
The World
Arctic Ocean
Arctic Ocean
Greenland
Svalbard (Norway)
Russia
Canada
North Atlantic Ocean
Kazakhstan
Mongolia
North Pacific Ocean
North Pacific Ocean
United States of America
China
Japan
Mexico
India
Taiwan
Philippines
Brazil
Indian Ocean
South Pacific Ocean
South Atlantic Ocean
Australia
New Zealand
Tasmania
Southern Ocean
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Ruminant Abortions

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Colorado State University
Veterinary Diagnostic Laboratories

References

Merck Veterinary Manual

https://www.merckvetmanual.com/

Large Animal Internal Medicine

6th Edition

Editors: Bradford Smith David Van Metre Nicola Pusterla

Hardcover ISBN: 9780323676885

Published Date: 27th June 2019

References

Infectious Causes of Bubaline Abortions

From the Departments of Veterinary Diagnostic Medicine (Maherchandani, Patnayak, Malik, Goyal), and the Clinical and Population Sciences (Mun˜oz-Zanzi), College of Veterinary Medicine, University of Minnesota, St. Paul, MN 55108. 1Corresponding Author: Sagar M. Goyal, Department of Veterinary Diagnostic Medicine, University of Minnesota, 1333 Gortner Avenue, St. Paul, MN 5

Pantnagar Journal of Research 199 [Vol. 17(3), September-December, 2019]
Epidemiology of brucellosis in India: a review; A. K. UPADHYAY, MAANSI, POOJASINGH and AASTHANAGPAL Department of Veterinary Public Health and Epidemiology, College of Veterinary and Animal Sciences, G. B. Pant University of Agriculture and Technology, Pantnagar -263145 (U. S. Nagar, Uttarakhand)

Brucellosis - zoonotic

Species affected: cattle, sheep, goats, pigs, bison, buffalo, camels, dogs, horses, reindeer, yaks, mithum and marine animals (dolphins, porpoises and seals).

Conclusion: prevention and control measures have not worked

Pantnagar Journal of Research 199 [Vol. 17(3), September-December, 2019]
Epidemiology of brucellosis in India: a review A. K. UPADHYAY, MAANSI, POOJASINGH and AASTHANAGPAL Department of Veterinary Public Health and Epidemiology, College of Veterinary and Animal Sciences, G. B. Pant University of Agriculture and Technology, Pantnagar -263145 (U. S. Nagar, Uttarakhand)

The 'National Animal Disease Control' programme aim is to control this brucellosis through proper vaccination

brucellosis in livestock - estimated loss of US $3.4 billion per year

cattle and buffalo accounted for 95.6% of total (Singh et al, 2015).

India - world's largest livestock population

512.05 million

cattle, buffalo, sheep, goat, pig, horses & ponies, mules, donkeys, camels, mithun and yak

19th Livestock Census (2012).

Brucellosis - zoonotic

Historical seroprevalence – 2018

cattle 5%; buffalo 3% Renukaradhya, 2002).

range- 6.6% (123/1860) Madhya Pradesh (Mehra et al., 2000)

- 60% Assam (Chakraborty et al., 2000

Indian Council of Agricultural Research (2012–2013)

estimated national seroprevalence - cattle app 13.5% (Rahman, 2013)

Reference

Infection Ecology & Epidemiology ISSN: (Print) 2000-8686 (Online)
Journal homepage: https://www.tandfonline.com/loi/ziee20

Bovine brucellosis: prevalence, risk factors, economic cost and control options with particular reference to India- a review

Ram Pratim Deka, Ulf Magnusson, Delia Grace & Johanna Lindahl To cite this article: Ram Pratim Deka, Ulf Magnusson, Delia Grace & Johanna Lindahl (2018)

Infection Ecology & Epidemiology, 8:1, 1556548, DOI:

https://doi.org/10.1080/20008686.2018.1556548

Ruminant Abortions – Brucellosis 2018

India - 300 million dairy animals - cattle & buffalo

dairy products main source of animal produced food in India

70 million households produce milk

Brucellosis

2% sero-prevalence (30,437 animals - 23 states represented)

estimated range 17%- 66% sero-prevalence

dairy-belt farms known abortions, retained placentas, etc.

brucellosis- estimated to cause a 10% loss in milk production (46% of total loss)

Increased calving interval- 18%

Treatment cost – 14%

Total loss of USD 3.4 billion total livestock sector

96% involved the dairy sector

Deka - 2018

Preventive Veterinary Medicine 69 (2005) 145–151

www.elsevier.com/locate/prevetmed

Seroprevalence of brucellosis in mithuns (Bos frontalis) in India

S. Rajkhowa*, H. Rahman, C. Rajkhowa, K.M. Bujarbaruah

N.R.C. on Mithun, ICAR Complex Jharnapani, Medziphema, Nagaland 797 106, India

Received 4 March 2004; received in revised form 13 **January 2005**; accepted 8 February 2005

Table 2
Risk factors for A–B ELISA seroprevalence of Brucella infection in 98 mithuns in India, 2002–2003

Risk factors	Number of animals tested	Seropositive		x^2	d.f.	P
		%	95 % CI			
Animal category						
Bull	25	16	2, 30			
Cow	43	47	32, 62	6.85	2	0.03
Heifer	30	30	14, 46			
Strain						
Arunachal	26	12	0, 24			
Manipur	20	30	10, 50			
Mizoram	22	55	34, 76	10.65	3	0.01
Nagaland	30	40	22, 58			

Ruminant Abortions - Brucellosis

Brucellosis - Zoonotic

Cattle, water buffalo, bison, yak, cervids -

Brucella abortus > B melitensis (sheep & goats)> B suis (clinical signs- variable; not contagious from cow to cow).

Transmission - ingestion primary route

fetal tissues –

uterine discharges

contaminated feed or water or may lick contaminated genitals of other animals.

environmental organisms -, viable for more then 2 months.

direct sunlight kills the organisms within a few hours.

Venereal transmission – natural matting rare.

artificial insemination – infected semen placed in uterus

not when placed mid cervix.

Exposure: contact with mucous membranes, conjunctivae

broken and intact skin

Ruminant Abortions - Brucellosis

Brucellosis - zoonotic

Clinical findings

Abortion (uncomplicated) - last trimester (usually abort once)

- stillborn or weak calves
- retained placentas
- reduced milk yield.

Bulls - Seminal vesiculitis, infected ampullae, testicles and epididymis

- organisms are present in the semen.
- testicular abscesses
- arthritis

Ruminant Abortions - Brucellosis

Brucellosis - zoonotic

Diagnosis

- bacteriology
  - placenta
  - fetal stomach content or lung
  - genital secretions early postpartum
  - milk
    - Recently The CSU bacteriology lab - cultured RB51 from the milk of cow that was part of the raw milk association of Colorado.

Ruminant Abortions - Brucellosis

Brucellosis - Diagnosis

Serology

agglutination test – standard plate - card

serum, milk and whey,

ELISA

serum and milk

complement fixation

rivanol precipitation

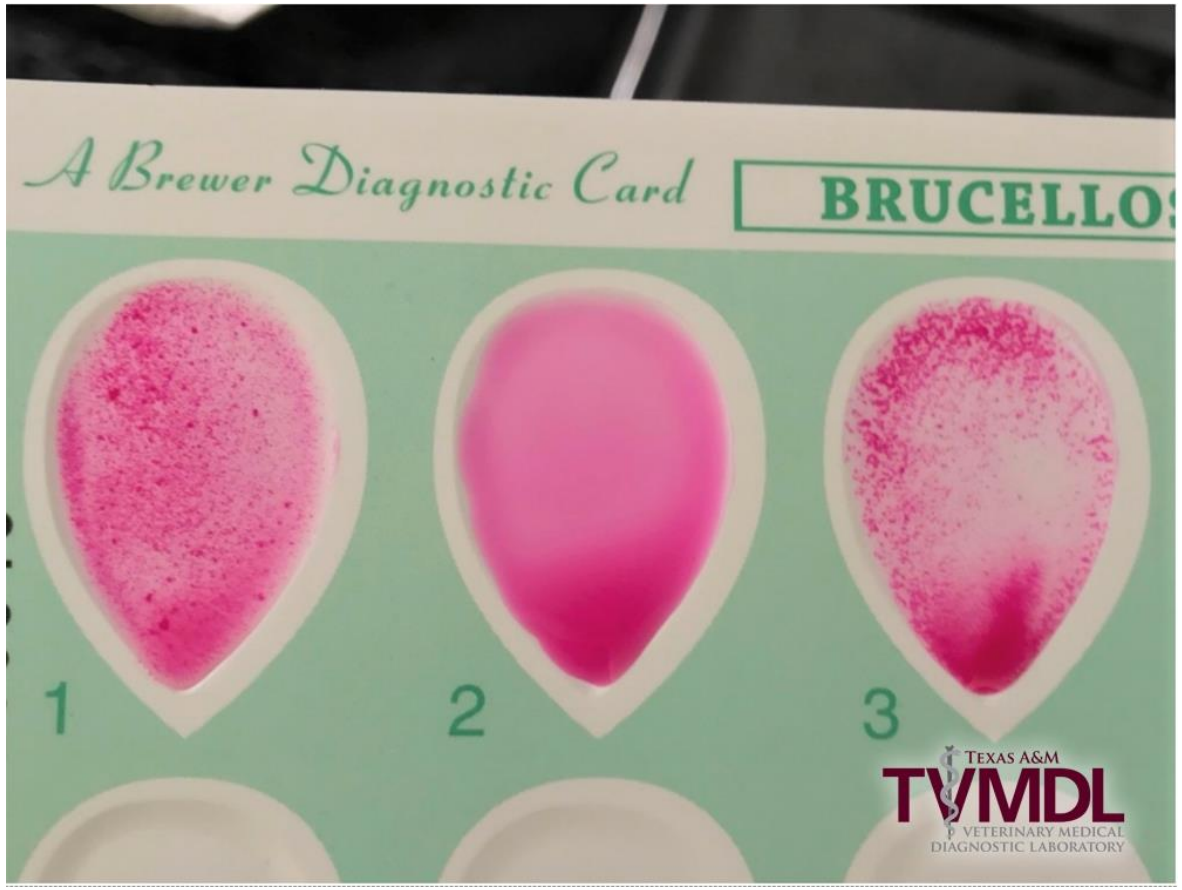
Molecular

multiplex PCRs

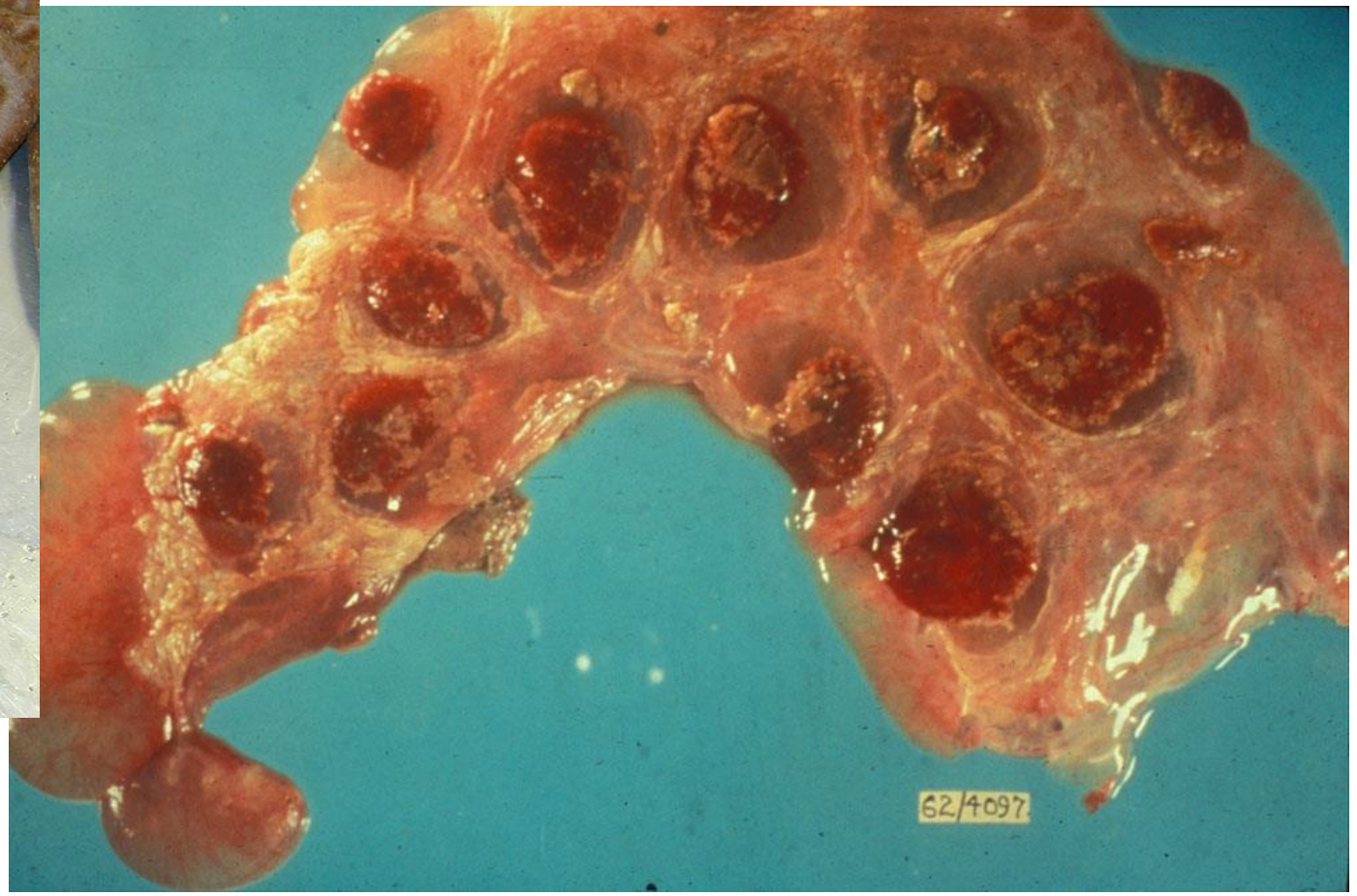
Brucella Agglutination Tests

Standard Plate

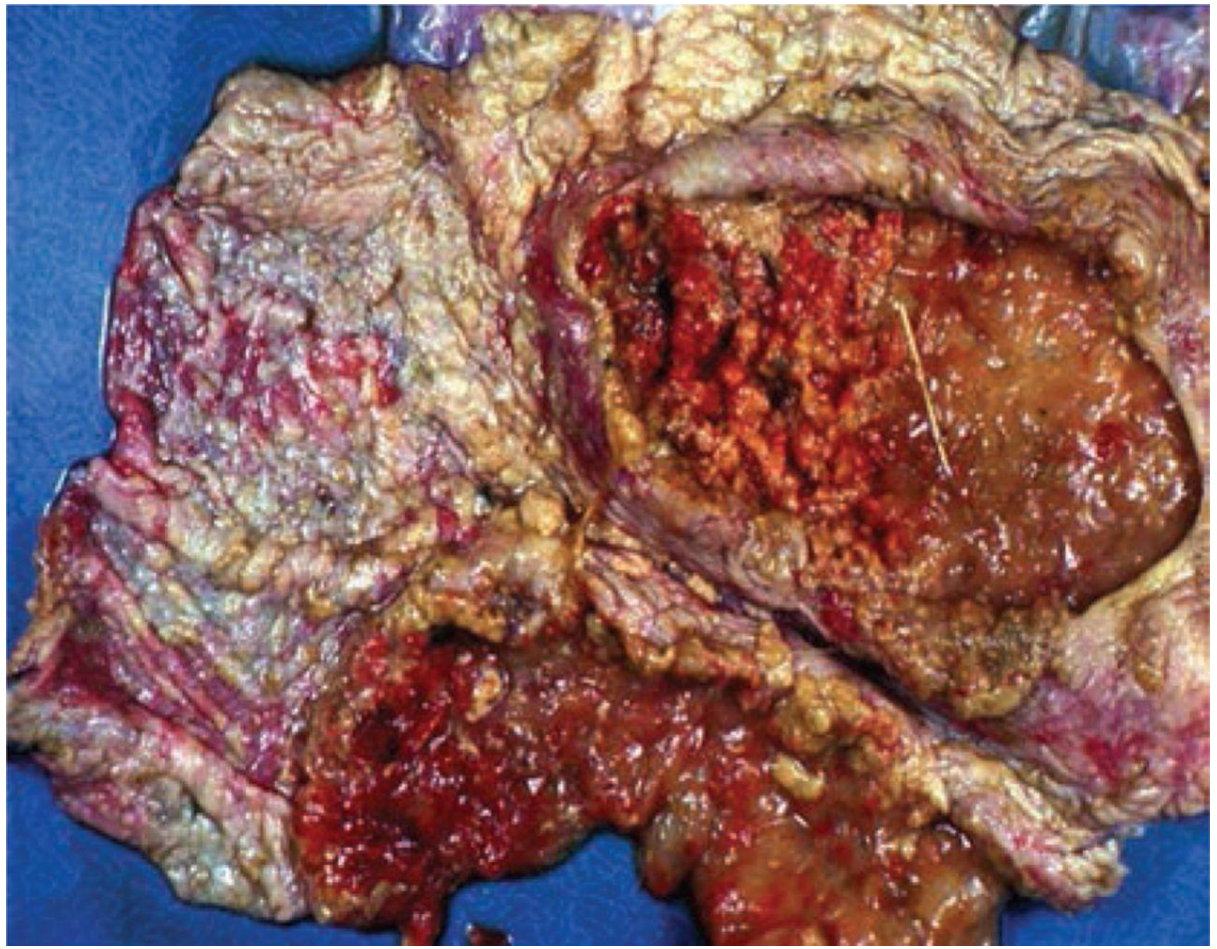
Card Test



Placentitis - non-cotyledonary regions: diffusely opaque, edematous and white/pink;
cotyledons were tan and had scattered hemorrhage.
https://www.askjpc.org/wsco/wsc_showcase2.php?id=WWxlb3AwYkpQeTFFbkgvZlFtNm9GUT09



thick, leathery yellow intercotyledonary areas; necrotic cotyledons covered with brown exudate



Ruminant Abortions - Brucellosis

Brucellosis

Treatment

none

Prevention

Vaccination of calves with *B abortus* Strain 19 or RB51 increases resistance to infection.

