Practical Health

Insight (1)

Lessons From Aujeszky's

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One of the highlights of the last 20-30 years has been the remarkable success story on the control, and in certain countries the eradication, of Aujeszky's disease virus (ADV) from the swine population. When I joined the pharmaceutical industry almost 30 years ago the first genetically engineered DIVA (Differentiating Infected from Vaccinated Animals) vaccines against ADV started to appear.

Researchers had discovered that certain ADV vaccines had acquired a 'natural' deletion of a certain protein in the capsid of the ADV. This so called glycoprotein E (gE) was lost during the attenuation procedure that is required to make a safe modified live ADV vaccine from a natural field strain.

This process normally involves a large number of passages of the ADV field isolate through laboratory cells that are not normally the natural cells that the virus grows in.

In the process of passaging through these 'not normal' cells the virus will lose some of its genetic information. By coincidence for certain ADV vaccines, the gE genetic code was lost, making them in fact a DIVA vaccine.

This was discovered in the early 1990s and by checking the pigs on those farms where these 'naturally' gE deleted vaccines were used for a longer period, the researchers found several things:

- All samples taken from the ADV vaccinated pigs on the farm were gE negative.
- On those farms with a good vaccination history, no signs of ADV field infection could be detected and if so they would have been gE positive!
- The performance of the farm was good, with less respiratory problems and no reproductive problems attributable to ADV.

These findings were the basis for a much larger field study involving many different farms in a very pig dense area in the Netherlands. Only one aspect needed more thorough consideration. Was every vaccine equally safe and efficacious and what was the optimal vaccination program?

The 'Golden Standard' testing program selecting the best ADV vaccines present on the Dutch market in the 1990s revealed that only five out of over 20 ADV vaccines present on the market fulfilled all criteria. The veterinarians participating in this field testing could choose from one of these five vaccines.

Discipline appeared to be a key word when the trial was underway. Important aspects in relation to discipline included applying the vaccine and the movement of pigs, especially incoming replacement gilts.

When analysing the reason for a 'break' these two parameters accounted for the vast majority of the sudden appearances of gE positive pigs on participating farms.

Interestingly, when discussing the progress of the trial with veterinarians and producers, they all agreed that the general health status of both the breeding animals and the growers had improved after the start of the trial.

Improved performance

This improvement in performance, as was also seen in the smaller trial mentioned above, in fact provided the funding for this trial and was a major contributor to the high level of discipline. The cost of the vaccination had to be fully paid for by the pork producers.

The vaccination scheme used was as follows. Breeding stock first had to receive a basic vaccination scheme (herd vaccination, twice with a four week interval) to continue thereafter with every four months with a single shot, again as herd vaccination.

Growers were vaccinated twice at 10 and 14 weeks of age. Incoming replacement gilts were vaccinated twice with a four week interval upon arrival in the quarantine section and then joined the regular herd vaccination scheme later. Only gE negative replacement gilts were allowed to enter the farm.

The success rate in reducing the number of gE positive animals in the case of the growers was spectacular. The gE positivity of the growers reduced from over 70% positive for gE antibodies to less than 5% positive at the end of the first year of the study. Typically the producers would refer to hearing less coughing in the stables.

In the breeders the decline of the gE positive animals was less spectacular. This was due to the fact that the average sow spends three years on a pig farm, while a grower spends only six months.

The decline in the gE status of the breeding herd is to a large extent related to the replacement rate. But normally in a period of three years the gE positivity, in a well vaccinated herd, would decline until a level comparable in the growers, so less than 5% gE antibody positive. Here again the producers were very happy with the improved performance in their breeding stock.

With all the positive feedback coming from this large field study, the Dutch pork producing industry decided that all pig farmers in the whole of the Netherlands were going to act in accordance to the field study in an attempt to eradicate ADV from the Netherlands. It took only a couple of years to bring ADV under control and to such a level that stopping vaccination could be considered.

However the pork industry was so happy with the results obtained that they were reluctant to stop with the compulsory vaccination. They feared re-infections. But some years later, the pork industry was willing to take the risk and by the turn of the century vaccination against ADV was completely stopped. ADV eradication was successfully completed in a number of West-European countries and until now they are all still free without using vaccination.

The pork producers are enjoying lower total cost of animal health products, not only because of not needing ADV vaccines but also because they avoid the cost of antibiotics to cure the secondary bacterial infections.

Despite the recent low pork prices they still have better prices because they have access to export-markets that they otherwise would not have had, were they still ADV positive as a country.

Lessons to be learned

ADV control is feasible and profitable on individual farms. The main improvement in growers is related to a higher ADG and a reduced usage of antibiotics. In the breeding stock, improvement is related to a quicker return to oestrus, so less empty days. In naïve breeding stock populations the damage can be enormous with 100% mortality in piglets up to four weeks of age coming from ADV naïve sows/gilts, high incidence of abortions etc. With a well designed vaccination program and using a proven safe and efficacious vaccine, adequate protection in both growers and breeders, against ADV infections will be attained.

ADV control is feasible and profitable on a regional level. Of course the farms in this region will have the same advantages as described above but the additional benefit is in the fact that the ADV infectious pressure in the region in total will go down. This implies that small mistakes in the execution of the program might pass without any punishment.

In epidemiological terms the regional control of a pathogen is a very powerful instrument to reduce disease incidences.

ADV control is feasible and profitable on a national level. When a country is free of ADV it can block imports from ADV positive exporting countries and they then have a tool to protect their own industry. When free of ADV they may export their pork to a larger number of countries.

ADV eradication is not an easy task and should not be underestimated. There are several countries in the world that have or had a program to eradicate ADV in place but have not managed to be successful.

This is due to a combination of reasons. One of the main contributors to this failure is that the individual pork producers might not be aware of the overall benefit of the program and their own important role in making the program a success. For an individual farmer somewhere in Japan or Italy this is also not easy to realise.

