

Farm biosecurity

Biosecurity is the total set of measures aimed at preventing the introduction and spread of disease on livestock farms. A distinction is made between external and internal biosecurity. External biosecurity involves the prevention of the introduction of disease into the farm from outside, while internal biosecurity means preventing or minimising the spread of germs between animals within the farm. A complete overview of the biosecurity measures to take on a pig farm, with risk-based scoring system, is shown on <http://www.biocheck.ugent.be>. The following text is a summary of the most important components of external and internal biosecurity on pig farms.

1. External biosecurity

The purchasing policy of animals is particularly important to prevent introduction of disease. This is because direct animal-to-animal contact is the most efficient way to spread infections among animals. Farms that do not purchase animals have the lowest risk of facing new infections. This is called a closed farm (single site) or a closed production system (multi-site). The farm immunity on closed farms or production systems is more stable than on farms that regularly purchase animals.

1.1. Purchase of animals

Although no purchase of animals is the most favourable situation to minimise introduction of disease, still animals are frequently purchased on livestock farms for various reasons (like more rapid genetic progress of the herd). Animals from another farm (with a specific "farm microbiota") by definition have a different past medical history than the animals that were born on the farm or have been there for a long time. If animals are to be purchased, one should always seek to minimise the number of different origins on the farm and to keep this to a minimum over time. When animals are delivered from outside the farm, the farmer must pay attention to the following:

- The health status of the farm of origin (e.g. free of specific pathogens) must be the same as or higher than the health status of the receiving farm.

- Animals arriving on the farm through auctions, exhibits or other collecting points have been in contact with animals from other farms, making their health status unclear. Animals often have stress during such events, making them more susceptible to infections and/or causing them to excrete germs more easily. Such animals are an extra risk for introduction of disease. - Also during transport, animals can still be infected with germs by contact with other animals or by germs left in the transport vehicle after previous transports. Vehicles designated for transporting animals must be cleaned and disinfected after each transport.

- Newly purchased animals must be put in a quarantine station for a certain period of time (**at least 6 weeks**), so that any infections can be detected before the animals come into contact with the other animals on the farm. The quarantine station is located near the farm, being either a separate barn or a unit within the farm. In addition to preventing introduction of disease (isolation stage), the quarantine period also allows the purchased animals to adapt to the farm-specific microbiota (adaptation stage). The latter may be done in various ways, being:

- using vaccinations,
- temporarily housing cull animals in the quarantine station together with the purchased animals
- applying the general farm management and feed of the farm.



1.2 Sale of animals

At the moment animals are sold, care should be taken that material of the transporter is not brought into the barn at any time. This includes the transporter himself. Especially when collecting cull animals (usually a lower number), one must be sure that no animals from other farms are present in the truck. So, collection of sows from several farms should be avoided at all times.

1.3. People visiting the farm

Visitors who are in (professional) contact with animals on other farms are also a major risk for introduction of disease. The following hygienic measures can be taken to prevent this:

- Using clean farm clothing and shoes and a hygiene lock (room where visitors must take hygienic precautions before entering the barn); preferably a (walk-through) shower is used as well;
- Placing disinfecting foot baths in front of the barn entrance; for efficient disinfection, (1) the shoes must be cleaned first and then disinfected, (2) the ambient temperature must always be higher than 15°C, (3) the prescribed concentration of disinfectant must be respected, (4) the shoes must be immersed for a sufficiently long time, (5) the disinfection tub must be changed regularly, (6) the required hand hygiene must be respected: the hands must be washed (best with a disinfectant) before and after entering the barn (preferably in the hygiene lock);
- Limiting the access to the barns to people that are strictly necessary for the animals (animal keeper, veterinarian or consultant). The doors are preferably locked against unauthorised access.
- The visitor's materials, such as for example ultrasound equipment, pig noose, injection materials, boots, ... should belong to the farm as much as possible. If this is not possible, the material must be thoroughly cleaned and disinfected at both arrival and departure.
- a log or register in which all persons visiting the farm are recorded (name, date, time and reason of visit) is recommended.

1.4. Trucks entering the premises

On livestock farms, much transport is done with vehicles or trucks that also frequently visit other farms. Especially vehicles that are in direct contact with the barn (delivery and removal of animals) or the animals (feed delivery, manure removal, delivery of housing materials, etc.) are a risk. Therefore it is recommended to apply the principle of a dirty and clean road. In addition, it is recommended that the transporter does not enter the barns. Loading and unloading sites must be paved and must be cleaned and disinfected after loading/unloading.

To avoid trucks with feed delivering to several farms at the same time, it is recommended to make sure that orders consist of full shipments as much as possible. The wheels of the vehicles entering the premises can be disinfected with citric acid.

1.5. Location of the farm

Several infections (e.g. viral infections, Mycoplasma) can spread between farms through air. The distance between farms plays an important role in this. However, pests and insects can also spread pathogens between farms over short distances. In animal-dense regions, it is therefore more difficult to prevent infection with such pathogens, which means that, in those regions, it is particularly important to pay much attention to biosecurity.

2. Internal biosecurity

Measures limiting the spread of germs within farms largely concern good farm management. The way in which the animals are bred and kept obviously plays a key role in the health of the animals.

2.1. Type of production system and separation of age groups

It is important to mix animals of different ages as little as possible. An "all-in/all-out" production system is recommended. This means that animals of the same age are kept as one group in the same room and that the room is only stocked with new animals when all animals from the previous production round have been removed. This prevents harmful germs from being transmitted from one age group to the next. To prevent infections from being transmitted from less susceptible to more susceptible age groups, walking lines need to be used. These form a set route through the farm starting from the youngest animals and ending with the oldest ones. This route must always be respected. For the same reason, materials (sorting panels, brushes, ...) must be kept separately for each age group. To facilitate this and to prevent mistakes, colour codes may be used, e.g. yellow for the younger animals, and green for the older ones. In addition, it is best to mix the animals as little as possible during transfer to a next unit or barn. This is because this causes stress in animals and reduces the beneficial effects of compartmentalisation and all-in/all-out production. It is recommended not to combine animals from different farms of origin.

2.2. Hygiene measures

For animal health, good hygiene in the barn is very important. It is recommended to use hygienic measures such as cleaning and disinfecting the barns and leaving the barns empty between successive production rounds. These are not only useful for preventing gastrointestinal disorders, but also for preventing other infections. It is also important that the materials used to keep and breed the animals are clean and that they are cleaned and disinfected after each round. Feeding areas, feeding troughs, feeding buckets and drinking troughs must be clean. They must be placed such that spilling is prevented and no faeces can fall into them. So excess faeces or urine in the pens and the environment of the animals must be removed. It is prohibited by law to feed catering waste to pigs.

Cleaning and disinfecting (C&D)

A full C&D procedure consists of several successive steps. It is very important that all these steps are carried out after each round in the right order and in the right way. In addition, sufficient time should be taken for each step and this should be done under the right conditions.

Cleaning: dry cleaning, soaking, wet cleaning & drying up

By cleaning we mean removing visible organic materials (blood, manure, bedding, secretions, etc.). The purpose of good cleaning is to minimise the number of germs before the disinfection. The smaller the number of germs at the start of the disinfection process, the more efficient and complete the disinfection will be. This is because remaining organic materials will quickly inactivate the disinfectants. Before starting the cleaning, the barns need to be completely empty, with all loose and detachable parts being removed from the barn as well. After this, rough dirt can be removed, first dry using a brush and a shovel. Then the surfaces need to be soaked with soaking agent. The use of a soaking agent reduces the cleaning time, reduces the use of water and loosens sticky dirt, such as



biofilms, allowing thorough cleaning during the next step. Make sure that the soaking agent can act on the surfaces for a sufficiently long time. The actual cleaning comes after the soaking and is best done with warm water, soap and a high pressure cleaner. After cleaning, everything needs to be rinsed with water to remove any organic materials splashed about. The last step is letting the barn dry up. It is important that no puddles remain in which the disinfectant can be diluted. The barn should not be bone dry, however!