Epidemiological Modeling of Bovine Brucellosis in India
Gloria J. Kang, L. Gunaseelan, and Kaja M. Abbas
Proc IEEE Int Conf Big Data. Author manuscript; available in PMC 2015 Aug 14.
Published in final edited form as:
Proc IEEE Int Conf Big Data. 2014 Oct; 2014: 6–10.
doi: 10.1109/BigData.2014.7004420

Vaccination

Mass vaccination is an effective and efficient strategy to control and prevent brucellosis in animals, especially for cattle.

single vaccination (strain 19)- efficacy of 70%,

2012 Mar;50(3):239-42.

Safety and immunogenicity of Brucella abortus strain RB51 vaccine in cross bred cattle calves in India

Rashmi Singh [1], Sanjay Singh Basera, Kamal Tewari, Shweta Yadav, Sumit Joshi, Brajesh Singh, Falguni Mukherjee

Brucella abortus RB51 - 29 animals - organised dairy farm in India

iELISA :

35 days – 100%

60 days - 95%

90 days - 20%,

Conclusion - Strain RB51 elicited an immune respose:

60 days - 80%

no reactions

no shedding

Ruminant Abortions - Brucellosis

Brucellosis Goats - *Brucella melitensis* – **zoonotic**

Clinical signs – same as cattle

- abortion – 4th month
- stillbirth
- arthritis and orchitis

Transmission - primarily ingestion

Diagnosis

- bacteriologic
  - fetal tissues
  - milk

Vaccination –

Rev1 strain - SC or intraconjunctival routes.

B melitensis is highly pathogenic for people.

Detection of Brucella Melitensis Rev–1 Vaccinal Antibodies in Sheep in India

Rajeswari Shome February 2014
Advances in Animal and Veterinary Sciences 2(3S):19-22
DOI: 10.14737/journal.aavs/2014/2.3s.19.22

National Institute of Veterinary Epidemiology

In sheep, brucellosis is mainly caused by Brucella melitensis which is an important reproductive disease and is characterized by abortion in the fourth or fifth month of gestation, stillbirths and reproductive failure. The Rev.1 live B. melitensis vaccine is the most widely used vaccine in control programs against brucellosis in small ruminants in different parts of the world. **This vaccine however shows a considerable degree of virulence and induces abortions. In India, B. melitensis Rev.1 vaccine for small ruminants is officially not recommended by the Government of India. Present study reports B. melitensis Rev.1 vaccinal antibodies detection in breeding sheep flock due to use of Brucella melitensis Rev1 vaccine**

six sheep (20 vaccinated; 26 unvaccinated)

tested for antibodies against B.melitensis Rev–1 vicinal strain.

19/20 (95%) vaccinated sheep tested positive

13/26 (65%) unvaccinated tested positive

RBPT, SAT and iELISA

Evidence of ovine brucellosis due to Brucella ovis and Brucella melitensis in Karnataka, India

April 2018
The Indian journal of animal sciences 88(5):522-525

"Ovine brucellosis is often neglected contagious bacterial disease causing enormous economic losses to sheep industry.

India is recognized as geographical hotspot for brucellosis and there is only one seroprevalence report of Brucella ovis infection in sheep."

300 serum samples (9 different districts of Karnataka):

Antibodies:

B. ovis – 5.34%

B. melitensis 8.67%.

Ruminant Abortions - Brucellosis

Sero-prevalence

Chakraborty 6.6%

Madhya --60% Assam

Rahman 2013 13.5%

Melitensis:

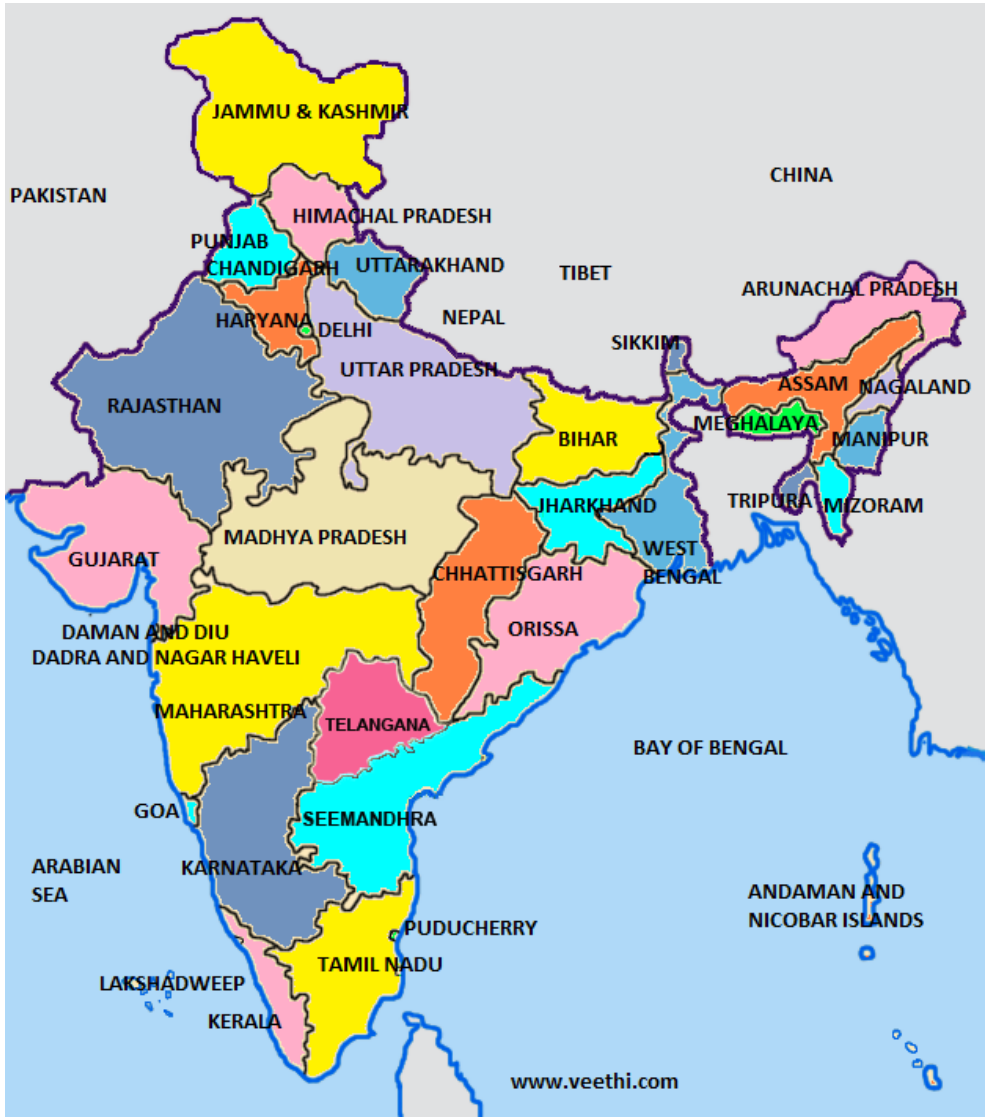
4.7% – 50% sheep –

4.7% -55% goats

Ovis:

4.43% -8.23% sheep

4.43% – 9.35% goats



Ruminant Abortions - Brucellosis

Sheep - Brucella ovis

Rams - lesions of the epididymis, tunica, and testis -

Ewes - abortions and placentitis

stillbirths/neonatal deaths

Clinical signs rams

poor semen quality with the presence of WBCs

bacteria – can persist for years

Epididymal enlargement - unilateral or bilateral.

Tail > head

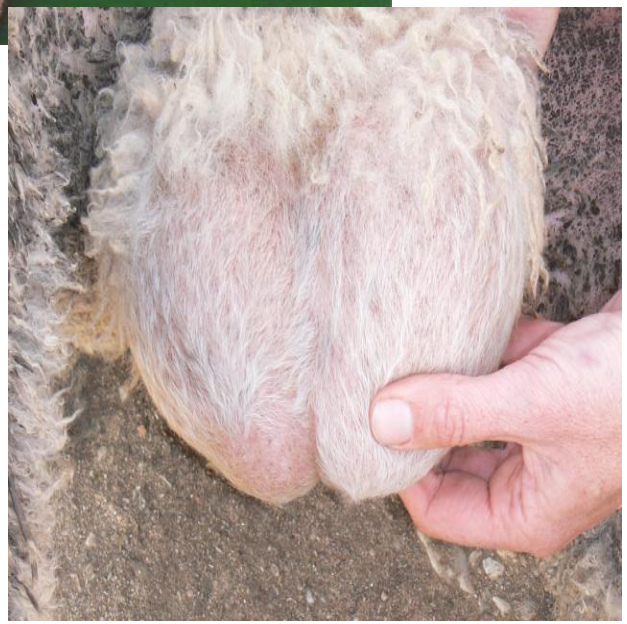
spermatoceles

thickening of the tunics

The disease can be transmitted among rams by direct contact.

susceptibility in rams increases markedly with age,

Ewes can become infected by natural breeding



Ruminant Abortions - Brucellosis

Sheep - Brucella ovis

Diagnosis – ram

- physical examination
- culture semen
- serology
  - ELISA

Treatment

- Chlortetracycline and streptomycin
  - costs?
  - fertility may remain impaired

Ruminant Abortions - Bovine Herpes Virus

Bovine herpesvirus 1 (BHV-1) –

- abortion
- infectious bovine rhinotracheitis (IBR) - rednose
- infectious pustular vulvovaginitis (IPV)
- balanoposthitis
- conjunctivitis
- encephalomyelitis
- mastitis.

Cows - abortion or IPV

Transmission: non clinical carrier animals

artificial insemination with infected semen

Cattle - latent BHV-1 infections; no clinical signs

recrudescence

Ruminant Abortions - Bovine Herpes Virus

Abortions:

- approximately 100 days post acute infections
  - generally last half of pregnancy
  - early embryonic death can occur

Ruminant Abortions - Bovine Herpes Virus

Bovine Herpes Virus – Infectious Bovine Rhinotracheitis (IBR)

Diagnosis:

serology -

titers - maximum at time of abortions

Fetus

pathology -

IHC - Immunohistochemistry – fixed tissues

FA – fluorescent antibody - fetal tissues

virus isolation

PCR - tissues or exudates.

Ruminant Abortions - Bovine Herpes Virus

Prevention

Immunization with modified-live or inactivated virus vaccines generally provides adequate protection against abortion and clinical disease

- Breeding animals
  - at weaning
  - 30-60 days before breeding
  - annual boosters

Iatrogenic abortions-

- modified-live vaccines may cause abortion in pregnant cattle.

2010 Feb;42(2):203-7.
doi: 10.1007/s11250-009-9407-7. Epub 2009 Aug 1.

Prevalence of brucellosis and infectious bovine rhinotracheitis in organized dairy farms in India

Bhavesh Trangadia[1], Samir Kumar Rana, Falguni Mukherjee, Villuppanoor Alwar Srinivasan
Affiliations PMID: 19644761 - DOI: 10.1007/s11250-009-9407-7

Prevalence of bovine brucellosis and IBR - organized dairy farms

Brucella: ELISA – 22.18%

Rose Bengal Plate Test (RBPT) -13.78%

Milk Ring Test (MRT) - one farm - 12.82%

2 cows milk cultured positive

IBR – 60.84%

Conclusion: Brucella and IBR caused abortions in these farms

the urgent need and the necessity for control of these infectious diseases which cause heavy economic losses to the organized farms.

Int. J. Livest. Res.. 2014; 4(5): 21-27
doi: 10.5455/ijlr.20140717052204

Epidemiological Studies on Infectious Bovine Rhinotracheitis (IBR) in Different Parts of India

Kollannur, Justin Davis, Syam, Radhika and Chauhan, R. S..

IBR - Seroprevalence - exotic and crossbred cattle- organized farms.

1010 serum samples (serum neutralization test)- 32.25%

highest - Uttar Pradesh

lowest - Himachal Pradesh.

50 semen samples (PCR) – 4% positive

Semen samples collected from the Germplasm Center of IVRI and samples received from different parts of the country by CADRAD were subjected to molecular analysis for detection of viral genome. In brief, DNA from semen samples were extracted by phenol cholorform method with SDS and Proteinase K. Polymerase chain reaction was carried out in 200 µl capacity thin-walled PCR tubes to a final volume of 25 µl using specific upstream and downstream primers for gI glycoprotein (Rocha *et al.,* 1998). The product was visualized by standard Agarose Gel electrophoresis by using 1% Agarose containing Ethidium Bromide (at the rate of 0.5µl per ml).

Result and Discussion

Seroprevalence

A total of 1010 serum samples were collected for screening of IBR from various parts of the country. Total number of 326 positive cases was discovered by SNT with a prevalence rate of 32.25%. Higher prevalence rate was noticed in Uttar Pradesh (55.42%) followed by Uttarakhand (40.71%). Least prevalence was noticed in Madhya Pradesh and Himachal Pradesh. The details of the samples with results are given below Table 1.

Table 1- State wise prevalence of Infectious Bovine Rhinotracheitis by using Serum Neutralization test

Total	Positive	Sero-prevalence (%)	Prevalence with 95% CI	States
99	34	34.34	24.99, 43.69	Chhattisgarh
43	3	6.98	-0.64, 14.6	Himachal Pradesh
200	45	22.5	16.71, 28.29	Kerala
130	26	20	13.12, 26.88	Maharashtra
315	115	36.51	31.19, 41.83	Punjab
83	46	55.42	44.73, 66.11	Uttar Pradesh
140	57	40.71	32.57 , 48.85	Uttarakhand
1010	**326**	**32.25**	**29.37, 35.13**	**Average**

Detection of Viral Genome In Semen Sample

Out of 50 semen samples, 2 (4%) were found positive for BHV-1 genome by published sequence of gI glycoprotein gene region of BHV-1, which was predicted to produce a PCR product of size 468 base pairs (bp) (Figure 1)

Discussion

Bovine herpesvirus-1 (BHV-1), the causative agent of IBR, is considered as the most common viral

DOI 10.5455/ijlr.20140717052204

Seroprevalence of bovine herpesvirus-1 antibodies in bovines in five districts of Uttarakhand, Veterinary World, 10(2): 140-143.
Thakur V, Kumar M, Rathish RL (2017)

Overall prevalence: 29.03%.

Pithoragarh district - 40.00%

Udham Singh Nagar 16.00%)

Uttarakhand

unorganized dairies - 31.02% > organized dairies - 26.51%.

buffaloes - 38.14% > cattle - 26.78%

Females - 30.08% > 16.21%

INFECTIOUS BOVINE RHINOTRACHEITIS (IBR): A SILENT PROBLEM CAUSING INFERTILITY IN CROSS-BRED CATTLE

Rashmi Rekha Kumari[1], Ravi Kumar[2], Shimpi Kumari[3], Pankaj Kumar[4] * and Manish Kumar[5]

Bihar Veterinary College,
Bihar Animal Sciences University
P.O. B V College, Patna- 800 014

Affiliations:

1. Assistant Professor, Bihar Animal Science University, Patna
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3. MVSc Scholar, Department of Veterinary Medicine, BASU, Patna
4. Senior Scientist, Veterinary Medicine DLFM, ICAR RCER, Patna-800 014
5. Associate Professor, Department of Biosciences and Bioengineering, IIT Guwahati-781 039, Assam

*Corresponding author email: pankajvet@gmail.com

India - huge livestock population supports the socio-economics of the majority of the population.

The country with a geographic area of 3,287,240 sq.km supports 300 million bovines, 65.07 million sheep, 135.2 million goats, and about 10.3 million pigs as per 19th livestock census.

cattle population – decreasing in response to a decrease in the indigenous population.

crossbred population of our country has shown increasing trends.

AI increasing (26% of 2017-2018 target 100 million cows by AI)

60% -70% conception – natural service/community bulls .

esponsible for many sexually transmitted diseases

Chandranaik et al. (2016) – introduced in 1976 - accelerated by crossbreeding policy to augment milk production

latent virus carrier cattle remain silent shedders of the virus and a potent source for disseminating infection

Conclusion - The most perilous situation is unawareness and ignorance about this disease amongst livestock owners or the field veterinarians, AI workers, and para-vets. A survey conducted under a project by Indian Council of Agricultural Research-Research Center for Eastern region (ICAR RCER), Patna endorsed such statement as no farmer was aware of this disease in 8 villages of Bihar and four villages of Jharkhand (Fig.1). Thus the objective of this article is to disseminate awareness about this disease, its control and available treatment for mitigation amongst veterinarians, extension workers, and academicians.

