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Biosecurity Measures in Animal Husbandry to Prevent Epidemic Zoonoses

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Biosecurity definitions

The word, biosecurity, is understood differently in different countries. Translations cause even more misunderstandings. According to FAO's general recommendations, biosecurity involves the management of biological risks in a comprehensive manner to achieve food safety, protect animal and plant life and health, protect the environment and contribute to its sustainable use. Personally, I would like to add also human health to this definition. Shorter and simpler definitions of biosecurity include; safety of living things, freedom of concern for sickness or disease, security from transmission of infectious diseases, parasites and pests.

In animal husbandry, biosecurity, simply said, means the prevention of disease causing agents entering or leaving any place where animals are, or have been, present. Although the biosecurity measures are simple, implementing them in practice can be very difficult. Biosecurity should not be something done after the accident has happened, but every day practice of doing things. Implementing biosecurity measures as standard practice, helps ensure that all those working with animals, or coming into contact with them, do not spread disease.

Biosecurity measures

Most common insecurity measures include monitoring, surveillance, isolation, transport limitation, elimination, eradication and prevention.

Monitoring and surveillance

Monitoring is to detect changes in the prevalence of disease in a given population and in its environment as soon as possible. Changes cause alerts, which are often followed by quick start of specific actions to stop the disease escalation. Monitoring should be done daily by owners in every herd. If anything exceptional is seen, veterinary advice should be required immediately. Monitoring must also be done on country level, and globally. Diseases, which globally are irrelevant, can be extremely important locally. And diseases, which may not have great importance for an individual herd, can cause a global catastrophe.

Global monitoring is arranged by Office International des Epizootics (OIE). This organization lists the most harmful diseases into two categories, list A and list B. List A includes diseases that have the potential for very serious and rapid spread irrespective of national borders, are of serious socio-economic or public health consequence or are of major importance in the international trade of animals and animal products. There are fifteen diseases on the list A: Foot and

mouth disease, Swine vesicular disease, Peste des petits ruminants, Lumpy skin disease, Bluetongue, African horse sickness, Classical swine fever, Newcastle disease, Vesicular stomatitis, Rinderpest, Contagious bovine pleuropneumonia, Rift Valley fever, Sheep pox and goat pox, African swine fever, and last but no least, Highly pathogenic avian influenza.

List B includes transmissible diseases that are considered to be of socio-economic and/or public health importance within countries and that are significant in the international trade of animals and animal products. Eleven multiple species diseases are; Anthrax, Aujeszky's disease, Echinococcosis/hydatidosis, Heartwater, Leptospirosis, New world screwworm (Cochliomyia hominivorax), Old world screwworm (Chrysomya bezziana), Paratuberculosis, Q fever, Rabies and Trichinellosis. The other diseases in list B are species specific, including Bovine babesiosis, Bovine brucellosis, Bovine spongiform encephalopathy (BSE), Bovine tuberculosis, Maedi-visna, Scrapie, Equine viral arteritis, Horse mange, Atrophic rhinitis of swine, Porcine reproductive and respiratory syndrome (PRRS), Transmissible gastroenteritis (TGE), Avian tuberculosis, Marek's disease, Tularaemia, Varroatosis (bees) and Viral haemorrhagic septicaemia (fish), among others.

OIE has an Internet based alert system to spread the information of new outbreaks. Global situation of infectious diseases can be checked from their Internet pages at the same time anywhere in the world. Internet is a powerful tool to get information quickly to millions of people. Surveillance means continuous investigation of a given population to detect the occurrence of disease for control purposes, which may involve testing of a part of the population. Sometimes in practice, it is difficult to decide if the aimed action should be called monitoring or surveillance.

Isolation, elimination, killing, eradication

Once the disease occurs, isolation of the sick animal, herd, village, county or even country, must be done as quickly as possible to stop escalation of the problem. It should be understood on every farm that oddly sick animals should be isolated immediately. Then they can be treated or killed, depending on the diagnosis.

Elimination of the disease often means killing the sick animals or all animals in the farm. Killing must be done quickly, but in a humane manner. Every farm, county and country should have a plan for quick killing and destroying individual animals, whole flock, or even animals from thousands of herds. Usually, slaughterhouse personnel are needed to assist if whole herds need to be destroyed. Sometimes the army may be needed to help. Elimination of the disease from a herd may also happen in other means than killing all animals (e.g., partial depopulation together with special sanitary measures). The word “eradication” has often been used in the same meaning as elimination, but more exactly it means getting rid of the disease in a wider population like county, country or continent.

“An ounce of prevention is better than a pound of cure”

Prevention is the cheapest and most effective measure of biosecurity. The only problem of prevention is that it must be done before accidents happen. Often people don’t recognise the risks. Or if they do, they don’t believe that it could happen to them. That is why it is so difficult to get funding to prevent diseases, but very easy to get hundreds and thousands times more money to treat the problem after the accident has happened. The earlier you notice a new threat, the cheaper it is to eliminate.

There are several details in disease prevention, but only a few big principles. The first principle is that animal buildings, animal movements, feed silos, and all functions in the herd should be planned bearing biosecurity in mind. Animal buildings should be planned so that animals are raised in batches. This so-called “all in – all out” system effectively stops spreading any diseases from one batch to another, and is widely applied in poultry and pig farming. Age segregation of animals is recommended to prevent older animals infecting younger ones. Age segregation is also

necessary for all in – all out production. Age segregation and all in – all out production are not possible, if the buildings are not planned for animal batches.

The greatest risk of introducing new diseases into the herd is caused by buying new animals. They have to be bought to get new genes, but they should be bought with care. Animals should be bought only from such herds, which can verify their freedom of major diseases. New animals should first be put in quarantine, verify that they are healthy, and then take them into the herd.

Feed control is the second most important measure of prevention. It should be proper feed, and produced locally or in the quality controlled feed mills. In Finland, the Disease Prevention Union ETT, takes care of controlling the feed mills. ETT keeps a positive list of qualified feed mills. Farmers are allowed to buy feed only from those on the positive list. If they use some other feed, slaughterhouses and dairy plants don't buy their products, and they are not qualified for the group insurance for diseases. Practically, they have no other choice than using feed belonging to the positive list.

The other risks are small compared to buying animals and buying feed, but not irrelevant. One should be cautious in allowing visitors to the farm. Only necessary visitors should be allowed, and they should wear farm clothes or disposable clothes. Foreign visitors should stay in the country two days (48 hour rule), before they are allowed to visit the farm. In Finland, sauna is warmly recommended before and after farm visit. Such farmers, who visit farms in other countries, often take their travel clothes to a sauna (100 ^{o}C) for a couple of hours, which is enough to kill most of the pathogens.

Companies selling disinfectants often eagerly introduce hygienic measures. Disinfectants are needed, but their over usage is not recommended. For example, changing boots between different locations is much quicker and much more effective than any disinfectant. Using different colour boots in different rooms is a simple way to control that all personnel really have changed their boots between the rooms.

Finally, good management is the best biosecurity measure against all diseases. It does not help if the facilities are good if the people working on the farm don't understand basic rules of biosecurity. In well managed farms animal density is not too high, general hygiene is good, animal welfare is taken care of and a veterinarian makes frequent, pre-planned visits to the farm.

One warning

Biosecurity frameworks should not be misused to create unjustified barriers to international trade.

Case example – avian influenza

Outbreaks of highly pathogenic avian influenza (HPAI) are often very difficult and very costly to control. Culling of infected and exposed poultry is recommended for AI subtypes H5 and H7, even when the virus shows low pathogenity, because the virus can mutate to highly pathogenic. In the present epidemic, which started in December 2003, more than 100 million birds have died or culled. The 2003 outbreak in the Netherlands caused the culling of over 30 million chickens, every fourth chicken in that country.

Nowadays, most poultry are raised in small backyard farms, in close proximity of humans and domestic animals, especially pigs. Especially risky is to raise ducks by the pond together with chicken and turkey. Domestic ducks attract wild ducks, and may transmit the disease from wild birds to domestic animals. Control measures should be implemented in several countries at the same time to make the epidemic stop. In poor areas, destroying healthy looking poultry may not be easily

accepted. Anyway, it must be done. It also costs lots of money, but money will be given, because the accident already has happened. Damages are intolerable, if control measures are not taken.

At the same time, preventive measures should be planned. Controlling HPAI, in the long run, is possible only if strict preventive biosecurity measures are applied. It means major changes in the food industry, actually in the whole society. These measures include denying backyard, open-air chickens, and restricting poultry farming to special poultry farming zones. All poultry should be raised inside, in bird-proof buildings. Environmental issues should be considered in establishing such poultry zones. Proper water supply and waste management should be planned.

Incoming persons to a poultry zone should take a shower and change their clothes. Incoming vehicles should be disinfected. Bird, insect and rodent control measures should be taken. No other animals should be allowed on poultry farms. All poultry locations should be registered, merely into a web database. All movements of chicken from one place to another should be recorded.

Frequent veterinary visits to poultry farms should be required to verify that the raising of the chickens is going on like it should. These visits should be recorded to the poultry database. When animals are ready to be slaughtered, they should be taken directly from the farms into the poultry slaughterhouse, not via any auction. This means that production should be contract based. Poultry buildings should operate on an “all in – all out” principle. Poultry slaughterhouses should be built on rural areas, and closed in cities. Chicken meat should be transported to cities properly packed, and kept cold. Principles of HACCP should be applied to poultry farming, and poultry industry.

Could all of this be done? Yes, if available recommendations are adopted and implemented in practise.