



CARE OF THE ORPHANED PUPPY AND KITTEN

CHAPTER 9

Michael E. Peterson

Puppies and kittens may require hand rearing for a variety of reasons; the most obvious is death of the mother. However, some mothers are agalactic, have mastitis, have an underlying disease, or are so debilitated that they cannot care for the litter. Occasionally, litters are so large the dam is incapable of supplying adequate nutrition to the offspring. Some neonates are much smaller or weaker than their siblings and have difficulty competing, thus necessitating hand rearing to improve their chances of survival.

A common assumption is that most neonatal orphans die from infectious disease. However, the majority of orphan puppy and kitten deaths are due to caregiver error by either a delay in identifying a problem or inadequate husbandry knowledge or technical capability to correctly respond. Normal puppies and kittens should eat or sleep for 90% of the day for the first 2 weeks of their lives; if not, all efforts should immediately be directed at identifying the source of their discontent.

Orphans are at higher risk of infection because of a variety of factors, including but not limited to a decreased immune response secondary to stress and not receiving local antibodies from their mothers' milk. Visits from individuals outside the home should be limited. Handling of the litter should be primarily restricted to the caregiver; and everyone should wash their hands before handling the neonates.

Orphaned puppies and kittens along with their mothers and littermates should receive complete physical examinations to ascertain the possible cause of the abandonment. Often, abandoned neonates have significant medical problems, including hypothermia, hypoglycemia, dehydration, and a variety of congenital malformations that need to be addressed. Dams that are preeclamptic secondary to low calcium levels often are nervous and poor mothers and may savage their young.

FOSTERING

Fostering is an excellent approach for managing abandoned or orphaned puppies and kittens. Fostering, if successful, allows issues of proper nutrition, stimulation to eliminate, and temperature control to be managed by the surrogate mother. This approach is not without risk as some bitches or queens may neglect or attack and kill the adoptive puppies and kittens. Successful foster mothers usually accept and nurse orphan neonates immediately. Often, caregivers try to put some odor from the natural offspring onto the adoptive neonates to aid in the process. This is not always necessary; however, care should be taken to monitor the interaction between the new foster mother, her offspring, and the orphan neonates, particularly early in the adoptive process.

HAND REARING

The basic precepts of raising orphaned kittens and puppies involve providing the proper environment (e.g., temperature and bedding), nutrition, stimulation to eliminate, and socialization.

Environmental Control

Control of the physical environment is very important. Orphans need a dry, warm, draft-free, and comfortable nesting box. The nesting box should have sides that are tall enough so the neonates cannot climb out when unattended and get chilled. The nesting box should be easy to clean. However, there are risks with materials that are easier to clean, since they can often be a tremendous heat sink; for example, stainless steel cleans easily, but any neonate coming into contact with this material will rapidly chill.

Plastic sweater boxes work very well as nesting boxes; heating pads can be set on low under a portion of the box.



Figure 9-1 A warm water bottle wrapped in a towel provides an adequate external heat source for neonatal puppies; the water must be changed when it cools. (From Poffenbarger EM, Olson PN, Ralston SL, et al: Canine neonatology. Part II: Disorders of the neonate, *Compend Contin Educ Pract Vet*, 13:25-37, 1991.)

This will limit the risk of moisture conducting heat from the electric heating pad, inducing significant burns of the neonates. One drawback of plastic or glass containers is that they are not absorbent, so care should be taken to deal with any fluids that may end up in the box. Some caregivers advocate locating the nesting box at table height, since neonates receive closer attention if caregivers do not have to bend over (Figure 9-1). Nesting boxes should not be placed near heating vents or air conditioning ducts.

Once puppies reach 4½ to 5 weeks of age and are much more ambulatory, the use of a child's plastic swimming pool works well as a housing solution. These pools are inexpensive and easily cleaned. Additionally, standard-sized folding exercise pens will fit firmly around the pool, keeping the puppies contained. Rubber-backed floor mats with close cloth nap work well as bedding, providing excellent footing and warmth. These are easily removed and cleaned, and when used as a pair, can be rotated so while one is in use the other is being cleaned and dried.

