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Animal Health Fact Sheet

INFECTIOUS REPRODUCTIVE DISEASES OF SMALL RUMINANTS

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INTRODUCTION

Several diseases which infect small ruminants result in abortion or reduced fertility and some may also infect humans (zoonotic diseases). Each of the diseases listed below will be briefly outlined. Those marked with an asterisk (*) may also cause human disease.

Akabane Disease
Bluetongue Disease
Border Disease (Hairy Shaker)
* Brucellosis
Cache Valley Virus
* Campylobacter (vibrio)
* Enzootic (Chlamydial) Abortion
Flagellated bacterium (Flexispira rappini)
* Leptospirosis
* Listeriosis (see the October 1999 International Animal Health News)
* Q fever
* Rift Valley Fever
* Salmonella
Tick Borne Fever
* Toxoplasmosis
* Wesselsbron Disease

The diseases that most commonly cause abortion of sheep in the U.S. are Campylobacter and Enzootic Abortion. But, the cause may vary greatly depending on the area and management systems used.

AKABANE DISEASE

Causative Agent:
- Viral agent affecting sheep, cattle or goats during gestation.
- Has been identified in Australia, Israel, Japan and Kenya.

Disease Signs:
- Abortion, stillbirth, premature birth, mummified fetuses and various deformities of joints, spine and brain (arthrogryposis and hydranencephaly - A-H). The timing of infection in relation to gestation is a major influence on clinical effects.
- Fever and viremia in the dam, 1-6 days after infection.

Spread of Agent:
- Arthropod vectors - mosquitoes and gnats

Diagnosis:
- History, lesions and disease pattern are suggestive.
- Virus isolation, immunofluorescence staining of fetal tissues and serologic antibodies.
- Must differentiate from other viral (especially Cache Valley Virus) nutritional, genetic and toxic diseases.

Prevention / Control:
- Vector (mosquito and gnat) control.
- Vaccines have been used in Australia and Japan

Treatment:
- None

Human Effects / Prevention:
- No known effects.

BLUETONGUE DISEASE

Causative Agent:
- Viral agent - 22 strains identified worldwide; 5 of those in U.S.; very little cross-protection between strains.
- The Epizootic Hemorrhagic Disease Virus (EHDV), which affects white-tail deer, is a closely related virus and it may also affect cattle.

Disease Signs:
- Adult cattle show few if any signs.
- Sheep of any age may be affected and will show edema of head and ears as well as erosions of the mucous membranes and skin of the feet.
- Resorption, autolysis or mummification of the conceptus,
- Birth of stillborn, weak, or dummy calves and lambs.
- Nervous system lesions - hydrocephalus; cerebral cysts; other brain lesions.

Spread of Agent:
- Primarily spread by a gnat (Culicoides variipennis) but also by semen from infected bulls and transplacentally.
- This gnat uses breeding sites of fecal-contaminated shallow water, animal and human waste water lagoons, and stagnant water in streams or ponds.

Diagnosis:
- Viral isolation, but only if the fetus was infected in late-term pregnancy.

Precolostral serum from aborted or newborn fetus - for antibodies

Prevention / Control:

Vaccine available in some areas - but little cross protection for other viral strains.

Treatment:

Good nursing care for those ill.

Human Effects / Prevention:

None.

BORDER DISEASE (HAIRY SHAKER LAMBS)

Causative Agent:

Viral agent, closely related to the bovine virus diarrhea virus (BVDV). Affects sheep worldwide.

Disease Signs:

If fetus is exposed during first 90 days of gestation - resorption, abortion, mummified, abo or normal birth (but may be persistently infected and shed to other sheep).

May be born alive but with a "hairy" coat and a trembling of muscles.

If fetus is exposed after 90 days of gestation - normal birth, and usually is not infected.

Spread of Agent:

From carrier animals, especially from those persistently infected, to dam and hence to fetus.

Diagnosis:

Viral isolation from tissues of affected animal.

Prevention / Control:

No vaccine currently approved. None of the cattle vaccines are approved for use in sheep.

Minimize exposure of susceptible, pregnant ewes.

Identify and remove persistently infected.

Treatment:

None effective.

Human Effects / Prevention:

None

BRUCELLOSIS

Causative Agent:

Brucella melitensis - infects goats and sheep; common in many countries; infects man. (The principle cause of human brucellosis.)

