





## Timing of Birth

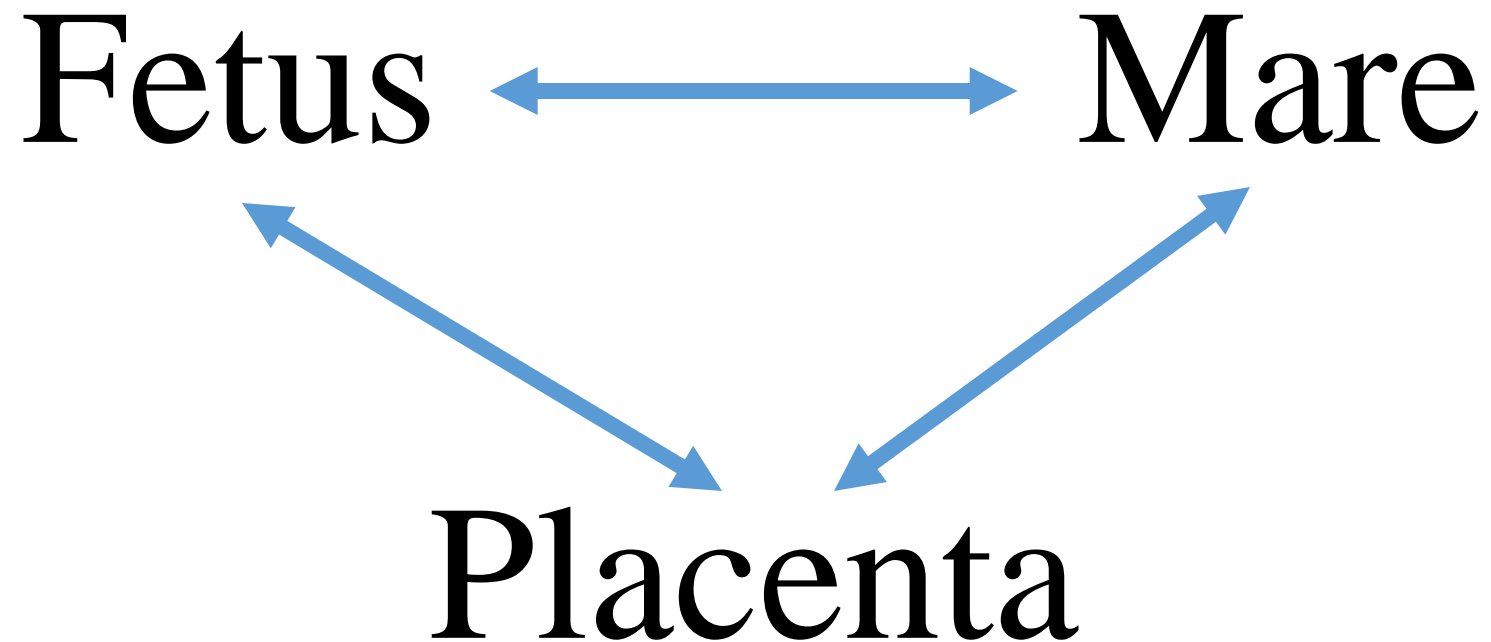
Prematurity  
Dysmaturity  
Postmaturity

# Prematurity

- Average gestational length
  - 334 to 340 days
- Traditionally premature
  - < 320 days
- Each mare - own normal
  - Range 310 – 390 days
- Can have an apparently mature foal
- Can have an apparently premature foal at 360 days



