

Infectious causes of infertility and abortions in cattle

G N Purohit

Specific Causes of Infertility

- Bacteria- Brucella, Camopylobacter, Leptospira, Listeria
- Viruses- IBR-IPV, BVD
- Protozoa- Tritrichomonas, Neospora, Toxoplasma
- Fungi- Aspergillus

Venereal diseases

- Venereal disease in cattle can be caused by bacteria, viruses, and protozoal organisms. *Campylobacter fetus* (*Vibrio*), *Trichomonas fetus*, Bovine Herpes Virus (a form of IBR), *Hemophilus somnus*, ureaplasma, mycoplasma, and Bovine Viral Diarrhea (BVD) are the most commonly recognized causes of venereal disease in cattle

Venereal diseases

- Diseases spread by the act of coitus
- The major venereal diseases of cattle are Campylobacteriosis and Trichomoniasis
- Trichomonas and Campylobacter infections can cause early embryonic death or first trimester abortions. Young bulls usually 'clear' the organisms quite rapidly, but become re-infected upon breeding a cow that is carrying an infection.
- Once the organisms are present in the herd, they can be passed from cow to cow by the herd bull(s) or by contaminated breeding equipment.
- Older bulls (aged 4-5 yrs and above) are
- more often chronically infected

Bovine Venereal Diseases: Trichomonas & Campylobacteriosis

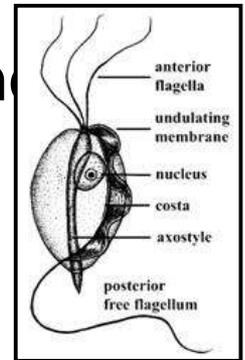
Trichomoniasis:

Caused by a Mobile, complex, three-haired, single-celled protozoan, called *Tritrichomonas foetus*;

Organism survives in microscopic folds of skin that line bull's penis and internal sheath

Prevalence World over

Insidious disease causing sterility abortion and pyometra



Transmission

- ✘ Transmitted from cow to cow by the bull – nearly always a disease of cattle who are naturally bred
- ✘ Transmitted via sexual contact with an infected mate
- ✘ Rare cases of transmission through artificial insemination

Clinical signs in cows

Repeat breeding, Abortion in 1st half of gestation,
Post service pyometra

Cow does not appear ill

Infected during breeding

The cow may show a subtle, mild, vaginal discharge,
1 – 3 weeks later (pyometra)

Protozoa attach to the lining of the reproductive tract

An inflammatory response occurs, resulting in the
death of the embryo and hence repeated breedings

Trichomoniasis in the bull

- ✘ No signs: semen quality and sexual behavior are not affected
- ✘ Trich lives in the crypts (folds) inside the sheath. Crypts deeper in older bulls
- ✘ As the bull ages, the skin grows, folds increase in the penis and sheath, creating additional places for the organism to thrive
- ✘ Older bulls (over 3 years) more likely to become chronically infected than younger bulls

Diagnosis

- Bull becomes lifetime carrier
- Best to test after 2 weeks of sexual rest
- Sometimes observed under scope immediately
- Usually culture for 1 to 7 days
- If even one bull is positive, you have to assume that the herd has been exposed!

- Cows usually clear infection rapidly
 - Test soon after embryo death or pyometra
- History of new bull introduction

Direct smear: abomasal contents of aborted fetus
Wet smear: vaginal discharge/ preparturient washings
Org culture: Diamonds/ Tobies media transport at 4
degree C
Vaginal mucus agglutination test / FAT
Virgin heifer test mating



Prevention and control

It is easier to prevent the infection than to try to control it after it enters the herd;

Avoid contact of uninfected cattle to other cows & new bulls

For infected cows give Sexual rest for 8-12 weeks

Avoid renting or leasing bulls/ replace culled bulls with young bulls

Use AI for breeding

Therapy of infected animals: Imidazole derivatives, Sodium Iodide, local application in bulls, Vaccination

Vaccination



Campylobacteriosis

is caused by campylobacter fetus a gram negative bacteria affecting cattle, buffalo, sheep and goats. The disease is venereal in cattle and is characterized by early embryonic deaths, increased services per conception and abortions at 4-6 months.

