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Review Scientific Paper

THE IMPORTANCE OF ASSESSMENT AND CONTINUOUS CONTROL OF BIOSECURITY ON CATTLE AND PIG FARMS

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Summary
Biosecurity, welfare, good production practice and risk analysis are very important elements for intensive production on farms of high yielding dairy cows and pigs. The planned application of biosecurity measures is crucial in protecting the health of cattle and pigs and for the production success. It is recommended that employees' awareness of improving biosecurity constantly raise, that there is an active attitude towards existing risks, and that the measures taken are the key to success in designing and preparing biosecurity plans for each specific situation i.e. the farm. It is generally known that oversights, omissions and mistakes in maintaining the required level of biosecurity usually lead to the emergence of diseases, decline in production, death and economic loss. Therefore, by applying more preventive measures to the health care of cattle and pigs, the concept of profitable production on farms can be fulfilled. It should be emphasized that the application of biosecurity measures on cattle and pig farms is the most important measure to prevent the potential introduction and spread of pathogens. Therefore, biosecurity measures must be well defined, practical, functional and understandable to farmers, i.e. cattle and pig breeders. This paper presents an evaluation of the permanent biosecurity control on cattle and pig farms, as part of the implemented project tasks.

Key words: biosecurity, health care, cattle, pig.

INTRODUCTION

Biosecurity on farms

Nowadays, in general, there are numerous definitions of biosecurity or biosecurity measures, which can be considered from different aspects as well as for different production systems. However, all definitions have in common that biosecurity includes a set of measures and procedures whose main goal is to reduce the risk of introduction,

occurrence and spread of various disease agents in or on a pig farm, regardless of the production levels (Alarcón et al. 2021 ; Prodanov-Radulović et al., 2022).

When considering the state of biosecurity at the farm level, one should simultaneously take into account related, but to some extent different concepts: biosecurity plans, risk assessment at critical control points and plans for emergency situations. Biosecurity plans are crucial for the prevention of production and infectious diseases. Also, biosecurity plans are crucial in preventing unwanted situations and improving business (Stanković et al., 2015a; Stanković et al., 2016; Hristov et al., 2006, Polaček et al., 2021).

Intensive production in cattle and pig farming implies a large concentration of animals in a relatively small area, which is why it is necessary to apply certain measures in order to preserve the health of cattle and pig herds, prevent the introduction and spread of production and infectious diseases in the herd and preserve production (WQ, 2009; Bojkovski, 2015; Bojkovski et al., 2017; Bojkovski et al., 2020). The application of biosecurity plans implies constant activity to create and preserve a frendly environment for the life of animals and their production, primarily in terms of preventing the introduction and spread of infectious disease agents, and it is important since the market for beef, dairy products and pork increasingly takes an international character (Stanković et al., 2011).

Many solutions that are applied on high-yielding dairy and pigs farms, in order to improve profitability, increase efficiency and safety of production, often cause discomfort, pain and stress, i.e. distress of animals, while preventing their natural instinctive behavior, which is reflected to the greatest extent in the economic results of production (Hristov et al., 2018). Overlooks, omissions and errors in maintaining the required level of biosecurity usually lead to the appearance of diseases, production loss, death and loss of income, thereby endangering the survival of entire herds of cattle and pigs (Hristov et al., 2007).

The concept of biosecurity implies three main factors:

1. Isolation, which prevents the contact of individuals from the controlled ambience and the environment, and refers to newly acquired animals, contacts between existing groups of cattle divided by age and/or into production groups, as production operations that are repeated in several groups of animals, such as feeding, loading, etc.
2. Traffic control, which includes monitoring the movement of vehicles, people and all animals from and to the farm and must be designed to prevent or minimize the risk of pathogens entering the farm and contaminating food and equipment.
3. Sanitation, which refers to the disinfection of materials and equipment entering the farm and the hygiene of people and equipment on the farm (Hristov et al., 2007).

Assessment of on-farm biosecurity settings

There is no single biosecurity plan for all dairy and pig farms. Achieving the required level of biosecurity on a dairy farm implies a plan that was created by analyzing the current epizootiological situation in the area where the farm is located (Stanković et al., 2008; Stanković et al., 2011).

Numerous limiting factors make it difficult to reach the required level of herd health protection and production success. The size of the farm and the production level understandably greatly limit the scope and quality of the measures taken, which can also be said for the intensity of production. This practically means that economic profitability must have a decisive role in determining the goals that need to be achieved by implementing a biosecurity plan, or at least certain biosecurity measures, expressed in the form of good husbandry practices, good veterinary practices or HACCP (Hazard Analysis Critical Control Point) oriented plans. (Ostojić-Andrić et al., 2017).