Disinfection

The purpose of disinfection is to further reduce the number of germs on the barn surfaces. For good disinfection, a number of basic rules should be followed: the disinfectant must be active against the germ(s) to be controlled, must be in contact with them, and all this in the right concentration and for a sufficiently long period of time. The spectrum of action of different disinfectants varies greatly. For example, many disinfectants are not active against bacterial spores (survival forms of certain bacteria in the environment). So it is important to check if the disinfectant is effective against the germ(s) to be controlled, taking into account the specific farm conditions. The right concentration is important as well. Therefore the manufacturer's instructions with regard to dilution rates need to be observed strictly. Remaining puddles after cleaning will dilute the disinfectant so that the right concentration is not obtained, causing insufficient disinfection. Not all products have equally high concentrations and consequently the amount that needs to be used may be different for different products. The disinfectant needs a particular temperature to be able to react. It is therefore important not to switch off the heating completely (particularly in cold winter months)! For example, formalin is known to be active only when the temperature is sufficiently high (at least 20°C). The reduced action of other disinfectants (e.g. quaternary ammonia compounds and caustic soda) is less well known. While these agents are active between 0 and 8°C, they will need a longer action time. So in the winter months, it is sometimes necessary to prolong the prescribed contact time or to heat the barn to be disinfected.

Rinsing

A step that is often forgotten after disinfection is rinsing. This step is essential, however, to remove the residues of the disinfectant that are present before the animals return to the barn. This is because disinfectants may be harmful to the animals. Rinsing may only be done after the disinfectant has been allowed to act on the surfaces for a sufficiently long time. In all steps of cleaning, but especially with rinsing, it is important that the rinsing water used is sufficiently clean so that the environment is not recontaminated by the rinsing water.

Empty barns

After this full C&D process, an empty period is recommended. During this period, the barn dries up completely (so do not forget to watch the temperature, especially in winter), which causes a further reduction of the number of remaining germs in the barns. This is because most germs are hardly or not resistant to drought.

2.3. Optimal stocking density

An optimal stocking density is not only required for animal welfare, but is also important to optimise technical performance and to minimise the spread of infectious agents and the use of medicines. Overstocking, even if temporary, can increase the spread of infections dramatically, and, furthermore, leads to more stress reactions, reduces feed intake and leads to the animals becoming less uniform. The stocking densities, laid down in legislation, are based on old research (1980s), and should therefore not be considered optimal values. More recent research has shown that the optimal surfaces per animal in the various weight classes are on average 24% higher than the legal minimum surfaces!



average animal weight (kg)	Minimum(legally)required surface m2	Optimal surface per animal
< 10 kg	0,15	0,17
10-20 kg	0,2	0,27
20-30 kg	0,3	0,35
30-50 kg	0,4	0,49
50-85 kg	0,55	0,7
85-110 kg	0,65	0,83
> 110 kg	1	

*Free floor surface: the surface an animal needs to be housed comfortably. Objects standing on the ground or rooms that are not permanently accessible need to be deducted from this.

2.4. Pest control

Rodents such as mice and rats can transmit diseases between animals within a farm, as well as between farms, and thus maintain infection cycles. They cause contamination of the feed and the environment and can cause much damage to the housing. A clean environment prevents many problems with pests. In addition, traps and bait can be placed and insect sprays can be used. So adequate rodent control, which may be carried out by a professional company, is very important. Insects can also cause much trouble and are an important vector for transmission of diseases. It is recommended to make barns bird-proof.

2.5. Barring pets from the barn

Pets such as dogs and cats increase the risk of spread of infections within the farm and should therefore not be allowed into either the barns or the rooms where no animals are present, such as for examples the hygiene lock or the passageways. Also avoid contact with wild animals (e.g. wild boars).

2.6. Managing the animals

It is important to clinically inspect the animals daily (twice a day if possible) and to treat or, optionally, separate sick animals when needed. It is recommended to use a "sick bay" for this, being a separate location where the sick or weak animals are housed separately. Once the animals have been in the sick bay, they cannot return to the pens. If the animals are incurably ill, it is better to euthanise them. Inspecting and feeding the animals should be done in a calm manner, and should by no means lead to fright and stress reactions. Preventive veterinary procedures such as vaccinations, supplying iron and castrating should be performed carefully, accurately and hygienically (regular disinfection of materials, replacement of needles/knife, ...). Cutting or clipping the teeth or docking the tails of piglets is only allowed with a veterinarian's certificate.

2.7. Management of deceased animals

Because deceased animals can be a source of infections, they need to be removed as quickly as possible. Carcasses should be kept such that no other animals (livestock, pests, birds, pets) can access them and the location can be cleaned and disinfected properly. To this end, the farmer keeps carcasses in a carcass container until they are collected by the destruction company. For one's own hygiene and safety, gloves should be worn at all times when handling dead pigs. The carcass container and all fittings should be cleaned and disinfected adequately.