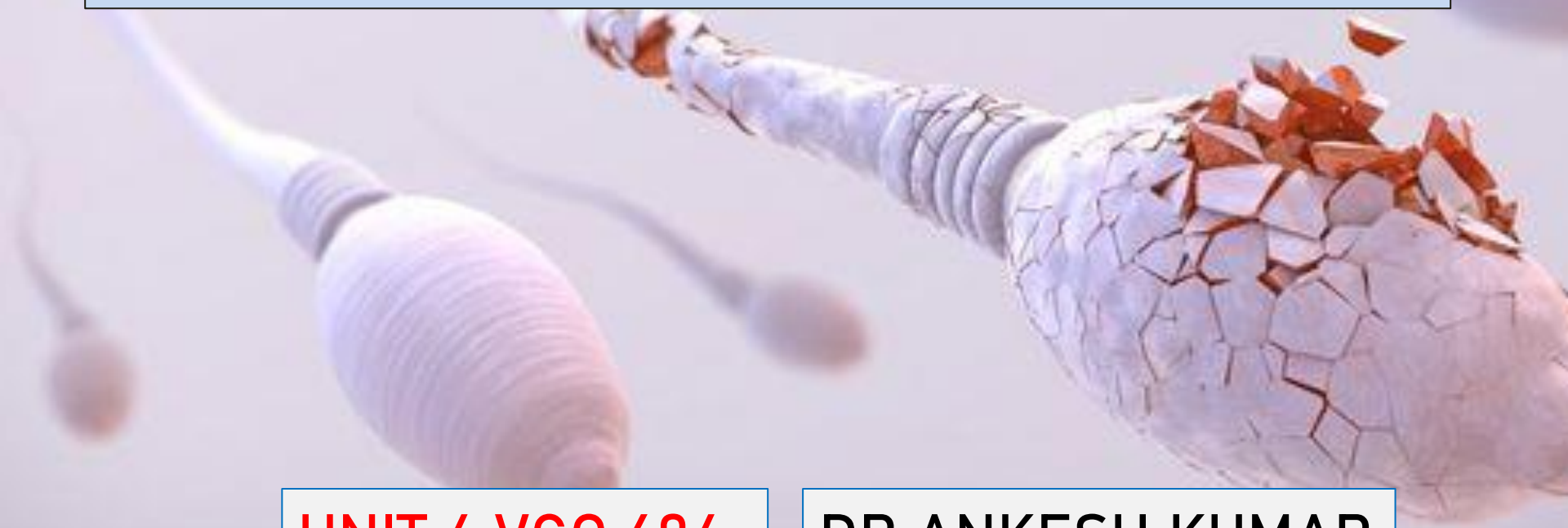
बिहार पशु विज्ञान विश्वविद्यालय
BIHAR ANIMAL SCIENCES UNIVERSITY

Diseases transmissible through semen in domestic animals



UNIT 4 VGO 604

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OVERVIEWS

- Introduction
- List of diseases transmissible through semen
- Different diseases
- MSP - Diseases and control
- Conclusion

Introduction

- Millions of semen doses are produces and distributed throughout the world
- For livestock improvement and easy application of ART
- The daily testing of frozen semen under most hygienic condition is mandatory
- The regulating agencies will monitor to prevent the spreading of infectious diseases through semen. Also to ensure the availability clean & quality semen
- Regular testing of semen donors under official veterinary supervision

Old Classification of Diseases Notifiable to the OIE List A

Transmissible diseases that have the potential for very serious and rapid spread, irrespective of national borders, that are of serious socio-economic or public health consequence and that are of major importance in the international trade of animals and animal products.

Old Classification of Diseases Notifiable to the OIE List B

Transmissible diseases that are considered to be of socio-economic and/or public health importance within countries and that are significant in the international trade of animals and animal products.

Diseases transmitted through semen

OIE List A

Disease or pathogenic agent	Bovine	Ovine, Caprine	Porcine	Equine
Foot and Mouth disease	**P**	**P**	P	
Vesicular stomatitis	P			
Swine vesicular disease			P	
Rinderpest	P	P	P	
Peste Petits ruminants		P		
Contagious bovine pleuropneumonia		P		
Lumpy skin disease	P			
Rift Valley fever	P			
Blue tongue	**P**	**P**		
Sheep pox and goat pox		P		
African horse sickness				P
African swine fever			**P**	
Classical swine fever			**P**	

(Adapted from Hare, 1985; Thibier and Guerin (2000) and Cseh *et al.*, 2012)

Diseases transmitted through semen

OIE List B

Disease or pathogenic agent	Bovine	Ovine, Caprine	Porcine	Equine
Multiple species				
Aujesky's disease			P	
Leptospirosis	**P**	**P**		
Q fever	P	P		
Paratuberculosis	**P**	**P**	P	
Bovine				
Bovine brucellosis	**P**			
Bovine genital campylobacteriosis	**P**	**P**		
Bovine tuberculosis	P	P		
Enzootic bovine leukosis	P			
IBR–IPV	**P**			
Tritrichomoniasis	**P**			
BVD/MD	**P**			

(Adapted from Hare, 1985; Thibier and Guerin (2000) and Cseh *et al.*, 2012)

Diseases transmitted through semen

OIE List B

Disease or pathogenic agent	Bovine	Ovine, Caprine	Porcine	Equine
Caprine and Ovine				
Brucellosis (*Brucella ovis)*		P		
Brucellosis (*Brucella melitensis*)		P		
Contagious agalactia (*M. agalactiae*)		P		
Enzootic abortion (*Chlamydia sps.)*	P	P		
Salmonellosis (*S. abortus ovis*)		P		
Porcine				
Brucellosis *(Brucella suis)*			**P**	
PRRS			**P**	
Porcine parvovirus			**P**	
Equine				
Contagious equine metritis (*Taylorella equigenitalis*)			P	
Dourine (*Trypanosoma equiperdum*)			P	

