Feeding Orphaned Kittens From Birth Through Weaning

Ann Wortinger, BIS, LVT, VTS (ECC, SAIM, Nutrition), Elite FFCP
Appalachian State University, Boone, North Carolina

Ellen Carozza, LVT, VTS Clinical Practice (Feline)
The Cat LVT, LLC, Herndon, Virginia

Abstract

The nutritional requirements of neonatal kittens are specific to species, age, and health status. For orphaned kittens, those requirements need to be met by their caregiver. To give these fragile patients the best opportunities for growth and a healthy life, caregivers should be familiar with the nutrients required, commercial products available, and proper administration techniques.
The neonatal period for kittens is considered the first 21 days of life; however, physical attention and emotional care for pediatric patients extend until the kitten is fully weaned, often beyond the expected age of 6 to 8 weeks for more critically ill patients.

The nutrient requirements of kittens differ from those of adult cats due to their exceptionally fast growth rates. When a queen is available to feed and care for the kittens, no further action is needed other than ensuring that the queen has access to a complete and balanced diet and plenty of fresh water. However, for orphaned kittens, or those that the queen has rejected, veterinary professionals and caregivers must often step in to ensure that they receive adequate nutrition and care. It can be misleading to assume that all orphaned kittens need only a formula to fit their needs and that they will simply grow according to the expected timeline. Although true for many, that assumption does not apply to all. Each kitten is an individual—and for some, diet modification can be crucial for their survival. Illness and problems resulting from an incorrect formulation can lead to life-threatening diarrhea, nutrient deficiencies, and electrolyte imbalances.

To ensure proper nutrition for orphaned kittens, consider the proper milk replacer to use, the current caloric needs of the kitten, and whether the kitten can consume those calories by volume. Keep in mind that publicly available charts that go by age and weight alone do not necessarily apply to all kittens. Therefore, it may be up to the veterinary professional to choose the best source of nutrition for orphaned kittens. For milk replacers on the market, there are no guidelines from the Association of American Feed Control Officials (AAFCO) for testing, nor are there other guidelines for minimum performance, thus raising the question as to exactly what makes a product better or worse for kittens. The nutrient breakdown provided in this article is that of queens’ milk, the ideal food for kittens. The most appropriate substitute would be replacers that are closest to the nutrient composition of queens’ milk.

KEY NUTRITIONAL FACTORS

The nutritional supplementation requirements of puppies and kittens differ and need to be reflected in the replacement formulations fed. Because of the specific nutrient requirements of cats as obligate carnivores, and kittens specifically, formulation of a milk replacer should be based on the composition of queens’ milk. Milk from other mammals is not appropriate for nursing kittens. Even when those types of milk have been supplemented (as may be with homemade formulations), the actual nutrient composition remains unknown.

Colostrum

Colostrum produced by the lactating queen provides not only essential nutrients to the newborn but also immunoglobulins. Ideally, all neonates have access to a lactating queen and her colostrum for a minimum of 48 hours, after which immunoglobulins cannot be provided in the diet as the intestines are no longer able to absorb them. Immunoglobulins can, however, be provided through subcutaneous injections of plasma from a suitable donor.

Water

As with all other animals, water is the most important nutrient for kittens. The total body water content of kittens is much higher than that of adult cats. At 1 week of age, a kitten will have a body water content...
of 78.8%, which by weaning drops to 70.1% and by adulthood to 67.7%. Because of their need to maintain high overall water content, kittens can quickly become dehydrated when nutrition has been withheld.\(^1\) A normal kitten needs approximately 155 to 230 mL of water per kilogram of body weight (or 4.4 to 6.5 mL per ounce) daily, which can be provided by properly diluting milk replacers. Dilution instructions are indicated on the labels; however, for a kitten already sick or dehydrated, dilution changes may be needed but should be made under the supervision of a veterinarian.

**Energy**

Newborn kittens require approximately 24 kcal of metabolizable energy (ME) per 100 g of body weight for the first 4 weeks (although the requirements differ for the first 6 days) (TABLE 1).\(^1\) If the calorie content of the milk replacer is known, energy needs should be calculated to ensure enough is being fed. The energy needs of neonates are often mistakenly underestimated; however, overfeeding can actually deprive kittens of energy if it leads to diarrhea, which can cause energy loss when nutrients are lost in the diarrhea.

**Protein**

The minimum protein requirement for nursing kittens has not yet been established; however, it is known that the protein requirement for weaning kittens is in the range of 14.2% to 16% ME; AAFCO recommends 22% ME.\(^1\) Protein contains 3.5 kcal/g; however, calculating the ME of a nutrient or diet is outside the scope of this article.

