliation from the Soviet Union.

Touted as the cheaper nuclear bomb, we were a nation repulsed and inexorably enticed by the weapons. We condemned nations for engaging in such abhorrent use of germs while testing our own, milder weapons on prisoners at the Ohio State Penitentiary. Miller writes in *Germs* that at one point, President Eisenhower claimed incapacitating agents were “a splendid idea” when his senior advisors described the idea of dropping viruses like influenza on areas that may have included both enemies and friends. Even General Mills was in it for the money - the maker of Lucky Charms and Trix cereals is less well known for its device to spray germs from airplanes in flight.

We elected Richard Nixon in 1969 and at the advice of scientists like Harvard biologist Matt Meselson, America’s hey-day of official research with biological weapons came to a close. Nixon’s decision to end the U.S. offensive bioweapons program and Britain’s Eighteenth Nation Disarmament Conference prompted a draft document renouncing bioweapons. In 1972, the United States, the United Kingdom, and the Soviet Union hammered out the provisions of the proposed Biological and Toxin Weapons Convention, later joined by twenty-two states including the U.S. The convention banned the production, development, and possession of germs except for peaceful purposes, and then only in small amounts. Meselson and others praise it for its brevity (less than two pages) and its simple intent-based definition. It poses the question: Are you using pathogens with ill will? If so, you’ve broken the convention.

In 1975, the same year the convention came into force, the United States, in “better late than never” form, ratified the Geneva Protocol - but took advantage of the sly reservation. Namely, that the United States would not consider itself breaking the protocol if it used biological weapons against an enemy state who had used them first.

Yet, despite our international promises to each other, treaty violations continued. Anthrax’s most chilling escapade illustrates precisely why Allen’s Boston coalition protests a germ-harboring facility – it accidentally escaped from a Soviet research lab and killed local civilians. In 1979, a Soviet military facility was testing and producing

anthrax spores in Sverdlovsk, a town about fifteen hours east of Moscow. But the full story of what caused the outbreak was not immediately known, only that a disaster had happened. In 1992, after the fall of the Soviet Union, Meselson, Guillemin, and a team of experts went to Sverdlovsk to investigate the cause of the epidemic and what they found was startling: a strong wind had carried the deadly pathogens across the city. The results were catastrophic: nearly 100 civilians died of inhalation anthrax. The estimated plume of the southward breeze outlined an emerging trail of death; sixty-four cases were found to lie within the strip bound by southerly wind currents.

If biological weapons struck fear in the heart of many, it was bioterror that convinced them they needed to act on it.

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It was 1995 and while Republicans were busy winning control of the U.S. House and Senate, a Japanese cult released a debilitating stockpile of sarin gas into the Tokyo subway. Sarin gas is a silent killer – odorless, colorless, tasteless, and 500 times as toxic as cyanide. The attack killed twelve and hospitalized a thousand, paralyzing the muscles around their lungs and suffocating them. Frighteningly, investigation revealed the cult had further plans for New York City and Washington, D.C. before they were caught.

The mayhem and concern about the possibility of a bioterrorist attack left American authorities scrambling to fortify their defenses. President Bill Clinton signed Presidential Decision Directive 39 creating the Counter-Terrorism Security Group, a network tying together six major government agencies including the CIA and the FBI to defend against terrorists with nuclear, biological or chemical weapons. The signing ushered in new biodefense money, funding the Lab Response Network to pump up existing biolabs' responses to bioterrorism and improve their cross-communication. Guillemin emphasizes in her book that as phase three of our chronicle with bioweapons began to unfold, Congress preferred a decentralized civil defense strategy and

encouraged states to prepare their own emergency responses. The Department of Defense allocated money to 120 cities across the country to purchase emergency equipment and run training scenarios to prepare for dirty bombs and bioweapons. President Clinton also began the National Strategic Stockpile of antibiotics and vaccines, created to allow for rapid deployment of medicine, and nicknamed twelve-hour Push Packages (notably used following 9/11).

Yet, our attentiveness to bioterrorism also made us our own enemies. The bioweapons production facility in Utah reported that as late as 1998, scientists were testing ways to turn wet anthrax into powder – the first disclosure of such manufacturing since we turned our backs on biological weapons in 1969.

It wasn't only real attacks that caused fear, but imaginary ones too. In summer 2001, the U.S. government ran a bioterrorism simulation called "Dark Winter" at Andrews Air Force Base. The fictional contagious disease of choice was smallpox and thirteen days worth of pandemic were done in two on a tabletop map. The model used was a worst-case scenario: smallpox was everywhere and there wasn't enough vaccine. Even in the mockup, the U.S. military was deployed to stop society from tearing itself apart. Two weeks later, the Dark Winter participants testified to Congress that increased vaccines and response training were a necessary investment.