For this reason it is so important that the Pork (or Meat) Board in a country, together with extension workers of the government, researchers, veterinarians, pharmaceutical industry, breeding and feed companies and others having contact with the pork producers are all supporting the program.

Of course the program should be good, executable and accommodating for national differences. But also an easy control system should be in place because there will always be producers that believe that rules are for others. ■

Practical Health
Insight (2)

Foot and Mouth Vaccination

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Some time ago I was very much involved in introducing and supporting a foot and mouth disease (FMD) vaccine in Asia. You can learn from everything you do and I learned a lot from this activity. In those years one of my favourite Asian countries was very active in trying to establish disease free zones, and of course FMD was one of the diseases to control.

I was travelling throughout the country giving presentations on FMD and its control through vaccination. The question was frequently asked about the efficacy of an FMD vaccine that was developed in Europe and used in Asia. Of course that was, for several reasons, a very relevant question. The answer, however, would inevitably end up in doing a field efficacy study. This was not considered a problem by itself as when you design a good protocol you need to include a negative control group.

For a field efficacy study against any other pathogen that is normally no issue, but for a notifiable disease it will become a major issue if you get a (FMD) disease outbreak in any of your groups on trial.

In such a case you have to inform the officials in the country of the outbreak, they have to report the outbreak to the OIE, the outbreak will get in official publications and, with a bit of luck, even the name of the company will also be mentioned in these documents.

Local trial needed

Although we were of the opinion that the question to test the efficacy of the FMD vaccine under the local Asian field conditions was a relevant one, a worldwide operating pharmaceutical company was not willing to undergo all the efforts and then run the above described risk. So, I went on giving presentations and the audience went on asking the question on efficacy under local conditions.

The only possible solution was that if the local authorities organised such a trial we, as vaccine providers, would be willing to absorb the cost of the study and act as advisors but no more. It was also made clear that the protocol and the execution of the trial would be the responsibility of the local authorities.

Approximately two years later, in the middle of the preparation for a new visit, I received a phone call asking if we were still interested to sponsor such a study and, if so, could I visit the local Ministry of Agriculture to discuss a protocol.

All questions were answered with a yes and a couple of weeks later we were in the middle of a long discussion. The main topic, of course, was how to set up an FMD field efficacy study in rural areas with a lot of backyard swine farming and small dairy and rice farmers that had only one or two cows or buffalos used to plough the rice fields.

Disease free zones

The government was still very interested in setting up disease free zones, with the ultimate purpose to export meat and other products from these special zones.

Vaccinating larger farms was no problem but to get a good vaccination coverage in the rural areas with many smallholdings, was seen as a challenge. To vaccinate both cattle and swine in an FMD control or eradication trial is very important.

FMD infected swine excrete massive amounts of FMD virus into the environment. Cattle, because of their enormous lung volume, act like a hoover. If there is a little bit of FMD virus in the air, they will inhale it. So, where cattle and pigs are in close contact with each other it is important to vaccinate both.

Swine are often kept close to the house in a confined pen, so vaccinating pigs is a matter of knowing who owns the pigs; you do not need to chase them. Cattle and buffalo in rural places however are often brought together from different holdings, go to different locations for grazing and it is difficult to keep track of them. Furthermore, a rural smallholder will have no benefit whatsoever from the creation of an 'export oriented disease free zone' so the likelihood that he will participate in a such a trial is low.

For most of the infectious disease control programs you need at least 80% vaccination coverage of all the susceptible animals with an efficacious vaccine in order to reduce the infection pressure to such an extent that the number of outbreaks will reduce dramatically. When this vaccination coverage of more than 80% of the susceptible population can be maintained for a number of years then the disease will disappear. Of course this is a very general statement and for individual diseases there are many other aspects to consider. However, in the case of FMD, using a potent vaccine and maintaining good vaccination coverage will do the majority of the work.

The questions thus were clear, first of all how do we get the buy in from the smallholders and, secondly, we might buy an efficacious FMD vaccine but how do we ensure that the vaccine will induce a good immune response in the animals kept in these rural areas?

To address that last question first, in tropical countries it is crucial that the logistic cold chain is maintained when the vaccine is transported from the place where it enters the country until the moment that it is used. Vaccination technique is equally important to get the best out of a vaccine. Correct dosing, correct needle length and correct vaccination location (in the muscle or under the skin) are all important. The manufacturer's leaflet or insert will provide essential information on this subject.

Generating interest

The first question of how to get at least 80% of the smallholders participating was by far the most difficult to find an answer for.

In the end there was no other choice but to visit the potential trial locations and discuss the issue over a cup of coffee at the smallholder's farm. Indeed our reservations were correct in that there was little interest in helping to create these disease free zones. So, the discussion diverted quickly to general issues on the weather forecast, and when to plant young rice etc.

Suddenly, one of the farmers made the remark that his biggest worry was that if his buffalo contracted FMD just before the period that he needed the animal to plough the fields, then he would have a major issue. The animal would hardly eat, would not walk and was therefore of no use to him. The infected animal would normally recover but by then the farmer would have had much delay in planting the rice.

This was interesting! So we asked him if he thought that he and his colleagues would be interested in having their animals protected against FMD just before the start of the ploughing period. The answer was yes. They were very much interested in protection against FMD in that period and they were convinced that the whole village would participate.

We were in business!

All of a sudden we were in business! Three villages were selected with a history of regular cases of FMD and three similar villages were selected to act as the 'control' meaning that they would do as they normally would.

In the participating villages it was agreed that all animals would be vaccinated on the same day. This was on request of the smallholders as it was easier for them to keep all the animals at home and allow them to go in a group to their grazing areas after the vaccination procedure was finished. Also, when all the animals were vaccinated on the same day, it was much easier to know that everybody had participated.

It was also easier for us to maintain the cold chain, check the vaccination technique used, check when the needles were changed and to control the dose.

