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Biosecurity in Poultry Farms

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Introduction:

Biosecurity is defined, in general terms, as the set of sanitary and preventive measures that, if applied permanently, prevent and avoid the entry and exit of infectious agents. There are a large number of infectious diseases whose prevention and control measures are strongly related to the biosecurity managed on the farm. Such diseases as Avian cholera, Newcastle disease, *Marek's disease, Salmonellosis, Coccidiosis, Mycoplasmosis, Colibacillus*, and Avian Influenza, among others. Biosecurity is the cheapest and at the same time most effective means of disease control available without, which no disease prevention programme will work well.

Major Routes for Disease and Pathogen Transmission

1. **Poultry** : transfer of birds from production area to other production area and dead bird disposal
2. **Other animals** : wild birds, feral and domestic animals, including other livestock and pets, insects, rodents—rats/mice etc., domestic birds
3. **People:** farm personnel and family members living on site; contractors, maintenance personnel, neighbours, serviceperson, visitors; disease can be transmitted by, for example, hands, boots, clothing, dirty hair etc.
4. **Equipment**: Feeders, waterers, nests, debeakers, vaccinators, sprayers, burners etc.
5. **Vehicles**: Feed Trucks, Product & waste collection vehicles
6. **Air** : transmission as an aerosol or dust
7. **Water supply**: water supplies may become contaminated with faeces from contact with avian or other animal species

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8. **Feed**: feed may be contaminated by the raw materials used, post-production and during transport, or by exposure to rodents and birds on the property. Bacteria and mould in poor quality or damaged feed may also be a concern.

Most important aspects of poultry biosecurity are:

Conceptual biosecurity

- It is best to build farm in an isolated area, atleast three km away from nearest poultry in the case of breeder farm and 1.6 km in the case of commercial layer and broiler farm.
- In the case of breeders, the farm should be away from the major road ways that may be used to transport commercial and backyard poultry.
- Maintain enough distance between breeders and grow-out farms and facilities such as hatcheries and feed mills.

Structural biosecurity

- Fencing of farm perimeter to prevent unwanted visitors.
- Test water source for minerals, bacteria, chemical contamination and pathogen load.
- Concrete stage with suitable water and power supply for sanitation of vehicles.
- Suitable location for storage of bagged feed.
- All-weather roads within the farm to ease cleaning and to prevent spreading of microbes by vehicles and foot wear.
- Facilities for safe scientific disposal of dead birds.
- Safe housing, with suitable wild birds and rodent proofing.
- Feed, litter and equipment should be stored in a section separated from live bird area to prevent contamination.
- A three metre boundary of land around the building must be kept free of all vegetation to prevent rodent and wild life activity.

Operational biosecurity

- Operation manuals should be developed for day-to-day activities carried out in feed mills, hatcheries, breeding and grow-out facilities incorporating emergency plans.
- Proper decontamination and disinfection of equipment, houses etc., following depletion of flock.

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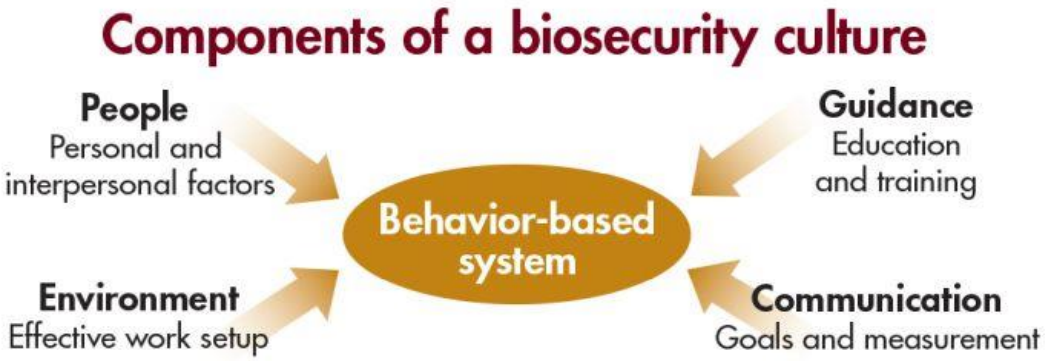
- In breeder farms, all visitors and workers require to shower and use clean farm clothes to prevent cross contamination between them.
- Maintain record for visitors and their purpose.
- In the case of breeders, no vehicles or equipment should be allowed within the farm area from the time of delivery of flock until disposal.
- In commercial broiler unit, a minimum inter flock interval of two weeks is recommended.
- Use an effective integrated pest management program to control pest and rodent through biological, chemical and mechanical means.
- Appropriate program of disease diagnosis and proper vaccination schedule should be implemented.
- In small scale egg production unit, follow all-in-all-out system. If it is not possible, pullets should be obtained from a source free of vertically transmitted diseases.
- Recycling of egg packing materials etc. should be decontaminated at the point of entry of farm.
- Routine disease monitoring procedures like postmortem examination and periodic serum antibody assay to determine immune status of the flock.
- Regular culling of unhealthy, unproductive and diseased birds.



