Goat Herd Health
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This presentation will be a review of drug use in small ruminants and common diseases affecting herd health.

**Label and extra-label drug use in small ruminants**
Sheep and goats are considered FOOD ANIMALS by the FDA. As such we must use drugs according to label or follow AMDUCA (Animal Medicinal Drug Use Clarification Act).

As there are very few drugs labelled for small ruminants we must use most in an ‘extra-labelled’ manner. Extra Label Drug Use (ELDU) refers to drugs not approved by the FDA and includes a change in route, dosage, duration, frequency, indication, or **species**. In essence, we must use a food animal drug, the drug must NOT be illegal, and we must establish appropriate meat/milk withdrawals.

ELDU requirements:
- ELDU is permitted only by or under the supervision of a veterinarian
- ELDU is allowed only for FDA approved animal and human drugs
  - A valid Veterinarian/Client/Patient Relationship (VCPR) is a prerequisite for all ELDU. Visit the premise, examine the animal(s); assume responsibility; provide follow-up
- ELDU for therapeutic purposes only (animals health is suffering or threatened) -- not drugs for production purposes
  - ELDU is not prohibited in feed/water
  - FDA prohibition of a specific ELDU precludes such use

AMDUCA states that we cannot go off label if there is:
- An approved food animal drug for a particular disease/condition
- Approved food animal drug for different disease/condition
- Approved veterinary or human drug

AMDUCA has a prohibited list and a list of drugs for which ELDU is not permitted. Some of these drugs have no food animal approval while others are approved but with no ELDU (i.e. Baytril!, labelled only for respiratory disease in beef cattle, dairy heifers and swine) -- not for other conditions (i.e. calf diarrhea) and not in other species (goats/sheep).

The FDA has made a few exemptions to the VFD for minor species. Within a valid VCPR, a veterinarian may recommend extra-label use of a medicated feed approved for use in a major species based on diagnosis of an active disease for which no other drug treatment is approved. The medicated feed must be for treatment only when the health of the animals is threatened and suffering or death would result from failure to treat affected animals. The most common application of this is the administration of higher than approved dose of chlortetracycline in feed prepared for cattle to sheep and goats to prevent abortion due to *Campylobacter fetus*.

**Vaccination**
Core vaccines include *Clostridium perfringens* types C and D and *C. tetani* for pregnant dams and kids. Few vaccines are labelled for goats specifically. Other vaccines can be added as needed for individual herd pathogen challenge, i.e. Campylobacter, Chlamydia, Contagious ecthyma, Johne’s.

**Caseous Lymphadentitis (CLA)/cheesy gland**
CLA is a chronic debilitating disease of small ruminants caused by the facultative intracellular gram – positive bacterium Corynebacterium pseudotuberculosis. There is global distribution and severe economic impact associated with a reduction in wool, meat, milk production, and from condemnation of carcasses and skins affected by CLA at packing plants.

CLA has zoonotic potential. There are two main syndromes identified: a) external associated with formation of abscesses in the superficial lymph nodes (e.g. parotid and submandibular) and b) internal (lung and mediastinal) lymph node involvement. The two syndromes can occur concomitantly.

The bacterium enters the body through the skin or mucosa and transfers via the blood stream to the local lymph node. During the early phase, phagocytic cells are recruited to the site of infection. This may lead to elimination of the pathogen, or secondarily there is recruitment of macrophages and lymphocytes leading to a focal lesion. Micro-abscesses develop in the cortex of the lymph node within 24 hours of infection; after 6 days, these coalesce and enlarge to form more significant lesions containing clumps of bacteria, cellular debris, and a high proportion of eosinophils (which turn the purulent material green). The lesions expand progressively through repeated cycles of necrosis and encapsulation (depending on location of the node, because subcutaneous nodes may rupture and discharge contents). The abscess content is initially soft and becomes increasingly solid as inspissation progresses; then, mineralization commences, and concentric capsular layers are formed (the so-called onion ring lesion) (Windsor 2011). CLA can have a long incubation period, ranging from 3 – 20 weeks (Mahmood et al 2015).

C. pseudotuberculosis secretes an exotoxin – Phospholipase D (PLD) which causes dermal necrosis with inflammation, necrosis, and increased vascular permeability, promoting invasiveness of the organism and transport to the regional lymph nodes through phagocytes, which they ultimately destroy. CLA lesions of the inguinal or scrotal lymph nodes of rams and bucks are important observations during a breeding soundness examination.

Diagnosis is usually made clinically. The classic way is detection of the organism via bacterial culture. Culture is only possible in chronic cases with superficial signs of abscesses. Differential diagnoses include infections by Actinobacillus, Truperella, and staphylococcal species as well as reactions to Johne’s disease vaccine. Serologic testing is available to screen herds for control programs. The ELISA for anti-phospholipase D antibody has a specificity of 99% and sensitivity of 75%. The false negative rate is still high but the test has been found useful in eradication programs.