The local football field was full of cattle and buffalo, everybody was excited by the activity, the local mayor was proud and everything was great. In a few hours all the animals were vaccinated and then, by using small motorcycles with cool boxes, the swine holders were visited and their pigs were vaccinated.

In all three participating villages we had the same kind of enthusiasm for the program and the same high level of participation. In short, the study was a great success. No FMD cases were seen in the three participating villages and the smallholders were very happy. Nobody was interested in what happened in the three control villages.

Then disaster struck. Highly pathogenic avian flu emerged, killing birds and people alike. All resources of the Ministry of Agriculture were directed towards fighting HP avian flu and the disease free zone development was put on hold.

But the lesson was clear. If you want the buy in from somebody, first find out what is in it for him! ■

Practical Health

Insight (3)

VACCINE HANDLING

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On a beautiful autumn day I travelled to a reported suspected adverse reaction case, involving dead piglets vaccinated with a recently introduced new vaccine. Of course this a serious matter because immediately after introduction, the experience one has with a new product is based only on laboratory experiments and limited pre-registration field trials. The moment registration is obtained the real world suddenly becomes the playing field for any new product. Everyone is aware that in the real world things will happen that no laboratory or field trial setting can accommodate for.

No matter how hard I tried there was nothing I could imagine to be the cause of this reported fatal reaction immediately after administration of the vaccine. It really worried me and I even felt a bit stressed.

Every suspected adverse reaction has to be taken seriously and the sooner you learn about things related to your products that you did not know of before, the better.

So I therefore undertook this 300km plus journey to the pig farm to investigate and witness the case personally.

Navigation systems nowadays are fantastic and three hours later I parked my car on one of those very scenic family-owned farrow-to-finish farms, in traditional architecture, that we still have in rural areas in north-western Europe.

Meeting the farmer

The owner of the farm had noticed me coming and came to welcome me. I can speak the local language so we immediately started a conversation about the journey to his farm, the weather, the size of the farm, and how the farm was organised etc.

He manages 200 plus sows in a batch farrowing-batch weaning system. Batch weaning appeared to be easier to implement than batch farrowing.

He sold part of the finishers at 12 weeks and partly finished them off himself on the same farm.

Nursery pens were in a separate section of the breeding unit. All-in all-out procedures were attempted but day-to-day practice learned that the slow-growers often stayed in the same unit when the new round of nursery or fattening pigs were entering that part of the farm.

Also, the interval between the first farrowing and last farrowing in the farrow-unit could easily be 8-10 days, making it almost a continuous flow farm.

He was turning 60 years of age and had no successor in his family lined up to take over the farm. So the interest to really invest in the farm and bring it up to modern standards was, understandably, low.

Of course he could not handle all the work himself and therefore he had made an agreement with a nearby agricultural school that students would follow their practical part of the curriculum at his farm.

In this way the farmer was assured of labour for his farm but with the disadvantage of course that there was a regular change in personnel.

Although there was a good reason for the lack of investment and the frequent change in labour working on this farm, I have learned through all my travelling that these factors are present in many countries and on many different farms all over the world.

Bank loans are not always easy to get and the larger farms especially depend heavily on hired staff. They all witness a frequent turnover of their staff which is to a large extent due to the nature of the work, the salary paid and the educational level which often brings them in conflict with their managers.

Dr Camille Moore, the Canadian swine veterinarian, addressed this issue in one of his lectures by stating 'Implement management practices that are routinely easy to check'.

For example, on every section of the farm the labourers are supposed to wear different coloured boots. Everyone knows this is easy to control, so the chance that even new, ignorant staff follow this rule is great and biosecurity is good.

Case discussion

My local colleagues and the veterinarian consulting on the farm had arrived so it was time to discuss the case in a more structured format.

The production parameters were average but given the low-cost production factors on the farm, this was acceptable. The vaccination scheme in both the breeding stock and piglets/fatteners was also normal with the only remark that a straightforward coli vaccine could not solve the diarrhoea in the young piglets and that a coli/clostridium combination gave a much better result.

The vaccination process

So, it was time to have a look at the vaccination process. Up we went to the entrance of the breeding unit of the farm, which was also the main building with accommodation for an office, workspace for equipment and the nursery units.

Here we could witness the storage place for the medicines and the vaccination equipment. The farmer showed us the records he was keeping, when the different medicines had arrived on the farm and when they were used.

The vaccine under discussion was given at weaning, so roughly when the piglets were 3-4 weeks of age and was stored in the refrigerator.

Vaccination equipment was no problem as it was clear that different vaccine companies were all giving equipment away with the purchase of their vaccines.

Inadequate refrigeration

I had difficulties locating the refrigerator and had to ask the farmer to show me where it was. He took me to a corner in his office where behind a large cupboard for boots and overalls a small rusty and dusty box was present.

It was connected to an electricity socket but the door would not close properly so the inside temperature was not far off the ambient temperature in the room.

In autumn the temperature can reach 15-20°C and by taking out a vial it was easy to check that the bottle temperature was far from a normal working refrigerator temperature. But this was not the main shock. The farmer had kept the bottle that was used when the piglets died 'on the needle' and he gave me that bottle.

In order to make sure that his labourers would take the same bottle from the fridge that was used last and not finished yet, he would leave the semi-automatic syringe attached to the bottle.

The interval that this vaccine was used was every 3-4 weeks, so the vaccinator would typically stay connected with the vaccine fluid during this time and stored inside a non-functioning refrigerator!

The vaccine fluid had become pasty and yellowish and was clearly far away from unbreached bottles of the same vaccine that were still in the refrigerator.

Now I had two possibilities, immediately inform the farmer of my concern or ask the consulting veterinarian to find out if he was aware of the situation that the vaccinator was mounted on the bottle and that the combination was kept for at least three weeks in a non-functioning refrigerator. I chose the latter, took the veterinarian aside and discussed the matter with him.