Restricted Access to Birds:

It means restricting access to a farm by employing fences and enclosures which creates a barrier between clean areas where poultry are kept and outside environment and it is the most important biosecurity measures for restricting source of infection away from farm and even from the infected farm to other non-infected farm.

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Management factors in disease prevention

The following managerial factors help to reduce the spread of disease and stress to the birds.

Isolation

- It is not advisable to rear birds of different age groups in the same house. Wherever possible, it is advisable to practise the all-in-all-out system.
- Proper layout of houses, appropriate designing to prevent any entry of rodents, proper ventilation, and the designing of feeders and drinkers to avoid spillage, are basic essentials in disease prevention.

Litter management

- Wet litter is a potential source of disease transmission. Maintain proper litter conditions.

Quality chicks

- Ensure that chicks are received from a hatchery where adequate preventive care is taken for breeder birds to guard against *mycoplasmosis, salmonellosis and infectious bursal disease*.
- Check for a history of vaccination against *Marek's disease*. Look for signs of dehydration.
- Ensure that the received chicks are healthy and are within the normal weight range.

Proper nutrition

- A good balanced feed prepared according to nutrient requirements at different ages will ensure proper health and good immune status in birds.
- Addition of *coccidiostats*, and vitamin and mineral supplements are essential.

Water quality

- Poultry farmers often fail to provide the birds with good quality water.
- Both the microbial and chemical quality of the water need to be tested before establishing a poultry farm in a given area.
- Microbial contamination of water may happen at the source, for instance in ponds, rivers, open wells and the public water supply system, or during transportation and storage, as well as in the overhead tank or bins. Unhygienic practices on the farm result in the spread of disease.
- The microbial load shoots up during flood conditions.

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- Faecal contamination of water will add to the presence of *coliform organisms*.
- Mineral levels in water depend on soil conditions, and show only minor fluctuations based on the season and the water table.
- They lead to hardness in water and affect the taste and palatability.

Quality guidelines for drinking water on poultry farms

- The desirable quality guidelines for drinking water on poultry farms are as follows:
- Total hardness : 60-180
- pH : 6.8-7.5
- Nitrate : 10 mg/litre
- Nitrite : 0.4 mg/litre
- Total bacterial count : 0/ml
- *Coliform* count : 0/ml
- Calcium chloride : 60 mg/litre
- Sodium : 50 mg/litre
- Sulphate : 125 mg/litre
- The removal of excess dissolved minerals by cheaper and simpler methods is not practicable, and the farmer should change to other water sources in case of excess minerals in the water.
- Chlorination is the best and cheapest method to get rid of micro-organisms.
- Five to eight grams of bleaching powder with about 35 percent available chlorine should be added to 1000 litres of drinking water to maintain a chlorine level of 1 to 2 ppm at delivery.
- A minimum contact time of one hour should be given before offering the water to birds. Where storage facilities are not available, liquid chlorine preparations like chlorine dioxide, 5 percent sodium hypochlorite (sanitech), etc., may be used at a level of one ml per 10 litres of water.
- Iodophores containing 1.6 percent available iodine are also used as water sanitizers at the same dosage level.
- Products containing Quaternary ammonium compounds like quat, quatovet, encivet, sokrena etc. may be used as water sanitizers as per the manufacturers' specifications.

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- By providing sanitized water to the birds, the chance of water-borne infections is reduced and the cost of medication is saved.
- The life of pipelines and storage tanks is also increased, and the overall growth of the birds and egg production efficiency will be improved.