You can h

Advisory for Farmers for IBR Prevention and Control

Avoid natural mating of your animal with stray bulls.

Use only certified semen for artificial insemination of cattle.

Practice isolation / quarantine (21 days) before introduction of a new cow or bull in the herd.

Practice IBR vaccination (where suggested), Castrate IBR positive bulls. Isolate carrier cattle from the herd.

Contact nearest veterinary hospital to inform about symptoms like abortion or observation of respiratory distress or appearance of papules /pustules in the vagina of cow or penis of bull.

http://www.vethelplineindia.co.in/ibr_india/

Ruminant Abortions – Bovine Virus Diarrhea

Bovine viral diarrhea virus (BVDV) - *Pestivirus* in the family Flaviviridae.

primary host - cattle

most even-toed ungulates are also susceptible.

BVDV biotypes:

noncytopathic – persistent infections (PIs)

predominant viral biotype in nature

cytopathic - cytopathic change and cell death in cell cultures.,

BVDV genotypes - 2

BVDV type 1

1a & 1b

BVDV type 2

Ruminant Abortions – Bovine Virus Diarrhea

BVDV - endemic most cattle-producing countries.

Persistently infections (PI) - noncytopathic BVDV

natural reservoir for virus.

fetal infection with NCP strains between 40 – 120 days gestation

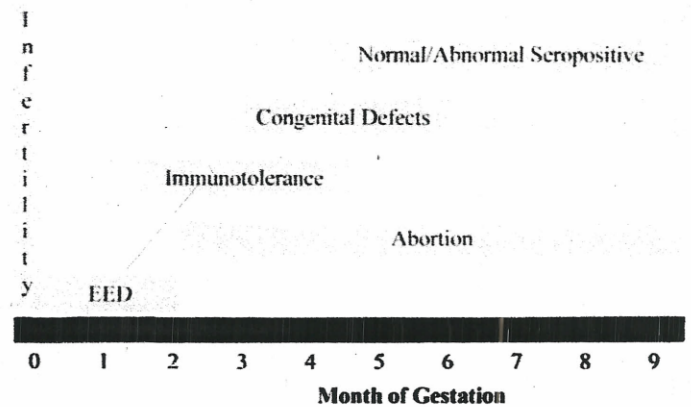
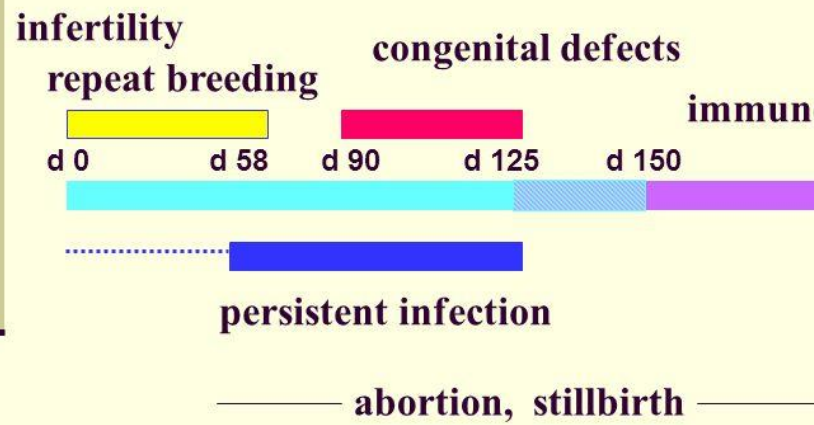


Fig. 1. Potential clinical reproductive outcomes following infection with bovine viral diarrhea virus. EED = early embryonic death.

BVD INFECTION DURING GESTATION



Ruminant Abortions – Bovine Virus Diarrhea

Fetal infection:

- resorption
- abortion
- mummification
- congenital malformations
- weak and undersized calves
- PI calves
- normal

congenital defects: cerebellar hypoplasia, hydrocephalus, hydranencephaly, +/- cranial deformation, dysmyelination of the spinal cord, lenticular cataracts, microphthalmos, chorioretinopathy, alopecia, brachygnathia, intrauterine growth retardation and thymus hypopla

PREVALENCE OF BOVINE VIRAL DIARRHOEA VIRUS IN WEST BENGAL, INDIA.
Available from: https://www.researchgate.net/publication/320596166

In India, serological evidence of BVDV first reported

- Chiplima Farm and Agricultural University in Odisha (Nayak et al. 1982) -

40.60% - Gujarat (Mukherjee et al., 1989).

30% -in cattle and buffalo from 14 states of India during 1999-2004 (Sood et al., 2007).

37.6% of Indian cattle were found positive (Bhatia et al., 2008)

Ruminant Abortions – Bovine Virus Diarrhea

Explor Anim Med Res,Vol.5, Issue - 2, 2015, p. 152-159

PREVALENCE OF BOVINE VIRAL DIARRHOEA VIRUS IN WEST BENGAL, INDIA

Reshmi Ghosh1, Sumit Chowdhury2*, Joyjit Mitra2, Shamindra Nath Sarkar2,Subashis Batabyal

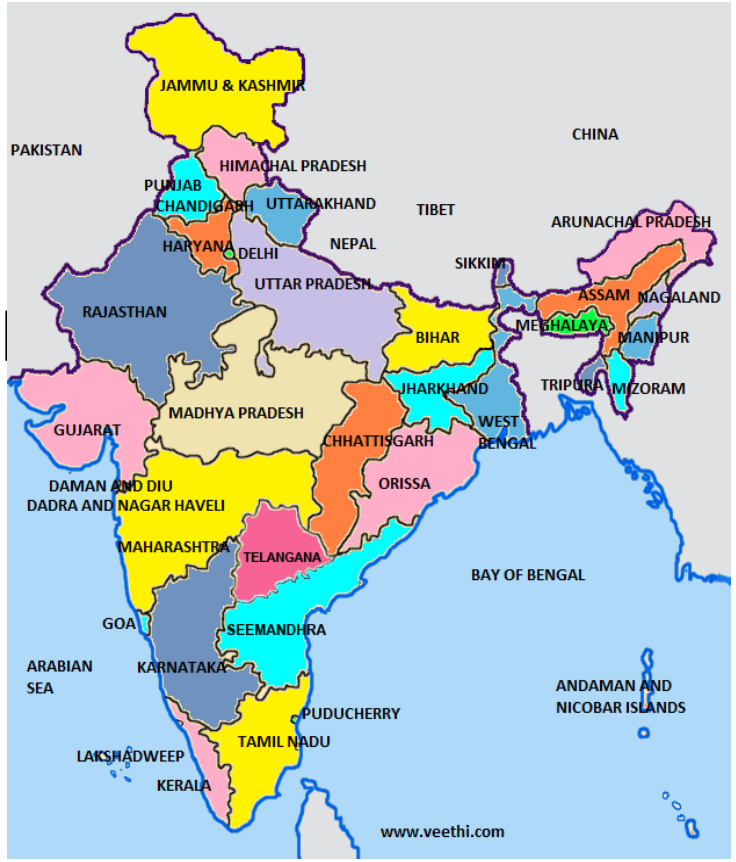
https://www.researchgate.net/publication/320596166_PREVALENCE_OF_BOVINE_VIRAL_DIARRHOEA_VIRUS_IN_WEST_BENGAL_INDIA

persistently infected (PI) - Antigen-ELISA

and Reverse Transcriptase PCR

organized farms & rural areas of West Bengal

0.73% positive (7/964)



Ruminant Abortions – Bovine Virus Diarrhea

BVD

2017 Aug;49(6):1149-1156.

doi: 10.1007/s11250-017-1310-z. Epub 2017 May 14.

First report on serological evidence of bovine viral diarrhea vi (BVDV) infection in farmed and free ranging mithuns (Bos frontalis)

a Singh [1], Niranjan Mishra [2], S Kalaiyarasu [3], R K Khetan [3], D Hemadri [4], R K Singh [1], K Rajukumar [3], J Chamuah [1], K P Suresh [4], S S Patil [4], V P Singh [3]

North Eastern India.

466 serum samples - ELISA and real-time RT-PCR.

prevalence 13.1% (7.6 – 27.5%)

Nagaland - 16.2%

Prevalence of Bovine viral diarrhoea virus (BVDV) antibodies among sheep and goats in India

N Mishra [1], K Rajukumar, A Tiwari, R K Nema, S P Behera, J S Satav, S C Dubey

2009 Oct;41(7):1231-9.
doi: 10.1007/s11250-009-9305-z. Epub 2009 Jan 21.

seroprevalence of pestivirus antibodies in sheep and goats in India.

2004-2008: 13 Indian states - cELISA

1777 sheep/92 flocks

1026 goats/63 flocks

Prevalence : sheep -23.4%

flocks – 66.3%

goats - 6.9%

flocks - 54.0%

Conclusion: wide spread BVDV infections in Indian sheep and goats, with predominately BVDV-1 and occasional BVDV-2

highlighting the potential risk of infection to other species

Ruminant Abortions - Leptospirosis

Leptospirosis – zoonotic

Leptospirosis serovar Hardjo

cattle are the maintenance host.

Serovar hardjo has the ability to colonize and persist in the genital tract of infected cows and bulls.

infertility and delayed calving

Subclinical infections: nonpregnant, nonlactating animals.

Acute or subacute leptospirosis is most commonly associated with incidental host infections and occurs during the leptospiremic phase of infection.

Ruminant Abortions - Leptospirosis

Leptospirosis – zoonotic

Clinical signs –

Acute

agalactia with small quantities of yellow-orange, blood-tinged milk

"milk drop syndrome" - less severe

flaccid udders – no heat or pain

Chronic – abortion rates – sporadic up to >40%

fetal infection

abortion

stillbirth

birth of premature and weak infected calves. Infected but healthy calves also may be born.

abortion – generally 6 -12 weeks post infection

abortions with incidental infections - late term "abortion storms."

serovar Hardjo - sporadic, 2nd- 3rd trimester, several months post infection

Ruminant Abortions - Leptospirosis

Leptospirosis

Treatment

long-acting oxytetracycline (20 mg/kg)

sustained-release ceftiofur – preventing shedding with serovar Hardjo.

Vaccination? - India

USA - pentavalent Pomona, Grippotyphosa, Canicola, Icterohaemorrhagiae, and Hardjo.

annual vaccination - closed herd or low incidence area

twice-yearly vaccination in an open herd or high incidence area

Sheep and goats - considered resistant to leptospiral infection

Incidental infections - sporadic outbreaks of acute disease and occasional abortion storms

Sheep can be maintenance host for serovar Hardjo; source for cattle

Ruminant Abortions - Leptospirosis

Leptospirosis

PM Lesions

- placentitis
- avascular edematous light tan cotyledons
- yellow intercotyledonary areas
- autolytic fetus
- icterus – pomona

Diagnosis :

Urine

- fluorescent antibody staining
- PCR

Serology:

hardjo – very low or no titers of <1:100 at the time of abortion.

can shed in urine for life

other serovars shed for months

Ruminant Abortions - Leptospirosis

Leptospirosis

Diagnosis

Serology

MAT antibody titer >1:800 at the time of abortion is considered evidence of leptospirosis.

hardjo serology often not of any value

Tissue – FA, PCR and IHC

placenta

fetal tissues

urine

.

Ruminant Abortions - Leptospirosis

Leptospirosis

Control

fence off water sources exposed to rodents, canines ,wildlife

rodent control feed sources

vaccination – Availability of lepto vaccines in India?

Elimination of carrier state:

oxytetracycline (20 mg/kg, IM)

tilmicosin (10 mg/kg, SC)

ceftiofur (5 mg/kg/day, IM, for 5 days or 20 mg/kg/day, IM, for 3 days

amoxicillin (15 mg/kg, IM, two injections 48 hr apart).

Leptospirosis is zoonotic

urine and milk remain infective for months

Ruminant Abortions - Leptospirosis

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 Volume 7 Number 04 (2018) Journal homepage: http://www.ijcmas.com

A Review on Bovine Leptospirosis with Special Reference to Seroprevalence in India

A. Prajapati1*, A. Kushwaha2 , D. Chayanika1 , N. Subhashree1 , P. Varsha1 , A. Marcia1 , L. Lahari1 , P. Shivashankar3 and Nikunj Patel3 1Division of Bacteriology and Mycology, 2Division of Virology, 3 Immunology Section, Indian Veterinary Research Institute, Izzatnagar, Bareilly-243122, India

Seroprevalence of bovine leptospirosis in India

States	Sero prevalence	Test used	Sample size	Serovars
Odisha	42.5%	Microscopic agglutination test (MAT)	120	L. Australis (50.9%); L. Hardjo (23.5%)
Nine districts of Bihar	9.11%	DAS-ELISA	450	L. Hardjo
Four districts of South Gujarat	5.77 %	I-ELISA kit	398	L. Hardjo
Pondicherry	36.4 % and 24.8 %	I-ELISA and MAT respectively	250	L. Hardajo (49%); L. Grippotyphosa (24.19%); Pomana (16%)
South Gujarat districts	12.81%	MAT	398	Pomona (28.89%)
South Andaman	69.44%	MAT	108	Automnalis (53.70%) Sejroe(28.70%) and Hardjo (22.22%
Kokan region Maharastra	41.04 %	MAT	575	Australis (23.61%) Hardjo (19.44%), Hebdomadis (16.67%), Bankinang (15.28%), Icterohaemorrhagiae (14.58%)
Maharashtra, Gujarat, Andhra Pradesh, Telangana, Karnataka, Tamil Nadu, Punjab, Haryana, Chhattisgarh, Sikkim and Uttarakhand	70.51%	MAT	373	Hardjo (27.76%), Pyrogenes (18.63%), Canicola and Javanica (17.49%), Hebdomadis (17.11%), Shermani and Panama (16.73%), Djasiman (16.35%)

Antimicrobial agents should also be added to inhibit the growth of contaminants, but allow the multiplication of Leptospira spp.

or possibly negative MAT titres in recently infected with L. Hardjo reactive antibodies caused by exp

JOURNAL OF FOODBORNE AND ZOONOTIC DISEASES Journal homepage: www.jakraya.com/journal/jfz

Epidemiology of leptospirosis: an Indian perspective Dhanze Himani1*, M. Kumar Suman2 and B. G. Mane3 1Ph.D. Scholar, Division of Veterinary Public Health, Indian Veterinary Research Institute, Izatnagar-243 122 (UP), India. 2Assistant Professor, Dept. of Veterinary Public Health, College of Veterinary Science and Animal Husbandry, Junagadh Agriculture University, Junagadh (GJ), India. 3Assistant Professor, Dept. of Livestock Prod *(6) (PDF) Epidemiology of leptospirosis: an Indian perspective*. Available from: https://www.researchgate.net/publication/299508866_Epidemiology_of_leptospirosis_an_Indian_perspective [accessed Oct 21 2020].

tures of leptospirosis is a critical step in designing interventions for diminishing the risk of the disease transmission. Intervention strategies can target many points in the transmission cycle of leptospirosis. Although little can be done in wild animals, leptospirosis in domestic animals can be controlled through vaccination with inactivated whole cells or an outer membrane preparation (Palaniappan *et al.*, 2002). Rodent control preferably through the use of slow acting rodenticides and improved environmental hygiene to eliminate possibility of water, soil and food contamination are some of the measures for diminishing the risk of leptospirosis transmission. Occupational hygiene (in sewers, farmers, and other high risk groups) that includes the use of water proof shoes and gloves is fundamental for preventing human leptospirosis (Koutis, 2007). The mass awareness or public education is of utmost importance.

Table 1: Distribution of Leptospira serovars in India

State	Animal species	Serovars
High prevalence		
Tamil Nadu, Kerala, Andaman	cattle, buffalo, sheep, goats, pig	pyrogenes, pomona, australis, utumnalis, hebdomadis, hardjo, icterohaemorrhagiae
Moderate Prevalence		
Maharastra, U.P., M.P., Gujarat, Karnataka	cattle, buffalo, goats, sheep, pigs, dogs, horse	pomona, hardjo, canicola, javanica, icterohaemorrhagiae, pyrogenes,
Rarely Reported		
Punjab, J&K, Rajasthan, North-Eastern Hills, Himachal Pradesh	cattle, sheep	icterohaemorrhagiae, pyrogenes, canicola

*Based on isolation and serology (Source - WHO, 2006)

Conclusion

Leptospirosis is a major endemic disease of zoonotic importance in India. Socioeconomic conditions, population density of animals, climatic conditions, environmental hygiene and occupational habits of humans are determinants of the incidence and prevalence of the disease in our country. Leptospirosis is preventable. Host/reservoir control measures, environmental control programs and animal vaccination, in conjunction with a strong surveillance system may significantly reduce, if not eliminate, the disease. The comprehensive and good understanding of the eco-epidemiological and cultural characteristics of a community that faces the problem of leptospirosis is an essential prerequisite for evolving an effective and acceptable control measure.

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Faine S (1982). Guidelines for the control of leptospirosis. WHO Offset Publication, Geneva, Italy.

Table 1: Frequencies of one or more serovars of *Leptospira* sp.