Queens’ milk contains 32% to 48% protein, depending on the age of the kittens. The content of all nutrients in a queen’s milk fluctuates according to the kittens’ needs; however, because human caregivers are unable to measure those changes, only the volume of the replacer given can be adjusted.

Kittens require essential amino acids, which must be provided by the diet but may not be met if foods with lower protein content are fed.\(^1\) Essential amino acids (e.g., arginine, histidine) are especially important, but that information is seldom available on the label. Another essential amino acid, taurine, is needed for normal growth and development. Taurine is more available in kittens than in adult cats, presumably because of reduced bacterial breakdown of taurine in the gastrointestinal tract. The queen’s dietary taurine intake affects milk taurine concentrations. Cows’ milk, in particular, is a poor source of taurine; correctly balancing homemade milk replacer is even more challenging when feeding cows’ milk to kittens.\(^1\)

**Fat**

The fat content of queens’ milk increases throughout lactation. Average concentrations are 28% dry matter.\(^1\) Dietary fat is a source not only of calories but also of essential fatty acids. The essential fatty acids \(\alpha\)-linolenic and arachidonic acids are needed by all cats but especially those that are growing quickly. Docosahexaenoic acid (DHA) is essential for normal retinal development and function in kittens; as with taurine, the queen’s dietary DHA intake affects milk DHA concentrations.\(^1\)

**Carbohydrate**

No carbohydrate requirements for nursing and growing kittens have been established. In queens’ milk, as the fat content in the diet increases, the carbohydrate content decreases. During a kitten’s first 4 weeks of life, the only glucose source that can be digested is lactose, a carbohydrate found exclusively in mammals’ milk. The pancreatic activity of amylase (the enzyme that helps to break down carbohydrates) is practically nonexistent during a kitten’s first 4 weeks, which prevents kittens from being able to digest non–lactose-based carbohydrates.

---

\(^1\) Adapted from Table 23.4.\(^1\)

\(ME = \text{metabolizable energy}\)
carbohydrates until they are older than 4 weeks. Queens’ milk has a lactose concentration of 14% to 26% dry matter, which ideally should be provided by a replacement formula. However, soon after a kitten is weaned, intestinal lactase activity declines, and overfeeding lactose-containing milk can contribute to diarrhea, bloating, and discomfort. Lactose-specific oligosaccharides require enzymes and intestinal transporters that are not found in young kittens, but when these oligosaccharides reach the colon, if a microbiome is present, they can function as prebiotic fibers and feed the microbiome, thereby helping to support the developing immune system. Other dietary oligosaccharides (many sugar molecules) can be digested by the intestinal microbiome.

Calcium and Phosphorus
Calcium concentration in milk increases during lactation from a very low level in colostrum to much higher levels in milk produced later. For kittens, calcium requirements increase during bone mineralization and growth. Milk phosphorus levels do not vary to the same extent as calcium; therefore, calcium:phosphorus ratios vary significantly from birth to weaning.

Trace Minerals
Concentrations of iron, copper, and zinc are markedly higher in queens’ milk than in cows’ milk. Mineral deficiencies are rarely reported in nursing kittens; however, for those fed milk replacers made from cows’ milk, mineral supplementation is needed to avoid deficiencies. Commercial milk replacers are often fortified with iron at levels exceeding those found in queens’ milk, which for underweight orphaned kittens may help support hematopoiesis (blood cell production) and avoid anemia.

OTHER NUTRITIONAL CONSIDERATIONS

Prebiotics and Probiotics
Commercial milk replacer formulations for kittens often contain added prebiotics and probiotics; however, they can be compromised by improper storage, excessive heat during shipping, and addition of water that is too hot when mixing (which renders any probiotic useless). The bacterial species used in the probiotic should also be specific to the animal species being fed and is still being researched. One type does not fit all.

Use of additional probiotics beyond weaning, until the orphaned kitten is passing normal formed stool, is recommended. Animals of any age that are receiving antibiotics should also receive probiotics to help recover normal gut flora after therapy. For both products to remain effective, probiotics should be fed 3 to 4 hours after antibiotics have been administered.

Digestibility
Digestibility of milk replacers (> 90%) is almost as high as that of queens’ milk (> 95%). High digestibility allows for smaller meals, more calories being digested, and less chance of diarrhea.

FEEDING PLAN

What to Feed
During their first 3 to 5 weeks of life, kittens should be fed only queens’ milk or milk replacer, after which their diet can be slowly transitioned to semisolid and later to solid foods. If a nursing queen is not available, commercial milk replacers formulated specifically for kittens are preferred over cows’ or goats’ milk, neither of which meet the nutritional needs of growing kittens.

