Pregnancy Loss and Parturition
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Distribution of Prenatal Losses
- Fertilization → 100%
  » Under optimal conditions
- 2/3 loss during embryonic development
  » Imprinting
  » Compaction
  » Blastocyst hatching and formation
  » Failure to prevent CL regression
    • Maternal recognition of pregnancy

Distribution of Prenatal Losses (cont.)
- 1/3 loss during fetal stage
  » Crowding
  » Placental insufficiencies
  » Not the fetus directly

Embryonic and Fetal Loss in Cattle

Embryonic and Fetal Loss in Pigs

Increased Prenatal Loss
- Nutritional Stress
  » Energy shortages
  » Mineral imbalances
  » Vitamin deficiencies
- Disease of the reproductive tract
- Endocrine imbalances
- Aging of gametes prior to fertilization
Effect of Oocyte Age on Fertilization and Embryo Viability

Mechanism For Parturition

- Skunk Cabbage
  - Prolonged gestation in Sheep
  - Hypoplasia of Anterior Pituitary

- Gene Defect
  - Autosomal recessive in Holstein cattle
  - Large calves, 1-2 months beyond due date
  - Hypoplasia of Anterior Pituitary

Fetal Adrenal Changes with Age

Change in Adrenal Size is a Response to Stress!

- Lack of space
- Lack of gas exchange
- Lack of nutrients

Hormonal Changes Associated with Parturition

Parturition

Fetal Nutritional Demands
Placental Insufficiency

CRH
Anterior Pituitary
Adrenal Cortex

Hypothalamus

Fetal Corticosteroids (Cortisol)
Parturition

Fetal Nutritional Demands

PLACENTAL INSUFFICIENCY

CRH

ACTH

HYPOTHALAMUS

ANTERIOR PITUITARY

ADRENAL CORTEX

Lung (surfactant)

Liver (glycogen)

Thyroid (metabolism)

Placenta

Progesterone

Estrogen

PGF

Uterine Myometrium

Cervical Ripening

Relaxin

Ovarian (CL)

Cow, Sow

Triggers CL Regression

Orientation of Fetus

- Fetus must reorient prior to parturition
  - Initially on back
  - Reorient so feet and head will exit first
  - Breech
    - Rear of fetus comes first
- Orientation not important in pig
- Abnormal orientation results in dystocia

Final Role of Oxytocin

Sensory Neurons in Cervix

Oxytocin from Posterior Pituitary

Myometrial Contractions

Orientation of Fetus

Fetal Orientation

Cervix

Vagina

Ovary

UTERINE HORN
Stages of Labor

- Preparative (2 to 12 hours)
  - Myometrial contractions
  - Uterine pressure
  - Abdominal discomfort
  - Cervical dilation

Stages of Labor (cont.)

- Expulsion of fetus (30 to 180 min)
  - Strong uterine contractions
  - Rupture of the allantochorion
  - Appearance of the amnion
  - Maternal recumbence and straining
  - Not only uterine but abdominal contractions as well
  - Rupture of the amnion and delivery

Stages of Labor (cont.)

- Expulsion of the placenta (1 to 12 hours)
  - Uterine contractions
  - Chorionic villi loosen
  - Expulsion of the placenta
  - Delayed in ruminants due to presence of cotelydons separating independently
  - Suckling induces oxytocin release which triggers further uterine contractions

Dystocia

- Difficult birth
- Excessive fetal size (90% for cattle)
- Abnormal presentations (5% for cattle)
- Multiple births (twins)
  - Twins presented at the same time
  - One is usually blocking the other
  - Uterus becomes fatigued
Perinatal Fetal Changes

- Cardiovascular
  - Ductus arteriosis
  - Foramen ovale
  - Ductus venosus
Perinatal Fetal Changes

- Cardiovascular
  » Ductus arteriosus
  » Foramen ovale
  » Ductus venosus

- Thermoregulatory
  » Must regulate own temperature
  » Increase metabolism (thyroid activity)
  » Brown fat - metabolism of produces heat

