disarm

Disseminating Innovative Solutions for Antiobiotic Resistance Management

Best Practice Guides

Internal Biosecurity

PROLOGUE


CATTLE


PIGS


POULTRY


SHEEP

This guide is written as part of the DISARM project 'Disseminating Innovative Solutions for Antibiotic Resistance Management', funded by the European Union's Horizon 2020 research and innovation programme under grant agreement 817591.

The DISARM project aims to reduce antibiotic resistance through a focus on disease prevention and animal health, thereby reducing the need for antibiotic use. DISARM has a wide range of resources available via our website and YouTube channel. We also have a vibrant and knowledgeable community within our Facebook discussion group (we welcome you to join, simply click this link and answer some short questions to gain access), and wider social media channels: Twitter, Facebook, LinkedIn.

DISARM also promotes the multi-actor approach – different people (farmers, veterinarians, nutritionists and other advisors) working together towards improved animal health and farm performance. If you want to find out more about this, check out our toolbox to get started!

This guide was based on the information that was gathered during the DISARM project; it should not be considered as a complete reference book. It gives a useful overview with links to practical videos, abstracts, articles, testimonies etc., to facilitate good practices. Not all recommendations will be applicable or suitable for your farm and any interventions should be discussed with your farm advisor(s).

This guide is one of the 10 Best Practice guides made during the DISARM project. The 10 guides all have the goal to inform you about a specific topic in order to reduce the antimicrobial use in the livestock industry.

The other DISARM Best Practice guides can be found here.

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Coordinated by ILVO Flanders research institute for agriculture, fisheries and food

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INTRODUCTION

What is Internal Biosecurity?

Biosecurity measures help to prevent the entry and spread of infectious diseases on and between farms, thereby reducing disease incidence and the need for veterinary antibiotic treatments. Biosecurity can be divided in two forms: internal and external. External biosecurity aims to prevent the introduction of pathogens onto the farm and you can find more information in this separate best practice guide published by DISARM.

Internal biosecurity consists of all measures taken to prevent the spread of infectious agents within the farm. The internal biosecurity lays down rules regarding disease management. Farm hygiene, appropriate disinfection, standardization of working lines, and other management-specific topics (e.g. stocking density, all-in/all-out principle). If you are interested to have a detailed read on the principles and practice of biosecurity in animal production the book **"Biosecurity in animal production and veterinary medicine"** is highly recommended.

Why is Internal Biosecurity Important?

A better internal biosecurity status will ensure that if/when there is an infection within a farm, actions will be taken to reduce its spread. In plain words, better internal biosecurity will lead to fewer disease cases. Applying the principles of internal biosecurity can contribute to a cleaner and more organized farm, improved production efficiency, as well as a reduction in the need for antibiotics in animal production.

What are the Main Components of Internal Biosecurity?

The main internal biosecurity components are:

1. Disease Management

A systematic disease management strategy is needed to protect the health of farm animals. It is important to:

- Include correct handling and treatment of diseased animals
- Make use of proper diagnostics
- Use isolation and disease registration
- Ensure a high immunity status for all animals (e.g. through vaccination)

Diseased animals should be isolated in a sickbay to prevent other animals being exposed to the pathogen. Any treatment of animals should be performed carefully to avoid mechanical transmission of disease. For example, the storage and disinfection of the injection equipment is important (Figure 1). The needles may get contaminated through use and storage by numerous environmental germs and as such become efficient disease transmitters.

In the case of a disease outbreak, an action plan needs to be put in place as soon as possible – information and guidelines on setting up a biosecurity plan can be found here. Although a general template is provided in Table 1, development of a plan requires input from all stakeholders involved i.e. the farm team and veterinarian. Each plan must be regularly reviewed and updated to meet the specific demands of the farm and should consider various factors, not just internal biosecurity.

A	*Identify the disease(s) that currently cause concern.*
B	*Review your current management practices*
C	*Create a farm diagram and identify critical points*
D	*Identify risk factors / possible sources of infection*
E	*Assess staff knowledge and interest in biosecurity*
F	*Consider legal requirements and how they can be adapted to the situation on your farm*
G	*Select the best biosecurity practices for your farm*
H	*Establish the new necessary biosecurity rules*
I	*Provide staff training where necessary*
J	*Nominate a biosecurity manager to lead biosecurity efforts on the farm*
K	*Organize regular biosecurity meetings with all relevant farm staff*
L	*Set and clearly define "clean" and "dirty" areas within farm*
M	*Implement the biosecurity plan and deal with other issues related to the farm*

▲ *Table 1. Biosecurity action plan template*

2. All-in/all-out principle (applicable mainly for pigs, veal calves and broilers)

The all-in/all-out principle helps to prevent cross-contamination between consecutive production batches and makes it possible to clean and disinfect the barns between different production groups. Strictly applying the all-in/all-out principle is very important to break the infection cycle between subsequent production batches. Slower growing animals should not be held back and added to the next batch of younger animals. Slow growth indicates those animals are likely carriers of one or more infectious diseases, so they represent an increased risk of infection to a younger, more susceptible, age group.

