CHAPTER ONE

The Problem of Securing Health

Stephen J. Collier and Andrew Lakoff

I. Biosecurity Interventions

In 2007 the World Health Organization (WHO) issued its annual World Health Report, entitled "A Safer Future: Global Public Health Security in the 21st Century."[1] The report began by noting the success of public health measures during the twentieth century in dealing with great microbial scourges such as cholera and smallpox. But in recent decades, it continued, there has been an alarming shift in the "delicate balance between humans and microbes."[2] A series of factors—demographic changes, economic development, global travel and commerce, and conflict—have "heightened the risk of disease outbreaks," ranging from emerging infectious diseases such as HIV/AIDS and drug-resistant tuberculosis to food-borne pathogens and bioterrorist attacks.[3]

The WHO report proposed a framework for responding to this new landscape of threats, which it called "public health security." The framework is striking in its attempt to bring together previously distinct technical problems and political domains. Some of the biological threats discussed in the report—particularly the use of bioweapons—have traditionally been taken up under the rubric of "national security," and approached by organizations concerned with national defense. Others, such as infectious disease, have generally been managed as problems of public health, whose history, though certainly not unrelated to conflict and military affairs, has been institutionally separate.[4] The WHO proposal also sought to reconfigure the spatial and temporal frame of existing approaches to ensuring health. The report emphasized a space of "global health" that is distinct from the

predominantly national organization of both biodefense and public health. "In the globalized world of the 21st century," it argued, simply stopping disease at national borders is not adequate. Nor is it sufficient to respond to diseases after they have become established in a population. Rather, it is necessary to prepare for unknown outbreaks in advance, something that can be achieved only "if there is immediate alert and response to disease outbreaks and other incidents that could spark epidemics or spread globally and if there are national systems in place for detection and response should such events occur across international borders."[5]

The WHO report is one among a range of recent proposals for securing health against new or newly recognized biological threats. Other prominent examples include recent "Pandemic and All-Hazards Preparedness" legislation in the U.S., reports on "global biological threats" from think tanks such as the RAND Corporation, new research facilities such as the National Biodefense Analysis and Countermeasures Center (NBACC), and ambitious global initiatives such as the Global Fund to Fight AIDS, Tuberculosis, and Malaria, and the President's Emergency Plan for AIDS Relief (PEPFAR). These initiatives build on a growing perception among diverse actors—life scientists and public health officials, policymakers and security analysts—that new biological threats challenge existing ways of understanding and managing collective health and security. From the vantage point of such actors, the global scale of these threats crosses and confounds the boundaries of existing regulatory jurisdictions. Moreover, their pathogenicity and mutability pushes the limits of current technical capacities to detect and treat disease. And the diverse sources of these perceived threats—biomedical laboratories, the industrial food system, global trade and travel—suggest a troubling growth of "modernization risks" that are produced by institutions meant to promote health, security, and prosperity. In response, proposals for new interventions seek to bring various actors and institutions into a common strategic framework.

The aim of this volume is to map this emerging field of "biosecurity interventions." As we use the term here, "biosecurity" does not refer exclusively—or even primarily—to practices and policies associated with "national security," that is, to military defense against enemy attack. Rather, we refer to the various technical and political interventions—efforts to "secure health"—that have been formulated in response to new or newly perceived pathogenic threats. In examining these inter-

ventions, the chapters that follow do not focus on the character of health threats per se, or on the social factors that exacerbate disease risk, but rather on the *forms of expertise* and the *knowledge practices* through which disease threats are understood and managed. As such, the chapters bring into view not only the complex ecologies of pathogenicity in which threats to health have emerged, but also the ecologies of experts and organizations that are being assembled in new initiatives to link health and security—public health officials, policy experts, humanitarian activists, life scientists, multilateral agencies such as WHO, national health agencies such as the Centers for Disease Control (CDC), national security experts, physicians, veterinarians, and government officials—and the practices in which they are engaged.[6] Through close examination of concrete settings in which biosecurity interventions are being articulated, these chapters show that ways of understanding and intervening in contemporary threats to health are still in formation: "biosecurity" does not name stable or clearly defined understandings and strategies, but rather a number of overlapping and rapidly changing problem areas.

II. Domains of Biosecurity

The current concern with new microbial threats has developed in at least four overlapping but distinct domains: emerging infectious disease; bioterrorism; the cutting-edge life sciences; and food safety. The first of these domains, "emerging infectious disease," initially drew the attention of public health experts in the late 1980s, in response to the AIDS crisis and the appearance of drug-resistant strains of tuberculosis and malaria.[7] Alarm about these emerging or reemerging diseases emanated from various quarters, including scientific reports by prominent organizations such as the National Academy of Science's Institute of Medicine, the reporting of science journalists such as Laurie Garrett, and the scenarios of novelists such as Richard Preston.[8] For many observers, the emerging disease threat—particularly when combined with weakening public health systems—marked a troubling reversal in the history of public health. At just the moment when it seemed that infectious disease was about to be conquered, and that the critical health problems of the industrialized world now involved chronic disease and diseases of lifestyle, experts warned, we were witnessing a "return of the microbe." This judgment seemed to

be confirmed in ensuing years by the appearance of new diseases such as West Nile virus and SARS, by the intensification of the AIDS crisis, and by the current specter of an influenza pandemic.[9] After considerable delay, we have recently seen the implementation of large-scale responses to these new infectious disease threats that bring together governmental, multilateral, and philanthropic organizations.