No of serovars	Numbers of positive serovars	Frequency (%)
One serovar	34	31.48
Two serovar	18	16.66
Three serovar	11	10.18
Four serovar	5	4.62
Five serovar	6	5.55
Six serovar	1	0.92
Total	**75**	**69.44**

from West Bengal (Mandal *et al.*, 2008). Knowledge of the prevalence of the *Leptospira* serovars is important for understanding the epidemiology of the disease and framing the public health policies aimed at prompt diagnosis and control measures. Studies of bovine leptospirosis in different parts of the world indicate that serovars responsible for reproductive losses vary depending on types of serovars that are locally endemic since leptospiral antibodies may present in the serum for a considerable period of time after infection, the sero-reactivity may indicate the present or past exposure to leptospiral antigens (Balamurgan *et al.*, 2013).

MAT is considered as the gold standard test (Wolff, 1954) or International Test (Venkataraman *et al.*, 1992) for the diagnosis of leptospirosis. It is serovar specific test and choice for sero-epidemiological studies for detecting both IgG and IgM antibodies in animal sera. The sensitivity and specificity of MAT reported in a recent study were 91.94% and 73.77%, respectively (Dassanayake *et al.*, 2009).

It is well known fact that Hardjo serovar is common in cattle (Leonard *et al.*, 2004) and present study also correlates the similar findings. In addition to this, the prevalence of serovars Autumnalis (53.70%) was highest among the all serovars in bovine species. This finding corroborates with the findings of Sarvanan *et al.* (2000) who reported that

Table 2: Frequency distribution of *Leptospira* serovars.

Serovars	No. of samples reacted (1:100 dilution)	% positive samples against total samples	% frequencies against total no. of positive samples
Autumnalis	58	53.70	77.33
Sejroe	31	28.70	41.33
Hardjo	24	22.22	32.00
Pomona	23	21.29	30.66
Pattock	13	12.03	17.33
Bataviae	5	4.63	6.66
Pyrogenes	5	4.63	6.66
Australis	2	1.85	2.66

Control strategy for farms:

Conduct MAT at periodic intervals as a herd test on 10% of the animals and cull or treat positive reactors.

If reactors are found, screen the entire herd by MAT or any other suitable test and cull or treat any other reactors.

Screen a cow which fails to carry a calf to term, produces a dead or weak calf, or exhibits any other signs of the disease by a suitable test and treat or cull if found positive.

Investigate signs of infection like mastitis and high numbers of abortion.

Paired sera samples taken 7- 10 day apart during acute and convalescent phases should be submitted from each suspected case.

Paired sera samples from a few apparently normal animals also need to be submitted along with the above.

Paired sera are of limited value in chronic infections.

Use veterinary gloves while assisting cows in calving.

Keep animals away from effluent ponds.

Do not spray pastures with effluent stored in ponds during the wet season.

Dry out pasture sprayed with effluent before allowing grazing.

Properly seal and drain effluent disposal tanks.

If pigs are kept on the farm, their effluent should be kept inaccessible to cattle.

Treat suspected bulls to reduce the level of urinary shedding.

Control of rodents in the farm is important.

Explor Anim Med Res,Vol.5, Issue - 1, 2015, p. 96-101

Research Article **SERO-PREVALENCE OF BOVINE LEPTOSPIROSIS IN SOUTHANANDAMAN ISLANDS, INDIA**

Joyjit Mitra1, Sumit Chowdhury2*, Shibabrata Pattanayak3

Ruminant Abortions- Campylobacter

Bovine Venereal Campylobacteriosis (BVC) – Zoonotic (C jejuni*: en*teritis in people)

Campylobacter fetus venerealis causes venereal disease

infertility or early embryonic death

occasionally abortion - mid to late term

C fetus fetus and C jejuni *transmission*

ingestion - hematogenous spread to the placenta

late term, sporadic abortions - aborted at any stage .

PM findings

Fetus:

fibrinous pleuritis and peritonitis

bronchopneumonia and interstitial pneumonia

widespread infection of all organs

Placentitis - hemorrhagic cotyledons/edematous intercotyledonary area.

Ruminant Abortions- Campylobacter

Transmission*:* venereal

contaminated instruments, bedding

artificial insemination using contaminated semen.

old bulls- possible permanent carriers

deep crypts -

young bulls – mostly transient

cows – varies: few months to years

pregnant with chronic vaginal infection

Ruminant Abortions- Campylobacter

Treatment

antibiotic sensitivity: spectinomycin, gentamicin, streptomycin and penicillin

bulls – injectable streptomycin (20 mg/kg, SC, 1–2 treatments)

topical 5 g of streptomycin applied to the penis for 3 consecutive days.

Prevention:

Vaccination

cows – one injection – 4 weeks before breeding

bulls - two injections – 3 weeks apart - curative in bulls

Artificial insemination

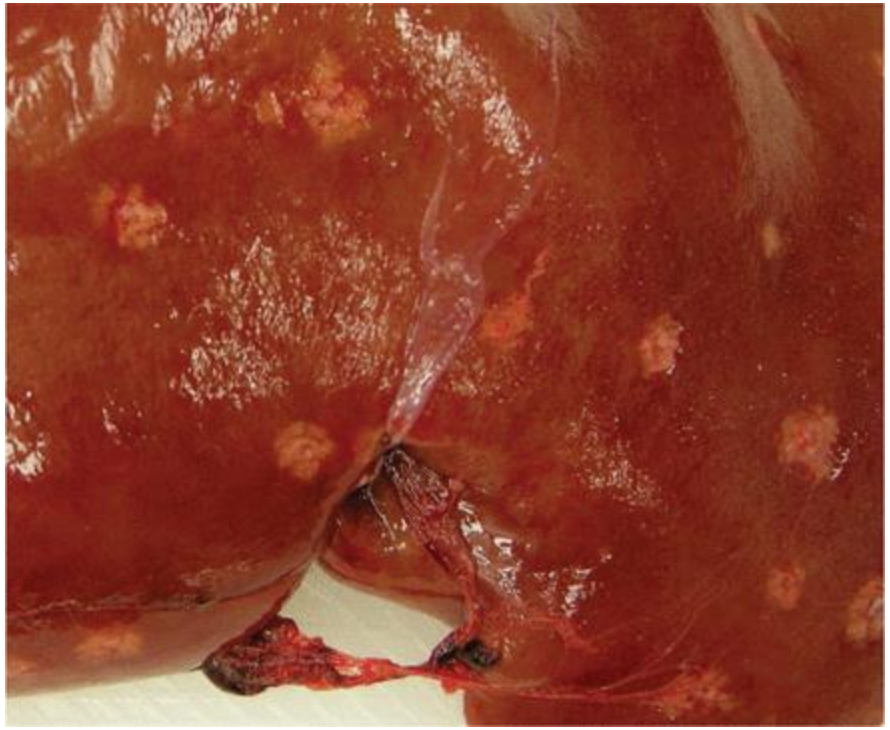
Campylobacter fetus subspecies fetus abortion in alpacas (Vicugna pacos) C. A. Bidewell, N. G. A. Woodger, A. J. C. Cook, T. V. Carson, S. L. Gale, J. I. Chanter, S. M. Williamson Veterinary Record (2010) 167, xx-xx doi: 10.1136/vr.c4461

Surveillance

Disease surveillance in England and Wales, March 2019

View Full Text

http://dx.doi.org/10.1136/vr.l1595



Bovine camphylobacter
Placentitis - hemorrhagic cotyledons and edematous intercotyledonary area.

Ruminant Abortions- Campylobacter

Diagnosis:

darkfield examination of abomasal contents

culture of placenta or abomasal contents.

Control:

vaccination?

artificial insemination and vaccination.

Prevalence of Campylobacter fetus in cattle and buffalo breeding bulls in Northern India
July 2006
The Indian journal of animal sciences 76(8):609-611
K. Joshi
Narinder Singh Sharma
S.K. Jand
Mohinder Oberoi

preputial washing and semen of 36 cattle breeding and 27 buffalo breeding bulls were screened for Campylobacter sp.

Preputial washings from 7 cattle and 3 buffalo bulls were positive for C. fetus by isolation.

9/15 isolates of C. fetus isolated were C. fetus subsp. venerealis

6/15 were C. fetus subsp. fetus

Ruminant Abortions- Listeriosis

Listeriosis - zoonotic

Etiology and Epidemiology:

Listeria monocytogenes is a small, motile, gram-positive, diphtheroid coccobacillus

grows - 4°–44°C (39°–111°F).

growth at 4°C aids identification; "cold enrichment"

ubiquitous saprophyte that lives in a plant-soil environment

natural reservoirs of *L monocytogenes* - soil and mammalian GI tracts

Animal-to-animal transmission occurs via the fecal-oral route.

improperly ensiled (ph >?) or spoiled silage enhances multiplication of *L monocytogenes*.

Outbreaks - ≥10 days to months after exposure (poor-quality silage)

Ruminant Abortions- Listeriosis

Listeriosis

Pathogenesis:

ingested or inhaled

septicemia/ encephalitis

abortion any stage

placentitis

stillbirths

metritis

Listeria - shed in uterine discharge and milk for a month or longer.

Infections acquired via ingestion tend to localize in the intestinal wall and result in prolonged fecal excretion.

latent infections:

approach 100% - few animals exhibit clinical listeriosis

2006 Oct 31;117(2-4):229-34. doi: 10.1016/j.vetmic.2006.06.018. Epub 2006 Jul 24

Isolation of Listeria monocytogenes from buffaloes with reproductive disorders and its confirmation by polymerase chain reaction

I Shakuntala [1], S V S Malik, S B Barbuddhe, D B Rawool

Listeria species isolated from 16/ 530 buffalo samples-infertility

- 6/16 were L. monocytogenes
- 10/16 were Listeria spp.

L. Monocytogenes was recovered from

- 4.4% repeat breeder
- 6.6 % abortions
- 6.25 % endometritis
- 4.44% - chronic infections

L. Monocytogenes - 4.44% of buffaloes with reproductive disorders.

L. Monocytogene - 6% in repeat breeding cases among cows and buffaloes from India (Sharda et al., 1991).

Pathogenic L. ivanovii (0.8%) have also been isolated from vaginal samples of buffalos.

samples from buffaloes having a history of reproductive disorders. Six isolates were confirmed as *L. monocytogenes*. The remaining 10 *listeria*e were considered as other *Listeria* spp. *L. monocytogenes* was recovered from 4.4, 6.6 and 6.25% of repeat breeders, aborted animals and buffaloes having endometritis, respectively. None of the samples from buffaloes with retained placentae was positive. The overall occurrence of listeric infection in these cases was 4.44%.

With pathogenicity testing of *Listeria* isolates via the PI-PLC assay, as well as *in vivo* tests, namely chick-embryo and mice inoculation tests, one hemolytic *L. monocytogenes* isolate (recovered from an abortion case) was found to be pathogenic (Table 1). The remaining five hemolytic *L. monocytogenes* isolates were negative in the PI-PLC assay and non-pathogenic *monocytogenes* isolate from an abortion case (Isolate 1), whereas two isolates (Isolates 2 and 5) possessed two genes (*hly*A and *iap*). The remaining three isolates (Isolates 3, 4 and 6) were found to be positive for *prfA*, *hlyA* and *iap*, *prfA*, *actA* and *hlyA*, and *prfA* and *hly*A, respectively (Table 1). No other *Listeria* spp. isolates yielded any virulence-associated genes.

Comparison of the pathogenicity testing of six hemolytic *L. monocytogenes* isolates by PI-PLC assay and PCR, as well as chick-embryo and mice inoculation tests, revealed one isolate to be pathogenic and possessing all five virulence-associated genes. It is interesting to note that the remaining haemolytic isolates (5) were negative in the PI-PLC assay, *in vivo* pathogenicity tests, as well as deficient in the *plcA* gene (Table 1).

Table 1
Pathogenicity and PCR profiles of *Listeria monocytogenes* isolates from buffaloes with reproductive disorders

Isolates	Case/(source)	Pathogenicity profile				PCR profile of virulence-associated genes				
		CAMP (+) with S/R	PI-PLC assay	Mice lethality	Chick-embryo lethality	*plcA*	*prfA*	*actA*	*hlyA*	*iap*
Isolate no. 1	Abortion (vaginal swab)	+S	+	+	+	+	+	+	+	+
Isolate no. 2	Endometritis (faecal swab)	+S	–	–	–	–	–	–	+	+
Isolate no. 3	Repeat breeding (vaginal swab)	+S	–	–	–	–	+	–	+	+
Isolate no. 4	Repeat breeding (faecal swab)	+S	–	–	–	–	+	+	+	–
Isolate no. 5	Repeat breeding (vaginal swab)	+S	–	–	–	–	–	–	+	+
Isolate no. 6	Repeat breeding (vaginal swab)	+S	–	–	–	–	+	–	+	–

PCR: polymerase chain reaction; PI-PLC: phosphatidylinositol-specific phospholipase C; CAMP: Christie, Atkins, Munch-Petersen test; S/R: *Staphylococcus aureus*/*Rhodococcus equi*.

Ruminant Abortions - Neospora

Neosporosis:

Neospora caninum - worldwide

a common cause of abortion in the USA.

Canids are definitive hosts for *N caninum*

Abortions – midterm most common

multiple abortions are common

repeat abortions in cows can occure

Most infections result in an asymptomatic congenitally infected calf.

neurologic involvement - paralysis or proprioceptive deficits.

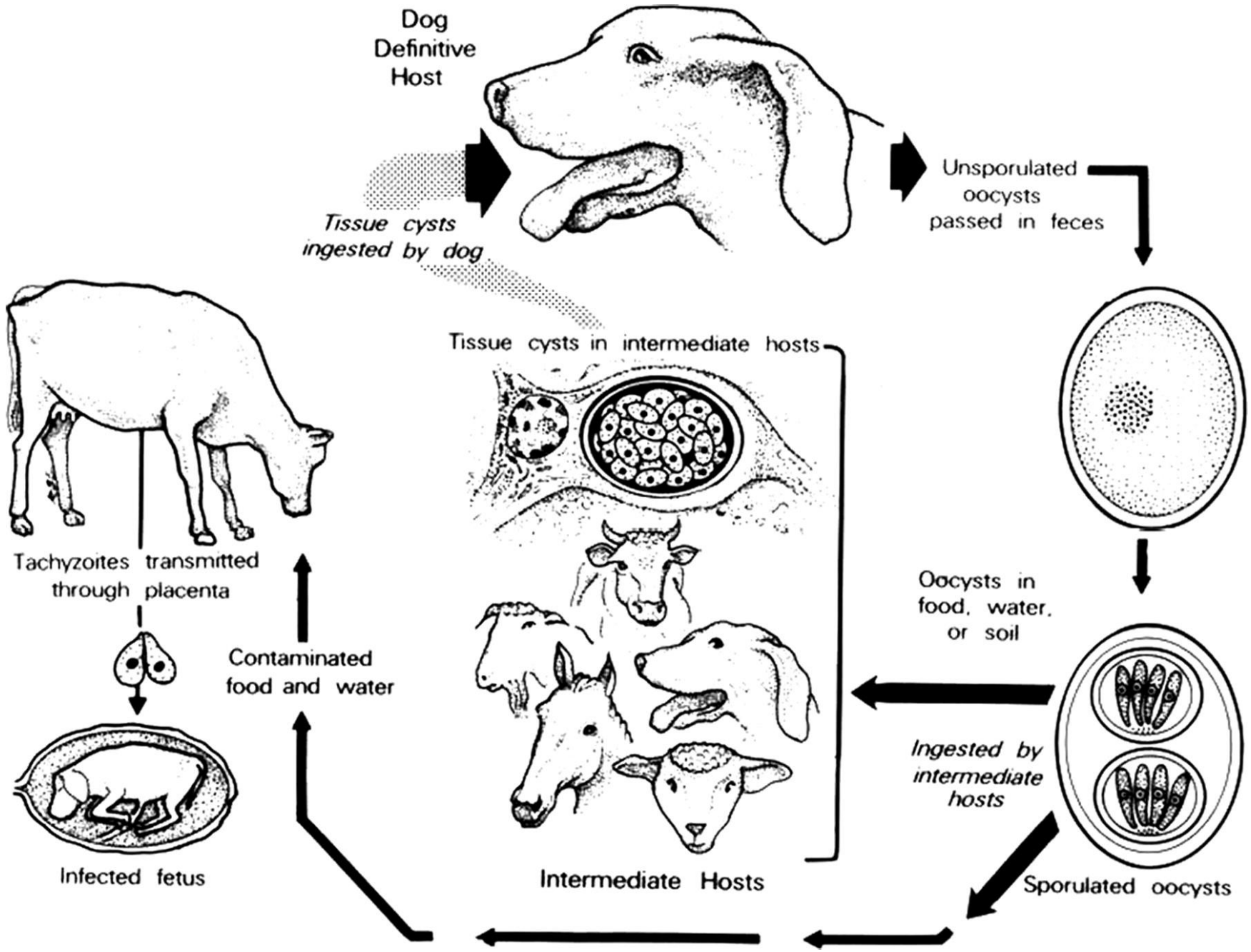
fetus is usually autolyzed or mummified

gross lesions -uncommon

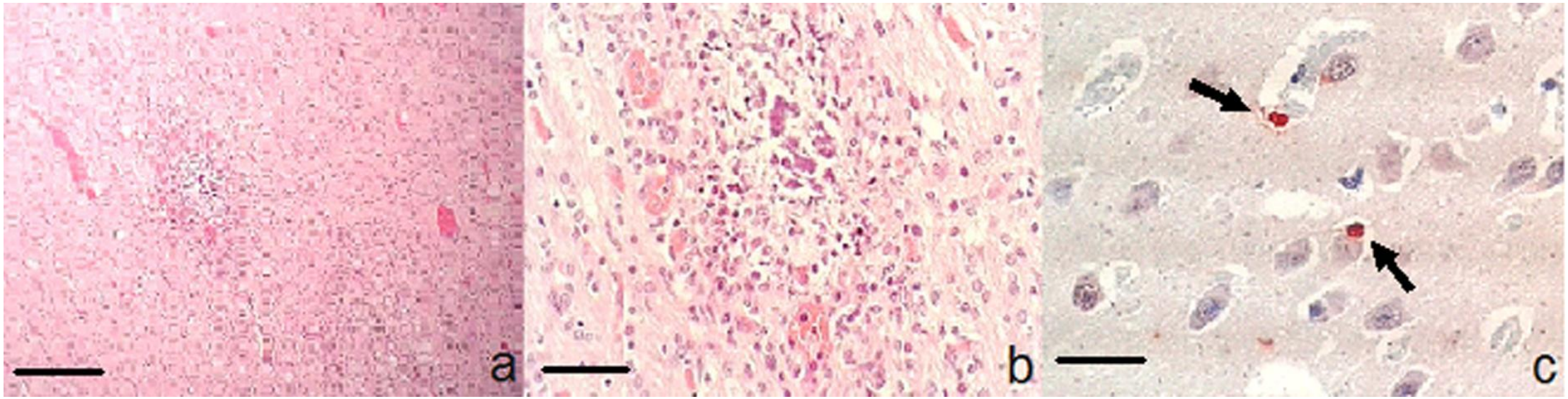
Histopathology-nonsuppurative inflammation: brain, heart, skeletal muscles.

