Diagnosis of Pregnancy Loss

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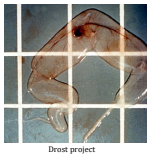
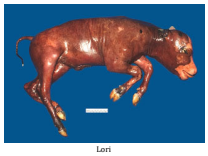
Overview

- Bovine pregnancy loss
- Producer education
- Diagnostic approach
- Samples
- Infectious agents
- Noninfectious agents
- Summary

Pregnancy Loss

- Early embryonic death = <42 days (before organogenesis)
- Abortion = >42 days (after organogenesis)
- Stillbirth


Drost project


Lori


agriculture.gov.ie

Bovine Abortion

- Abortion rate of 1-2% is acceptable in beef cattle
  - Maybe as high as 10% in dairy cattle
- >3% = concern
- Abortion from mid-gestation to term = loss of $600-1000
- Infectious agents = at least 50-60% of abortions
- Noninfectious = genetic, hormonal imbalances, nutritional deficiencies or excesses, and toxic plants or chemicals

Diagnostic Approach

- Educate producers
- History
- Herd investigation
- Sample collection and submission
- Interpretation of results

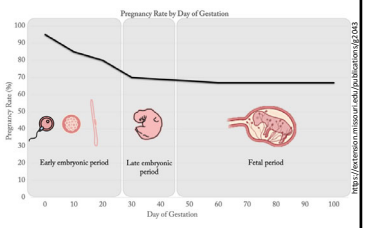
Protocol for Producer

- Identify and isolate the cow
- Collect fetus and **placenta**
- Call vet ASAP
- Package and chill samples and get to lab ASAP
  - NEVER freeze samples
- Records are important
  - Herd history
  - Biosecurity

Preparing the Producer

- Realistic expectation
  - Accurate diagnosis is difficult (<50%)
  - Time consuming
  - Expensive
  - Often unrewarding
- Can't fix what you don't know!

- Majority of pregnancy loss is in the first 30 days of gestation
- Stress
  - Transport – days 1-4 after AI or after 60 days
  - Heat
    - ↑ body temp by 2-2.5° for 9 hours can ↓ embryo development
    - 8-16days post breeding → ↓Progesterone, ↑PGF2α, and ↓embryonic weights

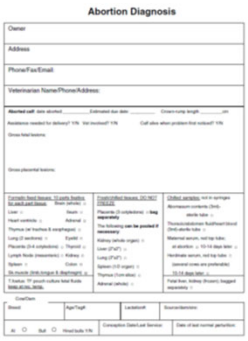


Get a Good History on the Case

- Number abortions/abortion rate
- Gestation age
- Age of the dam
- Duration
- Number of females at risk
- Weak calves
- Clinical signs
- Females sick/retained placenta
- Previous abortions

Broader Herd Investigation

- Vaccination protocol
- Breeding program
- Nutritional program
- Herd recently worked
- Weather
- New additions
- Abortions at neighbors?



Baumgartner: Bovine Reproduction

Before Sampling

- Create a "diagnostic kit" that includes:
  - Submission forms, pencil, pen
  - Double-chambered plastic courier bag
  - Slides, swabs, needles, syringes, scalpels
  - Blood collection tubes (not expired)
  - Slide holders/tube holders
  - Formalin containers
  - Tin foil, whirl-packs, culturette tubes

Slide courtesy of Dr. Krimer

Samples

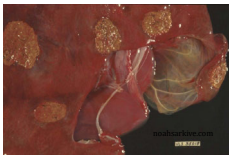
- **Placenta**
- Fetus
- Maternal blood

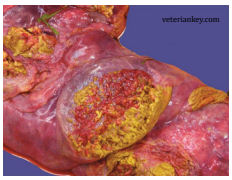
Placenta

Normal changes with time

Placenta

- Intercotyledonary opacities
  - Edema
  - Inflammation
  - Fibrosis
- Fibrin – yellow, friable
- Viral abortions rarely cause gross changes





