Practical Health

Insight (33)

Predicting lung lesion score

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Lung lesion Score (LLS) is an important parameter in the pig industry. Pig lungs are very small in relation to their bodyweight. Consequently, the volume of air (and thus oxygen) a pig inhales for maintaining essential body functions, is immediately impaired when parts of their lungs are affected – resulting in a reduction in average daily gain (ADG).

This is, of course, next to any reduction of the ADG due to the cost of infection. LLS is normally determined when lungs are analysed during the slaughtering process or during post-mortem. There are some drawbacks when using these two options. At post-mortem the sample size is often small and it is not coming from a random selection.

Tracing back the whole batch sent out for slaughtering is not easy in a lot of countries and sometimes even impossible. Therefore, the industry has been researching for some time to find a method that allows LLS to be predicted while the pigs are still on the farm.

Last year a paper appeared in PLOS ONE by Beatriz Garcia-Morante that looked at immune responses, measured when the pigs are still alive, that can be used to forecast Mycoplasma hyopneumoniae (M. hyo) lung lesions seen at slaughter.

This is a very interesting study and although it may not be the first one dealing with this subject, it is a very comprehensive one. The group studied different situations ranging from an experimental and well controlled setting to checking batches of pigs at slaughterhouses and also following pigs over time (a so-called chronological study).

In these different settings they looked for lung lesions, IgG and IgG1 and IgG2 antibodies in serum and for IgG and IgA antibodies in fluids collected by lavage from the bronchia and alveolar (BALF).

Why were these parameters checked and what is the difference between them?

LLS versus antibodies in BALF or serum

An affected lung will get a LLS. The score depends on the method used. There are different lung scoring systems and some of them are used worldwide. The LLS is an actual reflection of the situation at that moment. The process affecting the lung is maybe just starting or is already completely recovered.

In other cases, so much of the lung is affected that it is impossible to judge what happened initially.

Different circumstances affect the final LLS score. An early uncomplicated M. hyo infection cannot be differentiated by visual inspection from an early uncomplicated influenza virus infection.

It is also difficult to correctly score the variety in the affected lungs at the speed a slaughter line operates. This again creates the possibility of ending up with a lower or higher LLS for the batch of pigs investigated by different people.

When the lungs are severely affected, we assume that an initial infection paved the way for secondary infections aggravating the situation. But was this due to M hyo, influenza, PRRS, Aujeszky or mycotoxins?

Also here, the LLS, which is supposed to be a measurement for M. hyo infections, might not reveal the correct score.

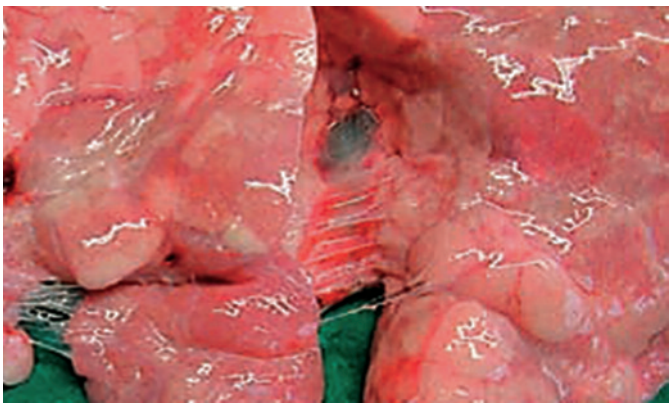
When looking to the M. hyo induced serum antibodies the situation is different but not much better. Serum antibodies are always a sign of the past. Whereas the LLS gives actual information, antibodies give historical information.

This is coupled to the differences between test kits; some give more false positives, others more false negatives. Test kit dependent results make interpretation rather difficult. The BALF IgA and IgG antibodies come up earlier than serum antibodies in the case of an M. hyo infection.

BALF antibodies start to decline between 21 and 28 days after infection, while serum antibodies increase above the calculated OD cut-off value at around 28 days and will persist for a much longer period.

BALF IgG showed the highest correlation with the LLS that focuses on the typical M. hyo location in the lung (see photograph).

In short, a lot of independent variables make it difficult to draw up a fixed relation between M. hyo infection and immune response parameters.



Typical M. hyo-type lesions in a section of the lungs.

What questions need to be answered?

Q. Is an immune response parameter a useful tool to detect M. hyo?
Four different situations should be considered:

- M. hyo can be detected in the lungs by PCR or by culturing but the pathogen does not cause any infection: so there is no LLS and no immunological parameter is activated.
- M. hyo vaccination gives a poor systemic immunological response that is unrelated to protection: so in the case of M. hyo vaccination the systemic immunological parameters are not predictably activated.
- M. hyo infection is present and is the cause of pathological changes in the lungs. In this case an immune response is detectable that is measurable at both local and systemic level.
- When M. hyo vaccination is succeeded by M. hyo infection an anamnestic immune response can be measured. This happens in most cases where vaccination gives partial protection.

Q. When can I detect these immune responses induced by a natural infection?
At location of the infection the humoral immune response to M. hyo can be detected quickly after infection and it disappears fast. This BALF technique is not useful under practical conditions. In serum these immunological parameters come up later and are detectable for a much longer period.

Q. Are M. hyo induced lung lesions always present at slaughter, easy to classify and always related to M. hyo?
No; they are not always present, when uncomplicated they come and go, so at slaughter they may be absent again. No; they are not easy to classify. That is also the reason why more systems were developed and used for classification. You need experience to obtain consistent results. No; they can easily be confused with lung lesions induced by other pathogens.

Q. What does this mean for the proposed protocol to predict LLS based on M. hyo serology?
Well, in this presented protocol use is made of the combination of actual and historical data and that on population (herd) level. This is the strong point when used correctly. It will provide valuable data that will help in analysing the M. hyo situation on the farm.

