Caring for the Neonatal Kitten

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Objectives

- Brief review of the "normal" neonatal kitten
- Brief review of common disease in neonates
- Care for the sick neonate
  - Thermoregulation
  - Fluid support/catheterization
  - Medication administration
  - Feeding
  - Blood transfusion
- Serial monitoring

Normal neonatal kitten

- Birth – 2 weeks = neonatal period
- 2-4 weeks = transition period
- >4 weeks = socialization/juvenile period
- Birth weight: 100 g +/- 10g
  - Best predictor of survival
  - Underweight if endocrinopathy, poor maternal nutrition, uterine crowding, congenital anomalies
  - Double weight in 10d (10-15g/day) if nursing

Normal neonate - Behaviors

- Sleep 90% of day (deep sleep only for 4 weeks)
- Standing by 10 days
- Able to learn by 3 weeks
- Eyes open at 10-14 days (cloudy cornea clears 24 hrs)
  - Corneal reflex present at birth
  - Menace--- learned after 3 weeks age+
  - PLRs difficult to assess until 21d old
  - Reflex lacrimation from time eyes open
- Reflexes
  - Born with righting, withdrawal, anal/urinary reflex
  - Suckling until 3 weeks age
  - Rooting reflex present at birth
  - Crossed extensors at birth → gone by week 2
  - Voluntary urination/defecation after 18-21 days

Normal neonate - thermoregulation

96-98°F week 1
99°F week 2
100.5°F week 3+

- Unable to shiver
- Impaired peripheral vasoconstriction
- Large body surface non-cornified skin
- Lack insulating fat
- Maintain 12°F greater than environment

Normal neonate - fluid balance

- 75% water with large body surface area non-cornified skin
- Nephrogenesis first 3 weeks life
  - Unable to concentrate urine
  - Highly susceptible to dehydration
  - Water turnover 2-3x of an adult
  - High normal BUN × 7d
  - spG 1.006-1.017
  - Mild glucosuria/proteinuria × 6 weeks

Normal neonate - development

- Decreased cytochrome P450 enzymes (liver) first 4 weeks
  - Abnormal bile acids
  - ALP elevation
  - Normal ALT
- GI tract sterile at birth
  - Colonized by bacterium from mother (E. coli, Proteus, Enterococcus, Lactobacillus, Clostridium, Bacterioides)
  - Stool yellowish-tan, soft
- Maternal immunity from colostrum within first 24 hours

Normal neonate - vitals

- Umbilicus fallen off by 3d post-birth
- RR= 30 by 3 hrs post-birth
- Mucous membranes
  - Dark pink/red for one week
  - Later pale pink (along with extremities)
- Heart rate/cardiac output/central venous pressure higher than adults
  - HR>250 bpm until at least 4 weeks age (No PNS tone)
  - No sinus arrhythmias
  - Heart murmurs innocent until 12 weeks age
- Blood pressure/stroke volume lower than adults

Normal neonate - diagnostics

- Blood sampling
  - Jugular venipuncture (hemolysis)
  - No alcohol (cooling)
  - 100 gm kitten blood volume= 6mL!
  - Hematoma formation
    - Significant loss blood
    - Obstruction airway
  - Less than 10% blood volume/24 hrs
    - 68-75ml/kg= blood volume

Normal neonate - diagnostics

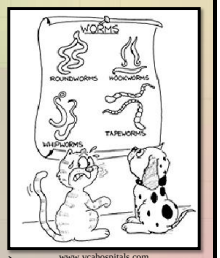
- CBC
  - High red cell mass (MCV) and PCV (42%) at birth
  - PCV decrease to 24% by 8 wks (dilution by increased ECF)
- Serum chemistry
  - BUN high × 7d → then normal
  - Creatinine lower than adults
  - ALP elevated, ALT normal range
  - Phosphorus elevated
  - Normal electrolytes
- Urinalysis
  - Low spG × 3 weeks
  - Proteinuria × 6 weeks
  - Glucosuria × 6 weeks

Normal neonate - diagnostics

- Radiographs hard to interpret
  - Size patient
  - Lack abdominal fat
  - Poor mineralization bones
  - Reduce KVP by 50% and detailed film/screens
- ECG
  - Lead II diagnose arrhythmias