(Adapted from Hare, 1985; Thibier and Guerin (2000) and Cseh *et al.*, 2012)

DISEASE TRANSMITTED THROUGH SEMEN IN BOVINE

Viral diseases

- **Infectious Bovine Rhinotracheitis-Infectious Pustular Vulvovaginitis (IBR-IPV)**
- **Bovine Viral Diarrhoea (BVD)**
- **Foot and Mouth Disease (FMD)**
- **Bluetongue (BT)**
- **Bovine leukosis (BL)**

Bacterial diseases

- **Brucellosis**
- **Bovine Tuberculosis (TB)**
- **Bovine genital campylobacteriosis**
- **Leptospirosis**
- **Johne's disease**

Protozoan diseases

- **Trichomonosis**

IBR / IPV Infectious Diseases

An infectious viral disease characterised by respiratory infection, conjunctivitis, encephalitis in calfs , abortions in cows and balanoposthitis in susceptible bulls

Etiology

Bovine Herpes Virus type 1 (BHV1), subfamily *Alpha herpesvirinae*

Incubation period: 5 – 14 days

Pathogenesis

- Nasal droplets, genital secretions, semen and fetal fluid and tissues
- Aerosol or droplet infection causes respiratory disease
- Through peripheral leucocytes virus reaches feto-placental unit and causes abortion
- Spread occurs through contact with the uterine discharge of an aborted or full-term fetus

IBR / IPV Infectious Diseases

Characteristic symptoms

- Fever
- Nasal discharge and conjunctivitis
- **balanoposthitis in bulls**
- **Vulvovaginitis in cow**
- shortened oestrus cycles
- Abortions in late gestation

Macroscopic features

- Rhinotracheitis, pneumonia
- mucopurulent exudate in trachea
- Pustules in vulva, vagina, glans penis and prepuce
- Endometritis
- Salpingitis
- **erosions in the vagina or on the penis** leading to adhesions

(Wentink *et al.*, 2000)

IBR / IPV Infectious Diseases

Hyperemia of nostril, purulent nasal discharge, foamy drooling of saliva, hyperemia of conjunctiva and lacrimation

Erosions on the penis

Erosions in the vagina

IBR / IPV Infectious Diseases

Disease risk through semen

- One of the most **common viral pathogens found in bovine semen** (Eaglesome & Garcia, 1997)

- Replicates in the mucosa of the prepuce, penis and distal part of the urethra, and semen is contaminated during ejaculation (Weiblen *et al*., 1992; Vogel *et al*., 2004; Wrathall *et al*., 2006)

- Excreted in semen both during the **acute phase** as well as after establishment of **latent infection.** Bulls may shed the virus in semen intermittently throughout life though remaining clinically normal (van Oirschot, 1995)

- Latently infected animals may have very low antibody titres or may be seronegative, especially if they have not been stressed (Deregt *et al*., 1993)

- The virus can inhibit sperm-zona binding by interacting with spermatozoa (Givens & Marley, 2008)

IBR / IPV Infectious Diseases

Diagnosis

- **Symptoms and lesions**

- **'Cornell semen test'**, in which pooled samples of semen are inoculated into susceptible calves or sheep which are then monitored for neutralising antibodies

  (Schultz *et al*., 1982)

- **Virus isolation**, examination of tissues by the fluorescent antibody technique (**FAT**) and serological testing (**SNT or ELISA**)

  (Eaglesome & Garcia, 1997)

- Molecular-based techniques such as **PCR** are used to detect the virus

  (Vilcek et al., 1994; Xia et al., 1995)

IBR / IPV Infectious Diseases

Control and Prevention

- **Vaccination** can be used to control BHV-1 infection in bulls in AI Centres (AIC)

(van Oirschot *et al*., 1993)

OIE

- Maintenance of an **IBR-free herd in an AIC** or be subjected, with negative results, to a serological test for IBR/IPV on a blood sample

(Chapter 11.8 of the OIE-Terrestrial Animal Health Code 2018)

- Should be tested serologically - a minimum of 21 days of entering preentry area with negative result

- Annual testing at SCC with negative result

- Each aliquot of frozen semen should be tested if herd is not from IBR free area

(Chapter 4.6 of the OIE-Terrestrial Animal Health Code 2018)

(BVD)

An contagious viral disease characterised by hypoplasia of cerebellum, ulcers in oral and nasal mucosa, eosphagus, abomasum and intestines

Etiology

Single-stranded RNA virus - genus **Pestivirus** of ***Flaviviridae*** family

- The BVD virus has two main biotypes characterised by **non-cytopathic** (NCP) or **cytopathic** (CP) effects on cultured cells

(Eaglesome & Garcia, 1997)

Incubation period: 1 – 3 days

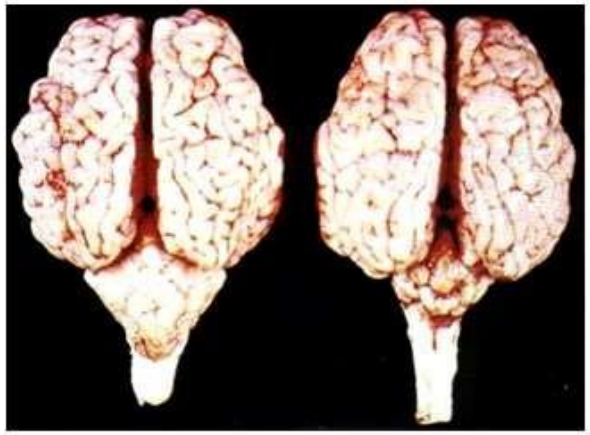
Pathogenesis

- Contaminated food, water, nasal discharges
- Virus mutilpiles in lymphocytes
- Ulcerative stomatitis and enteritis