Both the LLS and serological monitoring using an M. hyo ELISA, give information that confirm and supplement each other.

As with all new protocols, experience is needed to fine-tune the execution. That is also the case here simply because of all the variables like the method and staff for the LLS scoring and the ELISA test kit. But when these variables are under control, the staff trained and the right test kit chosen, a relation between the LLS and the M. hyo ELISA titer can be established. This will reduce the necessity of actual lung lesion scoring at the slaughter line.

Taking serum samples from the same batch of pigs at regular intervals is the method of choice that will provide information with value! ■

Practical Health

Insight (34)

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Innovation Excites

Our society is full of innovation. New developments are introduced constantly. Back-ups of digital files are now stored 'in the Cloud'. Why? Because your office space might experience a catastrophe leading to losing both your computer and the normally nearby located back-up disk! For most of us this is an unlikely event, but it is a risk.

When innovation allows for mitigating risks, it is immediately implemented on a large scale. Risk, in our modern society, is to be minimised. Exciting innovations make that possible.

Innovation does not come by itself. Innovation cannot be planned. You can create environments where innovative thoughts may pop-up. You need multidisciplinary, multicultural teams that meet in stimulating environments, take Silicon Valley as an example. However, this is not easy to organise in pork production.

Pork production is based on production tools that are naturally available. Innovation is directed at reducing cost, reducing labour and maximising production per m^2, per sow or per ton of feed. Going from small farms to larger farms, from manual feeding to automatic feeders, experimenting with ventilation systems and with an increased use of medication. These are all step by step improvements.

Innovative production

Under societal pressure the situation is now changing. Improvements are no longer driven by economy and that is a real difference. Now innovative production methods have to be developed that are used in a highly competitive environment and, secondly, to make sure that the public buys pork meat. The creation of these new production methods needs to be organised.

The organisers, representatives of the general public (politicians) know that the pork producing industry must make changes but also that they need to draw up the legislative conditions to make sure that it is happening. What kind of actions are organised to shape the future with innovation?

On instigation of the European Union Commission initiatives are underway in Europe to develop innovative solutions to bring pork production in line with societal demands. Although sounding vague as a concept the trends are clear. Society continues to advance with clear messages on production and health issues and the industry better prepare themselves. The developments are introduced in a competitive environment and therefore rules of business, in the EU, have to be equal. This is true for the EU legislation but should also be true for the degree of implementation, available production tools, experience and knowledge.

Under the EU initiated Horizon-2020 project there is a dedicated pork program that aims at developing innovative solutions for pork production issues. To have a real impact the solutions should be acceptable for producers across Europe.

Increasing farm efficiency

One of these pork programs is called EUPiG (www.eupig.eu) and 19 partners, from 13 member states with a budget of €2million, have created multicultural and multidisciplinary teams to contribute to the success of this program.

For 2018 the EUPiG group has selected to work on: Health Management, Precision Production, Animal Welfare and Meat Quality. The overall goal is to improve the health of European pig herds by increasing farming efficiency.

Another initiative under the same Horizon2020 umbrella is that multidisciplinary teams from different countries can participate in a contest to win a project under the heading: Rethinking management of health of farmed animals.

Activities include socio-economic and behavioural sciences to analyse practices, information and decision systems of farmers, veterinarians and other professionals involved in managing the health of farmed animals, identifying reasons why farmers accept or reject health management recommendations; identifying incentives for prudent use of antimicrobials and estimating the effectiveness of intervention measures.

Precision production is another topic under the EUPiG project. In pork production a lot is to be gained by optimising output and reducing wastage. The differences in, for example, number of slaughter pigs per sow per year is still enormous between countries. Or using what is now still called wastage as a resource in the famous circular economy of the future. Precision production is only possible when good qualitative and quantitative data is collected and analysed.

Pork with a nice layer of (outside-) fat and intramuscular marbling.

In a farrowing unit major improvements can be made when data leading to a better understanding of the performance is present. This will lead to a better decision when intervention strategies are discussed. Ranging from other genetics, to a different method for introducing new gilts etc, reliable and relevant data is essential for directing improvements and for calculating the cost-benefit ratio.

Welfare and meat quality

The other two topics on the EUPiG list are animal welfare and meat quality. Here also a lot is to be gained with improvements in animal welfare. Animal welfare is also studied by, again, another consortium that gets funding (this time indirectly through the Cost program) under the Horizon2020 EU project, and is called GroupHouseNet.

This project looks at reducing damaging behaviour in group housed animals and specifically, in pigs, to tail docking and tail biting. Although tail docking has been forbidden for a long time in the EU, this non-docking practice has successfully been implemented in a few EU countries only.

Innovative solutions for the larger highly industrialised farms are required to make it possible for them to adhere to this EU directive.

Meat quality is a topic which one can argue if it is necessary to study. But, for sure, yes it is! Pork is the most widely consumed meat in the world, today. Soon poultry will take over as the number one meat in the world. The choice made many years ago to go for lean pork meat and therewith reduce the marbling content, has to be reconsidered.

Flavour in meat is a matter of intramuscular fat (or marbling). Meat with taste (read marbling or fat) requires less grease or oil for cooking. Human health is affected by many serious matters. Tasty fat containing meat, cooked in a lean manner will be a minor issue in this discussion. Market share was lost to poultry for several reasons but trying to compete with lean and less tasty meat sold at a higher price, is a battle you will never win.

So yes, meat quality and educating the public on cooking techniques is a great subject to study with a lot of potential. Efficiency in pork production is just as essential as the correct positioning of the final product.

