DISCONTOOLS

Swine Mycoplasmosis
Summary

Introduction

1. This note provides a brief summary of the Disease and Product analysis prepared by a DISCONTOOLS group of experts on Swine Mycoplasmosis (SM) caused by Mycoplasma species. 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. Mycoplasmosis is a term frequently used to denote enzootic pneumonia of pigs, but could in fact refer to disease caused by three species of *Mycoplasma*, i.e. *M. hyopneumoniae*, *M. hyorhinis* and *M. hyosynoviae*. The impact of *M. flocculare* and *M. hyopharyngis* also found in pigs is not clear. Mycoplasmas may have various antigenic forms although these have never been formally classified. *M. hyopneumoniae* is the primary causative agent of enzootic pneumonia, which is historically one of the most common chronic respiratory diseases of swine. *M. hyorhinis* can cause polyserositis, arthritis, pneumonia and otitis media in piglets, while *M. hyosynoviae* can cause arthritis in fattening pigs. Among the three species *M. hyopneumoniae* is economically the most important and the most studied. Infections are found primarily in domestic pigs although wild boar and feral pigs can be infected. For *M. hyopneumoniae* infection, the mortality is low in uncomplicated infections (<5%). If complicated by infections with other respiratory pathogens, it may cause significant mortality. Mortality is also low for *M. hyorhinis* and *M. hyosynoviae* infections.

3. The mycoplasmas are found worldwide and are endemic with no evidence of epizootic strains. Switzerland eradicated *M. hyopneumoniae* during 1996-1999. Re-infections took place in the years after eradication and could be assigned to specific risk factors. The disease is easily transmitted by direct contact with factors such as transmission and dynamics of the disease include stock density, housing styles, ventilation and climatic condition all influencing the spread of the organisms. Transmission of *M. hyopneumoniae*, *M. hyorhinis* and *M. hyosynoviae* in field conditions occurs most commonly via direct contact with carrier animal. In many herds the transmission chain starts by sow-to-pig exposure. Subsequently the infection is spread between pen mates. Groups of pigs can be infected at mixing and moving and particularly at weaning. Next to nose-to-nose contacts and infection by droplets from sneezing and coughing, mycoplasma can also be transferred by bio-aerosols and airborne transmission between infected pig herds.

Risk

4. There are no known risks to human health. In many pig herds, the majority of antimicrobials are used against respiratory disease, in which *M hyopneumoniae* is often involved. Antimicrobial medication could be significantly reduced if *M. hyopneumoniae* infections were eliminated and absent.

Diagnostics

5. The diagnosis is made from the clinical history, post mortem appearance, histopathology and confirmatory laboratory tests. These include culture of fresh tissue using immunohistochemistry on fixed tissues, immunofluorescence on smears and frozen sections, and conventional and quantitative real-time PCR. Routine sampling methods for PCR testing include nasal and tracheobronchial swabs and bronchoalveolar lavage fluid. Antigen and antibody ELISAs have also been described. Many commercial diagnostic kits are available worldwide but there are no kits for *M. hyorhinis* and *M. hyosynoviae*. Pen side tests for antigen and antibody and use on non-invasive procedures *e.g.* saliva or nasal swabs would be of value. A combination of quantifying clinical signs and serological diagnostics is supportive for diagnosis in the field.
Diagnostic assays for clinical disease caused by *M. hyorhinis* and *M. hyosynoviae* need to be further developed. PCR tests are available.

November 2016

Vaccines

6. A number of vaccines have been developed for *M. hyopneumoniae*. These include killed organisms or extracts, with adjuvants. In a few countries, attenuated vaccines are available. Experimentally, intradermal, sub-unit vaccines, vector vaccines, DNA vaccines and live attenuated vaccines have also been produced. Most appear effective as they reduce clinical symptoms, lung lesions and production losses. Vaccination alone is not sufficient to eliminate the organism from a herd as vaccines are not able to prevent colonization or to significantly limit transmission of the pathogen. There are no licensed vaccines for *M. hyorhinis* or *M. hyosynoviae*. The development of improved vaccines for *M. hyopneumoniae* and effective vaccines for *M. hyorhinis* and *M. hyosynoviae* will be of value. In addition, new vaccines and/or vaccination strategies need to be investigated. Cell-mediated and likely also mucosal immunity are important for protection but more difficult to assess, while humoral immunity is easily accessible but without correlation for protection. Maternally derived antibodies last 3 to 8 weeks, depending on the initial titre. They may decrease but not eliminate the risk of colonization of piglets with *M. hyopneumoniae*.

Pharmaceuticals

7. Many different antimicrobials have shown to be effective including tetracyclines, macrolides, lincosamides, florfenicol, pleuromutilins, fluoroquinolones. Acquired antimicrobial resistance, mainly against fluoroquinoles and macrolides-lincosamides has been described but so far this is not yet a problem in practice. Medication has been widely used. There is a need for improved use of antibiotics to minimize potential for the development of resistance in target mycoplasmas. Improved treatment strategies are also required for minimizing clinical disease due to *M. hyorhinis* and *M. hyosynoviae*. Vaccination is typically preferable to treatment with antibiotics provided this is effective.

Knowledge

8. There remain significant areas of uncertainty in the understanding and knowledge about the mycoplasmas infecting swine. These relate to genetics, pathogenesis, immunology, vaccinology, epidemiology and control. There is a lack of knowledge about i) the virulence factors and mechanisms in all three mycoplasmas and ii) the protective immune responses against *M. hyopneumoniae.* A better understanding of genetics would enable the development of improved vaccines, diagnostics and control strategies. Continued molecular improvements and knowledge of the mycoplasma genome will also be important to understand the way in which they can regulate the immune response or avoid it. In addition, the relationships between the bacterial, viral and mycoplasma infections have not been fully elucidated. There is no information on the economic impact of *M. hyorhinis* and *M. hyosynoviae* infection.

Conclusions

9. *M. hyopneumoniae* eradication has been achieved by different strategies. Partial depopulation of all animals younger than 10 months combined with antimicrobial treatment has been shown successful, especially in smaller herds. There is always a risk for re-infection, especially in pig dense areas, after having obtained *M. hyopneumoniae*-free status. The main obstacle is the failure of farmers to adopt a strict all in /all out policy by age with proper cleaning and disinfection, drying and repopulation with disease free stock. Also more emphasis should be placed on proper housing, management and biosecurity and/or vaccines.