He was clearly embarrassed with the situation because he acknowledged that it the veterinarian's task to make sure that medicines in general are handled correctly. That the farmer handles the medicines himself does not relieve us from that responsibility.

He agreed that he would take the matter up with the farmer on his next consultation to the farm and that I would take the breached, vaccinator mounted, vial back to the company for a bacteriological investigation. In the bacteriological laboratory back home they found an enormous overgrowth of bacteria on the plate after a direct inoculation from the bottle on a culture plate under both aerobic and anaerobic conditions. This was most likely the cause of the reported suspected adverse reaction. ■

Practical Health

Insight (4)

Vaccines & Epidemiology

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A vaccine is an intriguing outcome of a sometimes crude and basic process and sometimes the outcome of a really very high-tech development process involving a full team of professionals with a high level of knowledge and coming from different disciplines. But basically they all try to do the same thing. Vaccines are asking the body to respond to the administration of a micro-organism that is thought to cause a disease problem in that population in the near future. This reflects a proactive approach.

Pharmaceutical products, for example antimicrobial preparations, are completely different. They only make use of body fluids to get the active compound from the site of entry into the body to the place where the infecting micro-organism causes the problem.

Pharmaceuticals are used in a reactive manner and make passive use of the body in contrast to a vaccine that makes active use of the body.

Vaccines are very powerful tools and can fight for a long time (months, sometimes even years) against the micro-organism it provides protection against. During this period it limits the multiplication of that micro-organism. A pharmaceutical typically only limits the multiplication of a micro-organism for a short defined period of time (ranging from hours to a couple of days) and then the micro-organism is free to multiply again. With this basic additional factor in favour of vaccines in mind, do we as veterinarians make the most out of the vaccines that we have available?

Make the most of vaccines

In my previous columns I touched on Aujeszky's disease virus eradication and FMD control as examples where vaccines played a key role in suppressing viral load in the environment and through this blockage of viral multiplication we could stop infection occurring in our livestock.

In the case of Aujeszky's disease virus (ADV) this is simple: get all animals in a region vaccinated for a number of years and introduce ADV negative breeding stock only on farms. But of course not all diseases are the same. In addition, the interest of the individual farmer does not often match the interest of the group. This is next to a large variety of other often complicated factors. Tapping in to my experiences in the prevention, control and eradication of atrophic rhinitis (AR), many of these aspects come together.

Long ago, in the Netherlands (my home country) we had a breeding company, selecting and selling future replacement gilts. On one of their farms they were already vaccinating against AR. As they had not seen any signs of AR for years in their offspring they wondered if they could stop vaccinating.

So they approached the vaccine company to see if they had any information and they contacted the Animal Health Service (AHS) in the Netherlands for independent third party advice. A meeting was held and everybody agreed that there was simply no knowledge to answer the question.

Typically for the Dutch culture, a committee was formed to follow-up the matter and come back with an assessment of the situation and with a recommendation.

Taking samples to look for dermonecrotic-toxin (DNT) Pasteurella multocida strains, the cause of AR, was seen as the first step with following piglets born from non-vaccinated breeding stock for possible AR clinical development, as a second step when the laboratory studies failed to show the presence on the farm of P. multocida DNT producing strains. No matter what they tried, they could not find the P. multocida DNT.

No indication for the presence of this specific bacterium was found in the laboratory in the many samples that they processed and no AR related clinical symptoms were seen in the piglets originating from the breeding animals that were kept purposely non-vaccinated.

What was the value of this observation? Again nobody knew, only the breeding company immediately saw their advantage. They could reduce their cost by stopping with one of their scheduled vaccinations and they could, maybe, sell their replacement gilts as P. multocida DNT (so AR-) free.

Within 10 years the sales of the AR vaccine in the Netherlands had slid off to very low baseline levels and the number of certified AR free breeding farms had risen to close to 95%. A remarkable success story that was based fully on a voluntary participation of the piglet breeders.

The fact that piglets coming from an AR free certified farm (certified means freedom of the farm of P. multocida DNT producing strains and no AR vaccination applied on this farm) would fetch a higher price, worked as a natural but powerful incentive.

Emergence of new diseases

Modern pig farming suffers from a new disease roughly every 10-20 years. If you do not eradicate diseases you end up with so many that it becomes difficult to manage.

Countries having eradicated diseases like CSF, FMD, Aujeszky's and AR are definitely better off with the planning and execution of their vaccination schemes. So, with this in mind, the vaccine producing company, the Animal Health Service organisation and the breeding company started to look over the borders to other countries to export this AR eradication program.

To start with the success story, the breeding company managed to get the program accepted by their sister companies in different countries and they were also successful in eradicating P. multocida DNT producing strains from their farm. The AHS organisation tried very hard in neighbouring countries and was somewhat successful on individual farms but nothing compared to the national success in the Netherlands.

The vaccine company approached the situation differently and dived into their statistics to see which country was leading in AR vaccine sales and then investigated the AR situation in that country. They requested one of the national veterinary schools in that number one selling country to study the matter.

That specific school had good contact with the local slaughterhouses and started to investigate pig carcases for deviations in their snouts that are typical of AR.

The outcome was shocking. Despite years of high sales of the same vaccine that helped to eradicate AR from the Netherlands, the percentage of snout deviations was still way too high and unacceptable. There was no other choice than to go back to the farms where the inspected pigs came from and investigate what is actually happening with respect to AR prevention.

The study revealed two important insights. Firstly, the fattening pigs with snout deviations originated from both replacement gilts and older sows and, secondly, the number of doses of vaccine actually sold on an annual basis and the calculated number of doses required per year based on the number of sows present and the vaccination scheme, did not match.

Importance of discipline

So what was happening on the farms? In short, there was no discipline in maintaining the vaccination coverage over all the breeding animals present on the farm. Some farmers and veterinarians thought that they could skip a vaccination in the older sows, relying on the immunity lasting from the previous vaccination that was given over six months previously.