- Causes of infertility and abortion
 - *C. jejuni*
 - *C. fetus* subsp. *venerealis*
 - *C. fetus* subsp. *Fetus*

The Organism

- Survives in moist environments
 - Weeks to months
- Some strains tolerate cold
- Remains viable in:
 - Feces
 - Milk
 - Water
 - Vaginal discharges
 - Poultry litter

Clinical Signs

Infertility

Early embryonic deaths

Abortions uncommon

The male is asymptomatic carrier

Adult bulls are more affected and may carry infection for long times.

Sheep aborting one year are resistant next year.

Diagnosis

- Bovine genital campylobacteriosis
 - History of increased services per conception, repeat breeding
 - Org identification in samples is difficult. Clarks or diamonds media must be used
 - Vaginal mucus agglutination test
 - Virgin heifer test mating
 - Fluorescent antibody test
-
- Detection of IgA in cervical mucus
 - ELISA
 - Culture
 - Sheath washings
 - Vaginal cultures

Therapy

Bulls may be treated

Cows usually not treated

Control:

Widespread use of AI has limited the disease

Vaccine is available

Avoid renting or leasing bulls

Replace culled bulls with young bulls

Test all new bulls

Disinfection

- *Campylobacter* spp. susceptible to:
 - 1% sodium hypochlorite
 - 70% ethanol
 - 2% glutaraldehyde
 - Iodine-based disinfectants
 - Phenolic disinfectants
 - Formaldehyde
 - Moist or dry heat
 - Gamma irradiation and UV radiation

Brucellosis

*Undulant Fever,
Contagious Abortion,
Bang's Disease*

A zoonotic bacterial disease affecting cows buffaloes, goats, sheep, horses and dogs causing late gestation abortions in cattle and orchitis in bulls many times seen in the form of outbreaks.

The Organism

- *Brucella abortus*
 - Gram negative coccobacillus
 - Facultative intracellular pathogen
 - Nine biovars
- Additional Brucellae that affect cattle
 - *B. melitensis* and *B. suis*
- Can persist in the environment



Populations at Risk

- Occupational disease
 - Cattle ranchers/
dairy farmers
 - Veterinarians
 - Abattoir workers
 - Meat inspectors
 - Lab workers
- Hunters
- Travelers
- Consumers
 - Unpasteurized dairy products



Geographic Distribution

- Distribution
 - Worldwide
 - Eradicated in some countries
- Notifiable disease in many countries
 - World Organization for Animal Health (OIE)
 - Poor surveillance and reporting due to lack of recognition



Mode of infection: Ingestion of contaminated pasture/water licking aborted fetuses

Organisms shed in milk & uterine discharges

Uterus of pregnant cows get infected from blood.
The erythritol sugar in uterus is a good medium for growth of Brucella

After abortion and uterine involution organisms colonize the udder

Disease in Cattle

- Cows
 - Abortion, stillbirth
 - Weak calves
 - Retained placenta
 - Decreased lactation
- Bulls
 - Epididymitis, orchitis
- Infertility, arthritis



Laboratory Diagnosis

- Direct examination
- Serology
 - *Brucella* antigen tests, complement fixation, ELISA, others
- Milk testing
- Culture and identification
- PCR

Stained smears from aborted
material Koster & Zeihl Nelson method

Orgs can be cultured from fetal
stomach/placenta which has a Moroccan
leather appearance

ELISA

Serological tests

Rose Bengal Plate Test CFT/FAT/MRT

The Rose Bengal plate test can be used as an initial screening test of serum samples. All positive samples are re-examined using the serum agglutination test or complement fixation test. Rose Bengal negative samples are not normally retested.

A Serum Agglutination Test (SAT) is very widely used but detects non-specific antibodies as well as specific antibodies from Brucella infection and vaccination.

The Complement Fixation Test is a more definitive test than the SAT, especially in differentiating titers arising from infection from vaccination.

The Milk Ring Test (MRT), which detects Brucella antibodies in milk, is very useful in screening the presence of brucellosis in herds by collecting bulk milk samples or in individual animals. Positive results can then be followed up by using other diagnostic tests on individual animals.

