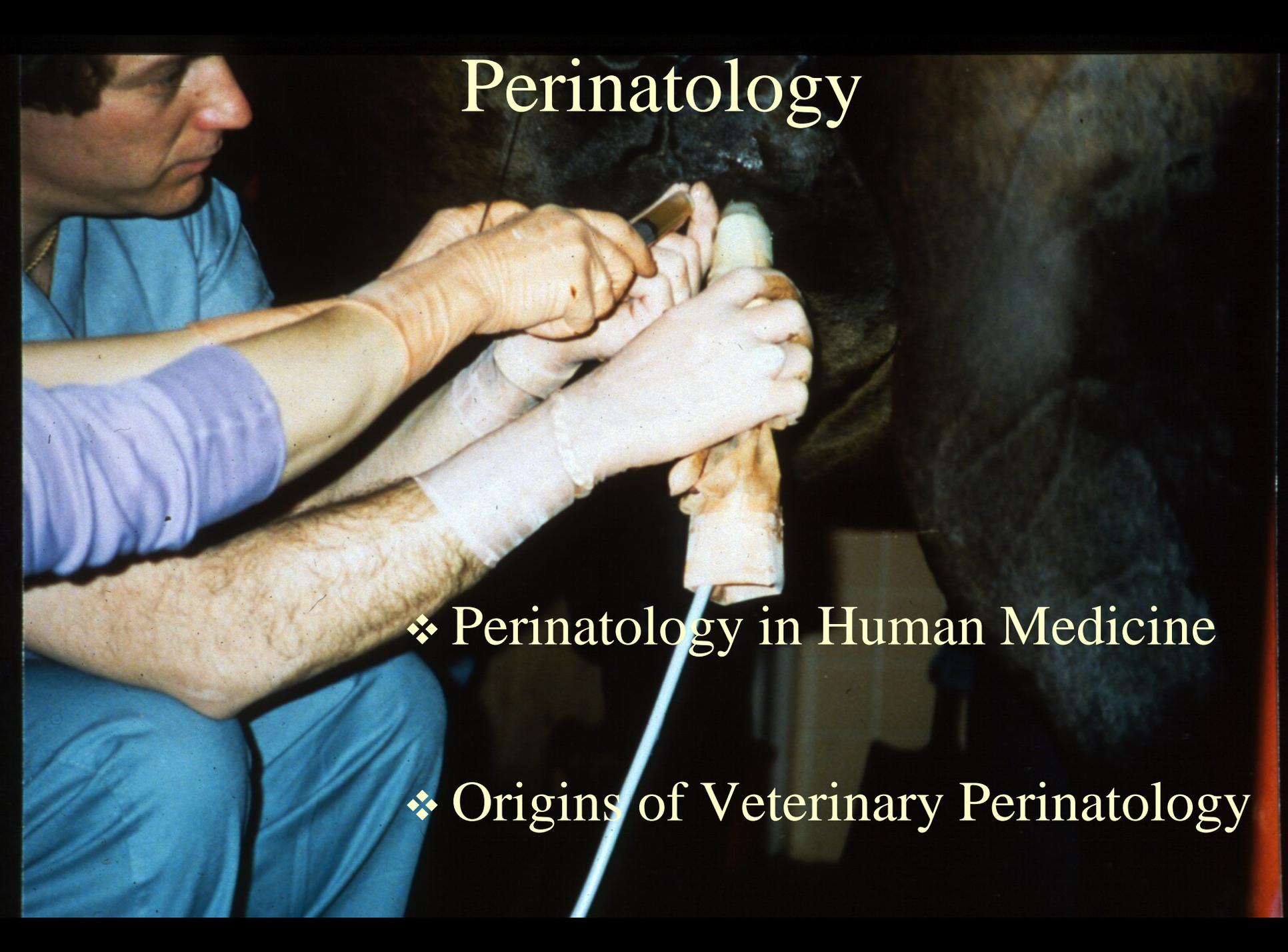


# Perinatology

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



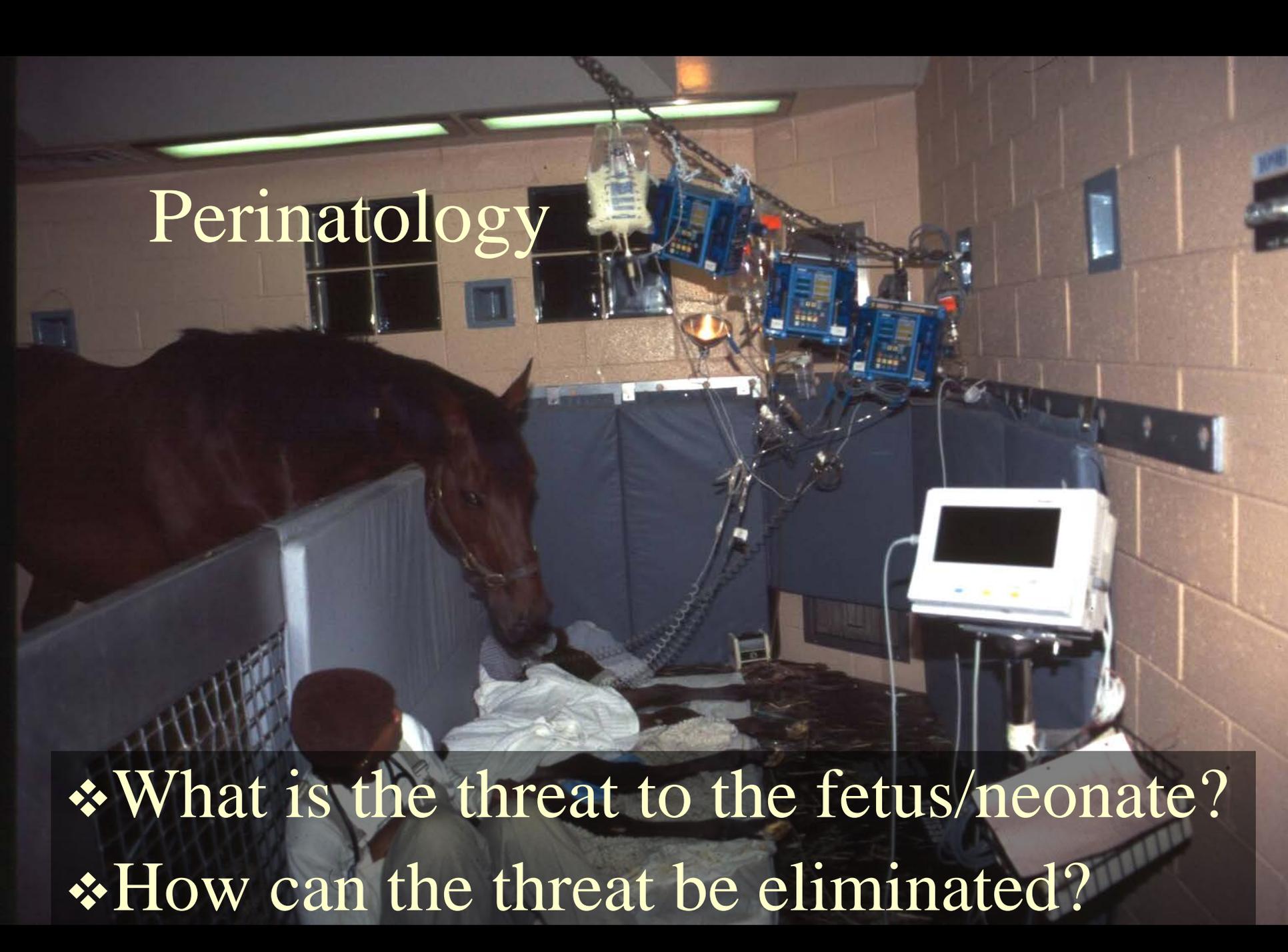


2001





# Perinatology

A dark brown horse is lying in a hospital bed in a veterinary clinic. The horse is positioned on the left side of the frame, facing right. The bed is covered with a patterned blanket and a white sheet. A person in a white lab coat is kneeling on the floor next to the