Nowadays, 'America First' is often featured in the media and here they also take the lead. Take this quote from the official USDA website on a new grading system for pork carcases: 'Modern pork production is characterised by products with improved colour and higher marbling content, two factors that have been consistently identified by researchers as the main components affecting pork eating quality'.

The proposed adaptation of the grading system is also driven by the USA export markets. Their Asian customers have a great sense of what high quality pork means in terms of taste and flavour. This grading system leads to a higher price for carcases when they possess the desired marbling content. Targeting the much higher priced, high quality beef.

Innovation excites! ■

Practical Health

Insight (35)

Pork Safety

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Food safety is an extremely important matter – not only for government officials that are supposed to safeguard customers on daily food matters, but also for everyone making money in the food industry. Only, as always, some like to make money quickly and they typically do not care much about the health of consumers. Others might have no idea that their actions can have such far reaching consequences, so alertness is required.

Factors affecting pork safety can be split into two main categories: 1) chemical and 2) microbiological.

Chemical

Under the heading 'chemical' many different groups can be classified ranging from residues of pharmaceutical products, compounds produced by fungi like mycotoxins, to compounds that have a completely different origin, including waste chemicals and the so called 'industrial pollutants'.

Pigs are omnivorous animals which means that they eat almost everything. The industry makes use of this by adding many different left-overs or industrial waste products to pig feed. Citrus pulp is just one example but there are many industrial left-overs that would normally be disposed of at a cost and now end up at no cost and sometimes even with a profit in pig feed.

For the advocates of using all available (and otherwise waste-) resources for producing added value products, this is great. But it also entails a risk. In waste management a lot of money is at stake.

The documented correct disposal of (waste) chemicals is often expensive. Companies engage third parties to take care of their chemical waste and pay the bill for the disposal.

The party involved in the disposal might go for the financially lucrative way and add the chemical waste to citrus pulp, for example, that finally ends up in pig feed at almost no cost for the mafia-like party. Is this a theoretical example? No, a real example that occurred recently.

The chemical waste compound was detected, the source was found and great damage to the pork industry was the result.

Does this only happen in the pork industry? No everywhere where people think they can make quick money, even if it is a risk for others, this will happen. Governments are cutting down on costs so the number of inspectors on the road is declining every year, reducing the chance that these companies are caught.

Scientific articles describe how man-made toxicants, such as insecticides, industrial pollutants, and even pharmaceuticals, can have an impact on the health of farmed animals and how these chemical compounds, through animal products, may even enter the human food chain. Is there anything the industry can do? Yes! Buying from reliable sources operating under certified quality standards is definitely helping although it may not be a 100% guarantee.

Hit and run checks on feed mills, farms and meat processors by competent authorities will always be required for maintaining customer confidence.

Microbiological

Under 'microbiological' different groups can be identified. In this section the focus will be on zoonotic microbes and microbes conferring antimicrobial resistance.

The zoonotic microbes are gaining more and more attention and for several reasons. Of course more knowledge is acquired, tests are becoming more specific and sensitive, and husbandry practices are changing. The moment domestic pigs are exposed to a more natural environment, the zoonotic microbes present in this natural environment, but not present in a confined pig unit, will have a chance to infect domestic pigs again.

Good kitchen hygiene and proper cooking will take care of eliminating most of the zoonotic pathogens.

Marketing pork with confidence.

Still, some of them are making more and more victims every year and need attention. Salmonella spp are already notorious in the poultry industry and to a lesser extent in the pork industry and it is hoped that this will remain so. Trichinella suis will be more important when outdoor production is practiced or when more wild boar meat becomes available.

Recently, in peer reviewed journals the role of wild boar in zoonotic disease transmission got renewed attention. There are more wild boars in more places of the world and the number of hunters, butchers and general public that are processing and consuming wild boar products is increasing. Brucella suis gets a lot of attention in these articles with the incidence in sampled wild boar going up in a number of countries, but still with a low percentage of fatal infections in man. Streptococcus suis is another but incidental matter of concern.

Special attention in these papers is given to the role of wild boar in the epidemiology of Nipah and Japanese Encephalitis virus. These viruses are seen as the most concerning human emerging diseases in which wild boar is involved.

Hygienic precautions like wearing gloves when processing wild boar is a must!

Influenza has been given less attention in recent years compared to before. Here the theoretical danger of swine becoming the mixing vessels of different flu viruses that then become new strains catastrophic for humans has proved to be of little practical danger. However, this may change! Potentially the risk is still there, but so far it is a hypothetical scenario.

There are even well documented cases that pigs were infected by humans. Flu virus has the capability to cross species including humans infecting pigs! Hepatitis E virus is another worrying example. More and more humans are sero-positive, meaning that they have been in contact with the Hepatitis E virus and that has, in many cases, a pork origin. When the Hepatitis E virus becomes more virulent for humans, it will become a real issue for safe pork.

Microbes conferring antimicrobial resistance

This is a relatively new aspect that gets a lot of attention. It is also a very different discussion. Due to production conditions and the use of antimicrobials in pork production pigs can harbour bacteria that contain genes that make these bacteria resistant to antibiotic compounds. These resistant genes carrying bacteria can be transferred to humans through a large variety of routes – by simply being in the neighbourhood of pigs, through handling of pigs, being involved in slaughtering processes, or by processing meat products through inadequate kitchen hygiene or cooking procedures.

But indirect routes are also described, meaning that these bacteria can also reach humans by air, dust, manure or by polluted water etc. There are also documented cases that involve the pig farmer and his family who have these pig-origin bacteria carrying the resistant genes.

But it also becomes more and more evident that it very seldom happens that the resistant bacteria will leave the small farm community as described and assumed above. Although potentially a serious matter, the real danger is still a hypothetical scenario.

Articles have appeared that tried to investigate this scenario and so far they have been able to prove the short distance transfer of resistance on farm level but not the long distance transfer. The authors often come to the conclusion that more research is needed. Which basically means: 'we have looked for it but could not find it'.

Does this mean that the animal protein producing industry can just go ahead and use antimicrobials as before? No, prudent use of antimicrobials is in the direct interest of the meat producing industry itself.

Prudent use will reduce the incidence of resistance and therewith the (short-distance) spread to the benefit of all. ■

Practical Health

Insight (36)

Parallel Worlds

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Antimicrobial resistance development is a scary topic. There is a lot at stake when nothing happens to turn the tide. There is also a lot at stake when certain advice is followed. The two fields in which the discussion concentrates are human health care and the animal health sector. Other sectors using antimicrobials are not covered in this column.

The two sectors are often addressed in a similar manner when antimicrobial resistance is discussed and this approach finds its justification by the widely adopted concept of antimicrobials as 'societal' drugs.

Whatever happens in one sector has a direct impact in the other sector. But is this concept based on a correct assumption and can these two sectors really be compared?

For the question on inducing antimicrobial resistance, the answer is of course a firm: YES.

But it can also be argued that the answer is a firm: NO! These two sectors have too many differences to make a comparison.

It is widely accepted that antimicrobial resistance develops under natural circumstances even without any interference. The human and animal health sector induce a clear pressure on resistance development and act indiscriminately from each other.

Although there is evidence of an exchange of resistance genes there is, in fact, very little spill over. More and more well documented cases are reported that either show a difference in resistance genes for the same bacteria when isolated from either a human or an animal or report on a low percentage of actual cross-contamination.

Eye-opening study

The recently held symposium by the Wageningen University on resistance genes (ESBLs) was an eye-opener.

The study lasted four years and when looking to the genetic code of these resistance genes they discovered two different worlds: ESBL resistance genes that have a genetic code that is only found in samples with a human origin; and resistance genes that have a genetic code that is of animal origin only. The spill over is limited and mainly in the field of products of poultry origin.

So yes, resistant bacteria travelling from animals to humans does happen. In the ESBL case they count for 10-15% of all cases. Over 85% of all cases were human to human transfer without any (genetic code) evidence of animal involvement.

Other documented cases of cross species transfer are always confined to short distances. Looking at the total picture these cases are worrying and need attention but are still seldom when compared to the larger picture. If so, then what is the larger picture and what can we do about that?

The larger picture: focus on animal health

For the larger picture, animals raised under commercial conditions are considered (industrial farming). In this type of farming animals are kept in large groups and these groups are controlled by a few persons only, who are also in charge of giving treatments. The drawback is that resistance genes can spread easily.

Positive points include the fact that the related veterinarians, owners and herdsmen can be identified, trained and controlled. So when control on antibiotic use is demanded, the regulating authorities know who to target. Checks are also easily implemented because it is impossible to hide these large farms. It is a matter of rules, regulations and control.

Countries where large reductions in the use of antimicrobials in the animal health field have been achieved do have these systems in place. Examples are present and nicely documented.

Prudent use of antimicrobial products in animal health is of the utmost and direct interest of the animal protein producing industry itself. Resistance incidence can be reduced by prudent use! From now on new antibiotic products will only very seldom come to the market. Pigs perform better when diseases are prevented. When treatment is needed economic damage is already happening.

In animal protein production the message is: design production systems that prevent disease expression! Any indirect help to the human antimicrobial resistance problem will be appreciated by our human health colleagues but they are better advised to concentrate on their own problems.

What are the differences when resistance development in the human population is studied?

The incidence of treatment failure due to the presence of resistant bacteria is growing rapidly. The predictions of human deaths due to antimicrobial resistance for 2050 are alarming.

The spread of resistant bacteria is worldwide. Tourism and migrations for economic or war related reasons do move people around the world and they may carry resistance genes. Secondly, increased urbanisation means that millions of humans are living together in enormous agglomerations.

Thirdly, (human) treatment is on an individual level and is, in most cases, not controlled. Patients might not have the right knowledge on how important it is to finish antimicrobial treatments etc.

It is also important to realise that in many parts of the world antibiotics are 'over the counter' non-prescription drugs or the prescription is made on the spot by the pharmacist.

So, if the human sector wants to start to control the current situation then they should have information from, and contact with, multi-billions of small outlets.

Furthermore, it is questionable if the human pharmaceutical industry has an interest in regulating this 'free trade' market.

Next to that there are also many cheap generic products producers that serve another complicating purpose. Without their cheap products many lower income persons would have no access at all to affordable health care!

Antimicrobial resistance is a worrying matter. There is no doubt and no discussion about that and this is applicable for the use of antimicrobials in both human and animal health.

It is also becoming more and more clear that these worlds run, in fact, in parallel, are very different in nature and that in both worlds antimicrobial resistance development takes place.

It is time to consider these sectors as two parallel worlds and that both will need to find solutions to prepare themselves for the future of their own sectors.

Also, here there are many things in common but control is much easier to implement in animal health. For example,when arranging clean drinking water for 100,000 pigs we might need to contact only one address. When arranging this for the same number in a human population, we might need to contact 10,000-20,000 families!

Executing control on the correct use of antimicrobials is facing a challenge of the same magnitude.

One of the small pharmacies selling all kind of drugs, including antibiotics. I visited this place for many years to get my supply of medicines required for a global traveller. The only question asked in all these years is how many tablets I needed!

Summary

When looking at the larger picture the animal health sector is much better off than the human health sector.

In the animal health sector the target can be identified and efforts can be focused.