Coordination of maturation  
Timing of foaling



# Coordination of maturation

## Maternal Preparation for foaling

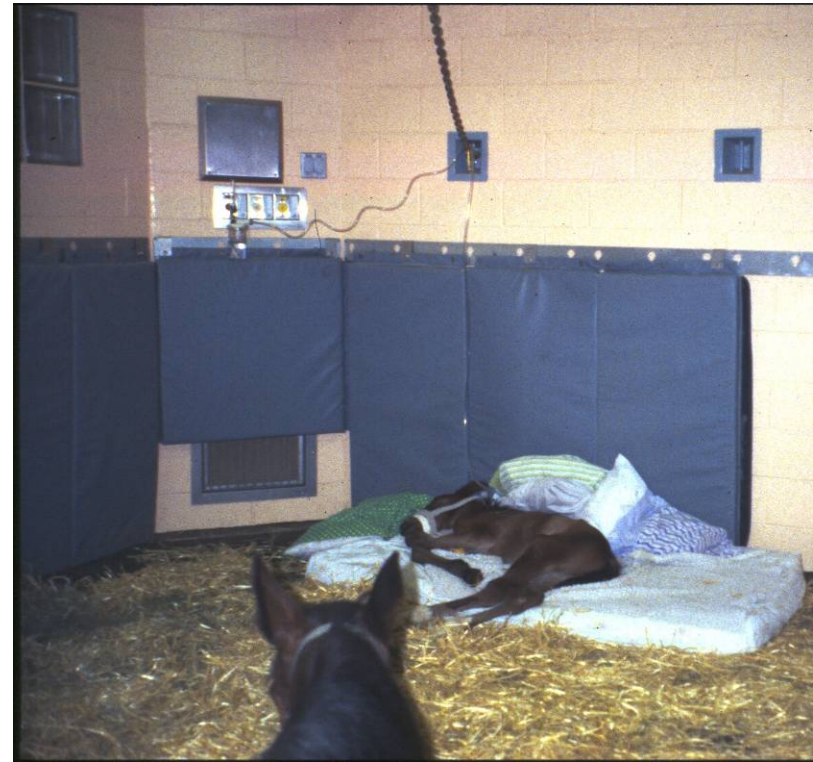
- Myometrium preparation
  - Antepartum contractions
  - Hormonal preparations
- Relaxin production
- Mammary gland preparation
  - Glandular development
  - Colostrum production
- Behavioral adaptation



# Coordination of maturation

## Fetal Preparation for foaling

- Lung maturation
  - Final parenchymal development
  - Cellular differentiation
  - Surfactant appearance
- Cardiovascular transition
- Adrenal maturation
- Metabolic transition
- Renal transition
- Gastrointestinal maturation