Common illness of neonatal kitten

- Parasitism
  - Fecal-oral parasites (environment)
  - Transplacental transmission
  - Cause
    - Dehydration
    - Anemia
    - Diarrhea
    - Impaction
    - Neurologic disease (aberrant migration)



www.vcahospitals.com

Common illness

- Septicemia
  - Bacteria enter from GI tract, respiratory tract, urinary tract, skin, umbilical cord
  - Predisposed by:
    - Inadequate colostrum
    - Hypothermia
    - Hypoglycemia
    - Poor nutrition
    - Viral infection
    - Endoparasitism
    - Mastitis/metritus in dam

www.tabbysplace.org

Common illness

- Clinical signs septicemia
  - Prolonged crying
  - Restlessness
  - Weakness
  - Cyanosis or mucous membrane hyperemia
  - Discoloration/sloughing extremities

www.pet-informed-veterinary-advice-online.com

Common illness

- Fading kitten syndrome
  - Fail to gain weight, weak, die
  - No apparent reason
  - Look for underlying infection, congenital abnormalities, etc.

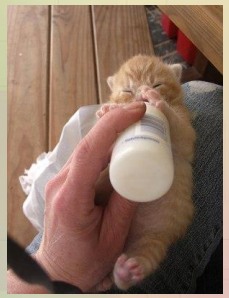
Common illness

- Neonatal isoerythrolysis
  - Type B dam with type A tomcat
    - Type A or AB kittens at risk (maternal anti-A antibodies)
  - Hemolysis from maternal antibodies
  - Anemia, icterus, nephropathy (secondary to pigmenturia), DIC
  - First signs hours to days after initial nursing

www.dr-addie.com

Common illness

- Hypoglycemia
  - Inadequate nursing
  - Infrequent feeding
- Hypothermia
  - Lack of fat and thermoregulation
  - Temperature <93°F likely to die
- Dehydration
  - Diarrhea
  - Anorexia
  - Inadequate food intake



http://cat-chitchat.pictures-of-cats.org

Treatments for the neonate

1. Thermoregulation
2. Fluid support
3. Glucose supplementation
4. Antibiotics
5. Feeding
6. Blood products

Thermoregulation

- Hypothermia can be deadly
  - Below 94° F: weak suckling, hypomotile intestines, tachycardia
  - Below 85° F: GI stasis, chance bacterial translocation, decrease in heart rate, hypoglycemia
  - Below 70° F: motionless and appears dead, bradycardic, no pulse

Thermoregulation

- Rewarm slowly
  - Over 1-4 hrs (to 98-99°F)
  - Too quickly → increase metabolism and oxygen demand → excess water loss → hypovolemia and shock
- Increase body temperature
  - Heating blankets, hot water bottles, etc
    - Allow for neonate to move away from heat
    - Rotate every 10-20 minutes
  - Increase room temperature/remove drafts
  - Warmed fluids (95-98°F) IV or IO

Fluid support - crystalloids

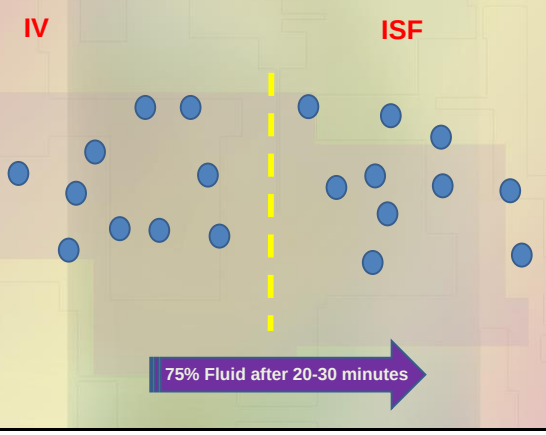
Isotonic crystalloids (plasmalyte, LRS, or 0.9% saline)

- Give for resuscitation OR for dehydration
- Hypotension/hypovolemia
  - Bolus in 10 mL/kg aliquots → reassess after each bolus
  - Fluids warmed prior to administration
  - Up to a total of 60ml/kg (1 blood volume)

Fluid support - crystalloids

- If dehydrated, replace dehydration AND provide for daily maintenance fluid
  - Dehydration
    - Estimate percent dehydration × body weight (kg) = deficit (L)
  - Maintenance fluids
    - $70(\text{wt in kg})^{0.75}$ + 20ml/kg/day = daily fluid requirement
    - Estimate 60-100mL/lb/day

Isotonic crystalloids



Fluid support crystalloids

Example calculation 100g kitten 7% dehydrated:

100g= 0.1kg (1kg= 1000g)

Dehydration:

$0.07 \times (0.1) = 0.007$ L = 7 mL

Maintenance:

$70(0.1)^{0.75} = 70 \times (0.18) = 12.4$ mL/day

20 ml/kg/day = 20(0.1)= 2 ml/day

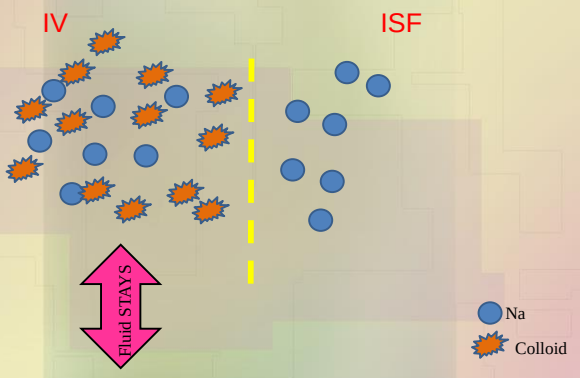
} 14.4 ml/day or 0.6ml/hr

Total fluids = 21.4ml/day = 0.9 mL/hr for first 24 hours

Fluid support - colloids

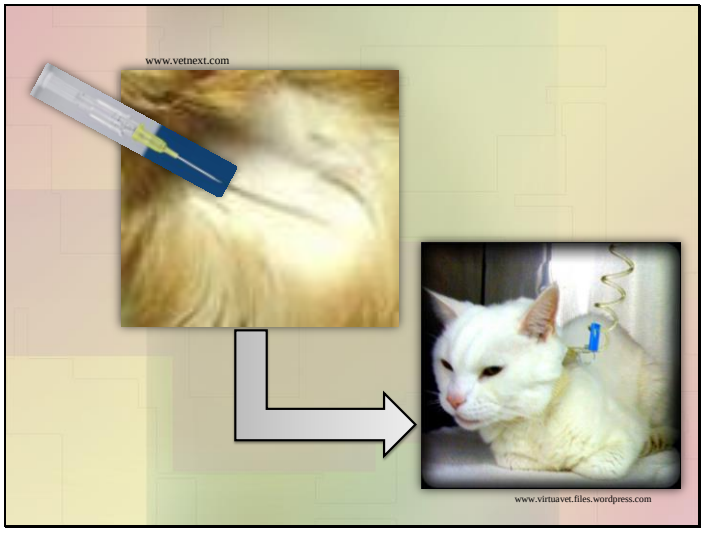
- No data for neonates (or cats in general)
- Used for hypovolemia or hypotension
  - Non-responsive to crystalloids
  - "hold" fluid in the vascular space
- Hetastarch
  - 20 ml/kg/day
  - Bolus 5 ml/kg at a time → up to total 20ml/kg
- VetStarch
  - 20 ml/kg/day
  - Labeled for small animals (no data for kittens)

Colloids



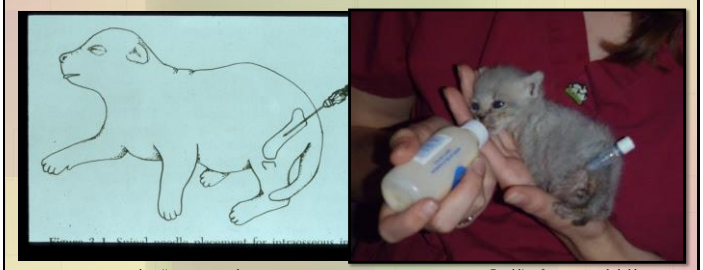
Fluid support - routes

- Oral (less critical)
  - NOT if hypothermic
  - Must tube to give oral fluids
- Subcutaneous fluids (less critical)
  - Warmed fluids
  - 1ml/30g
- IV
  - Place any size catheter (24g or smaller)
  - Any vein is adequate
  - Difficult in tiny animals
  - Don't forget about using regular catheters as a jugular catheter!!!



Fluid support - routes

- Intraosseous catheter



Advantages of IO catheter

- Can place in ANY sized kitten
- Use hypodermic needles (22 or 25 ga.)
- Administer
  - Fluids
  - Blood products
  - Dextrose (diluted to at least 12.5%)
  - Antibiotics

Dextrose administration

- Give PO, IV or IO (not SQ!!)
- Orally
  - Via syringe
  - Via feeding tube
  - 0.25-0.5mL/100g of 5-10% solution dextrose
- IV or IO
  - Dilute to 12.5% solution (1:4 solution of 50% dextrose)
  - 0.1-0.2 ml/100g of 12.5% solution