Starting from scratch with setting-up the identification system of all involved, controlling the logistic chain from animal health products manufacturers and importers to actual on farm use and setting up the targets, a country like the Netherlands needed roughly 20 years.

Therefore, if countries that have no control in place start now, they can still be ready before 2050 arrives! ■

Practical Health

Insight (37)

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The Power of Air filtration

It is not so long ago that the discussion on airborne transmission of PRRS virus divided the pork community into two camps. One camp could not prove that airborne transmission occurred – no matter how often they tried and no matter how ingenious their experimental setting was. They were thus convinced that airborne transmission was not happening. The other camp was convinced that PRRS virus was transmitted by air but did not do anything to prove it.

Then, at the beginning of this century, a visit was organised to bring some PRRS experts from the USA to Bretagne in France to visit a PRRS free farm that was located in the middle of a pig dense area with many farms being PRRS positive.

This PRRS free farm had excellent biosecurity systems in place but that did not prevent regular PRRS (re-) infections until the moment the farmer decided to install an air filtration system.

Impressed by the story of the farmer and impressed by the farm performance, cleanliness (no dust) etc, the USA PRRS experts decided to set up an experimental setting that included a unit where the incoming air was filtered. The unit without air filtration broke several times with PRRS, while the unit with the air filtration system installed remained free of a PRRS virus infection.

All other factors, like biosecurity protocols, were identical for both units. The rest is history. This study was published and presented on all the major congresses. Both camps were finally united!

What did we learn?

When using air filtration, one can decide to go for positive pressure systems, meaning that the air pressure in the houses where the pigs are kept is higher than the pressure outside. This leads to air being pressed out of the pig-houses through all available smaller or larger openings and therewith preventing air to come in, except for the filtered air that is actively pushed in.

The other choice is installing a negative pressure system. Here it should be realised that outside air with the higher pressure is sucked in through all available smaller and bigger openings, bypassing the filters. In other words airborne pathogens can enter easily.

Sometimes positive pressure air filtration is wanted but the construction of the barns cannot cope with this higher pressure and in such cases negative pressure is the only option.

That this (negative air pressure-) situation is far from optimal is clear and for the rest of this column only positive air pressure systems are considered. These (positive air pressure-) systems are fantastic, are used all over the world and the number of farms with these systems is growing rapidly.

Why? Well diseases like those caused by PRRS virus are very costly. Numerous scientific articles coming from both the USA and Europe, have revealed the cost related to PRRS virus infections. And although there is a variation in the results, invariably a huge amount of money is involved. Nowadays air filtration is not only installed for AI or sow units but also in fattening units (see picture).

The principle of air filtration

To keep it easy: outside air is only allowed to enter the houses when passing through a set of filters. The first line of filters are stopping larger particles only and the following lines of filters go to effectively stopping very small particles (99.9% of the particles >0.3 micron in size). However PRRS virus is <0.3 micron, the size of PRRSv is in the range of 0.05-0.065 micron. So how does this work?

Well, the virus is carried on aerosols. Aerosols are in the range of 0.4-0.7 micron. These aerosols are trapped by the filters, therewith indirectly trapping the virus. The same counts for swine influenza virus and PCV2 , Mycoplasma with a size of 0.3-0.9 micron should also be trapped directly.

Next to this basic description, the efficacy of air filtration is based on three principles:

- >0.4 micron particles are blocked by a process called impaction, they are simply too large to pass.
- Interception takes place when smaller particles stick to the fibres when they come in close distance to the fibres by a process called the 'van der Waals forces'.
- The last principle is called diffusion, which is due to turbulence in the air filtration system which increases the chance that a particle is stopped by either impaction or interception.

Use in the field

Is there a fixed template that can be used for every farm? No. In all cases the specific situation needs to be analysed in detail in order to come up with the most cost effective solution. Here experience gathered over many implemented systems is important. Local conditions like the PRRS situation in the region, how close the neighbour's pig farm is etc, and weather conditions in summer and winter are important to take into account. Application in existing buildings is possible but adaptations will be required which will increase the costs.

When new facilities are considered air filtration should always be discussed in the planning phase. If only to get a clear picture on the additional cost. Air filtration will never replace biosecurity protocols but when air filtration is chosen it will be a major addition to biosecurity protocols. Currently, in many biosecurity protocols air does not get any attention which is definitely a mistake.

The risk of air causing a biosecurity break has to be included in any design phase of a new facility. Prevailing winds are always a risk factor. Research has shown that PRRSv infections are more common in certain periods of the year and location, temperature, humidity and wind are the important factors.

PRRSv breaks or infections are generally costly. When the cost of a PRRS outbreak is put against the cost of installing and running air filtration, the conclusion can only be that a well-functioning air filtration system is nowadays a cost effective addition to biosecurity protocols aiming at preventing PRRSv infections. As in any other biological situation a 100% guarantee will never be given but air filtration has definitely become part of PRRSv risk management on a pig farm.

Is this all we can expect?

No, air filtration has many applications that can also be used on pig farms. Manure handling is such an example. When a manure transportation tank is filled with liquid manure coming from the pig house, air is released from that transportation tank.

What is the origin of substances present in this escaping air? Yes; they originate from the previous load of pig manure. A potential source of pathogen introduction.

To release this air through a box with a filter is not only a case of 'good thinking' but also very advisable when contractors are using the same tanks on different pig farms. Last but not least, in general the climate on pig farms with air filtration is much better than it is in pig houses without. Dust has to be at minimal levels when air filtration is used and dust normally carries lipopolysaccharides (LPS).