B. abortus - infects primarily cattle but can infect sheep and goats; infects man.

B. suis - infects swine; can also infect cattle and man.

B. canis - infects dogs; can infect man, but rarely does.

B. ovis - infects sheep as a major cause of epididymitis in rams; no known effect in man.

Disease Signs:

Abortion in late gestation, retained placenta, perhaps some weak newborn animals.

Spread of Agent:

Oral ingestion of organisms from the fetus, placenta, uterine discharge, or contaminated

feed and water.

Enters through conjunctiva, mucous membranes, wounds and intact skin.

Unpasteurized milk.

Diagnosis:

Culture of organism from fetus, placenta, etc.

Serological tests on animals which abort (or herdmates). Tests can also be conducted on milk or whey.

An intra-eyelid allergy test is available as a screening test that could be used in areas without laboratory access.

Prevention / Control:

Many countries have control programs involving testing and slaughter of infected animals. Some countries have eradicated this disease via these programs.

Vaccines are available and have been successfully used in control programs, until these programs enter the later stages of eradication. Strain 19 and RB51 (for *B. abortus*) have been used in the U.S. and the Rev 1 strain (for *B. melitensis*) is used in many other countries.

Isolate aborting animals.

Clean up and burn the aborted fetus and placenta, contaminated bedding, manure, etc.

Keep all aborted tissues and fluids away from dogs, birds, etc.

Clean and disinfect floors, feedbunks, buildings, equipment, etc.

Use serologic tests to identify infected animals and send to slaughter.

Quarantine herd or area until further serological testing reveals no new cases.

Buy all replacement animals from herds or flocks that have been certified free of brucellosis or have animals tested as serologically negative prior to bringing them into herds or flocks which are free of brucellosis.

Treatment:

No treatment will effectively eliminate the carrier state, in animals.

Human Effects / Prevention:

Names for human form of Brucellosis: Undulant fever, Malta fever, Mediterranean fever, Bang's disease.

Worldwide disease.

Predominantly an occupational disease of those working with infected animals or their carcasses.

Sanitation and wearing of protective gloves will aid in prevention.

Sporadic cases occur among consumers of unpasteurized milk or cheese made from this milk. Provide pasteurization.

Human treatment is with long-term antibiotic use (tetracycline, oxytetracycline, chlortetracycline, cloxycycline, rifampin, etc.).

There is no good vaccine available for human use.

CACHE VALLEY VIRUS

Causative Agent:

Viral agent, known to occur in the U.S.

Disease Signs:

Very similar to Akabane Disease but only known to affect sheep.

Abortion, stillbirth, premature birth, mummified fetuses and various deformities of joints,

spine and brain (arthrogryposis and hydranencephaly - A-H). The timing of infection in relation to gestation is a major influence on clinical effects. If a susceptible ewe is infected at less than 28 days of gestation, the embryo usually dies and is resorbed. If between 28-45 days of pregnancy, the fetus usually develops the A-H syndrome. If infected after 45 days, there are usually no adverse effects.

Ewes infected seldom show any signs of disease and develop a good immunity that persists for several years.

Spread of Agent:

Biting insects - primarily mosquitoes.

Diagnosis:

Characteristic history, lesions and serum antibody titer.

Prevention / Control:

No vaccine available.

Adequate exposure of ewes imported to area, prior to breeding season.

Delay of breeding season until after frost has killed mosquitoes.

Moving of breeding ewes away from mosquito areas and control of mosquitoes.

Treatment:

None

Human Effects / Prevention:

No known effects

CAMPYLOBACTER (VIBRIO)

Causative Agent:

Primarily an abortion problem in sheep but can occasionally affect goats.

Campylobacter fetus subsp. fetus (primary agent)

C. jejuni - common in the digestive tract of dogs; can also cause sheep abortion. This organism is a major cause of human gastroenteritis. It has been found in wild and domestic ruminants, swine, dogs, cats and fowl. Infection results from consumption of contaminated water, food, raw milk and contact with feces of infected animals (especially young animals with diarrhea).

Disease Signs:

Abortions and stillbirths in late term pregnancy.

Fetus decomposed and 40% have orange-yellow, necrotic foci in liver (similar to those caused by Flagellated Bacterium).

Inflamed placenta, necrotic cotyledons, leathery area between cotyledons.

Spread of Agent:

Aborted fetus, tissues and all discharges.

Digestive tract is probably a long-term reservoir.

Diagnosis:

Culture organism.