Others did not vaccinate incoming gilts – relying on the immunity of the herd. The slaughterhouse results clearly showed that by applying this approach they failed to activate the powerful epidemiological feature of the used vaccine.

P. multocida DNT positive strains managed to find the non-protected sows and gilts and kept the infection going on the farm. Only by installing the recommended vaccination scheme and stressing the importance of executing this scheme in a disciplined manner were they able to solve the problem on some of the farms. Why only on some farms? Well, discipline also has something to do with culture. ■

Practical Health

Insight (5)

The 2014 ESPHM

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Sorrento was the place to be in May 2014 for European swine veterinarians. The European Symposium of Porcine Health Management (ESPHM) has created, in a very short period of time, a solid place for itself in between all other swine health related conferences. But where does it come from and where are these swine conferences going to?

The world's political leaders like to talk about 'One World – One Health' but as is often in the political arena, reality is different. In our global swine health world we have major regional differences.

In Asia, the Asian Pig Veterinary Society (APVS) addresses issues like FMD, CSF and HP PRRS viral infections during the congress they organise every two years. These are important matters for them, but of little interest in other parts of the world. This APVS congress has only been held six times so far, but already attracts over 1300 delegates every time it convenes.

The congress circulates among the Asian countries that are the constituting members of the APVS. The 7th session of the APVS will be held in the Philippines in 2015 and Dr Lapus, who is leading the organising committee, will provide the participating delegates with a very fine tailor-made Asian program. World renowned keynote speakers will be on the program to address global issues, but the majority of the speakers will have their focus on Asia.

To have a platform to address Asian swine health issues was clearly needed, as the success of the 2013 congress in Vietnam testifies.

Americas

In the Americas with the AASV meeting held every year in North America, the situation is very similar. The influenza situation in the USA is very distinct from other parts of the world, and the structure of their swine industry and the strong presence of a number of renowned universities makes the USA in the swine health scene a power house with their own specific problems.

The PRRS situation in the USA is a good example. On every congress or symposium new data is reported and new studies are proposed. In the meantime between 2005-2012 the economic damage caused by PRRS virus in the USA alone rose from an estimated US$560 million per year to US$664 million in 2012/13. PRRS virus will keep the American pork producers, swine veterinarians and scientists busy for more time to come. It is natural that they want to spend their time finding solutions. This is not an easy task given the PRRS virus that they have and the limited number of tools available to fight the virus.

PED is now both an issue in the USA and Canada, and in Asia. But the way the disease is dealt with differs a lot. So, although these two regions have a common interest, the need for information still varies and so does the approach.

Europe

In Europe we have the European Symposium of Porcine Health Management (ESPHM). This is a joint effort between the European College of Porcine Health Management (ECPHM) and the European Association of Porcine Health Management (EAPHM), with the assistance of a local organising committee.

The ECPHM (or the Diplomats) is an organisation that fits the structure desired by the European Union (EU). The EU wants to have a college for every profession. There is a college for cattle veterinarians and for 10 years there has been a college for swine veterinarians. Everyone that graduates from an EU accredited veterinary faculty can follow the classes, sit the examination and, when he or she passes the examination, they are enrolled as a Diplomat into the College. The Association, on the other hand, is open for everyone interested in swine health.

Members' holding voting rights in meetings held by the Association however are members that are swine veterinarians, graduated from an EU University with a veterinary faculty. The College and the Association both have a common goal in the continuous education of swine veterinarians. Hence their cooperation in organising this Symposium. A working party of European swine veterinarians representing different disciplines and different countries, sat together at the first Symposium that was organised by Professor Jens Peter Nielsen and his team in Copenhagen in 2009.

They agreed to set up a European Association and to work for a couple of years to give it a chance to develop. In 2010 at the 2nd Symposium in Hannover the 'Copenhagen' working party presented a structure with a board, bylaws, mission and vision to the delegates present. The assistance of the AASV in preparing these indispensable documents was, and still is, highly appreciated. The delegates adopted the proposed new Association and the EAPHM was born. Thereafter symposia were held in Helsinki, 2011; Bruges, 2012; Edinburgh, 2013 and in Sorrento in 2014. The 2015 EAPHM meeting will be held from 22-24th April in Nantes, France.

During the Sorrento Symposium Dr Enric Marco, the President of the EAPHM, presented a special offer to become a member. Over 300 delegates took this up, giving the Association a much stronger membership base. This is important as the larger the membership base, the higher the credibility of the organisation. The EAPHM holds its office in Brussels close to the EU Parliament buildings. European questions related to swine health should be directed either to the ECPHM or the EAPHM.

Before the appearance of the College and the Association, EU decision makers had no one to direct their questions to in the field of swine health. There was also no specific swine health section within the FVE. That gap is now closed!

From 200 interested delegates at the first meeting in Copenhagen the symposium jumped to over 1200 in Bruges in 2012 (a remarkable job by Professor Dominiek Maes and his team to accommodate all these delegates when 300-500 was the estimated number of participating delegates). In Edinburgh in 2013 the ESPHM grew to over 1300 and closed in Sorrento this year with nearly 1500 delegates.

IPVS

So we have the Asians with their APVS, the Americans with their AASV, the Europeans with the ESPHM, and ABRAVES in Latin America enjoys a good reputation in their part of the world. So what about the IPVS?

The IPVS is an institute with a great reputation and a great history. When the late Tom Alexander chaired the organising committee for the first IPVS in 1969, he could not have foreseen that the IPVS would fulfill such a big need in the years that followed.

The 2nd IPVS Congress was held in Hannover in 1972 and every two years thereafter swine veterinarians come together to discuss matters arising in different parts of the world. Back then the internet did not exist and intercontinental telephone conversations were only available to the more wealthy veterinarians among us. In the meantime the world has changed considerably. News spreads all over the world in just a split second. The internet brings disease related matters to your desktop or mobile phone from all remote places through reputed (Chief Veterinary Officer's offices) and unofficial channels.

