

FOODBORNE DISEASES-BIOTERRORIST THREAT TO PUBLIC HEALTH

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ABSTRACT

The nature of food and foodborne diseases has changed dramatically over last century. Hundreds of millions of people worldwide, both in developed and developing countries, suffers from diseases caused by contaminated food. WHO/FAO and governments all over the world are intensifying their efforts to improve food safety. The causative agents includes bacteria (*Campylobacter spp.*, *Clostridium perfringens*, *E. coli* O157:H7, other *E. coli*, *Listeria monocytogenes*, *Salmonella spp.*, *Shigella spp.*, *Staphylococcus aureus-enterotoxin*, *Brucella spp.*, *Vibrio spp.* *Bacillus Anthracis*), viruses (*Hepatitis A, E*, *Norwalk-like viruses*, *Enteroviruses*), prions (vCJD, BSE) and parasites (*Cyclospora*, *Toxoplasma gondii*, *Giardia lamblia*).

Food bio-terrorism is defined as an act of threat of deliberate contamination of food and water (used in preparation of food) for human consumption, with biological agents. Several pathogens could potentially be delivered by bioterrorists through foods (*Bacillus Anthracis*, *Shigella spp.*, *Salmonella spp.*, *Clostridium perfringens*, *Vibrio spp.* *E. Coli*, *Brucella spp.*). Deliberate contamination of food can occur along the food chain from farm to table. Many developing countries, lack basic food safety infrastructure are very vulnerable to deliberate acts of sabotage. Contamination of food in one country can have significant effects in other parts of the world. The target could be civilian population and military personal. Potential effects can be impact on public health services, illnesses and deaths, economic, trade, social and political implications. Suspicious outbreaks, with unexpected or unusual clinical or epidemiological characteristics, may be the results of covert biological attack by another nation, criminal or terrorist attack, or escape of a biological agent from facility developing prohibited weapons.

Advances of National health surveillance systems, regulatory control, infrastructure development, research, education, enhance the epidemiological and investigative skills of healthcare professionals, including laboratory personal, developing and introducing advanced and rapid biological identification systems, introducing and implementing HACCP, GMP and ISO standards, are necessary measures to ensure the food safety and adequate response on bio-terrorist attack or threat.

KEY WORDS

Food bio-terrorism, foodborne diseases.

INTRODUCTION

Food bio-terrorism is defined as an act or threat of deliberate contamination of food (including water used in the preparation of food) for human consumption with biological agents for the purpose of causing injury or death to civilian populations and/or disrupting social, economic or political stability.

Thousands of outbreaks of disease occur annually among humans, domestic animals, crop plants, and wild animals and plants. More than 200 known diseases are transmitted through food. The causes of foodborne illness include viruses, bacteria, parasites, toxins, metals, and prions. The symptoms of foodborne illness range from mild gastroenteritis to life-threatening neurologic, hepatic and renal syndromes.

Foodborne diseases agents belongs to subset of List of Category B, second highest priority agents (*Salmonella spp.*, *Shigella dysenteriae*, *E. coli O157:H7*, *Vibrio cholerae*, *Cryptosporidium parvum*) (Mitchem K, 2002). Analysis of Mead at al. (1999) in their study suggested that unknown agents account for approximately 81% of foodborne illness and hospitalizations, and 64% of deaths. Among cases due to known agents, Norwalk-like viruses account over 67% of all cases, 33% of hospitalizations, 7% of deaths. *E.coli* O157:H7 was estimated to cause 10,000 to 20,000 illnesses annually.

Threats from terrorists, criminals and other anti-social groups who target the safety of the food supply are already a reality. Deliberate contamination of food can occur at any vulnerable point along the food chain (table 1). Potential effects of food bio-terrorism could be: 1) Illness and deaths; 2) Economic and trade effects; 3) Impact on public health services; 4) Social and political implications. This release would probably initially be considered as a natural or unintentional event. Civilian populations are usually more vulnerable than military personnel. Ashford at al. in 44 of 1,099 investigations, identified causative agents had bio-terrorism potential. In six investigations, intentional use of infectious agents was considered (Ashford at al., 2003).