Smear of uterus, placenta uterine discharge or fetal abomasum.

Fluorescent Antibody (FA) test on tissues.

Dark-field microscope to observe organism.

Prevention / Control:

Ovine vaccines are available but should be used prior to exposure. They may not protect for all strains.

Antibiotics can be fed prophylactically during pregnancy (tetracycline at 100 mg/hd/day)

Feed in mangers and water in troughs to avoid contamination of feed and water by those aborting.

Remove aborting ewes, fetus, placenta, etc. from lambing area.

Parenteral injection of oxytetracycline (antibiotic) followed with repeated injections, will decrease the abortion loss. The long acting antibiotic products are preferred. Or, antibiotics (tetracycline or related product) can be fed at 400 mg/hd/day for 5 days and then followed with continued feeding of antibiotics (tetracycline at 200 mg/hd/day).

Treatment:

Parenteral antibiotic if the aborting ewe becomes ill.

Human Effects / Prevention

Persons handling animals which have aborted or which have diarrhea should wear protective gloves, if possible, and wash hands carefully after handling.

Food should be well cooked and milk pasteurized.

Drinking water should be treated to control the organism.

ENZOOTIC (CHLAMYDIAL) ABORTION

Causative Agent:

Chlamydia psittaci (other strains cause poly-arthritis and eye lesions [keratitis]).

May infect sheep, goats, cattle and humans. Widespread throughout the world.

Disease Signs:

Late term abortion (during last month); stillbirths or weak newborn. Usually only abort once.

Fetus is usually fresh.

There is often an inflamed placenta with necrotic, red-brown cotyledons and a thickened intercotyledon area.

Spread of Agent:

From aborted products (fetus, placenta, discharge), orally or inhalation to susceptible animals.

If infected late in gestation, they will usually abort in the next pregnancy. If infected early in gestation, they would usually abort later on (late pregnancy). Ewe lambs can be infected at birth and would then abort during their first pregnancy.

Diagnosis:

Make slide smears of vaginal discharge or placenta, stain with giemsa and observe under microscope for elementary bodies.

A fluorescent antibody and serological test are also used.

Prevention / Control:

Isolate all affected ewes and any surviving lambs, away from pregnant ewes.

A vaccine has shown some benefit, when it is available. It must be given prior to breeding and requires two doses the first year.

First year abortion rate is often 20-30%, but usually only 5% after that.

Treatment:

Treat ewes / nannies in flock that have not lambed or aborted. Use a long-acting oxytetracycline injection followed by including in the feed, an oral tetracycline type product (at 400-500 mg/hd/day).

Human Effects / Prevention:

May cause a flu-like illness and human abortion. The bird strains of chlamydia may cause pneumonia.

Keep pregnant women away from pregnant and especially aborting ewes or goats, in areas where this disease occurs. Do not let them be involved in handling or assisting with lambing/kidding.

FLAGELLATED BACTERIUM (*FLEXISPIRA RAPPINI*)

Causative Agent:

An unusual shaped bacterium, first diagnosed at the South Dakota Diagnostic Laboratory (U.S.) in 1984. It was shown to cause abortion in ewes and guinea pigs.

Disease Signs:

Aborted lambs in last trimester or birth of weak lambs. Ewe is not ill.

Large, necrotic liver lesions sometimes occur, which would be indistinguishable from those caused by Campylobacter.

Spread of Agent:

Unknown - may not be economically important, except for confusion with Campylobacter.

Diagnosis:

Culture and isolation (difficult).

Prevention / Control:

Unknown

Treatment:

None

Human Effects / Prevention:

None

LEPTOSPIROSIS

Causative Agent:

Leptospira interrogans - one of several serovars may be involved, depending on the locale. Sheep are relatively resistant.

Occurs worldwide and is considered by some as the most prevalent zoonotic disease.

Disease Signs:

Fever, anemia, jaundice and bloody urine.

Abortion may follow the acute or mild form.

Spread of Agent:

Carried and spread in the urine by a wide variety of previously infected animals, from rodents to ruminants, swine, canines, etc. Spread especially via contaminated water. Cattle being run with sheep or goats should be evaluated as to their potential as a reservoir of infection.

Can also infect humans through contact with water, food or soil contaminated with urine from infected animals. Can enter via mouth, eyes, nose (mucosal surfaces) or broken skin.

Diagnosis:

Microscopic "Dark-field" examination of urine or fetal kidney.