Furthermore, refined diagnostics have shown that although the disease might have a common name, like PRRS, information from one part of the world cannot simply be used in another. The IPVS congress will continue to be the world platform bringing swine veterinarians together. Cancun, Mexico, 2014 and Dublin, 2016 will continue the good tradition.

However, the congress might need to adopt a different structure focusing more on the common global issues and explaining differences when they exist. They should refrain from trying to cope with all health issues in all parts of the world. ■

Practical Health

Insight (6)

PRRS Virus

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Writing a column on the PRRS virus is a nightmare. The subject is so extensive that it looks like there is no beginning and no end to the story. When one follows the literature or listens to the presentations and reads the books, very little of all the data that is presented is supporting observations made in the field.

The situation in the USA is a good example. According to two very detailed studies done by the same investigators, the economic damage caused by PRRS virus cost an additional US$110 million between 2005 and 2012/13 according to two very detailed studies done by the same investigators.

And still we read papers and listen to presentations where researchers claim that progress has been made in understanding and controlling PRRS virus infections.

Another example comes from China. PRRS virus in China killed 40 million pigs in one year, but in a different challenge experiment using an isolate of that same highly pathogenic (HP) PRRS virus strain from China, only a rise in temperature was seen in the challenged pigs.

Nobody will believe that this challenge strain is the same as the HP PRRS field strain. Of course the challenge strain used originated from a clinical case in China, but that is no guarantee for being exactly the same PRRS strain as the one causing the problems.

Careful evaluation needed

So how should we look at all this information? What do we actually know? Should we believe all the opinion leaders or should we absorb their data with some caution?

Well, 23 years after the discovery of Lelystad virus (the first isolation of PRRS virus was by Dr Gerrit van Wensvoort in 1991), and many dollars spent on research, a lot of caution is indeed still required.

Do we know which PRRS viruses are pathogenic (in other words can cause disease)? No, we do not have any pathogenicity markers. We cannot distinguish the real bad boys from the ones that are causing hardly any economic damage.

Do we know how PRRS virus is inducing protective immunity? No, we have no idea.

Are we sure that when we do virus isolation or sequencing that we analyse the PRRS virus that really is the cause of the problem on that farm? No, multiple PRRS viruses can be present at the same moment and the PRRS virus we analyse is simply the one that pops-up and is not necessarily the bad guy. Virus isolation on tissue culture might already alter the PRRS virus genome to such an extent that the resulting virus has different characteristics, as in the China case.

Is homology between vaccine strain and the field-isolate important? No, even in the USA where serum inoculation was practiced with PRRS isolates coming from the PRRS infection on that farm, satisfying results were reported but not always obtained.

The reality is that we lack essential information on both causing disease and inducing protection. This lack of knowledge has far reaching consequences. Basically, trial and error is so far the only way forward, but then with the correct interpretation there is a lot of room to play with.

Repeatability of an observation is the essential key to success. Too often in the case of PRRS virus control, a single observation was promoted as the way forward. When this observation was repeated on a larger scale disappointments were often seen. It is also true that repeatability does not mean 100%. In the biological world with PRRS virus and pig and farm conditions as the main players, there are simply too many variables to assure 100% repeatability of a certain observation. Are there certain things that we do believe to be applicable for PRRS virus control or economic damage control? Are we comfortable with the advice that we give?

When we are confronted with a certain PRRS outbreak, sure we have some idea on what to advise, but this advice is never accompanied by a certificate of guarantee and has a short shelf life.

There are computer aided programs in which the information of hundreds of farms is stored. The input of all this information, in some of the systems, is done in a structured way. This structure allows elements of this large data set to be grouped by subject. In this way a clear overview of the situation involving a certain pathogen and a large number of farms can be retrieved.

For example the data set can be asked to select the data on breeding farms and whether they have had a PRRS virus outbreak in a given period. Here, a PRRS virus outbreak is defined by experiencing economic damage most likely caused by PRRS virus infection.

So now we get the information on two input fields – the total number of breeding farms included in the data set and the number of breeding farms that experienced a PRRS virus outbreak.

Vaccination against PRRS

As a third selection criterion we can add whether these breeding farms were vaccinating against PRRS virus infections – yes or no.

In a lot of European countries we do see a large percentage of breeding farms vaccinating against PRRS virus infections and, typically, we see that in a high percentage no economic damage related to PRRS virus infection is reported on these breeding farms. However, some breeding farms that vaccinate against PRRS virus infections still experience economic damage caused by PRRS virus infection. But why certain farms end up in one or the other group, nobody knows. This is all important and relevant information.

The conclusion from this observation based on a large data set coming from the field is that PRRS vaccination is effective but not in all cases. With the current state of knowledge we cannot answer why this is the case. A difference in the sequence of ORF5 or ORF7 between field isolate and vaccine strain is definitely not the answer.

A second observation that is seen frequently and was also reported at the last European Symposium of Porcine Health Management by Palzer and co-workers on a PRRS virus outbreak on breeding farms, is that the economic damage incurred by PRRS virus on vaccinated breeding farms is less compared to a PRRS virus outbreak caused by the same virus on non-vaccinated farms.

The PRRS virus in these cases was introduced to the farms via infected semen, so a common source and most likely the same PRRS virus.

The duration of the period with economic damage was shortened on vaccinated farms and these farms did return to their normal routine quicker.

What's new in control

Is there nothing new in the field of PRR virus control? Yes, there should be more things coming, but it is difficult to predict the future. The patents restricting the work done on vaccine development are expiring and we will see more PRRS vaccines entering the market.

There is no guarantee that they will be any better, but at least they will get a chance to be tested in the real world and that is the only thing that counts.

Next to that there are areas in the world where good initial results are obtained with regional control of PRRS virus by area vaccination. There are also more countries interested in investigating the epidemiological power of PRRS vaccination in a certain region of their country.