Dead bird disposal

- The main principle involved in the prevention and control of current and emerging diseases is the scientific disposal of dead birds.
- Mortality is inevitable on every poultry farm, and it varies with the prevailing disease and sanitary conditions on the farm.
- When birds die, their carcasses remain as a source of infection for pen-mates and other birds on the farm (or other farms).
- All carcasses should be removed from the pen as soon as possible.
- Diseased and ill birds also discharge infectious material into the environment and act as reservoirs for disease-producing organisms.
- It is essential to eliminate ailing birds from the flock rather than jeopardize the health of the remainder of the flock.
- The habit of throwing dead birds on to the nearest manure pile or into an open field is dangerous and unscientific for the following reasons:
- The smell of the carcasses attracts street dogs and cats, which consume the infected carcasses and harbour the enteric organisms infectious to poultry. Because of their free movement, these animals are capable of carrying contaminated material or a portion of a carcass to neighbouring farms, with disastrous results.
- Vultures and other wild birds invade the carcasses and become potential carriers of the disease-causing agents from one farm to another or even from one country to another country if they migrate.
- The carcasses lure insects and flies, which act as transmitters of infectious agents.
- The disease agents carried by rain water contaminate other water sources.
- The surrounding area of the farm is contaminated with feathers and bones, causing soil pollution.
- On decomposition, the carcasses may emit a foul smell and cause air pollution.

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- The disposal of carcasses of birds dying from known or unknown causes, should be carefully attended to.
- There are many methods for the efficient disposal of carcasses such as burying, pit disposal, incineration, septic tank disposal, or composting.
- In general, the following points should be observed while disposing the carcasses:
- Remove the dead birds from the flock as soon as possible;
- Do not deposit carcasses in or near a flowing stream;
- Take the necessary precautions to prevent spillage of infectious material from the carcasses during transportation from the farm or post-mortem room to the disposal site.
- Take sound bio-security measures at the disposal sites to prevent disease transmission.
- Moreover, with the present concern for the environment, the poultry industry needs to pursue efforts to protect the environment.
- Therefore, all methods that allow for environmentally safe and scientific ways of disposing of carcasses should be considered.

Litter removal

- After the pen is emptied, deep litter and caged layer droppings should be removed to a field far from the poultry shed, and spread to dry in the sun.
- It should be disposed off as soon as possible for manure or other purposes and not allowed to remain accumulating for a long period.
- Composting is better, since the heat produced will destroy the pathogens.

Disinfection

- Disinfection is the process or act of destroying pathogenic microorganisms.
- A disinfectant is an agent that destroys pathogenic organisms, and that can be applied on inanimate objects or used as a footbath.
- Phenol, cresol, chlorine compounds and iodophors can be used for disinfecting surfaces as well as the egg room, feeders, drinkers, buildings and footwear; liquid formalin at 5 percent level, or formaldehyde gas by fumigation, will also serve as an effective disinfectant.
- Sun-drying may be practised for washed equipment; for cement surfaces-dry heat in the form of flame is recommended.

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- Copper sulphate as a 0.5 percent solution is effective against fungi.
- Quaternary ammonium compounds are good disinfectants when used according to directions. However, they are not effective in hard water.
- They can be used for disinfecting surfaces, washing egg rooms, feeders and drinkers and other equipment.

Rodent control

- Keep rodents out from the initial stage of farming itself, since once the farm is infested, it is difficult to get rid of them.
- Remove piles of unused equipment and empty gunny bags as they serve as breeding places for rats, mice and squirrels.
- Remove spilled feed daily. Store feed in well-ventilated, rodent-proof rooms.
- Use traps in the initial stages and later rodenticides. Rodenticides should be used at night according to specifications.

Insect control

- Counter measures against insects are part of maintaining a sanitary environment, as insects play a significant role in transmitting disease-producing micro-organisms, tape worms, etc.
- Flies sit on the birds, irritate them, prevent them from taking water and feeding normally, causing stress which results in reduced egg production especially where cage rearing is practised. Insect or fly control measures include:
- Avoiding stagnation of water in and around the farm premises.
- Provision of proper drainage facilities, attending immediately to leaky drinkers, water lines, etc.
- Use of insecticide sprays or dusting at required intervals,
- Treating the birds and checking the feed and water quality to avoid watery droppings.
- Keep the surroundings clean by covering the area with treated soil devoid of vegetation or by growing grass lawns.

