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### Report Summary

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#### Biological Warfare

The following is a summary of testimony presented by Joshua Lederberg on August 24, 2001, to the Committee on Foreign Relations, Senator Joseph R. Biden, Chair. This testimony is particularly pertinent in view of the recent terrorist attacks and subsequent episodes of anthrax.

Dr. Lederberg, a research geneticist, is past president and Sackler Foundation Scholar, The Rockefeller University. He was a pioneer in the field of bacterial genetics with the discovery of genetic recombination in bacteria. In 1958, at the age of 33, Dr. Lederberg received the Nobel Prize in Medicine for this work and subsequent research on bacterial genetics. Since 1966, he has been concerned about the potential abuse of microbiology and has advised government agencies about its control. In 1989 he was honored with the National Medal of Science by President George H.W. Bush, who cited his role as consultant. Dr. Lederberg is cochair of a study on biological weapon threats and defensive measures tasked by the Defense Science Board and the Defense Threat Reduction Agency. He is also the editor of "Biological Weapons: Containing the Threat," published by MIT Press in 1999.

I am honored to address the committee on a matter of transcendent importance to U.S. security and global human welfare. I define biological warfare as use of agents of disease for hostile purposes. This definition encompasses attacks on human health and survival and extends to plant and animal crops. Biological warfare was the focus of billion-dollar investments by the United States and the former Soviet Union until President Nixon's unilateral abjuration in 1969. This declaration was followed by the negotiation, ratification, and coming into force (in 1975) of the Biological Weapons Convention, a categorical ban on the development, production, and use of biological weapons.

Biological weapons are characterized by low cost and ease of access; difficulty of detection, even after use, until disease has advanced; unreliable but open-ended scale of predictable casualties; and clandestine stockpiles and delivery systems. Per kilogram of weapon, the potential lives lost approach those of nuclear weapons, but less costly and sophisticated technology are required.

Intelligence estimates indicate that up to a dozen countries may have developed biological weapons. Considerable harm (on the scale of 1,000 casualties) could be inflicted by rank amateurs. Terrorist groups, privately or state-sponsored, with funds up to \$1 million, could mount massive attacks of 10 or 100 times that scale. For each 1,000 persons on the casualty roster, 100,000 or 1,000,000 are at risk and in need of prophylactic attention, which in turn necessitates a massive triage. Studies of hypothetical scenarios document the complexity of managing bioterrorist incidents and the stress that control of such incidents would impose on civil order.

While powerful nations maintain a degree of equilibrium through mutual deterrence and shared interests, less powerful elements may find in biological warfare opportunities to harm their enemies. Under current levels of preparedness (e.g., physical facilities and organization and operational doctrines), biological warfare is probably the most perplexing and gravest security challenge we face.

President Nixon's abjuration of biological warfare as a U.S. military weapon in 1969 set in motion the most important diplomatic and legal steps towards its eradication globally, laying the groundwork for the Biological Weapons Convention treaty. The treaty lacks robust verification mechanisms, mainly for reasons intrinsic to the technology. However, verification is not the foundation of the U.S. stance; the United States has long since abandoned the idea that it would respond in kind to such an attack. Were it not for the Biological Weapons Convention, a gradually escalating technology race would have amplified even further this threat to human existence. The treaty does set a consensually agreed-upon standard of behavior: it has become institutionalized into international law, and infractions open the door to enforcement.

Although further provisions for verification would do little to enhance our knowledge of those infractions, they would nevertheless have important symbolic value in reaffirming international commitment to the principles of the treaty. Creative leadership is needed to develop other ways to strengthen that reaffirmation. The real problem with the Biological Weapons Convention is enforcement, not verification. We have all-but-certain knowledge that Saddam Hussein has continued Iraq's biological weapons development program. To convince our allies, much less neutral nations and potential adversaries, of what is at stake, we may have to elevate the priority we give to this threat. We must also become more knowledgeable about the local political and cultural terrain and more ingenious in designing sanctions that will not impose undue hardship on the Iraqi population. Our public diplomacy is predicated on the stated proposition that use of biological weapons is an offense to civilization. This major accomplishment of the Biological Weapons Convention needs to be reaffirmed both in the attention we give to our own defense and in our stern responses to substantial infractions from any quarter.

Unlike the aftermath of nuclear or high-explosive bombardment, attack with biological weapons is amenable to interventions for some hours or days after the event, depending on the agent used. With the most publicized agent, anthrax, administration of appropriate antibiotics can protect the majority of those exposed. The other side of the coin is recognizing the syndrome within hours of the earliest symptoms. Biosensors are being developed to confirm suspicions of anthrax. We will have to rely on early diagnosis of the first human (or animal) cases to provide the basis for focusing those sensors. Because a wide list of diseases must be considered, this surveillance entails reinvigorating our overall public health infrastructure. In contrast to the explosive rise of health-care expenditures, public health funding has been allowed to languish, boosted only very recently by public arousal about emerging infections and bioterrorism. That boost entails personnel and organizational structures, but improvement also depends on funding for new as well as established programs.

## News and Notes

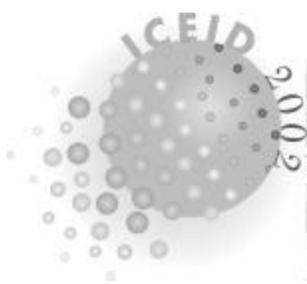
In addition to diagnostic capability, we need organizational and operational doctrines that can confront unprecedented emergencies, we need trained personnel on call, and we need physical facilities for isolation, decontamination, and care. We also need stockpiles of antibiotics and vaccines appropriate to the risk, preceded by careful analysis of what kinds and how much. We need research on treatment methods (e.g., how should inhalational anthrax be managed with possibly limited supplies of antibiotics). Still more fundamental, research could give us sharper tools for diagnosis and more usable ranges of antibacterial and antiviral remedies.

Organizing the government to deal with mass contingencies is a goal that is vexing and still poorly addressed. It entails coordination of local, state, and federal assets and jurisdictions and the intersection of law enforcement, national security, and public health. A time of crisis is not ideal for debates over responsibility, authority, and funding.

Our main bulwark against direct large-scale attack is the combination of civic harmony and firm retaliation. Better intelligence is key to retaliation, apprehension, and penal containment and sanctions. This territory is technically unfamiliar to most of the intelligence community, which has taken many positive steps but has a long way to go.

Resources for managing biological threats are fewer than those allocated to other, more familiar threats.

I have already alluded to public diplomacy (starting with firm conviction at home) about the level of priority to be given to the biological weapons threat if a successful attack is to be averted. A dilemma is how to study the threats of bio-warfare in detail and develop vaccines and other counter-measures, while maintaining the policy of abhorrence at the idea of using disease as a weapon. The central premise of the Biological Weapons Convention is that infectious disease is the common enemy of all humans and that joining with that enemy is an act of treason against humanity. This premise clearly inspired adherence to the Convention, even by countries that might otherwise exploit biological weapons to level the playing field against a superpower. Having set aside biological weapons as of small advantage to U.S. military power, we are fortunate that we share the treaty's interests and conclusions. They can only be strengthened if we internalize them and participate ever more fully in global campaigns for health. Current levels of funding for AIDS, malaria, and tuberculosis are small but are certainly steps in the right direction. We should assume leadership among nations cooperating with the World Health Organization to bolster global systems of surveillance and outbreak investigation of diseases that could threaten us all.



### International Conference on Emerging Infectious Diseases, 2002

The National Center for Infectious Diseases, Centers for Disease Control and Prevention, has scheduled the Third International Conference on Emerging Infectious Diseases for March 24-27, 2002, at the Hyatt Regency Hotel, Atlanta, Georgia, USA. More than 2,500 participants are expected, representing many nations and disciplines. They will discuss the latest information on many aspects of new and reemerging pathogens, such as *West Nile virus* and issues concerning bioterrorism.

Conference information is available at <http://www.cdc.gov/iceid>

The Call for Abstracts is available at <http://www.asmta.org/mtgscr/iceido2.htm>

Contact person is Charles Schable, [cas1@cdc.gov](mailto:cas1@cdc.gov)

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