Bedding material should be soft, absorbent, nonabrasive, and easily cleaned and should comfortably insulate the neonate from heat loss. Bedding should provide good footing and be incapable of bunching up and trapping the neonate. Many breeders like newspaper (some purchase unprinted newspaper from local newspaper publishers) because it is easily obtained, absorbent, and inexpensive. Other caregivers (including this author) prefer fabric because it tends to provide better footing; however, material should be selected that does not allow the neonates nails to snag. Poor bedding will retain moisture, dissipating the heat away from the puppies and allowing increased bacterial growth. Regardless of how appropriate the bedding material employed, it must be kept clean or changed frequently.

Environmental temperature control is important for a variety of reasons. Normal rectal body temperature in the first week of life is considerably lower than in adult dogs or cats. Neonatal puppies and kittens do not generate heat by

TABLE 9-1 Environmental temperatures for neonates

Age in days	Nesting box temperature	Normal neonatal body temperature
0-7	85° F (29° C)	96-98° F (35.5° C-36.5° C)
8-28	80° F (26.5° C)	99° F (37° C)
29-35	75° F (24° C)	100.5° F (38° C)
35+	70° F (21° C)	100.5° F (38° C)

movement and do not have an active shiver reflex until about 6 days of age, relying on the environment and brown fat for thermogenesis. In the first week of life, normal body temperature is 95° to 97.5° F (35° to 36° C). In the second and third weeks of life, before the puppy or kitten is actively crawling and walking consistently, normal body temperature ranges from 98.6° to 100.0° F (36° to 38° C).

Puppies and kittens rely on environmental temperatures to keep warm, particularly early in life. Room temperature during the first few weeks of life should be no less than 72° F (22° C). Remember that floor temperatures are significantly lower than thermostat height (heat rises).

Requirements for strict temperature control are particularly needed when there is a single orphan. When there are multiple neonates, they will huddle together to preserve their heat. Neonates in the first week of life need an incubator-like environment with temperatures approximately 85° to 90° F (29° to 32° C). The nesting box temperature can then be dropped to 80° F (26.5° C) for the next 3 to 4 weeks (Table 9-1).

A variety of heat sources are available; however, radiant heat is preferred. Hot water bottles wrapped in towels are effective but can be frustrating since they are labor intensive and necessitate frequent monitoring and reheating. The use of heat lamps is common; however, drawbacks include poorer humidity control and increased risk of burning down the house, kennel, or cattery. Another disadvantage of the heat lamps is that many kittens dislike the open bed required for their use. Heating pads are avoided by some as they can generate inconsistent temperatures (the low setting on one pad can be significantly different from another pad) and are much more likely to induce thermal burns (or scalding) if moisture soaks through from the neonate to the electric pad. Heating pads set on low with some moisture barrier between the pad and the neonates is the most common heat source employed. Very young neonates do not respond well to high environmental temperature and cannot be relied on to crawl away if overheated.

Correct humidity should be 55% to 65%; less humidity is dehydrating and more increases the chances for bacterial growth and subsequent infection. The risk of dehydration is high in the newborn, since 82% of their weight is water. Glomerular filtration rates are 21% of those of the adult at birth but increase in function to 53% by 8 weeks of age.

Minimizing stressful situations is important, allowing the neonates to sleep, eat, and grow. Orphaned neonates are already stressed as they try to cope with a new environment and life without the calming effects of their mothers. Areas with lots of foot traffic and noise increase the stress level. Overhandling, particularly by children, significantly increases stress levels and should be avoided until the neonates are at least 3 to 4 weeks old. High stress levels decrease the immune system, increasing the risk of infection, and can have potentially detrimental effects on future socialization. Some kennels and catteries use pheromone dispensers in the nursery area (Feliway for cats from Veterinary Products Laboratories, Phoenix, AZ, and Dog Appeasing Pheromone for dogs from CEVA Animal Health Inc., Manchester, MO) in an attempt to minimize neonatal stress levels.

Proper hygiene is vital because puppies and kittens have a variety of structural, metabolic, and immune conditions that, although normal for their age, make them more susceptible to infectious disease. Orphans are at greater risk for infectious disease, and the owner should be meticulous about cleanliness of bedding and feeding supplies. The number of individuals handling the orphans should be kept at a minimum, and everyone should frequently wash their hands.

