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Recent Advances in the Prevention of Bioterrorism Attacks

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Since the September 2001 attacks on the World Trade Center and other locations in the United States, a primary concern for the global community has been to heighten homeland security and thereby prevent terrorist attacks. Additional attacks following the tragedy in 2001 across the world included mailed envelopes containing viable *Bacillus anthracis* or Anthrax spores that caused 5 deaths in the US. As a countermeasure to bioterrorism attacks, the US implemented the "Public Health Security and Bioterrorism Preparedness and Response Act" in 2002. This was recently strengthened by the passing of the "Food Safety Modernization Act" of 2010. Both laws are intended to provide resources to oversight agencies for tighter regulation and control of food entering and being distributed in the US. It raises the question to what degree a nation can prepare for a potential bioterrorism attack on the food supply.

The Centers for Disease Control and Prevention (CDC) have identified several biotoxins that could be used for dispersion. Many of these agents are listed in categories A (including anthrax, botulism, smallpox, and the plague) and B (including strains of *Salmonella* and *Escherichia*, Cholera, and Ricin) of the CDC list of potential bioterrorism agents that can be dispersed with relative ease and result in high morbidity and mortality rates. A major concern is the preparedness of public health authorities and the timeliness of the response and recognition of an actual incident. A recent risk analysis of the response to a bioterrorism incident involving *Salmonella* or *Escherichia* bacteria concluded that it would take between 3-5 days and at least 2 confirmed cases to detect and contain the source [1]. Variables that were crucial to the response included exposure time, geographical location, and response of the local healthcare system. Another model simulating a bioterrorism attack including botulinum toxin in milk calls for more stringent risk assessment by the food manufacturer and analysis of potential population exposure [2]. A crucial point in both simulations was the detection and identification of the bioterrorism agent as early as possible in the food production and manufacturing process before the product reaches the consumer. There have been significant advancements in analytical techniques and identification of biomarkers for biotoxins over the past decade. Some of these devices can be used in the field (such as biosensors) or provide fast responses (e.g. multiplex PCR) while delaying food processing and distribution to a minimal degree [3, 4]. Despite these advances in technology, there are still no sensors available that can detect multiple agents with the necessary sensitivity and specificity simultaneously [5]. This is highly desirable to allow for early detection of bioterrorism agents at multiple stages in the food supply chain.

Although the Bioterrorism act of 2002 already required food manufacturers and distributors to register their facilities and maintain records, the provisions that increased regulatory oversight and enforcement by the FDA through the Food Safety act of 2010 provides further measurements to reduce bioterrorism attacks on the food chain. The FDA, however, now has to implement these additional oversight measures which will take several years to complete. In the meantime the threat of a bioterrorism attack on the food supply in the US or in any other nation remains. While local, regional, national, and global preparedness have been discussed both by the World Health Organization and the United Nations [6, 7], early detection systems that include counterterrorism intelligence, control of imported and exported goods, as well as technological advances in the detection of bioterrorism agents remain the primary focus.

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