



SCIENTIFIC OPINION ON THE PANDEMIC (H1N1) 2009 INFLUENZA VIRUS IN ANIMALS

Per Have

SCoFCAH April 04, 2011

Timeline

Date	Event
2009	
April	First human cases recorded
2 May	First cases in pigs notified in Canada
9 June	SANCO-ECDC-EFSA brainstorming meeting
30 October	Conference: Influenza at the human-animal interface
13 November	Mandate to EFSA
2010	
9 September	Adoption of EFSA opinion on animal health aspects
2011	
24 February	Adoption of EFSA opinion on emerging strains

- Nine questions (Terms of Reference)
 - 6 addressing significance for animal health
 - 3 addressing significance for development of new strains with pandemic potential from animal influenza viruses or their gene pool

SCIENTIFIC OPINION ON THE PANDEMIC (H1N1) 2009 INFLUENZA VIRUS IN ANIMALS

ToR 1: question

- To assess the significance for the health of animals of different species (specially pigs and different poultry species) of the occurrence of pandemic (H1N1) 2009 influenza virus in the EU and elsewhere

- Field observations
 - Pig herds (clinical disease, from May 2009 onwards)
 - Breeder turkeys (drop in egg production)
 - Carnivores (dogs, cats)
- Experimental studies
 - 6 published studies in pigs

ToR 1: conclusions - pigs

- The impact of pH1N1 virus for the overall health of the EU pig population is considered minimal.
- Pigs in the field have been infected subsequent to exposure to pH1N1 virus infected humans.
- In field infections, a subclinical course was very common; when clinical signs were seen they were generally mild.
- Pig passages with the pH1N1 virus have occurred but no increase in virulence of the virus has been observed.
- The potential zoonotic risk of pH1N1 infected pigs has not been documented, but cannot be excluded

ToR 1: conclusions - poultry

- In poultry, outbreaks of pH1N1 have been reported only in turkeys specifically in breeder flocks.
- Turkeys, chickens and ducks are refractory to experimental infections with pH1N1 virus via the respiratory tract
- Turkeys can be infected experimentally with pH1N1 virus by the intrauterine and intracloacal route
- The most likely cause of outbreaks in turkey breeder flocks is transmission of pH1N1 virus from infected poultry workers carrying out artificial insemination.
- Drop in egg production and decreased shell quality is the main clinical sign of pH1N1 virus infection of turkeys.
- Awareness should be raised about the risk of infecting breeder turkeys with pH1N1 virus during artificial insemination. Specific guidelines should be developed to lower the risk of transmission.

ToR 2. Virus evolution - question

- To assess the implications and consequences of the possible evolution of the pH1N1 virus on animal health

ToR 2. Virus evolution - evidence

- Very limited evidence available from monitoring in pigs.
- Until the time of writing, the virus has remained stable without any significant evolution

ToR 2. Virus evolution - conclusions

- pH1N1 has not changed its behavior and based on previous spread of pandemic virus to pigs, if pH1N1 continues to circulate in pigs, divergent evolution in pigs compared to those viruses in humans appears likely, and there is no evidence that this will lead to the emergence of more virulent or zoonotic viruses
- Monitoring of circulating influenza viruses in swine and poultry populations should be instigated to establish baseline data from which evolution of the pH1N1 virus including changes in virulence etc can be assessed

ToR 3. Control options - question

- To assess the effectiveness and efficiency of disease control options such as establishing animal movement restrictions in protection and surveillance zones, culling of infected pig herds and contact herds for pH1N1virus , as it is common practice for other notifiable diseases, e.g. CSF, AI, FMD

ToR 3. Control options - evidence

- Epidemiology and modes of transmission
- Diagnostic performance
- Applicable control measures
- Evaluation by cross-tabulation of outcome of measures as applied at different diagnostic stages

ToR 3. Control options - conclusions

- Measures similar to those implemented for control of highly contagious animal diseases that induce severe losses (such as CSF, FMD and AI) were considered disproportionate at the time of this report.
- From the animal health point of view no specific measures are considered necessary at all.
- Place strong emphasis on information to (a) increase disease awareness and (b) to ensure that general hygiene measures are implemented to reduce potential spread of pH1N within and between animal units but also from humans to animals and back

ToR 4. Transmission - question

- To assess the risk that animals from a herd/flock which was infected with pandemic (H1N1) 2009 influenza virus spread the virus after the last clinical signs of disease have been observed

- Limited evidence from experimental studies
 - Clinical signs
 - Virus shedding
 - Time course
 - Subclinical infection

ToR 4. Transmission - conclusions

- The exploitation of clinical signs as temporal proxy for termination of virus excretion within an infected epidemiological unit is not valuable in both pigs and poultry
- In both species the duration of virus excretion is not consistently associated with the expression of clinical signs
- It is recommended not to use clinical signs as a basis to decide on the end of an infection with pH1N1 virus in an infected herd/flock
- In case of an urgent need for reducing spread of infection by animal movement from herds known to have been infected, it is recommended to test a number of nasal/pharyngeal or cloacal swabs for pH1N1 virus by PCR to prove absence of circulating virus

ToR 5. Vaccination - question

- To assess the possibility, efficacy and efficiency of vaccination, using existing vaccines or newly developed vaccines against pH1N1 virus, in pig and poultry populations, also in relation with possible evolution of variants of influenza viruses posing a serious risk to public and animal health

- Existing vaccines
 - Cross-protection studies
 - Only available from US
 - Cross-titration of post-vaccination sera
 - Estimates of field level seropositivity against pH1N1
- New vaccines with homologous pH1N1 strain
 - One vaccine available in US
 - Vaccines under development in Europe

ToR 5. Vaccination – conclusions, pigs

- Immunity resulting from vaccination with existing SIV vaccines on the European market will provide some extent of cross-protection against infection with the pH1N1 influenza virus, but specific pH1N1 vaccines will offer a superior protection
- Cross-infection studies with the well-known endemic SIVs indicate that prior infection with these viruses will confer some cross-protection against infection with the pandemic virus
- At present the epidemiological situation of pH1N1 in pig does not justify vaccination of pigs with pH1N1 vaccine. Vaccination on a voluntary basis will likely protect the vaccinated animals, but it will not prevent the spread of the pandemic H1N1 virus in swine populations
- Compulsory vaccination cannot be justified, because of the mild course of the infection and disease. Similarly, emergency vaccination cannot be justified
- There is no urgency for vaccination of pigs against pH1N1 virus. It could be useful, however, to have a specific vaccine, based on the pH1N1 virus

ToR 5. Vaccination – conclusions, poultry

- Breeder turkeys are the only poultry that may justify the development of a specific pH1N1 vaccine.
- Currently, no vaccines against H1 viruses for poultry are available.
- At present, there is no need to vaccinate poultry against pH1N1 virus

ToR 6. Wildlife - question

- To assess the role of wildlife, in particular wild boar and wild birds in the epidemiology of pandemic (H1N1) 2009 influenza virus, if any

ToR 6. Wildlife - evidence

- Monitoring and surveillance in wild birds
- Only very few observations from wild mammalian species and pets
 - No evidence from wild boar

ToR 6. Wildlife - conclusions

- No pH1N1 virus infections have been reported in wild boar. Although expected to be susceptible for pH1N1 they are not expected to play any epidemiological role
- To date no infection with pH1N1 virus of wild birds have been reported despite the many surveillance programmes on influenza viruses that are conducted in wild birds in particular since the start of H5N1 epidemic in poultry in 2004
- Mammalian viruses (human, swine, equine) have never been detected in wild bird surveillance

Scientific Opinion on monitoring for the emergence of possible new pandemic strains of influenza in animals

ToR 1-3. determining factors, monitoring, predicting emerging strains

1. To indicate the most important factors to be monitored in animals that would suggest a risk of emergence of a new pandemic influenza strain
2. to assess possible options of monitoring for the presence of the most important factors that would suggest a risk of emergence of influenza viruses in different animal populations
3. assess the possible predictability of the emergence of a new pandemic influenza strain by monitoring the molecular evolution of influenza viruses in different animal populations

- Transmissibility
 - Cellular receptors (α 2-3 or α 2-6 sialic acid linkage)
- Animal model – ferret
 - Transmissibility to and between humans
 - Pathogenicity
- Molecular markers
 - receptor binding, host and tissue tropism, virulence, modulation immune response, efficiency of replication and transmission
- Reassortment
- Phylogenetics

- Past experience has shown that reassortment events involving inter-species transmission are necessary steps in the evolution of new pandemic strains
- Recent findings show that not only pigs but also man and some gallinaceous avian species express both $\alpha 2-3$ and $\alpha 2-6$ linked receptors (mixing vessel)

- Avian influenza viruses have played a role in the generation of the known human pandemic viruses, as in all instances at least one out of eight segments was donated by an avian virus
- Routine monitoring of poultry and wild birds for AIV subtypes, other than H5 and H7, is not mandatory and, consequently, knowledge on viruses such as H1, H2, and H3 is rather scarce

- It appears that there is insufficient coordination between medical and veterinary diagnostic systems in Europe to support the routine detection of swine or avian influenza viruses infecting humans
- It is very likely that there is an incomplete view of the influenza virus strains circulating among pigs globally, although in Europe consistent information about circulating strains has been obtained through the ESNIP projects

- No single genetic marker or genetic constellation can be reliably associated with increased pathogenicity or transmissibility of influenza virus strains in mammals and cannot therefore be used to identify an emerging problem
- With the current state of knowledge, new reassortants of public health significance are more likely to be detected by monitoring human samples. Nevertheless, interpretation of the origins and pandemic potential would require knowledge of the influenza gene pools in both pigs and birds