How Much to Feed
At birth, newborn kittens require approximately 15 kcal ME per 100 g of body weight (TABLE 1).

When to Feed
To avoid hypoglycemia, most neonatal kittens should be fed every 2 to 4 hours during the first week of life, increasing to every 4 to 6 hours until the kittens are old enough to wean. Kittens’ body temperature must be within normal limits for proper digestion; a hypothermic kitten is unable to digest food because the needed enzymes are inactive at below-normal body temperatures.

How to Feed
Kittens that are stable and willing to nurse are best fed from a bottle. Bottle feeding enables the kitten to nurse until full, helping to prevent overfilling of the stomach. However, many kittens will fail to nurse or give up
before they are full if it is too difficult for them to use the bottle. Several types of nipples are available. The hole in the nipple should be large enough to allow 1 drop of milk to dispense when the bottle is inverted.1

Kittens that are too weak to suckle or have a cleft palate may need tube feeding with a soft rubber or silicone tube. Be sure to mark the tube with permanent marker or tape to indicate how far to pass the tube and to recheck the distance every few days as the kittens grow.

The amount fed should be based on kilocalories, not volume. Not all replacers have the same amount of kilocalories. Weigh the kittens frequently to ensure that they continue to gain weight and that an adequate number of calories are being given.

### When to Wean
Weaning typically begins at 3 to 4 weeks of age and is completed by 6 to 9 weeks. For nursing kittens, the queen initiates the weaning process. For orphaned kittens, the handler should not attempt weaning until the kittens start showing an interest in outside foods. Let each kitten drive the weaning process.1

Not all kittens are physically or mentally mature enough for weaning at 3 to 4 weeks.

---

**TABLE 2 Composition of Milk Replacers Compared With Queens’ Milk**

<table>
<thead>
<tr>
<th>PRODUCT</th>
<th>GUARANTEED PROTEIN</th>
<th>GUARANTEED FAT</th>
<th>GUARANTEED FIBER</th>
<th>GUARANTEED MOISTURE</th>
<th>GUARANTEED CHO</th>
</tr>
</thead>
<tbody>
<tr>
<td>QUEENS’ MILK, 1.21 KCAL/ML</td>
<td>10.72</td>
<td>2.78</td>
<td>0.5</td>
<td>79</td>
<td>7</td>
</tr>
<tr>
<td>Guaranteed analysis, %</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metabolizable energy, %</td>
<td>43.8</td>
<td>27.6</td>
<td>—</td>
<td>—</td>
<td>28.6</td>
</tr>
<tr>
<td>MILK REPLACEMENT WITH OPTI-GUT FOR KITTENS, POWDER (NUTRIVET, NUTRI-VET.COM), 2 KCAL/ML</td>
<td>30</td>
<td>40</td>
<td>0.5</td>
<td>5</td>
<td>24.5</td>
</tr>
<tr>
<td>Guaranteed analysis, %</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metabolizable energy, %</td>
<td>19.78</td>
<td>64</td>
<td>—</td>
<td>—</td>
<td>20.3</td>
</tr>
<tr>
<td>FOSTER CARE KITTEN MILK REPLACER (BREEDER’S EDGE, BREEDERSEDGE.COM), 0.9 KCAL/ML</td>
<td>32</td>
<td>44</td>
<td>0.2</td>
<td>5</td>
<td>18.8</td>
</tr>
<tr>
<td>Guaranteed analysis, %</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metabolizable energy, %</td>
<td>20.3</td>
<td>67.78</td>
<td>—</td>
<td>—</td>
<td>11.92</td>
</tr>
<tr>
<td>CAT MILK REPLACEMENT, POWDER (VET WORTHY, VETWORTHY.COM), 0.87 KCAL/ML</td>
<td>42</td>
<td>25</td>
<td>0.5</td>
<td>5</td>
<td>27.5</td>
</tr>
<tr>
<td>Guaranteed analysis, %</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metabolizable energy, %</td>
<td>32.25</td>
<td>46.63</td>
<td>—</td>
<td>—</td>
<td>21.12</td>
</tr>
<tr>
<td>KITTEN MILK REPLACER, POWDER (PETAG, PETAG.COM), 0.83 KCAL/ML</td>
<td>40</td>
<td>28</td>
<td>0.6</td>
<td>5</td>
<td>26.4</td>
</tr>
<tr>
<td>Guaranteed analysis, %</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metabolizable energy, %</td>
<td>30.44</td>
<td>51.75</td>
<td>—</td>
<td>—</td>
<td>19.64</td>
</tr>
<tr>
<td>KMR KITTEN MILK REPLACER, LIQUID (PETAG, PETAG.COM), 0.83 KCAL/ML</td>
<td>—</td>
<td>5.2</td>
<td>0.8</td>
<td>82</td>
<td>5</td>
</tr>
<tr>
<td>Guaranteed analysis, %</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metabolizable energy, %</td>
<td>—</td>
<td>51.28</td>
<td>—</td>
<td>—</td>
<td>20.3</td>
</tr>
<tr>
<td>WELL &amp; GOOD KITTEN MILK REPLACER POWDER (PETCO, PETCO.COM), 0.39 KCAL/ML</td>
<td>42</td>
<td>25</td>
<td>0.2</td>
<td>5</td>
<td>27.8</td>
</tr>
<tr>
<td>Guaranteed analysis, %</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metabolizable energy, %</td>
<td>32.18</td>
<td>46.52</td>
<td>—</td>
<td>—</td>
<td>21.3</td>
</tr>
<tr>
<td>MOTHER’S MILK CANINE AND FELINE FOOD SUPPLEMENT, POWDER (WYSONG, WYSONG.NET), NA KCAL/ML</td>
<td>49</td>
<td>17</td>
<td>4</td>
<td>7</td>
<td>23</td>
</tr>
<tr>
<td>Guaranteed analysis, %</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metabolizable energy, %</td>
<td>43.25</td>
<td>36.44</td>
<td>—</td>
<td>—</td>
<td>20.3</td>
</tr>
</tbody>
</table>

*Metabolizable energy was calculated by authors, using guaranteed analyses. CHO = carbohydrates; NA = not available.
MILK REPLACERS
The availability of kitten milk replacers is convenient and can be a cost-effective way to support orphaned kittens. With increased awareness of animal care and an increasing number of programs aimed at assisting orphaned kittens, more products are being used than ever before. Powdered milk replacers make up approximately 90% of the milk-replacer market, although liquid forms are available. Some products claim to have the “same ingredients that are present in mother’s milk.” It is important to remember that the body uses nutrients, not ingredients, and having the same ingredients does not mean that they are equal. Using a lactating queen as the gold standard, how do the various milk replacers compare? It is known that queens’ milk contains all the essential macronutrients in a highly absorbable form that is age appropriate. As a result, composition of the queen’s milk changes as the kittens age and begin the weaning process (TABLE 2).

FEEDING TIPS
Having several types of small animal or wildlife bottles available with different nipple systems gives kittens the option of choosing what is comfortable to latch onto. For kittens that cannot latch, have a weak suckle response, or refuse or are unable to eat due to an illness, the standard of care is tube feeding. Although calories should be calculated, a safe standard of 4 mL of fluids per 100 g body weight provides a comfortable volume. Whether feeding by bottle or tube, the formula temperature should mimic that of the queen (100 °F [37.8 °C]). At no time should a neonate be fed formula at room temperature or cold, as their inability to self-regulate body temperature means the temperature of their food can directly affect their core body temperature.

POTENTIAL PROBLEMS
Although other complications are possible, the following are seen most commonly and require immediate intervention.

Diarrhea
Diarrhea is common in orphaned kittens. Possible causes of diarrhea include lack of exposure to the mother’s vaginal flora (currently under study), gastrointestinal infection secondary to omphalitis (umbilical stump infection), or ingestion of infected fecal matter (resulting from non-nutritive nursing on the anogenital area of siblings or from a mother who may have poor grooming habits if ill herself). Kittens with clinical signs of gastrointestinal distress should be treated regardless of age. Although milk replacer formulas can affect stool consistency, perhaps the neonatal gastrointestinal tract is not set up for success with those diets.

Aspiration Pneumonia
When feeding orphaned kittens, caution is needed to avoid aspiration pneumonia. Causes include formula not being fully mixed in water or clots of formula clogging the nipple, causing the kitten to suck harder and then choke on the formula after the clot rushes into the mouth. Inhalation of formula is a risk if kittens are not positioned sternally or if the caregiver squeezes the bottle in an attempt to get the kitten to nurse faster.

Ileus
Compromised neonates are prone to ileus and delayed stomach emptying, which can cause physical distress with bloating, fermentation, and death if not addressed.

Tube Feeding Complications
Complications associated with tube feeding orphaned kittens that are unable or unwilling to nurse on their own are outside of the scope of this article. For more information, visit kittencoalition.org/tube-feeding-for-kittens.

SUMMARY
Caring for orphaned kittens can be a time-intensive yet rewarding endeavor for caregivers. Mortality rates for these fragile patients can be minimized by ensuring that the milk replacer being used mimics what the queen would naturally produce, replicating queen-raised environmental conditions, feeding at appropriate intervals, and monitoring and maintaining ideal body and food temperature.

References