# Readiness for Birth

## Role of Cortisol

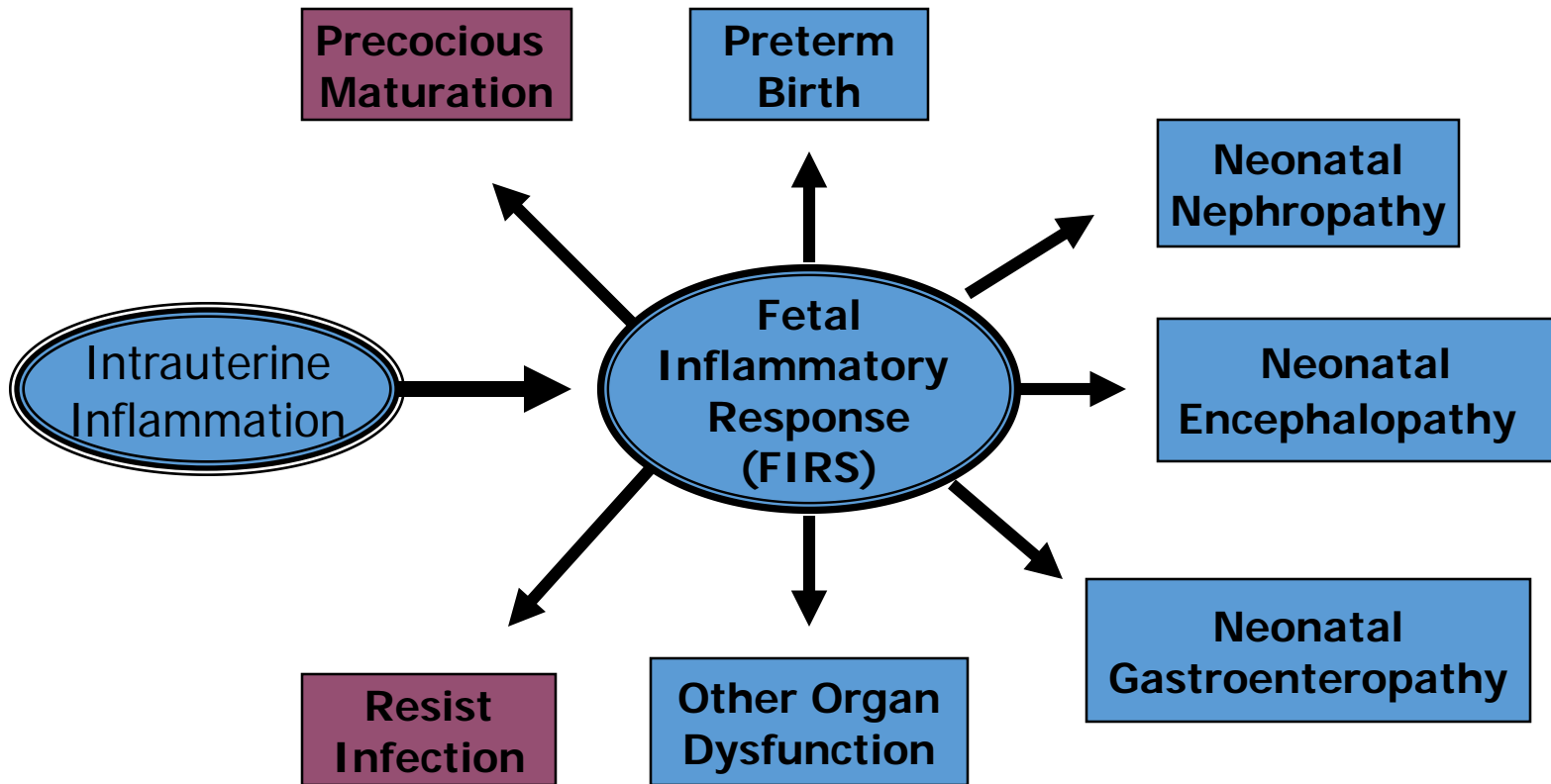
Cortisol orchestrates final development

In the fetal foal there is a late cortisol surge

Fetal foal

- Final maturation occurs in a 48 hr window
- Foal born before this
  - Premature
  - Stress responsiveness poor
  - Poor prognosis







# Readiness for Birth

## Precocious maturation

### Mare with placentitis/dying twin

- Precocious udder development
- Hastened preparation for foaling

### Fetal response

- If birth occurs soon
  - Premature
  - Poor prognosis
- If birth is delayed
  - Foal born vigorous
  - Good prognosis
  - Small size
  - Incomplete ossification





# Readiness for Birth

## Precocious maturation

Foals born after prolonged placentitis



Hyperfibrinogenemia

Leukocytosis - often  $> 20,000$

Presuckle IgG  $> 800$  mg/dl

# Readiness for Birth

## Coordination of maturation

- If mare gives birth before foal can mature
  - Premature foal
- If foal is mature before mare is ready
  - Continues to grow
  - May outgrow placenta
  - Postmature foal
- If mare and foal mature together
  - Normal foal
  - Even when gestation length > 400 days or < 320
- Gestation length usually follows history

# 400 Day Club



# Prematurity

## Clinical Characteristics

- Low birth weight
- Small frame
  - May appear thin
  - Poor muscle development
- Periarticular laxity
  - Hoof-to-withers Test

