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Review Article

Bioterrorism: Significance in Livestock Production and Bio-Security Measures

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Abstract

Bioterrorism can be described as hazardous effects produced due to the intentional release or dissemination of biological agents. They may be naturally occurring bacteria, viruses, or toxins, and may be in a naturally occurring or a human-modified form. Bioagents are readily available in the modern world and are relatively inexpensive to produce, store and transport from one country to another and can affect livestock health & productivity. The increased bioterrorism is due to the advances in biotechnology, the increased availability of dual-use materials and the ease of transporting biological agents across borders. Bio-security is implementation of measures to prevent the introduction of infectious agents into a healthy population of animals or limit the spread of disease by adopting isolation, traffic control, sanitation, vaccination, serological monitoring of diseases and air quality etc. The bioterrorism has significance not only in livestock but also indirectly affecting the human health and safety hence it is important to bring awareness on bioterrorism.

Keywords: Bioterrorism; Bacteria; Viruses; Toxins; Vaccination; Serological monitoring.

Introduction

Healthy and productive livestock produces a wide variety of food products for direct and indirect human consumption and processing. These products include blood, eggs, meat and meat products, milk and dairy products, viscera as well as rendering by-products. Animal food products from healthy and productive livestock improve farmers' access to both domestic and international markets. Bioterrorist attack the Economic hub of country.

Bioterrorism is terrorism involving the intentional release or dissemination of biological agents. These agents are bacteria, viruses, or toxins, and may be in a naturally occurring or a human-modified form (Atlas, 1998). Bioterrorism can be defined as deliberate release of viruses, bacteria or other germs to cause illness or death (Sharma, 2010). Cultured & genetically engineered biological organisms (bio-weapons) is the most dangerous of all existing weapons technologies (Henderson, 1999). Bio-weapons are defined as biological organisms and substances derived directly from living organisms that can be use to cause death or injury to humans, Animals or Plants (Dudley & Woodford, 2015).

Bioterrorism is defined as "the use of microorganisms or toxins derived from living organisms to cause death or disease in humans, animals, or plants in civilian settings" (Huxsoll *et al.,* 1987). Although the possible motivations behind an attack of this kind are numerous, the most important aspect of bioterrorism is to be able to recognize the signs or clues that an attack has

occurred as soon as possible. When attempting to detect a bioterrorist attack, some indications that a biological agent has been released include: 1) an abnormal grouping of illnesses or deaths that may be temporal or geographical in nature that affect a large number of people or animals, which may include unusual or unexplained symptoms; 2) healthy individuals become ill suddenly; 3) unusual symptoms for a particular area arise; 4) an unusual age distribution among affected individuals; or 5) the disease appears outside of its "typical" season.

History of Bioterrorism

The first intentional spreading of an animal pathogen on a large scale seems to have been organized in the year 801, in the context of a lengthy war between the Prince of Benevent (ruling the former eastern roman empire) and the Emperor Charlemagne, (ruling his western European empire). The way in which the disease was spread remains unclear, but the event was discussed at the time by those who suffered this criminal epizootic. According to the Chronicle of Agobard (779–840, archbishop of Lyons, France), many people did not believe the story: they wondered how a 'poisonous powder' could be harmful only for the bovine species, and how such a small amount of this powder could be effective. The true nature of the 'powder' has of course not been known, but could have simply been small ground pieces of infected tissues taken from animals affected with Rinderpest. Germans carried out carefully planned and executed clandestine operations during World War I. There were substantially supported allegations made that German secret agents had prepared and inoculated or spread cultures of Anthrax and Glanders. These microbes were intended to kill cattle, sheep, horses or reindeer. Attacks were targeted against Argentina (1916–1917), France (1917), Norway (1916), Romania (1915–1916), Spain (1915–1918) and the United States of America (1915–1916), but their success remained questionable (8,9). Before and during the First and Second World Wars, many experiments and field trials were conducted in countries in Europe and the USA, using various infectious agents, but it seems that these agents were never released in the battlefield.

Many of the potential agents that are used in bioterrorism are zoonotic. Zoonotic organisms are organisms that can be transmitted from animals to humans. This is an important fact to consider when dealing with zoonotic diseases. First, some diseases may manifest symptoms in animals before they are seen in humans. Second, animals -including pets, livestock, and wildlife- may serve as sentinels. A sentinel is an individual in a group or population that is susceptible to a disease being monitored for the appearance of the causative agent ("sentinel"). These sentinels can also serve as vectors and spread the disease to large areas in the case of wildlife that can travel long distances, which makes them potential sources of infection for both humans and other animals.

In a disease control program, one should first understand the disease transmission mode i.e direct contact with infectious material, indirect contact through contaminated food and water or by vectors and aerosol transmission.

Producers in the animal industry also play a part in disease control and bio-security. Maintaining a healthy herd will reduce the risk of outbreaks of disease. This can be done by implementing a protocol that includes vaccination and proper hygiene for both animals and handlers. It is also important for producers to purchase animals from a reputable source and to quarantine all incoming animals before introducing them to the rest of the herd. In addition, sick animals should be identified as quickly as possible and quarantined from the rest of the herd. The herd veterinarian should be contacted immediately if unusual illness or signs are noticed. Table scraps and garbage should not be fed to farm animals. Producers should also control insects, birds, rodents and other animals that may introduce and spread disease on their farm, while paying particular attention to feed storage areas.

