



Indian Farmer
Volume 8, Issue 10, 2021, Pp. 522-527.
Available online at: www.indianfarmer.net
ISSN: 2394-1227 (Online)

POPULAR ARTICLE



Biosecurity: A fruitful approach for disease prevention at dairy farm

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"Biosecurity is an investment; not an expense"

Article Received: 25 September 2021

Published: 24 October 2021

Bio means life, and security means protection. Biosecurity is the vital measure aimed to reduce and prevent the introduction and/or spread of diseases or harmful organisms (viruses, bacteria etc.) to animals and plants. In developing countries, zoonotic diseases are the major public health challenges as about 60% of emerging infectious diseases in humans are estimated to be zoonotic (Robertson, 2020). Farmers and veterinarians who come in contact with the infected animals also serve as a source of disease spread between different farms (Gwida *et al.*, 2010). Prevention of disease spread, animal welfare, early disease identification and protection of food supply are the goals of biosecurity. Interventions such as improved livestock practices and biosecurity measures can help in contracting the risk of animal diseases and increasing the farm productivity. Continued vaccine failures and emergence of more virulent forms of diseases have brought to light the limited efficacy of antibiotics and the vaccines in controlling the diseases. The significance of balanced nutrition along with improved management practices like adopting strict biosecurity measures at the farm will ensure sufficient protection and minimize any incidence of disease outbreak. External biosecurity focuses on the contact points of the farm with the outside world and aims to prevent those pathogens that can enter or leave the farm. This applies both to exotic diseases, which occur rarely in a country, as well as to endemic diseases, which are common in a country but do not occur at every farm. Internal biosecurity or bio containment includes all measures taken to neutralize the spread of infectious agents within a farm or the management practices intended to prevent the infectious agent from leaving the farm (Ryan, 2016)

There are three levels of livestock biosecurity; conceptual, structural and procedural (FAD PRoP/NAHEMS Guidelines: Biosecurity, 2016).

1. Conceptual Biosecurity / Primary level

Primary level of biosecurity emphasize on location of the farm along with its various components. Physical isolation is one of the most effective ways to contract risk of disease. Farms should not be located adjacent to the public connectivity, especially when the area has a high density of animal facilities. Similar isolation methods include limiting the use of common vehicles and facilities, limiting access by personnel not directly involved with the operation, and controlling the spread of disease by vermin and wild animals.

2. Structural Biosecurity / Secondary level

Secondary level of biosecurity deals with physical factors such as farm layout, perimeter fencing, drainage, number/location of changing rooms, and housing design. Long-range planning should consider on-site movement of vehicles and animals and feed delivery/storage.

3. Procedural Biosecurity / Tertiary level

Tertiary level deals with routine procedures to prevent introduction (bio exclusion) and spread (bio containment) of infection within a facility.

Sources of infection: Chief source of new and hazardous diseases is people working inside the farm through their mobility and duties and the visitors coming from endemic areas of infection. Infections can gain entry to the farm from various other sources also like insects, flies and rodents; mixed species of livestock, contaminated equipments, feed and water, wild birds etc.

Spread of disease: Disease transmission can occur through direct contact, indirect (Fomites includes inanimate objects) and vectors such as living organisms (e.g. insects)

Prevention of diseases and their spread:

“Prevention is better than cure”, a familiar saying, implies well to the livestock wherein the cost of treatment is very high as compared to the cost of prevention. This is achieved by adopting:

- Vaccination
- Medication
- Nutrition
- Farm environment
- Hygiene & disinfection
- Limit non-essential traffic on the farm
- Record keeping of all farm visitors
- Must have only one entrance/exit
- Use of Personal Protective Equipments

- Manure handling
- Disposal of dead animals

Any of the above practice alone is not sufficient to control and prevent occurrence of disease but all these together have synergistic effect for the disease prevention and control despite of adopting good management practices, vaccination and better feeds used.

Methods for maintaining biosecurity:

Quarantine: It is the process of segregating apparently healthy animals which may have been exposed to a communicable disease to see if they become ill and to restrict their movement to control the spread of disease. Newly purchased animals & animals returned from the show must be strictly quarantined for at least 3 weeks to prevent the introduction of new diseases or more resistant or virulent strains of a disease. The quarantine shed should be constructed at the entrance of the farm. The best place to buy animals is from reputable breeders, who maintained mostly closed herds. Young animals make safer purchases than mature animals, as they are less likely to be disease-carriers. It is advisable to buy multiple animals from a single source than single animals from multiple sources. In India, animal quarantine & certificate service (AQCS) is provided by quarantine stations located at Delhi, Chennai, Mumbai & Kolkata. Quarantine stations are governed by the Livestock Importation Act, 2001.

Disinfection: Destruction of pathogenic microorganisms from a place to make it free from infection is called as disinfection. Most of the disinfectants, germicides, antiseptic substances are able to kill organisms & their spores but not necessarily kill all the microorganisms, especially resistant bacterial spores.