General flexibility





# Hoof-to-Withers Test

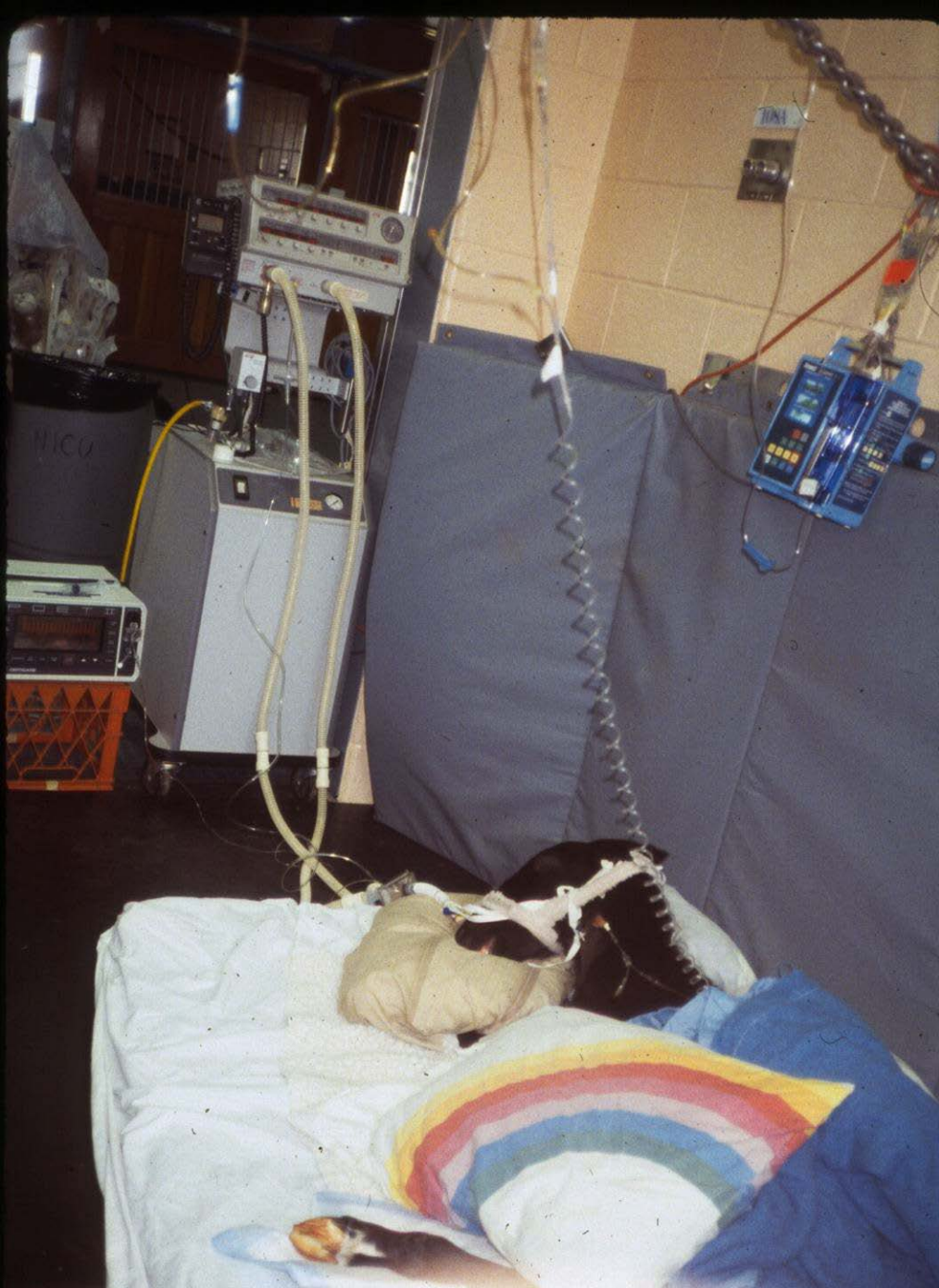




# Prematurity

## Clinical Characteristics

- Usually flexor laxity
  - Occasional contracture
- Usually hypotonia
  - Occasional hypertonia
- High compliance to chest wall
  - Soft ribcage
- Low compliance to lungs
  - Stiff lungs
  - Respiratory distress secondary to fatigue



# Prematurity

## Clinical Characteristics



- General muscle weakness
  - Delayed time to standing
- Short, silky hair coat
- Domed forehead
- Poor ear cartilage development
- Weak suckle



# Prematurity Clinical Characteristics



- Poor thermoregulation
- GI tract dysfunction
- Delayed maturation of renal response
  - Low urine output
- Entropion with secondary corneal ulcers
- Poor glucose regulation

# Prematurity

## Laboratory findings

- Decreased PCV
- Leukopenia, neutropenia
  - Associated with low cortisol, sepsis
- Abnormal glucose homeostasis
- Low IgG
  - Poor absorption?
  - Dysmotility
  - Sepsis
  - Not nursing
- Electrolyte disturbances

# Postmaturity

## Clinical Characteristics

- Normal to high birth weight
- Large frame but thin with muscle wasting
- Often flexor contracture
  - Occasionally flexor laxity
- Usually hypertonia
  - Occasional hypotonia
- Delayed time to stand
  - Hyperreactive state
  - Poor postural reflexes



