

ADVISORY COMMITTEE ON DANGEROUS PATHOGENS

Avian influenza in pigs

Background

- Pigs are considered an important host in influenza virus ecology since they are susceptible to infection with both avian and human influenza A viruses. Susceptibility to infection with most if not all virus subtypes has been demonstrated experimentally
- Pigs serve as a major reservoirs of H1N1, H3N2 and H1N2 influenza viruses that are endemic in pig populations worldwide
- The maintenance of these viruses in pigs and the regular exchange of viruses between pigs and other species is facilitated directly by swine husbandry practices which provide for a continual supply of susceptible pigs that have regular contact with other species particularly humans
- Increasingly farming at the global level of mixed species including pigs has been shown to present an increased risk for the transmission of novel viruses for pigs
- Influenza A viruses emerge or modifications to existing strains can occur by one of three mechanisms: interspecies transmission of virus; antigenic change or drift in the major viral antigens through mutation; and by genetic re-assortment that occurs when two influenza viruses co-infect the same host.
- All three mechanisms have occurred naturally in pigs in Europe resulting in the emergence of 'new' influenza viruses that have contributed to changes in the epizootiology of swine influenza
- Following transmission to, and independent spread of avian or human influenza A viruses in pigs, these viruses are generally referred to as 'avian-like' swine or 'human-like' swine, reflecting their previous host, and following genetic re-assortment with other influenza A viruses, some of the genes of these viruses may be maintained in the resulting progeny viruses
- There are significant variations in virus epidemiology in different continents and regions together with approaches to swine husbandry and disease control

Epidemiology

- Currently influenza A viruses of H1N1, H3N2 and H1N2 subtypes are endemic in European pig populations with some regional variations in distribution and prevalence
- Serosurveillance results in Great Britain indicated that more than half of adult pigs in the national population had been infected with one or more influenza A viruses during their lifetime
- Since 1979 the dominant H1N1 viruses in European pigs have been 'avian-like' H1N1 viruses that became established in European pig populations following the transmission of virus from the avian 'reservoir'
- More recently H1N2 influenza viruses derived from a multiple reassortant event over a number of years involving human H1N1, 'human-like' swine H3N2 and 'avian-like swine' H1N1 emerged in GB and spread subsequently to pigs on the European mainland
- Locally in many parts of Europe 'swine adapted' human H3N2 viruses still circulate widely. The progenitor viruses were derived from human influenza strains and crossed to pigs in the early 1970's

- Pigs infected with human H1N1 or H3N2 influenza virus readily develop specific antibodies to these viruses. As a result the transmission of human influenza viruses to pigs has been studied widely and monitored using serosurveillance methods.
- However, it has been shown that pigs infected with some avian influenza viruses may not always produce a detectable antibody response due to the resulting transient infection inducing no or low levels of humoral antibody.
- Surveillance in pigs needs to focus on active virus circulation to provide virus that can be studied with respect to host range, pathogenesis and potential for interspecies transmission
- It would appear that following transmission of avian or human viruses to pigs the adaptive processes can take many years before stable lineages are established (as occurred following transmission of both avian H1N1 and human H3N2 viruses to pigs)
- There is no definitive evidence supporting the establishment of H5N1 HPAI virus in pig populations.
- The transmission of avian viruses to pigs *in-toto* that leads to the virus becoming established in pigs and therefore presenting a higher risk to human health, is very rare

Zoonotic infections

- Occasionally influenza viruses transmit from pigs to humans especially those who are occupationally exposed on a regular basis
- Swine influenza viruses apparently lack the capability to transmit human to human, although they can acquire genes through genetic re-assortment that might lead to the production of progeny virus with enhanced transmissibility. No evidence is available from naturally occurring viruses for this phenomena.
- Even though the pig has been cited as an 'influenza mixing vessel' there is no evidence supporting involvement of pigs in the emergence of the last three pandemic viruses.

Surveillance of UK pig populations for influenza viruses

- Formal programme funded by Defra since 1995
- Determination of influenza A subtypes and antigenic/genetic variants present in the national pig population
- Contribute information to EU network (ESNIP) in support of swine influenza surveillance
- Provide information to the public health sector on influenza A viruses from pigs which may pose a threat to human health
- Passive surveillance programme based upon clinical case definition of acute respiratory disease. Materials submitted via the VLA regional laboratory network in collaboration with private practitioners. Target 100 case submissions annually.
- Since 1998 'avian-like' swine H1N1 and swine H1N2 viruses have co-circulated. A total of 53 viruses have been isolated in the period 2002-2006 representing 8.8% case positivity rate. Seasonal and annual distribution data will be presented at the meeting.
- **There is no evidence for the spread of other influenza viruses from avian species to pigs through this programme**

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