DISCONTOOLS

Swine Influenza
Summary

Introduction

1. This note provides a brief summary of the Disease and Product analysis prepared by a DISCONTOOLS group of experts on Swine Influenza (SI). They reviewed the current knowledge on the disease, considered the existing disease control tools, identified current gaps in the availability and quality of the control tools and finally determined the research necessary to develop new or improved tools. Full details are available on the web site at http://www.discontools.eu/ and can be downloaded by selecting Disease Database, then the specific disease and highlighting the variables of interest. This is completed by selecting "create a report" which can then be downloaded as either a PDF or Excel spread sheet.

Disease profile

2. Like all influenza viruses, Swine Influenza viruses (SIV) are a genetically unstable as they undergo antigenic "drift" and "shift". Antigenic drift involves the gradual accumulation of small mutations in the virus genome, especially in the genes encoding HA and/or NA. This may result in subtle antigenic changes, leading to decreased recognition of the virus by the immune system and thus a greater chance for an influenza epidemic. Most SIVs are a result of genetic reassortment and they contain a mix of human and/or avian and/or swine virus genes. Pigs have been shown to be susceptible to influenza A viruses of a wide range of H and N subtypes, but only H1N1, H1N2 and H3N2 viruses have maintained themselves in the swine population. The swine viruses differ from their human counterparts at the antigenic and genetic level, because they followed a different evolutionary course after their introduction in pigs. The origin and nature of SIVs also differ on different continents. They are usually endemic becoming epizootic only when a new strain appears and very soon this becomes endemic. SIV circulates all year-round

3. In many cases the disease may be sub-clinical due to previous exposure/immunity but in most cases there is a sudden onset. Clinical signs result from direct respiratory cell damage by the virus and, most importantly, from an extensive production of pro-inflammatory cytokines during the very acute stage of infection. Clinical signs are very similar to the symptoms observed in humans and include a rapid onset of high fever, dullness, loss of appetite, laboured abdominal breathing and coughing. A considerable weight loss can be observed. Morbidity is high (even up to 100%), but mortality is usually low (<1%) unless in very young animals and/or when there are concurrent infections. Recovery generally occurs within 7 to 10 days and is as sudden as the onset of disease

Risk

4. A large body of evidence clearly demonstrates that transmission of SIVs to humans can occur. It is important to note that transmission of SIVs to a human being per se is not sufficient to result in a pandemic. So far, most SIVs that are transmitted from pig to human did not become established in the human population. Approximately 70 proven cases of SIV infection have been reported in humans since 1958. Most of these people had occupational contact with pigs. None of the SIVs was able to transmit from human-to-human. Serological data suggest a higher frequency of infection, especially in pig farmers and veterinarians. The likelihood of spread for an SIV in the human population is rare as the virus needs considerable changes to become adapted to humans. What changes are required, when they occur and how frequent they occur is largely unknown. However, the novel 2009 H1N1 pandemic virus clearly obtained the capacity for human-to-human spread and did become established in the human population. An important requirement is the continual monitoring of the virus and its zoonotic or reverse zoonotic potential but unfortunately the surveillance of the pig populations worldwide has not changed a lot, despite the outbreak of H1N1. The main reason is the lack of logistics to perform extensive surveillance.

Diagnostics

5. Diagnosis is by clinical signs, post-mortem examination, and histopathology especially with immuno-histochemistry. Virus isolation is usually in eggs, but occasionally strains are found which do not grow in eggs and tissue cell lines are used. Continual surveillance of the molecular characteristics of the virus is very important as they change by antigenic drift, shift or species transfer and this is the starting position for strain typing and genetic analysis.

6. Infection with SIV induces a rapid and efficient immune response, which results in complete elimination of the virus within a week and a solid protection against reinfection. The specific immune response to SIV includes the production of antibodies in the circulation and at the mucosae of the respiratory tract, as well as a cell-mediated immune (CMI) response. Serological testing relies on the HI test. Other tests have been used but are not commonly carried out by labs with the exception of commercial ELISA kits which are currently available. Antigen ELISAs are not swine-specific and can be used for all influenza A viruses. The antibody ELISA is swine-specific.

Vaccines

7. A variety of vaccines, usually adjuvanted and using endemic strains in the country of use are available. Currently available vaccines for swine seem to be highly efficient and efficacious although the oil-adjuvanted vaccines provide a broader protection than those with other adjuvants. The following vaccines are currently available: Bivalent (H1N1 + H3N2) and Trivalent (H1N1 + H3N2 + H1N2). At this stage it does not seem warranted to change the vaccine virus at a high frequency (e.g. every year), as is done in humans. Other vaccines such as DNA, sub-unit, recombinant, adenovirus and live vaccines have been tried experimentally but are not commercially available. Whilst there is good potential for vaccines most farmers are aware that if they practice good husbandry the losses from swine flu are usually minimal and may not justify the cost of a vaccination policy

Pharmaceuticals

8. No antivirals are available at present. Support therapy and antimicrobial treatment may be necessary if the pigs are severely ill

Knowledge

9. What factors determine whether an SIV will jump from pig to human is largely unknown. Moreover, transmission of SIVs to a human being per se is not sufficient to result in a pandemic. So far, most SIVs that are transmitted from pig to human did not become established in the human population. Recent evidence clearly shows that the species barrier for an SIV to jump to humans is much stronger than previously suspected. It is unclear why certain SIV, like the novel 2009 H1N1 pandemic virus, subsequently obtain the capacity for human-to-human spread. An SIV needs considerable changes to become adapted to humans. What changes are required, when they occur and how frequent they occur is largely unknown.

Conclusions

10. At the moment the disease is a self-limiting disease of pigs which causes minimal clinical problems and usually resolves without problems unless there are concurrent or predisposing factors.