(BVD)

Characteristic symptoms

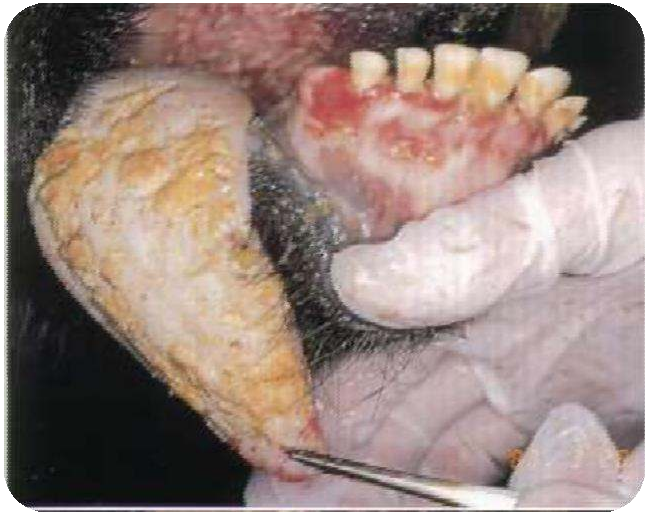
- Fever
- Drooling of saliva
- Ulcerative mouth and nasal lesions
- Diarrhoea
- Dysentery with melena



Macroscopic features

- Hypoplasia of cerebellum
- Ulcers and hemorrhages in GIT
- **Erosion of the oral and nasal mucosa**
- Hemorrhages in vagina, pericardium and S/C tissue

(BVD)



Erosions at the gum and yellowish white elevated lesions on the surface of the tongue

Ulcers seen on mucous membrane of the omasum

Erosions surrounded by hemorrhages on mucous membrane of the rectum

Bovine Viral Diarrhoea (BVD)

Disease risk through semen

- BVDV antigen has been detected in the epithelial cells of **the ductus epididymis, accessory glands, urethra, Sertoli cells, and Spermatogonia**

  (Borel et al., 2007; Newcomer et al., 2014; Givens. 2018)

- Virus can be present in semen from bulls with **persistent** infection**,** and **acute** infection

  (Givens. 2018)

- When infected in the first 4 months of pregnancy, cows may deliver persistently infected (PI) calves that shed the virus throughout life

  (Wentink *et al.,* 2000)

- The major source of infection is **persistently infected (PI)** animals present in a herd

- The PI bull is capable shedding BVDV for long periods of time and in large amounts, despite producing semen with normal concentration, motility, and morphology

(BVD)

Diagnosis

- **Symptoms and lesions**
- **Virus isolation** (Afshar & Eaglesome., 1990)
- Antigen capture **ELISA** (Shannon et al., 1992) and **PCR assay** (Pfeffer et al., 1995)
- For identifying **PI bulls** is by virological examination of two **blood samples** collected **four weeks apart**

  (Eaglesome & Garcia, 1997)
- Antibodies to BVDV may be detected by complement fixation (**CFT**), **indirect FAT** and **SNT**

  (Radostits & Litdejohns., 1988)

(BVD)

Control and Prevention

OIE

- Prior to entering pre-entry isolation facility
  - i) virus isolation test or a test for virus antigen
  - ii) a serological test to determine the serological status of every animal

- Should be tested **VI** or for virus antigen or serologically - a minimum of 21 days after entering pre-entry area with negative result

- Annual testing at SCC with negative result

(Chapter 4.6 of the OIE-Terrestrial Animal Health Code 2018)

Blue Tongue

An infectious viral disease characterised by edema and congestion of face, cyanosis of tongue and endothelial hyperplasia and arteritis

Etiology

Orbivirus consisting of **27 distinct serogroups (retroviridae family)**

Incubation period: 3–6 days

Pathogenesis

- Transmitted between ruminants by biting midges of **Culicoides species**
- **Insemination** from infected animal
- **Replicates in the hemopoietic cells and endothelial cells** of blood vessels
- Hemorrhage, edema and thrombosis

BLUE Tongue

Characteristic symptoms

- Fever
- Facial edema
- **Cyanosis on tongue**

Macroscopic features

- **Edema and congestion of head, face and neck**
- Edema and cyanosis of tongue
- Petechial hemorrhages on oral and nasal mucosa
- Hemorrhage on coronet leading to pododermatitis
- Hemorrhages in abomasum and intestines

BLUE Tongue

Disease risk through semen

- BTV-associated **red blood cells and mononuclear cells** leaking into the semen through microvascular injuries due to inflammation within the male reproductive tract

  (Wrathall et al., 2006)

- The presence of live, virulent BTV serotype 8 in extended semen from naturally infected bulls has been clearly demonstrated

  (Vanbinst et al., 2010)

- **Cattle** usually serve as a **reservoir host** due to prolonged, low level cell-associated viremias that can last up to several months

  (Vanbinst et al., 2010)

- Depending on the strain involved, disease may result in early embryonic deaths, abortions, malformed calves or lambs, **temporary infertility in bulls and rams**, and **shedding of BTV in semen may occur**

  (Vanbinst et al., 2010)

BLUE Tongue

Diagnosis

- Symptoms and lesions
- Virus identification tests include **VI** and **PCR** done on whole blood
- Agar gel immunodiffusion **(AGID)** and **ELISA**

Control and Prevention

OIE

- Disease free herd
- At least **60 days** before commencement of and during collection of semen

  (a) kept outside a restricted zone

  (b) protected against viral vectors

  (c) kept during the seasonally vector-free period in a BT seasonally free area.