A second area in which microbial threats have received renewed attention as a technical and political problem is in response to the prospect of bioterrorism. U.S. national security officials began to focus on this threat in the wake of the Cold War, hypothesizing an association between rogue states, global terrorist organizations and the proliferation of weapons of mass destruction.[10] Revelations during the 1990s about Soviet and Iraqi bioweapons programs, along with the Aum Shinrikyo subway attack in 1995 and the anthrax letters of 2001, lent a sense of credibility and urgency to calls for biodefense measures focused on bioterrorism. Early advocates of such efforts, including infectious disease experts such as D. A. Henderson and national security officials such as Richard Clarke, argued that adequate preparation for a biological attack would require a massive infusion of resources into both biomedical research and public health response capacity.[11] More broadly, they claimed, it would be necessary to incorporate the agencies and institutions of the life sciences and public health into the national security establishment. The eventual success of their campaign is reflected in the exponential increase in total U.S. government spending on civilian biodefense research between 2001 and 2005, from $294.8 million to $7.6 billion.[12]

Third, developments in the cutting-edge life sciences have generated new concerns about the proliferation of technical capacities to create lethal organisms, particularly in light of recent developments in fields like synthetic biology that promise dramatic advances in techniques of genetic manipulation.[13] Security experts and some life scientists worry that existing biosafety protocols focused on material controls in laboratories will not be sufficient as techniques of genetic manipulation become more powerful and routine, and as expertise in molecular biology becomes increasingly widespread. A number of new biosafety regulations have been imposed on research dealing with potentially dangerous pathogens. Meanwhile, intensive discussions about how to regulate the production of knowledge are underway among policy planners, life scientists and security officials;

and lawmakers have put in place new oversight mechanisms such as the National Science Advisory Board for Biosecurity (NSABB).

Fourth, and with more pronounced effects in Europe than in the United States, a series of food safety crises has sparked anxieties about agricultural biosecurity and the contamination of the food supply. In Europe, outbreaks of mad cow disease and foot-and-mouth disease in the 1990s drew attention to the side effects of industrial meat production. In the wake of these outbreaks, controversies raged both about the failures of the regulatory system in detecting new pathogens and about the mass culling measures that were mobilized in response. Also in Europe, environmental activists put the problem of regulating genetically modified food at the top of the political agenda. In the U.S., meanwhile, public outcry over food safety has been provoked by outbreaks of *E. coli* and by the presence of sick animals in the food supply, which led in early 2008 to the largest beef recall in the history of the meat industry.

In each of these four domains, a series of events has turned the attention of policymakers, health experts, civic groups, and the media to new biological threats. At one level, these may usefully be seen as "focusing events" in Thomas Birkland's sense: they have raised public awareness of threats to health, and catalyzed action on the part of governments and other actors.[14] But this characterization elides the fact that the meaning of such "focusing" events is not self-evident; indeed, these events are characterized by substantial ambiguity. In all of them, we find that health experts, policy advocates, and politicians have competing visions about how to characterize the problem of biosecurity and about what constitutes the most appropriate response. Thus, the question is not just *whether* certain events (or potential events) have been characterized as "biosecurity" threats that require attention; we also need to ask what *kind* of biosecurity problem they are seen to pose, what techniques are used to assess them, and how certain kinds of responses to them are justified.

In this light, it is worth examining more closely how these new or newly perceived threats to health have been *problematized*.[15] Problematization is a term that suggests a particular way of analyzing an event or situation: not as a given but as a question. As Michel Foucault writes, "a problematization does not mean the representation of a pre-existent object nor the creation through discourse of an object that did not exist. It is the ensemble of discursive and non-discursive practices that make something enter into the play of true and false and constitute it as

an object of thought (whether in the form of moral reflection, scientific knowledge, political analysis, etc.)."[16] The reason that problematizations are problematic, he argues, is that "something prior must have happened to introduce uncertainty, a loss of familiarity; that loss, that uncertainty is the result of difficulties in our previous way of understanding, acting, relating."[17]

This mode of inquiry into problematizations is not that of a first-order actor who seeks, as Rabinow puts it, to proceed directly toward intervention and repair of the situation's discordance.[18] Rather, it is that of a second-order observer whose task is to achieve a "modal change from seeing a situation not only as a given but equally as a question, to understand how, in a given situation, there are multiple constraints at work…but multiple responses as well."[19] This analytical approach, when turned to the field of biosecurity, makes neither broad prescriptions for the improvement of health and security, nor blanket denunciations of new biosecurity interventions. Rather, it examines how policymakers, scientists, and security planners have constituted potential future events as biosecurity threats, and have responded by criticizing, redeploying, or reworking existing apparatuses.