Control is through strict biosecurity, quarantine, testing and culling. Spraying any wounds from shearing etc. with iodine tincture will decrease risk of transmission (Serikawa et al1994). In addition, several vaccines are available. When given appropriately these will decrease the incidence and severity of the disease. It is important that label recommendations are followed. For sheep, vaccination requires two priming doses in lambs and yearly boosters in adult sheep. Not all vaccines available for sheep have the same efficacy for goats. Revaccination in goats at 6 monthly intervals is often recommended. In addition, the side effects of vaccination are more intense in goats, with increased clinical severity, fever, malaise, reductions in milk production and distribution of lesions.

Environmental control is important. The zoonotic potential of the bacterium must be considered and proper hygiene exercised. If culling is not an option, surgical drainage or removal of external lumps may be done. Surgical management prevents environmental contamination. Sheep with abscesses identified by routine palpation should be quarantined. When ripe the abscess can be lanced and cleaned.
(collecting the purulent discharge and disposing of it) with strong iodine or chlorhexidine solution. The sheep would need to be isolated until the lesion has healed. Up to 30 days has been recommended. Four to 6 weeks of parenteral antibiotics has been recommended to reduce likelihood of recurrence. Intra-lesional or systemic Tulathromycin (Draxxin™) use has been described (Washburn et. al. 2009). In this study, they compared PPG systemically with closed flushing of the abscess with saline to systemic tulathromycin with saline closed flush and just intra-lesional tulathromycin. There was no significant difference in shedding and recovery between groups. Recurrence is common. Feeders and waterers are important sources of fomite transmission. Bacteria can survive on some surfaces and fomites such as hay, straw, and wood for up to eight weeks and in soil up to 8 months. Shearing equipment and supplies should be cleaned and disinfected routinely.

**Caprine arthritis/encephalitis virus**

This disease is caused by a non-oncogenic retrovirus from the Lentivirus subfamily, which includes CAEV, OPPV (Maedi-Visna), EIAV, FIV, and HIV-1. Infection is lifelong.

Infection with CAEV may be subclinical or cause multisystem diseases: arthritis, pneumonia, mastitis and weight loss, and encephalitis. Not all infected animals will become symptomatic. The diseases are slow-developing. Arthritis is typically seen in sexually mature goats. The carpi are most commonly affected and become distended. Labored breathing associated with lung pathology may be seen in kids or adults. Mastitis is referred to as ‘indurative’ due to deposition of connective tissue in the udder as part of the immune response. During and after kidding the udder becomes firm and swollen, often referred to as ‘hard udder’. In kids 2-4 months old encephalitis is most common form with inflammation of the brain and brainstem. Initially the kids appear wobbly and will develop difficulty placing limbs. As the disease progresses they become paralyzed on one side and then all four limbs. There may be signs of depression, walking in circles, head twitch, head tilt, abnormal head position and muscle tremors.

Transmission is commonly through ingestion of virus-infected colostrum or milk from infected does. Other potential routes for infection are in utero, birthing, and via saliva and respiratory secretions that may contain monocytes or macrophages. Adult goats may be infected via fomites like milking machines, tools, reproductive tract secretions, respiratory tract secretions, and people. Care should be taken when comingling animals at shows.

Control starts with preventing vertical and horizontal transmission. Removal of kids at birth and feeding heat-treated goat colostrum and pasteurized milk or milk replacer will help break the cycle of infection. Heat treatment of colostrum for 60 minutes at 56°C will help prevent transmission of CAEV to kids. Despite kids from positive dams only being fed pasteurized colostrum, about 10% will still seroconvert to CAEV by 6 months of age. This may be due to: 1) in-utero transmission, 2) transmission from contact with dam vagina during birth, 3) accidental ingestion of colostrum from CAEV-infected does, or 4) transmission from dam via exposure to saliva or respiratory secretions during licking the kid. (Rowe and East 1997).

A farm-specific tailored serological surveillance program can be instituted. Seropositive animals should be segregated or culled. No effective vaccines are available. Antibodies from heat-treated colostrum used in control programs may interfere with serology until kids are 2-3 months of age. Serologic testing of kids from 6 months of age is recommended to avoid false positives. After exposure to oral, intravenous or intra-articular CAEV infection experimentally, goats will
seroconvert in 3-12 weeks. Natural exposure has been observed to take up to 8 months for seroconversion to occur, making routine testing difficult. ELISA testing tends to be a more sensitive test than the AGID (which has less false-positives). Currently there is no standardized testing for CAEV across laboratories so be sure to use a laboratory that is running the tests regularly to ensure consistent result interpretation.

Recommended steps to prevent CAEV

1) Removal of kid immediately following birth, taking care not to allow contact between the kids and the secretions of the dam.
2) Isolation of the kids and separation from infected goats by at least 2 meters.
3) Feed CAEV free or heat-treated colostrum.
4) Feed CAEV free milk, pasteurized goat milk, or pasteurized cow milk.
5) Serologic testing of kids at 6-month intervals, with separation of seropositive and seronegative animals.
6) Milk seronegative animals before seropositive does.
7) There is potential for venereal transmission so choose bucks carefully.
8) Avoid iatrogenic risk through shared needles and equipment like dehorners and tattoo pliers.

References:

