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## Fluid Therapy in Foals

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# Fluid Therapy in Neonatal Foals

Dr. Melissa Hines, University of Tennessee

“Not your mother’s fluid space” - Dr. JE Palmer

- I. Physiologic differences between neonatal foals and adult horses
- **Higher total body water** – largely due to higher interstitial fluid volume

Fluid compartment	Adults	Foals
TBW	60%	80%
ECF	20%	40%
ICF	40%	40%

- Increased capillary filtration and large interstitial fluid volume reserve
  - Fetal lambs
    - Capillary filtration coefficient 5x adult values
    - Permeability for plasma proteins – 15x adults
  - Helps foal adapt to fluid challenges
    - After fluid loss – neonates can restore plasma volume in 1/10 the time of an adult
    - Once distress is detected – can be severe
  - Potential problems
    - Makes it more difficult to treat hypovolemia as fluid readily goes to the interstitium
    - Makes foals more susceptible to fluid overload
      - Rapid fluid redistribution thus little stimulus for vasopressin and renin release
      - Fluid tends to be retained outside the vascular space
- **Easily sodium overloaded**
  - Compounded by perinatal disease
  - Many commercially available replacement fluids are high in sodium
  - Goal – limit daily sodium intake to < 3 mEq/kg/day
    - This would be 1 liter of Na based crystalloids to a 50 kg neonate
  - However – renal tubular damage can result in Na wasting so foals with renal dysfunction may require additional sodium
- **Require energy** – exogenous glucose support common
- **Often require IgG, colloid support?**

## II. Normal fluid balance

- **Normal maintenance fluid requirement = 100 ml/kg/day (5L for a 50 kg foal)**
- **Dietary intake**
  - Normally 20-25% of body weight or 10-12.5 L/day
  - Therefore once they begin nursing well urine is hyposthenuric
- Urine output – can help monitor nutritional intake and hydration status
  - First urination
    - Typically 6-12 hours of age
    - Initial urine s gr often >1.020, decreases to < 1.010 over time
  - Over 24 hrs of age – urine production ~ 150/ml/kg/day
    - 5-10 fold greater than an adult horse

## III. Fluid therapy for hypovolemia

- **20 ml/kg over 10-20 minutes**
- **Re-evaluate** patient – successful therapy indicated by:
  - Improve pulse quality
  - Warm extremities
  - Return of borborygmi
  - Urine production
  - Improved mental status
- **Repeat** bolus if necessary – goal is return of adequate perfusion (often not normal)
- Generally balanced ionic solutions are best
  - Supplemental dextrose may be beneficial
  - Hypertonic saline – concerns for sodium overload
  - Colloids – may be indicated in some cases but “generally not the answer” for hypovolemia in foals
    - Leak into interstitium
    - Increase fluid retention in interstitial space

## IV. Fluid therapy for maintenance of hydration

- **General maintenance – 100 ml/kg/day – but influenced by many factors**
- Do not be locked into a rate based on “tradition”
- Fluid overload is common when 100 ml/kg/day is given – esp. in sick foals
  - Fluid overload is more of a problem than mild fluid restriction
  - Therefore, the fluid rate is often decreased
- Maintenance fluids generally preferred – lower in sodium
  - Plasmalyte-56
  - Normosol-M

## V. Fluid therapy for glucose support

- Most compromised foals not eating benefit from exogenous glucose support

- Independent of glucose status i.e. even hyperglycemic foals that are mobilizing glucose faster than it is being used typically do not have adequate glucose stores
- **Start at 4 mg/kg/min**
  - If this is tolerated, increase to 6mg/kg/min and then 8 mg/kg/min
  - Ex: 50 kg foal
    - $4 \text{ mg/kg/min} \times 50 \text{ kg} = 200 \text{ mg/min}$
    - $200 \text{ mg/min} \times 60 \text{ min} = 12,000 \text{ mg/hr}$
    - 10% dextrose = 100 mg/ml
    - Infusion rate = 120 ml/hr of 10% dextrose
  - May require insulin therapy