However, high alertness did not predict high probability of conflict. While we simulated attacks, we had no real ones. The anthrax work at Fort Detrick began to fade as we elected the nation's 43rd president, George W. Bush. Then the calendar rolled over to September 11, 2001.

The day began as a normal Tuesday and ended as a historic terrorist attack on the United States that would leave an enduring legacy. Two planes flew into the World Trade Center Towers causing a catastrophic collapse and a month later, four letters sent through the U.S. Postal Service tested positive for anthrax. "YOU CAN NOT STOP US," read the letters, "WE HAVE THIS ANTHRAX." Twenty-two people were affected

by the spores; Five died. Decontamination cost the country over twenty-three million dollars. We resumed our laser focus on bioterrorism. (Bruce Ivins, an employee at the Army biolab, was eventually charged with the crime though to this day, the case has no clear answers.) These events gave basic science new respect, new importance, and new money. Most of all, during a time of simultaneous fright and record-high public trust in government, they gave the world new biolabs.

The NIH brought together groups of scientists and policy makers to discuss directions for the country's biodefense. Specifically, the National Institute of Allergy and Infectious Diseases (NIAID) was mandated to support research for vaccines, tools, and drugs to protect the nation from bioterrorism. Anthony Fauci, leader of NIAID since 1984 and famous for his work with HIV/AIDS (and sometimes referred to as the J. Edgar Hoover of biology), was the driving force behind using the department to lead the development of biodefense countermeasures.

This work was shifted into overdrive with President Bush's signing of the Homeland Security Act on November 25, 2003. From the panel's plan came new national programs, including those that resulted in new level 3 and 4 labs. NIAID admits frankly that there wasn't standardization or specification of facilities before September 11th. "There was a proliferation of building the facilities in response to weapons of bioterror," explained NIAID's Michael Kurilla. With newly budgeted money, the level 4 labs were set to be built. Nine bids were accepted. Galveston and Boston were picked.

Though the Boston biolab now claims little relation to its past, Richard Ebright, a biodefense expert at Rutgers University explained, "These [BSL-4 labs] are biodefense facilities. These are not emerging infectious diseases facilities these are not general infectious diseases facilities. 100% of the rationale, 100% of the financing is contingent on the increased awareness of biodefense." On the other hand, some scientists argue that a good chunk of the money was always meant to go to infectious disease research that would be useful with or without a terrorist threat. David Franz of the Army biolab said, "People have complained about money being taken away from HIV and TB for

biodefense. I think that's true for a percentage of it, but a lot of it was also useful for dual passage.”

The United States knew of no way to react to the threat of terrorism except by reappropriating money. By 2002, the United States' budget for bioterrorism had increased to over \$3 billion. A year after the founding of the U.S. Department of Homeland Security, sixteen percent of its budget or \$5.9 billion dollars had been allocated specifically toward bioterrorism - more than double what the Bush Administration budgeted for federal energy programs. Of this, \$2.4 billion was dedicated to scientific research and development. Between 2001 and 2003, the civilian biodefense research and development budget increased by fourteen times from \$271 million to nearly \$3.74 billion.

Similarly, at the National Institutes of Health, the NIH received its largest annual funding increase in history and with the help of Fauci, NIAID's budget for laboratories went from zero to \$495 million. The square footage of level 4 labs across the country expanded from 16,000 in 2002 to 150,000 by 2009. Meanwhile, the number of level 3 labs exploded – too many for even the CDC to keep track of. Yet until a government hearing in 2007, no one stopped to consider if we'd used too much money on the labs or we'd built too many.

Now Americans, the city of Boston, the community in Roxbury, are left with the products of a nation's frightened past and the suspicions cultivated by years of government secrecy. An autopsy of our decision to create and now keep the labs leads to another type of controversy and perhaps, a pending solution.

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In a darkly patterned tie, black suit jacket, and thin wire-rimmed glasses, Dr. Leonard Cole looked comfortable behind the table. Sitting in a black leather chair, hands relaxed in front of him, he spoke clearly and precisely into the microphone. “In a

sense, biological [warfare] is both the best and the worst kind of confrontation to have to deal with. Worst, because in worse case scenarios it can be absolutely devastating ... best, because ... there are potential defenses by way of vaccines, antidotes, antibiotics ...” It was 2012 and Dr. Cole, an expert on bioterrorism and terror medicine was speaking to the Committee on Homeland Security on Counterterrorism and Intelligence.