Part of this involves studying the importance of strict biosecurity and, when applicable, tracing back the origin of new infections in the area. This is the only research field where sequencing (ORF5 or ORF7) still plays a role. Often it is difficult to get all pig farmers aligned to participate in such a regional program.

There are, however, examples where the same farmers that were difficult to convince to participate are now the strongest advocates for continuing with the program. Why is this? This is the only easy to answer question in the case of PRRS virus infection – money! ■

Practical Health

Insight (7)

NEONATAL DIARRHOEA

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Young piglets are, like most other newborns, charming little creatures. These cute little friends of ours are at the start of an explosive career lasting for 6-7 months and that brings them from 1kg at birth to 100kg at slaughter. They are real athletes! But as with athletes, everything they do should be aimed at helping them to reach this goal. Possible hurdles should be avoided or taken seriously when they occur.

One of the first hurdles they often meet on their way up is diarrhoea. In terms of consequences, diarrhoea has it all. It is both life threatening, can leaves scars for short moments but also until they reach slaughter age, and can be very mild; just passing by with little damage to the piglet.

In terms of preventing diarrhoea, also diarrhoea (-prevention) has it all. Biosecurity, cleaning and disinfection, sow preparation both for milk production and immunity transfer, piglet handling, housing, feeding schemes, etc, etc, all play their role in helping the piglet to get through the early phases of life with the least possible impact of diarrhoea.

Complex disease situation

The PED virus situation in Asia, the USA and Canada has again made it very clear. In the current high tech swine production environment a complex disease situation like PED virus introduction will not be solved by a single initiative by a single profession.

Biosecurity, cleaning and disinfection can be raised to a very high standard at great expenses but what does it help if a virus enters the farm with feed or feed components?

Salmonella is another example where many (veterinary public health -) control schemes have been tried.

International trade in feed components, travellers and migrant-workers are instrumental in introducing resistant forms of indigenous salmonella strains or new exotic varieties, without any problem. The flu outbreak in Alberta, Canada a few years ago is also one of these cases where 'unintended' introduction of flu virus simply happened.

Biosecurity has no real definition. For some of us a gate at the farm entrance is the symbol of biosecurity, others add a fence around the farm area, again others add shower-in combined with changing clothes, the most advanced ones install filters to control the incoming air and use positive pressure to prevent air leakage in. But, in essence, biosecurity aims at controlling, and making free of possible pathogens, all materials that enter the farm. This includes the workers, transport and machinery, and the air but also feed materials, for example. This latter aspect cannot be controlled by the farm manager. He has to rely on information provided by the supplier.

Biosecurity is a very complex matter if you want to do it right. We always have to be prepared for leaks in the system.

Therefore, as in all cases but also for diarrhoea prevention, the basics should be good. This is no guarantee that nothing will happen but at least it will limit the number of problem causing possibilities.

Besides biosecurity, diarrhoea prevention in the young piglet starts with the handling of the gilts or sows. Gilts are the single most important group on any breeding farm. With a replacement rate of 30-40% or even more, they are on an annual basis also the largest group present on a breeding farm.

Gilts are often partially immune to the pathogens present on a farm. Just as we humans have childhood diseases that are of no concern to the adults, gilts and sows are also not affected by the pathogens that are causing the typical piglet diseases. But they can play a crucial role in preventing some of these piglet diseases.

Gilts are very often raised under 'cleaner' conditions. This does not help in building up breeding farm specific immunity. Escherichia coli (E. coli) diarrhoea in young piglets is a good example to illustrate this.

E. coli is everywhere but only specific E. coli strains cause diarrhoea in just born piglets. These specific E. coli strains are excreted by the sows in large quantities just before and immediately after parturition. This has major consequences.

First of all, of course, for the young piglet that is suddenly confronted with a major life threatening pathogen from the earliest moment in life onwards.

Secondly, the gilts that are put together with the older sows in the same farrowing unit can only ingest these E. coli strains at that moment and only then can they start producing antibodies.

Normally it takes up to 2-3 weeks before they are detectable in the blood. These antibodies play a crucial role in the protection of the piglet against these specific diarrhoea causing E. coli strains.

How do antibodies work?

Basically these antibodies work like this. The antibodies are directed against the attachment factors of the E. coli. When they are bound with the attachment factors the attachment factor loses their function and the E. coli cannot attach itself to the intestinal wall. But it is not the attachment factor that is causing the diarrhoea. The diarrhoea is caused by a toxin. This toxin however, has to be present in a certain amount to be able to cause diarrhoea. When the E. coli attaches itself and starts to colonise on the intestinal mucosa, the amount of locally available toxin increases and diarrhoea is the result.

So when the piglets ingest antibodies directed against the attachment factors with the colostrum, the antibodies prevent the attachment and the pathogenic E. coli that has entered the body, passes through the body and is excreted into the environment without doing any harm. From the above you can learn two things.

Firstly the new born piglet will most likely ingest the pathogenic E. coli before they get any colostrum. So the time between birth and first intake of colostrum should be as short as possible to limit the time advantage the E. coli has.

Secondly, colostrum has to have antibodies against the attachment factors and preferably in large quantities. In the case of first litter sows this is highly unlikely unless they are vaccinated prior to farrowing.

Colostrum is the only way for a piglet to obtain maternally derived immunity. Before farrowing the sow does not transfer any immunity against any disease to her piglets. All depends on the intake of colostrum in the first 24-36 hours of life.

A colostrum-intake-management-system is an essential part of managing piglet production. Not only for the prevention of neo-natal E. coli diarrhoea but for a series of other diseases.

E. coli is a classical and straightforward example. It is amazing how often this problem is still seen while there are such good tools to prevent it with such a sound rationale.

More research needed

In the case of PED, very much at the other end of the scale, we still have a lot to learn. How immunity against PED actually works we do not know. How long immunity lasts we still have to find out. There are farms where a second outbreak did occur but it is not clear yet whether the affected piglets came from young sows that escaped the first infection.