# Postmaturity

## Clinical Characteristics

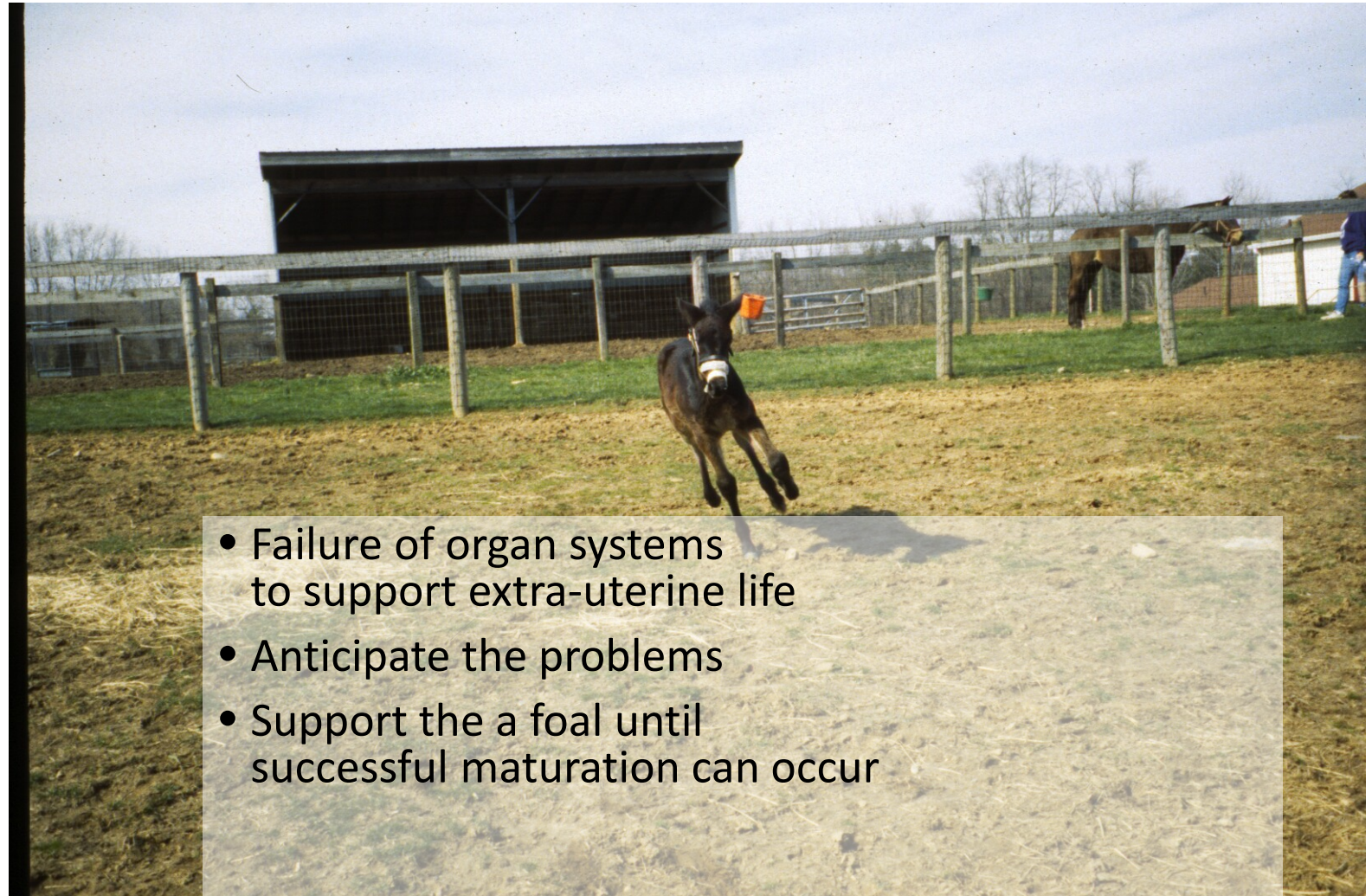


- Long hair coat
- Fully erupted incisors
- Weak suckle
- Poor thermoregulation
- GI tract dysfunction
- Delayed maturation of renal response
  - Low urine output
- Poor glucose regulation