Cleaning and disinfecting should not be considered as synonymous because few disinfectants work well in the face of organic debris; therefore proper cleaning should occur before disinfecting the area. Proper cleaning consists of mild soap, warm water, and elbow grease. This activity along with frequent removal and washing of bedding material needs to be accomplished before any disinfecting activity.

Proper selection of disinfectants is important and care should be taken to keep these from becoming environmental toxins. Neonates have very thin skin and transdermally absorb toxins more readily than adults. Additionally many disinfectants are significant respiratory irritants at higher concentrations. The owner should be particularly careful with cleaning agents such as pine oils and phenols. Overuse of bleach or other disinfectants or employing high concentrations of these products put the neonates at risk.

Feeding

The most common questions regarding feeding of orphans are what to feed, how to feed, how much to feed, and how frequently. Proper hygiene is paramount when feeding neonates. All bottles, nipples, tubes, and any other equipment must be kept clean. Caregivers should carefully wash all feeding equipment, mixing only enough formula to last for 24 to 48 hours and refrigerating any unused quantities in a glass container.

Picking up and handling each neonate for feeding can often alert the caregiver to problems. The neonates should be vigorous, squirmy, and fat. Orphaned puppies and kittens should be weighed twice daily, and the caregiver should acquire an adequate scale for this task (Figure 9-2). Weight loss or failure to gain is one of the earliest indicators of health problems, which should provoke an immediate investigation into the cause.



Figure 9-2 A food scale used to weigh a neonatal pup. (From Johnston SD, Root Kustritz MV, Olsen PNS (eds): *Canine and feline theriogenology*, St Louis, 2001, Saunders/Elsevier.)

BOX 9-1 Homemade milk replacer for puppies

- 120 ml cow's or goat's milk
- 120 ml water
- 2 to 4 egg yolks
- 1 to 2 tsp vegetable oil
- 1000 mg calcium carbonate

Adapted from Hoskins JD (ed): *Veterinary pediatrics: dogs and cats from birth to six months*, ed 3, St. Louis, 2001, Saunders/Elsevier.

BOX 9-2 Homemade milk replacer for kittens

- 90 ml condensed milk
- 90 ml water
- 120 ml plain yogurt (not low fat)
- 3 large or 4 small egg yolks

Adapted from Hoskins JD: Nutrition and nutritional problems. In Hoskins JD (ed): *Veterinary pediatrics: dogs and cats from birth to six months*, ed 3, St. Louis, 2001, Saunders/Elsevier.

Weaning usually begins at 4 to 4½ weeks of age and is discussed in detail later in this chapter. Until weaning age, it is necessary to provide proper nutrition to the orphans. This can be accomplished by feeding an appropriate milk replacement diet. Administering improper replacement diets, such as cow's milk, leads to poor nutrition with inadequate rates of growth and is usually accompanied by the onset of diarrhea. Commercial replacement diets are generally used because they come with a balanced nutritional content. Homemade diets can be made; sample recipes are included in this chapter (Boxes 9-1 and 9-2). However, formulating a nutritionally balanced homemade milk-replacer is difficult. Some owners would prefer homemade

diets over commercial diets; however, several problems need to be overcome. Preparing homemade diets has some significant drawbacks, including acquiring quality ingredients, increased risk of bacterial contamination, and difficulty replicating the dam's normal milk constituents. Bitch's milk contains high amounts of fat, low amounts of lactose, and moderate amounts of protein. Cow's milk and goat's milk are high in lactose, lower in protein and fat, and have less caloric density than bitch's milk. Although supplements can be added to cow's milk and goat's milk to make them more closely approximate bitch's milk, they are too high in lactose, which increases the risk of diarrhea. Studies have demonstrated that homemade diet recipes, even when administered in larger volumes and more frequently, still resulted in slower growth rates than commercial formulas. Cottage cheese should never be used in diets for neonatal puppies and kittens as it congeals in the stomach and can obstruct the neonate. Homemade diets should only be used in an emergency situation until a commercial diet can be acquired. The primary problems with powdered commercial milk formula revolve around mixing errors. Improperly mixed milk formula may be too concentrated, leading to vomiting, bloating, and diarrhea; conversely, formula that is too diluted diminishes the caloric density of each milliliter fed, necessitating more feedings.

