Investigating Causes of Conception Failure and Pregnancy Loss

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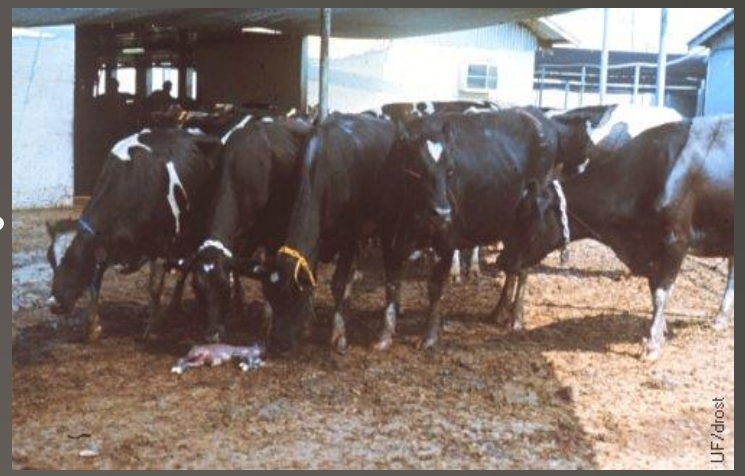
Why isn't she calving?

- Was she pregnant?
- If so why did she lose it?
  - Management
  - Environment
  - Infectious agents
- Analyze preg check results
  - Did I have a normal distribution of early, mid and late bred cows?
  - Did I have an acceptable PR?
- Pregnancy loss
  - Up to 45 days – early embryonic death
  - Abortion – 45 days to term
  - Stillborn – may be born alive but fails to rise and nurse or dies within hours

History

- Every clinical case examination begins with a thorough history
  - This includes:
    - Herd Health Program
      - Vaccinations, deworming any health products
      - Nutrition program
      - Routine procedures – BSE's, cow records like BCS at breeding?
- Biosecurity – recent herd additions (tested?)
- Recent changes or events
  - Feed, pastures, working, etc
- Using information in the history helps formulate a plan



Rule out list

- Non-infectious
  - Toxic
    - Nitrates
    - Fungus- *Aspergillus*
    - Gossypol
    - Pine needle abortion
    - Ergot
  - Management (missed management)
    - Infertile or sub-fertile bulls
      - Insufficient or inexperienced
    - Nutrition
      - Deficiencies
      - Excesses
      - Imbalances
  - Average cow age of herd

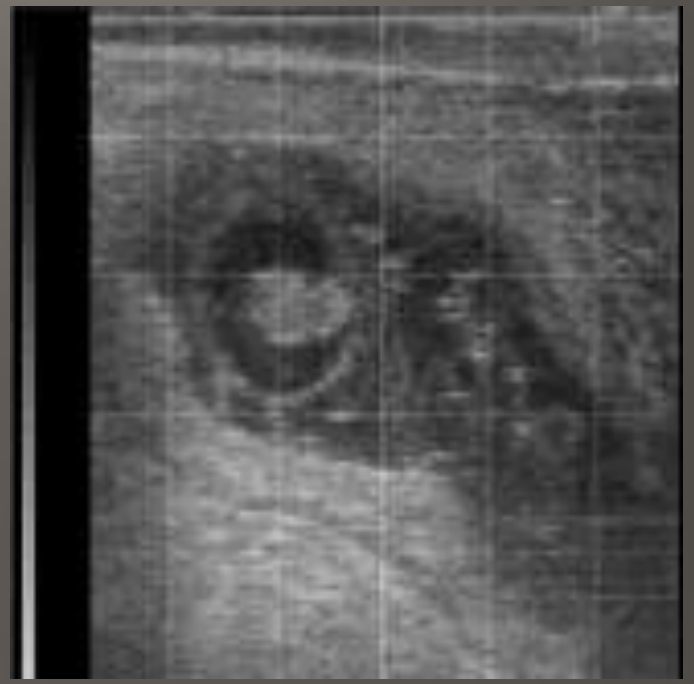
Non-infectious

Generalized interpretation for forage nitrate test.*	
ppm NO_3 (dry matter basis)	Interpretation
0 – 3,000	Generally safe for all cattle
3,000 – 5,000	Generally safe for non-pregnant beef cattle. Low risk of reduced breeding performance and early term abortions. Total ration for dairy cattle should be less that 2,500 NO_3
5,000 – 10,000	Some risk for all cattle. May cause mid to late term abortions and weak newborn calves. May decrease growth and milk production.
> 10,000	Potentially toxic for all cattle. Can cause abortions, acute toxicity symptoms, and death.