Failures in the application of certain biosecurity measures were observed on the cattle and pig farms that were included in the project research. The aim of this review, which was part of the project tasks, is to provide information related to the improvement or introduction of biosecurity measures on farms of high yielding dairy cows and pigs.

Biosecurity indicators on the farm

13. Isolation as an element of biosecurity on the farm

Farm location is a key element of a sustainable biosecurity plan. Isolation of facilities in relation to potential sources of pathogenic microorganisms is an important measure of protection, especially when it comes to airborne infections (Stanković et al., 2015b). This means that the location is determined by a number of related factors, of which distance is the easiest to measure, but it also includes the type and size of the farm, prevailing winds, humidity, and more. The importance of the green protective belt around the farms is almost regularly neglected (Hristov et al., 2007; Stanković et al., 2015b).

14. Quarantine

Newly acquired animals must be placed in isolation in order to confirm their safe health status, as well as acclimatization to the new housing conditions, taking into account the location of the appropriate barn and the duration of the isolation. The duration of isolation is inversely proportional to the health status of the domestic herd, which means that if it is higher, the control must be stricter and usually lasts 4 weeks, but it is more recommended to last six weeks (Hristov et al., 2007).

15. Health status of the herd

Sustainable health protection and successful production are possible only if there are no causative agents of infectious diseases and factors that lead to the appearance of technopathies. The way of use, storage, maintenance and handling of therapeutic agents, instruments, semen, as well as the use of single-use agents certainly affect the achievement of a satisfactory health condition of all categories of cattle and pigs (Stanković et al., 2015b).

16. How the staff handle with equipment

The causative agents of infectious diseases can also be transmitted indirectly through equipment. In order to reduce the spread of agents with equipment, the following is undertaken: hand washing before each entry into the farm segment and after working with diseased animals, wearing protective gloves. Separate use of equipment for working with food and manure, single use of needles, sterilization of instruments, marking and washing of clothes with appropriate detergents (Hristov et al., 2007).

17. Movement and traffic control

Control of the movement of vehicles, people and animals from and to the farm must be an integral part of production technology and must be designed to prevent or minimize contamination of herds, food and equipment (Hristov et al., 2007). In practice, some important elements of movement control, related to the barrier and procedure for entering the farm for vehicles and foreign persons, are often neglected, although all of this is provided in the farm's protocol. Desobarriers are regularly uncovered, exposed to atmospheric and surface water, and the solution is not changed often enough as required by the frequency of traffic.

18. Visiting regime

In order to reduce the possibility of contaminant dispersion, it is necessary to inform visitors and drivers about protection methods and to insist on their cooperation in minimizing the possibility of contamination, preventing the entry of visitors into accommodation and eating areas, placing signs for prohibited entry, with a contact phone number at the entrance of the farm (Hristov et al., 2007)

19. Control of food and feeding equipment

Proper storage protects food from contamination. Food for different categories and systems should be labeled and sorted in order to avoid omissions. Also, the quality of water should be monitored and a suitable water supply system should be provided. If food is purchased, it is best to buy it from producers with a controlled regime of production, quality and biological safety (Hristov et al., 2007).

20. Manure management

The location of the manure dump within the farm and the evaluation of the manure treatment provide a large amount of information about the level of biosecurity on the farm and the awareness of employees (Hristov et al., 2007).

21. Removal of carcasses of dead animals

It is very important that all carcasses are removed from the farm as soon as possible and in an appropriate manner (Hristov et al., 2007).

22. Relation to other animals on farm

Although it is not desirable, sometimes the desire of farm owners to have dogs, cats or horses on the farm cannot be ignored. In this sense, the mentioned animals should be denied access to the parts of the farm where the production animals are located (Hristov et al., 2007).

23. Bird and rodent control

Bird control has its meaning on commercial pig farms. Birds (pigeons, sparrows, starlings and swallows) can carry infectious material on their feet or in their digestive system. It is therefore recommended to close holes suitable for making nests; placing nets on windows and ventilation openings, closing openings on silos and covering edges under roofs and eaves suitable for nests and laying (Hristov et al., 2007). Rodent population control is a mandatory part of any biosecurity plan and the following is undertaken: construction of facilities where rodents cannot penetrate, closure of safe hiding places, elimination of feeding and drinking opportunities, and destruction of existing populations by poisoning, fumigation and traps.

24. Sanitation

Sanitation has implications for commercial pig farms. The term sanitation refers to the maintenance of hygiene, cleaning and disinfection of materials, people and equipment entering the farm and the hygiene of people and equipment on the farm (Hristov et al., 2007).