Cole was telling the committee that while we had the ability to protect the country from bioterrorism, we were not doing it right. He would go on to testify that level 4 laboratories were not the best use of biodefense funds. “There’s a lot that can be done with select agents that would be very ... effective, if properly used, like anthrax and plague bacteria, where you develop and work on them in BSL-3 labs,” he explained later on the phone. In particular, the Biomedical Advanced Research and Development Authority (BARDA), within the Department of Health and Human Services, does research using level 3 procedures and have successfully made seventeen different medical countermeasures, including treatments for anthrax and smallpox, currently worth over \$2 billion.

Cole had also put his finger on the biggest wedge between lab believers and opponents: the argument that we are over capacity. There are over 1,400 level 3 and level 4 labs combined (majority being level 3) – over 300% up from the 415 that existed in 2004. The U.S. Government Accountability Office (GAO) is a congressional watchdog that issues reports on how taxpayer dollars are used. In 2007, the GAO testified to Congress that no federal agency could identify the exact number of approved level 3 labs in the country. The same agency wrote a 2013 report stating there is no one who can confirm the nation’s actual need for level 4 labs.

Richard Ebright, a biologist at Rutgers who has followed the issue for many years and agrees with Cole, added that following the September 11th attacks there was no “needs assessment to determine the capacity that would be appropriate to respond to the heightened awareness of threat.” Therefore, he explained, “vast amounts of overcapacity currently exist, and there’s still construction in the pipeline which will



Sign on a fence in Roxbury

increase the overcapacity further,” - referring to a biolab slated to begin construction in Manhattan, Kansas (which has only been discouraged by the National Academy of Sciences.)

The argument of an overabundance of labs stems from two issues: limited funding and near non-existent oversight. Maximum containment labs are not only expensive to build, they're expensive to maintain. During his explanation of the Boston biolab, Jack Murphy explained how much it costs to run one. Level 3s cost about \$210 per square foot per year. Maximum containment at level 4 more than doubles the price to \$550-\$560 per square foot per year, and this is before the salaries of the workers or other utilities are included.

The GAO came down hard on the biolabs again in 2009, releasing recommendations after determining, shockingly, that they weren't overseen by one government entity, nor were they accountable to any particular office. In 2013, they followed up on the recommendations, highlighting in a deeply disappointed tone the lack of strategic, centralized regulation. The National Security Staff responded, "it is not in the best interests of U.S. national security to allocate resources in that way" with the blessing of the White House Office of Science and Technology Policy. The GAO scolded the National Security Staff for failing to instill national standards "for designing, constructing, commissioning, and operating high-containment laboratories."

If the probability of an attack remained high, opinions would likely be different. Instead, while our budget for bioterrorism increased, the threat remains unclear. Richard Danzig, former secretary of the Navy under President Clinton, wrote *Driving In The Dark* in 2011 as a metaphor to illustrate the incredible difficulties inherent in predicting threats to national security. Cole summed it up in his testimony, emphasizing to congress that, "We tend to respond, we all know, as human beings, to the most recent incidents. And when something doesn't happen, then we're told that it's likely to happen." We haven't had a recent incident, he argued from his seat, but that doesn't change the statistics for a future event – it doesn't mean we can expect an attack.

In June 2003, the U.S. government reported to the United Nations that there was a high probability that al Qaeda would attack using a Weapon of Mass Destruction (WMD) sometime in the next two years. The time passed without incident. Again in 2008, the U.S. Weapons of Mass Destruction congressional committee reported that within the next five years, an attack on the country using a WMD was likely. Cole, wary of the implications, took a moment in his testimony to remind the congressional committee this was not an absolute prediction just an interpretation. Even those whose labs partially live on funding for bioterrorism remain questioning. Jean Patterson, director of a biolab in Texas commented, "I am still not convinced that biological weapons are our biggest threat... in light of planes flying into buildings, dirty bombs... I'm not so sure." And with any luck, the sleeping dogs of bioweapons past will continue to lie. Said bioweapons expert Jeanne Guillemin, "I hope chemical weapons and biological weapons ... just become this junk that we developed in the 20th century that no one now really wants."

What Cole did not comment on and what defense committees do not say is that while bioterrorism is near unpredictable, natural terrorism by rat, bat, cow, or flea is a certain threat. Our counterterrorism narrative doesn't have to continue the way it always has; there's a silver lining of redemption for the biolabs in the average germ. The labs could transform the infectious disease research landscape if they were directed to research existing, prevalent problems. The biolabs are no longer so much about where they came from, as where they're going.