horse's head, attending to it. The room is equipped with various medical devices, including several blue monitors mounted on a stand above the horse, and a white monitor on a stand to the right. There are also IV bags hanging from a stand. The walls are made of light-colored, textured panels, and there are windows in the background.

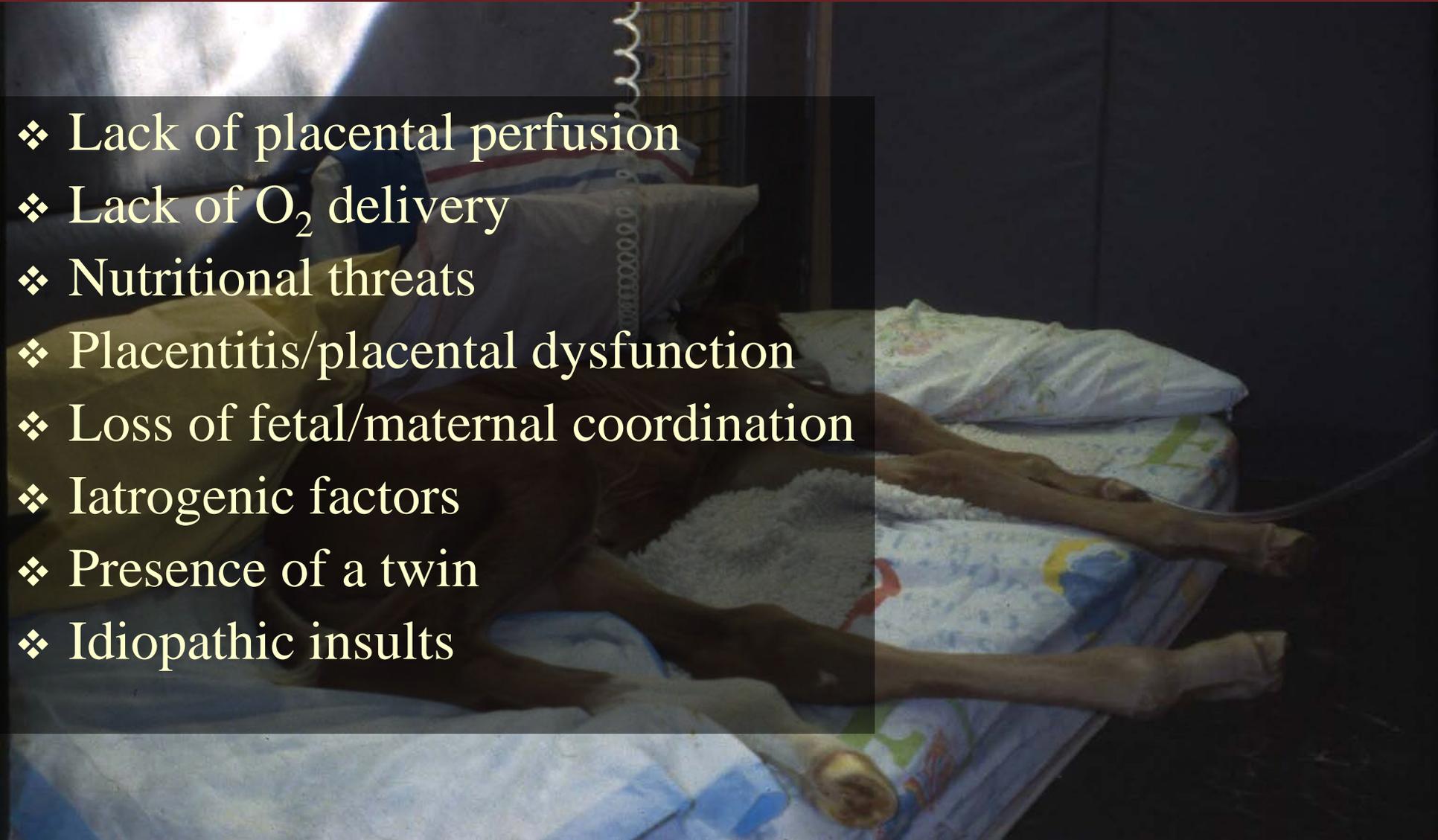
- ❖ What is the threat to the fetus/neonate?
- ❖ How can the threat be eliminated?

