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S. S. Snook  
Iowa State University  

E. A. Riedesel  
Iowa State University

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Feline Neonatal Medicine

S.S. Snook, DVM*
E.A. Riedesel, DVM**

Introduction

Veterinary pediatrics, with the possible exception of the foal, is an unfortunately neglected discipline. Feline pediatrics, specifically, is almost entirely neglected in the literature. This neglect is out of proportion with the numbers of kittens seen by veterinarians for both routine health checks and treatment of diseases. Consequently, clients are often ill informed regarding kitten care and an unnecessary number of kittens die that would, with proper care, survive to become healthy pets and show animals. More importantly, sick or weak kittens should not be considered genetically inferior and be destroyed on the assumption that they would never develop normally. In many situations, feline pediatric medicine can be both practical and economical. Many therapeutic measures effective in kittens are easy, inexpensive, and can be attempted with minimal time and money invested.

The rewards of pediatric medicine are many. Seeing a kitten recover from an illness is rewarding in a way that treating a geriatric or terminally ill patient could never be. In addition, every kitten that is successfully treated is a potential patient for the next 15 years.

The purpose of this paper is to present a description of the kitten’s normal development, healthy care, common illnesses encountered and their treatments, and the rearing of orphans. The neonatal period, or the first 9 weeks of life, will be discussed. Much of the information presented is anecdotal, based primarily on personal observations or extrapolated from puppy data. The lack of information on feline pediatric medicine in the literature is disappointing. The material presented here will hopefully stimulate interest in feline pediatrics and encourage documentation of the ideas presented.

*Dr. Snook is a 1986 graduate of the College of Veterinary Medicine at Iowa State University.
**Dr. Riedesel is an associate professor in the Department of Veterinary Clinical Sciences.

Normal Development and Care

Newborn kittens should weigh approximately 100g. This may be less (85-90g) on very large litters. Birth weight is probably the single most important indicator of kitten viability. Underweight kittens need special care and it can be assumed that their respiratory and gastrointestinal systems are underdeveloped. Breeders should be encouraged to keep reliable records of the weight of newborns. A normal newborn should lie on its side with its head extended. A kitten in the first week of life will move by pushing with its hind legs, while moving its head from side to side.

All kittens should be observed nursing within one to two hours after birth. Most colostrum is absorbed during the first 24 hours of life. There is no documentation as to the amount of antibodies kittens derive transplacentally versus via colostrum. Until this is determined, it can probably be assumed that a majority of antibodies come from the queen’s colostrum. It is important to remember that gut absorption of antibodies, at least in foals, rapidly declines as a direct result of that very absorption. In other words, if a kitten is fed a noncolostrum substance before it consumes colostrum, absorption of antibodies may be impaired. Therefore, it is important that colostrum is the first substance to be ingested by a neonate.

For the first week, kittens should do two things, eat and sleep. While sleeping, an occasional jerk or twitch should be observed. Excessive vocalization and movement is probably an indication of hypothermia. Shivering and vasoconstrictive reflexes are not present during the first week of life. This, combined with size and lack of fat deposits, results in a functionally poikilothermic animal. Consequently, it is essential that kittens are provided a warm, draft free environment (70°F with the queen). If cold is a problem, hot water bottles can be provided. Kittens will regulate their temperature by moving closer to, or farther away from a
heat source. The normal rectal temperature of a newborn kitten is approximately 96 °F and will rise during the first week to approximately 100 °F. A kitten will not be able to adequately regulate body temperature until 4 weeks of age. Weight gain is the most accurate indicator of health status in the newborn. Kittens should gain weight every day, approximately 100g weekly. If weight loss or stasis is observed, the kitten should be closely observed and treated as a critically ill patient. The most important investment that can be made regarding pediatric health care is an accurate scale. Most food scales will work well, and are relatively inexpensive.

At birth kittens will be under predominantly flexor tone. By 3-4 days of age extensor tone in the head, neck and forelimbs should take over. This can be monitored by picking the kittens up by the scruff of the neck. If extensor tone fails to develop, this should be considered a grave sign and probably indicates a severe defect warranting a poor prognosis.

Kittens should be crawling by the second week and should begin walking during weeks 3 and 4. Their eyes will open between 10 and 16 days of age. This is a gradual process. If the eyes become mattery or exudative, it will not hurt the kitten to open the eyelids prematurely and clean the eyes with a warm, moist cloth. Ears become functional by days 15-17.