Contamination of food in one country can also have significant effect on health in other parts of the world. Cooperative effort between government and food industry is necessary. WHO is in a unique position to coordinate existing international systems for public health surveillance and emergency response, which could include consideration of food bio-terrorism. Member States require alert, preparedness and response systems that are capable of minimizing any risks to public health from real to threatened food terrorism (WHO, 2002).

SUSPICIOUS OUTBREAKS

Despite advances in the identification of pathogens, outbreaks of unexplained illnesses continue to occur. Suspicious outbreaks with unexpected or unusual clinical or epidemiological characteristics should consider the possibility of covert biological attack by another nation, criminal or terrorist attack, covert attack by a nation on a sub-national group within its borders, or escape of a biological agent from a facility developing prohibited weapons (Wheelis, 2000). Also, the etiologic agent may differ from agents naturally found in the environment. Multiple infections (with several strains) are not normally encountered in natural outbreaks. Intentional contamination may resemble naturally occurring outbreaks, may spread slowly through a population, and may involve endemic pathogens. Because of the potential similarity between naturally occurring and intentional outbreaks and increased threat of bio-terrorism, the intentional contamination should be considered in cases of: 1) unusual or not easily explained outbreaks, 2) outbreaks resulting from bio-engineered pathogens, not easily detected by existing assays.

SURVEILLANCE

Surveillance of foodborne illness is complicated by several factors. The first is underreporting. Although foodborne illnesses can be severe or even fatal, milder cases are often not detected through routine surveillance. Second, many pathogens transmitted through food are also spread through water or from person to person, thus obscuring the role of foodborne transmission. Finally, some proportion of foodborne illness is caused by pathogens or agents that have not yet been identified and thus cannot be diagnosed. Many of the pathogens of greatest concern (e.g. *Campylobacter jejuni*, *Escherichia coli* O157:H7, *Listeria monocytogenes*, *Cyclospora cayetanensis*) were not recognized as causes of foodborne illness just 20 years ago.

National health surveillance systems may allow early detection of bio-terrorism. Education about bio-terrorism should enhance the epidemiologic and investigative skills of healthcare professionals, including laboratory personnel, especially those in primary care settings, who are likely to be the first contact for people and communities affected by acts of bio-terrorism. Clinical labs, especially microbiology labs, could actually unknowingly abet a bio-terrorist. Laboratories may have collections of specimens of organisms that could easily be accessed by employees, and could certainly be transferred to locations outside of the laboratory by anyone who knows proper handling procedures. The process used to obtain agents that could be used in food bio-terrorism is also coming under greater scrutiny (Mitchem, 2002). Until rather recently, culture were really easy to access by almost anybody through mail order purchases (biological agents discovered in Iraq, 1993, were purchased from the American Type Culture Collections-Manassas, VA, USA, and the Pasteur Institute-Paris, France).

PREVENTION

In the context of food bio-terrorism, prevention means preventing the sabotage of food during production, processing, distribution and preparation. Although never completely effective, it is the first line of defense. The diversity of sources of foods,

including global market, makes prevention difficult, if not impossible. At the same time, many developing countries lack basic food safety infrastructures and are vulnerable to deliberate acts of sabotage.

CONCLUSION

Response to food bio-terrorism depends on awareness of the possibility of a terrorist act and recognition of the incident involving food. Advances and preparedness of National health surveillance systems, regulatory control, infrastructure development, research, education, enhance the epidemiological and investigative skills of healthcare professionals, including laboratory personal, coordination, communication and integration among local, regional, national and international resources, are necessary measures to ensure the food safety and adequate response on bio-terrorist attack or threat.

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Table 1.