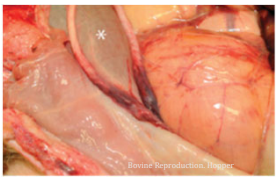
Fetus

- Submit whole fetus or do field necropsy

- Gestational age
- Condition
- Lesions
  - Raised skin plaques = mycotic infection
  - Meconium stain = fetal stress

Fetus

- Signs that was alive at birth
  - Inflation of lungs
  - Milk in abomasum
  - Thrombosis or hemorrhage of umbilical vessels



Fetus

- Liver lesions
  - Necrosis - *Listeria monocytogenes,* BHV-1, *Yersinia pseudotuberculosis,* and *Samonella enterica*

- Abomasal contents
  - *T. foetus, Campylobacter,* and Lepto

Tissue Collection

Formalin fix
- Lung
- Liver
- Kidney
- Spleen
- Heart
- Brain
- Skeletal muscle
- Thymus
- Eyelid
- Abnormal tissue

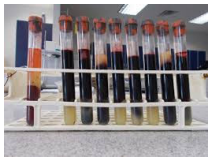
Fresh - chilled
- Lung
- Liver
- Kidney
- Spleen
- Heart
- Brain
- Abomasal contents
- Ocular fluid
- Thoracic fluid

Fetal Serology

- Blood or thoracic fluid
- Test:
  - IgG > 20mg/dL = immune response in fetus
  - BHV-1, BVD, *Leptospira, Neospora, Brucella*, bluetongue virus, and PI3

Maternal Blood

- Elevated titers indicates exposure ONLY
  - Natural exposure vs vaccination
- Many infectious agents cause elevated titer weeks prior to or after abortion
  - Normal levels at time of abortion
- Serial samples
  - 3 weeks post abortion
- Sample non-affected females

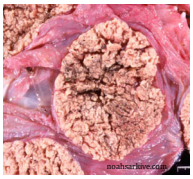


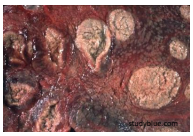
Diagnostic Test

- Bovine Abortion Serology Panel
  - Serum or clotted blood
  - BVD, IBR, *Lepto, Brucella abortus*
  - In state = $22, Out of State = $22
- Bovine Abortion/Reproductive PCR Panel
  - Preputial Wash, Vaginal Swab, Fetal tissue, Abomasum, Placenta
  - BVD types I & II, Brucella, IBR, *Tritrichomonas foetus, Campylobacter fetus, Campylobacter jejuni, Chlamydia, Leptospira, Neospora caninum*
  - In state = $85, Out of State = $100
- Bovine Abortion Panel 2
  - Serum
  - BVD, IBR, BT, Lepto, Neospora
  - In state = $25, Out of State = $30

Brucella abortus

- Abortion rate = 80+% in unvaccinated herd
- Time = 6-9 months
- Lesions
  - Placenta – necrotizing fibrotic placentitis
    - Moroccan leather placenta
  - Fetus – pneumonia
    - Cobblestone texture to the lung surface with small white foci
- Samples
  - Fetal – lung, abomasal fluid
  - Placenta





Campylobacter vaginalis fetus

Vibrio

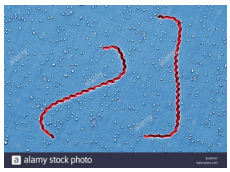
- EED > abortion
- Time = 5-8 months
- Abortion rate <10%
- Lesions
  - Placenta - mild placentitis
    - Hemorrhagic cotyledons & intercotyledonary edema
    - Not retained
- Samples
  - Fetal abomasal fluid and lung
  - Placenta

Chlamydophila abortus

- Sporadic abortions
- Time – late term
- Lesions
  - Placentitis – thickened brown exudate
  - Fetal – pneumonia, hepatitis
- Samples
  - Fetus, placenta

Leptospira

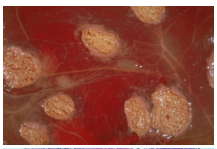
- Abortion rate = 5-40%
- Time – last trimester
- Lesions
  - Placenta – diffuse placentitis
    - Avascular, pale, tan cotyledons
    - Yellow, edematous intercotyledonary areas
  - Fetus – autolyzed
- Samples
  - Placenta, fetus (kidney)