(chapter 8.3 of OIE -Terrestrial animal health code)

BLUE Tongue

OIE

1. lack of detected **antibodies to the BTV** group at least every 60 days throughout the semen collection period and between 28 and 60 days after the final collection

2. **Virus isolation** from blood samples collected at commencement, at least every 7 days during, and at conclusion of semen collection with negative results

3. **PCR test on blood** samples collected at commencement, at least every 28 days during, and at conclusion of semen collection with negative results

(Article 8.3 of the OIE-Terrestrial Animal Health Code 2018)

FMD

An contagious disease of cloven footed animals characterised by presence of vesicles in oral mucosa and foot

Etiology

Apthovirus of the family Picornaviridae comprising seven serotypes

- Serotypes **A, O, C, SAT-1, SAT-2, SAT-3 and Asia-1**
- **Serotype 'O'** is most common in India

Incubation period: **2 - 8 days**

Pathogenesis

- Inhalation, ingestion, inoculation, semen and fomites
- Virus excretion 24 hrs prior to onset on clinical signs

FMD

Characteristic symptoms

- Fever
- Vesicles in mucosa of mouth, tongue, feet and udder
- Drooling of saliva
- lameness

Macroscopic features

- Presence of vesicles in mouth cavity
- Erosions may lead to gastro entiritis
- Myocarditis – Tigroid heart
- Spleen enlargement

FMD

Disease risk through semen

- FMD virus is easily transmitted by semen
- In acutely infected cattle, this virus is shed in all secretions and excretions including expired air, saliva, skin lesions, urine, feces, and semen.
- Virus has been detected in the semen of up to 4 days before the development of oral vesicles (Sellers et al., 1968)

Diagnosis

- Symptoms and lesions
- Virus in semen can be
  - isolated after extension on a variety of cell culture
  - can be identified by CFT or SNT
- Electronmicroscopy

FMD

Control and Prevention

- Rest period of 30 days before semen collection following vaccination
- Laboratory testing of semen upon its arrival in the importing country

OIE

a. Show no clinical signs of FMD on the day of collection

b. Kept for at least 3 months before collection in a FMD-free country, zone, or compartment

c. Kept in an artificial insemination centre where no animals had a history of infection with FMDV

(Article 8.8 of the OIE-Terrestrial Animal Health Code 2018)

BOVINE Leukosis

An infectious viral disease characterised by malignant lymphoma and lymphocytosis with immature lymphocytes in blood

Etiology

bovine leukemia virus classed as **oncovirus** of **retroviridae** family

Incubation period: **Up to 35 days**

Pathogenesis

- Lymphocytic infection leading to their proliferation
- Viral genome gets incorporated into host genome resulting in neoplastic growth of cells
- Vertical and horizontal transmission

BOVINE Leukosis

Characteristic symptoms

- **Enlargement of superficial lymphnodes**
- Weakness, cachexia

Lymphosarcoma of intestines

Macroscopic features

- **Benign persistent lymphocytosis**
- Enlargement of superficial lymphnodes (mesenteric, pelvic and sublumbar)
- Emaciated and cachectic carcass

Neoplastic mass in heart

BOVINE Leukosis

Upsurge of eye-ball of both sides (lymphosarcoma)

Enlargement of the cervical lymph nodes

Nodular growth scattered throughout the body skin

BOVINE Leukosis

Disease risk through semen

- Transmission by semen is very unlikely

(Monke, 1986; Straub, 1988)

- The virus is rarely found in semen though possibly present in association with virus-infected lymphocytes in the genital tract

(Choi et al., 2002; Wrathall et al., 2006)

Diagnosis

- **Symptoms and lesions**
- **ELISA, AGID**
- The virus may be demonstrated in the blood by **PCR**-techniques

BOVINE Leukosis

Control and Prevention

OIE

- EBL free herd

- If less than two years of age, the bull came from a serologically negative ‘uterine’ dam

- Tests for EBL on blood samples on **two occasions** with negative results, the first test being carried out at least **30 days before** and the second test at **least 90 days after** collection of the semen

(chapter 4 OIE-Terrestrial Animal Health Code 2018)

Bovine genital campylobacteriosis

An infectious diseases characterised by **early abortions, suppurrative metritis, cervicitis and vaginitis**. A widespread bacteral disease associated with both bovine infertility and abortion

Etiology

***Campylobacter* (Vibrio) *fetus*,** particularly the subspecies *venerealis*

Incubation period: <3 days

Pathogenesis

- Inhabitant of reproductive tract of bovines
  - Preputial cavity, mucosa of glans penis, distal portion urethral
  - Vagina, cervix, uterus, oviduct
- Spreads through natural or artificial insemination

Bovine genital campylobacteriosis

Characteristic symptoms

- Abortion in midgestation
- Mucopurulent vaginal dishcarges
- Retention of placenta

Macroscopic features

- Yellowish purulent exudate in uterine discharges
- Congestion of vagina
- Edema of foetus and placenta
- Necrotic foci in lver

Bovine genital campylobacteriosis

Disease risk through semen

- **Survive cryopreservation of semen** (Peter, 1997)

- Transmitted to female cattle at natural or artificial service and causes vaginitis, cervicitis, endometritis, salpingitis, infertility, delayed return to estrus, early embryonic death, and rarely abortion (4–7 mo of gestation)
(Peter, 1997; BonDurant, 2005)

- Organisms reside in the epithelium of the preputial cavity of infected bulls; with increasing age, the epithelial crypts of the prepuce become deeper, providing a microaerophilic environment that supports replication of these microbes. Thus, a **bull can develop a life-long infection**