* Nitrate Toxicity in Livestock, Oklahoma Cooperative Extension Service, F-2903, Oklahoma State University, Gary Strickland, Glenn Selk, Earl Allen, Tom Thedford, D.V.M. Page 2903.5

- Nutrition
  - BCS herd
- Toxins?
  - Nitrates – hay analysis >3000ppm is dangerous for bred cows
  - Moldy – hay refusal and often associated with poor condition or diarrhea
  - Mycotoxins – pastures and in improperly stored feed – ZER, DOX
- Most of the time we can diagnosis agroceriosis rather easy
  - Not a protein deficiency…….an energy deficiency
  - Supplement – adequate?
- Genetic
  - Haplotypes – Holstein, Angus – (Hoff, et al 2017)
- Trauma and environment

Rule-out list



- Infectious
  - Trichomoniasis
  - Leptosporosis
  - Vibriosis – *Campylobacter fetus*
  - *Neospora*
  - *Anaplasma marginale*
  - *Brucella abortus*
  - Viral agents – bovine viral diarrhea virus, bovine herpes virus 1
- Less common infectious agents
  - Histophilus, Brucellosis, ureaplasma, bluetongue

Leptospirosis

Abortion – throughout gestation

5 common serovars in vaccines- *limited protection*

L. hardjo bovis

- Host adapted, lives in kidneys of cows
- Seminal vesicles in bulls

Can be shed in semen

Interferes with conception

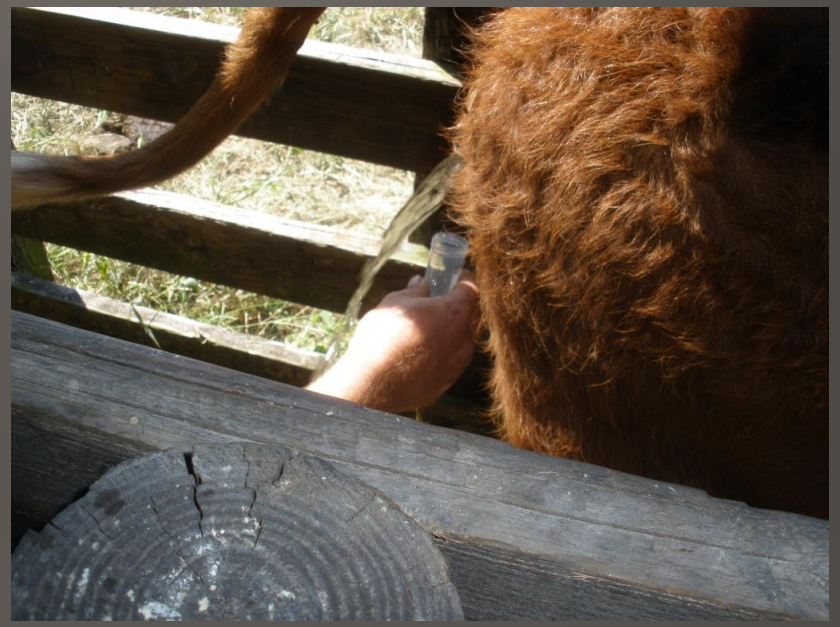
Causes abortion at any stage of gestation