Diagnosis: immunohistochemical (IHC) staining; PCR

precolostral antibodies


Dog
Definitive
Host
Tissue cysts
ingested by dog
Unsporulated
oocysts
passed in feces
Tissue cysts in intermediate hosts
Tachyzoites transmitted
through placenta
Oocysts in
food, water,
or soil
Contaminated
food and water
Ingested by
intermediate
hosts
Infected fetus
Intermediate Hosts
Sporulated oocysts

Pesquisa Veterinária Brasileira
Print version ISSN 0100-736X*On-line version* ISSN 1678-5150
Pesq. Vet. Bras. vol.37 no.9 Rio de Janeiro Sept. 2017
http://dx.doi.org/10.1590/s0100-736x2017000900004
LIVESTOCK DISEASES
Transplacental transmission of *Neospora caninum* in naturally infected small ruminants from northeastern Brazil



Ruminant Abortions - Neospora

Neosporosis:

Vertical transmission most common source of infection.

Treatment - none.

Prevention - strict hygiene

prevent contamination of feed by dogs or coyotes feces

Ruminant Abortions - Neospora

Neosporosis

Maherchandani S, Kumar A, Kashyap SK. **Infectious Causes of Bubaline Abortions In:** Bubaline Theriogenology, Purohit G.N. (Ed.). International Veterinary Information Service, Ithaca NY, 2018.

Worldwide seroprevalence of N. caninum:

buffalo - approximately 48%

dairy cattle - 16.1%

beef cattle -11.5%

Trop Anim Health Prod (2013) 45:205–210 DOI 10.1007/s11250-012-0192-3

Prevalence of Neospora caninum antibodies in dairy cattle and water buffaloes and associated abortions in the plateau of Southern Peninsular India

P. P. Sengupta & M. Balumahendiran & A. G. Raghavendra & T. G. Honnappa & M. R. Gajendragad & K. Prabhudas

India - 172 million cattle (second largest in the world – 15%)

106 million buffalo (largest in the world – 53%)

(FAO Food and Agricultural Organization 2011)

seroprevalence: ELISA

bovine (Holstein–Friesian) 12.61% - (912 unorganized; 1015 organized)

water buffalo (Surti) – 9.97%

mithuns from northeastern India (Meenakshi et al. 2007; Rajkhowa et al. 2008; Sharma et al. 2008).

Ruminant Abortions - Neospora

seropositive cattle were 8.84 times more likely to have abortion history than their seronegative counterparts in organized herds.

Abortion may take place at any stage of pregnancy and irrespective of whether the infection (in the cow) is recent, chronic, or congenital (Romero-Salas et al. 2010). However, such data in the present study was not available during interview.

Meenakshi et al. (2007) observed seropositve cattle were 4.7 times more prone towards abortion than their seronegative counterparts.

Ruminant Abortions - Neospora

Like cattle, in water buffaloes prevalence rate increased with the increment of the age

Dogs, foxes, and coyotes are generally considered as the definitive hosts for N. caninum and they shed oocysts in their feces in pasture. The cattle pick up the infection by ingestion of contaminated fodder.

Introduction of the vaccination practice with commercially available N. caninum vaccine may be helpful to the farmers in this region.

first report of neosporosis from the southern peninsular

Ruminant Abortions - Trichomonas

Trichomonas – Tritrichomonas fetus

T foetus is found in the genital tracts of cattle.

Transmission – natural service - 30%–90% females infected,

Bulls >3 years likely chronic

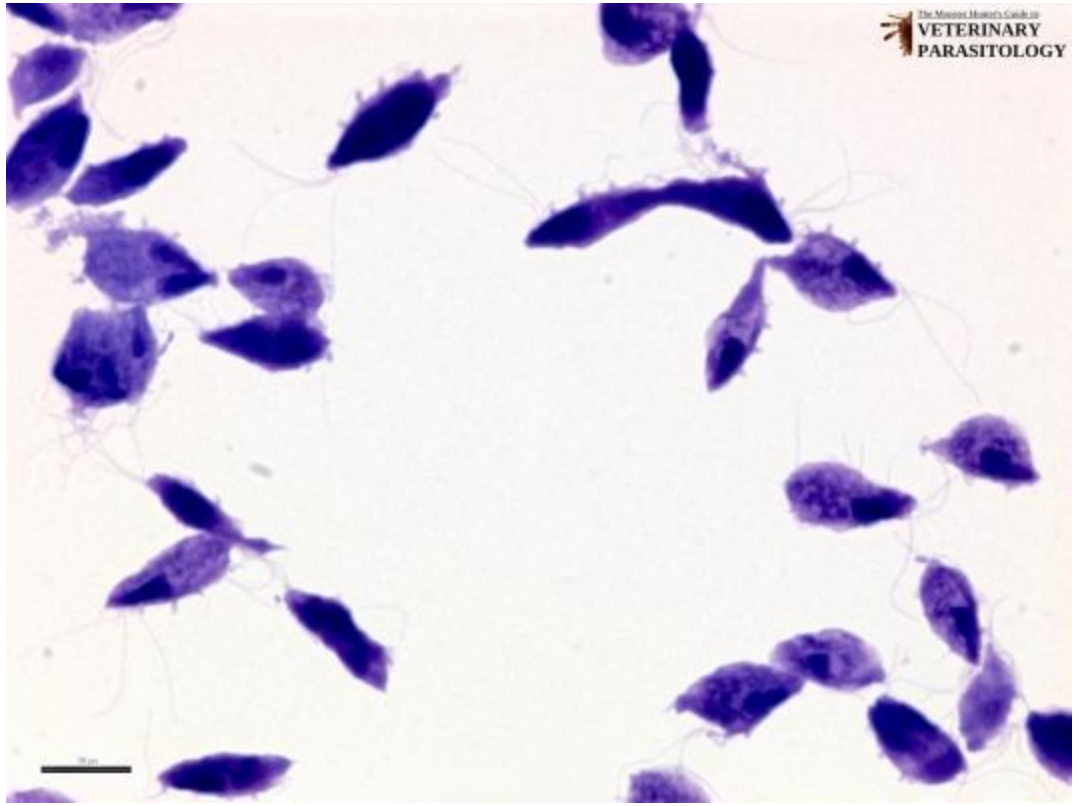
Cow generally clear infection in 3-5 months after breeding.

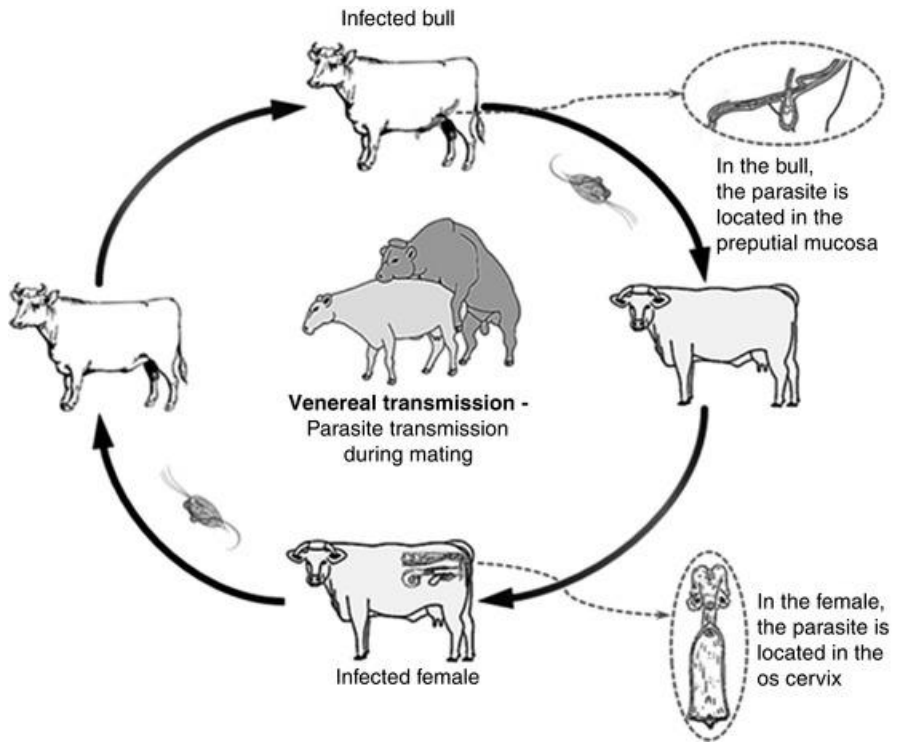
immunity is short lived

cows have delivered live calves while infected with trich.

AI transmission ??

Ruminant Abortions - Trichomonas





Ruminant Abortions - Trichomonas

Clinical Findings

infertility caused by early embryonic death (EED)

cows in heat when they should be pregnant.

poor pregnancy test results

increased -“nonpregnant abnormal” reproductive tract ;

pyometra

endometritis

mummified fetus.

abortions - not as common as EED

Ruminant Abortions - Trichomonas

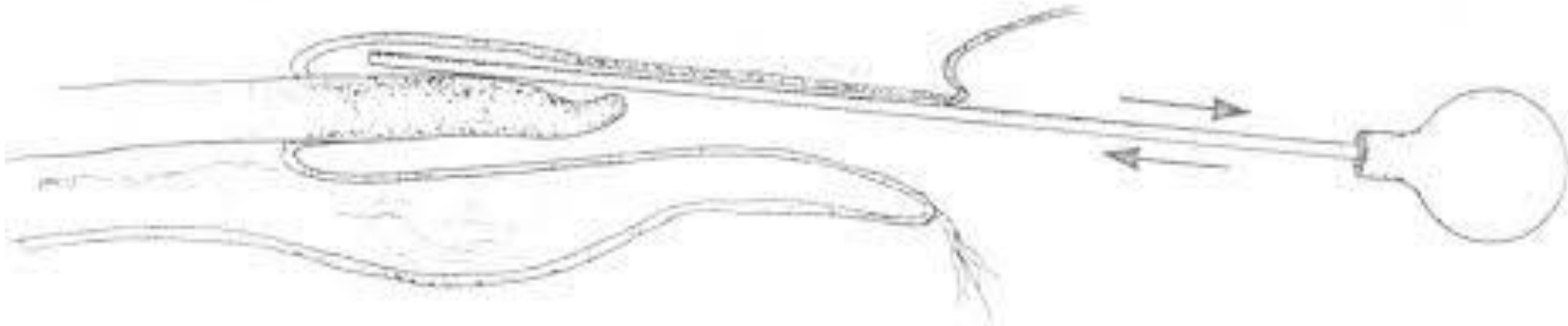
Diagnostic efforts are directed at bulls, because they are the most likely carriers.

- Prepucial scrapings or washing – 2 weeks sexual rest
- vaginal discharge (after treatment of pyometra)
- cervical mucus of a luteal phase)

Transport media

- Diamonds media or modified diamond media
- PBS (phosphate buffered saline)
- LR (lactated ringers)

Transport time 72-120 hours – in US



Trich Transfer Media

Journal of Entomology and Zoology Studies 2019; 7(1): 1328-1334

Current status of abortion in buffalo (Bubalus bubalis) associated with infectious agents: A short communication Satish, Satish Kumar, Surendar Singh Nirwan and Naveen Chahar

Buffalo- Trichomonads detected (Jacobo et al. 2007)

buffalo to be partially resistant?

Ruminant Abortions

Treatment and Control of Trichomoniasis in Cattle

None legal in the USA

Control is by culling infected bulls

Vaccination?

Research article Open Access Published: 14 April 2017

Metronidazole for the treatment of *Tritrichomonas foetus* in bulls

David Love, Virginia R. Fajt, Thomas Hairgrove, Meredyth Jones & James A. Thompson

BMC Veterinary Research volume 13, Article number: 107 (2017)

Current control programs – test and cull

poor sensitivity

treatment of all the exposed bulls

equate sexual rest for the exposed cows

Treatment - metronidazole (concentration - 0.5 µg/mL) - only 1 bull

not approved in the USA

estimated effective IV dose of 60 mg/kg metronidazole

two treatments at 24 hour intervals

Conclusion: A bull that had tested positive for Tritrichomonas foetus culture at weekly intervals for 5 weeks prior to treatment was negative for Tritrichomonas foetus culture at weekly intervals for five consecutive weeks following this treatment regimen.

Ruminant Abortions - Trichomonas

Treatment protocol

An 891 kg, Charolais-cross, trichomonas positive bull

culture positive multiple times over 6 months.

restrained in a squeeze chute and an intravenous catheter was placed in the left jugular vein.

10.8 l of 5 mg/mL (approximately 60 mg/kg; 54 g total dose)

administered IV over a period of one hour.

treatment was repeated 24 h later

Ruminant Abortions - Toxoplasmosis - Zoonotic

Etiology and Pathogenesis: Toxoplasma gondii

Definitive host – feline: cats main reservoir of infection. T

three infectious stages:transmission

tachyzoites (rapidly multiplying form) vertical fetal infection

bradyzoites (tissue cyst form) –uncooked meat

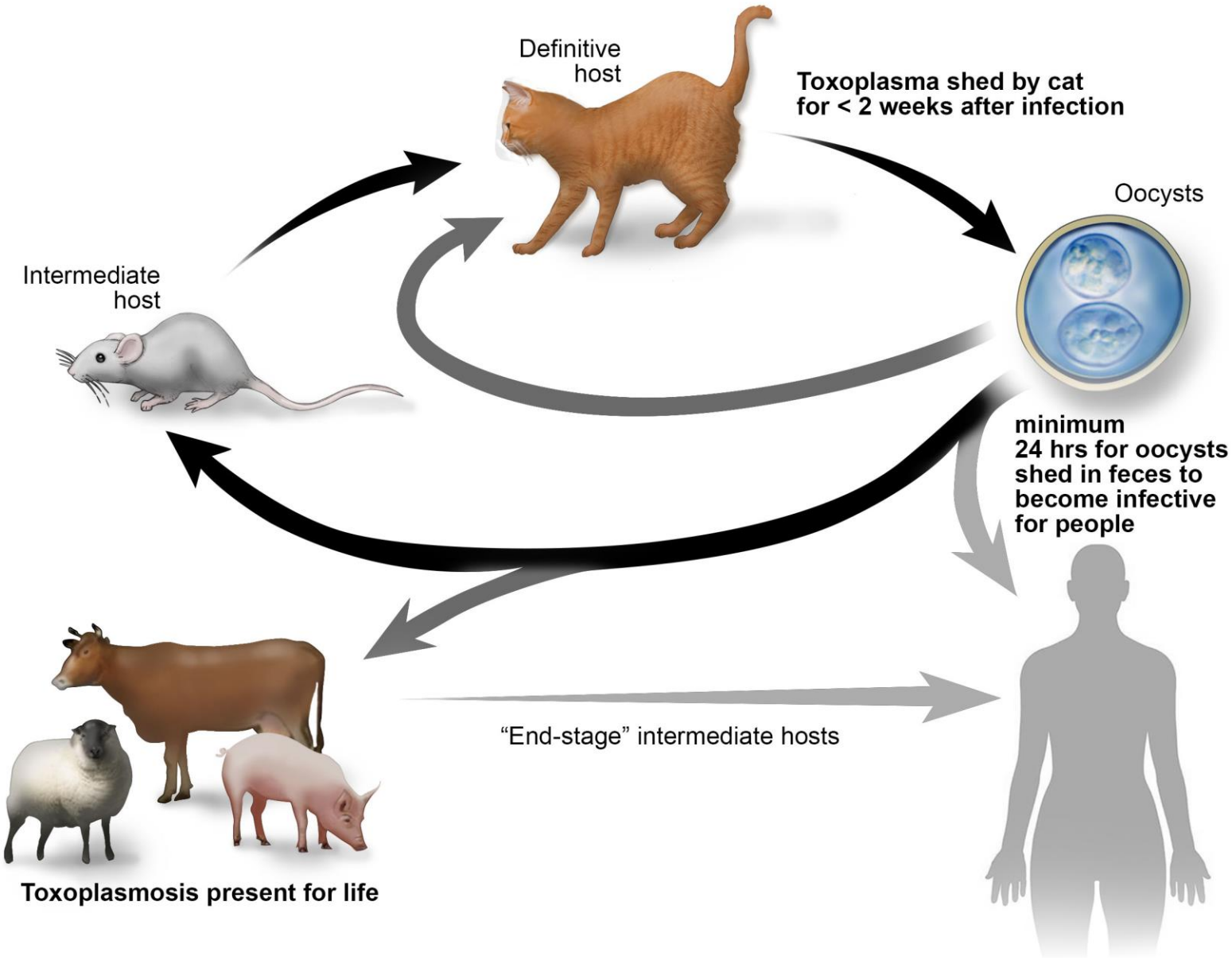
sporozoites (in oocysts) – contamination with cat feces