There are many commercial formulas on the market for milk replacement in puppies and kittens. One new commercial diet (Gastromate with IgY from PRN Pharnacol, Pensacola, FL) has further simulated mother's milk by adding immunoglobulins (avian IgY) against common canine and feline neonatal gastrointestinal (GI) pathogens. According to the company, these antibodies support local digestive tract immunity and bridge the "blank" period between natural local immunity and immunization. Some commercial diets have added bovine colostrum, which is not as effective as canine or feline colostrum.

Feeding can be accomplished by either bottle or tube feeding with an appropriate milk replacement diet. Bottle feeding works well for vigorous puppies and kittens with a strong suckle reflex because they will suckle until they are full. Weaker or sick neonates are often not able to sustain suckling long enough to receive adequate quantities of formula. If the neonate cannot suck satisfactorily, tube feeding becomes necessary.

Bottle feeding can be accomplished after selecting a properly sized nipple; larger puppies can use human baby bottles and nipples, whereas smaller puppies and kittens require specific neonatal commercial bottles with much smaller nipples (Figure 9-3). Nipples on the commercially purchased bottles usually do not have a premade opening. A proper hole can be made with a hot needle (to melt the hole open). The nipple opening should be just large enough for milk to slowly drip out if the bottle is held upside down; any less and the neonate has to work too hard for the formula, and any larger and the formula flows rapidly, increasing the risk of aspiration. Formula should always be sucked and never squeezed from the bottle.



Figure 9-3 Nursing bottle sizes for puppy compared to toy puppy or kitten.

Feeding position is important. Sternal recumbency is the proper position for feeding with a bottle, the neonate should be able to push off with its front legs (as it would with its mother) and the nipple should be aligned straight into the mouth. Nipple placement is important, since the nursing neonate rolls its tongue around the nipple and creates a seal when nursing. If the nipple is placed at an angle in which this seal cannot be accomplished, the neonate sucks in air and develops colic. The neonate should not overextend its head during feeding because this position increases the risk of aspiration.

If proper technique can be learned, tube feeding has some advantages over bottle feeding, including better approximation of quantity of formula administered, faster administration (important if multiple orphans are to be fed), and increased efficiency. The disadvantages to tube feeding include a learning curve to develop proper tubing technique and increased risk of instillation of formula into the neonates' lungs. The equipment necessary for tube feeding includes a syringe and a flexible rubber or plastic feeding tube. The tube size should be large enough to have some stiffness so it will not flex back on itself, usually between 7 and 8 Fr and occasionally smaller, depending on the neonate's size. The tube should be measured from the neonate's last rib to the end of the nose with the head extended. The tube should be marked at this point. Inserting the tube to this mark will ensure the end of the tube is in the stomach and not in the esophagus or in the lungs. Multiple tube-feeding demonstration videos performed by veterinarians are available on Internet websites. The tube should be placed into the warm milk replacer and the formula pulled up into the syringe in such a way as to keep the tube full of milk so it will not introduce air into the stomach. The neonate should be upright with its head flexed (not extended) and the tip of the tube inserted along the roof of the mouth, following the path of least resistance. No force is needed and most neonates will swallow the feeding tube easily. The tube should be held in place as the milk is slowly infused into the neonate's stomach. Instill the formula slowly because rapid

feeding by stomach tube can cause vomiting or bloating. Infuse the milk over 1 to 2 minutes. Once the feeding is finished, the catheter should be kinked, then slowly removed to avoid milk dripping from the tip and risking aspiration.

With tube feeding, the caregiver determines the volume of formula the neonate receives, as opposed to bottle-feeding in which the neonate decides when it is full. The average stomach capacity in neonates is 0.7 fl oz (4 tsp) per lb (40 ml/kg). The proper amount of formula gives the neonate a rounded belly appearance, but care should be taken to keep from overextending the stomach. Some caregivers advocate “burping” neonates after feeding, although this is not a necessary procedure unless air has been introduced into the stomach.

