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Public Health Importance of Biosecurity Measures in Animal Production

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Interest in biosecurity measures in animal production is intensifying due to the current increased attention to public health, including food safety. There is a growing concern that crowded confinement of large numbers of animals is potentially leads to the risk of disease outbreaks. Effective biosecurity measures in animal production are crucial to safeguard public health. These measures aim to prevent the introduction and spread of animal diseases, which can pose significant risks to human health. Zoonotic diseases, those transmissible between animals and humans, are a major threat, accounting for approximately 60% of emerging infectious diseases. Amongst animals, mammals including ungulates had identified as the 80% reservoir of human infectious agents. Biosecurity practices in animal production systems help to reduce the risk of zoonotic disease transmission through various mechanisms, including prevention of animal exposure to pathogens, minimize the human-animal contact, and control the movement of animals and animal products. Thus, biosecurity measures in animal production are inextricably linked to the "One Health" approach.

Keywords: Biosecurity, Livestock, Food Safety, Zoonoses, prevention, one health.

Introduction

Biosecurity measures in animal production play a crucial role in safeguarding public health by preventing the introduction, survival, and spread of animal diseases that can cause significant risks to humans. In current scenario potential transmission of existing or emerging pathogens from animals to humans is a serious concerned. Wild waterfowl and other wild migratory birds acts as carriers of diseases and shared common avian diseases with domestic ducks, chickens, and geese through contaminated air, water or faeces. Consequently, biosecurity measures are essential to protect human health and well-being, by ensuring food safety, and promoting sustainable animal production practices. One Health recognizes the interconnectedness of human, animal, and environmental health, emphasizing that the well-being of each is dependent on the health of the others. Effective biosecurity practices in animal production systems directly contribute to the One Health goal of reducing the risk of zoonotic disease emergence and transmission. By reducing animal exposure to pathogens, controlling human-animal contact, and regulating the movement of animals and animal products, biosecurity measures help to break the chain of transmission for zoonotic diseases. This, in turn, protects human health from potential outbreaks and ensures the overall well-being of the human-animal-environment interface. Biosecurity measures should be implemented on all farms, regardless of size or type of production.

Importance of Biosecurity measures comprising of:

- **Prevention of Zoonotic Diseases**: Animal production systems serve as a potential reservoir for zoonotic diseases, which are infectious diseases that can be transmitted from

animals to humans or vice versa. Biosecurity measures help to prevent the transmission of zoonotic diseases by reducing the risk of animal exposure to pathogens and minimizing the spread of pathogens within animal populations. Effective biosecurity practices can significantly reduce the incidence of zoonotic diseases like brucellosis, Tuberculosis, rabies, salmonellosis etc.

- **Ensuring Food Safety:** Animal derived foods are a vital source of nutrition for humans worldwide. Biosecurity measures in animal production help ensure the safety of these foods by preventing the contamination of animal products with harmful pathogens. Proper biosecurity practices can minimize the risk of foodborne illnesses caused by pathogens like *Salmonella* spp., *Campylobacter* spp., *E. coli*, etc. protecting consumers from foodborne illnesses and promoting public health.
- **Promoting Sustainable Animal Production:** Biosecurity measures contribute to sustainable animal production practices by protecting animal health and also reduce the need for antibiotics and other veterinary interventions.

Components of Biosecurity in Animal Production

Effective biosecurity in animal production encompasses a range of measures that address various potential sources of pathogen, introduction and spread. These measures include: Bio-exclusion, Biocontainment, Biohygiene, Biovigilance and Biosafety.

1. Bio-exclusion: It is the first line of defense for prevention the introduction of diseases into an animal production system. It is a set of practices that are designed to keep pathogens out of the animal environment. This includes measures to prevent the entry of infected animals, contaminated equipment, feeds and vehicles, as well as measures to keep wild animals, birds and pests out of the animal facility.

Key strategies for bio-exclusion include to:

- Create physical barriers: This includes fences, gates, and controlled access points to restrict the movement of animals, people, and vehicles also to prevent unauthorized access to the animal facility.
- Control access to the animal facility: This includes visitors to sign in and out, providing visitors with appropriate footwear and clothing, and restricting access to certain areas of the facility.
- Foot baths: Foot baths can be used to disinfect the feet of visitors and staff before they enter the animal facility.

Fig.1. Footbath ($KMnO_4$) at the entrance of Cattle farm

- Quarantine procedures: Isolating new animals for a specified period before introducing them to the main herd can prevent the introduction of diseases from external sources.
- Use clean equipment and vehicles: This includes disinfecting equipment and vehicles that enter the animal facility, and using dedicated equipment for each animal group.

Fig. 2. Calcium Carbonate at the entrance of the poultry farm

Fig. 3. Calcium Carbonate around the poultry shed

- Waste Management: This includes properly disposing of animal waste, manure, and bedding to prevent the spread of pathogens. Composting is a way to safely dispose of animal waste, manure, and bedding.
- Monitor for disease: This includes regular health checks of animals, and testing for diseases that are of concern.
- Testing and monitoring: Regular testing of animals, feed, and water can help to detect pathogens early which allow for prompt intervention and containment.
- Dedicated manpower/ worker and equipment: Dedicated manpower and equipment should be used for each animal group/ shed to prevent the spread of disease between groups.
- Biosecurity training: Awareness and training on biosecurity protocols is essential for ensuring consistent and effective implementation.