# 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<sub>2</sub> 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 O<sub>2</sub> Delivery

- ❖ Maternal threats

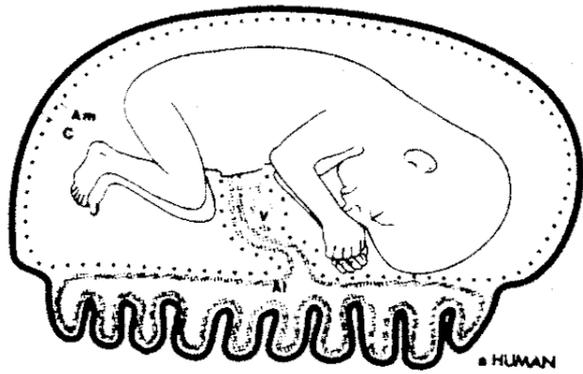
- ❖ Maternal anemia
- ❖ Maternal hypoxemia
- ❖ Decreased perfusion

- ❖ Fetal response

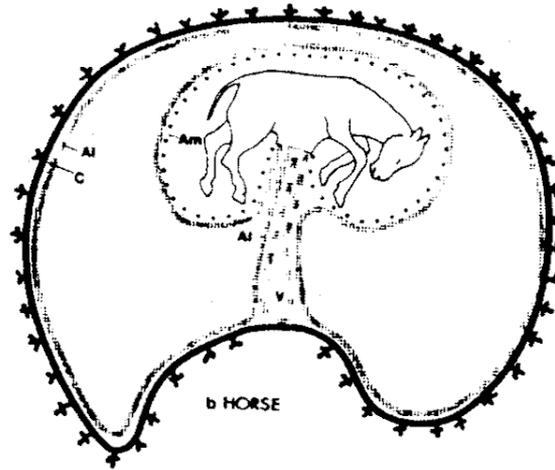
- ❖ Unique aspect of placentation
- ❖ Placental oxygen transport mechanisms