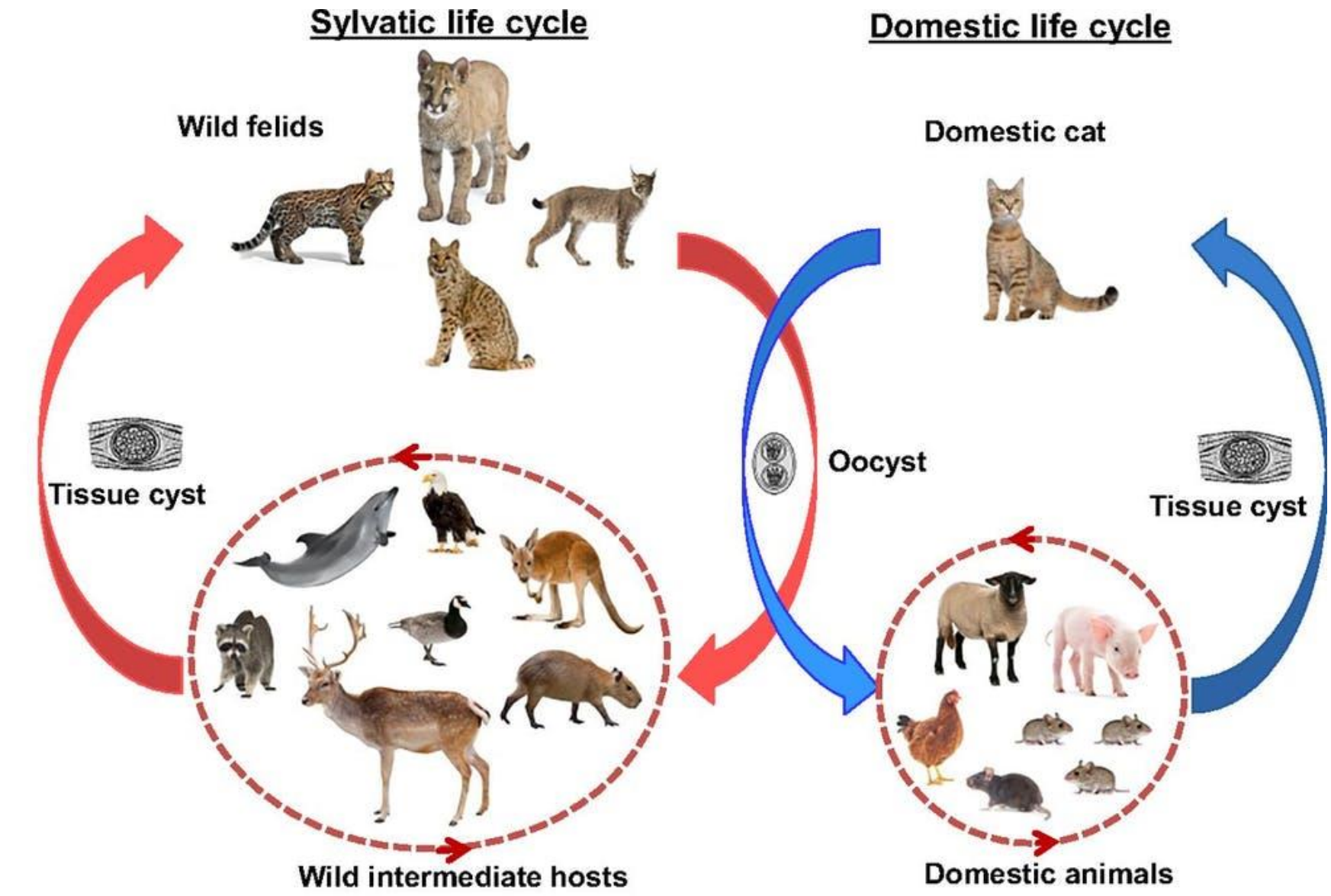
found in feces 3-20+ days after infection

infectious at 1–5 days depending on environment

cat generally develop immunity to *T gondii* after the initial infection and therefore shed oocysts only once in their lifetime.

Life cycle of Toxoplasma




Sylvatic life cycle
Domestic life cycle
Wild felids
Domestic cat
Tissue cyst
Oocyst
Tissue cyst
Wild intermediate hosts
Domestic animals
Domestic life cycle dominant in agricultural environment
Sylvatic life cycle dominant in natural environment

Ruminant Abortions - Toxoplasmosis - Zoonotic

Clinical Findings:

abortion: sheep & goats >pigs

systemic spread to placenta and fetus

necrotic placentitis

fetus – multiple organ failure

Ruminant Abortions - Toxoplasmosis - Zoonotic

Diagnosis:

serology

- indirect hemagglutination assay
- indirect fluorescent antibody assay
- latex agglutination test
- ELISA

CSF and aqueous humor may be analyzed for the presence of tachyzoites or anti-*T gondii* antibodies.

Postmortem, tachyzoites may be seen in tissue impression smears. Additionally, microscopic examination of tissue sections may reveal the presence of tachyzoites or bradyzoites. *T gondii* is morphologically similar to other protozoan parasites and must be differentiated from *Sarcocystis* species and *Neospora caninum*.

Ruminant Abortions - Toxoplasmosis - Zoonotic

Treatment:

Sulfadiazine (15–25 mg/kg)/pyrimethamine (0.44 mg/kg)

beneficial- acute stage (active multiplication)

they will not usually eradicate infection.

Clindamycin: 14–21 days - dogs 10–40 mg/kg

cats 25–50 mg/kg

Zoonotic Risk:

pregnant women

birth defects

immunocompromised individuals

Toxoplasmosis - **Diagnostic Exercise From The Davis-Thompson Foundation*** Case #: 89 Month: January Year: 2018

Morphologic diagnosis: placenta: severe, multifocal, necrotizing, cotyledonary placentitis:

intralesional tachyzoites.

J Parasit Dis (July-Sept 2017) 41(3):869–873 DOI 10.1007/s12639-017-0908-4

Isolation and characterization of Toxoplasma gondii from small ruminants (sheep and goats) in Chennai City, South India

Ajay Suryakant Satbige1 • C. Sreekumar2 • C. Rajendran3 • M. Vijaya Bharathi1

Fourteen samples (14/193) (10 sheep; 4 goats)

positive @ 1:100 titre

subjected to mouse bioassay

All mice were tested positive at 1:100 by MDAT at 40 dpi

tissues were positive by

. 2017 Jul 15;241:35-38.

Molecular detection of Toxoplasma gondii in the slaughter sheep and goats from North India

Deepali Kalambhe[1], J P S Gill[1], Balbir Bagicha Singh[2]

PMID: 28579027
DOI: 10.1016/j.vetpar.2017.05.009 Epub 2017 May 18

400 cardiac/skeletal muscle samples (sheep-177); (goat -223)

PCR positive:

sheep - 1.69%

goats - 1.34%

Conclusion: “The results indicate that T. gondii in slaughter sheep and goat presents a low food safety risk for public health in North India.”

Ruminant Abortions - Toxoplasmosis - Zoonotic

Prevalence, molecular detection and risk factors investigation for the occurrence of *Toxoplasma gondii* in slaughter pigs in North India

Rashmi Thakur, Rajnish Sharma, R. S. Aulakh, J. P. S. Gill & B. B. Singh

BMC Veterinary Research volume 15, Article number: 431 (2019) Abstract

Results

DNA of *T. gondii* - 6.7% (54/810)

Punjab - 8.2%

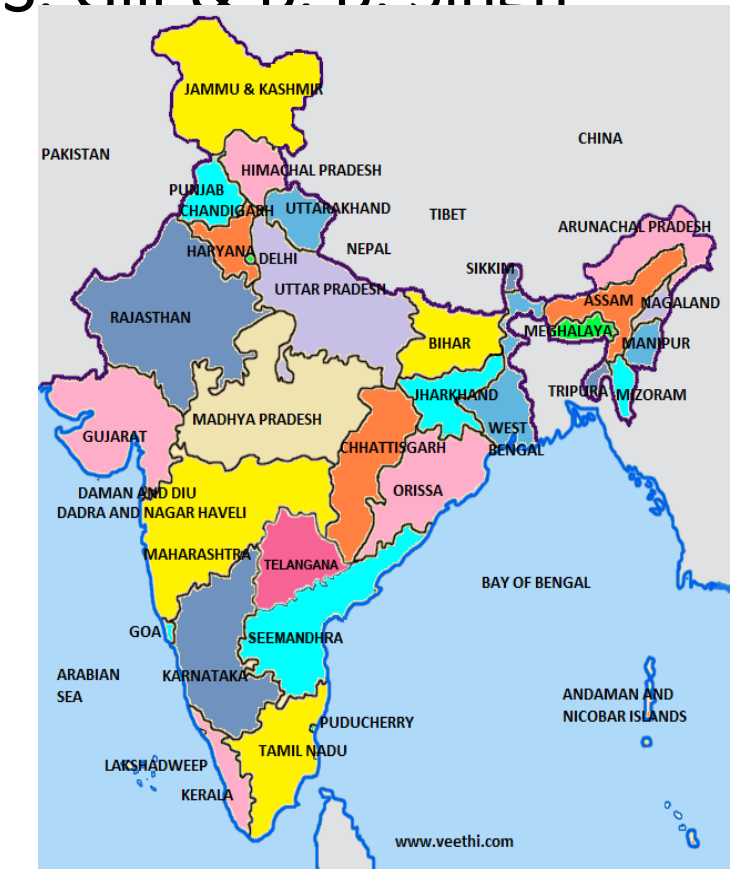
Chandigarh 5.3%

Uttarakhand 4.8%

Antibodies against *T. gondii* - 48.3% (73/151)

slaughter pigs - Chandigarh abattoir:

scavenging by pigs was a significant risk factor.



Coxiella burnetii-Q fever - zoonotic

Sheep , goats – major economic significance

cattle – less so

Reproductive loss:

abortions

stillbirth/premature births

infertility

anestrus

Human exposure - inhalation of contaminated aerosols during parturition - necropsy

Q fever prevalence has been reported in buffaloes from India and Africa

The Veterinary Journal
Volume 200, Issue 2, May 2014, Pages 218-229
Review
Laboratory diagnosis of ruminant abortion in Europe
Author links open overlay panel NicoleBorel[a]Carolineet, Et. al

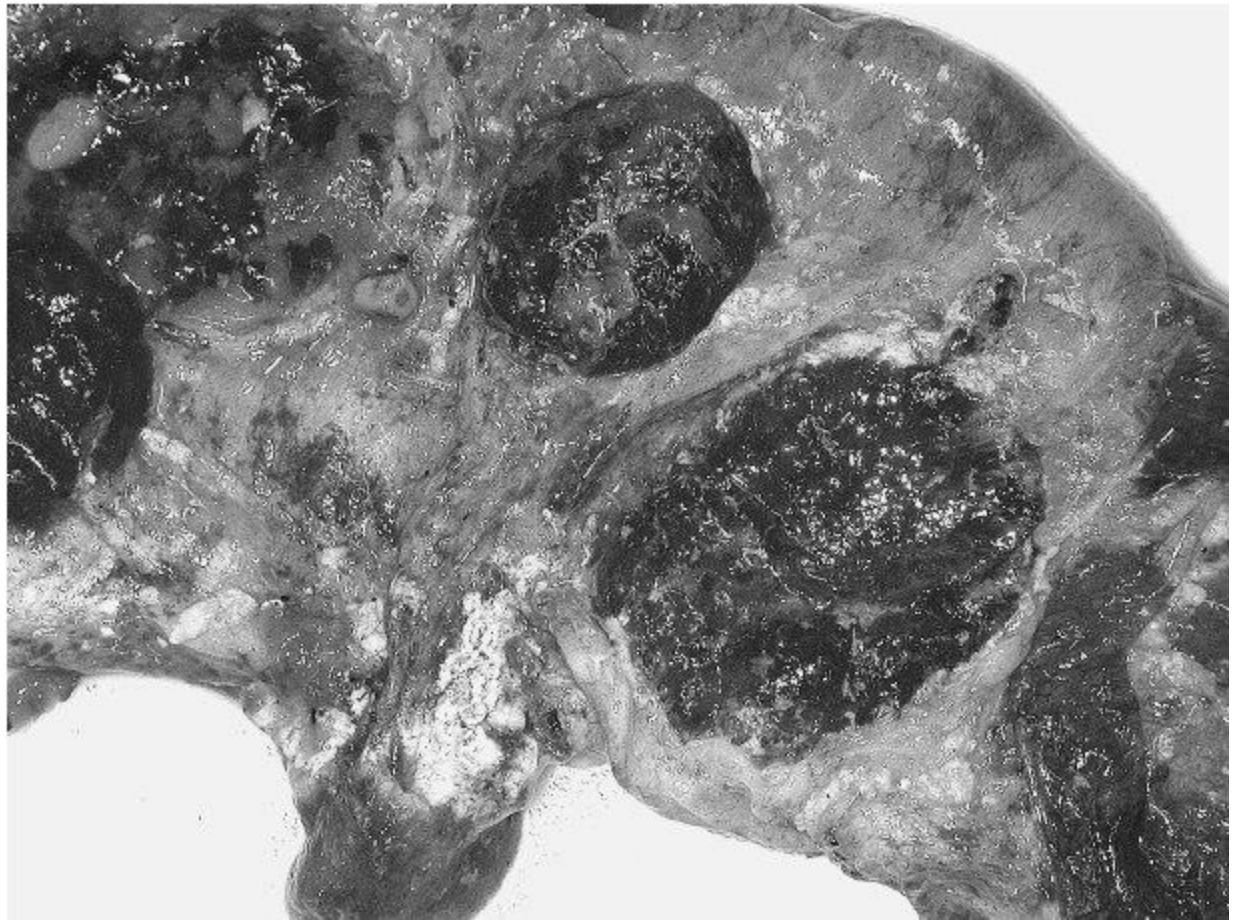
Normal

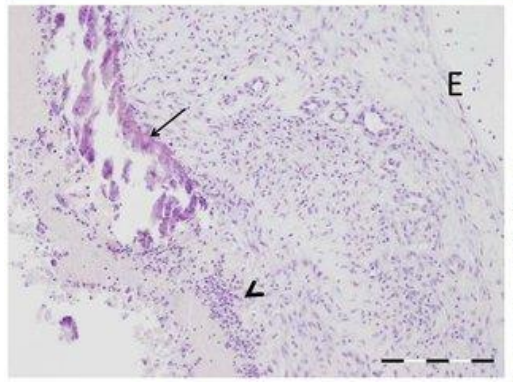
necrotic/purulent

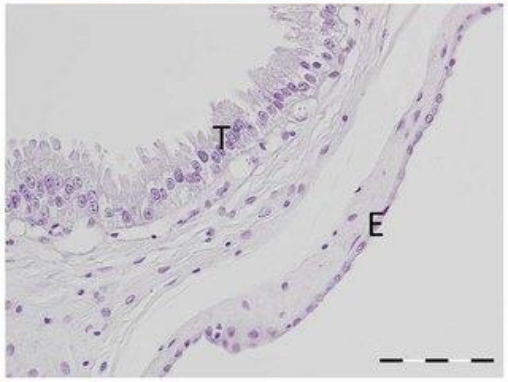
Photograph illustrating a purulent and necrotising placentitis of unknown aetiology. A placental cotyledon exhibits diffuse reddening and multifocal yellow discolouration (necrosis). The inter-cotyledona tissue is covered in purulent exudate.

Ruminant Abortions –Q-Fever - Zoonotic

Q Fever –Coxiella burnetii - zoonotic







Ruminant Abortions –Q-Fever - Zoonotic

Randhawa et al.(1973)

Prevalence - Punjab:

16.2% - cattle,

9.6% - buffaloes,

6.1% - goats

3.7% - sheep, indicating the existence of the disease.

Sodhi et al - 1980 serum samples- farm with a high rate of abortions

cattle 23.2%

buffaloes 24.1%

Table 1
Prevalence of Q fever in the bovine population in Punjab, India based on a study conducted in 2017-18. Serum samples obtained from cattle and buffalo were tested using indirect ELISA. Milk, vaginal and preputial swabs were tested using trans-PCR assay.