Types of disinfectants:

a) Physical disinfectants:

- Heat: Destroys microorganisms by denaturation of their cellular proteins
- Dry heat: It may be applied in the form of flame (300°C) to floors, walls & surfaces
- Ionizing radiation like X-ray and gamma rays can also be used

b) Chemical method:

- Phenol: Phenol is the most common medical disinfectant. Chloroxyleneol, cresol, Lysol, thymol are different examples of phenols. It can be used at a conc. of 0.5-5%
- Alcohol: Ethanol is also used as a disinfectant and also as an antiseptic in veterinary practice
- Bleaching powder: (35% available chlorine) available in the form of white powder. It is a potent oxidizing and chlorinating agent. In dairy barns, it is also used as deodorizer. About 3-5g stabilized bleaching powder should be added to 1000L of drinking water in order to maintain a chlorination level of 1-2ppm
- Calcium hydroxide: Most commonly used for white washing the walls
- Calcium oxide/quick lime: It is used in burial method of carcass disposal

c) Gaseous disinfectants:

- Fumigation: For gaseous disinfection, potassium permanganate and formalin are mixed. Other gases like cresol and ozone can also be used for disinfection.
- Ethylene oxide: It is very potent because it acts against all types of microbes including spores. Object has to be exposed to ethylene oxide for about 3-12 hours for full sterilization. As this gas is highly toxic and explosive, necessary care must be taken. This gas is also a potent carcinogen.

Isolation:

Isolation is a process in which the affected animals are segregated/separated to prevent the spread of the contagious diseases. The animal is usually shifted to separate chamber known as isolation box. Separate attendants and equipments should be there for healthy & disease stock. If it's not possible the healthy animal should be attended first and then the diseased animals. Moreover the attendant should follow the maximum personal hygiene including his cloth, shoes, gloves etc. The isolated animal/sick animal is brought back to the healthy shed only when they are confirmed of their recovery from the disease.

Feed Management:

- Keep food storage areas inaccessible to rodents, birds, dogs, cats, and any wildlife
- Moldy or spoiled material should be repeatedly check for and dispose of in silos and bunks
- Storage areas should be cleaned frequently
- Feed refusals should be removed and disposed of if not consumed within 24 hours
- Store bags of feed off the floor on pallets
- Clean waterers once a week
- Protect all water sources and containers from animal carcasses (e.g. dead birds or vermin) and manure

Footbath:

Fomites are the inanimate objects which act as a potent source of infection for disease spread. In dairy barns footwear can act as a portal of microbial entry. Hence at entry point foot baths are provided. These are filled with germicidal solution. Handler's feet, animal's feet and vehicle wheels must get disinfected with the solution. The most common disinfected solution used in foot baths are formalin @ 3-5%, CuSO₄ @ 5-7% and ZnSO₄ @ 10-20%.

Spray race: In case of animals, if they are often allowed to move outside for grazing purposes, they may harbor some ectoparasites (ticks, mites, lice). To remove ectoparasites different insecticidal solution are sprayed on the animal. There is a race tunnel of about 2.5m x 1.8m with a slope of 1:40. Showers and nozzles are fixed at a height of 2m. Care should be taken to make floor non-slippery, to prevent the falling of animals.

Disposal of carcass: Disposal of carcass in accurate way is a very important method to check the spread of disease. The informal attitude of dairy farmers toward proper disposal

of carcass and aborted material could be exposing free-roaming dogs to probable infections including brucellosis (Singh *et al.*, 2020). Dead animals should be disposed of by burning, burial, or composting to contract the survival of pathogens and to avoid access by scavengers (Carr and Howells, 2018). Problems associated with carcass disposal:

- A potent source of infection for spread of disease
- Improper disposal may cause contamination of ground water & surface water from Leachate into the soil
- This may cause a risk to public health and environmental pollution

Methods of carcass disposal:

Burial method:

The site for burial should be 300 feet distant from the nearest water source or well. The carcass is usually buried covered with sufficient quantity of disinfectant like quicklime (CaO). The dead animals should be buried upon their its back with feet upwards. Any bedding material that has been with the infected animal has to be disposed with the dead animals. The top soil where the dead animal was lying should also be buried along with the carcass. In case of carcass suffered with anthrax, quick lime shouldn't be used in the burial method.

Incineration:

This is the best method of carcass disposal as it eliminates any source of infection but it can't be practiced in case of mass disposal.

Rendering: It is the process of removal of fat from the animals. Dry and moist rendering are two types of rendering. Moist rendering is the most effective method.

Conclusion

On-farm biosecurity is imperative for preventing the spread of numerous contagious diseases. Biosecurity measures helps in contracting the risks of exotic (both bacterial and viral diseases) as well as zoonotic diseases. Good management practices at livestock farm ensure public as well as animal health. Maintaining an effective biosecurity at farm level prevent losses, improves farm profitability and thus contributes in establishing a more viable business/venture. Education campaigns on biosecurity measures must be promoted to create awareness among the farmers and to reduce the community spread of zoonotic diseases when they occur.

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