3. Stocking density

A high stocking density induces stress which results in increased sensitivity to infections, and an increased excretion of germs. Besides this, high stocking density is associated with decreased animal welfare. EU legislation on animal health and welfare is addressing these concerns by setting certain limits (pigs: m^2/animal, broiler chicken: kg/m^2) for each animal species (Table 2, see overleaf).

▲ *Figure 1. Injection equipment in a farm*

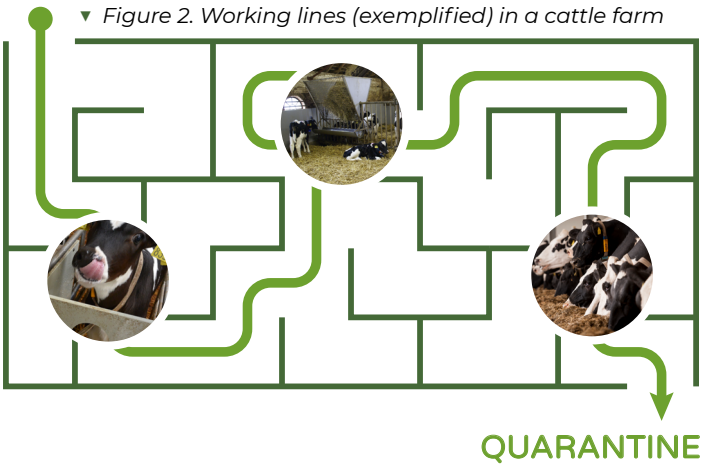
	Maximum stocking density	Notes
Piglets <10kg	0.15 m^2/pig	
Pigs >110kg	1 m^2/pig	
Gilt	1.64 m^2/pig	
Sow	2.25 m^2/pig	
Boar	6 m^2/pig	10 m2/boar if used for natural service
Poultry	33 kg/m^2	39 kg/m2 if equipped with ventilation, cooling and heating systems. Under exceptional conditions, it can go up to 42 kg/m2

▲ *Table 2. Maximum stocking density limits according to the EU legislation (in m^2) per animal (Council directives 2008/120/EC for pigs and 2007/43/EC for broilers)*

4. Compartmentalization and Working Lines

Animals of different age groups may have different levels of sensitivity to certain pathogens. It is crucial to keep age groups separate and to work according to strict working lines starting at the youngest animals, moving towards the oldest animals, and ending with the quarantine stable and sick bay (Figure 2). To avoid dragging germs on footwear, boot washers and disinfection baths can be placed between production units. For risk-bearing groups (e.g. quarantine stables, sickbay), an additional hygiene lock for changing of clothing, footwear and washing of hands is recommended to avoid pathogen spread between different age groups.

▼ *Figure 2. Working lines (exemplified) in a cattle farm*



5. Cleaning and disinfection

To prevent recurring infections between consecutive production rounds, thorough cleaning and disinfection of pens is required.

Seven steps for thorough cleaning and disinfection:

1. Dry cleaning and removal of all organic material
2. Soaking of all surfaces to loosen all remaining organic material
3. High pressure cleaning with water to remove all dirt
4. Drying of the stable to avoid dilution of the disinfectant (to be applied in the next step)
5. Disinfection of the stable to achieve a further reduction in the concentration of germs
6. Rinsing and drying of the stable to ensure that animals do come into contact with remaining disinfectant
7. Testing of the effectiveness of the procedure by sampling the surface

A short video on the fundamentals of cleaning and disinfection is available by DISARM. Dutch insights from applying cleaning and disinfection measures in pig, poultry and dairy farms as part of their routine are presented in an informative video.

The pictures below (courtesy of Ghent University) illustrate these seven steps.

1. Dry cleaning and removal of all organic material

2. Soaking of all surfaces to loosen all remaining organic material

3. High pressure cleaning with water to remove all dirt

4. Drying of stable to avoid dillution of the disinfectant

5. Disinfection of the stable

6. Drying of the stable

7. Testing of efficacy

EXAMPLES FROM PRACTICE

In this section selected links and information will be shared for the main livestock categories. More results from practice and research are available in the State of the Art report regarding biosecurity.

Pigs

A best practice video has been produced by DISARM to inform about internal biosecurity on pig farms. A more detailed video is available from the Flemish department of agriculture.

The experiences of a Belgian farmer focusing on farm biosecurity to reduce antibiotic use are shared in this DISARM video. With regards to internal biosecurity, the farmer stressed mainly the components of "compartmentalization and working lines", and "cleaning and disinfection".