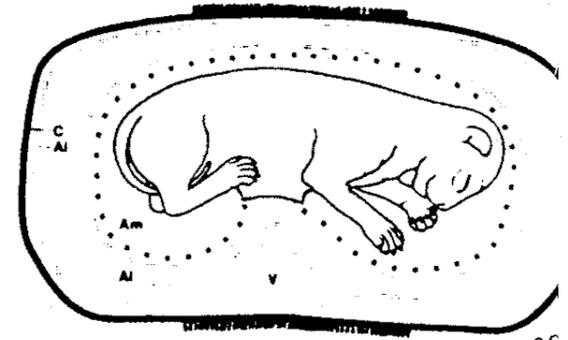
# Placentation



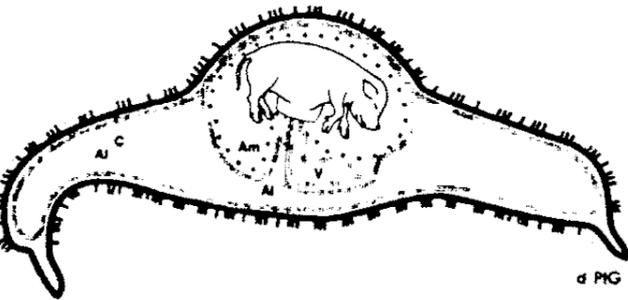
a HUMAN



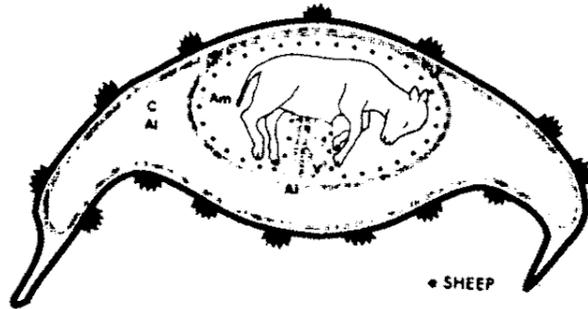
b HORSE



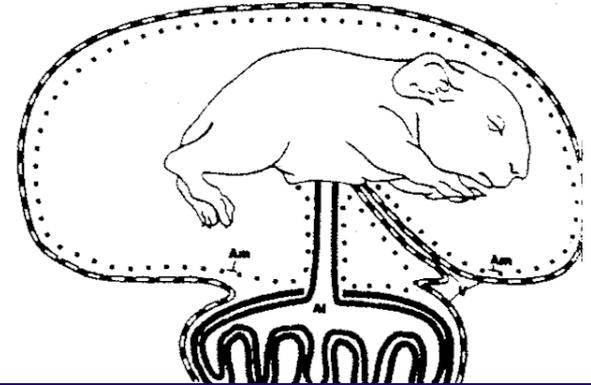
c C



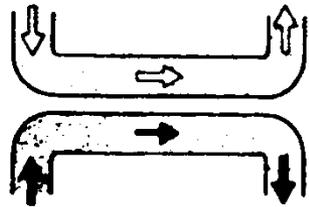
d PIG



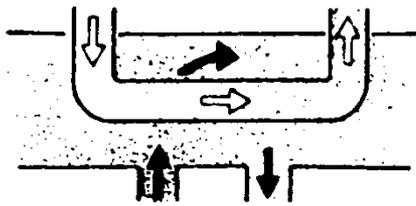
e SHEEP



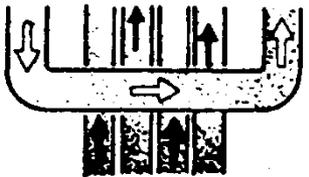
# Placental Circulation



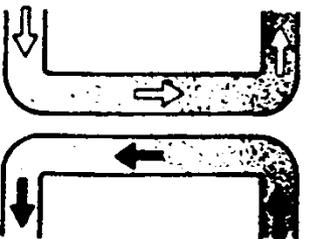
concurrent



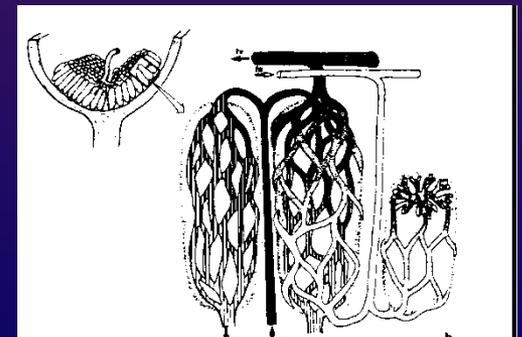
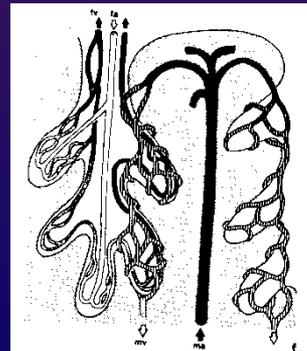
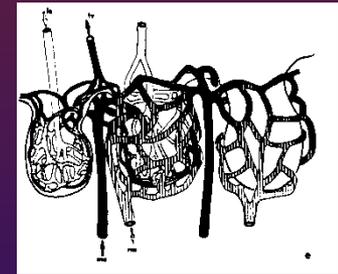
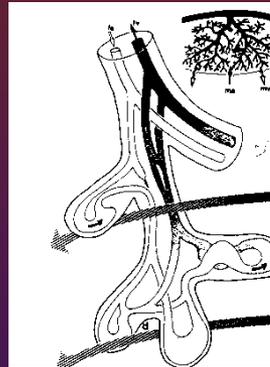
multivillous