To move the disease from an acute lethal piglet disease to a more chronic disease affecting older pigs is also not a good solution for the industry. The transmission of PED virus on a farm goes very rapidly but between farms is still a matter of study. This implies that applying strict biosecurity to keep PED virus out is still a matter of guess work. You can only control what you know.

Vaccines are available in some countries and are being developed in other countries. The message in reports on their efficacy depends very much on the region where the report comes from but is not always equally positive.

Due to all these questions, the lack of essential knowledge and the impact PED has on the industry it is no wonder that the PED virus is currently seen as the major threat for the pork industry. ■

Practical Health

Insight (8)

Batch wise production

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It is already a long time since the advantages of a batch wise production system became clear to the industry. In all swine health related textbooks chapters are devoted to this subject. During all my travels and farm visits we used to pay attention to the level to which the batch production system was implemented on these farms.

Often the problems that provided the reason to visit the farm came from the finishing unit but the origin of the problems are normally coming from one (the nursery unit), or even two steps (the farrowing unit), earlier. After arrival at the farm the farm manager would reply to our questions on how he was running his farm including questions on what type of, and how he was handling, batch wise production.

No wonder, seeing the attention in the different textbooks, that we were given the right type of answers. On our request we would start at the beginning of the production system and work our way through all sections on the farm. The answers from the manager to our questions and our interpretation of the reality (what we actually saw) often differed a lot. Why, so often, do we meet this discrepancy between what should be done and what is actually done?

Researchers can show us how progress can be achieved by changing the way we work. They do this on a regular basis. Genetic companies, over the years, have consistently improved the performance of the breeding stock in the number of pigs weaned per sow per year. But the reality is that farmers may not have the resources to follow these new developments with the accompanying suggested changes in their facilities.

Pork prices are often not at the level to finance these changes using their own resources or the bank is not willing to provide the necessary loans. So the production manager or farm owner has no other choice than simply 'overcrowding' or tries to implement the suggested changes with minimal adaptations within the same facilities.

These compromises lead to achieving only a part of the benefits that proper batch wise production would otherwise have brought.

This is an important finding when we are analysing a problem that is reported from a more downstream section in a production system. This not only true for a farrow-to-finishing farm. A dedicated finishing farm will also benefit from the arrival of a cohort of pigs that are uniform in age and, as a group, are large enough to fill up the complete barn, or even preferably the whole site!

Let's introduce some definitions:

- **A batch:** A group of pigs that stays together from birth to slaughter. They are housed as a group in separate dedicated units from farrow, through nursery to finishing. Optimally the age difference is in the range of four days. Two days originate from the difference in moment of mating, the other two days in the natural variation of the gestation period.

- **A farrowing unit:** In batch wise production this is a unit that can be separated from all other activities on the farm, can be closed off from the other animals present on the farm and can be cleaned as a separate unit. The parity number of the sows present in the farrowing unit normally differs and typically newly introduced gilts will always be present. So the timely appearance of heat in the replacement gilts in line with the moment of mating of the weaned sows is very important.

The number of sows in one farrowing unit is determined by the size of the farm and the system used on the farm. For example the farm may use a one week, a three week, a four week or even a five week system. On a given farm when the time-interval increases the number of sows (and number of piglets weaned) will increase and consequently the size of the farrowing, nursery and finishing unit.

The aim is to have the system organised in such a way that every time a farrowing unit is made empty there are enough piglets to optimally fill-up a nursery unit section.

By having batch mating and allowing only pregnant sows and gilts in the same farrowing unit that became pregnant through mating with a maximum time interval of only a few days, we end up with a group of weaned piglets that have a very narrow margin between the oldest and youngest in age.

- **A nursery unit:** Basically it has to fulfill exactly the same criteria as the farrowing unit. It must be a separate unit of the farm that can be closed off from all other compartments on the farm. It is filled up with pigs from one farrowing unit, with a narrow margin in age and weaned on the same day. It is extremely important that the nursery unit is made totally empty and cleaned before the new group enters the unit.

No animals from the group that was present in that unit before can be included in the new group entering. After leaving the nursery unit, all pigs will leave as a group on the same moment and fill up one finishing section.

- **A finishing unit:** Again the same set of rules applies. Within a two week period the animals should leave the finishing farm and go to market or slaughterhouse. Time should be allocated to clean the unit and make it ready to fill up with a new batch from a dedicated nursery section. It is especially in this section of the farm where the highest health advantages can be achieved.

Conversely when the whole system is not implemented correctly it is also the section that will present the health problems that we are often confronted with.

This system looks straightforward, so why does it go wrong so often?

Firstly the problem arises from the natural desire of producers to go for the maximum number of animals that they can have on their premises. So there is a tendency to go for maximum and not for optimal. This is often results in overcrowding in nursery and finishing sections. This can be due to the genetic improvement in the performance of the sows but also due to increasing knowledge with piglet survival rates improving.

This larger number of piglets has to fit into the available facilities and often on the farm there is a restriction in space to expand. This implies that there is also not enough space for a dedicated unit to separate the poor performers from the faster growers, the so called 'sick pen'.

As a result they are often mixed with the new incoming group, which is really a major mistake in health management. For the farrowing unit we also often encounter the unit filled up with gilts or sows that were mated much later, making the age difference between the piglets too large. To the trained eye all these items are easy to spot. So how can we improve on this? First of all, have your priorities right. Optimal use of resources will lead to a better health situation on the farm and will give better economic results than when you go for overcrowding.

If the consequence of filling up your space in an optimal manner is that you will need fewer sows than do so. A sow in pork meat production is not more than a production cost! Secondly, where should you start? That is the easiest question. Batch wise mating and batch wise farrowing is the basis of all. If you control this part and follow the rules given above, you will see major health improvements in the sections that follow. And that is where you make your money! ■