The chapters in this volume provide a guide to the various ways in which the field of biosecurity is being problematized today. On the one hand, they examine the different *political and normative frameworks* through which the problem of biosecurity is approached: national defense, public health, and humanitarianism, for example. On the other hand, they examine the *styles of reasoning* through which uncertain threats to health are transformed into risks that can be known and acted upon: public health practices based on cost-benefit analysis, preparedness strategies that emphasize the mitigation of vulnerabilities, and precautionary approaches that seek to avoid potentially catastrophic threats.[20] And the chapters show how, in fields such as public health and biomedical research, existing apparatuses are being reconfigured to shape new assemblages of organizations, techniques, and forms of expertise.

III. Toward National Preparedness

We first turn to one field in which an existing set of practices, understandings, and institutions has been refigured as experts perceive and respond to new microbial

threats: public health. To simplify a very complex story: the field of public health developed in the eighteenth and nineteenth centuries as a new way to understand and manage disease. In contrast to prior understandings of disease as an unexpected and unpredictable misfortune that beset human communities from without, public health traced disease to the immanent properties of the social field—sanitation practices, water supplies, forms of habitation and circulation—using statistical analysis of the incidence and severity of disease events across a population over time. Public health also provided an approach to evaluating a given response to disease events in a population. For example, as Foucault showed in his classic analysis of "the security of the population," beginning in the early nineteenth century statistical techniques were used to evaluate inoculation strategies by weighing the probability of disease outbreaks against the probability of adverse effects from inoculation.[21] Such "cost-benefit" analyses became the norm for assessing public health interventions.

Public health institutions consolidated after World War II, but simultaneously, in parallel domains such as biodefense, experts began to point to possible limits to the public health approach. Thus, Lyle Fearnley has shown that in the U.S. after World War II, as officials perceived endemic disease to be increasingly well managed, some biodefense experts, concerned about bioweapons attack, began to conceptualize outbreaks of infectious disease as anomalous events—that is, novel occurrences about which historical data do not exist, and about which little is known.[22] And yet, as Andrew Lakoff (chapter 2) points out, well into the post–World War II period techniques had not been established for assessing or managing such uncertain disease "events." Thus, in responding to a possible swine flu epidemic in 1976, U.S. public health authorities did not have a paradigm for managing a future event whose likelihood and consequence was unknown, and therefore had a difficult time agreeing on appropriate response measures—for example, whether to undertake mass vaccination of the population.

In recent decades, newly perceived threats to health—including bioterrorist threats such as a smallpox attack and emerging infectious diseases such as avian flu—have placed greater pressure on public health departments and national security officials to develop an approach to disease events not easily managed through the traditional paradigm of public health. As Lakoff shows, one significant response

to these new threats has been the articulation of *preparedness* practices among local public health jurisdictions in the U.S. In contrast to classic public health, preparedness does not draw on statistical records of past events. Rather, it employs imaginative techniques of enactment such as scenarios, exercises, and analytical models to simulate uncertain future threats.[23] The aim of such techniques is not to manage known disease but to address vulnerabilities in health infrastructure by, for example, strengthening hospital surge capacity, stockpiling drugs, exercising response protocols, and vaccinating first responders. Approaches based on preparedness may not be guided by rigorous cost-benefit analysis. Rather, they are aimed at developing the capability to respond to various types of potentially catastrophic biological events.

The demand for "public health preparedness" escalated as public health institutions faced mounting concerns about, first, a possible bioterrorist attack and then, beginning in 2005, a devastating influenza pandemic. The U.S. Congress's 2006 "Pandemic and All-Hazards Preparedness Act" delegated a number of new health preparedness functions to local and national public health authorities. According to the Center for Biosecurity, the legislation marked "a major milestone in improving public health and hospital preparedness for bioterrorist attacks, pandemics, and other catastrophes and for improving the development of new medical countermeasures, such as medicines and vaccines, against biosecurity threats."[24] Preparedness has thus become a crucial interface between public health and national security.

But increased attention and funding to health preparedness by no means implies consensus around a single approach. The existing institutions of public health are not easily reconciled with the new demands and norms of health preparedness and there is considerable disagreement about the appropriate way to achieve preparedness. One question is whether preparedness measures should focus on specific interventions against known agents such as anthrax and smallpox, or instead on generic measures that would be effective against currently unknown pathogens.[25] Another debate surrounds the "dual use" potential of biodefense measures.[26] Advocates of increased health preparedness argue that even in the absence of a bioterrorist attack, resources spent on strengthening the public health infrastructure will be useful for managing other unexpected events, such as the outbreak of a "naturally" occurring infectious disease. However, the ideal of dual use faces

many difficulties, in part because public health professionals often do not agree with security experts about which problems deserve attention, and how interventions should be implemented.[27] Such disagreements point to broader tensions provoked by the current intersection of public health and national security.[28] Public health officials and national security experts promoting preparedness strategies have very different ways of evaluating threats and responses. As a result, programs that depend on coordination between these groups may often founder.

Take, for example, the 2002–2003 Smallpox Vaccination Program examined here by Dale Rose (chapter 4). The Smallpox Vaccination Program, whose goal was to vaccinate up to ten million "first responders," was initiated, in part, in response to imaginative enactments of the type Lakoff describes (chapter 2). A June 2001 scenario-based exercise called "Dark Winter" convinced officials that the U.S. was highly vulnerable to smallpox attack. This focus on smallpox intensified in the run-up to the second Iraq war, as White House security officials became concerned that Iraq might retaliate against a U.S. invasion with a smallpox attack in the U.S. The vaccination campaign, Rose notes, was meant to "take smallpox off the table" as a threat to national security. But here a problem arose around conflicting styles of reasoning—as well as conflicting political positions. Public health experts are trained to weigh the risks of disease against risks posed by vaccines. From this perspective, the expert committee charged with making vaccination recommendations to the CDC had trouble gauging the costs and benefits of smallpox vaccination. The likelihood of a smallpox attack was unknown, while the side effects of the vaccine could be fatal. As a consequence, the committee could not develop a credible recommendation. What is more, the program faced resistance from public health workers—particularly hospital medical and nursing personnel—who were skeptical about the likelihood of a smallpox attack and who, in many cases, were reluctant to be enrolled in national security efforts. In the absence of convincing cost-benefit data about the program, they were unwilling to take the risks associated with vaccination. As a result of such conflicts, the vaccination program faltered.[29]

A similar problem of normative conflict combined with political distrust, described by Lyle Fearnley (chapter 3), has hindered federal efforts to build a nationwide health monitoring system based on so-called "syndromic" surveillance. Initially developed by local public health departments in response to an

E. coli outbreak that went undetected by physicians, syndromic surveillance uses sources other than physicians' diagnostic reports—such as over-the-counter drug sales—to alert health authorities of possible disease outbreaks. In the late 1990s, national security experts began to explore the possibility of using this kind of system to detect a biological attack, given that physicians might not immediately recognize the symptoms caused by an unexpected or unknown pathogen. It soon became apparent, however, that national security planners at the federal level and local public health officials had very different priorities in designing the system's algorithm—its mechanism for distinguishing normal from anomalous fluctuations in syndrome incidence. Rather than data quality and predictive value—emphasized by public health officials, who were accustomed to dealing with known, regularly occurring diseases—national security planners wanted a highly sensitive algorithm that would ensure the rapid detection of a wider range of potential disease outbreaks. While most signals from anomalous events would be insignificant, they believed each must be considered potentially catastrophic. Local public health officials argued that they did not have the epidemiological capacity to investigate a high number of signals and that resources needed to address existing health problems would be wasted chasing after false positives. As one early developer of syndromics put it, in a trenchant critique of the contradictions inherent to the program, "We have 80 percent of the nation covered but we really have nothing covered"—since, in the absence of adequate local epidemiological capacity, even a highly sophisticated syndromic surveillance program is useless.

IV. Global Health and Emergency Response

"Global health" is a second field in which health threats have been problematized in new ways. Contemporary articulations of global health typically share two elements. First, they focus on "globalization" processes as a key source of pathogenicity, claiming that the intensifying global circulation of humans, animals, and agricultural products—as well as knowledge and technologies—encourages the spread of novel and dangerous new diseases. Second, there is the problem of regulation and responsibility: given the global scale of biological threats and their multiple sources, it is often unclear who has regulatory jurisdiction or responsibility for managing a

given disease event. A good example of such an articulation of global health comes from an influential 2002 RAND Corporation report, *The Global Threat of New and Reemerging Infectious Disease.* The report defines emerging disease as one among a number of new threats to security that "do not stem from the actions of clearly defined individual states but from diffuse issues that transcend sovereign borders and bear directly on the effects of increasing globalization that challenge extant frameworks for thinking about national and international security."[30]

Proposed responses to this new "global threat" have come from various kinds of organizations, with diverse agendas. International health agencies such as WHO are developing new preparedness-based approaches to potential outbreaks of infectious disease; humanitarian organizations such as *Médecins Sans Frontières* focus on the immediate problem of reducing human suffering in the context of emergencies; and philanthropic ventures such as the Gates Foundation seek to manage global health threats by developing and disseminating low-cost interventions. Despite differences in their approaches, these efforts to respond to urgent global disease threats share what we might call an emergency modality of intervention. The emergency modality does not involve long-term intervention into the social and economic determinants of disease. Rather, it emphasizes practices such as rapid medical response, standardized protocols for managing global health crises, surveillance and reporting systems, or simple technological fixes like mosquito nets or drugs. Such emergency management techniques are characterized by their mobility: at least in principle, they can be deployed anywhere, regardless of the distinctive characteristics of a given setting.