crosscurrent



countercurrent



# Equine Placentation

Chorioall

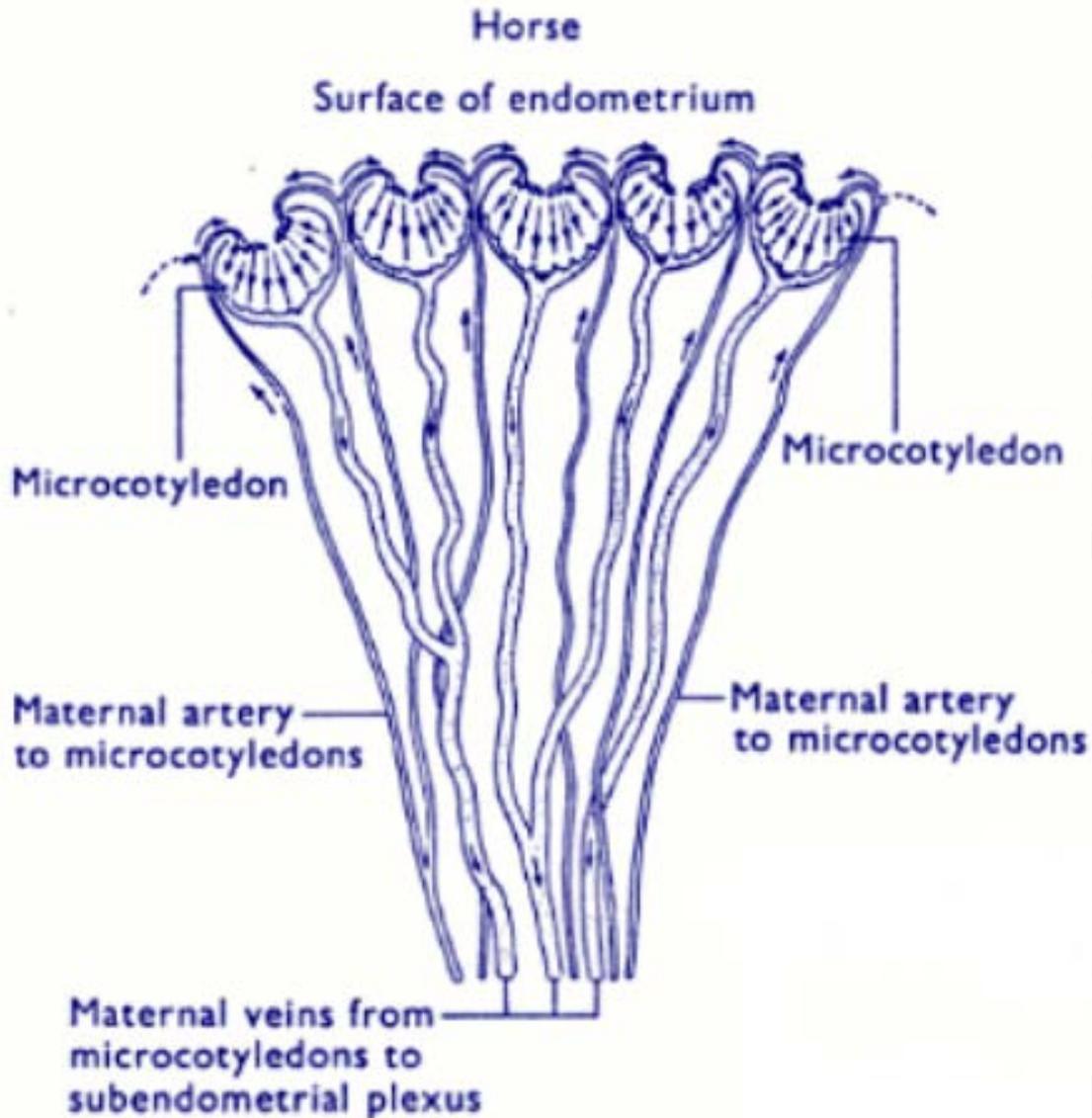
Fetal side  
microcoty

Openings  
glands

Uterine  
epithelium

Maternal  
side of  
micro-  
cotyledon

Uterine  
artery



Micro-  
cotyledon

Endometrial  
gland

Uterine vein

# Effect of Maternal Oxygen Therapy

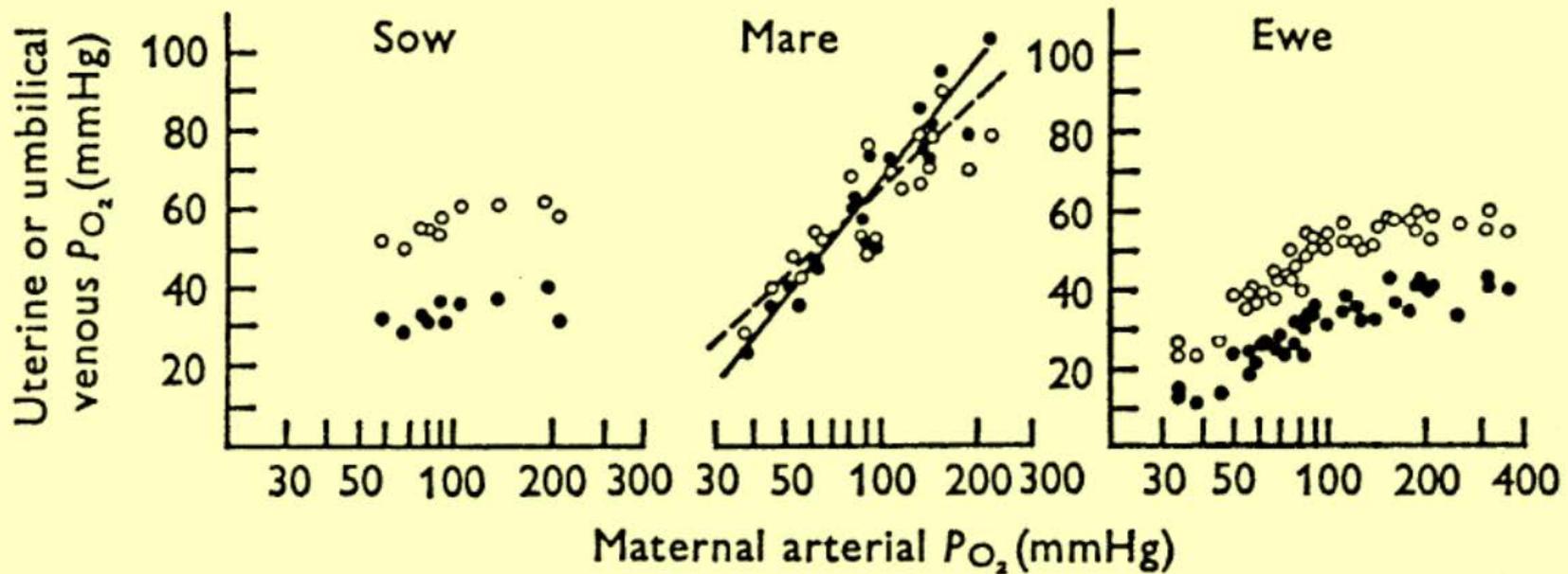


Fig. 4. The relationship between  $P_{O_2}$  in maternal arterial blood (log scale) and that in the uterine vein (○) and umbilical vein (●) in seven ewes and seven mares (data from Comline & Silver 1970b), and in five sows.

# Placental Blood Gas Transport

## Fetal Blood Oxygen Affinity

- ❖ Higher than maternal blood
  - ❖ Umbilical blood becomes highly saturated
  - ❖ Even at a low  $P_{O_2}$
- ❖ Fetal Hemoglobin - in ruminants
- ❖ Erythrocyte Concentration of 2,3-DPG (lower)
  - ❖ Fetal pig
  - ❖ Fetal Foal - small effect (2 torr)

# Fetal Resuscitation

## Lack of O<sub>2</sub> Delivery

- ❖ Fetal hypoxemia - supplement with INO<sub>2</sub>
  - ❖ Take advantage of the countercurrent system
  - ❖ Even if normal Pao<sub>2</sub> 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