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It was a beautiful day in Boston. Sandwiched between the sparkling shores and waterfront restaurants were the tall arches of the John Joseph Moakley United States Courthouse. Boats buoyed to their spot in the harbor glistened in the afternoon sun and pedestrians in windblown dresses and shorts roamed the sidewalk, dazed by the cloudless weather. The coalition, the NIH, and representatives of the Boston biolab had

gathered at the courthouse to find out from the U.S. District Court of Massachusetts what the future of the lab would be. The day's sunny circumstances were a fitting time to reopen the argument over the Boston biolab's risk report -- the dangers were calculated using an average spring weekday in the city.

Inside courtroom nineteen, the two sides were sharply divided. On stage right, business men and women of all types, young and old, who looked fresh from a white collar workday. "All suits," said the men in baggy shirts behind me. On stage left, an assortment of plaid, white hair, and several activists donning shirts with "The Pledge of Resistance." I read the first stanza on the back of their shoulder blades:

*We believe that as people living
In the United States it is our
Responsibility to resist injustices
Done by our government in our names*

At 2:18 p.m., twelve minutes to showdown, both sides were equally filled out. As the minutes ticked by, more dissidents in rain jackets and hiking boots trudged in the mahogany doors, very few looking under the age of fifty-five. By the time the judge, Chief Justice Patti Saris, said, "All rise," there were over thirty coalition members strewn across the back of the courtroom. Klare Allen was there too, "just running my mouth," she said in a silky grey blouse, her hair tied up in a lilac wrap. She glided between both sides, shaking hands and greeting the crowd. They told her she looked fantastic and she laughed, "I'm trying not to be identified." Of course, it was impossible - the judge called her out, smiling as she recognized familiar faces from a half-decades worth of cases.

The young bailiff read the case file, "Allen versus National Institutes of Health," and the latest verbal jabs began. No clear knockout was in sight; The audience began to fidget as the power point slides went by. But then, in a surprising interruption, the judge stopped the attorneys to probe them on whether it was possible to ban only

certain bugs from the biolab. Perhaps the lab could study SARS, but not anthrax. Or tuberculosis, but not smallpox. The attorneys stuttered into the microphone. Neither of them knew the answer. Such an unprecedented ruling might kick open the cracked door for the coalition's Alternative Vision. As biodefense expert Nancy Connell put it, "Hell, use [the labs] for all these other things that are killing people instead of stuff that isn't."

If the Boston biolab does head down that road, they can rest assured that NIAID has already mapped the route. NIAID's website states that work beyond 2008 "represents a shift toward a more flexible, broad spectrum approach" – in other words, research on all diseases, not just rare ones or those associated with germ warfare. Another sign of the turning tide, *The New York Times* reported in 2011 that Fauci's budget drove approximately 70% of NIAID's biodefense funds towards natural disease research like malaria or AIDS. Under Fauci's guidance, NIAID is on track to make the labs public health powerhouses, no longer bound by their biodefense roots. Everyday diseases like influenza, hepatitis, or West Nile virus may not be Jack Murphy's dream for the Boston facility, but research on the microbes could have a significant impact on the world of today – not a future we can't predict.

The Roxbury showdown doesn't have to end in a draw. There's hope for a win that will resonate, regardless of courtroom outcome, if the biolab chooses its bugs, its public health battles carefully. "Y'know, science is a wonderful thing," Allen said, "when it's done correctly."

Appendix 1. Maximum Containment Laboratories (Jens H. Kuhn, Fort Detrick)

BSL-4 Lab	Location
Special Pathogens Branch, Division of Viral Rickettsia Diseases, National Center for Infectious Diseases, Centers for Disease Control and Prevention	Atlanta, GA
Southwest Foundation for Biomedical Research	San Antonio, TX
Center for Biodefense and Emerging Infectious Diseases, The Robert E. Shope, MD, Laboratory in the John Sealy Pavilion for Infectious Diseases Research, University of Texas Medical Branch	Galveston, TX
United States Army Medical Research Institute of Infectious Diseases, Fort Detrick	Frederick, MD
Virginia BioTechnology Research Park, Division of Consolidated Laboratory Services	Richmond, VA
Center for Biotechnology and Drug Design, Georgia State University	Atlanta, GA
NIH's Maximum Containment Laboratory, Building 41A	Bethesda, MD
NIH's Maximum Containment Laboratory, Twinbrook III Building	Rockville, MD
National Emerging Infectious Diseases Laboratory	Boston, MA
Department of Homeland Security National Biodefense Analysis and Countermeasures Center, Fort Detrick	Frederick, MD
Galveston National Laboratory	Galveston, TX
NIAID's Integrated Research Facility, Fort Detrick	Frederick, MD
Rocky Mountain Laboratories	Hamilton, MT
Department of Homeland Security National Bio- and Agro-Defense Facility (*pending)	Manhattan, KS

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