

Ovine chlamydiosis (*C. abortus*) Summary

Introduction

1. This note provides a brief summary of an analysis undertaken by a DISCONTTOOLS group of experts on ovine chlamydiosis, specifically caused by the Gram-negative obligate intracellular bacterial pathogen *Chlamydia abortus*. Full details can be downloaded from the web site at <http://www.discontools.eu/>

Disease profile

2. *Chlamydia abortus* (*C. abortus*) is a major cause of abortion and foetal loss in sheep and goats, causing considerable losses in most small ruminant-rearing countries worldwide. Other animal species susceptible to chlamydial abortion include cattle, pigs, horses and several wild/domesticated ruminants. The pathogen has also been detected in avian species, which has recently resulted in a proposal to include such strains in a new avian subtype. The disease it causes is variously referred to as Enzootic Abortion of Ewes (EAE), Ovine Enzootic Abortion (OEA), ovine chlamydiosis and chlamydial abortion.
3. Clinical signs are primarily associated with outbreaks of abortions (enzootic abortion) in sheep and goats in the last month of pregnancy. In cattle, abortions tend to be sporadic, usually occurring near or at term. Asymptomatic carrier animals persistently-infected with *C. abortus* are the main reservoir. Ewes (female sheep) can remain persistently infected after the initial abortion and can excrete the organism. Abortion storms can occur in sheep flocks following the introduction of infected ewes and abortion may occur in up to 30% of the ewes. In goat herds, as many as 60-90% of pregnant animals may abort.
4. *C. abortus* is mainly excreted on the coats of dead lambs, infected placentas and post-abortion uterine discharges, all representing the major sources for transmission. The pathogen can also be excreted in the faeces of aborting animals. Most infections occur by ingestion following contact with contaminated material or via aerosol transmission. Infection is not thought to be spread through sexual contact. The organism is relatively stable in the environment and can survive for long periods in near-freezing temperatures and for several days under temperate climatic conditions.

Risk

5. *C. abortus* is a zoonosis but reports of human cases are relatively rare, possibly due to under reporting as infection in humans is not notifiable in all countries. Abortion and severe illness can occur in pregnant women. In non-pregnant humans, an influenza-like respiratory illness has been reported on a number of occasions. The risk to humans is mainly limited to pregnant women and immunocompromised individuals who have contact with *C. abortus* through infected pregnant sheep or goats, especially during the lambing or kidding season. As *C. abortus* is a particular risk to pregnant women, they should avoid all involvement with lambing/kidding animals and should avoid contact with all potential sources of infection, including contaminated clothing from those working with these animals. Immunocompromised or immuno-suppressed individuals should also avoid contact with potential sources of *C. abortus* infection.

Diagnostics

6. A number of different types of tests exist for the detection of antibodies, including the complement fixation test (although the test is not *C. abortus*-specific and now considered outdated) and ELISAs. Antigen detection tests including ELISA and immunofluorescent antibody tests are available but lack sensitivity and specificity. Various PCR and microarray assays have been developed for detection of the *C. abortus* genome. Preliminary identification of the agent can be made by examination of stained smears from affected placental cotyledons and/or stomach contents of aborted fetuses, prior to confirmation by PCR. The current gold standard test is detection of pathogen DNA in cotyledons, foetal



stomach contents or vaginal swabs using a *C. abortus*-specific PCR. Other confirmatory methods include isolation of *C. abortus* in embryonated chicken eggs or in cell culture, although these methods require specialist facilities.

7. Serology can be useful for acute clinical disease confirmation on an individual animal basis for sheep and goats, as well as for general flock/herd screening. Detecting the presence of subclinical *C. abortus* infection in non-pregnant sheep is currently very difficult. Current serological tests do not detect persistently-infected animals.
8. Molecular tests have been developed that distinguish vaccinated from naturally infected animals (DIVA). Currently, there are no serological DIVA tests.

Vaccines

9. Inactivated and live vaccines are available for use in sheep and goats but not for use in cattle. Interestingly, recent evidence shows no genetic basis for any attenuation in the live vaccines, which have been shown to cause disease in some animals. The incidence and severity of abortions in ruminants can be reduced by the use of vaccines but at present these do not confer complete protective immunity and do not completely prevent shedding at parturition. Vaccination will not eradicate infection from a flock but does have an important role in reducing the incidence of abortion and shedding, thus reducing potential transmission to naïve animals. However, due to the evidence that the live vaccines can cause disease in some animals, there is a requirement for safer, more stable and cheaper alternative commercialized vaccines. These will likely be based on recombinant protein technology, as multi-component vaccines.

Pharmaceuticals

10. Long acting tetracycline's given at the correct time and dose will reduce the severity of infections and prevent abortions although *C. abortus* may still be shed at birth. Antibiotic treatment has been considered as the most practical measure for control of disease in cattle, where the abortions are more sporadic. However, there are general concerns with the overuse of antibiotics in farming due to antimicrobial resistance and which has been observed for another chlamydial species (*Chlamydia suis*) that infects pigs. However, there may be a potential market for pharmaceuticals which could eliminate the pathogen from individual persistently-infected animals.

Knowledge

11. There are gaps in knowledge concerning the transmission of infection. The role, if any, of wild-life species, such as rabbits as reservoirs or of ticks as vectors of infection is unknown. Definitive information concerning the infectious dose and how long the microorganisms are viable in fluids and placenta is lacking. More studies need to be done on the stability of the organism in the environment and the effect of weather and temperature, as this is important with regards to risk of transmission and period of viability. A greater knowledge of pathogenesis in species other than sheep, including goats, cattle, pigs and horses is required.
12. A better understanding is needed of the immune response of sheep and other ruminant species and pigs to infection and to existing commercial vaccines, in particular with regard to those elements of the specific immune response that are protective.

Conclusions

13. *C. abortus* is one of the most important causes of abortion in sheep and goats in many parts of the world. It can also cause abortion and severe illness in humans but reports are relatively rare, possibly due to under reporting.
14. Vaccines for small ruminants are available but improved vaccines which are cheaper to produce, prevent shedding, give 100% immunity and do not cause disease are needed. Better diagnostic tools are required especially to identify persistently-infected animals and to differentiate naturally infected from vaccinated animals.