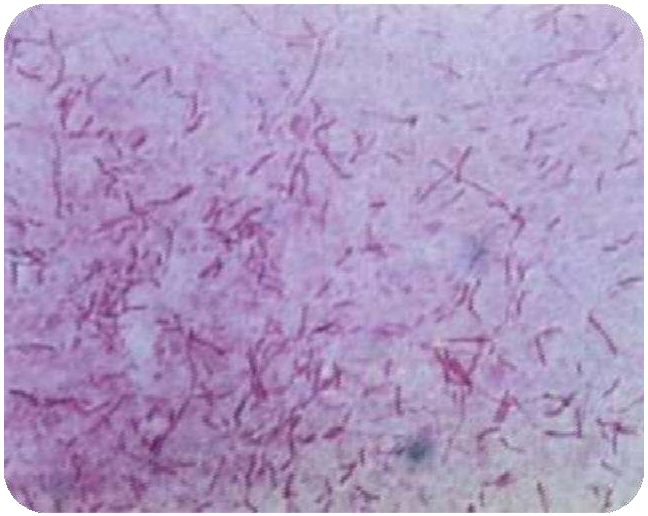
- Infection is not accompanied by either pathological lesions or modifications in the characteristics of the semen (Eaglesome & Garcia, 1997)

Bovine genital campylobacteriosis

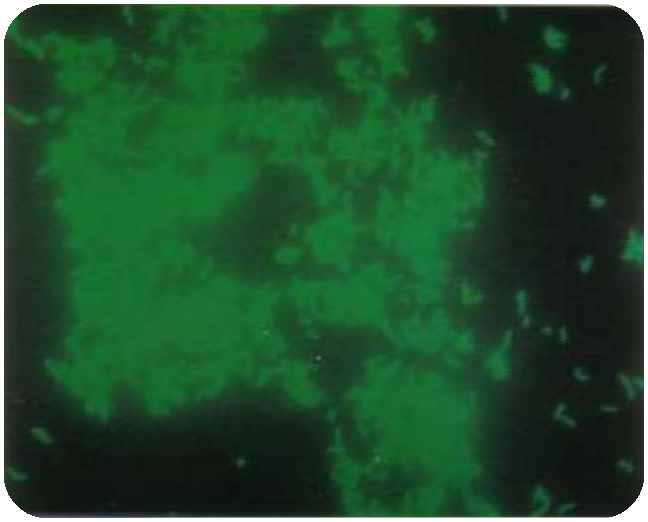
Diagnosis

Preputial scrapings and semen from bulls are the usual specimens taken for laboratory tests

- Symptoms and lesions
- Isolation and identification of bacteria
- ELISA
- Demonstaration of organisms in tissue section using special staining



Gram staining



Fluorescent antibody method

Bovine genital campylobacteriosis

Control and Prevention

- Bulls are usually tested in quarantine by culture of preputial samples on three occasions to ensure that they are free of *C. fetus* before entering AI centres

- In SCC disease-free status is confirmed by semi-annual testing

- A combination of gentamycin, lincospectin and tylosin, has been recommended for Liquid or frozen semen

  (Shin et al., 1988; Eaglesome & Garcia, 1997)

- **OIE** recommends

  Gentamicin, Tylosin, Lincomycin–Spectinomycin; Penicillin, Streptomycin, or Amikacin and Dibekacin

BRUCELLOSIS

Infectious bacterial disease characterised by **abortions in late gestation** and formation of **granulomatous lesions in genital organ**

- Brucellosis affects approximately 5% of livestock world-wide and continues to increase (Eaglesome & Garcia, 1997)

Etiology

Brucella abortus (occasionally by *B. melitensis*)

Incubation Period: 14–120 days

Pathogenesis

- Ingestion, inhalation, through abraded skin or conjunctiva
- Localize and multiply in regional lymph nodes, spleen, liver, joints
- Congenital infection
- High affinity for Erythritol in placenta and foetus

BRUCELLOSIS

Characteristic symptoms

- Orchitis and fluid accumilation in scrotum
- Abortion in late gestation
- Retention of placenta

Macroscopic features

- Thickened and edematous chorion
- Edematous foetus with serosanguinous fluid in body cvity
- Scoratal enlargement
- Induration of mammary glands in cows

BRUCELLOSIS

Disease risk through semen

- The organisms survive in the environment in favourable circumstances for prolonged periods

- Localize in the reproductive tract of the bull leading to orchitis, epididymitis, seminal vesiculitis, ampullitis, decreased libido and infertility (Givens & Marley, 2008)

- Bulls will shed *B. abortus* organisms in semen during the acute phase of infection, after which shedding will cease or become intermittent (Bercovich et al., 1998)

- Infected bulls may be serologically positive or negative (Plant et al., 1976)

- Spread occurs through contact with the uterine discharge of an aborted or full-term fetus and also infection through milk and semen of infected cows and bulls is also possible

BRUCELLOSIS

Diagnosis

- Symptoms and lesions
- Isolation and identification of bacteria
- Demonstration of organism in tissue sections
- Serological tests (CFT and ELISA)
- Agglutination tests on milk or seminal plasma
- DNA amplification using gene sequencing

Hygroma of knee

BRUCELLOSIS

Control and Prevention

- Live strain 19 vaccine and the killed 45/20 vaccine

- Strain 19 may produce permanent infections in bulls similar to those of natural disease (Nicoletti et al., 1986)

- RB51, an avirulent rough mutant lacking an O-chain, can induce a protective cell-mediated immune response without an accompanying seroconversion (Schurig et al., 1996)

OIE

- Should come from brucellosis free herd (Article 8.4 of OIE 2018)
- Should be tested serologically - a minimum of 21 days after entering preentry area with negative result
- Annual testing at SCC with negative result

(Chapter 4.6 of the OIE-Terrestrial Animal Health Code 2018)

Bovine Tuberculosis

Chronic bacterial disease characterised by presence of **tubercle nodules** in lungs, spleen and lymph nodes resulting in **progressive emaciation** of the affected animal