Normal nursing behavior is important for both nutrition and behavioral development. Nursing behavior changes with age. During the first 3 weeks the queen stimulates the kittens and encourages them to nurse; weeks 4 through 6, the kittens initiate nursing as often as the queen complies; weeks 7 through 9, the kittens initiate nursing and the queen gradually stops complying until the kittens are weaned at approximately 9 weeks of age. It is important that kittens are allowed to grow through these developmental stages. Premature weaning can result in aberrant behavior as an adult. Through the normal progression both kittens and queen will decrease nursing frequency until weaning. Remember that kittens suckle not only for sustenance, but to satisfy an innate behavioral need that is as yet little understood.

During early infancy, kittens will be stimulated to urinate and defecate by the queen. By 4-6 weeks of age, elimination behavior comes under conscious control. Kittens will start making digging movements and if provided litter, will begin normal adult elimination behavior. Contrary to popular belief, the queen is not needed for this behavior to develop as it appears to be innate.

The Sick Kitten

Most illnesses in the newborn are consequences of their inadequate thermoregulation, digestion and absorption capacities, and immunological mechanisms. Accordingly, treatment of such diseases involves correcting and meeting the patient’s heat and energy needs as well as fighting infectious diseases. Infant mortality is highest during the first week of life, especially the first 48 hours. During this time, it is important that early signs of poor doing are promptly recognized. As mentioned earlier, kittens are functionally cold-blooded during the first week of life. If chilled, they cannot nurse, digest food, or fight infections. A cold kitten will initially cry, then become immobile and unable to nurse. A kitten found in this state should be removed from the litter and slowly warmed. Queens will not accept a cold kitten, in fact, they will actively reject a cold neonate. Therefore, it is absolutely essential that a kitten be warmed slowly before being returned to its mother. Closed incubators, warmed towels, and warm water bottles are appropriate means of warming a cold kitten. It is often very difficult to distinguish between a cold kitten and a dead kitten. By holding the kitten securely in your hands and moving it down, as if falling, one should observe a grasping reflex in a live kitten. The grasping reflex may be poorly demonstrated thus it is advisable to warm up the suspect kitten before declaring it dead. Never attempt to feed a cold kitten. The gastrointestinal system is nonfunctional in a cold kitten; therefore, feeding can only result in over distention of the stomach and excess gas production by bacteria in the intestine. A kitten should be warmed slowly, never rapidly. Once a kitten is warmed, it can be returned to the queen and/or given supplemental nutrition. Five to ten percent glucose orally is a good supplement for weak but nursing kittens. This should be given at the rate of 0.01 ml/g body weight via a nurser bottle or oral-gastric tube. The former is safer and preferred.

Keep in mind that the newborn has little or no fat stores and is dependent on a relatively small supply of liver glycogen. Because of this, relatively short periods of anorexia will result in hypoglycemia. When treating sick newborns (which are almost always anoretic), it is essential to meet their energy needs. The oral glucose described will be adequate as will the subcutaneous administration of a solution containing one-half 5% dextrose and one-half Lactated Ringers Solution. This combination will be a good supplement for weak but nursing kittens. This solution can be dosed at .02 ml per gram body weight, and can
be given hourly.4

Dehydration accompanies any illness in the newborn. Water turnover is estimated to be two times that of an adult.4 Additionally, the underdeveloped state of the skin allows excess evaporation. In the immature kidney, glomerular filtration rate is less than 50% of the adult and tubular secretion is less than 15% of the adult.4 The combination of these factors can result in rapid and lethal dehydration.

Monitoring hydration in a neonate is difficult. Skin turgor is misleading due to the lack of subcutaneous fat. Specific gravity of urine can be used adequately. Values in excess of 1.017 are suggestive of inadequate hydration in the puppy.4 Urine is easily obtained by gently rubbing the genitalia of the kitten with your finger. Since only a drop is necessary for specific gravity determination, this method should be readily and effectively used by practitioners. If no urination reflex is initiated by genitalia stimulation, dehydration should be assumed. As described, fluid treatment in the newborn should include electrolytes and energy. It is easy and effective and, in many instances, can mean the difference between life and death.

It should be kept in mind that a unique feature of neonatal disease is its relatively rapid onset and rapid recovery. Kittens can return to normal from a moribund state within hours if given adequate care. In many instances, adequate care merely involves providing warmth, fluids, and energy.