Fig. 4. Calcium Carbonate at the entrance of the hatchery

2. **Biocontainment**: It is a set of practices and procedures that are designed to control the spread of pathogens within an animal production system. The effective biocontainment practices can help to prevent the spread of disease from infected animals to other animals, as well as to humans and the environment in order to protect public health.

The key principles of biocontainment:

- Isolation of infected animals: This includes separating infected animals from other animals, and providing them with dedicated care and feeding.
- Control the movement of animals.
- Practices of proper hygiene and disinfection: This includes disinfecting animal housing, equipment, and vehicles, and using proper hygiene practices when handling animals.
- Disposal of waste properly including animal waste, manure, and bedding materials to prevent the spread of pathogens.
- Regular monitoring for diseases: This includes routine checkup and screening for diseases that are of concern.

3. **Biohygiene** (sanitary management): It is a crucial aspect of animal production that encompasses practices and procedures aimed at maintaining a clean and sanitary environment to minimize the risk of pathogen transmission and promote optimal animal health. The effective biohygiene practices, can contribute to a sustainable and responsible approach to animal production, safeguarding the health of animals, humans, and environment.

The Key principles of biohygiene in animal production are:

- Thorough cleaning and disinfection: Regularly cleaning and disinfecting animal housing, equipment, and utensils by applying appropriate disinfectants is essential to remove pathogens and prevent their spread.
- Waste management
- Personal hygiene: Maintaining proper personal hygiene among workers, handlers, and visitors is essential to reduce the introduction of pathogens into the animal environment. This includes washing hands frequently with soap and water, using appropriate protective clothing, and changing clothes after working with animals.
- Vaccination: Vaccination of animals helps to prevent the spread of diseases and maintain their health.
- Monitoring and surveillance

4. **Biovigilance**: It is a proactive and systematic approach to monitoring animal health and promptly detecting, investigating, and responding to potential disease outbreaks or other threats to animal health.

Key Principles of Biovigilance in Animal Production are:

- Continuous Surveillance: Establish a system for ongoing surveillance of animal health, including daily observation, regular health examination, and timely reporting of any abnormalities or concerns.
- Diagnostic Testing: Use of appropriate diagnostic tests to identify and confirm suspected disease outbreaks or other health concerns.
- Traceability: Maintain accurate records of animal movements, interactions, and origins to facilitate tracing and containment of potential disease outbreaks.
- Risk Assessment: Regularly assess and evaluate potential risks to animal health, considering factors such as new animal introductions, environmental changes, and emerging diseases.
- Communication and Collaboration: Foster open communication and collaboration among animal producers, veterinarians, animal health authorities, and public health officials to ensure timely and effective responses to potential threats.

Examples of Biovigilance Practices in Animal Production are Daily Health examinations, Disease Reporting, Laboratory Testing, Movement Tracking and Biosecurity Audits.

5. Biosafety: Biosafety in animal production refers to the set of practices and procedures designed to protect workers, animals, and the environment from exposure to hazardous biological agents, such as viruses, bacteria, fungi, and parasites. These practices aim to minimize the risk of accidents, infections, and the release of pathogens into the environment.

Key Principles of Biosafety in Animal Production includes following points:

- Hazard Identification and Assessment: These includes detection of potential hazards associated with the biological agents used in animal production.
- Containment: Implementation of appropriate containment measures will prevent the release of pathogens into the environment. This may include physical barriers, negative pressure ventilation systems, and personal protective equipment (PPE).
- Safe Handling and Disposal: These are essential for biological agents, including proper disinfection, sterilization, and waste management practices.
- Biosafety Training: Training on biosafety procedures is essential for concern persons, including hazard identification, risk assessment, containment measures, and emergency response protocols.
- Emergency Response Plan: An emergency response plans are essential to address potential accidents or incidents involving biological agents.

Conclusion

The public health importance of biosecurity measures in animal production is profound and multifaceted. Prevention and spread of infectious diseases, and implementation of effective biosecurity practices are recommended to safeguard not only the health and productivity of livestock but also critical to protect human beings from zoonotic diseases and help to promote overall well-being. Effective biosecurity measures not only reduce the need for antibiotics but also other treatments cost, and help to combat the growing issue of antimicrobial resistance. Furthermore, by ensuring the safety and quality of animal products, biosecurity measures contribute to food security. Investing in biosecurity measures is an investment in public health, preventing the spread of infectious diseases, protecting the economy, and ensuring a safer world for all. In essence, biosecurity measures in animal production serve as a cornerstone of the One Health approach, fostering a balance between animal, human, and environmental health. Overall, the implementation of robust biosecurity protocols is essential for the sustainable development of the animal production industry and the protection of public health for a more sustainable world.