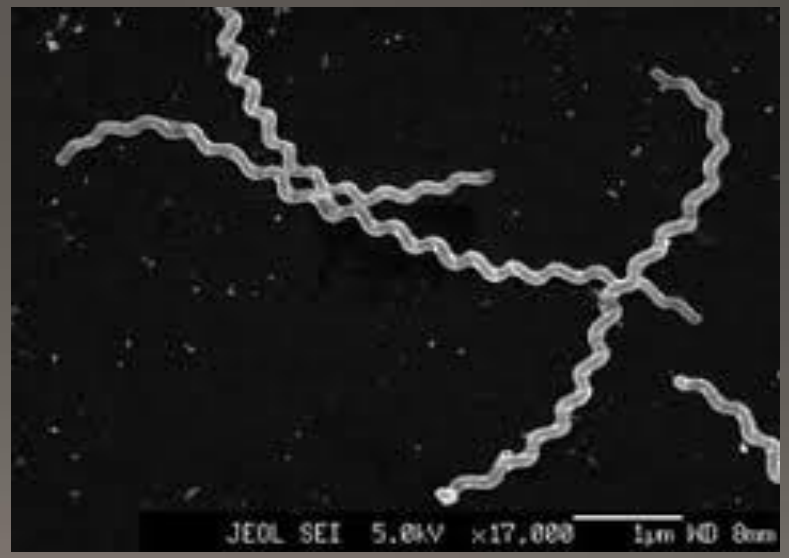
Furosemide (1cc/100#) wait

collect a midstream sample – PCR or FAT

Serology isn't rewarding – titers <1:100

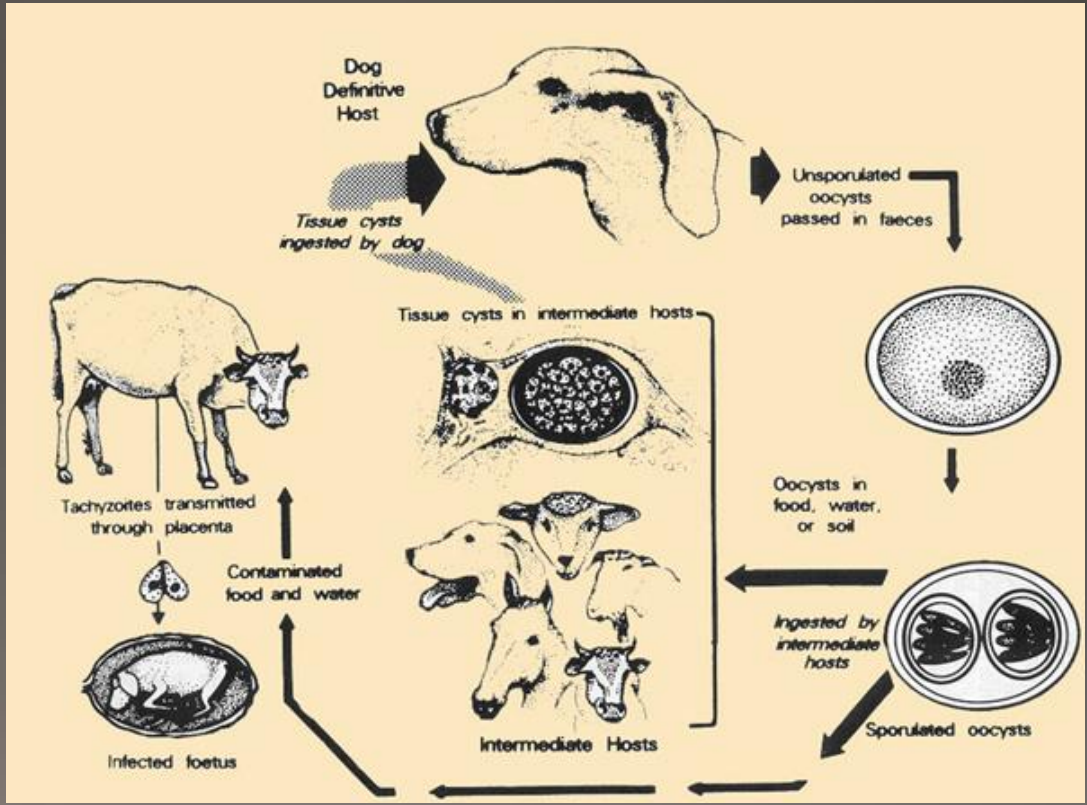
Caution! - zoonotic





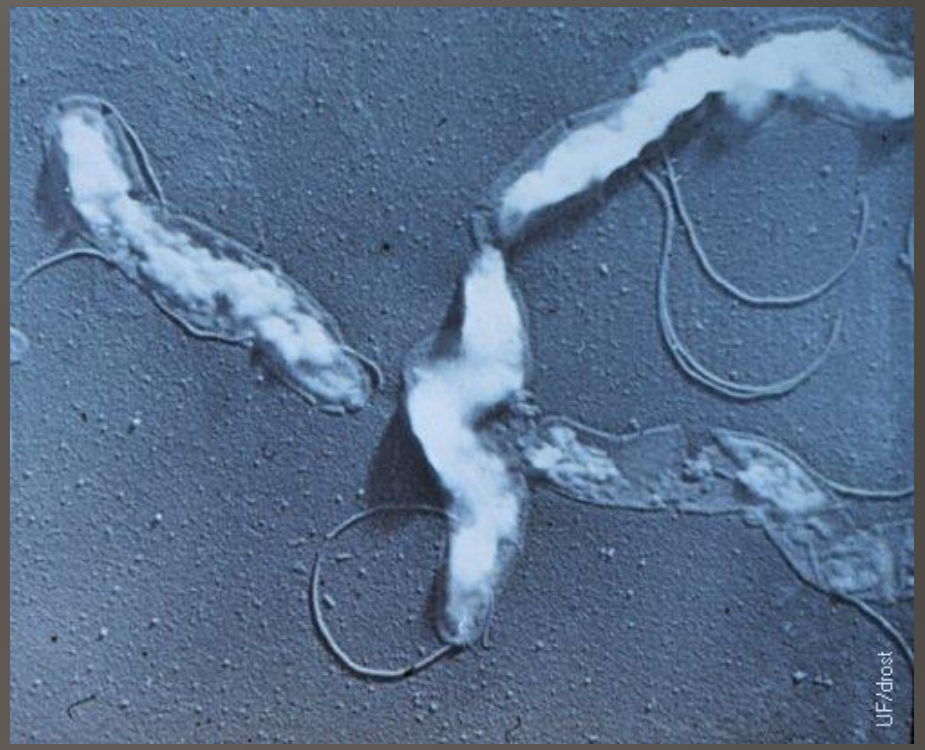
Neospora caninum

- Mid to late gestation abortions
- Latent organisms or ingested transmitted transplacentally
  - Vertical
- Diagnosis
  - Histopath of aborted fetus
  - IHC or PCR of *Neospora* in fetal tissues
  - Seropositive dam or fetus



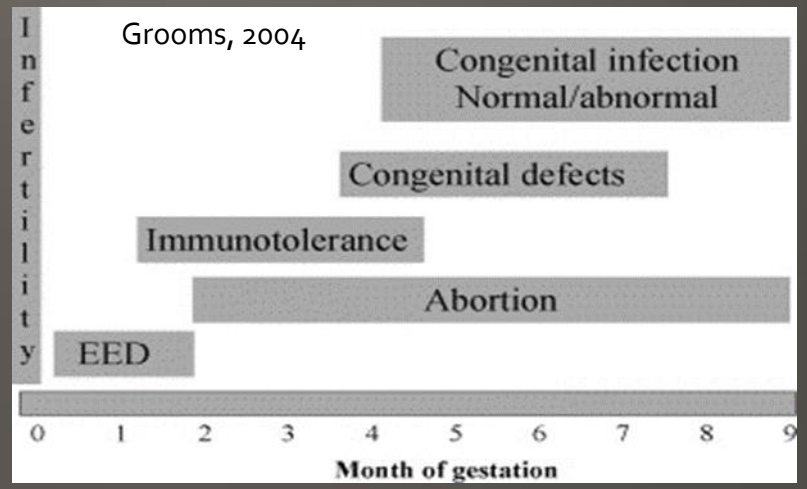
- *Campylobacter fetus*- vibrio
  - Abortion- late pregnancy or stillbirths