Additional supportive measures include maintaining adequate humidity (55-60%) to decrease evaporative fluid loss and supplemental oxygen (40%).2 The latter may reduce hypoxia resulting from underdeveloped alveoli and decreased cardiovascular function. Hypoxia becomes more pronounced with dehydration and it is this author’s experience that oxygen relieves one extra complicating factor facing a sick neonate. Both humidification and oxygen can be provided via an infant incubator—a piece of equipment commonly found in many small animal hospitals.

Some specific problems uniquely affect the newborn. One is bleeding secondary to hypoproteinemia, vitamin K deficiency, and thrombocytopenia. Newborns routinely have low packed cell volumes, plasma proteins, and thrombocyte counts when compared to the adult. Normal values are not available for the kitten, but puppy values are shown in Table 1. The vitamin K deficiency is most pronounced during the first 4 days, prior to the establishment of a stable gut flora. Consequently, it is advisable to administer vitamin K to all newborns as soon as possible. This can be given intramuscularly at the dose of .04 mg/100g. According to Mosier, only natural vitamin K should be used since synthetic vitamin K has been associated with hyperbilirubinemia.10 While prophylactic vitamin K treatment is not realistic in the general cat population, it is a practice that can and should be instituted in catteries and wherever else possible.

A second problem unique to the neonate is the inability to digest food. Low birthweight kittens, in particular, often ingest more milk than they can digest. As enzymes are used up faster than they are made, the feces of such kittens turn whitish gray. (Normal stool should be semiliquid and mustard yellow.) Affected kittens will cry, exhibit a distended, painful abdomen, and will become anorectic. Such kittens should be supported with subcutaneous fluids for 12 to 24 hours or until symptoms subside. Nursing can be slowly reinstated and supplemented with oral 5-10% glucose. If feeding formula, the milk should be diluted with equal parts of 10% glucose for the next 48 hours. One drop of a bicarbonate based antacid per os may help relieve symptoms. Forty-eight hours is usually adequate for a return to normal digestive ability, but this problem can recur in the same kitten.

Infectious diseases can be devastating to a kitten. Peritonitis and septicemia are commonly seen secondary to umbilical infections. The umbilicus of a sick kitten should always be examined, however, one cannot rule out an ascending umbilical infection even in the presence of a normal appearing umbilicus. Septic kittens are depressed, anorectic, and may have hyperemic mucous membranes. Peritonitis results in a swollen, painful abdomen with the overlying skin often appearing gray and translucent. Peritonitis is easily confused with the maldigestion syndrome previously described and care should be taken to differentiate between the two. Gram positive bacteria are most likely involved in both septicemias and peritonitis.4 Treatment includes the supportive measures already discussed as well as antibiotic therapy.

Drug therapy in the neonate deserves special consideration. Remember, kidney function is limited in the newborn, and if sick, the kitten is dehydrated. Consequently, it is best to administer antibiotics which are considered non-nephrotoxic and easily metabolized. Penicillin, Ampicillin and Kanamycin are three drugs likely to be effective

| TABLE 1 — Blood values in normal puppiesa |
|-----------------------------|---|---|---|---|
| Age (Weeks) | 3 | 6 | 9 | Adult |
| Hemoglobin (gm/dl) | 8.6 | 7.7 | 8.3 | 15 |
| Packed Cell Volume (1%) | 29.6 | 24.8 | 26.3 | 43 |
| Total Plasma Protein (gm/dl) | 4.3 | 4.7 | 4.8 | 6.7 |

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while being nontoxic. Antibiotics should be administered parenterally as the subcutaneous route is probably the easiest. If peritonitis is suspected, intraperitoneal injection is necessary. Peritoneal lavage can be performed using a neonatal feeding tube through a small abdominal incision. Warmed fluids should be used for this procedure.

Prophylactic antibiotics are an area of controversy. Many veterinarians believe the possible disruption of gut flora contraindicates the prophylactic administration of antibiotics. In the opinion of the author, weak, low birthweight or colostrum deprived kittens will benefit from the prophylactic administration of antibiotics. It is the author’s experience that gut disturbances are much more successfully treated than septic conditions. If a bacterial infection is treated, such treatment should be continued for at least two weeks beyond resolution of symptoms as relapses are not uncommon. Once the kitten is suckling again, oral antibiotics can be substituted for parenterals. Mosier has noticed increased vitality and growth rates in puppies given prophylactic antibiotics compared to controls. This contradicts common opinion and supports the use of antibiotics in those kittens at risk.