Serology.

Prevention / Control:

Avoid using leptospira contaminated water as a source of drinking water.

Isolation of animals ill or aborting from Lepto.

Vaccines are available for some serovars and are variably effective.

Treatment:

Antibiotics are effective but it may require an extended treatment time to cure the carrier state.

Human Effects / Prevention

Effects are similar as in animals.

Avoid drinking, bathing or swimming in contaminated water.

Wear protective gloves and clothes when working with infected animals.

LISTERIOSIS

(An in-depth article was published in International Animal Health News, Vol 10, October 1999)

Causative Agent:

Listeria monocytogenes.

Common in goats; sheep affected occasionally. Man may be infected.

Disease Signs:

Nervous disorder (clinical signs of circling disease)

Abortion - decomposed fetus; necrosis of cotyledons and inter-cotyledon area; necrotic foci in liver and lung (0.5-1.0 mm). May have severe uterine infection after abortion. Abortions commonly occur during late pregnancy.

Generalized infection (septicemia) - fever, digestive upset, or respiratory infection.

Spread of Agent:

Spoiled silage - with soil and rodent contamination and poor ensiling (pH > 5.6).

Diagnosis:

Culture of aborted fetus, affected brain (nervous form), or other tissues.

Prevention / Control:

Improve the storage and management of silage or other forages.

Treatment:

Early and/or herd treatment with antibiotics may be indicated in an outbreak.

Human Effects / Prevention

Generalized infection, infection of brain or infection of skin.

Large numbers of the infectious bacteria may be present in the feces, meat and milk of infected animals, as well as aborted fetus and tissues.

Manure should be well composted before applying to vegetable crops and they should be well washed before use. Cooking will protect against infection.

Pregnant women and others with reduced immunity should avoid "soft" cheeses and raw or semi-cooked meats such as lunch meats, hot dogs, sausage, etc.

Water may be contaminated but can be purified by boiling or chemical treatment.

Q FEVER

Causative Agent:
- *Coxiella burnetii* (rickettsia)
- Worldwide

Disease Signs:
- Can cause abortion in sheep (late term or delivery of weak lambs), goats, and cattle.
- Flu-like symptoms in man; usually self-limiting but can be fatal. An acute and chronic form of the disease.

Spread of Agent:
- Sheep, goats, and cattle are common hosts, but many other species may be infected.
- Excreted in milk, urine, feces and with especially high numbers in the birth fluids and fetal membranes.
- Most of the human cases diagnosed have been related to animal research facilities located at medical institutions. These are usually related to aerosol transmission.
- Pregnant cats have been identified as sources of human infection.
- Ticks can serve as a reservoir, and also spread the disease.

Diagnosis:
- Serological tests
- Histopathology

Prevention/Control:
- Burn or bury reproductive offal.
- Infection in closely confined animals is almost universal.
- The level in research flocks can be reduced by periodically testing their serum and culling any infected.

Treatment:
- Prompt treatment with tetracycline will reduce the duration of acute illness. Treatment of animals is not effective in preventing shedding of the organism.

Human Effects/Prevention:
- Pregnant women should not handle Q-fever infected animals or tissues.
- Previous exposure usually provides lifetime immunity.
- Prevention of exposure is almost impossible for those who work closely with animals.

RIFT VALLEY FEVER

Causative Agent:
- Virus - infects sheep, goats, cattle and humans.
- Endemic on African continent (most of continent); especially the sub-Saharan area. Periodic outbreaks when high rainfall and a susceptible population.

Disease Signs:
- Fever, hepatitis, and death of newborn animals.
- Illness and abortion in pregnant females.
- Outbreaks are favored by high rainfall.

Spread of Agent:
- Arthropod vectors (gnats, mosquitoes)

To man by direct contact or aerosol.

Diagnosis:

Sudden outbreak of illness with fever, short course and high death rate of newborn.
Affecting sheep, cattle and influenza-like disease in attending persons, simultaneously.
Liver swollen, mottled and friable.
Serological tests

Prevention/Control:

Vaccines are available (see World Health Organization).
Control of mosquitoes and gnats.

Treatment:

No specific treatment; just good nursing care

Human Effects/Prevention:

Precaution by workers during a potential outbreak.
Some areas use the vaccine.