  - Cows infected at breeding
- Diagnosis
  - Finding organism in fetal fluids - abomasum
  - Fetal membranes
  - Culturing bulls is difficult <50%

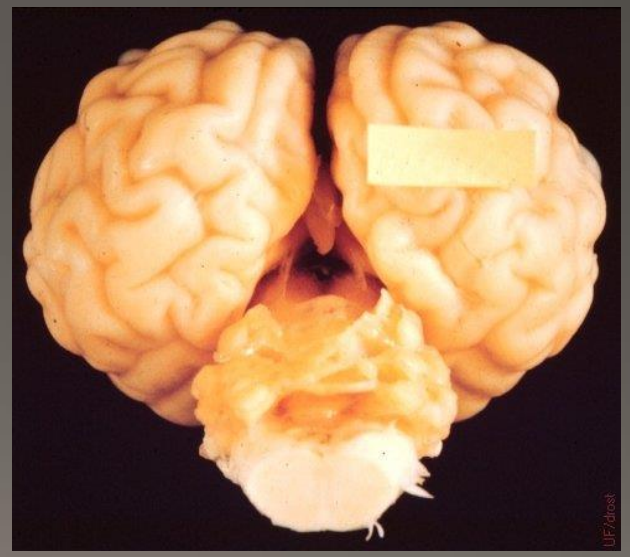
  Treatment
  - Vaccination twice 4 weeks apart



BVD virus

- Infertility- cows and bulls
  - Affects egg and sperm quality
- Abortion
  - Early- less than 50 days
  - Late- more than 150 days
- Persistent infection - noncytopathic
  - Less than 125 days
- Deformed calves-can't stand
  - Cerebellar hypoplasia
  - Cataracts, microophthalmia





BVD Risk Factors

- Web site for you or your clients

Bovine herpes virus 1 (IBR)

- Failure to conceive
- Abortion
  - Up to 100 days post exposure – complicates serology or VI
- Recrudescence
  - Latent infection-hides in nerve bundles
- ML Vaccine induced abortion
- Diagnosis – histopath, VI, serology
  - Sometimes autolysis of fetus

Bluetongue and EHD

- Both are *orbivirus* (cross react); spread by *Culicoides* (midges)
- Abortion, mummification or weak or stillborn calves
- Weak or dummy calves, hydranencephaly
- Rear leg deformities – arthrogryposis
- Akabane and Schmallenberg virus have similar effects but are FAD
- Affected cattle may have oral lesions and high fevers

Anaplasma marginale

- Anaplasmosis is a cause of bovine abortions
- Infection with A. marginale caused extravascular hemolysis of RBC and anemia
- Cows often experience hypoxia which may lead to fetal stress in late bred cows
- Herds that have sporadic weak, stillborn or late term abortions should test for anaplasmosis
- Sporadic cow deaths and an occasional abortion may have anaplasmosis. Some herds are 'endemically stable'
- Am is identified through ELISA or PCR. Fetal spleen is the best organ for aborted fetus

Tritrichomonas foetus

- Single cell parasite
- Sexually transmitted
  - Reservoir is typically bulls – FL dairies is infected cows
- Resides in prepucial folds
- Reproductive tract of cow
  - Documented to carry over pregnancy in some cows
- Known in over 30 states
  - Prevalence unknown
  - Regional estimates 30%
  - Worldwide
- Other species

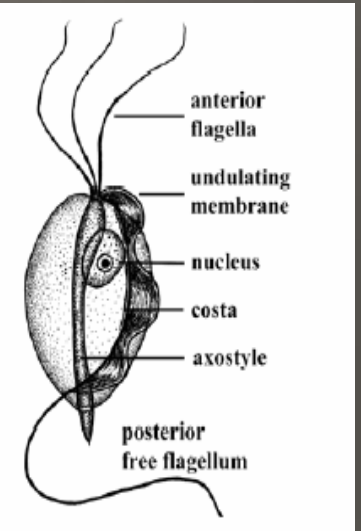
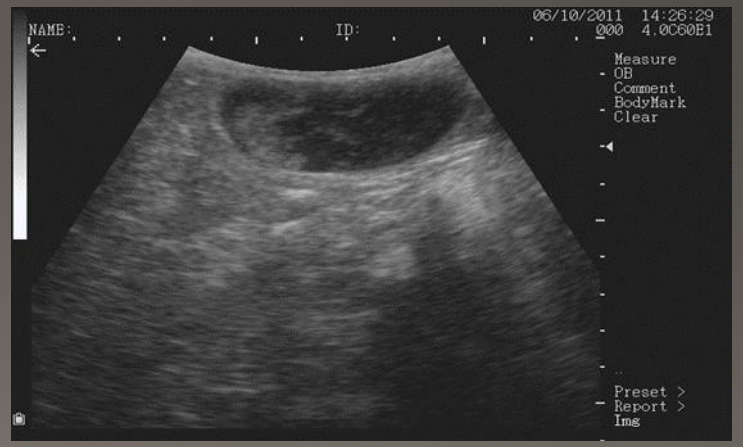


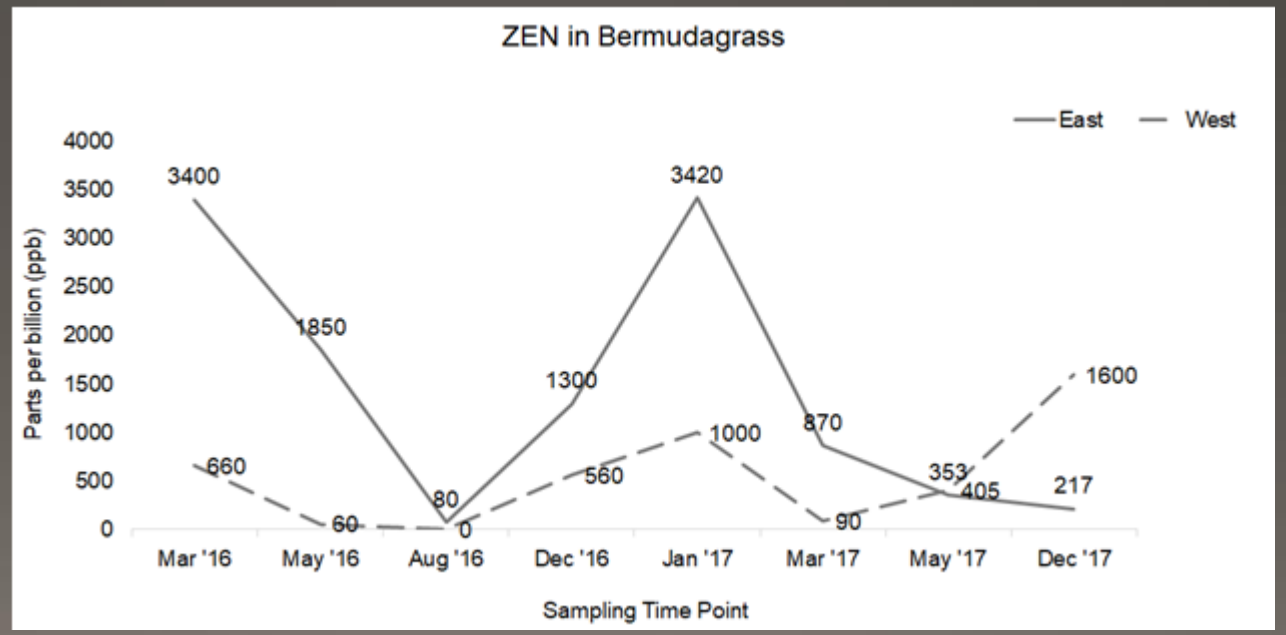
Figure 1. *Tritrichomonas foetus.*



Mycotoxins in Pasture Forages

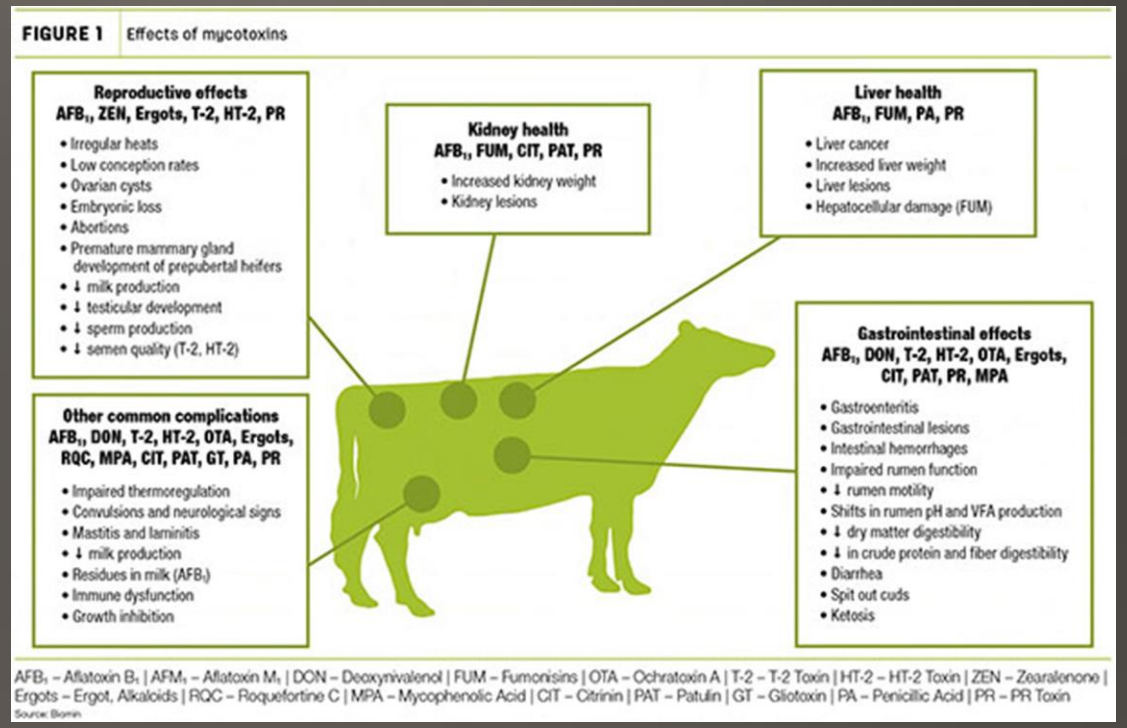
- Tall fescue – fescue toxicity, ergovaline
  - Reduced milk production, reduced fertility, heat intolerance
- Others?

- Florida pastures
  - 400 forage samples - 68%
  - Zearalonone
  - Impacts
    - Preg rates
    - Weaning weights
    - BCS



Mycotoxins

- Multiple system effects
- Variable levels
  - Moisture, weather dependent
- Future research opportunities
- Supplements may mitigate effects
- Studies to determine effects on bull fertility



Investigating Abortions in Herds

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Investigating Abortions

Investigating abortions can be frustrating

Prepare client expectations

Determine how important it is for clients to know the cause

One abortion may not be worth effort, however, it may be the first of several in an outbreak

- Assess whether additional losses are anticipated

Abortion storms can be caused by contagious agents or toxic agents ingested

Many abortions caused by infectious agents are in fact opportunistic and don’t affect multiple animals

For best results – Thorough history and thorough samples

Define the Problem

Abortion or Failure to calve? *Define* the problem

Was pregnancy ever diagnosed or confirmed?

In the case of failure to calve, the investigator may check additional cows to see if more than one animal is affected

In the case of observed abortion – expelled fetus or membranes hanging from vagina

- Owner collect aborted material (always use gloves!)

Helpful to know if any animals have had recent clinical signs – morbidity or mortality

What is the *Extent* of the problem? 1 case may be 'normal' or first of many

- Up to 2% of cows experiencing abortion may be considered not unusual; >5% is definitely cause for concern

Immediate Response

If it is the beginning of an outbreak or suspected

- Take steps to remove affected animals – biocontainment
- Remove animals from environment or remove feed – exposure

This assumes *Risk Factors* can be identified

In this case veterinarians may have to be extra cautious and recommend a variety of control measures until more information can be obtained – history from owner or diagnostics

With a single event, there are many directions the investigation can go. With multiple abortions, there is the possibility of a pattern or common cause or exposure

It is important that even if diagnostics aren't performed on the first animal, at least obtain a thorough history for the record

HISTORY - Who?

Assuming there is a group, what group is affected?

The abortion(s) may or may not be restricted to a group or it may be limited to a group within the herd if commingled

- For instance, new additions may be affected but not resident cows or heifers or visa-versa
- Even though cows may be in one ‘group’ there are subgroups
  - Aged cows, thin cows, heifers, new additions, etc

If problem is restricted to a group that helps narrow the possibilities

Environment – is it a pasture or different feed

HISTORY – When?

Obviously, an abortion is a specific time when the owner noticed

- Occasionally, there is a difference between when something happened and when they noticed

Has it happened before – may need to ask some questions several times in different ways

- History taking has a way of nudging memory
- Owners may not relate sporadic events but it could be useful information

Other abnormal events – calves born with congenital defects

- Some agents may cause abortion and congenital defects

What we are trying to assess is whether this is something endemic, contagious or environmental by developing a picture – *Epidemic Curve*

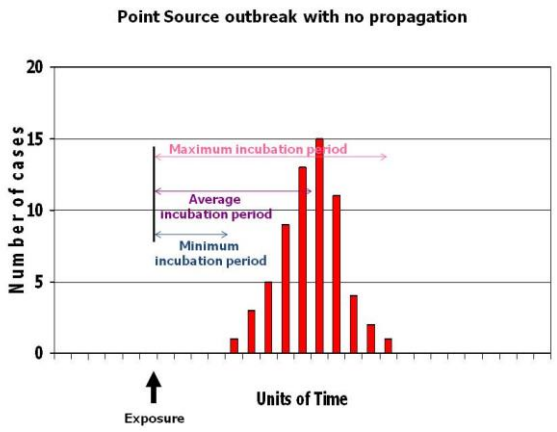
Epidemic Curve

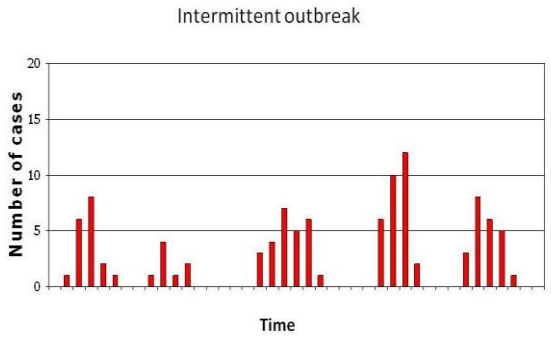
One case is impossible to pattern – Is it the *Index Case*?

- Endemic – periodic episodes or events of disease, minor fluctuations
- Epidemic – point source, often has typical bell curve
- Sporadic – environmental

Important in approach to diagnostics

- If something is sporadic then extensive diagnostics may not be advised
- Epidemic might be self limiting and obvious cause
- Endemic might be worth more investment
  - Test and cull or adjust management





Where?