# Prematurity/Postmaturity

## Therapeutic goal



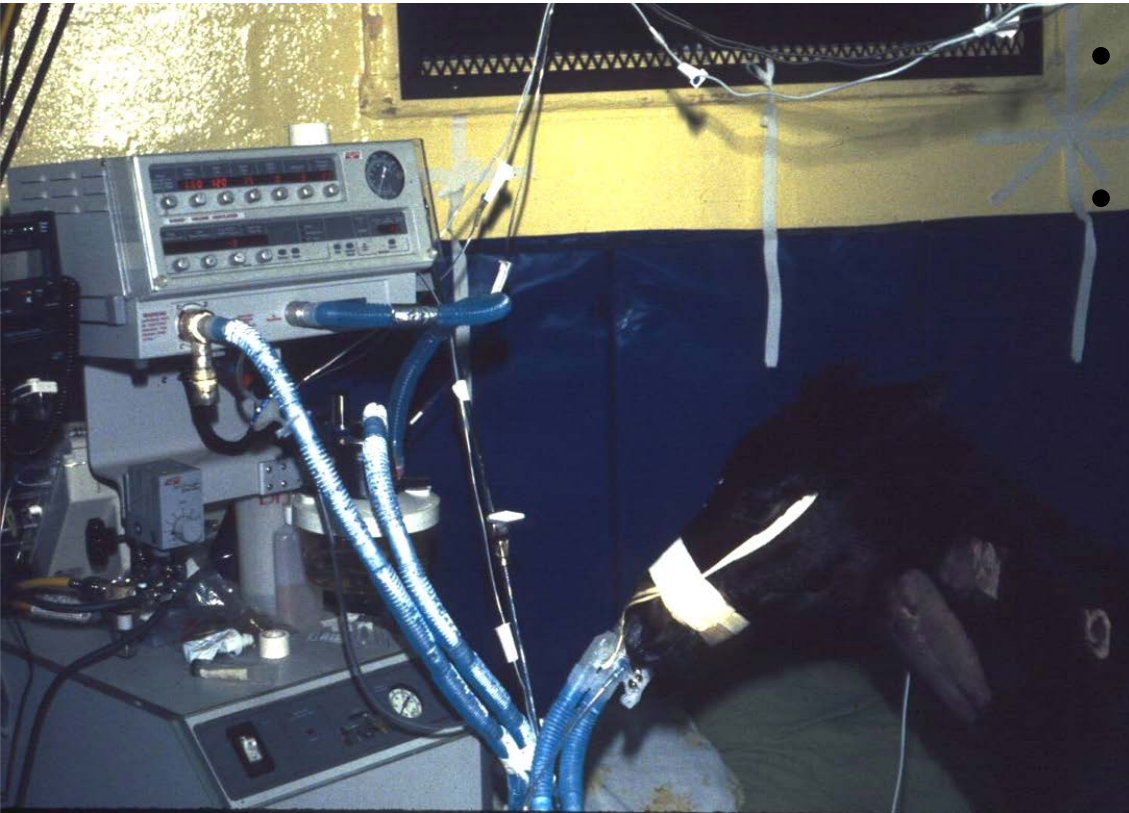
- Failure of organ systems to support extra-uterine life
- Anticipate the problems
- Support the a foal until successful maturation can occur

# Prematurity/Postmaturity Treatment CNS

- Adequate perfusion - oxygen, nutrient delivery
  - Maintaining intravascular fluid volume
  - Maintain tissue perfusion - pressors and inotropes
- Hypoxic ischemic asphyxial or inflammatory insult
  - Prenatal, intranatal, or neonatal period
  - Treat as a foal with neonatal syndrome