Etiology

Mycobacterium bovis (occasionally by *M. Tuberculosis*)

Incubation period: 3 weeks

Pathogenesis

- Contact with infected animals, discharges and morbid tissues
- Fomites - instruments, utensils and beddings
- Localization in Pharyngeal and mesenteric lymph nodes
- Coughing and droplet infection

Bovine Tuberculosis

Characteristic symptoms

- Low grade fever
- Progressive wasting and loss of production
- Coughing

Macroscopic features

- Consolidation of lungs
- Tubercle nodules with cheesy mass in lungs
- Granulomatous lesions in spleen, liver, intestines and lymph nodes
- Tubercle nodules on pleura and mesentery (Pearl's disease)

Bovine Tuberculosis

Disease risk through semen

- Tuberculosis is a zoonotic disease and transmission by semen is possible

  (Wentink *et al.*, 2000)

- Bull diagnosed with TB on slaughter which was used for AI has resulted in infection of more than 100 cows out of 1000 inseminated

  Raumy (1966)

- Transmission of tuberculosis has been reported via natural breeding as well as in fresh and frozen semen samples using PCR

  (Bartlett, 1967; Ahmed et al., 1999)

- The organism is resistant to environmental influences and may survive for several months.

Bovine Tuberculosis

Diagnosis

- Symptoms and lesions
- Isolation and identification through culture from nasal secretions
- Delayed hypersensitivity testing – **single intra dermal test** (tuberculin)
- Demonstration of **acid fast bacilli organism** in tissue sections
- Serological tests (**ELISA**)

Bovine Tuberculosis

Control and Prevention

- CSS requires a negative intradermal tuberculin test within 60 days prior to entry into the isolation facility

(Certified Semen Services, 2015)

OIE

- Tuberculosis free herd or should be tested serologically negative

(Article 8.11 of OIE 2018)

- Annual testing at SCC with negative result

(Chapter 4.6 of the OIE-Terrestrial Animal Health Code 2018)

Bovine Paratuberculosis

Chronic bacterial disease characterised by **dehydration, emaciation, chronic diarrhoea** and **thickening of intestines**

Etiology

Mycobacterium paratuberculosis

Incubation period: 12-24 months

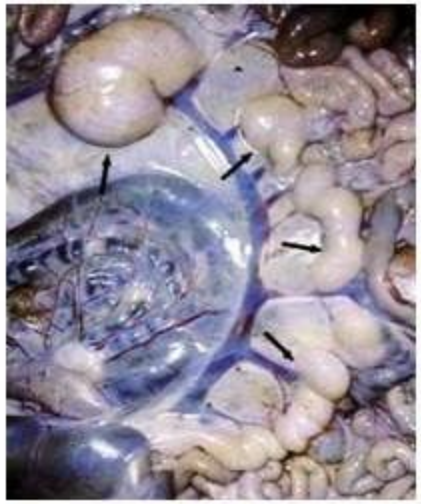
Pathogenesis

- Faces is the primary source of infection
- Ingestion of contaminated feed and water
- Localization in intestinal mucosa and lymph nodes
- Decreases absorptive surface area resulting in malabsorption diarrhoea

Bovine Paratuberculosis

Characteristic symptoms

- Chronic diarrhoea
- Progressive wasting and loss of production
- Hidebound condition



Macroscopic features

- Emaciation and cachexia
- Thickening of intestinal wall
- Corrugations can not removed even after stretching intestines
- Enlarged mesenteric lymph nodes

Bovine Paratuberculosis

Disease risk through semen

- The organisms survive in the environment in favourable circumstances for prolonged periods

- *M. paratuberculosis* was found in the semen of bulls suffering from severe clinical disease.

(Wentink *et al.*, 2000)

marked emaciation and adhesion of feces

LEPTOSPIROSIS

Infectious disease characterised by widespread hemorrhages inn visceral organs, nephritis, icterus, hepatitis and anemia

Etiology

Leptospira interrogans

- Serovars include Hardjo (*L. hardjo*), *L. pomona*, *L. grippotyphosa*, *L. canicola*, and *L. icterohaemorrhagiae*

Incubation period: <7 days

Pathogenesis

- Direct contact with urine if infected animal
- Ingestion of contaminated feed and water
- Aborted fetus and uterine discharges
- Localises in kidney resulting in acute or chronic nephritis

LEPTOSPIROSIS

Characteristic symptoms

- High fever
- Anemia
- Icterus
- Abortion
- Hemoglobinuria

Macroscopic features

- Hemorrhages (lung, liver, Kidney, lymph nodes)
- Enlargement of spleen and kidney
- Abortions
- Greyish white foci on viscera

LEPTOSPIROSIS

Characteristic symptoms

- High fever
- Anemia
- Icterus
- Abortion
- Hemoglobinuria

Macroscopic features

- Hemorrhages (lung, liver, Kidney, lymph nodes)
- Enlargement of spleen and kidney
- Abortions
- Greyish white foci on viscera

LEPTOSPIROSIS

Disease risk through semen

- Recovered from the semen of **naturally** (Kiktenko et al., 1976) and **experimentally** infected bulls (Sleight et al., 1964), and seminal transmission has been reported (Sleight. 1965)

- Transmission of the organism may be possible through **fresh and frozen semen** (Eaglesome et al., 1997; Miraglia et al., 2003)

- *Leptospira* spp. can be isolated from the genital tract of **subclinical bulls** and transmitted in semen (BonDurant, 2005)

LEPTOSPIROSIS

Diagnosis

- Symptoms and lesions
- Demonstration of organism using **dark field microscopy**
- Microscopic agglutination test (MAT)

Control

- The addition of antibiotics to extended semen has been shown to be effective in controlling the number of leptospiral organisms (Miraglia et al., 2003)