These LPS (endotoxins) have a proven detrimental effect on the (respiratory-) health of both pigs and workers in the pig houses. When the working condition in the houses is better, workers are inclined to spend more time with pigs. More time with pigs results in better pig health by better pig health management! ■

Interior of a finishing unit using air filtration.
(photo: Gilles van der Lans, TripleAir Animal Virus Air Filtration, Emmen, Netherlands).

Practical Health

Insight (38)

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The EU and Long Curly Tails

It is 10 years since EU countries adopted the EU Council Directive regulating the minimum standards for protection of pigs housed in groups for pork production. Directives are documents that regulate an EU problem and the Member States have a legal obligation to implement Directives. In the 2008 Directive, pork production support practices, such as tail-docking, tooth-clipping and tooth-grinding, were regulated. These practices are seen as immediate pain-causing actions.

Castration will cause pain which is worse when tissues are torn. These actions are considered to have a negative impact on the welfare of pigs. Little progress has been seen in the prevention of tail docking in the majority of Member States. Tail-biting incidents also occur when tails are docked, therefore docking, as such, does not solve the tail-biting problem. Tail-biting may be seen in different scenarios starting from a constant low-grade problem in a production unit, to explosive outbreaks in batches. As such, the incidence is highly variable depending on the management of the production site.

In consequence, a Commission Staff Working Document (SWD) (2016) 49 was issued. This SWD accompanies the Commission Recommendation (C(2016)1345 (a recommendation is not binding and without legal consequences) on the application of Council Directive 2008/120/EC describing best practices and describing minimum standards for the protection of pigs to reduce the need for tail-docking.

An action plan was adopted that included audits to take place in different EU countries to investigate and report the level of compliance with the 2008 Directive in the member states.

The final statement in the 2016 Recommendation reads: "However, the single most important animal-based welfare indicator for weaned, growing and finishing pigs is an intact curly tail." In other words, welfare is the goal, with the intact curly tail as the most important sign that pig welfare has improved. In December 2019 the Council will discuss all reports, audits etc.

What has happened? In 2018 an average of over 90% of all pig tails in the majority of Member States are still docked. From this figure it is obvious that whatever was tried did not lead to a wide adoption of the Directive, issued 10 years before.

However there is a small number of countries (Sweden, Finland, Norway and Switzerland) in which the ban on docking was successfully implemented.

The non-complying EU member states are of the opinion that these countries are not representative for the production methods used in their own country and therefore find information from these countries not relevant on how to implement the directive or the recommendation.

Is this a correct opinion? As always the answer is both a Yes and a No.

Why a No? Well, all countries that changed from docked tails to long curly tails did see a large variety of problems emerging on the farms that had to change. It was definitely not an easy path to follow.

Finland for example implemented the 2008 Directive almost overnight. So the industry had an enormous task to quickly develop methods to raise pigs with intact tails.

Immediately after the implementation it became obvious that there is no uniform rule, or so-called golden bullet, to manage the change from docked to intact tails. Welfare is the individual translation of many different (production-) factors. Biting the tail is linked to a lack of welfare. So the underlying mechanism for the origin of tail biting is multifactorial (this also has to include individual variation).

As a consequence, every country, region, farm, or even every unit on a farm, has to find out which welfare enhancing parameters must be increased to make keeping curly tails economically feasible. In Finland three other important things took place:

- The government provided funds to an expert group for visiting individual farms as an aid to help pork producers in the process of finding ways to deal with long curly tails.
- The Finnish market was closed for pork carcases with docked tails.
- The Finnish slaughterhouses, as part of the pork industry, played an active role in supporting the implementation of the Directive.

These three important Finnish steps are also the main reason for the second possible answer: Yes! The systems between different countries cannot be compared. In other EU countries the new situation was very much seen as a (pork-) industry problem with little governmental or industry support.

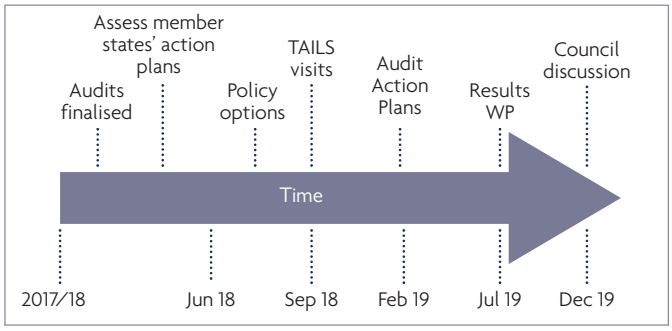
The farming community is getting tired of all the rules and regulations that are imposed on them and have to be implemented at their own risk and cost.

The escape route in the Directive – that it was at the judgement of the veterinarian whether tail docking was necessary on farms – was widely used throughout Europe.

The large percentage of docked tails however makes it questionable how seriously suggestions to increase welfare and therewith reduce the need for tail docking were tested. But without any support from (competent) National Authorities the escape route was a welcome alternative.

The implementation of the Directive was the subject of several meetings organised by different stakeholders and Commission since 2013, including the main organisations involved in pig farming, scientists and experts from the sector. Representatives from civil society including veterinary and animal welfare organisations have contributed to the work. However the ultimate goal still seems to be far away.

The roadmap to the EU Council meeting in December 2019.



Why do pigs bite other's tails? Pigs have a natural tendency to perform exploratory and foraging behaviour for many reasons: searching for food, looking for bedding materials, finding a place to lie down or simple curiosity about their living area. Exploratory and foraging behaviour is natural pig behaviour, starting immediately after birth. Pigs need to perform it even if they are provided with enough feed to satisfy their dietary needs. When these needs are not met, a range of adverse consequences results.

One of these consequences is tail-biting. It is a response to boredom, insufficient stimulation and frustration in association with other negative environmental and management factors that can increase pigs' stress levels. This peculiar behaviour can also take the form of ear, flank or even vulval or penis biting.

