UNIVERSITY OF CALGARY

Sampling Protocol for Small Ruminant Abortions

1. **Many infectious agents involved in small ruminant abortions are zoonotic.**
2. **Examine the placenta for any abnormalities**
    a. Collect multiple sections of cotyledonary and intercotyledonary areas for histopathology (formalin fixed), bacteriology (fresh), and virology/PCR (fresh-frozen). Essential to the diagnosis of some infections!
3. **External examination of the fetus for any outward congenital malformations, meconium staining, or skin lesions**
4. **Estimate/verify the gestational age (refer to the chart on aging)**
    a. Weigh the fetus
    b. Measure the crown to rump length
    c. Note fetal characteristics
5. **Determine the state of preservation**
    a. Fresh, autolysed, mummified, macerated
6. **Classify the fetal death**
    a. Abortion, stillbirth, non-viable neonate (partially inflated lungs)
7. **Perform a routine necropsy and note any gross abnormalities**
    a. Remember to section a femur to look for growth disturbances
8. **Collect the following tissues for ancillary testing. Remember to maximize sampling initially. You can always discard samples later!**
    a. **Histopathology and immunohistochemistry** (10% neutral buffered formalin; 10:1 formalin to tissue ratio)
        i. Eyelid, parotid salivary gland, tongue, thyroid, thymus, lung, heart (t-section),diaphragm, liver, kidney, adrenal gland, spleen, ileum, colon, mesenteric lymph node, skeletal muscle, brain, placenta
        ii. IHC is available for many infectious agents
    b. **Bacteriology/mycology via culture or PCR** (fresh)
        i. 5 ml abomasal content, lung, liver, placenta
        ii. Collect stomach content in a syringe with a large gauge needle
        iii. Package each specimen separately in sterile containers
    c. **Virology and molecular techniques (PCR)** (fresh-frozen)
        i. Lung, liver, kidney, spleen, placenta, brain
        ii. Package each sample separately in sterile containers
    d. Nutrition/Toxicology (frozen)
        i. Liver (2-5 grams of tissue is required)
    e. Serology (refrigerated or frozen)
        i. Fetal fluids- heart blood, thoracic fluid, abdominal fluid
        ii. Collect in sterile red top tubes

Gestational age estimates for ovine and caprine fetuses

Gestational Age (weeks)	Crown to Rump Length (cm)	External Fetal Characteristics
>3-4	0.3-2.0	Head, body, and limbs discernible
5-6	2-9	Hoofs are visible at the end of digits
7-9	9-15.5	No hair; rumen development near the end of this gestational period
10-13	15-35	Large tactile hairs on lips and upper eyelids
14-18	35-40	Eyelashes are well developed, some hair on tail and head
19-21	40-48	Fetus becomes fully haired, hoofs complete but soft

Adapted from: Gestational age estimation based on fetal measures and phenotypic characteristics. 2012. In Njaa BL (Ed.), Kirkbride's Diagnosis of Abortion and Neonatal Loss in Animals ed 4. West Sussex, UK, Wiley-Blackwell, pp. 222.