This lecture will review the risks posed to developing or nursing calves by a number of xenobiotics, including plant toxins and mycotoxins.

**Review of the physiology of parturition and lactation**
- Maternal recognition of pregnancy
- Sources of progesterone during pregnancy
- Changes in maternal physiology during pregnancy
- Embryonic and fetal morphogenesis
- Cascade of endocrine events leading to parturition
- Physiology of lactogenesis and galactopoiesis in cattle

**What can go wrong?**
- Embryonic loss
- Teratogenesis
- Abortion
- Prolonged Gestation
- Stillbirth
- Dystocia
- Subfertility
- Neonatal Loss
- Dysgalactia/Agalactia

**Modern view of teratogenesis**
- There are CRITICAL PERIODS of exposure corresponding to when susceptible structures/functions develop.
- NOT ALL exposed animals are AFFECTED.
- ALL DEVELOPMENTAL PROCESSES CAN BE TARGETED!!!
- TERATOGENESIS IS MANIFESTED BY EMBRYONIC OR FETAL MORTALITY, ALTERATIONS IN BIRTH WEIGHT, MORPHOLOGIC ABNORMALITIES, and/or IMPAIRED FUNCTION.
- The DOSAGE of toxicant → TERATOGENESIS → Generally LOWER than the DOSAGES → MATERNAL DISEASE.
- TERATOGENESIS → INTERACTIONS BETWEEN THE TERATOGEN AND GENOTYPE.

THE PLACENTAL “BARRIER” IS NOT AN EXTREMELY EFFECTIVE BARRIER TO THE MATERNAL TRANSFER OF XENOBIOTICS FROM THE MATERNAL TO THE FETAL CIRCULATIONS!!!

**Some important considerations**
- MOST xenobiotics reach pharmacologic concentrations in the fetus after exposure of the mother
- Umbilical vein concentrations of a given xenobiotic are several times higher than maternal circulating concentrations.
- Intoxications from topically administered insecticides MIGHT be more likely during pregnancy, because of increased dermal absorption.
- During pregnancy the amount of antibiotics necessary to maintain antimicrobial drug concentrations MIGHT increase and the elimination ½ life might decrease.
- Weak bases are more likely to pass into the milk than weak acids.

**Guiding principles for the administration of therapeutic xenobiotics to pregnant/lactating females**
- NO medications are without potentially toxic effects, BUT the anticipated benefit of a therapeutic approach MUST outweigh its associated risks.
- HIGHER doses and/or CHRONIC administration of medications are MORE likely to be “TOXIC” than lower doses and/or one-time use.
- Medications should be administered during pregnancy ONLY in accordance with product LABEL INSTRUCTIONS AND PRECAUTIONS.
• IDEALLY, fetal viability/gestational health should be MONITORED over the course of a treatment regimen or, at least afterwards.
• REMEMBER CATTLE ARE FOOD ANIMALS!!!

Specific examples of poisons & medications impacting pregnancy & lactation
  • Plant Toxins
  • Mycotoxins
  • Metals
  • Pesticides
  • Antibiotics
  • Other “Medications”

How to prove and prevent problems
  • For diagnosis of abortions submit BOTH fetus and fetal membranes!!!
  • Samples fixed in neutral-buffered formalin and fresh/frozen!!!
The prevention and management of “fescue toxicosis” and exposure to other sources of ergot alkaloids, such as ergotized grasses and small grains, continue to be ongoing challenges to bovine practitioners and cattle producers in certain parts of the U.S. This session will briefly review ergot alkaloid intoxication and provide updates on animal and forage management approaches which can be utilized to minimize production losses associated with endophyte-infected tall fescue and grasses and/or grains infected with “ergot”.

What is “fescue toxicosis”?  
- Associated with endophytic ergot (ergopeptine) alkaloids in tall fescue grass.  
- The endophytic fungus (Epichloë coenophiala) is not visible to the “naked eye”.  
- There is a symbiosis between the endophyte and tall fescue (Lolium arundinaceum).  
- Ergot alkaloids (specifically ergovaline) cause hypoprolactinemia and vasoconstriction  
- Dry gangrene (“fescue foot”) is observed in winter (cold temperatures).  
- “Summer slump” is observed during the summer (hot temperatures)

What is “ergotism”?  
- Associated with fungal ergot (ergopeptine) alkaloids produced by Claviceps purpurea.  
- Claviceps purpurea infects the seed heads of many grasses and small grains (NOT corn).  
- Claviceps infection occurs most frequently following cool, wet springs.  
- The “ergot bodies” (sclerotia) of Claviceps species are visible to the “naked eye”.  
- Ergot sclerotia can contain very high concentrations of ergot (ergopeptine) alkaloids.  
- These ergot (ergopeptine) alkaloids cause hypoprolactinemia and vasoconstriction.  
- The signs of ergotism can be indistinguishable from those of “fescue toxicosis”.  
- However, ergotism is less dependent on ambient temperature and can be fatal.

Forage management strategies for “fescue toxicosis”  
- “Fescue toxicosis is likely a reality in the beef industry for the foreseeable future.  
- Toxic endophyte-infected tall fescue is not “ALL BAD” and can be managed.  
- Several agronomic practices can eliminate/reduce the effects of tall “fescue toxicosis”.  
- “Testing” tall fescue pastures can provide important information.  
- Renovation of toxic endophyte-infected tall fescue can eliminate the problem.  
- Over-seeding tall fescue fields with clovers can dilute the effects of endophytic toxins.  
- Avoidance of high nitrogen fertilization rates reduces the severity of “fescue toxicosis”.  
- Removal (mowing) of seed heads can reduce ergovaline content.  
- The forage ergovaline concentration can also be reduced by drying (production of hay).  
- Ammoniation of hay has also been shown to reduce forage ergovaline content.

Forage management strategies for “ergotism”  
- Observation/“testing” of pastures for “ergot” can provide important information.  
- Removal (mowing) of seed heads can reduce the number of aerial “ergot bodies”.  
- Mature “ergot bodies” can be physically removed during the production of hay.

Animal management strategies for “fescue toxicosis” and “ergotism”  
- Be aware of the problems!!!  
- Most management strategies focus on the management of “summer slump”.  
- Feeding supplements has been reported to be “helpful” in minimizing clinical effects.  
- Rotation of cattle to warm-season forages in summer and stockpiled tall fescue grass in the fall has been proven to be a helpful management strategy for “fescue toxicosis”.  
- Recent research shows that animal tolerance to “fescue toxicosis” is possible!!!  
- Using tolerant livestock where exposure to toxic endophyte-infected tall fescue is unavoidable might give innovative producers a competitive edge!!!  
- GENETIC TESTING/STRATEGIC BREEDING ARE LIKELY TO BE THE WAVE OF THE FUTURE!!!

123
CAN THESE NOVEL STRATEGIES FOR “FESCUE TOXICOSIS” BE APPLIED TO “ERGOTISM”?

References