There are various reasons why organizations in the field of global health are drawn to an emergency modality. One is that emergencies galvanize public attention and resources in a way that long-term problems do not. Another is that—at least from the vantage of first-order actors—measures focused on mitigating potential emergencies are easier to implement than longer-term structural interventions. As Nicholas King writes, short-term, technically focused emergency measures have "the advantage of immensely reducing the scale of intervention, from global political economy to laboratory investigation and information management."[31] And as Michael Barnett notes, such measures seem to avoid the complex entanglements implied by longer term interventions in development and

public health that "are political because they aspire to restructure underlying social relations."[32]

For these reasons, even experts who understand that social issues such as poverty and deteriorating health infrastructure are critical determinants of disease risk may propose narrower technical measures given the difficulty of implementing more ambitious schemes. In 1996, for example, Nobel Prize winner Joshua Lederberg noted the connections between global inequality and threats to U.S. health security: "World health is indivisible, [and] we cannot satisfy our most parochial needs without attending to the health conditions of all the globe."[33] But the concrete interventions Lederberg advocated, such as networks of reference laboratories and global disease surveillance systems, were modest and, as he put it, "selfishly motivated"—that is, focused on protecting the U.S. from outbreaks rather than on addressing major problems of political and economic transformation. Medical anthropologist Daniel Halperin has pointed to the tendency of global health organizations to self-consciously avoid investment in public health infrastructures despite the awareness that such investments would reduce mortality. While billions of dollars have been earmarked to fight what are seen as disease emergencies, he notes, basic public health issues are often not of interest to major donors. "Shortages of food and basic health services like vaccinations, prenatal care and family planning contribute to large family size and high child and maternal mortality. Major donors like the President's Emergency Plan for AIDS Relief, known as PEPFAR, and the Global Fund to Fight AIDS, Tuberculosis and Malaria have not directly addressed such basic health issues. As the Global Fund's director acknowledged, *'We are not a global fund that funds local health.'*"[34]

The emergency management approach thus seeks to develop techniques for managing health emergencies that can work independently of political context and of socioeconomic conditions. As several chapters in the volume show, this approach has become an increasingly central way of thinking about and intervening in global health threats. For example, Erin Koch (chapter 5) describes the implementation of a TB-control program called DOTS (for "Directly-Observed Treatment, Short-Course") in post-Soviet Georgia. Part of the attraction of DOTS for nonstate funders is that it can seemingly be implemented without treating longer-term issues of social and economic development. Thus Koch quotes a doctor from a U.S.–based

NGO, who says: "[With DOTS] your TB program works under whatever conditions: in refugee camps, in prison, wherever.... If you do your program you can forget about the big social economic approach." Peter Redfield (chapter 6) describes the impressive logistical capabilities of *Médecins Sans Frontières,* which enable the humanitarian NGO to rapidly respond to health emergencies around the globe. Redfield focuses on the container-sized "humanitarian kit," a ready-made device, transported in shipping containers, for immediate intervention irrespective of place that has proven its efficacy in acute health emergencies. And Nick Bingham and Steve Hinchliffe (chapter 7) describe a WHO-prescribed program of massive poultry culling in Cairo to mitigate the risk of avian flu contagion. The program, based on an emergency-oriented protocol designed to be implemented automatically in the event of disease detection, is an example of the effort to develop a "standard, worldwide approach to dealing with 'out of place' biological entities."

However, there are serious limitations to forms of intervention that focus only on emergency response—whether such response is based on a humanitarian imperative of sympathy for suffering strangers or on a security-based logic seeking to avert the spread of emergencies. As Craig Calhoun has recently noted in an essay on the rise of emergency as a mode of justification for urgent global intervention, and on the limitations to such intervention, "There is a tension between responses rooted in simply providing care and responses linked to broader notions of human progress."[35] This tension relates to a difference in aims but also in forms of intervention: emergency response is acute, short-term, focused on alleviating what is conceived as a temporally circumscribed event; whereas "social" interventions—such as those associated with development policy—focus on transforming political-economic structures over the long term. Thus, in global health initiatives we find a contrast between possible modalities of intervention that parallels the one already described in U.S.–based biosecurity efforts: between acute emergency measures on the one hand and long-term approaches to health and welfare on the other.

One common problem in emergency-oriented response is that highly mobile protocols or devices are often implemented without attention to what is necessary in order for these protocols to function in concrete settings. Thus, Koch shows that the DOTS protocol for treatment of drug-resistant TB in "resource poor" settings

like post-Soviet Georgia faces major hurdles. The economic situation has led to a massive deterioration of the public health infrastructure, making adherence to DOTS' strict diagnostic and treatment regimen nearly impossible. Compounding the problem in Georgia, the professional norms of Soviet-trained doctors are incommensurable with the practices required by DOTS: most doctors in Georgia have been trained in very different methods for managing TB and are therefore unwilling or unable to comply with the protocol's directives. The implication, Koch notes, is not necessarily that DOTS is the "wrong" answer, but that it cannot be successfully implemented without attention to a broader range of questions concerning social development and health infrastructure.

Redfield, meanwhile, shows that the very strength of the humanitarian kit and of the emergency modality more generally—its independence from social and political context—becomes a weakness as soon as *Médecins Sans Frontières* seeks to manage longer-term problems. Redfield points to the challenges posed by a new MSF initiative to provide sustained treatment to patients with HIV/AIDS in Uganda: to what extent can the kit—and the ostensibly apolitical humanitarian project it is associated with—be assimilated to chronic disease? Given its traditional focus on acute intervention, MSF struggles to provide the long-term care necessary to adequately treat HIV/AIDS. The organization is not equipped to deal with social and economic problems that are outside the scope of biomedical intervention. As Redfield writes: "Finding jobs and forging new relationships were matters of keen interest for members of patient support groups I encountered. Although sympathetic, MSF was poorly equipped to respond to matters of poverty, unemployment and family expectations. The translation of treatment from rich to poor countries could not alter the structural imbalance between contexts in economic terms. That particular crisis exceeded the boundaries of a shipping container."