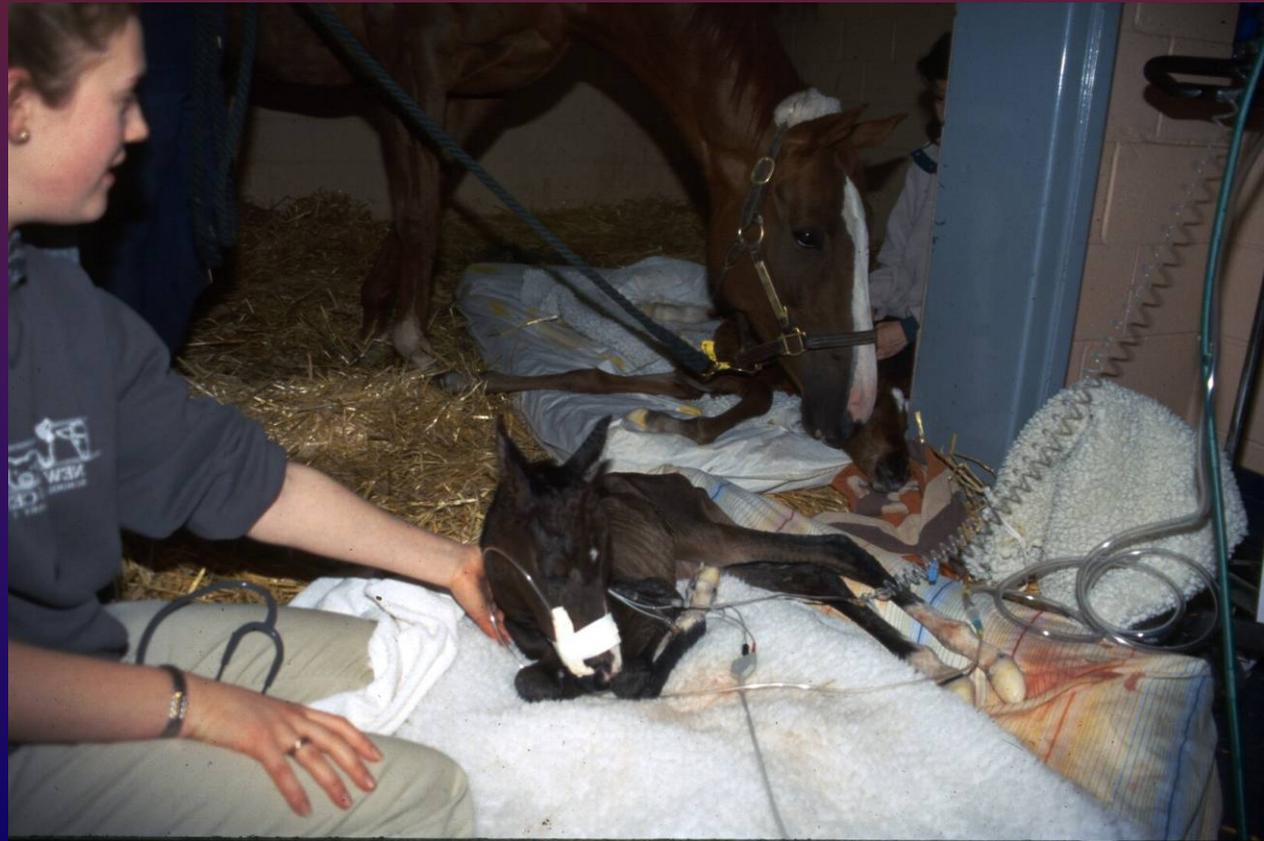
# Fetal Resuscitation

## 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



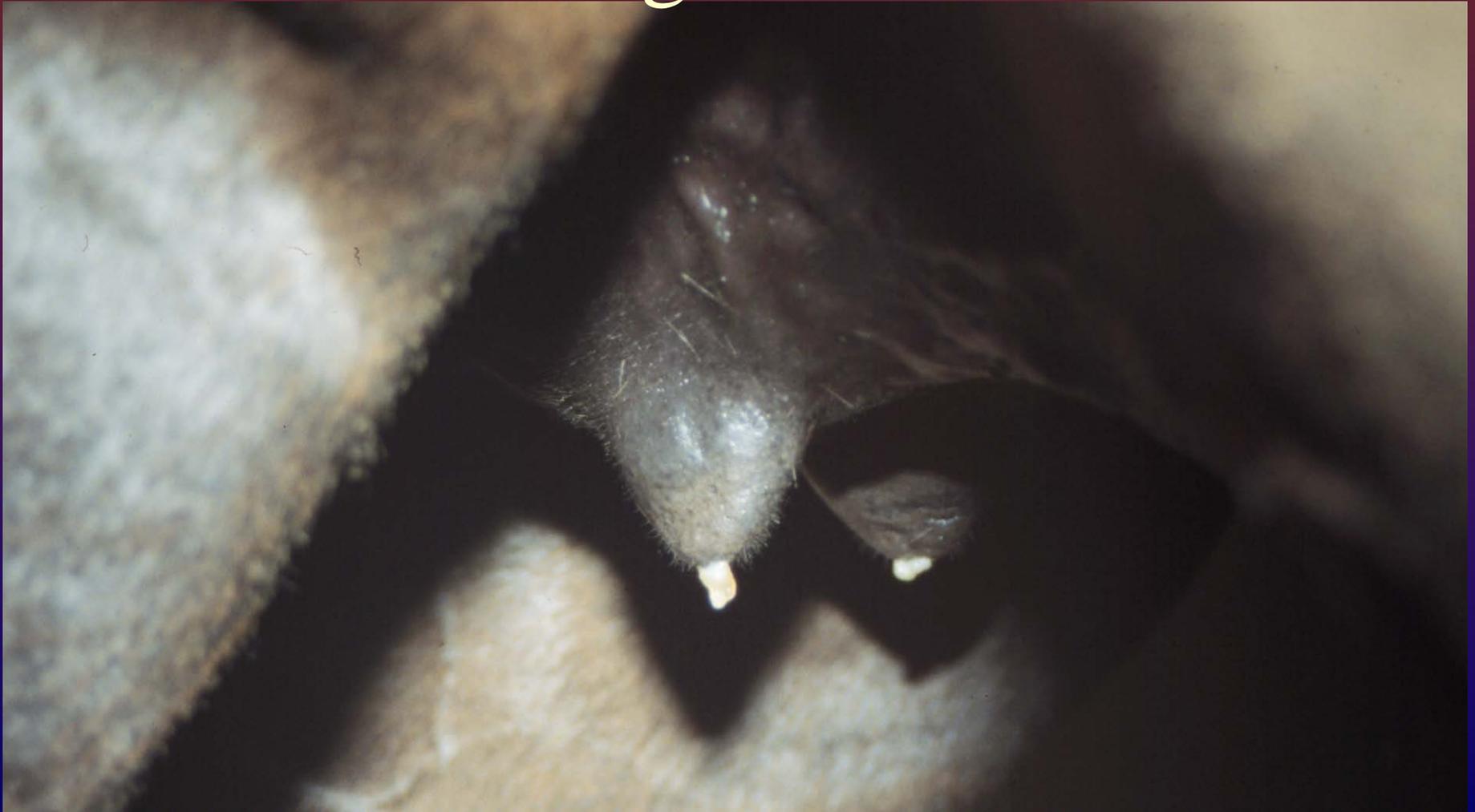
# Fetal Monitoring History

- ❖ 