Bio-terrorism and anthrax as wmd

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Anthrax has been well studies for over 150 years; however, the re3cent threat of anthrax as a bioterrorism agent has necessitated improvements in pathogen detection methods (Popoviv, 2005). Because anthrax spore are hardy, highly infectious, and easily airborne, environmental detection of the pathogens in facilities and public areas is particularly necessary. Many research activities and political actions have been taken to improve the reliability and speed of anthrax detection through sampling of bioagents on-site as well as in-lab culturing and confirmation of bioagents in collected samples. Following the anthrax letter attacks of 2001, the United States Postal service, and other public facilities, instituted Biowatch programs, specifically geared at early anthrax detection in order to minimize contamination. At this point no standard method existed for determining airborne anthrax threats, of particular concern. The USPS " Biohazard Detection System (BDS)" is a system that was put in place to identify potential threats and confirm these threats quickly by high-reliability LRN laboratory analysis (Popoviv, 2005). The CDC conducted regular sampling of many facilities in order to ensure that anthrax was not present. The sampling process is the first phase of anthrax detection, and it is the one that is the most difficult to control because of variants in sampling environments and in personnel responsible for attaining samples. At the Brentwood postal facility, the CDC conducted scientific “ side-by-side” studies that demonstrated that different sampling methods showed much different in-lab results for anthrax spores. The study compared dry-swab, wet-swab, and vacuum methods for sample collection using different swab materials, showing that pre-moistened cotton tipped swabs or macro-foam swabs were the most effective for successful collection of anthrax from surfaces. At the Trenton

postal facility, the CDC conducted similar “ side-by-side” trials to identify airborne anthrax using analysis of various air sampling methods and filter types, published in peer-reviewed literature. Additional research provided the details on amount of moisture, light, and temperature required to successfully transport anthrax samples to LRN laboratory facilities (Popoviv, 2005). Great steps forward were made in anthrax sampling techniques in response to bioterrorism threats. In the lab, anthrax, like other bioagents, must be cultured in order to provide enough anthrax for isolation from other bacteria and fungi that may have been captured in the sampling method, and eventual analysis. Anthrax can be cultured on media, like many other microbes; however, the CDC conducted research on using Polymerase Chain Reaction (PCR) technology in comparison to standard culture approaches, resulting in methods that take much less time to amplify the samples needed in order to undergo analysis that will allow for identification of anthrax in a sample (Popoviv, 2005). These advanced methods of anthrax culturing allow for a much faster overall laboratory analysis timeframe, because culturing microbes traditional can take long periods of time when significant amounts are required. Anthrax confirmation tests are completed according to standardized methods. When new methods are developed, they are normally compared against a standard reference method or tested against a sample with known concentration. This allows the method’s accuracy and precession to be documented and compared with other methods. In addition to accuracy and precision, however, methods for determining anthrax must also be economical and, most importantly, fast in order to provide adequate response in the case of a bioterrorism event (Popoviv, 2005). The CDC and many other public and private institutions

have engaged in method development for anthrax identification. The standard method for B. anthracis (anthrax) identification was created by the LRN and made public to other interested laboratory facilities in the literature. The first standard was a culture-based method that took long period to culture the pathogen before testing. More contemporary methods include nucleic-acid and immunological testing that require very little living bacterial cultures, but can be instead artificially amplified by technique such as PCR for quick results. One of the biggest advancements was the availability of Total Analysis Systems (TAS) for anthrax based on PCR methods. These are full equipment methods designed to be conducted on-site or in a research lab, specifically geared to combine the culture and analysis process to provide immediate results, with less skills technicians needed (Edwards et al., 2006). The implementation of these systems has made testing for anthrax in smaller public health facilities much more affordable in terms of both resources and manpower. In addition to environmental sampling, as discussed above, detection of anthrax for diagnostic purposes may be performed by analysis of the blood, capable of identifying anthrax at very low levels. In addition, modern physicists have created methods that allow for laser identification of anthrax directly from a surface, those these methods have not yet found in-field application, partially due to their expense (Edwards et al., 2006). Laboratory diagnostic by amplification and subsequent analysis remains the standard for anthrax identification, though new techniques that allow for anthrax identification in the field exist but are not widely applied. The important steps of anthrax identification are sampling, culturing or amplification, and analysis for presence of the pathogen. Response time, critical in the event of bioterrorist activity, has

been greatly improved primarily by improvements in testing methods that do not require traditional culturing, but instead rely on quicker, less expensive gene amplification methods. Additionally, sampling has been standardized, reducing errors in detection. References Edwards, Katie; Clancy, Harriet; and Baeumner, Antje. (2006) Bacillus anthracis: toxicology, epidiology and current rapid-detection methods. Anal Bioanal Chem, 384, 73-74. Popovic, Tanja. (2005). Assessing Anthrax Detection Methods. Statement before The Committee on Government Reform Subcommittee on National Security, Emerging Threats, and International Relations United States House of Representatives Retrieved from http://www. hhs. gov/asl/testify/t050405. html