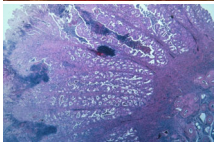


veteriankey.com

Listeria monocytogenes

- Abortion rate = sporadic to >50%
- Time – last trimester
- Lesions
  - Placenta – white necrotic foci on cotyledons
    - Often retained
  - Fetus – autolyzed fibrinous polyserositis, small liver with white necrotic foci
- Samples
  - Placenta, fetus (brain, lung, abomasal contents)





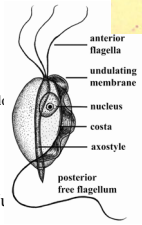
noahsarkive.com

Ureaplasma

- Natural inhabitant of reproductive tract
  - Opportunistic pathogen – takes advantage in stressed/sick animal
- Sporadic abortions
- Lesions
  - Placenta - retained
    - Intercotyledonary areas - thickened, opaque and white to brown
    - Amnionic lesions – multifocal/extensive areas of necrosis, hemorrhage, fibrosis, and mineralization
  - Fetus
    - Interstitial pneumonia
- Samples
  - Placenta, fetus (lung, abomasal contents)

Tritrichomonas foetus

- EED > abortion
  - Sporadic
  - Repeat breeders
- Lesions
  - Placenta – mild placentitis
    - Hemorrhagic cotyledons & thickened intercotyledo areas
    - Pyometra
    - Often retained
- Samples
  - Placenta, fetus (abomasal contents), vaginal/u fluid



www.k-state.edu/parasitology

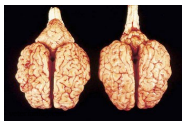
Neospora caninum

- Abortion rate = 30%
- Time – 5-6 months
- Lesion
  - Placenta – none
  - Fetus
    - Microscopic – focal encephalitis, hepatitis
    - Mummification rarely
- Samples
  - Placenta, fetus (brain, kidney, lung, liver, skeletal muscle), maternal blood

noahsarkive.com

BVDV

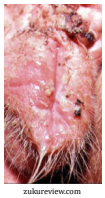
- Abortion rate = low
- Time – up to 4 months
- Lesions
  - Placenta – retained
  - Fetus – variable
    - Autolyzed, mummified, hydrocephalus, cerebellar hypoplasia, microphthalmia, retinal dysplasia, cataracts, brachygnathism
- Samples
  - Placenta, fetus (lung, liver, skin, heart)



Bovine Herpes Virus 1

Infectious Bovine Rhinotracheitis

- Abortion rate = 5-60%
- Time – 4 months to term
- Lesions
  - Placenta – usually none
    - Necrotizing placentitis
  - Fetus – autolyzed, focal liver necrosis
  - Maternal
    - Ulceration of nose, respiratory disease, genital lesions
- Samples
  - Placenta, fetus (kidney, adrenal, liver, lung), maternal blood



zukureview.com

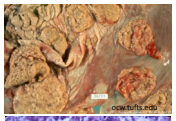
Bluetongue

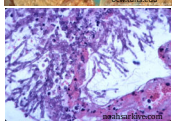
- Endemic in US ruminant population
- Abortion rate = low
- Time – variable
- Lesions
  - Fetus – autolyzed
    - Hydrocephaly, arthrogryposis, dwarfism, excessive gingival tissue, microphthalmia
- Samples
  - Placenta, fetus (brain, spleen)

calfology.com

Mycotic Infections

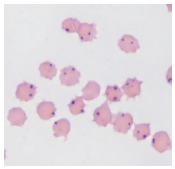
- *Aspergillus fumigatus* – most common
  - Also *Mucor, Rhizopus*
- Abortion rate = sporadic to 5-10%
- Time – 4 months to term
- Lesions
  - Placenta - severe necrotizing placentitis, enlarged cotyledons, leathery thickened intercotyledonary areas
  - Fetus – autolyzed
    - Gray round lesion on neck and head
- Samples
  - Placenta, fetus (abomasal contents, lungs, skin,)