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

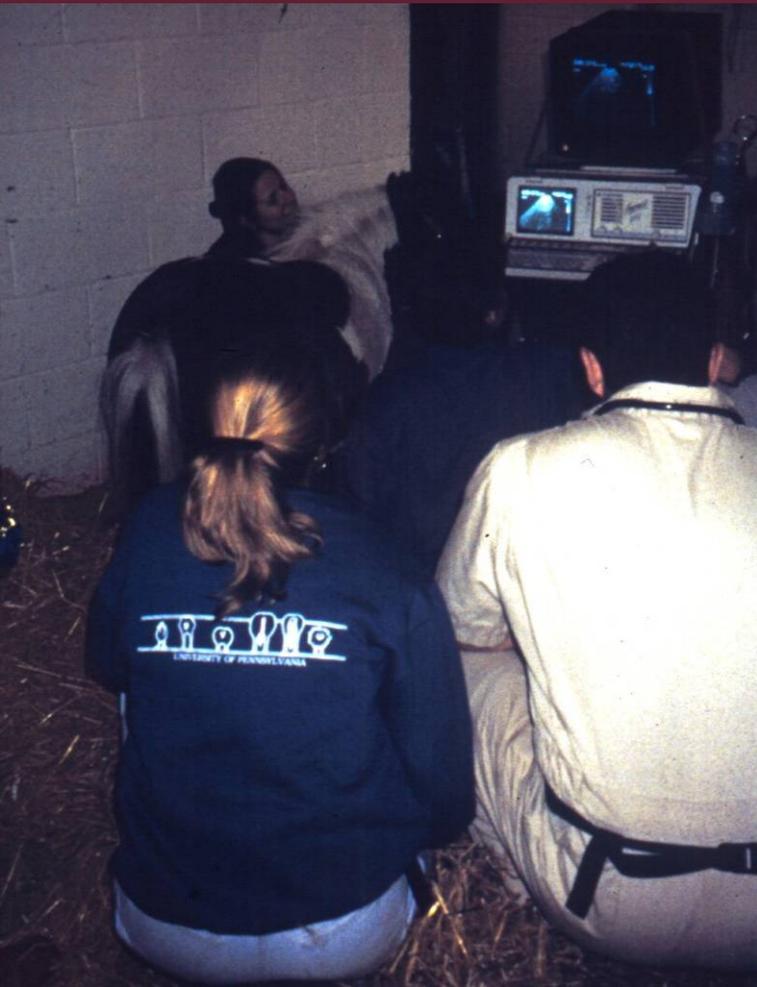
Most reliable sign of fetal distress



# 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



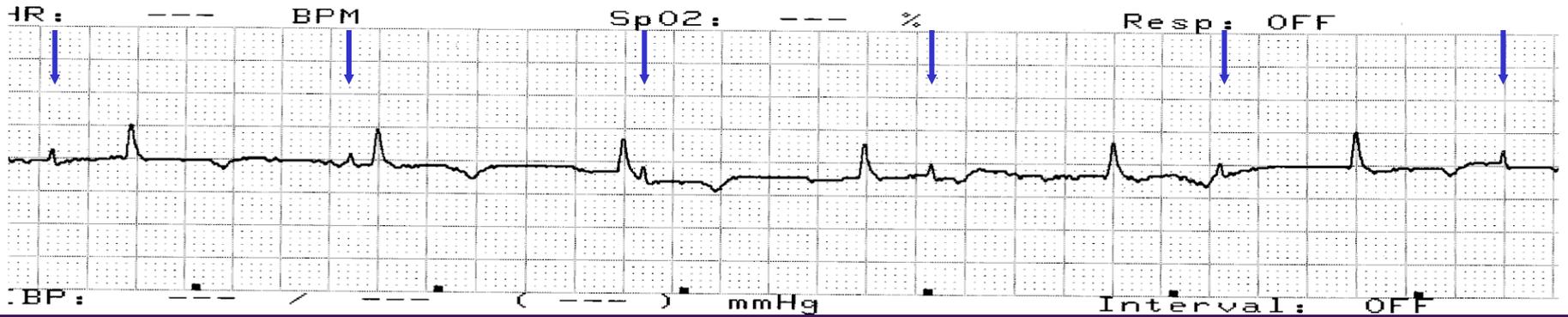