Most kitten and puppies need about 100 kJ of daily energy per 100 gm of body weight. Milk replacers usually have recommended feeding amounts printed on the label. Most commercial milk formulas provide approximately 5 kJ of metabolizable energy in each milliliter (Table 9-2). The total calculated volume of milk should be divided into multiple feedings. The frequency of feedings is controlled by the size of the recipient’s stomach or by the neonate crying for more food.

Avoid overfeeding at any one meal because this can lead to diarrhea, vomiting, or even aspiration. If the neonate is not gaining adequate weight, increase the frequency of feedings to increase the total daily caloric input. This is easier than dealing with the vomiting, diarrhea, or aspiration that results from overfeeding.

Normal puppies and kittens need about 60 to 100 ml of water per lb of body weight per day. Water should be given until 90 ml/lb body weight has been given. Correct hydration is important, and intake should be calculated since the formula may not supply adequate water at the recommended dilution.

Feeding frequency depends on several factors, including age of the orphan, volume of each feeding, and caloric density of the food. Newborns should be fed 6 to 8 times daily or about every 2 to 3 hours. Once the neonates are a couple of weeks old, the feeding intervals can be increased.

TABLE 9-2 Volume to feed

Week of life	Daily caloric requirements per ounce of body weight
Puppies	
1	3.75 cal/oz
2	4.50 cal/oz
3	5.00 cal/oz
4	5.50 cal/oz
Kittens	
1-2	6.00 cal/oz
3-4	8.00 cal/oz

Milk substitutes roughly contain about 1 cal/ml. Read milk replacer label for actual calories per milliliter. Use puppy milk replacer for puppies and kitten milk replacer for kittens.

Hungry kittens and puppies are restless and will cry until fed. Food must be warmed before feeding and should be at maternal body temperature (101.5° F) (38.6° C); the milk’s temperature can be tested on the back of the clinician’s hand before feeding to make sure the temperature is slightly warmer than skin. Cold food can stimulate vomiting, induce hypothermia, and inhibit absorption by slowing peristalsis. Food that is too hot can burn the neonate’s mouth, esophagus, and stomach. The first few feedings with milk replacer should be diluted (if using canned) or made (if using powder) with a balanced electrolyte fluid to diminish the risk of osmotic diarrhea (Table 9-3).

Puppies and kittens need to be stimulated to urinate and defecate for the first 3 weeks of life. A warm, wet cotton ball can be used to gently wipe the urinary and anal openings. Many caregivers stimulate elimination just before each feeding. Usually, elimination is quickly stimulated, and puppies and kittens have a couple of moderately yellowish stools daily, although neonates may not defecate with every stimulatory session.

Monitoring Growth

Hand-reared neonates may not grow as fast as maternally nursing puppies and kittens. However, once weaned, they usually quickly catch up to their littermates. As a general rule, puppies and kittens double their weight in the first week and then gain 1 to 2 gm/lb of anticipated adult weight each day. Therefore a German Shorthair puppy expected to weigh 50 lb as an adult should gain approximately 50 to 100 gm/day as a puppy.

TABLE 9-3 Common causes of feeding-related problems

Problem	Clinical manifestation	Corrective action
Poor feeding positioning	Increased risk for aspiration	The neonate should be sternal with head in relatively flexed position
Incorrect formula temperature	Hypothermia, poor digestion, burns	Food should be mother’s body temperature when feeding
Feeding too rapidly	Vomiting, colic, bloating	Infuse the milk over 1-2 minutes
Incorrectly mixing the milk replacer	Diarrhea, bloating, poor nutrition	Mix formula according to directions, first few feedings mix or dilute with balanced saline solution
Poor hygiene	Diarrhea, vomiting, infection	Wash all feeding equipment, mix only enough formula to last for 24 hours; keep refrigerated

Neonates should be weighed at the same time twice daily for at least the first 2 weeks. After the initial 24 hours, in which a slight weight loss is expected (10% or greater weight loss in the first 24 hours is evidence of a very poor prognosis for survival), steady growth should occur. After that, monitoring growth every few days should be sufficient. A poor growth rate indicates that there is a problem. It is possible that the entire litter could have some infectious or management issue (e.g., temperature, stress) that could cause failure to thrive (see Chapter 11). If other management issues seem to be in order and all the neonates are losing weight, then strong suspicion arises with the quality of the milk replacer, the amount being fed, the method of feeding, or the frequency of feeding. If the majority of the litter is growing except for a single neonate, then suspicion turns to some underlying problem with the individual puppy or kitten.

Weaning or Introducing Solid Food

Weaning generally begins at about 4 to 4½ weeks of age. Smaller puppies and kittens wean at about 5 weeks of age. Weaning is a stressful event for the neonate. The GI system will be exposed to new protein, carbohydrate, and fat sources. Additionally, the change in texture and bulk of the ingesta is significant. Alterations in GI microbial populations occur. Rapid introduction of solid foods can precipitate constipation. The weaning puppies and kittens not only have to adjust to solid food but also significantly increase their water consumption to maintain hydration. Fresh water should be readily available at all times for weaning puppies and kittens.

Solid food soaked in the milk formula the puppies and kittens are currently receiving can be made into a warm gruel and offered to the neonates. Some readily take to the food, and once one does, the others mimic and begin eating. The initial meal quantities should be limited to smaller portions until the GI tract has had time to adequately adjust (usually a few days). Some kitten and toy breed caregivers use human baby foods as initial diets (no garlic or onions). Any warmed food releases more odors and can stimulate the neonate to taste. Smearing some of the gruel onto the kittens' or puppies' lips can often induce them to lick the food away and get their first taste of solid food. After a couple of days the qualities of food can be increased and often the amount of fluid added can be decreased. The author's Lakeland Terrier puppies are often eating dry food with their mothers at 5 weeks of age; these puppies weigh less than 3 lb.

A note of caution: water dishes should have low sides since puppies have been known to drown in buckets.

Socialization

Proper social development is important for any puppy or kitten since the expectation is that they will become healthy, well-adjusted pets as adults. Key developmental stages and proper socialization techniques to maximize them are beyond the scope of this chapter. Raising orphan puppies and kittens to adulthood with unacceptable social behaviors defeats the

goal of the initial intervention, which should be the development of pets with balanced temperaments for their eventual owners. Why rescue them as orphans just to see them euthanized for significant behavioral issues later?

A kitten reared in total isolation from other cats is at risk of developing psychological abnormalities, including nervousness, aggression, and a reduced ability to cope with strange surroundings, people, or animals (see Chapter 12).

Dogs are highly social animals and are significantly affected by interacting with other dogs, people, and the environment. Several important developmental stages in their lives mold their future temperament and ability to interact acceptably as adults (see Chapter 13).

Passive Transfer Failure

A major question with very young orphaned neonates is whether they received colostrum. Obviously, when the mother dies at parturition, colostrum ingestion has not occurred. Kittens may receive as much as 25% of their maternally derived antibodies through the placenta, whereas puppies receive 5% to 10% at best. Ingestion of colostrum is necessary for significant passive transfer of maternal antibodies. Maximal absorption of antibodies through the GI tract occurs at about 8 hours of life, with virtually no GI uptake of antibodies after 1 day of life. If the clinician is unsure if a neonate has ingested colostrum and is sure another has, then blood can be drawn from both and serum alkaline phosphatase (ALP) and gamma-glutamyl transpeptidase (GGT) levels compared. The enzyme concentrations are dramatically higher (often in the thousands) in neonates that have ingested colostrum and remain high for up to 10 days after consumption.

In those neonates who have not ingested colostrum, antibodies can be provided by administration of serum or plasma from any vaccinated adult of the same species, given orally if the neonate is less than 24 hours old or as subcutaneous boluses in older puppies and kittens. Generally, kittens are administered 15 ml of serum pooled from several adults, given as 3 boluses (oral or subcutaneously), which are administered at birth, 12 hours, and 24 hours later. There is concern about the possibility for isoerythrolysis, and serum should be crossmatched before it is administered. The empirical regimen for puppies is administration of 10 ml/lb (22 ml/kg) of pooled adult serum; this can be given at once in large pups or split into boluses as described for kittens.

SUGGESTED READINGS

- Abrams-Ogg A: Hand-rearing newborn puppies and kittens. In Mathews K (ed): *Veterinary emergency and critical care manual*, ed 2, Guelph, Ontario, 2006, Lifelearn.
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