Viral diseases of the feline neonate are poorly described. The terms “fading kitten” or “feline mortality complex” are often used to describe the kitten born apparently healthy, that gradually deteriorates and dies. Associations have been made between these “fading kittens” and feline infectious peritonitis virus and feline leukemia virus. Nothing definitive has ever been published. It seems likely that “fading kitten” results from many causes, some probably viral, others probably those problems already discussed. Some catteries have reported a high incidence of a congestive cardiomyopathy resulting in sudden deaths. The cause of this syndrome has not been determined and may be genetic, viral or incidental.

The major respiratory diseases of cats are particularly severe in kittens. Feline Herpesvirus and Calicivirus can both cause severe upper respiratory disease resulting in serous to mucopurulent discharges with oral ulcers and erosions. Both are treated symptomatically and are best prevented by queen vaccination and isolation of kittens until vaccination. Kittens should be vaccinated beginning at 6-8 weeks of age, according to manufacturers directions. If necessary, kittens can be vaccinated as early as 3 weeks of age without problems.

Orphan Care

Veterinarians are often called upon to advise clients regarding the hand rearing of orphaned infant animals. Unfortunately, inadequate or incomplete information is often dispensed resulting in a bad experience for the client along with the death of many kittens. The goal of hand raising is to end up with healthy, developmentally normal pets or show animals. This requires a 24 hour a day time commitment for 6 weeks or more. Clients must be willing to make this commitment or they will likely fail. The first two weeks of a kitten’s life will require the most time and energy. An alternative to clients taking care of orphans at home should be for practitioners with intensive care facilities to hospitalize the kittens for the first one to two weeks. This should be an option when dealing with valuable litters and clients willing to pay for intensive care. This suggestion is made in order to emphasize to the reader that those first two weeks are a time when constant supervision, early intervention, and special techniques, not readily available to clients, can make a decided difference in the outcome of hand rearing. This is especially so when dealing with low birthweight or weak kittens, which is often the case with orphans. Given the interest, most large clinics could provide such a service.

It is to be emphasized that orphans should not be treated casually if there is a strong desire, on the part of the client, for them to survive. Too often a survival of the fittest attitude prevails when active intervention can be successful.

Special problems face orphans which do not face kittens with a queen. Lack of colostrum is such a problem. If the kitten is orphaned before it has an opportunity to ingest colostrum, it should be considered immunoincompetent. Measures taken to protect this kitten from overwhelming infections include isolating it from other cats (but not littermates) and administering prophylactic antibiotics. In this author’s opinion, orphans are excellent candidates for prophylactic antibiotics. In addition to being colostrum deprived, the extra stress of being hand reared probably has a detrimental effect on the immune system of an orphan. Accordingly, antibiotics may add an additional protective mechanism.

Housing is another special concern. Facilities that are draft free and provide warmth and humidity are essential. Cardboard boxes and circulating water heating pads are adequate if an incubator is not available. Terry cloth toweling is suitable as bedding as it helps conserve warmth and gives the kitten a textured surface to crawl on. Older kittens may benefit from being placed on disposable diapers, as these absorb excrement and thus provide a cleaner environment. During weeks 2 through 4, kittens will stimulate each other to urinate and defecate,

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TABLE 2 - Formulas for feeding orphaned kittens

<table>
<thead>
<tr>
<th>Age (weeks)</th>
<th>Amount to feed (ml/100g body weight)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>13</td>
</tr>
<tr>
<td>2</td>
<td>17</td>
</tr>
<tr>
<td>3</td>
<td>20</td>
</tr>
<tr>
<td>4</td>
<td>22</td>
</tr>
</tbody>
</table>

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Nursing bottles are readily available. Kittens should be fed from a bottle if at all possible. Oral gastric tube feeding potentiates several complications. First, one cannot adequately determine the correct amount to feed. It is better to allow kittens to self-regulate their intake by bottle nursing. Second, traumatic rupture of the esophagus or stomach can be a common complication of tube feeding. Third, kittens need to suck. It is an innate behavior, and if denied, will result in aberrant behavior including self and littermate mutilation. Fourth and most important, the sucking reflex is a sensitive indicator of the kitten’s health. By bottle feeding one can monitor the kitten’s suck every few hours and, therefore, pick up slight changes in the kitten’s health status before major problems develop. A bottle fed kitten should be held horizontally and be allowed to suckle warm formula ad libitum. In general, a kitten will drink 13 ml/100g body weight daily (divided into six feedings per day) during the first week of life. More frequent feedings may be necessary in weak or small kittens. The amount fed per 100 grams body weight will increase with age (Table 3). Kittens need to be stimulated to burp, urinate, and defecate following each feeding. Burping can be induced by rubbing the kitten’s back in a circular motion. Urination and defecation are initiated by rubbing the kitten’s genitalia with a moist cloth or finger. Kittens will urinate following every feeding and will defecate at least once per day. Take care of the fragile perineal skin as it easily becomes irritated, erythemic and ulcerated. An ointment applied to this area between feedings will help protect the skin.