Tail-biting is the most widespread problem. Tail-biting has a multi-factorial origin but there is evidence that some causal factors have more weight.

The accumulation of risk factors can lead to tail-biting and the risk factor, which acts as the trigger, is not necessarily the one which presents the greatest individual risk.

Suggestions mentioned by several parties to increase welfare include:

- Improving the quality of the flooring surfaces.
- Increasing the living space available for sows and gilts.
- Introducing higher level of training and competence on welfare issues for personnel.
- Setting requirements for light and maximum noise levels.
- Providing permanent access to fresh water and to materials for rooting and playing.
- Setting a minimum weaning age of four weeks.

These suggestions formed the basis and were tailored to fit the production system of that farmer and with success. Restricting import of pork carcases to those with intact tails only is a very interesting non-tariff trade barrier – especially in an era when tariff-based import/export agreements are changing rapidly! ■

Practical Health

Insight (39)

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ESPHM 2018 HIGHLIGHTS

Pork production in Europe is facing many challenges. No wonder the European Symposium of Porcine Health Management attracted a large number of delegates from all over Europe and a growing interest from delegates from the rest of the world wanting to keep pace with European developments. Why? Well Europe might still be leading in certain aspects, but developments in other countries are going so fast they will soon be catching up and will face similar problems with (and attitudes from) consumers, production regulating authorities and the general public.

African swine fever hangs as a big dark cloud above pork producers across Europe. The topic was not only dealt with during the keynote sessions but also during the breaks and at social gatherings between the delegates. Not only were lessons learned on the impact of the so called 'human' factor exchanged, but also on the observation that hunting practices sometimes actually lead to further spreading of ASF virus instead of stopping it.

Rethinking old opinions

The experts agreed that they have learned a lot during this dramatic episode and that they have had to change their opinion on certain subjects simply because the reality told them so!

We can use hunting as an example:

- A dead wild boar is found and is ASF virus positive.
- The regulators reaction: start immediately to hunt and kill as many wild boar in that area as possible.
- Wild boar reaction: leave the area and find a more quiet place 20, 30 or even 50km away.
- Result: potential spread of ASF. Of course the wild boar is blamed but the real cause is the applied hunting strategy.
- New insights: when a wild boar is found dead and is ASF virus positive, leave the area in peace. Do not hunt. Hope that the (infected-) wild boar stays in the area and will die. Draw a circle of 20, 30 or even 50km around the spot where the ASF infected wild boar was found, work in the direction away from the infection zone and reduce the number of wild boar in that area.

The possibility for contact infection diminishes when a low number of wild boar is present in a large area. No discussion on that point, everybody agrees.

Simply because measurements that were judged as effective in the past but did not give the desired results (see the example above), does not mean that new, very draconic measurements should be proposed.

Like a fence to separate countries. Although this seems a solid solution, we tend to forget that we had many fences in the past that did not stop either humans or animals from crossing borders. And between Poland and Belorussia there are many fences.

Other important human related factors are that there are always people who think they will benefit if the farm of somebody else is infected with a disease like ASF virus.

They have no idea of the consequences of their actions and are only interested in their short term personal gain. It must be made clear to the general public in infected and in neighbouring areas that intentional spreading of list A diseases is a criminal offence!

However the way these viruses (read diseases) travel short and long distances and infect often totally unrelated other premises is still, for many of us living in these affected areas, an essential part of the story. Here the human factor stands a solid number one on the possible causative factor list.

Biosecurity, organised and infringed by humans is, in all its aspects, a matter of education and discipline. Small farmers often have a limited educational background. Labourers on larger farms tend to come and go with, as a result, little investment by their employers in education. Management is more and more an office job. All valid reasons for a low level of biosecurity with all related possible consequences, of which ASF is only one of them!

Klaus Depner (Germany) shared his long standing experience with ASF with the delegates of the ESPHM 2018 and focused on this human factor. Fernando Rodriguez (Spain) explained that a lot of work is currently being done to develop an ASF vaccine but that it will still take some years to come.

Biosecurity

Another hot topic was biosecurity, addressed by Dominiek Maes (Belgium) and Marta Hernández-Jover (Australia) during this ESPHM 2018.

Biosecurity is an undisputed and essential tool in modern pork production but also has many faces. No one biosecurity protocol is suitable for all farms so no one protocol is the same.

The main target of the on-farm biosecurity system can also be different. Airborne transmitted pathogens require a different protocol and related technologies than, for example, when pathogens introduced by humans are the main target. Management decides on the balance between investing in biosecurity and the risk (or cost) of infections and knows that whatever they are willing to do, breaks are still occurring.

But, just to come back to ASF, biosecurity is the only way to prevent ASF virus infections in the domestic pig population. Biosecurity is an extremely powerful tool but education and discipline, both initiated, enforced and controlled by management, are essential.

Western Europe only stands a chance of keeping ASF out of the domestic pig population when biosecurity protocols are focusing on keeping possible ASF virus infected animals away from the domestic pig population.

In such cases all possible options and details are important. For example there is currently a lot of trade in wild boar meat due to increased hunting activity.

This wild boar meat can come from ASF virus infected countries! Dominiek Maes addressed the organisational parts of biosecurity and introduced scoring systems to see where the farm in question ranked.

Marta Hernandéz informed the audience on soft, or social, factors related to the industry and prevailing attitudes beside the role of institutions. She made it clear that there is often a complicated relation between the farmers and the bodies that regulate their industry on a national level. When an uniform and disciplined activity is required, such a complicated relation will not help.

Other main topics were related to the cost of diseases (Font, Spain), economic efficiency of animal health interventions (Holtkamp, USA) and on how to manage large litters (Emma Baxter,UK and Enric Marco, Spain).