Antibiotics

- Often for upper respiratory disease, neonatal septicemia
- Not for diarrhea (disrupt flora → worse diarrhea)
- Prefer parenteral administration if possible
- Penicillins, cephalosporins
- Avoid:
  - Aminoglycosides -- renal damage and ototoxicity
  - Tetracyclines – enamel hypoplasia
  - Chloramphenicol – bone marrow suppression
  - Fluoroquinolones -- damage to growing cartilage (moreso pregnant dams)

Antibiotics

www.ppcdrugs.com

www.safefetus.com

- Dosing:
  - Use 30-50% of adult dosage
    - Increased absorption (low serum albumin)
    - Altered drug re-distribution (water, fat percentages)
  - Few to no drugs evaluated for neonates
  - Limited to liquid formulations

Feeding

- Oral only if normothermic, suckling
  - Bottle feeding with commercial milk replacer
  - Use at manufacturer's suggested proportions

http://www.maddiesfund.org/Maddies_Institute/Videos/Orphaned_Kitten_Care_How_to.html

www.raising-happy-kittens.com

Feeding

- Tube feeding
  - Risk of over-feeding
  - Oro-gastric
  - Nasogastric

Orogastric tube

- 5 Fr red rubber tube
- Measure from rostral aspect mouth to last rib
- Flex head forward and advance tube along roof of mouth
  - Small amount water to test tube placement
  - Often meow while feeding
  - No coughing while feeding
- Kink tube when remove (aspiration)
- Stomach capacity 4-5mL/100g

Lowchensaustralia.com

Little 2012

Nasogastric tube

- More permanent feeding tube
- Continuous feeding
- No risk aspiration
- 3.5 Fr red rubber tube must fit into kitten's nose

Nasogastric tube

- Placement
  - Measure tip of nose to last rib – mark tube
  - Lidocaine into nostril
  - Feed tube through nostril to mark on tube
    - Initially tip nose downward
    - Raise head once tube into oropharynx
  - Suture into place
- Radiograph to test placement

How much to feed?

- Caloric requirements vary
  - 1-3 days old: 15 kcal ME/100 g body weight at 1–3 days old
  - > 6d age: 20–25 kcal ME/100 g body weight
- Water 13–22 ml/100 g wt per day
- In general feed
  - 10-15% of body weight as milk replacer day 0-7
  - 20-25% of body weight as milk replacer day 7-28
  - Less volume/day
    - Monitor body weight
    - Gain 10-15 g/day
  - Divide into feedings every 2-4 hours or feed continuously through NG tube
  - Stomach 4-5ml/100g capacity

Anemia

- Neonatal isoerythrolysis
  - Remove kitten from dam ASAP (<24 hrs)
  - Watch for developing anemia
- Parasitism (hookworms, fleas, etc)
- Blood transfusion
  - Weakness, tachycardia, PCV<15%
  - $\frac{\text{Desired PCV- current PCV}}{\text{Donor PCV}} \times 100 \times \text{Wt (kg)}$

Anemia

- Blood type kitten if >3d old (3 drops blood)
- Neonatal isoerythrolysis
  - First 3d life: use blood from dam
  - After 3d: use kitten type blood
- Give transfusion over 1-4 hours
  - Monitor kitten for transfusion reaction
  - Give IV, IO

Failure passive transfer

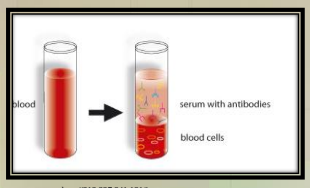
- Should receive colostrum within 18 hrs birth
- Problem in orphaned kittens

www.cattipper.com

- Kittens at risk for infection until >4 wks old

Failure passive transfer

- Give serum SQ from adult with compatible blood type
  - 15 mL/100g weight serum
  - Give SQ
  - Divide total into three injections (q 8 hrs)



http://212.227.241.121/imupro-international/media/ENG_090511/03_Blood.jpg

Monitoring

- PCV can be positively affected by treatments (deworming, transfusion)
  - Recheck PCV 2-4 hours after transfusion
  - No more often than q24 hrs
- Dehydration
  - Physical exam limited useful-ness
  - SpG <1.017

Monitoring

- Serial body weights critical!
  - Measure every 12 hours
  - 10-15g/day expected weight gain
- Stool color/consistency
  - Normal= pasty yellow/tan
  - Overfeeding= green/yellow/watery
  - White stools= liver disease, enzyme deficiency
  - Bloody stool= coccidia, sepsis
- Exhibit normal behavior

Thank you for your attention!!!

For Animal Care Staff and Volunteers:
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