Swine influenza – a practitioner's perspective

Influenza viruses in pigs, or "flu" for short, have probably been the subject of more public interest than any other swine disease in recent times. In truth, however, it is one particular strain of virus that has grabbed the attention due to its emergence in Mexico in 2009 and subsequent spread around the world. It became dubbed "Swine Flu" by the World's media, which gave the pig industry some rather toxic PR for a while, even though the majority of cases in pigs were thought to have been transmitted to our porcine friends *from* sickly humans. In contrast to the severe effect on some people, the virus seemed to pass through most pig farms almost un-noticed.

Fast forward to 2013, and where are we now with influenza in pigs in the UK? A little confused and somewhat frustrated would be a simple and rather flippant answer, although not entirely inaccurate. Paul Pemberton, from specialist pig vets Garth Partnership, attempts to explain.

Antigenic drift and shift

An antigen is a part of a virus that can be seen and identified by the immune system of an animal. Antibodies and white blood cells are produced by the animal that can recognise, attack and destroy the virus particle. The immune system has a "memory" so that if it sees the same antigens again it can mount a very quick and effective response. However, if there is a change in antigens, the immune system has to start the process from scratch. This takes time which allows the virus a free reign in the meantime and, depending on the virulence of the virus, may lead to disease.

The confusion and frustration referred to above is partly caused by the ability of the flu viruses to mutate. This leads to changes in their genetic material and, possibly, the nature of their antigens. There are two main mechanisms. RNA, the genetic code of influenza viruses (rather than the DNA of the vast majority of living organisms) undergoes frequent random mutations. The majority of these are harmless, but very occasionally a mutation will change the antigens very slightly so that the virus presents to the immune system mildly disguised. This is the process of antigenic drift, a gradual change in appearance which usually leads to mild disease before the immune system adapts.

Antigenic shift occurs when two different strains of flu virus meet in the same host animal. If the timing and conditions are right, the replicating viruses can accidentally "swap" genetic material, resulting in a brand new strain. It is this kind of dramatic change in RNA that tends to result in epidemics and is likely to have been behind the emergence of "swine flu", known in scientific circles as pH1N1. The "H" and the "N" refer to antigens on the virus particle whose variants have been determined and identified by a number (eg: H1N1, H3N2) while the "p" in this case stands for "pandemic" to distinguish it from other H1N1 strains.

Diagnosis - Chasing a moving target

The variation in strains can lead to, among other things, a variability in clinical signs which makes flu difficult to diagnose by observation alone. In a finisher herd these signs can vary from an occasional cough to widespread coughing and sneezing with discharges from the eyes and nose. In the breeding herd there may be a range of fertility problems from a failure to conceive through to late abortions, although the virus may also pass through almost un-noticed.

The flu viruses tend to have a very short period of activity in individual animals. The damage they cause in the airways may lead to coughing for several weeks, but the period during which the virus can be detected on nasal swabs is no more than five days. Therefore, veterinary involvement in a suspected flu outbreak needs to be prompt if a diagnosis is to be made by the swabbing method.

The same applies to serological testing for it to be definitive. Blood samples must be taken at the start of a clinical outbreak so that rising antibody levels can be picked up by repeat sampling 2-3 weeks later. This is known as paired serology. Antibodies to flu persist in the pig for several months, so a single positive test does not guarantee that flu is the cause of a current problem.

Historically our diagnoses of flu in pigs have tended to be based on clinical suspicion because of the cost of testing and the lack of an effective treatment, with the result that you could spend a lot of money proving you had flu but were unable to do much about it. However, cheaper tests are now available, such as the subsidised Animal Health and Veterinary Laboratories Agency (AHVLA) nasal swab PCR test and an ELISA-A serological test, both of which we have used widely in our practice over the last year or so. The results of our testing, particularly on blood, suggest that flu viruses are even more prevalent in pigs than we previously thought, with the vast majority of farms screened showing positive antibody titres.

Transmission

Further confusion arises from the method of spread of the virus. As vets on the ground we often see cases of flu on farms where airborne transmission appears to be the only possible source of infection. Scientists, however, tell us that flu can only be transmitted from pig to pig across a few metres and that most transmission is via people or objects. This is consistent with medical advice during the pH1N1 outbreak that hand-washing was essential prevent the spread of flu within the human population, and suggests that good biosecurity will keep pig units flu-free.

Treatment

Although viruses remain frustratingly immune to practical antimicrobial therapies (eg: antibiotics), vaccines to protect against flu in pigs are now available in the UK. “Gripovac 3” is fully licensed in this country, while “Flusure Pandemic” can be imported under licence from the USA. The former contains three strains (H1N1, H1N2 and H3N2) while the latter contains pH1N1. It is obviously preferable to vaccinate with a strain to which you are likely to be exposed, but this is difficult to predict. The strains found circulating recently in the UK by the

AHVLA scanning surveillance programme are H1N2 and pH1N1, so the toss of a coin may be as good a way as any to decide which vaccine to use! Having said that, before Flusure became available we had apparent success with Gripovac on farms that were subsequently shown to have been infected with the pH1N1 strain.

To complicate matters further, significant H3N2 titres have been found in UK pig blood samples in the last few months although the virus itself has not been identified in pigs by the AHVLA for over 15 years. This is believed to be a cross reaction and investigations are on-going, but the strain is found in pigs in Europe and has been increasingly prevalent in the human population of the UK over recent years.

Even if the strain is identified and a suitable product is available, bear in mind that vaccination does not give direct protection against disease – it merely primes the immune system which must be fully functional to achieve the best effect. Antibiotics are often prescribed in cases of flu despite their ineffectiveness against viruses. This is to treat or guard against secondary bacterial infections which frequently arise because of viral damage to the lining of the airways. Anti-inflammatory drugs can also help to improve the demeanour of infected pigs but do not necessarily affect the long-term outcome.

Latest Developments

Worryingly for the UK pig industry it may be that the issue of different strains is about to become even more complex. In the USA there are certain groups of flu viruses that show a much greater level of diversity than we have been used to in this country. It is normal practice in certain regions of the USA to manufacture autogenous flu vaccines. These are vaccines made for individual farms from an influenza virus isolate from that particular farm. This type of vaccine is necessary because commercial vaccines based on just a few standard strains do not confer full protection against the farm strain.

These diverse strains are derived from the group of viruses that includes pH1N1, which had not been seen in the UK prior to the 2009 “swine flu” outbreak. Now this strain is present in the UK, it is possible that strain diversity will increase massively, and we may end up with a situation like PRRS virus currently where vaccine development cannot keep pace with the natural development of the virus.

Final thoughts

In some ways, the subject of influenza in pigs was a much more straightforward proposition a few years ago with less knowledge and no treatment. It seems the more we learn of it the more complicated it becomes, and the more options we have the greater the pressure to take the right ones.