Other biosecurity measures that the producer can implement on the farm include controlling the flow of traffic into the farm and regulating visitors. Some suggestions to control the flow of traffic include posting signs regarding entry and exits, and guidelines to be followed in farms keeping the gate locked when not in use, and keeping all unused buildings locked. Vehicles that enter and leave the farm should be clean and sanitized to avoid the transfer of dirt, mud, or manure and parked away from livestock areas and barns, preferably on concrete. Visitors to the farm should be kept to a minimum. Be sure that they have on clean clothing and boots that have been disinfected or provide them with disposable plastic boot covers. Do not take visitors to livestock areas or barns unless it is necessary. It is also a good idea to monitor and document all visits to your farm. Concerning personnel and animal handlers, prescreen new employees and train them to spot common disease signs and patterns, so they can recognize

abnormalities in the herd. Personnel that visit or work on multiple farms should: 1) wash hands thoroughly with disinfectant soap before and after accessing livestock areas; 2) use clean coveralls and rubber or disposable boots for each farm; 3) place dirty coveralls in a plastic bag after each farm visit; 4) and clean and disinfect boots after each visit. It is also a good practice to always have on hand the contact information for the herd veterinarian, the state veterinarian office, USDA/APHIS area office, animal extension personnel, and the state public health and agriculture departments.

Biosecurity is the prevention of disease causing agents entering or leaving any place where farm animals are present (Defra, 2003) which will aid in prevent the entry and control the pathogens in and around the farm (Stoltenow, 2008).

Advantages of Bio-security in Terms of Livestock Production

- Improve Health performance
- Greater productivity & Reproducibility
- Reduced Disease infestation
- Early detection and management of any diseases
- More Profit through livestock production
- Reduced costs if there is an outbreak of disease, pests or weeds – early detection and sound farm biosecurity practices may result in faster eradication and shorter quarantine periods.

Basic Bio-security

The vulnerability of the animals on a ranch/farm to disease is influenced by a number of factors including: cleanliness, stress, nutrition, and other management factors; these are all aspects that can be managed. The three main issues to address in a successful bio-security management program are isolation, traffic control, and sanitation.

Isolation

The most important step in disease control is limiting contact, co-mingling, and movement of livestock. This issue is of special importance for new animals arriving on the farm/ranch, including replacement animals, breeding animals, or animals returning from livestock shows. Even co-mingling between established groups of livestock on the farm/ranch should be minimized. An important biosecurity option on ranches is to separate livestock by age and/or production groups. Isolation of animals can be particularly difficult during natural disasters because of damage to facilities and or perimeter fences or lack of feed resources. Isolate sick animals, especially animals with unfamiliar symptoms or those with symptoms that do not improve with usual treatment.

Traffic/Movement Control

Traffic control within the operation should be designed to stop or minimize contamination of animals, feed, and equipment. It is important to remember that traffic includes more than vehicles. All animals and people should be considered when addressing the issue of traffic. Restrict people to places where they need to be. Limit visitors' access to barns and lots. Post a warning sign asking visitors to keep out and giving instructions or a telephone number to call instead of entering the operation. Keep a record of all visitors that enter the premises. Visitors to a ranch/farm operation present several potential problems. Consideration should be given to a visitor's previous stops; both the people and their transportation are potential contaminants. Be aware of foreign visitors and ban footwear, clothing, and other products from foreign countries. People who have traveled outside of the United States should be denied access to a ranch/farm for a minimum of 14 days to control accidental introduction of foreign animal diseases (FAD). Disposable boot covers may be a better option than footbaths to contain contamination from soil and manure. Other animal traffic concerns include pets, dogs, cats, horses, wildlife, rodents, and birds. Traffic control within the operation should be designed to stop or minimize contamination of livestock, feed, feed handling equipment, and equipment used on animals.

Sanitation

The sanitation component of bio-security addresses the issue of the disinfection of people, equipment, animals, and material entering the ranch/farm and the maintained cleanliness of people and equipment. Avoid using common syringes and needles for vaccination, blood testing, or administering animal health product. Be vigilant when working with sick animals: move from healthy to sick animals during the day, never vice-versa. An important objective of sanitation is to prevent fecal contaminates from being ingested by livestock. The use of separate equipment for feed handling and manure/dead animal removal is optimal. If the same equipment is utilized for manure and feed handling, perform thorough cleaning and disinfection.

Additionally, loaning of equipment or trailers presents another opportunity for pathogen

introduction to the ranch/farm. Cleaning of facilities and equipment between groups of livestock during processing is a good management practice to reduce pathogen transmission.

Future Prospect

1. Enactment of national & International laws against the bio-terrorism.
2. Need to support increased investment & research efforts aimed at eliminating threats of Bio-terrorism.
3. Need to Develop a Vaccine & drugs not only to combat infectious diseases, but also to counter bio-terrorism.
4. Need to develop genetically modified organism.
5. Development of Antidotes against different bioterror agents.
6. To enhance national and civil defense systems to contain and counteract the use of biological agents in the manufacture of bio-weapons.

Conclusion

1. Bio-terrorism presents a major threat to the National & Global security in terms of livestock production.
2. Prevention is the cheapest and most effective measures of bio-security.
3. Adequate bio-security measures in the vaccine/ drug production & research laboratories should be designed carefully to avoid dangerous bio-materials & sensitive information for bio-terrorism.
3. Updating the knowledge of field veterinarian or farmers.
4. Rapid diagnosis of emerging infectious diseases is essential for maintaining livestock production.
5. Efforts may be done to make the country free from economically important infectious diseases. Since Rinderpest, the premier scourge of cattle, has already been eradicated from India, the focus is now on control and eradication of Foot and Mouth Disease, Peste des Petitis Ruminants (PPR), Brucellosis, Swine Fever and other diseases having major impact on productivity.
6. A national institutional mechanism, in collaboration with the ICAR and other institutions would be put in place to deal with the issue of Bio-terrorism & bio-security in the livestock sector.

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