Personnel hygiene

1. Specific over all clothing for employees must be provided.
2. Wash hands thoroughly before and after entering the farm area. Washing of hands can be done with soap or detergents with contact time of 10 minutes.

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3. Wear clean clothes or coveralls while working with birds in the farm. The clothes should be washable with laundry detergent. Preferably for this purpose detergents or oxidizing agents and alkali can be used, especially at the entrance on foot mats to clean the shoes gumboots and other items. Quaternary-ammonium salts can be used for the treatment of walls, floors, ceilings and equipment, Cresolic-acid 2.2% solution or Synthetic phenols 2% solution can be used for the treatment of floors.
4. Since disease in poultry can be transmitted easily through boots, therefore, boots should be used after cleaning and disinfection. The best approach would be disinfecting footwear before and after working with birds or keeping a separate pair of shoes to work around birds and changing into other shoes when leaving the premise. The person should use coveralls, which can be removed and cleaned when leaving the premise. Boots should be washed in chlorinated water or with soapy water. Also scrub boots while entering and existing.
5. Medical check up of all workers coming in contact with livestock and feed should be done.

Training

- Training sessions for all poultry farm workers on biosecurity issues should be strengthened. This constant exercise guarantees good practices.
- Cleaning the farm: The staff is in charge of cleaning the entire farm. This includes many processes such as correct sweeping of the areas, washing with water and detergents, among others.
- Farm disinfection: When all the birds in a production cycle have left, the staff must empty the facilities and wash and disinfect each area. Personnel must be trained in the correct use of disinfectants to ensure the elimination of microorganisms.
- Records: The staff must keep a good record of all the processes carried out on the farm that include: change and maintenance of equipment, entry and exit of trucks and people, use of disinfectants, mortality, and sick birds, etc.
- Emergencies: Farm operators must have first aid equipment, a first aid kit, and be trained to respond and request help in the event of an eventuality such as accidents, illness, or dangers (fire, power outages).

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- In addition to the biosecurity measures described, there are some others focused on the management of birds and their different requirements

All-in and all-out system:

It consists of the entry and exit of all the birds of the production at the same time, that is, the same group enters and leaves. There should be no crossings of groups of birds of different origins or ages because this facilitates the entry of microorganisms. Besides, it allows that, between productive periods, the entire farm can be emptied, cleaned, and disinfected.

Vaccination

In poultry farming, each farm must be aware about the diseases that circulate in the region where they are located and vaccinate to prevent them. Vaccination is a vital biosecurity process that every farm must implement to control serious infectious diseases such as Marek's Disease, Newcastle disease, or Avian Infectious Bronchitis, among others.

Medicines

All medicines used within the poultry farm must have the legal records of each country. Also, the residuality of these must always be taken into account (the time that the drug can remain in the animal and remain in its meat or eggs). They must be used when strictly necessary due to the costs and effects they generate.

Isolation and quarantine of new birds:

Isolation and quarantine of new birds is necessary in a separate place and enclosure so that infectious agents which may be there in the newly introduced birds may be detected before introduction of these birds with other flocks.

1. If the birds have been used for a show or a fair, keep them isolated from rest of the flock for 21 days after the event and observe for signs of any disease.
2. New birds should be kept separate from old stock for at least 21 days and they should be observed for any disease symptoms and samples (blood, faecal, swabs) should be collected for thorough investigation before mixing to the already existing old stock.
3. It should be ensured that shed houses birds of same age group, even if farm consists of birds of different age group.
4. Pest proofing is recommended before restocking

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Multiple Species rearing and precautions:

The specific guidelines for keeping multiple species are to be further deliberated. However, the following thumb rules may be kept in mind:

1. Poultry units should be distantly located or well bifurcated from each other.
2. Separate hatchery for each species may be considered.
3. Provision of separate feed storage facility at units of different species may also be considered.
4. Equipment meant for different species of birds should be separate.
5. Provision of all-round spray system of disinfectants at the entry of each species units
6. Exclusive infrastructure facility is essential to rear each species separately and to follow all-in all-out system