The microbiome as part of your biosecurity programme

Over recent decades, the main focus in the livestock sector has been to increase productivity at a reasonable cost. Production costs and optimising efficiency have become the key parameters in modern pig farming. Such progress was possible thanks to the development of technologies that allow more accurate management of the production environment (improvement of building facilities, temperature control, ventilation, etc).

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Parallel to the evolution of technologies for managing the production environment, the predominant approach regarding animal health was the curative approach.

Nowadays, due to antibiotic resistance, this way of managing diseases is definitely recognised as non-sustainable. The World Health Organisation (WHO) has defined antimicrobial resistance (AMR) as 'a catastrophe that must be managed with the utmost urgency'.

There are new EU Veterinary Medicinal Products and Medicated Feed Regulations coming into effect on 28th January 2022. These regulations aim to increase the availability of veterinary medicinal products, reduce administrative burdens and address the public health risk of AMR.

One new regulation aims to reduce antimicrobial usage and includes the following important principles:

- Antibiotics must not be applied routinely.
- Antibiotics must not be used to compensate for poor hygiene, inadequate animal husbandry or poor farm management.
- Antibiotics must not be used for prophylaxis (preventive treatment to a healthy animal) except in very exceptional circumstances.
- Antibiotics must not be used for metaphylaxis, (treatment of a healthy group of animals) except when the risk of spread of an infection or of an infectious disease in the group of animals is high and no other appropriate alternatives are available.

The need for improved biosecurity is really urgent. Prevention at farm level as well as at a regional, national or international level is a must today.

Biosecurity is defined by Stephen R. Collett in the Merck Veterinary Manual, as 'all procedures implemented to reduce the risk and consequence of infection with a disease-causing agent. This broad definition recognises that disease is a complex interaction between the host, the disease-causing agent, and the environment'.

How to set up an effective prevention strategy?

We can distinguish three management axes:

- **The environment:**
work on providing a stress-free environment for the animals.
- **The disease-causing agent:**
work on decreasing the pressure of infection by keeping the disease causing agent away from the animals.
- **The host:**
work on maintaining a defence system by strengthening the animal's capacity to resist challenging conditions.

Biosecurity and pig production environment

This is what is perceived as the traditional measures behind the term 'biosecurity', such as keeping a clean and disinfected environment, setting up quarantine measures, and working in an all-in-all-out system. Although very well known, these measures need to be repeated, validated and regularly improved.

Infection pressure and pig production

The challenge is to keep the bacteria responsible for disease away from the animals. This is easier said than done. There is no such thing as a dual situation where we could distinguish 'good' bacteria from 'bad' bacteria.

Bacteria are everywhere in the production facilities, as well as inside the animals. A microbiome is a community of micro-organisms (such as bacteria, fungi and viruses) that inhabit a particular environment and especially the collection of micro-organisms living in or on the body.

Recent technologies are now allowing us to be more aware of the flora present in the gut, and the role that they play in digestion and disease prevention.

The benefits of having a solid robust microbiome are multiple, as the impact of the microbiome on the host is broad: not only does it digest specific undigested feed ingredients, but it also produces some essential nutrients (such as vitamins).

The micro-organisms also assist in specific detoxification processes. A microbiome in good shape with a good diversity has the power to render the gut environment inaccessible to potential pathogenic organisms.

Host and disease prevention

The host immune system is the defence mechanism developed to detect any danger in the environment.

Every day, the immune system is programmed to 'check' the environment to detect any potential threat. The immune system is present in the lungs to check the incoming air, and it is also present in the gut to check what is ingested.

Daily stress makes the immune system less efficient. Some examples of daily stress in the life of a pig are: being born, being weaned, heat stress, feed changes and pen transfer.

High technical performances often lead to inflammations. The digestive tract is one of the first organs to be affected by performance induced stress.

The microbiome is sometimes presented as an 'organ' composed of the epithelial membrane, together with the mucus layer and the flora living in the intestines.

The latest scientific research has detected that this 'super organ' is essential for digestion, as well as for the immunity of the animals.

It also plays a role in biosecurity as it consists of one of the procedures implemented by the animal in order to reduce infection. ■