Fetal Heart  
Rate Response

# Fetal heart rate measurements

## Fetal ECG

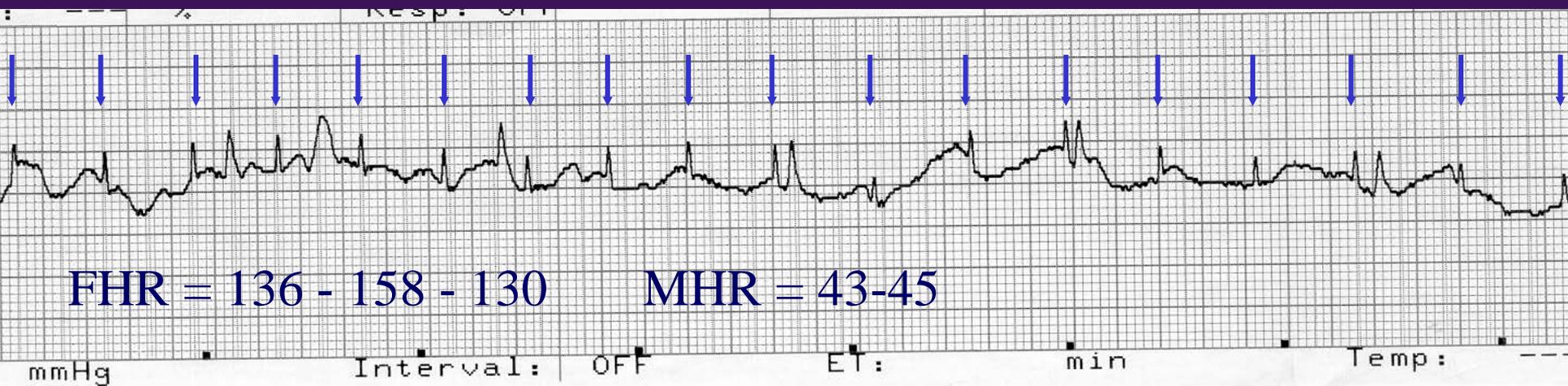
FHR = 48-52

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

