

# DEVELOPMENT OF COUNTERMEASURES FOR BIOTERRORISM IN THE UNITED STATES

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## 1 INTRODUCTION

Shortly after the terrorist attacks of September 11, 2001, 22 people contracted anthrax infections from *Bacillus anthracis* spores deliberately disseminated through the U.S. postal system. Five of them died [1]. The anthrax killings, together with terrorist groups' demonstrated intention to inflict catastrophic casualties on civilian populations, focused the attention of the U.S. public, lawmakers, and government officials on the acute dangers of bioterrorism.

Bioterrorism presents unique threats to the security of the United States and other nations. Attacks involving contagious biological weapons, in particular, pose a risk of widespread disease outbreak. Such attacks can mimic naturally occurring disease, potentially delaying recognition and response [2].\* In addition, once a terrorist has the capability of producing a biological weapon, there are few if any limits on the quantity of that weapon the terrorist can produce. In the right environment, a pathogenic microbe can reproduce on its own. This characteristic distinguishes biological weapons from other weapons that terrorists might use to cause mass casualties, such as chemical, nuclear, and radiological weapons, which are limited by the availability and cost of critical production materials and equipment [3].

Biological weapons also present unique challenges due to their ability to evade countermeasures, either

through natural alteration or genetic manipulation. Recent advances in biotechnology and the life sciences, including the spread of expertise needed to create modified or novel organisms, have the potential to expand the spectrum of biological agents that might be used as weapons (HSPD 10). In 2000, for example, Australian scientists inadvertently discovered that introducing the interleukin-4 gene into an *ectromelia* virus (the cause of mousepox) suppressed primary antiviral immune responses in recently immunized genetically resistant mice [4]. Others have shown that it is possible to create strains of *B. anthracis* that are resistant to powerful antibiotics, including fluoroquinolones and macrolides [5]. These and other findings suggest that the bioterror threat will require increasingly sophisticated responses over time.

This chapter focuses on one element of biodefense—the development of medical countermeasures to be used in advance of, or in response to, a bioterrorist attack. Unlike other areas of medicine, for which private market forces are generally sufficient to spur private industry to develop and market useful products, there are few market incentives to develop and market vaccines, diagnostics, and therapeutics for biodefense purposes. To the contrary, the disincentives to such investment in the absence of government intervention far exceed the incentives. First, the market for biodefense products is unpredictable. Even assuming that a manufacturer could find a buyer for a biodefense countermeasure, the product may be stockpiled but never used, and the demand for the product ultimately will

\*Homeland Security Presidential Directive 10 will be hereafter appear as HSPD 10.