Post Mortem Lesions

- Granulomatous inflammatory lesions
 - Reproductive tract
 - Udder
 - Lymph nodes
 - Joints
- Abnormal placenta
- Enlarged liver
- Bulls: swollen scrotum



Control S19 vaccination calf hood
vaccination 4-8 months RB 51

Eradication: Notification, Isolation of
aborting animals, disposal of aborted
fetuses, placenta

Genital Mycoplasmasmosis/ Ureaplasmosis

Cell wall deficient organisms

Mycoplasma cause vulvovaginitis and both these organisms can cause infertility and abortion they are frequently isolated from semen and their transmission is through semen.

Genital Tuberculosis: Peritoneal - Adhesions of uterus, abscess

Glandular - Nodules formed on the uterus
Epithelial Pin head sized granular lesions

The presence of ovaro-bursal adhesions and thickened tortuous fallopian tubes is diagnostic of TB

An animal showing a chronic vaginal discharge must be examined for acid fast organisms

Leptospirosis A zoonotic disease caused by parasitic spirochaetes and characterised by fetal death, abortion and birth of weak calves.

Acute: ↑ body temp, haemoglobinuria, icterus, abortion (L.pomona, canicola, icterohaemorrhagiae, grippityphosa)

Chronic: Abortion after 6 months weak calves, mastitis, blood tinged milk (L.hardjo) Disease most common in september & october

Transmission: Mucus membrane and abraded skin

Diagnosis: antibodies in fetal sera, urine sediments

Treatment: Streptomycin + vaccine

Control: separate cattle from pigs, rodent control & drainage of water

Listeriosis (Gram positive coccobacilli) sporadic disease of ruminants characterized by encephalitis, abortion (last trimester), neonatal septicemia commonly occurring in winter

Transmission: By ingestion

Clinical signs: Abortion, RFM, endometritis, weight loss, transient infertility

Diagnosis: Fetal tissues

Treatment: Tetracycline

Control Remove fetal tissues, avoid spoiled feed

Salmonellar abortions:

Abortions are sporadically caused by *S.dublin* in cattle, *S. abortus ovis* in sheep and *S.enteritidis* in pigs however, the most important is *S. abortus equi* which causes abortion in mares.

Salmonella are present in the environment

Mares abort at 6-9 months and evidence slight fever.

Streptococcus zooepidemicus is another cause of abortions in poorly managed farms.

VIRAL INFECTIOUS CAUSES OF INFERTILITY AND ABORTION

Infetious Bovine Rhinotracheitis (IBR, Red Nose) and Infectious Pustular vulvovaginitis (IPV) Caused by Bovine herpes virus 1 affects cattle and buffaloes

Respiratory form causes fever congestion of nasal mucosa, nasal discharge and ulcers on nose, trachea.

Conjunctival form affects all ages of animals and usually causes conjunctivitis

Abortive form causes abortion in 2nd half of gestation. There is red colored fluid in body tissues of fetuses

Encephalitic form affects young calves less than 6 months of age

Vulvo-vaginitis (coital vesicular exanthema) has a venereal transmission and causes balano-posthitis in bulls and vulvo-vaginitis in cows with whitish discharge for 2-3 weeks

Transmission: contact with infected cattle.

Diagnosis: Organism identification from Vulvar, vaginal scrappings, nasal conjunctival swabs. Samples should be refrigerated and send on culture medium to the lab.

Histopathology of fetal liver shows multifocal necrosis.

Treatment: Palliative

Vaccines: Infected animals are life long carriers. Heifers are immunised at 6-8 months. The immunity is 3 years and live vaccines often produce latent infection

Control: Destruction of aborted material and movement restriction

Modified live vaccines (MLV's) and killed vaccines for pregnant animals.

Bovine Virus diarrhea (BVD-MD) Caused by toga virus 2 types type 1 and 2 causes gastrointestinal disease and abortions

Transmission: Aerosol and contact with persistently infected (PI) animals

Bulls excrete virus in semen following chronic infection

Calves born from infected animals are persistently infected (PI)

Clinical signs: Pyrexia, diarrhea, oculonasal discharge, ulcers and abortion at 2-4 months and mummification. The mucosal type of disease shows diarrhea and nasal discharge

Diagnosis: History of diarrhea, immuno-histochemistry on fetal tissues, PCR, ELISA

Control: Strict isolation and removal of PI animals

Vaccination of replacement heifers with MLV vaccine 2 months before 1st breeding

Killed vaccines for other animals

Chlamydiosis: most common cause of abortion in sheep and goats and rarely cattle caused by *Chlamydia psittacci* is a gram –ve intracellular organism that have both DNA and RNA

Transmission: Pigeons, sparrows are reservoirs, ticks and insects help in transmission. The organism persist in feces of infected animals and shed in uterine discharges for 3 weeks post abortion.