The fact that emergency-oriented measures do not take into account the social realities of the contexts in which they are applied often undermines the effectiveness of such measures. Thus Bingham and Hinchliffe point out that WHO–prescribed culling measures in Cairo do not attend to the distinctive political and economic characteristics of the setting. Subsistence farmers' dependence on their poultry stocks for their livelihood, along with their lack of trust in the government, meant that they were unlikely to comply with the mass culling

directive: "Householders skeptical of the government's promises or level of compe nsation…successfully hid their birds, unwilling to let such valuable possessions be needlessly culled." More broadly, Bingham and Hinchliffe argue, the "contemporary project of worldwide integration and harmonization of biosecurity measures," exemplified by such mass culling programs, "is fraught with risks however appealing it might sound": it may fail to decrease the likelihood of a flu pandemic, while exacerbating problems of hunger and poverty. They suggest that the uncertainties endemic to contemporary biosecurity threats such as avian flu point to the need to develop new ways of living with and managing the possibility of outbreaks that are more nuanced than current attempts to achieve absolute security at the expense of local well being.

V. Health Security and Modernization Risks

The regulation of what Ulrich Beck calls "modernization risks" comprises a third field in which biosecurity has been newly problematized. As Beck has argued, increasing dependence on complex systems and technical innovations for health and welfare has "systematically produced" new risks.[36] In the domain of health, modernization risks have been linked to processes such as expanding trade, industrial food production, or advances in the life sciences. Of course, these problems are not entirely new. But, following Beck, the recent intensification of such processes has created new uncertainties about the forms of expertise appropriate to understand and mitigate these risks.

To illustrate, we can take the area of food safety. Again, to simplify a complex story: the modernization of food production over the last century through industrial agriculture and food processing has, in the richest countries, provided access to an abundant and predictable supply of food. But this increase in "food security" through industrialization and rationalization has consistently generated new risks, and, in response, new efforts to manage these risks. Thus, the first wave of food industrialization in the late nineteenth century led to abuses and scandals that were addressed in the United States by progressive era reforms, including the founding of the Food and Drug Administration and an expansion of the responsibilities of the U.S. Department of Agriculture.

For a variety of reasons, however, the food safety risks that have emerged in recent decades challenge such existing apparatuses of regulation. First, the globalization of industrial food production has posed new difficulties, such as the problem of maintaining quality control over global food and drug production chains, as indicated by recent scandals over the regulation of ingredients for pet food, toothpaste, or blood thinner that are imported from China.[37] Second, emerging pathogens such as BSE and virulent new strains of *E. coli* have cast doubt on the adequacy of existing protocols and organizations for regulating food safety.[38] Third, intervention into agricultural production at the molecular level (e.g. genetically modified [GM] soy and corn) has led to disputes about proper forms of regulation, particularly in areas where risks are unknown.

As Beck notes, modernization risks are often associated with disputes over the authority of expert knowledge.[39] In the field of biosecurity, such disputes are characterized by technical disagreements over how to evaluate threats: cost-benefit analyses versus "precautionary" approaches that emphasize worst-case scenarios, for example, or different models for assessing the risk of certain experiments in the life sciences. In the area of food safety, one well known case concerns the regulation of GM foods. In the 1990s the European Union sought to ban the import of GM foods, influenced by a movement toward "precautionary" regulation which argued that new technologies could be restricted even in the absence of conclusive evidence about the risks they posed. The U.S., which beginning in the 1980s instituted the use of cost-benefit analysis for addressing environmental and health risks, challenged the European Union's policy in the World Trade Organization, insisting that without quantitative risk assessment, the ban constituted an illegal restraint on trade.[40]

Similar questions about risk assessment have played out in national regulatory systems. For example, Frédéric Keck (chapter 8) shows how the outbreak of spongiform encephalopathy (known as mad cow disease, or BSE) in France cast doubt on existing approaches to regulating food safety. In the French regulatory system, he notes, food safety had previously been the responsibility of veterinarians, who sought to manage diseases that occurred regularly in animal populations. But the scandals around BSE triggered a reproblematization of food safety. Human mortality had to be avoided at all costs, pushing the government to favor

a precautionary approach that emphasized uncertain but potentially catastrophic threats—replacing, at least in part, the cost-benefit approach of traditional public health. In response to the BSE crisis, the existing authority of veterinarians was supplanted by a new French Food Safety Agency in which physicians played a leading role. In his research into these events, Keck finds that "the controversy between veterinarians and physicians on animal diseases profoundly structures the field of food safety, and gives a specific meaning to the term 'biosecurity' as it emerges in this field."

While these conflicts appear in technical disputes about methods of risk assessment, they often have much broader social and economic consequences: the "politics of expertise" relates to questions about the distribution of social goods—and, as Beck points out, of social "bads."[41] In their chapter, Hinchliffe and Bingham show that the WHO consensus that avian flu can be traced to the interaction of wild bird migration and domestic poultry has meant that measures to counteract avian flu—particularly culling techniques—have disproportionately harmed the poor and benefited large-scale poultry farms that international officials assume to be biosecure. An alternative theory—that the spread of avian flu can be traced to the international circulation of poultry through legal or illegal trade, and to industrial poultry production and processing—has been largely ignored in international protocols to contain the disease, but would imply a very different set of measures.[42]

Conflicting frameworks for assessing and managing modernization risks are also found in debates around regulation of the life sciences, particularly in light of concerns that new techniques of genetic manipulation could become instruments of bioterrorism. Debates about the regulation of the life sciences are not new—they can be traced at least to the 1970s, when civic and environmental groups in the U.S. raised questions about the "social and ethical implications" of scientific research at a number of levels. The "social responsibility" of scientists was scrutinized, particularly in light of physicists' contributions to military research. Meanwhile, biomedical scandals such as the Tuskegee Syphilis Experiment shaped an emergent field of bioethics, and the environmental movement drew attention to the risks of an accidental release of new pathogens created in laboratory environments. As Susan Wright has shown, life scientists managed to fend off these critiques, in part

by shifting attention from the possibility of a pathogen release outside of the lab to questions of laboratory safety.[43] From this perspective, leading biologists argued, the most relevant measures were material controls in laboratories, and self-regulation by scientists, who claimed that they were best able to judge the potential danger of experiments, thus excluding others from the assessment of risks.

More recently, however, this regime of material controls and self-regulation has been called into question. This is due in part to advances in techniques of genetic manipulation that have made it ever easier to engineer dangerous new pathogens. But it is also due to the increasing attention paid to bioterrorism, which has shifted the discussion about regulating science in significant ways. In the 1970s civic groups focused on whether well meant scientific experiments could have unintended consequences. Today, by contrast, the focus is on the intentional malevolent use of scientific knowledge, a concern that has been voiced by some scientists, but which has predominantly come from the national security establishment, including think tanks such as the Center for Strategic and International Studies (CSIS).[44] From the national security perspective, advanced research in the life sciences may in the future make it possible to detect, characterize, and mitigate the effects of a bioterrorist attack. But such research may also introduce new threats. The question, for security officials, is no longer one of material controls and self-regulation, but of regulating the production and circulation of dangerous knowledge.

In this context, disputes have taken shape over how to assess the threat posed by research in the life sciences. These disputes often pit security planners, oriented to precautionary measures in the face of worst-case scenarios, against scientists, who cling to autonomy and free inquiry against what they perceive to be, as Carlo Caduff notes (chapter 10), "provisional rules, vague obligations, and impossible demands [that] are systematically imposed on biomedical research in the name of national security." Underlying these explicit debates are often divergent assumptions about how scientific knowledge works, and what might make it "dangerous." Security planners tend to see scientific knowledge as easily abstracted from its context of production: once it is developed, they fear, it can be used anywhere to reproduce pathogenic organisms. As chapters by Caduff and Kathleen Vogel demonstrate, however, experiments considered "dangerous" may in fact depend on highly specific contexts that are difficult to reproduce.

Thus, Vogel (chapter 9) argues that most participants in discussions about the regulation of potentially dangerous scientific knowledge assume that both the knowledge produced in advanced labs and the materials that they employ could easily be used elsewhere. She cites a report from CSIS that claims that if the results of research in the life sciences "are published openly, they become available to all—including those who may seek to use those results maliciously."[45] She also points to a 2004 National Academy of Sciences report, *Biotechnology Research in an Age of Terrorism,* which argued that "it is unrealistic to think that biological technologies…can somehow be isolated within the borders of a few countries."[46] But on the basis of three case studies—the Soviet anthrax program, the 2003 poliovirus synthesis, and the 2003 synthesis of phiX bacteriophage—Vogel shows that, in fact, the replication of such feats of biological engineering is extremely challenging, depending on tacit knowledge and complex research apparatuses. She proposes an alternative approach to assessing "dangerous knowledge" not in terms of isolated materials and knowledge but in terms of the sociotechnical assemblies required to make experiments actually work.

Caduff makes a similar point in his study of the laboratory synthesis of the 1918 flu virus at the Centers for Disease Control, which was conducted under stringent biosafety controls. Media coverage focused on the possibility that the publication of results from these experiments could arm potential bioterrorists. Echoing Vogel, Caduff notes that such concerns rested on a questionable model of pathogenicity. Viral pathogenicity is a property not of a virus in isolation, but of an interaction between the virus and the "host"—that is, human beings. Since humans are not, with respect to the 1918 virus, a naïve population (influenza viruses of the H1N1 subtype are still circulating today), it is unlikely that a release of the virus would have the same effects as it did 90 years ago.

Nonetheless, Caduff shows, just as "biosafety" transformed the practice of science in the 1970s, biosecurity practices are transforming it today. Scientists involved in the synthesis of the 1918 flu virus faced a demand to demonstrate that their experiments did not raise biosecurity issues. Thus, "anticipating biosecurity"—focusing not on the threats themselves but rather on *concerns* about the threats—has become a central part of scientific work in fields like virology. In the case of the 1918 flu virus synthesis, experiments to demonstrate that current vaccines and

antiviral drugs are effective against the 1918 virus were conducted simultaneously with the synthesis itself. As Caduff notes, "By enrolling a few recombinant viruses, some tissue culture, and a couple of inbred mice a truth was performed to open up rather than close down the future of a research project." In other words, scientists sought to anticipate biosecurity concerns through an experimental demonstration that the knowledge they were producing was not as dangerous as the media might suggest.

VI. Toward Critical, Reflexive Knowledge

Although there is a great sense of urgency to address contemporary biosecurity problems—and while impressive resources have been mobilized to do so—there is no consensus about how to conceptualize these threats, nor about what the most appropriate measures are to deal with them. This situation is recognized by some of the more reflective observers in the fields in question here. Thus, as Richard Danzig has argued in the case of bioterrorism, despite the striking increase in funding for biodefense in the U.S., there is still no "common conceptual framework" that might bring various efforts together and make it possible to assess their adequacy.[47] Similarly, Laurie Garrett has noted, in a recent commentary on ambitious new initiatives to fight infectious disease on a global scale, that health leaders are just beginning to ask: "Who should lead the fight against disease? Who should pay for it? And what are the best strategies and tactics to adopt?"[48]

There is no shortage of attempts to answer these questions. As we have seen, the field of biosecurity is filled with actors laying claim to authoritative knowledge about the most serious threats to health, and about the most appropriate responses to these threats. Political elites and policy experts make urgent calls to enact new biosecurity measures, whether for reasons of national security, of global health, or in the name of a moral imperative to alleviate suffering. Meanwhile, experts of various stripes, engaged in developing and implementing interventions, debate how to evaluate and improve existing measures. In studying the work of these first-order actors, the second-order observation conducted by the authors in this volume addresses the problem of health and security in a different register. The authors do not advance claims about the urgency (or nonurgency) of biological

threats; nor do they offer direct solutions to biosecurity problems. Rather, they take the conflicting claims of first-order actors—and the disputatious claimants—as objects of analysis.

A key insight of such second-order observation is that there are different kinds of biosecurity—that is, there are diverse ways that biosecurity can be problematized—and these different kinds of biosecurity entail not only different technical understandings of threats, but different underlying values.[49] From this vantage many of the disputes that emerge in the field are not simply matters of technical disagreement, of finding the right protocol, the right drug, or the right approach to risk assessment. Rather, these disputes revolve around questions that cannot be settled—or, indeed, even posed—by technical experts alone. One of the contributions of this volume, in this light, is to make these values—and tensions over conflicting values—more explicit as objects of reflection.[50]

Thus, Keck notes that culling programs imply a judgment about the value of human versus animal life: animals, it is assumed, can be sacrificed on a massive scale to avert deadly human disease, even if the risk of widespread outbreaks in humans is unknown. In a similar vein, Hinchliffe and Bingham show that WHO protocols implicitly assume that the economic costs of culling domestic poultry in Cairo—a cost that falls disproportionately on the poor—is a "reasonable" price to pay for measures that may avert a global pandemic. But are such programs in fact reasonable, particularly when experts disagree about how effective culling will be in mitigating the risk of an influenza pandemic? "Reasonable" will mean different things depending, in part, on the standard of rationality used in making assessments. But it will also depend on political and ethical judgments about how the costs and harms of biosecurity interventions can be justly distributed when the benefits are uncertain or highly diffused. Thus, the dispute over the smallpox vaccination program is in part a dispute about technical risk assessment. But it is also a dispute about the politics of risk that cannot be resolved in purely technical terms. How should known risks taken by first responders be weighed against the unknown benefits of the program for the national population in the event of a smallpox attack? How, as in the case of syndromic surveillance programs, should the resources of government be directed, and where does its responsibility lie? Is the primary imperative to respond through public health measures to known

and regularly occurring disease? Or to take measures that may avert uncertain but catastrophic outbreaks? Such problems are most acute, perhaps, when the field of regulation is global. How to decide which measures to undertake in situations with tremendous needs, and limited resources—such as the TB crisis amid the crumbling health infrastructure of post-Soviet Georgia?

These kinds of questions are crucial to address today, when responses to the problem of health and security are still taking shape. Doing so requires critical and reflexive knowledge that examines how technical efforts to increase biosecurity relate to the political and ethical challenges of what might be called "living with risk." Security—the freedom from fear or risk—always suggests an absolute demand; security has, as Foucault wrote, no principle of limitation. There is no such thing as being "too secure."[51] Living with risk, by contrast, acknowledges a more complex calculus. It requires new forms of political and ethical reasoning that take into account questions that are often only implicit in discussions of biosecurity interventions. We hope the contributions in this volume provide an initial guide to developing such forms of reasoning.