If tube feeding is required, a human neonatal feeding tube is preferred. Each feeding should be administered in small amounts over a 5 minute period. As stated before, tube feeding is considered much less desirable than bottle feeding and is discouraged.

Kittens should be bottle fed as long as possible. Remember, kittens are not naturally weaned until 9 weeks of age. Times between feedings can be gradually increased to 8 hours over the first 3 weeks of life. No effort to wean kittens, other than providing soft cat food ad libitum, is necessary. By 6-7 weeks of age, kittens start eating available food on their own and by 9 weeks of age are rarely interested in the bottle any more. Forced weaning at an early age (3-5 weeks) is stressful, possibly detrimental for normal development, and unnecessary. Just as kittens need little assistance to begin normal elimination behavior, they also need little assistance in weaning. What they need is time and patience. Given these, they will naturally move through normal developmental stages and hopefully become a well-adjusted, behaviorally normal adult. Weaning is an area that is widely misunderstood. This author is convinced that the generally accepted practice of weaning orphans as soon as possible is contraindicated in pet species.

Orphans must be monitored more closely than their queen raised counterparts. Daily weights are absolutely essential to use as an indicator of kitten health. Maldigestion is more likely in orphans as an infectious disease problems. Treatment of ill orphans is the same as described previously.

Treating neonates as well as raising orphans can be extremely satisfying endeavors, both for the client and the clinician. A little information and observation can make a significant difference in pediatric care. Client education and cooperation is essential. With little expense, a clinician can become a relative expert in neonatal care and thus endear himself to loyal clientele.
Pacheco’s Disease

E.S. Galisky, BS, DVM*
S. O’Brien, DVM**

Introduction

Pacheco’s disease is a viral infection to which only psittacine birds are susceptible. The susceptible birds are often young and affected birds usually have been stressed. This disease occurs worldwide and is also known as inclusion body hepatitis of psittacines. The order Psittaciformes (psittacines) characteristically has curved beaks and feet in which 2 toes are forward and 2 toes are back. Common pet birds in this order include: parakeets, parrots, macaws, cockatoos, cockatiels, lovebirds, lorikeets, and conures. Man and poultry are not affected by Pacheco’s virus.

History

Dr. Genesio Pacheco, a veterinarian working at the Biological Institute of Sao Paulo, Brazil, in 1930 first described this disease. In 1932 a virus was determined to be the causative agent and Pacheco’s disease was so named in 1933. In 1975, Dr. C.F. Simpson identified the virus as a Herpesviridae causing hepatic necrosis and eosinophilic intranuclear inclusions in the hepatocytes. Since then, outbreaks have been reported worldwide.

Clinical Signs

The clinical signs usually follow a definite pattern. Yellowish watery diarrhea occurs 1-2 days before death with depression only hours before death. Frequently there may be no diarrhea, with death occurring 2-4 hours after the depression phase. This phase may be characterized by anorexia, lethargy, inactivity (reluctance to move), ruffled feathers, frequent prolonged closing of the eyes (droopy eyes), and a preference for the cage floor as opposed to the perch. While Pacheco’s disease should be suspected, these clinical signs are nonspecific and may be inconsistent or subtle. If the depression phase is missed, death may be the only sign. Acute death is the hallmark of Pacheco’s disease; therefore, a thorough and meticulous necropsy should be performed.

Post Mortem

The necropsy may show no significant lesions. More often, however, affected birds will have a slightly discolored liver with petechial hemorrhage and tiny focal areas of necrosis. Some birds show only a very subtle diffuse mottling of the liver due to centrilobular necrosis. Additional findings may include a swollen spleen with hemorrhage and necrosis, swollen kidneys, enteritis, and areas of hemorrhage on the heart muscle.

*Dr. Galisky is a 1986 graduate of the College of Veterinary Medicine at Iowa State University.
**Dr. O’Brien is an assistant professor in the Department of Veterinary Clinical Sciences at Iowa State University.

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