Clinical signs: Abortion during last month in primiparous ewes. Slight febrile reaction and blood tinged discharge. Placentitis is common.

Diagnosis: Necrotic changes in placenta. Microscopic examination of ZN stained smears from placenta or fetal tissue.

Treatment and control: Oral feeding of 400-500 mg/animal/day of oxytetracycline for 2 weeks during an outbreak, or long acting tetracycline 6-8 weeks before parturition.

Vaccine (Enzovac) IM or SC 8 weeks prior to breeding. The immunity lasts for 3 years.

Chlamydia can affect human beings.

Neosporosis :is a protozoan infection affecting cattle and rarely sheep and goat acquired by ingestion of feed contaminated with feces of dogs and characterized by abortion between 4-6 months of gestation and birth of congenitally infected heifers.

Clinical signs: Abortion when animals are stressed.
No other signs

Diagnosis: White foci in muscles, heart, liver of fetuses. PCR, FAT and ELISA are the tests.

Enzootic bovine abortion is a cause of abortion and premature calving in cattle grazing in California, Nevada and Oregon of USA. The disease is caused by an unnamed bacteria a gram -ve bacteria of myxobacterium family.

Transmission: By an argasid tick

Clinical signs: The abortions are sporadic or outbreaks can occur in last trimester mostly in heifers

Diagnosis: Typical lesions on the fetus include Petechiae on conjunctiva, tongue, oral mucosa. There is enlargement of pre-scapular lymph nodes and reduction of thymus with hemorrhages over it.

Control: Control the ticks in the area.

Mycotic abortions

Aspergillus fumigatus, mucor spp or candida spp are the sporadic cause of abortion and infertility in cattle, mares, sheep, goat and swine.

Abortions are common in winter after a wet summer.

Feeding of straw with fungi is the etiology. Rarely inhalation of spores can cause the infection.

Abortions occur during 6-8 months in cattle placentitis with coffee bean or cup shaped cotyledons is characteristic lesion of mycotic abortions.

Diagnosis: Microscopic examination of placental or skin lesions after treatment with 10% KOH reveals the fungi or their hyphae.

NON-INFECTIOUS CAUSES OF ABORTION

Include 1) Ingestion of poisonous plants or administration of chemicals. Plants like locoweeds, sweet clover (fatal hemorrhages due to dicoumarol), pine needle and administration of pharmaceuticals like nitrates, xylazine, anthelmintics etc. can cause abortions.

2) Hormonal deficiencies (like deficiency of progesterone) or accidental administration of hormones like estrogens, corticosteroids can result into abortion in animals.

3) Nutritional deficiencies like Vitamin A, E, Iodine or Se can cause abortion

4) Severe stress like heat, cold, transport and trauma.

5) Accidental AI of pregnant animals

6) Genetic defects of embryo

Induced abortions (Vetero-medical termination of pregnancy VMTP)

Abortions are sometimes desired to be induced in various farm animals. When they are induced nearer to parturition they are called induced parturitions.

Reasons for inducing abortions: Diseases of pregnancy like **pregnancy toxaemia** in sheep and goats where continuance of the pregnancy would further worsen the condition of the patient. Systemic diseases like **hemoglobinuria** in buffaloes often indicate the induction of abortion to reduce the load of the ailing patient.

Abnormal pregnancies like hydrops allantois, ventral hernia, rupture of the prepubic tendon, fetal mummification also indicate an induced abortion.

Termination of accidental small age pregnancies of heifers

Induced abortion

Cattle and buffaloes

Prostaglandins are the most suitable drugs for inducing abortion in cows they are effective at all stages of gestation except during the 5-8 month period when they should be combined with corticosteroids to terminate the pregnancy.

Estrogens and Corticosteroids (25 mg dexamethasone) can be used to terminate bovine pregnancies.

In sheep and goat PG + corticosteroids are effective whereas in the sow PGs alone are effective in terminating pregnancies. Estrogens are ineffective in the sow as they are luteotropic in this species.

THANK YOU