Another Belgian farmer shares the existing biosecurity measures in his farm (e.g. different colour-codes for materials and clothing to be used with different age groups, and clear demarcation of "clean" and "dirty" areas of the unit).

Information on how to best use a hygiene lock in pig farms is presented in another DISARM video.

As is the case with each animal species, the biosecurity measures are tailor-made to address the unique features of rearing pigs (e.g. presence of a finishing unit). A detailed guide on internal biosecurity in pigs is provided by Biocheck.UGent. For instance, when washing the sows it is important that this happens before they enter the farrowing pen to avoid the contamination of these pens though the process of washing.

Poultry

A short video on the fundamentals of cleaning and disinfection in broiler houses is available from DISARM. A detailed video (in French) has been produced by ITAVI to go through the main stages of cleaning and disinfection in poultry buildings.

Insights from a Latvian poultry farm on their way to antibiotic-free poultry farming are shared in this DISARM video. Biosecurity is, according to this company, the main pillar of their antibiotic-free approach.

As is the case with each animal species, the biosecurity measures are tailor-made to address the unique features of rearing poultry (e.g. egg management). A detailed guide on internal biosecurity in poultry is provided by Biocheck.UGent. For instance, it is very important that there is as little contact as possible between the persons employed in the poultry houses and those working in the egg collecting room.

Cattle

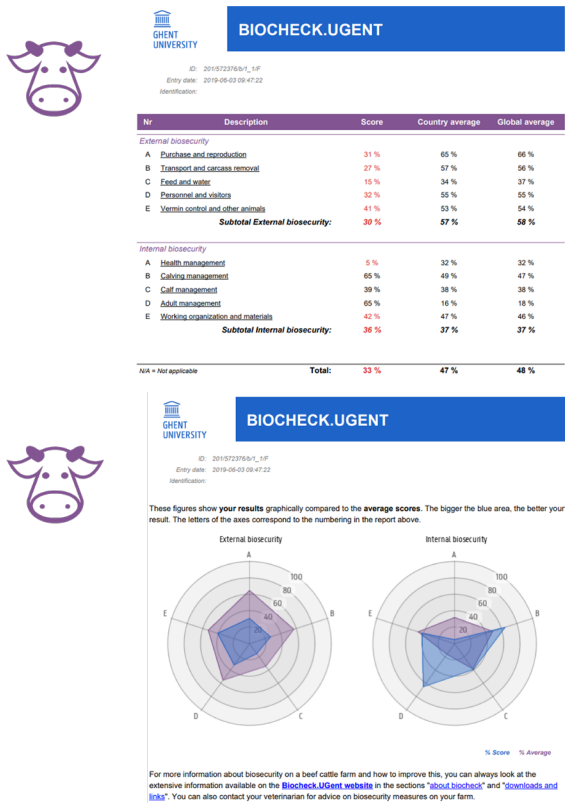
A best practice video has been produced by DISARM to inform of the general biosecurity measures for visitors to dairy farms.

A two-part video here and here on guidelines for reducing antimicrobial resistance from the dairy sector has been produced by the International Dairy Federation (IDF) in which measures related to internal biosecurity play a fundamental role.

As is the case with each animal species, the biosecurity measures are tailor-made to address the unique features of rearing cattle (e.g. dairy management). A detailed guide on internal biosecurity in cattle is provided by Biocheck.UGent. For instance when focusing on dairy management, well-functioning milking equipment is of utmost importance. Yearly maintenance and control of the milking equipment should be performed using a static (without milking cows) and dynamic (while milking cows) test.

How can you Assess the Internal Biosecurity Level of your Farm?

Several tools have been produced to assess biosecurity. One of the best known and most used tools is the Biocheck.UGent tool. It is a scoring system developed by the University of Gent to measure and quantify the level of biosecurity on farms. The score ranges from 0 (worst) to 100 (best). It has been applied on more than 15000 broiler, pig and cattle farms worldwide. This tool is composed of all relevant components of biosecurity and takes the relative importance of the different biosecurity aspects into account, resulting in a risk-based weighted score. A main advantage is that Biocheck.UGent can produce specific output (results) for internal (and/or external) biosecurity and for its main components (Figure 3a, 3b).



▲ *Figure 3. Output of Biocheck.UGent. It first produces the specific results per category as table (3a) and then uses a spider web diagram to graphically present the results (3b).*

More from the DISARM Best Practice Guide Series

- External Biosecurity
- Optimal Housing for Livestock
- Precision Livestock Farming for Early Disease Detection
- Potential of Breeding and Genetics for Robust and Resilient Animals
- Drinking Water Quality
- Youngstock Management and Early Rearing
- Vaccination Protocols
- Improving Animal Health by Using Adapted Feeding, Watering, and Feed Additives
- Good Practices for Prudent Use of Antibiotics

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