Perinatology

Care of the mother and fetus during pregnancy, labor, delivery, and early neonatal period, particularly when the mother and/or fetus are at a high risk for complications.
Perinatology

- Perinatology in Human Medicine
- Origins of Veterinary Perinatology
High Risk Pregnancy

- History of previous problems
- Development of problems during current pregnancy
Perinatology

- What is the threat to the fetus/neonate?
- How can the threat be eliminated?
Fetal Resuscitation

- Identify the fetal problem
- Direct therapy at the problem’s source
High Risk Pregnancy
Threats to Fetal Well-being

- Lack of placental perfusion
- Lack of $O_2$ delivery
- Nutritional threats
- Placentitis/placental dysfunction
- Loss of fetal/maternal coordination
- Iatrogenic factors
- Presence of a twin
- Idiopathic insults
Threats to Fetal Well-being
Lack of Placental Perfusion

- Late term fetus
  - High oxygen demand
  - Must receive constant perfusion
  - Margin of safety in late pregnancy small
- Maternal compromise
  - Dehydration/Shock
  - Decreased perfusion for any reason
- Placental response limited
- Compromised placental circulation
  - Hypoxic ischemic insult
Fetal Resuscitation
Maintenance of Placental Perfusion

- Aggressively treat hypovolemia in dam
- Aggressively treat hypotension in the dam
- Avoid anesthesia in late term mares
Threats to Fetal Well-being
Lack of O₂ Delivery

- Maternal threats
  - Maternal anemia
  - Maternal hypoxemia
  - Decreased perfusion

- Fetal response
  - Unique aspect of placentation
  - Placental oxygen transport mechanisms
Placentation
Placental Circulation

- Concurrent
- Multivillous
- Crosscurrent
- Countercurrent
Equine Placentation

Horse

Surface of endometrium

Microcotyledon

Maternal artery to microcotyledons

Maternal veins from microcotyledons to subendometrial plexus

From: Steven & Samuel (1975) J. Repro. Fert., Suppl. 23:579
Effect of Maternal Oxygen Therapy

![Graph showing the relationship between maternal arterial $P_{O_2}$ and uterine or umbilical venous $P_{O_2}$ for sow, mare, and ewe.](image)

**Fig. 4.** The relationship between $P_{O_2}$ in maternal arterial blood (log scale) and that in the uterine vein (○) and umbilical vein (●) in seven ewes and seven mares (data from Comline & Silver 1970b), and in five sows.
Placental Blood Gas Transport
Fetal Blood Oxygen Affinity

- Higher than maternal blood
  - Umbilical blood becomes highly saturated
  - Even at a low Po2

- Fetal Hemoglobin - in ruminants

- Erythrocyte Concentration of 2,3-DPG (lower)
  - Fetal pig
  - Fetal Foal - small effect (2 torr)
Fetal Resuscitation
Lack of $O_2$ Delivery

- Fetal hypoxemia - supplement with INO$_2$
  - Take advantage of the countercurrent system
  - Even if normal Pao$_2$ in mare, foal may benefit
  - Could be important with placental edema
  - May see improved FHR parameters
Maternal Oxygen Therapy
Nutritional Threats
Glucose Utilization

- The placenta
  - Actively metabolic tissue
  - High glucose utilized by placenta in horse
  - Glucose for placenta also comes from fetus
- Maternal distress – less glucose
  - More glucose delivered from fetus
  - Can lead to negative net glucose transport to fetus
IUGR
Intrauterine Growth Restriction
Threats to Fetal Well-being
Nutritional Threats

- Chronic malnutrition of the dam
  - Lack of intake
  - Malabsorption
  - Tumor cachexia
- Acute fasting of the dam
  - Forced fasting
  - Capricious appetite - late gestation
Threats to Fetal Well-being
Nutritional Threat of Acute Fasting

- Fasting the mare for 30-48 hr
  - Decreased glucose delivery
  - Rise in plasma FFA
  - Increased PG’s in uterine and fetal tissues
- Increased risk of preterm delivery
  - Within one week of ending the fast
    - Associated with myometrial sensitivity to hormones
Fetal Resuscitation

Nutritional Threats

- Support the mare’s nutritional needs
  - Enteral supplementation
  - Parenteral supplementation
  - Encourage a high plain of nutrition
- Avoid acute fasting
  - Avoid elective procedures requiring fasting
  - Encourage anorexic late term mares to eat
- If acute fasting is unavoidable – colic, anorexia
  - Supplement with intravenous glucose therapy
  - Consider flunixin meglumine therapy
Threats to Fetal Well-being

Placentitis/Placental Dysfunction

- Premature placental separation
- Infection
- Inflammation
- Degeneration
- Edema
- Hydrops
Threats to Fetal Well-being

Placentitis

- Percentage of abnormal placenta
  Not a predictor of fetal outcome
- Presence of abnormal placental tissue
  Is enough to cause serious problems
- Fetal foals born with placentitis
  More likely to have neonatal diseases
Fetal Resuscitation
Placentitis/Placental Dysfunction

- Treat as infectious
  - Trimethoprim potentiated sulfa drugs
- Try to minimize PG formation
  - NSAIDs - flunixin meglumine
- Hormone supplementation therapy
  - Altrenogest (ReguMate)
Threats to Fetal Well-being

- Iatrogenic Factors
  - Early delivery
  - Drugs
- Presence on a Twin
- Other peripartum hypoxic ischemic asphyxial events
Fetal Monitoring

History

- Intrapartum fetal monitoring
  - Rational decision to hasten parturition - C-section
  - Explosive nature of parturition in the mare

- Prepartum fetal monitoring
  - Allow prediction of intrauterine hypoxia and distress
  - Result in effective fetal resuscitation
  - Rational decision about early delivery
Early Udder Development
Precocious Lactation
Most reliable sign of fetal distress
Fetal Monitoring
Biophysical Profile

- A collection of ultrasound derived observations
- Correlate with fetal health or fetal distress
- In man fetus with abnormal profiles
  - Clearly in trouble
- In man fetus with normal profiles
  - Usually normal
  - May have life threatening hypoxemia, other problems
- Not sensitive enough for all problems
Fetal Monitoring
Equine Biophysical Profile

- Fetal heart rate
- Fetal aortic diameter
- Maximum fetal fluid depths
- Utero-placental contact
- Utero-placental thickness
- Fetal activity
Fetal Monitoring
Equine Biophysical Profile

- Not sensitive
  - Fetus with normal profiles may be suffering from life threatening problems

- Not specific
  - Occasionally extreme values in normal fetuses
Fetal Heart Rate Response
Fetal heart rate measurements

Fetal ECG

FHR = 48-52  MHR = 60

FHR = 136 - 158 - 130  MHR = 43-45
Fetal Resuscitation
If Fetus Clearly in Distress

- Consider early induction, early delivery
  - Oxytocin induction
  - C-section

- These should be considered high risk procedures for the fetus and mare
No way back