Trichomoniasis

Protozoan disease characterised by abortion, vaginitis, metritis and balanitis in cattle

Etiology

Trichomonas foetus

Incubation period: **<7 days**

Pathogenesis

- Coital infection from infected bull
- Abortion followed by pyometra due to secondary bacterial infection

Trichomoniasis

Characteristic symptoms

- Abortions in early pregnancy
- Retention of placenta
- Sterility
- Pyometera

Macroscopic features

- Vaginitis
- Metritis and pyometra
- Balanitis in bulls

Diagnosis

Preputial scrapings and semen from bulls are the usual specimens taken for laboratory tests

- Symptoms and lesions
- Isolation and identification of organism
- ELISA
- Demonstaration of organisms in tissue section using special staining

Control and Prevention

- Disease-free herds and be tested in quarantine by the direct microscopic and culture tests on three occasions

MSP- Diseases and Control

Bovine brucellosis

Tuberculosis

Paratuberculosis

Campylobacteriosis

Trichomoniasis

Foot and mouth disease

Quarantine

A quarantine period of minimum 60 days is compulsory before bringing new bulls into a semen station. Only after favorable results from the health control point, the bulls shall be admitted to the semen station

A. In the quarantine station, new animals shall be housed for a minimum of 60 days in a place which is effectively separated and away from (preferably at a distance of 5 km) the facilities occupied by resident bulls. Manpower deployed and all equipment used in handling, feeding, watering and cleaning the new bulls shall not be shared with the resident herd
B. Each new animal in quarantine station will be tested against major contagious diseases before its entry to resident herd e.g. TB, JD, Brucellosis, Campylobacteriosis and Trichomoniasis. All tests shall be done by an accredited agency or disease diagnostic laboratory
C. During quarantine period, the bulls shall be vaccinated against FMD, HS, BQ, Theileriosis and Anthrax. However, vaccinations against bacterial diseases shall be done only if there is an outbreak or prevalence of a particular disease.

Note : Once the quarantine period is over, all bulls shall be introduced to the young bull rearing station.

Testing of Bulls

As per OIE guidelines, the breeding bulls should be free from above mentioned diseases. Though Johne's disease is not a sexually transmitted disease but from the herd health point of view, bulls found positive should be removed and therefore it has been included in the MSP. The bulls in the rearing station and the resident herd should go through periodical testing and vaccinations as per the schedule listed in the manual.

Culling of Bulls and Semen Doses due to Specific Diseases

Diseases	Bulls	Semen doses
FMD	Retain	Last one month's doses to be discarded
Brucellosis	Castrate & remove	FS doses in stock to be discarded since the last negative test
TB	Remove	FS doses in stock to be discarded since the last negative test
JD	Remove	FS doses in stock to be discarded since the last negative test
Campylobacteriosis	Treat and retain	FS doses in stock to be discarded since the last negative test
Trichomoniasis	Treat and retain	FS doses in stock to be discarded since the last negative test

The semen station must remove bulls (within 48 hours) which are positive for Brucellosis, TB and JD. Bulls found positive for Campylobacteriosis and Trichomoniasis shall be isolated and treated. Besides, the semen station shall cull those bulls which have completed eight years of productive period or 3 lakh semen doses, whichever is achieved earlier. In addition, the bulls with poor libido, poor semen quality, incurable lameness, etc. shall also be culled.

Details of the tests to be conducted

Disease	Test	Samples
Brucellosis	ELISA	Serum
TB	DTHTuberculin PPD	Intradermal On the bulls
JD	DTH- Johnin PPD	Intradermal On the bulls
Trichomonasiasis	Agent identification	Preputial washings / semen
BGCB	Agent identification	Preputial washings / semen
FMD	ELISA	Serum

Quarantine of adult bulls of unknown health status

Quarantine period : Minimum 60 days or long enough to allow at least two tests for MSP diseases to be performed during quarantine with a minimum interval of 30 days between the two tests. In case of TB and JD the interval between the two tests should not be less than 62 days.

Shifting of bulls from the quarantine: Within 30 days from the date when the last test was performed and all bulls were found negative.

Action on finding a positive result :

Brucellosis, TB, JD, Bovine Genital Campylobacteriosis, Trichomoniasis-----Cull / remove the positive bull and put all the remaining bulls under extended quarantine

Extended quarantine:

For a period of minimum 60 days or long enough to allow at least two tests for the diseases mentioned above to be performed, from the day last positive bull was culled/ removed. Perform one test within the last 30 days of the extended quarantine.

Action on finding a positive during extended quarantine

During Quarantine, if the bulls are housed and managed

Individually - Remove only the positive bull. In groups (not more than 3 animals in each group) – Remove all bulls in the group in which positive was detected. Free and not in groups- Remove all the bulls.

Quarantine of adult bulls of known health status

Quarantine period: Minimum 30 days or long enough to allow at least one test for all MSP diseases

Shifting of bulls from the quarantine: Within 30 days of the last negative test

Extended quarantine: For a period of minimum 30 days from the day last positive bull was culled/ removed. Perform one test within the last 30 days of the extended quarantine.

Disease testing & management of bovine tuberculosis in semen station

Delayed hypersensitivity – Single Intra Dermal test
Bovine tuberculin PPD
Animals above 2 months of age

Positive

skin thickness of **≥4mm**
OR
Clinical signs 72 hours post-inoculation

Isolation and removal from herd

Frozen semen doses - Destroy since last negative test

Negative

Skin thickness of **<2mm**
OR
No clinical signs
72 hours post-inoculation

Positive herd testing	• 42 days after culling last positive animal
Negative herd testing	• 6 monthly testing after whole herd negative testing
TB free herd	• Negative on 2 consecutive tests at 6 months interval

Adapted from Annexure-4 Minimum standards for production of bovine frozen semen

Disease testing & management of bovine paratuberculosis in semen station

Delayed hypersensitivity – Single Intra Dermal test
Johin PPD
Animals above 2 months of age

Positive

skin thickness of ≥4mm
OR
Clinical signs 72 hours post-inoculation

Isolation and removal from herd

Frozen semen doses - Destroy since last negative test

Negative

Skin thickness of <2mm
OR
No clinical signs
72 hours post-inoculation

Positive herd testing	• 42 days after culling last positive animal
Negative herd testing	• 6 monthly testing after whole herd negative testing
JD free herd	• Negative on 2 consecutive tests at 6 months interval

Adapted from Annexure-5 Minimum standards for production of bovine frozen semen

Disease testing & management of bovine brucellosis in semen station

ELISA
Serum
All age animals

- Positive
  - **Isolation and removal from herd after castration**
  - **Frozen semen doses - Destroy since last negative test**
- Negative

Positive herd testing	• 30-60 days after culling last positive animal
Negative herd testing	• Annual testing after whole herd negative testing
Brucellosis free herd	• Negative on 2 consecutive annual tests

Adapted from Annexure-6 Minimum standards for production of bovine frozen semen

Disease testing & management of bovine genital campylobacteriosis in semen station

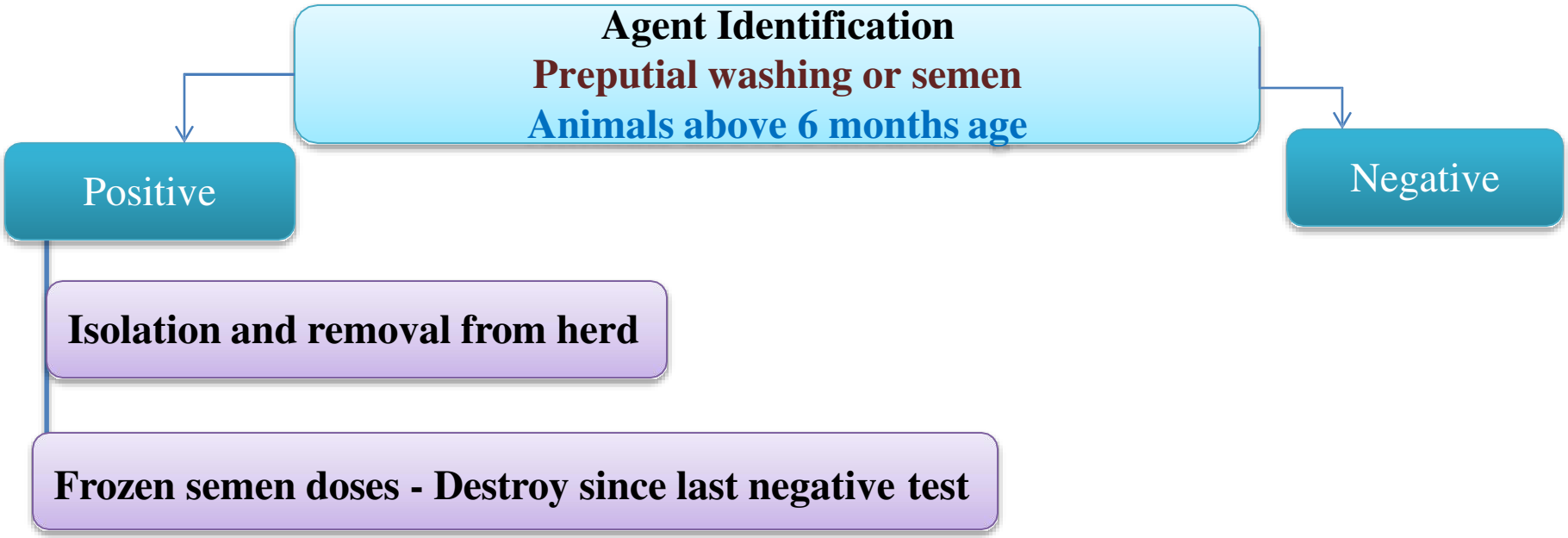
Agent Identification
Preputial washing or semen
Animals above 6 months age

- Positive
  - **Isolation and removal from herd**
  - **Frozen semen doses - Destroy since last negative test**
- Negative

Positive herd testing	• Minimum 30 days after culling last positive animal
Negative herd testing	• Annual testing after whole herd negative testing
Campylobacteriosis free herd	• Negative on 2 consecutive annual tests

Adapted from Annexure-7 Minimum standards for production of bovine frozen semen

Disease testing & management of Bovine trichomonasis in semen station



Positive herd testing	• Minimum 30 days after culling last positive animal
Negative herd testing	• Annual testing after whole herd negative testing
Trichomonosis free herd	• Negative on 2 consecutive annual tests

Adapted from Annexure-8 Minimum standards for production of bovine frozen semen

Management of FMD in Semen Station

Outbreak in Semen station

- Disinfect premises and destroy contaminated feed and fodder by burning
- Destroy frozen semen doses of animal from past one month prior to outbreak
- Isolate and treat the animal and rested for 90 days after recovery
- No semen collection from healthy bulls from outbreak to one month after recovery of last case
- Suspend semen sale till 30 days after the last case has recovered

Outbreak in areas surrounding semen station

- Ring vaccination within a radius of 10 Km
- Disinfect roadsides adjacent to the farm daily
- Stop all the fodder movement through area of infection
- Stop animal movement of semen station through area of infection

Adapted from Annexure-9 Minimum standards for production of bovine frozen semen

CONCLUSION

Special housing and operating specifications

Only disease free animals shifted from quarantine

Monitoring the health of individual animals through regular clinical examination

Assessment of semen for detection of various pathogens

hygiene for humans

disinfection of materials

eradication of vermin

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Thank You