SALMONELLA

Causative Agent:

Salmonella abortus sp. ovis - in Europe
S. dublin and *S. typhimurium* - England and Europe
For other areas, an outbreak of salmonella is usually related to stress and/or poor sanitation. A variety of salmonella organisms have been isolated.

Disease Signs:

The pregnant dam becomes ill, at any stage of gestation, runs a fever and then aborts.

Spread of Agent:

Salmonella occurs worldwide and may infect almost all types of animals, including rodents, birds and man. Some infected individuals become clinically normal carriers, who continue to shed the organism intermittently. It tends to localize in the gall bladder and is then shed in the feces during periods of stress.

Diagnosis:

The aborted fetus is partially decomposed with no specific lesions.
Culture of the fetus, placenta and uterine discharge.

Prevention / Control:

Some producers are currently planning to establish salmonella free farms. But for most producers, this organism is so widespread as to make that impractical. It is very important to implement good sanitation practices and minimize stress to animals to control this disease.
Protect feed and water from fecal contamination.
Clean up and dispose of manure.
Isolate aborting animals and clean up aborted products and the area..
Isolate animals with diarrhea.

Treatment:

Administration of antibiotics may benefit ill animals but could be counter-productive if used for the general population of animals, due to the development of antibiotic resistance by the organism.

Human Effects / Prevention

A variety of salmonella species may infect man and cause diarrhea and illness.

Personal hygiene of persons working with and handling animals.

Wear protective (rubber, latex, plastic) gloves when handling aborting or diarrhetic animals

Wash hands after handling animals

Wear coveralls while handling animals and remove those before going home. Launder coveralls.

TICK BORNE FEVER

Causative Agent:

A rickettsia (*Ehrilichia (cytoecetes) phagocytophilia)*, transmitted by ticks.

Occurs in sheep, cattle and goats.

Identified in Scotland, Ireland, Norway, Finland, and India.

Disease Signs:

Fever, stiffness and lameness. A high percent of those affected abort and some die.

Spread of Agent:

Bite of infected tick.

Diagnosis:

Evidence of tick parasitism, fever, depression, and abortions. Lameness and gait appears similar to louping-ill.

Prevention / Control:

Avoid heavy exposure of susceptible sheep to tick vector. Bring new sheep into area of the disease during periods of low tick activity, to allow them to acquire a natural immunity.

Treatment:

Oxytetracycline at 11 mg/kg per day for several days, for dam.

Ethoxyethyglyoxal dithiosemicarbazone (early in course) depresses fever and parasitemia.

Human Effects / Prevention:

None

TOXOPLASMOSIS

Causative Agent:

Toxoplasma gondii

Common in sheep and goats. One of the leading causes of abortion in many countries. Much less common in cattle.

Can affect the fetus of pregnant women.

Disease Signs:

Dam not ill

If infected early, may cause resorption or mummified fetus. If infected later in gestation, it may cause abortion or death soon after birth. Ewes are immune after abortion.

Spread of Agent:

Cats are the primary reservoir, and definitive host. They usually spread it only for a few weeks as kittens, but if their feces contacts feed or water, that will remain contaminated for a long time.

Humans most commonly obtain Toxoplasma via undercooked or uncooked meat, which contains Toxoplasma cysts. Or, they may occasionally be exposed by contact with cat feces and inhalation or ingestion of the oocysts.

Diagnosis:

An inflamation of the placenta with gray-white lesions (1-3 mm) present in some cotyledons. The area between the cotyledons is normal, except for some edema.

Histopathology, fluorescent antibody test, and paired serum titers.

Prevention / Control:

Keep cats away from feed storage and feeding areas. Some producers have found it best to maintain one adult, neutered cat which then tends to keep younger, stray cats away from the area.

Burn or bury aborted products. Wear rubber gloves while handling these tissues and fluids.

Treatment:

None

Human Effects / Prevention:

Toxoplasmosis may cause flu-like symptoms in humans, but is much more severe for those who have an impaired immune system.

If a woman is infected during pregnancy, it may cause fetal defects.

Cook meat thoroughly. Clean cat litterbox daily, (over 24 hours are required for oocysts to become infective). Pregnant women should avoid contact with the litterbox and wash hands carefully after handling any cats or uncooked meat.

WESSELSBRON DISEASE

Very similar to Rift Valley Fever in all aspects but is caused by an antigenically different virus.
Affects a variety of animals and also man.
A vaccine is available but may cause abortion if used in pregnant dams.
Control of mosquitoes will reduce the spread.

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