- Energy metabolism
  » Until suckling, relies on own stores of glycogen
**Perinatal Fetal Changes (cont.)**

- Immune status
  - Has no antibodies to protect
  - Gets passive immunity from mother
    - Gut permeable to antibodies in colostrum
    - Only first 1 - 2 days
    - In rabbit, rat, man get some antibodies absorbed through placenta

**Return to Estrus**

- Fertility increases with # of estrous cycles
  - First = 35% pregnancy rate
  - Second = 50%
  - Third = 73%
  - Fourth = 72%
- Lactational anestrus or Lactational amenorhea

**Return to Estrus (cont.)**

- Special postpartum estrus
  - Mare - foal heat, 6 - 13 days postpartum
    - Fertility depends on body condition
  - Sow
    - Anovulatory estrus 3 - 5 days post-farrowing
    - Weaning induces estrus 3 - 5 days latter

**Retained Placenta**

- Definition
  - If not expelled within 24 hr it may be retained for 5 - 6 days
- Most common in cattle (5 - 15 %)
  - Not seen in sows or ewes
  - Sometimes seen in mares (retained = > 4 hrs)

**Equine Retained Placenta**
Retained Placenta (cont.)

- **Cause**
  - Normally get lack of blood flow to chorionic villi and this causes them to regress
  - High incidence in premature or early delivery
  - High milk producers
  - Twins
  - Dystocia
  - Induction of parturition
  - Nutritional deficiencies
    - Vitamin A
    - Selenium

Retained Placenta (cont.)

- **Treatment**
  - Manual removal not recommended
  - Daily antibiotics
  - Large single antibiotic bolus
  - Oxytocin or PGF
- Major concerns in humans and mares
  - Can cause death of mother from septicemia

Induction of Parturition

- **Dexamethazone**
  - Potent synthetic cortisol
  - Works in all species
  - Takes 2 to 3 days
- **PGF$_{2\alpha}$**
  - Swine, cattle and sheep
- **Oxytocin**
  - Human, horse

Review Remaining Slides for Species Specific Procedures!

Cow

- Do not induce before last 7-14 Days of gestation

Method:
- **Dexamethasone** - parturition in 48 hours, 20-50 mg/IM
- Azum (trade name) combined with 25 mg Lutalyse induces within 35+2 hours. Requires a live fetus to work and does not work on a mummified fetus
  - High incidence of retained placentas and lower postpartum fertility
  - Retained placenta is not problem if treated properly
  - Giving estrogen before induction of parturition reduces incidence
- **Prostaglandins** used in cases of a mummified fetus and are also effective in inducing abortion the first 4-5 months

Sheep

- Best within a few days of parturition
- Dexamethasone (8-20 mg) Parturition in 24-72 hours
- Retained placenta not a problem
- Can use Lutalyse to abort before Day 50 of gestation

Sow

- Do after day 111 of gestation

Note that this is less than 3 Days from normal parturition
- PGF$_{2\alpha}$ (Lutalyse 10 mg/IM) parturition in 29-48 hours.
- Close synchrony - Lutalyse at 8 AM followed by oxytocin 40 IU 24 hours later. Sows farrow between 8 AM and 5 PM (32 hours from start)
- Piglets should be born within 1 to 8 (average 1-4) hours with 15-minute intervals between piglets
  - May give oxytocin in last few piglets to decrease stillborn numbers in large litters or after extended delivery interval
  - It is important to give PGF$_{2\alpha}$ no earlier than Day 111. If given on Day 110 will cause stillborn piglets (too immature to survive)
**Mare** - Do after day 320 of gestation

- Oxytocin (20-60 I.U.) close to term !!!
- Takes less than 1 hour!
- Placenta expelled in < 1 hour

**Make sure of the following before inducing foaling:**

1. Udder is enlarged with presence of colostrum
2. There is relaxation of the perineal region
3. Cervical relaxation (can insert 1 to 2 fingers)

Usually induce for only two reasons:
1. Demonstration  
2. Prolonged gestation

In normal pregnancy, mare can control time of day for foaling through her release of oxytocin. Inject oxytocin give no choice of time.