Categories	Sample size	Number of ELISA positives	Sero-prevalence (95% CI)	Number of PCR positives	Molecular prevalence (95% CI)	Overall positives	Overall prevalence (95% CI)
Overall	610	33	5.4 (3.4-7.4)	13	2.1 (0.9-3.4)	43	7.0 (4.7-9.4)
Species							
Cattle	378	24	6.3 (3.6-9.1)	11	2.9 (1.2-4.6)	33	8.7 (5.5-11.9)
Buffalo	232	9	3.9 (1.4-6.4)	2	0.9 (0.0-2.1)	10	4.3 (1.7-6.9)
Cattle breeds							
Crossbred/Exotic	322	21	6.5 (3.4-9.6)	9	2.8 (0.9-4.7)	29	9.0 (5.4-12.6)
Indigenous	56	3	5.4 (0.0-11.3)	2	3.6 (0.0-8.1)	4	7.1 (0.6-13.6)
Sex							
Male	21	0	0 (-)*	0	0 (-)*	0	0.0 (-)*
Female	589	33	5.6 (3.6-7.6)	13	2.2 (0.9-3.5)	43	7.3 (4.9-9.7)
Age							
Under 1 year	52	1	1.9 (0.0-5.6)	0	0 (-)*	01	1.9 (0.0-5.6)
1 to 3 years	101	2	2.0 (0.0-4.6)	1	1.0 (0.0-2.9)	3	3.0 (0.0-6.2)
Over 3 years	457	30	6.6 (4.1-9.1)	12	2.6 (1.0-4.3)	39	8.5 (5.5-11.5)

* Inestimable.

some of their animals. Therefore, we ended up collecting 610 blood, 610 genital swabs and 361 milk samples from 610 of the 1142 bovines in 179 households, recording an overall response rate of 72.5% (179/247) at the household level and 53.4% (610/1142) at the animal level (Table S1).

Overall prevalence was estimated to be 7.0% (95% CI: 4.7, 9.4). The overall prevalence was 8.7% (95% CI: 5.5, 11.9) in cattle and 4.3% (95% CI: 1.7, 6.9) in buffalo. Detailed prevalence estimates are presented in Table 1. The agreement between ELISA and Trans-PCR was 10.3% (95% CI, 3.2%, 17.4%) and between shedding of *C. burnetii* in milk (2.8%) and genital secretion (1.1%, for lactating animals) was 14.3% (95% CI, 5.6%, 22.9%).

The NCBI GenBank accession numbers for the submitted sequences were obtained (MH598510- MH598511; MH605306- MH605308). The phylogenetic tree based on the alignment of partial IS1111a sequences indicated that all positive samples belonged to *C. burnetii* (Fig. 1). Out of the five sequences, two from Amritsar district and one from Gurdaspur district (MH605306, MH605308 and MH598510) were found to be clustered together with *C. burnetii* sequence from IVRI, Bareilly, India representing the prevalence of common strain in the region and adjoining states. While the other two sequences, one each from Amritsar and Gurdaspur (MH605307 and MH598511) were grouped with rest of the sequences from the different part of the world indicating a common genotype/strain (Fig. 1).

4. Discussion

This study was conducted to estimate the prevalence of Q fever in cattle and buffaloes in Punjab, India. We recorded an overall prevalence of 7.0% (95% CI: 4.7, 9.4) in the bovine population. Earlier studies conducted by Randhawa et al. (1973) reported a 16.2% prevalence of Q fever in cattle and 9.6% in buffaloes. In another study, Sodhi et al.

PLOS ONE

Apparent prevalence and risk factors of coxiellosis (Q fever) among dairy herds in India Pankaj Dhaka et. al

Division of Veterinary Public Health, ICAR-Indian Veterinary Research Institute, Izatnagar, Bareilly, India,

711 blood samples: cattle 543; buffaloes 168

eight farms at different geographical locations in India

prevalence (positive for PCR and/or ELISA) for coxiellosis

24.5% in cattle

8.9% in buffaloes.

In a study-Punjab State of India, overall prevalence:

cattle - 8.7%

buffaloes - 4.3%

Table 2. Results of PCR assays and ELISA screening for coxiellosis in bovines.

Study area	Targeted farms	Animals	Blood samples		% ELISA positivity
			% trans-PCR positivity	% com1-PCR positivity	
Uttar Pradesh	Farm 1	182 Cattle	12.6% (23/182)	9.3% (17/182)	23.1% (42/182)
	Farm 2	74 Cattle	6.8% (5/74)	6.8% (5/74)	16.2% (12/74)
Rajasthan	Farm 3	208 Cattle	6.7% (14/208)	4.3% (9/208)	14.9% (31/208)
Chhattisgarh	Farm 4	34 Cattle	5.9% (2/34)	5.9% (2/34)	14.7% (5/34)
	Farm 5	45 Cattle	4.4% (2/45)	4.4% (2/45)	13.33% (6/45)
	Farm 6	24 Buffaloes	4.2% (1/24)	4.2% (1/24)	12.5% (3/24)
Haryana	Farm 7	114 Buffaloes	0 (0/114)	0 (0/114)	9.6% (11/114)
	Farm 8	30 Buffaloes	0 (0/30)	0 (0/30)	0 (0/30)
Total		Cattle: 543	8.5% (46/543)	6.5% (35/543)	17.7% (96/543)
		Buffaloes: 168	0.06% (1/168)	0.06% (1/168)	8.3% (14/168)

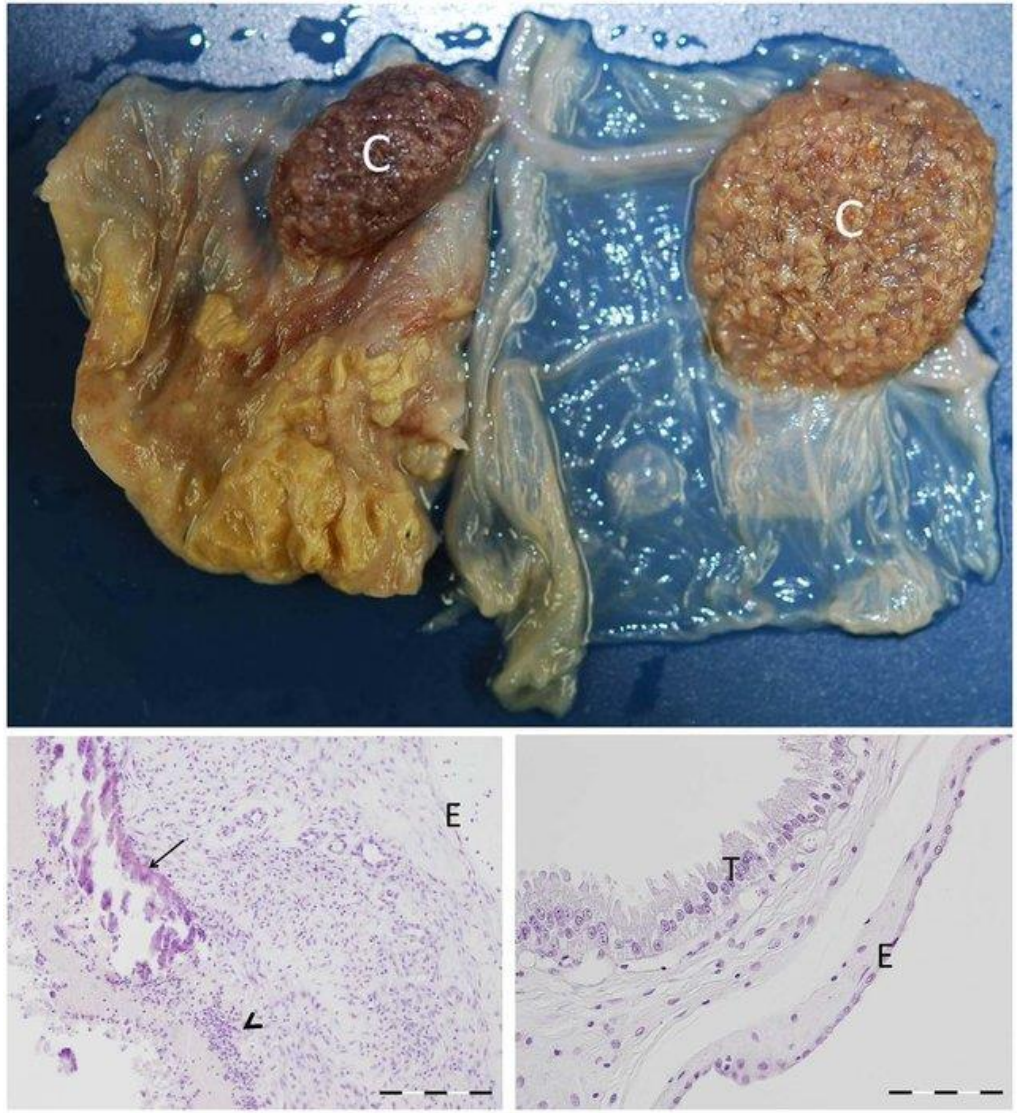
https://doi.org/10.1371/journal.pone.0239260.t002

Contrary to the above observations, the inadequate floor spacing per animal at Farms 3, 4 and 5 exhibited 1.64 higher odds than the other farms (Farm 1 and 2). Also, the history of clinical entities such as mastitis and reproductive disorders at individual animal level among bovines screened were having the odds of 2.35 and 2.54 (p-value: <0.05) for coxiellosis, as compared to apparently healthy animals (Table 3).

Table 3. Univariable analysis of observed risk factors for coxiellosis.

Parameters	Risk Factors	Test for *C. burnetii* (PCR assays and ELISA)		Odds Ratio	95% CI	p-value
		+ ve	- ve			
Species	Buffaloes	15	153	1.00		0.00002
	Cattle	133	410	3.31	1.88–5.82	
Breed of cattle	Jersey	8	37	1.00		

https://www.researchgate.net/publication/233419409 **Q Fever in Pregnant Goats: Pathogenesis and Excretion of Coxiella burnetii** Article in PLoS ONE · November 2012 DOI: 10.1371/journal.pone.0048949 · Source: PubMed CITATIONS 101 READS 177 7 authors, including: Some of the authors of this publication are also working on these related projects: HoPaCi und Co View project Chronic Q fever View project Hendrik-Jan Roest Wageningen University & Research



https://doi.org/10.1016/j.prevetmed.2019.03.003

Prevalence ofCoxiella burnetiiin cattle and buffalo populations in Punjab,India R. Keshavamurthya, B.B. Singha,∗, D.G. Kalambhea, R.S. Aulakha, N.K. DhandbaSchool of Public Health & Zoonoses, Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana, Punjab, 141004, IndiabSydney School of Veterinary Science, The University of Sydney, Camden, NSW, AustraliaARTICLE
INFOKeywords:BuffaloCattleCoxiella burnetiiIndiaPrevalencePunjabQ fever

Ruminant Abortions –Q-Fever - Zoonotic

Estimate Q fever prevalence in cattle (378) and buffalo (232)

22 random villages, 179 households; Punjab.

610 blood samples- IgG ELISA

610 vaginal swabs - PCR

378 milk samples – PCR

Conclusion: the disease is present in the state and further epidemiological information should be collected to determine its zoonotic potential and its impact on animal and public health in Punjab, India.

Ruminant Abortions – Chlamydophilia - Zoonotic

Chlamydia abortus, - enzootic abortion of ewes,

sporadic abortion in cattle.

most common - last trimester

Placenta:

thick - yellow-brown exudate adhered to the cotyledons and intercotyledonary areas.

Histologically:

placentitis

fetus:

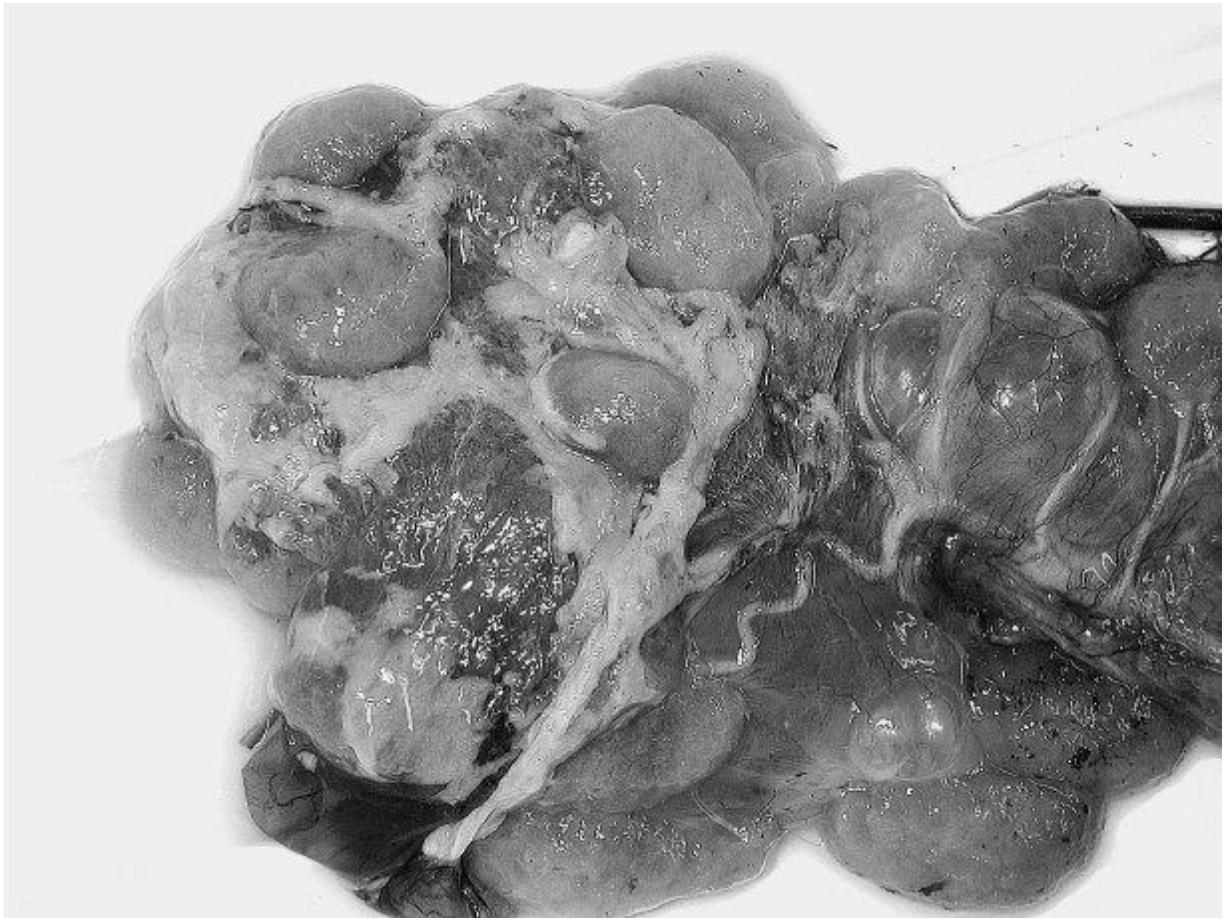
pneumonia

hepatitis can be found in some cases.

Acta Veterinaria Hungarica 54 (4), pp. 503–515 (2006) DOI: 10.1556/AVet.54.2006.4.8 0236-6290/$ 20.00 © 2006 Akadémiai Kiadó, Budapest

EPIDEMIOLOGICAL AND PATHOLOGICAL STUDY ON THE CAUSES OF ABORTION IN SHEEP AND GOATS IN HUNGARY (1998–2005)

L. SZEREDI* , Sz. JÁNOSI, M. TENK, L. TEKES, M. BOZSÓ, Z. DEIM and T. MOLNÁR Central Veterinary Institute, H-1149 Budapest, Tábornok u. 2, Hungary (Received 2 January 2006; accepted 24 May 2006)



Ruminant Abortions - Chlamydophilia

Diagnosis:

stained smears of the placenta

ELISA

FA

PCR

Vaccination – sheep

zoonotic - occasionally producing life-threatening disease and abortion in pregnant women.

Veterinary World, EISSN: 2231-0916 Available at
www.veterinaryworld.org/Vol.8/January-2015/15.pdf

Seroprevalence studies on animal chlamydiosis amongst ruminants in five states of India R. Chahota, et.al

Department of Veterinary Microbiology, DGCN College of Veterinary and Animal Sciences, Palampur, Himachal Pradesh, India.

Revised: 08-12-2014, Accepted: 12-12-2014, Published online: 24-01-2015

clinical or subclinical disease -in cattle, buffalo, ovine, caprine and wild animal species.

seroprevalence: ruminants in five states of India was:

Himachal Pradesh: Cattle-10.90%, sheep-10.60% and goats- 22.46%;

Punjab: Cattle-1.45%; Andhra Pradesh: Cattle-2.80%, buffaloes-0.93%, sheep-8.90% and goats-9.46%;

Maharashtra: goats-8.33%;

Jammu and Kashmir: sheep-12.50%.

Veterinary World, EISSN: 2231-0916 Available at www.veterinaryworld.org/Vol.8/January-2015/15.pdf

Seroprevalence studies on animal chlamydiosis amongst ruminants in five states of India R. Chahota, et.al

Department of Veterinary Microbiology, DGCN College of Veterinary and Animal Sciences, Palampur, Himachal Pradesh, India.

Revised: 08-12-2014, Accepted: 12-12-2014, Published online: 24-01-2015

The mean seroprevalence values:

cattle-4.65%

buffaloes-0.93%

sheep-9.82%

goats-19.33%.