Evaluation of inspected farms

Nowadays, there are numerous methods of evaluation, i.e. assessment of biosecurity measures on pig farms, with the possibility of a scoring and statistical data processing. We also use a scale from 0 to 5 in the assessment of biosecurity indicators. SWOT analysis (strength, weakness, opportunities, threats) is also sometimes used. For example, based on the indicator's assessment and SWOT analysis, we found that respiratory infections are present in a large number of pig farms. The presence of *Mycoplasma hyopneumoniae* and *Actinobacullus pleuropneumoniae* was established. On farms that we inspected, the frequency of the above pathogens was high. One of the more serious health problems on farms is the presence of PRRS (porcine reproductive and respiratory syndrome). On the inspected farms, the health condition indicator was low due to the fact that on the majority of inspected farms, inadequate accommodation, nutrition and implementation of therapy, as well as the absence of implementation of preventive measures, were found. As a result of such a situation, there were significant losses of suckling piglets, as well as loss in the category of piglets that were weaned. The economic problem is represented by the losses in the fattening category, which are smaller compared to the losses of suckling and weaned piglets (Bojkovski et al., 2022; Bojkovski et al., 2023). In addition to the above, a large number of authors state that zoohygiene conditions on the farm are one of the ways to prevent the presence of pathogenic agents of production or infectious diseases, that is, that the implementation of zoohygiene measures is the basis for biosecurity indicators to be well evaluated (Asaj, 2003; Stanković et al., 2009; Krnjaić, 2010). As a basis for prophylactic measures, immunoprophylaxis is very often carried out, which basically has no legal obligation, but is very important from an economic point of view. However, vaccination is decision of the farm management, that is, it is carried out as the owner's personal choice, which is not good when viewed from a professional perspective.

Bearing in mind the differences that exist within the existing farm production in the Republic of Serbia, every commercial as well as family farm should have its own plan and protocol on the application of biosecurity measures developed and adopted, in accordance with the existing infrastructure and capacities in the production plant. It is of particular importance that persons working on the farm should be familiar with biosecurity measures, that is, all preventive and control measures implemented on the farm in order to prevent the introduction of the causative agents of particularly dangerous infectious diseases of pigs. Therefore, in order to effectively apply biosecurity measures, continuous work on education and information of all persons involved directly and/or indirectly in the production process on the pig farm (farmers, farm workers, professionals) is necessary.

On high-yielding dairy farms that were included in the project task, the following bacteria were isolated from calves: *Pasteurella multocida*, *Mannheimia haemolytica*, *Pasteurella spp*., *Histophilus somni*, *Haemophilus spp*., *Trueperella pyogenes*, *Pseudomonas aeruginosa*, *Salmonella Enteritidis*, *Salmonella Typhimurium*. The most important causative agents of gastrointestinal diseases in calves are enteropathogenic strains of *E. coli* and *C. perfringens*. Only those strains of *E. coli* that are capable of becoming dominant in the intestinal flora and progressively reproduce in the front parts of the small intestines play a role in the development of the disease. Gastrointestinal diseases caused by clostridia are especially characteristic of calves younger than three weeks, which are more susceptible than adults. Gastrointestinal diseases of viral etiology (*Rotaviruses*) occur when the influence of the virulence of a certain strain of virus suppresses the local intestinal immunity and reduces the intestinal bacterial flora. Viruses are not considered to be the primary cause of disease, even when isolated from the feces of diarrheal calves. The presence of enteropathogenic strains of *E. coli* enhances their pathogenicity, and inadequate animal hygiene conditions and irregular mature management favor the retention of pathogenic microorganisms from feces in facilities (Bojkovski et al., 2022; Ninković et al., 2023). Diseases of calves are most often of multifactorial etiology, and the most significant health problems on farms with high-yielding cows are diseases of the respiratory and digestive organs. Unfavorable hygienic and microclimatic housing conditions and inadequate technological procedures in breeding are of great importance in the emergence of infectious diseases of various etiologies. Intensive breeding of calves requires continuous monitoring of the health status of calves and adequate application of veterinary-prophylactic, hygienic-sanitary and zootechnical measures (Ninković et al., 2023).

CONCLUSION

Regarding the biosecurity level indicators, it should be known that people's awareness to protect production as a whole and constant work on removing threats to biosecurity is the key to success in designing and implementing biosecurity plans for each specific situation and farm. Farm owners have the greatest responsibility in protecting their own herds. Also, farm employees, as well as visitors, must be aware of their role in

maintaining the safe health status of the farm. Biosecurity should be considered as the basis of all preventive and health programs in the control, suppression and eradication of swine and cattle diseases. It should be emphasized that the application of biosecurity measures on pig and cattle farms is the most important measure in preventing the potential introduction and spread of pathogenic microorganisms. Therefore, biosecurity measures must be well defined, practical, functional and comprehensible to farmers, i.e. cattle and pig breeders.

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