Quim Segales and his team, supported by GrupoPacifico, did a fantastic job and they composed, together with the scientific committee headed by Professor Heiko Nathues, an excellent program.

Plenary sessions followed up by two parallel sessions ensured that the informal exchange of information with other delegates was easy. And isn't that the prime importance of these meetings? Be there, where your colleagues are, and keep yourself informed – both by the experts on stage and at the coffee table during the breaks! ■

Quim Segales, President of the ESPHM 2018, addressing the delegates during the opening session.

Practical Health

Insight (40)

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The Art of Management

The duties of (pig-) farm managers increase continuously and get more and more complicated. Pork production is subject to the good execution of a large number of individual processes that all have a great degree of detail with a direct influence on the final financial outcome. The objectives of management are very much focused on bottom-line control, but must also ensure that the operation stays in line with new societal and technological developments. Old diseases like PRRS, but also emerging diseases like African swine fever, pose threats to the farm.

In addition to all of this, increasing pressure on production methods and animal welfare absorb the manager's attention and his 'span of control' is reaching its limits.

One of the key elements in bottom-line management is optimal use of resources. This is buying what you need at a normal price, storing and handling the goods correctly, using them in such a way that you create the maximum return on your investment and re-using whatever can be recycled with an absolute minimal amount of waste left.

When visiting farms you often see things that are far removed from the general statement made above. Sometimes it is clearly visible that waste is generated; sometimes it is more difficult to understand that optimal use of resources is not happening on the farm. When a manager notices that unnecessary waste is being created it is his duty to bring to the attention of his staff that this is not acceptable.

It even goes further than that. Waste creation is often an attitude matter and when staff are allowed to develop such attitudes, such as unnecessary waste generation, then negligence will also creep in to other areas.

When we visit a farm that is well kept, with no rubbish lying around etc, then we immediately realise that waste generation is limited or under control. But the reality is that we often visit farms where the general behaviour is not at all geared to having clean premises and when we see this and look for other symptoms of a less than desirable attitude they are easy to find.

It is this attitude that managers must change. Simple examples include: not always using animal health products with the shortest shelf life; keeping the door of a refrigerator open for a long time so that the products in the fridge are exposed to a higher than prescribed temperature for a much longer period than necessary; or leaving used needles and syringes hanging around. Adopting the right attitude will reduce waste creation, ensure cleaner premises, have an impact on how staff approach their work and will automatically lead to a better use of resources.

Quality control circles

Japan has always been renowned for its quality control circles. This is basically an organised platform where workers can vent what they see happening in their immediate working environment. Furthermore, they are encouraged to speak out on matters which they think important for the next management layer to know. In many cases this will lead to an improvement in output or in the working conditions.

These quality control circles tackle different topics during the year so that the information coming from the floor has a focus. Next to the main agenda point there is, of course, always the option for 'any other business' to address other issues.

When the matter raised is considered important enough, a plan is made to implement the changes. This could be related to reducing waste creation, to improving better use of resources or on working conditions, and having checkpoints installed to record improvements.

With managers spending less time on the working-floor, this structured way of creating a constant flow of work related information coming from the floor is essential to keep the business running smoothly.

When handled correctly by the managers it is also very rewarding for the workers as they see that their observations are valued, paid attention to and taken seriously by the management.

People management includes optimal use of your staff, but this is not just related to what they have to do. It also relates to obtaining information on what they notice as problems in correctly executing their work and it relates to tapping into their ideas on how to solve these operational issues.

Very often people on the floor have good ideas on how to solve the issues that they are confronted with. The reality is that often there are managers in between, with less experience at floor level, that take the decision without much consultation of their staff.

The art of management is to get the most out of the materials you are working with. In large operations it is not possible for managers to take care of all the important details that are taking place on their farm. The size of the operation is simply too large and work is done on a 24/7 basis. So the solution is thought to be in installing more and more sensors that feed computers that will give the manager access to constantly updated 'Big Data'.

With 'Big Data' there are always a couple of issues. Firstly, we have to make absolutely sure that the data generated is representative of the given situation. Secondly, the sensors feeding the IT system have to be geared well for their task, be reliable and constantly checked to make sure that they are working correctly.

Last, but not least, understandable presentation of the data generated is crucial. It happens too often that interpretation of the generated data conveys the biggest problem when 'Big Data' has to be analysed.

Comparing over the years the amount of feed, in tons, bought per year with the amount in kg of live weight sent off to the slaughter-house per year, is an easy one. But when it gets to following a batch of pigs over time for medication, for tail biting and coughing index, feed conversion, average daily gain and other parameters, it becomes a different issue.

When data is collected in order to learn and to use the knowledge for the next batch of pigs, then correct interpretation is essential.

Whatever the IT specialist tells you, be assured that in a biological environment a trained eye and an experienced brain on the working floor will still be indispensable.

In biology variation is the rule. IT always assumes standard conditions from which deviations to the rules are measured. In the hybrid working place of a pig farm (so both standard conditions and biological variation are present) this poses a big challenge to the developers of IT systems.

Precision livestock farming

Precision livestock farming is a development with great advantages and creates excellent opportunities for the optimal use of resources.

It goes without doubt that it has taken the farming of crops to a much higher level, but in pork production precision livestock farming still has a long way to go.

Steps are being made, and will continue to be made, to generate a high level input of computerised data that needs to be analysed providing artificial intelligence support for the manager executing his work. Currently, the IT specialists are still working very hard to make their promise come true. Whatever the future will bring, for today's manager it still counts that the art of management is to make optimal use of the available staff! ■

Dispose of used needles and syringes properly.