Anaplasma marginale

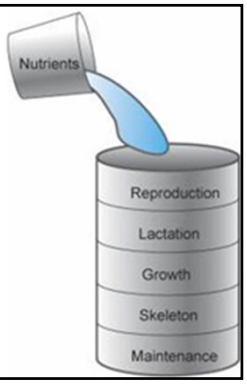
- Abortion rate = low
- Time – variable
- Progressive anemia
  - Abortion due to hypoxia in any stage of gestation
- Lesions
  - Fetus - splenic enlargement, lung and liver petechiation
- Samples
  - Blood, fetus, placenta



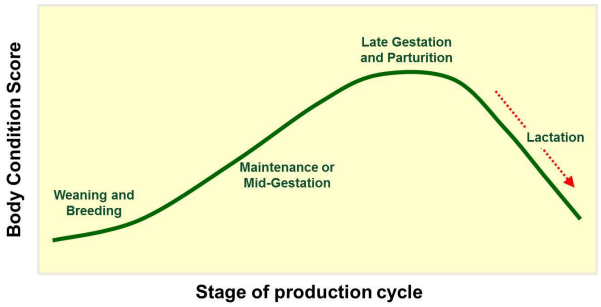
www.eclinpath.com/ngg_tag/anaplasma

Inadequate nutrition

- Can't starve a profit out of a cow
- What is BSC?
- When nutrients are scares, body has to make a decision of what functions it will support
  - What is the priority?



Normal Changes in Body Condition Score



Effect of body condition during the breeding season on pregnancy

	BCS ≤4	BCS 5	BCS ≥6
Percent pregnant after 150 days	58	85	95

Body Condition Score

- Optimal BCS for calving and breeding of beef cattle =6-7
- Scoring cattle 2 months before calving season starts allows for sorting and supplemental feeding of thin cattle +/- culling
- Thin cows < fertile
- Thin or fat cattle also have more dystocia and prepartent disease

Nutritional Deficiencies

- 'Can't starve a profit out of a cow'
  - Emaciation → abortion
- Protein
  - Late term gestation
  - Premature, dystocia, neonatal mortality

Herris Maxwell

Nutritional Deficiencies

- Vitamin A
  - Late term abortion
  - Weak, blind calves (retinal development)
- Iodine
  - Hyperplastic goiter
  - Hairless, weak calves
- Selenium
  - Nutritional muscular dystrophy, premature calves, placentas

pinsdaddy.com/goiter-in-cow

Nutritional Excesses

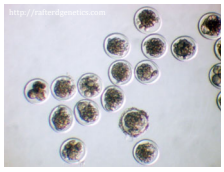
- Iodine
  - Abortion
- Selenium
  - Weak calves
  - Abortion

Hormonal Imbalances

- Endotoxemia & metritis
  - Inflammation → Endogenous PGF2α → CL lysis → Abortion
- Estrogen
  - Silage, Legumes, & Poultry litter → Abortion

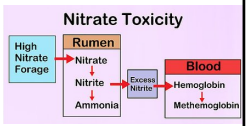
Heat Stress

- High ambient temperature contribute to early embryonic death
  - <30days
- Fetal hypotension, hypoxia, and acidosis



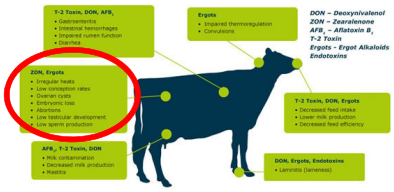
Toxins

- Nitrates
  - Methemoglobin → Hypoxia → EED & Abortion
  - Drought
  - Chocolate brown blood
  - Clinical signs – bluish mucous membranes, staggers, weakness, death
  - Treatment – methylene blue
    - 4mg/lb IV



Toxins

- Mycotoxins – zearalenone
  - Estrogen-like activity → Abortions
- Ergot alkaloids
  - Abortions



Genetic

- Happens <90 days in gestation
- Caused by:
  - Lethal genes
  - Chromosomal abnormalities

Summary

- Diagnosis can be difficult
- History and samples are key
- Clinical finding + diagnostic result + herd evaluation = BIG PICTURE
- More causes than on the abortion panel

Questions?

References