Table 2: Seroprevalence of chlamydial infections amongst ruminants

Name of the state	Cattle (%)	Buffaloes (%)	Sheep (%)	Goats (%)	Total (%)
Himachal Pradesh	12/110 (10.90)	-	44/415 (10.60)	62/276 (22.46)	118/801 (14.73)
Punjab	1/69 (1.45)	-	-	-	1/69 (1.45)
Andhra Pradesh	7/251 (2.80)	4/429 (0.93)	42/467 (8.90)	7/74 (9.46)	60/1221 (4.91)
Maharashtra	-	-	-	1/12 (8.33)	1/12 (8.33)
Jammu and Kashmir	-	-	3/24 (12.5)	-	3/24 (12.5)
Total	20/430 (4.65)	4/429 (0.93)	89/906 (9.82)	70/362 (19.33)	183/2127 (8.60)

Note: Positive percentages are shown in the parenthesis

Analysis of disease-related data from five states revealed that seroprevalence was highest, i.e. 19.33% amongst goats. However, seroprevalence of chlamydiosis amongst goats of different states of India showed variations from 8.33% in Maharashtra to 22.46% in Himachal Pradesh, and the detail is shown in Table-2. The low positive percentage in Maharashtra may be due to small sample size. Amongst sheep population, we detected a mean prevalence of 9.82%, ranging from 8.9% in Andhra Pradesh to 10.6% in Himachal Pradesh. Studies on limited samples and area in India by Mahapatra *et al.* [25] using AGPT for chlamydiosis, recorded 28.0% and 34.0% seropositivity for sheep and goat, respectively. Similarly, Joshi *et al.* [26] also reported seropositivity of 29.90% and 43.29% in sheep and goats, respectively. In cattle and buffaloes, overall 4.65% and 0.93% samples were found seropositive, respectively in our study. We tested 429 samples of buffaloes from Andhra Pradesh only; however, it requires further studies of buffalo samples from other parts of India also. In one of our previous studies on buffalo serum using AGPT, total 8.70% samples were found positive from Himachal Pradesh [14]. In this study, no significant statistical difference was found in the seroprevalence of chlamydiosis amongst ruminants of five different states of India. This may be due to the small size of the representative samples from each state. Thus, a more exhaustive epidemiological study is required to know the actual chlamydial prevalence in different states.

Conclusion

The results of the present investigation indicated that chlamydial infections are endemic amongst ruminants in studied areas of five states of India, which may represents one of the causes of abortion, pneumonia, enteritis, arthritis and other clinical manifestations. Therefore, large-scale screening of native livestock species along with characterization of involved indigenous chlamydial strains is urgently required. Thus, integrated strategies are required to be adopted for control and prevention of sporadic chlamydial infection cases or disease outbreaks keeping in view the zoonotic importance also.

Authors' Contributions

RC was associated with overall planning and execution of the research work. SG, BB and PM carried out laboratory work. SV and MS analyzed the data and drafted and revised the manuscript. All authors read and approved the final manuscript.

Acknowledgments

The authors are thankful to Department of Biotechnology (DBT), Ministry of Science and Technology, Government of India, New Delhi, for partly funding this study (DBT Grant No GOI-468/40).

Competing Interests

The authors declare that they have no competing interests.

References

Ruminant Abortions - Bluetongue

Journal Veterinary Quarterly

An updated review on Bluetongue virus: Epidemiology, pathobiology, and advances in diagnosis and control with special reference to India

Mani Saminathan,**Karam Pal Singh**,Jaynudin Hajibhai Khorajiya,Murali Dinesh,Sobharani Vineetha,Madhulina Maity, show all

Received 03 May 2020, Accepted 29 Sep 2020, Accepted author version posted online: 01 Oct 2020

Download citation

https://doi.org/10.1080/01652176.2020.1831708

Ruminant Abortions - Bluetongue

Bluetongue (BT) - non-contagious domestic and wild ruminants.

Orbivirus and family *Reoviridae*. 24 sero-types

Conclusion: “Major hindrances with control of BT in India are the presence of multiple BTV serotypes, high density of ruminant and vector populations.”

A pentavalent inactivated, adjuvanted vaccine is administered currently in India to control BT.

Ruminant Abortions - Bluetongue

BT is endemic in India.

BTV antibodies: goat, cattle, camel, buffalo and mithun;

clinical disease –infrequent

Joardar et al. 2015; Maan et al. 2017; Shah et al. 2017; Karam et al. 2018.

Economic impact of bluetongue virus in India

BT in 2005 caused greatest direct annual economic losses to Indian sheep industry,

Ruminant Abortions - Bluetongue

Clinical Findings:

cattle and sheep infected during pregnancy

Subclinical -cattle, goats & camelids.

- abortions, deformed newborns
  - hydranencephaly or porencephaly
  - ataxia
  - blind

Blue Tongue - Ruminant Abortions

Cattle

Diagnosis

- precolostral antibodies - serum

PCR. -Brain, spleen, and whole blood

Control - vaccination ???

modified-live and inactivated vaccines

management to reduce exposure to biting midges.

Ruminant Abortions - Bluetongue

Transmission:

Culicoides biting midges -

prolonged viremia - up to 11 wk

year-round transmission in domestic ruminants; short winter

Mechanical transmission- bloodsucking insects- minor significance.

Semen from viremic bulls - natural service or artificial insemination.

Transplacental transmission

viremic calves,

Ruminant Abortions - Bluetongue

Diagnosis and Lesions:

A serologic response in ruminants can be detected 7–14 days after infection and is generally lifelong after a field infection.

agar gel immunodiffusion

cELISA -

does EHDV (epizootic hemorrhagic disease virus) antibody.

Ruminant Abortions - Trueperella

Trueperella (Arcanobacterium) *pyogenes*

- sporadic abortion at any stage of pregnancy.
- positive culture is significant
- placentitis results from septicemia
  - reddish brown to brown color.
- endometritis

Fetus

- autolyzed
- fibrinous pericarditis, pleuritis, or peritonitis
- bronchopneumonia histologically

Diagnosis - bacteriology

- placenta
- abomasal contents

Ruminant Abortions - Mycotic

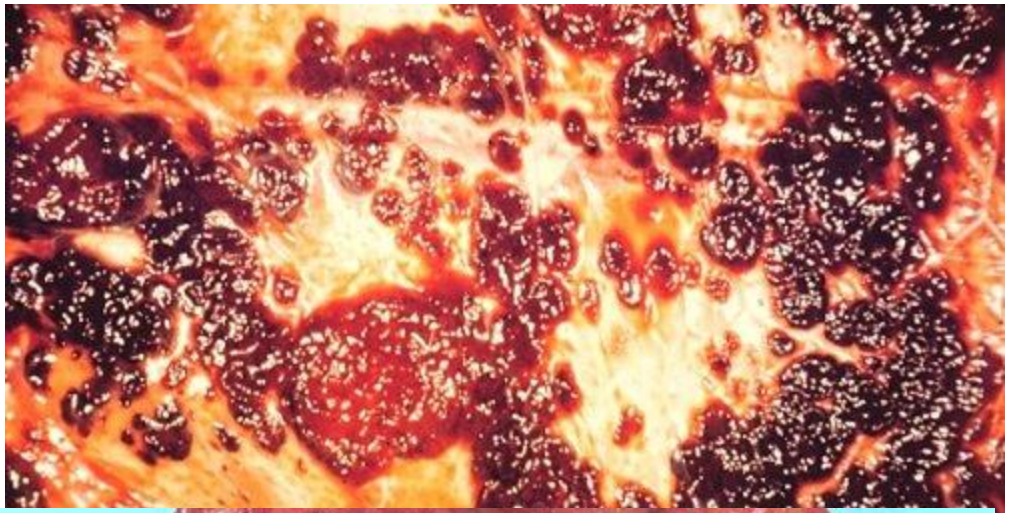
Fungal placentitis - *Aspergillus* sp (60%–80% of cases), or to *Mucor* sp, *Absidia*, *Rhizopus* sp,

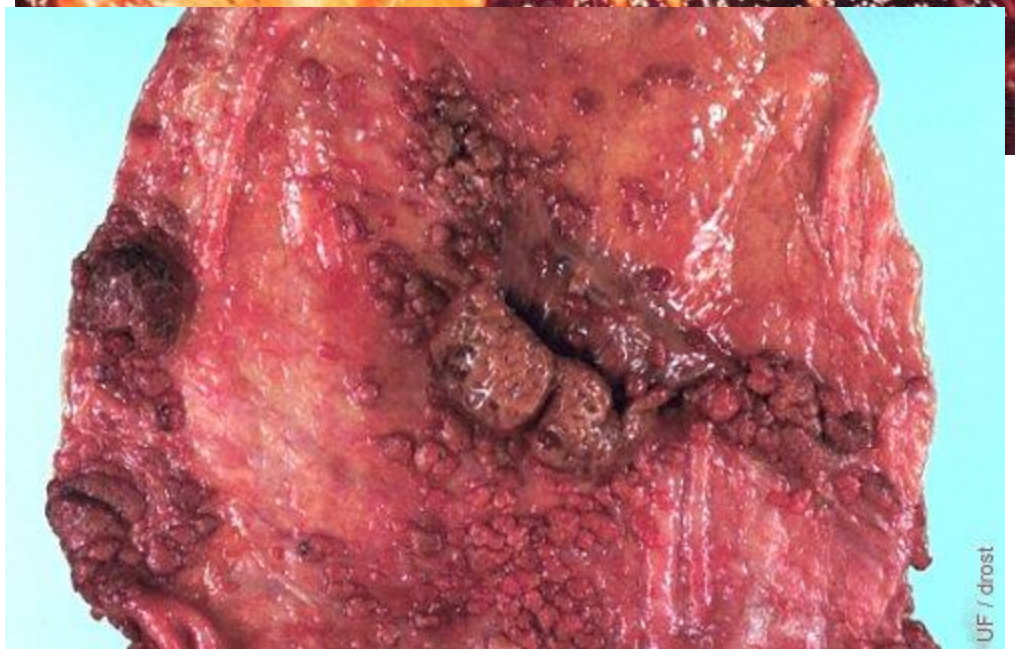
- bovine sporadic abortion
  - generally >4 months
  - winter most common

Transmission - oral or respiratory tracts

- spread to placenta via blood
  - severe necrotizing placentitis
    - Cotyledons – enlarged, necrotic with turned-in margins
      - intercotyledonary - thickened and leathery
        - adventitious placentation is common.

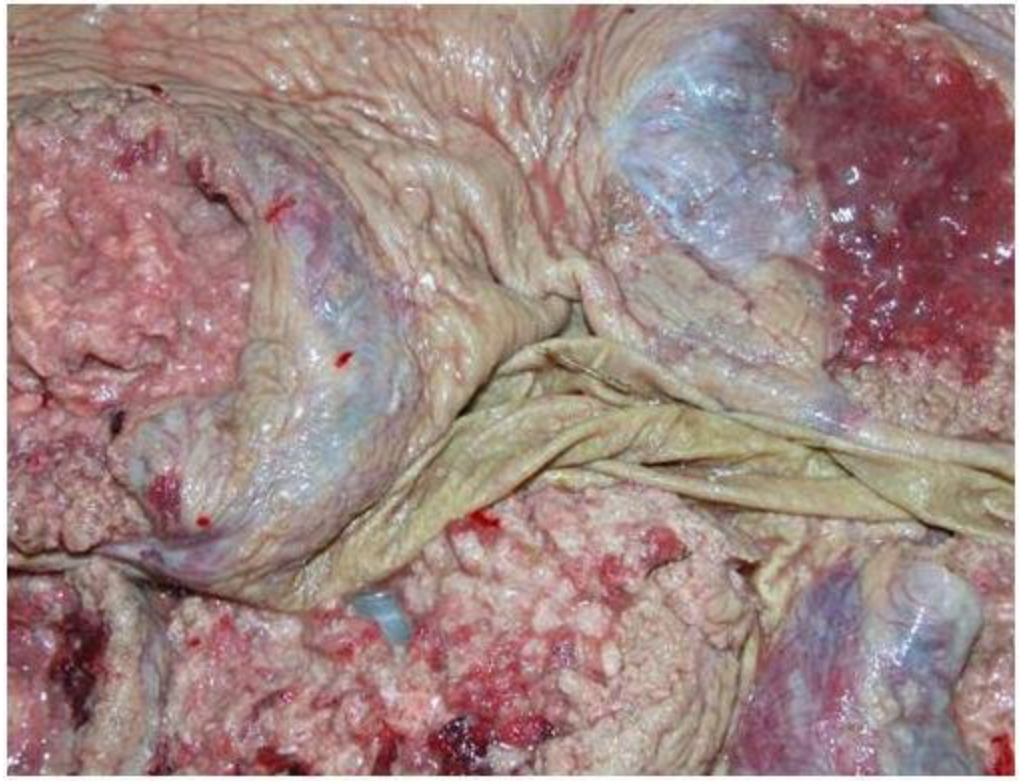
Ruminant Abortions - Mycotic Adventitious Placentation





Agriculture
Spoiled Feeds, Molds, Mycotoxins and Animal Health
https://www.gov.mb.ca/agriculture/livestock/beef/print,spoiled-feeds-molds-mycotoxins-and-animal-health.html

Mycotic Placentitis – Photo. Dr. Mark Swendrowski, MAFRI



Ruminant Abortions - Mycotic

Ruminant Abortions - Mycotic

Mycotic Abortion:

Fetus – expelled fresh

gray ringworm-like skin lesions- head and shoulders

Diagnosis- presence of fungal hyphae associated with necrotizing placentitis, dermatitis, or pneumonia

fungal culture- stomach contents, placenta, and skin lesions

Prevention

monitor feed for mold

Fetal Disease and Abortion
Chapter 54Fetal Disease and Abortion: Diagnosis and Causes

Wes Baumgartner
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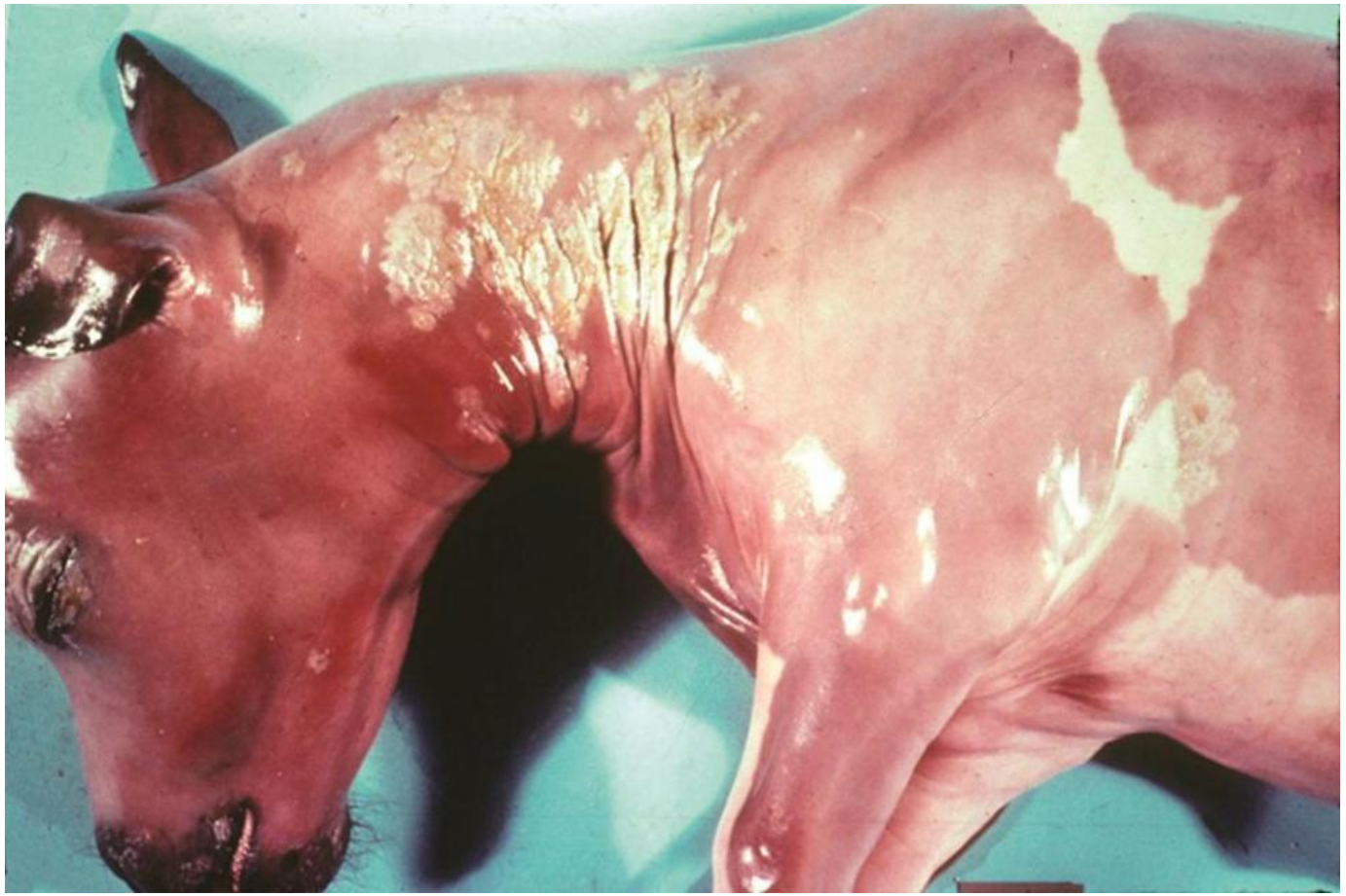

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Infectious Causes of Bubaline Abortions