Different pastures or pens

Recent movements

Are animals fed different feed

- Hay may be stored at a location near different pastures
  - Other feeds such as supplements may be different
  - Other different management – facilities, herd work, etc

Refine Intervention Recommendations

New information from history

- Care to take into account deficiencies in history
- Ongoing modifications

Working diagnosis helps determine and action list

My experience with beef clients is that you often get one chance to submit diagnostics

- As long as the pain of the event is still felt
- However, often these cases need repeated and refined approaches - **$$$$$**

Herd Visit or Specimen Exam

Often, the first contact is ‘Doc, I have a cow that aborted’

Followed by our inquiry – ‘Did you find and save the fetus and placenta?’

Tissue submission

- Fetus
- Placenta – improves odds of a definitive diagnosis
- Blood samples – red top and purple top (adequate fill)
  - Acute and convalescing
  - Other affected and unaffected

Treat these as separate entities

- Don’t assume by submitting fetus I can diagnose the cow

Fetus

Submit whole if possible, refrigerated not frozen

Samples – next slide

Take video or copious pictures of necropsy and tissues

Be systematic – nose to tail; weigh fetus if possible

- Record condition or if parts are missing – sometimes found after scavengers
- Maybe call ahead and find out if samples are even worth submitting

Formalin fixed	Fresh
Placenta (cotyledon and chorion)	Placenta (both)
Skeletal muscle (tongue/diaphragm)	
Ear notch	
Thymus	Thymus
Lung	Lung
Heart	Heart
Liver	Liver
Kidney	Kidney
Spleen	Spleen
Lymph node(s)	Lymph node(s)
Adrenal gland	
Brain (1/2)	Brain (1/2)
Eye lids	Stomach contents
	Thoracic fluids

Blood Samples

Acute – Red top and purple top

- Red – serology
- Purple (EDTA) – molecular – PCR

Convalescing – recovery, typically 2-3 weeks later – serum (red top)

- Changes in titer – 4 fold increase is considered exposure (but not necessarily cause!)

Herd mates - comparison

- Unaffected – preferably same pen or pasture and maybe others from different pasture
- Affected – see if titer rises are consistent

Not uncommon to see variable titers to Lepto serovars

Results and Action

Serology can be confusing – exposure doesn't necessarily mean cause

- Can be difficult to discern from vaccination titers

Unfortunately, the majority of abortion investigations do not result in a definitive diagnosis - >60%

However, sometimes diagnostic results or investigation can still help eliminate some possible etiologies and veterinarians can recommend management changes such as vaccines or biosecurity steps

Diagnostic Tests

Depend on samples and kinds of pathogens suspected

Placenta – useful for all bacterial and fungal diseases – culture and histopath

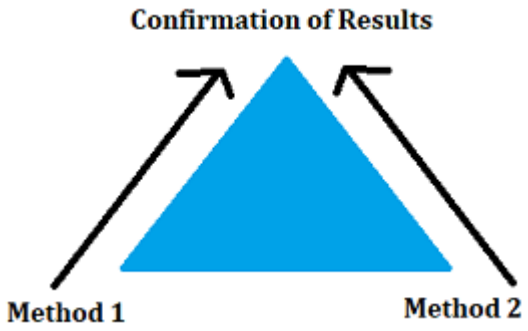
- All insults to fetus have to cross the placenta
  - Ascending infection from reproductive tract
  - Hematogenous route from dam

Fetus – different agents found in different parts of the fetus

- Important to get a variety of tissues; proper handling, collection, shipping or storage

Serology – relative to herd health procedures and compared to others

PCR, IHC, FAT histopath, culture, VI, ELISA, microscopy (direct visualization)



What to do with results?

BVD – test, cull and clear

IBR (BHV-1) – aggressive vaccination program with alternate killed and MLV

Vibrio – only present in natural service – test and treat or cull bulls

A marginale – test and control; VFD; AM is likely in the environment – association with BT?

Trichomoniasis – test and cull

Lepto – vaccinate and reduce potential reservoirs; treat with oxytet

Listeria, fungus or mycotoxins*?* – manage feed

Ureaplasma – health and hygiene; don't reuse CIDRs!

Neospora – test and cull?

Fertility

- Many variables impact herd fertility
- Some are out of our control
- Veterinarians can be a key influencer for producers to help manage things we can manage
- Fertility isn't just getting cows pregnant; it's also achieving optimal weaning rates and weights
- Increasing resistance and decreasing exposure are our 2 primary tools to avoid diseases that impact fertility