# Prematurity/Postmaturity

## Treatment respiratory system

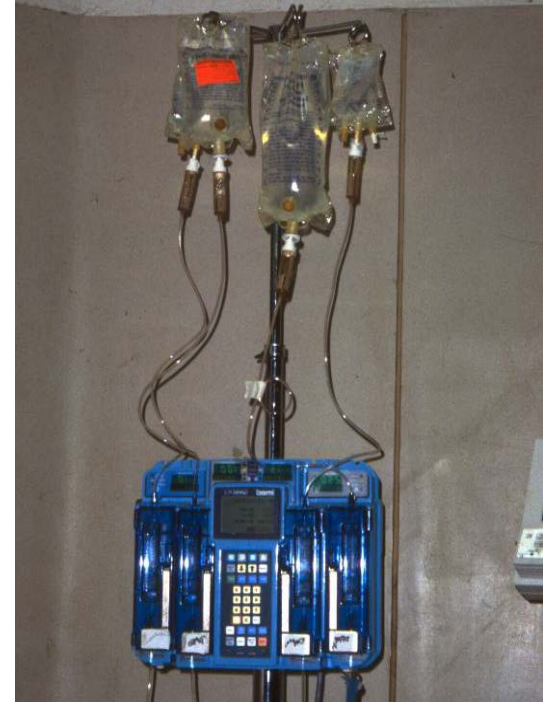


- Surfactant
- Complaint chest wall, weak muscles, and stiff lungs
- Respiratory failure
  - Intranasal oxygen
  - Positional support
  - Mechanical ventilation

# Prematurity/Postmaturity

## Treatment cardiovascular system

- Poor or marginal cardiovascular function
  - Lack of responsiveness of vessels to pressors
- Cardiovascular failure
  - Fluid support
  - Inotropes and pressors
    - Vasopressin, dobutamine, dopamine,  
norepinephrine, epinephrine



# Prematurity/Postmaturity

## Treatment renal system

- Poor renal function initially
  - Foals are born with unique renal function
  - Maintain fetal renal response pattern
  - Neonatal Vasogenic Nephropathy
  - Hypoxic ischemic damage
  - Inflammatory damage
- Do not fluid/sodium overload



# Prematurity/Postmaturity

## Treatment gastrointestinal system

- May not be ready to function fully
  - Lack of GI maturity
    - Dysmotility
  - Hypoxic insult
  - Inflammatory insult
- Dysmotility
- Necrotizing Enterocolitis
- Before feeding is attempted
  - Metabolic, cardiovascular, respiratory stability
- Volumes fed should be slowly increased
- Parenteral nutritional support is often needed



# Prematurity/Postmaturity

## Treatment glucose instability

- Blood glucose monitoring
- Intravenous glucose
- Insulin therapy
  - Constant IV infusion of regular insulin



# Prematurity/Postmaturity

## Treatment hypothermia

- Premature neonates have difficulty with thermoregulation
- Control environmental temperature
- Warm the neonate
  - Heat lamps
  - Hot water bottles
  - Warm air blanket
- Iatrogenic hyperthermia





# Prematurity/Postmaturity

## Transfer of Immunoglobulins

- Colostrum
  - Enteral feeding may not be possible
  - Trophic feeding
  - Absorption may not be efficient
  - Colostrum substitutes – don't work well
- Plasma transfusions are indicated

# Prematurity

## Incomplete ossification

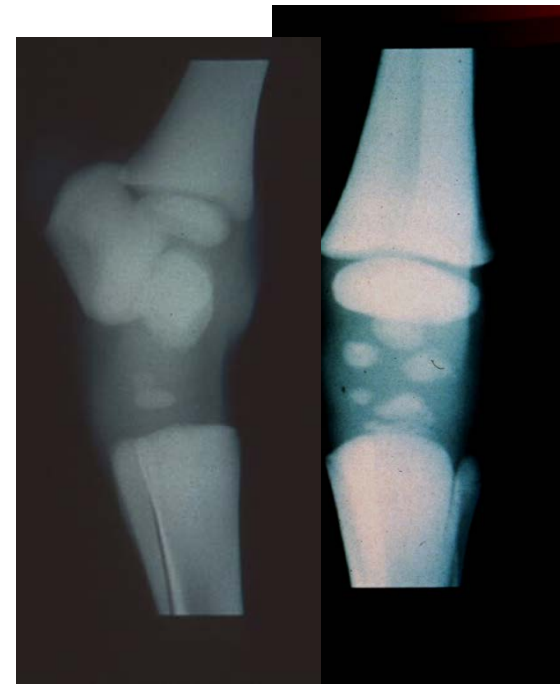
Should always check

- Even in precocious premature foals

Various approaches have been used

Current approach

- No splints or casts
- Confine to padded stall
- Allow limited, supervised exercise
  - Initially 5 minutes or less
  - Gradually increase periods standing
- Carefully monitor for angular deformity





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# Prematurity/Postmaturity Complications

- Secondary bacterial infections
- Fungal infections
- Self trauma
- Limb deformities
- Gastrointestinal problems
- Aspiration pneumonia



