

Hand-Rearing of Small Felids

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Why Hand-Rear?

Anyone watching a mother cat with her kittens, domestic or wild, can readily see an emerging pattern as the kittens alternately sleep and eat on their own schedule. Sometimes they suck for food, other times simply for the psychological pleasure and comfort that it provides. Always, they are curled up against the warm bodies of siblings or their mother. She is attentive to their every need, licking, repositioning, nuzzling, cleaning and feeding them. Contrast this to the hand-reared kittens, who are periodically awakened from their sleep to have a hard, rubber nipple thrust into their mouth on someone else's schedule, and quickly drink milk of a temperature and taste of someone else's choosing.

Optimally, kittens should be mother-reared. Even the most dedicated human caregiver can never replace the nurturing abilities, psychological needs and nutritional requirements of the natural mother. The comfort and need provided by this early bonding between mother and neonates contributes greatly to their future overall well being. Ultimately it affects their social adjustment, development, behavior and ability to adapt positively to captive life among conspecifics. Experience has also shown that female kittens pulled immediately after birth, most often do not prove to be good mothers. This perpetuates generational cycles of maternal neglect that can often impact general adjustment as well as the success of future breeding programs.

Many factors influence the decision to pull newborns for hand-rearing. The most obvious of these involve maternal neglect due to environmental stress, illness or lack of milk. In larger cats it is felt that a single kitten often is unable to stimulate enough milk let down to produce an amount adequate for its own survival or for the mother to retain her interest in nursing. There is no reason to believe that this could not also be true in singleton births in the small felids.

Today, as captive gene pools, particularly among the threatened and endangered felids, become less diverse and new blood lines less available, more kittens are being pulled at birth. While this is done of necessity, to insure continued propagation of certain animals, it also can begin the cycle of poor mothering that can lead to an on-going need for good hand-rearing protocols. Thus it becomes incumbent upon caregivers to be prepared to pull and hand-rear, rather than repeatedly forfeit young to habitual and known maternal neglect and/or cannibalism. The ultimate goal in these situations, is to learn to hand-rear effectively in a way that will best enable these kittens to be successfully integrated with conspecifics and become contributing members of their species.

Many cats, even those who have been mother-reared, can be confused or inept with a first birthing experience, yet go on to show strong maternal tendencies

with future litters. With potential problem cases, if the disposition and tractability of the mother (and zoo policy) make it possible for a keeper to safely sit with her, placing kittens on nipples and staying until the dam seems to understand what is expected of her, this can be a great aid in the successful bonding process, and hopefully, enable good continuing maternal care. Once colostrum and milk begin to flow, stimulated by increased sucking, the mother-kitten bond usually settles into a positive pattern. Every attempt should be made to facilitate this natural rearing prior to any decisions to pull neonates.

If kittens are to be pulled from a good, attentive mother for intentional hand-rearing (as opposed to necessity), it is recommended that this not be done until at least 8-10 days of age. [The Felid TAG does not recommend intentional hand-rearing for any small felid.- editors] The natural mother should be considered an advantage. In cases where the mother will allow some degree of co-rearing with a keeper or caregiver, kittens can be removed between two to three weeks and still become very manageable cats. The age at removal should correlate directly with the duration and success of this early human contact, as well as the general disposition of the specific species involved.

Whereas a newborn will suckle on anything offered, a kitten that has been nursing from its mother will take longer to accept an artificial nipple and replacer milk. In this situation, do NOT assume that an animal will eat when it's hungry. This is simply not true and you will likely find yourself with a dead or severely depleted kitten. This is a time when great patience is needed. From the moment an older kitten is pulled from the mother, the caregiver must repeatedly give it the opportunity to feel the nipple in its mouth and slowly squirt drops of milk onto the tongue to accustom it to a new taste. With kittens who are several weeks old, it will likely take nearly two days before they begin to suck well. If they have had no human contact during this time, you will be dealing with a hissing, spitting, frightened ball of fur that appears to be all claws. During this period you must be sure that they ingest enough formula to keep them nourished and well hydrated. Drip formula into the side of their mouth, a drop at a time, so they don't aspirate (or squirt directly on the tongue each time it spits!) and be sure to allow them time to swallow between each new drop. This is a time consuming procedure, but it must be done. Once good sucking begins, it will continue and become easy to initiate a feeding schedule. Always begin with a diluted formula, gradually working up to full strength, regardless of the age of the animal.

In the event of a single kitten having to be pulled, it is important to make every effort not to have it isolate reared. Four weeks is a good age to introduce a domestic kitten or kitten of its own or another species. This companionship will provide valuable play experience necessary to socialization and normal developmental skills. Another very visible solution, for a singleton or even a litter, is to make use of a domestic queen as a surrogate. Several institutions have had success with this, and one even used an extremely maternal German shepherd as a foster mother! Hexagon Farm acquired a healthy, lactating domestic queen, who proved to be a wonderful wet nurse for a single newborn clouded leopard. She cared for it completely, as if it were her own. For socialization, a caracal

kitten on a bottle was introduced and the domestic cat cleaned and nurtured it along with the suckling clouded. Over the years this domestic cat continued to care for bottle-fed babies of five other wild species. A pronounced difference in the temperament and adjustment of these kittens could be seen, because of the more normal nurturing that they received. Acceptance of kittens by a surrogate is not always this easy, but it is well worth attempting.

How the kittens are eventually to be used will dictate how they are raised. If their purpose is for use in education programs, for example, then a great deal of human interaction is necessary after the first few weeks of life. In these situations it is very important not to encourage rough play, nor to promote any type of behavior that will become unsuitable and unsafe as adulthood and sexual maturity are attained. First and foremost, these animals are predators, possessing all of the innate instincts for killing and survival that the name implies, regardless of how mild their demeanor may usually seem. Knowing how to "read" your cat's behavior is a plus, but know too that a hand-reared animal can also be the most potentially dangerous. These cats feel no fear or threat from humans, allowing a handler a false comfort level that is never felt with a "wild" cat.

Cats to be used for breeding purposes or exhibit should be handled minimally, and have a chance for socialization and interaction with their own kind. Regardless of what a kitten's future is to be, always provide every opportunity to habituate them to the noises, smells, sights and general routines of life around them. This is important to the adjustment and lowered stress level of all felid species.

Continuing environmental enrichment provides important and necessary stimuli for successful development and behavior. Between 3-4 weeks of age, kittens are ready for simple playthings and plenty of room to practice motor skills. Try to provide an enclosure that best replicates normal species specific behavior and expand it as the kittens grow and become ready for exposure to new challenges. [See also chapter on enrichment by Mellen in husbandry manual.]

Most felids actually do better in a captive environment where some degree of human interaction is involved, regardless of the age at which it begins. Positive keeper/cat involvement can noticeably enhance the animal's daily life and lower stress levels. This enables them to be inquisitive and relaxed in their enclosure, rather than intimidated by their immediate surroundings. Hence, they become a more effective display animal, remaining more readily visible to the public. Perhaps more importantly, are the husbandry benefits of better manageability - e.g., being able to shift, capture, gain closer proximity to observe or medicate, and even, in extreme cases, to be able to palpate an expectant or new mother for milk let down and to pull kittens [see Wooster, this volume].

Preparing for Hand-Rearing

Familiarize yourself with available protocols and needed equipment ahead of time; then, decide what will work best for you. Have a specific plan in place and

be ready to proceed, should pulling neonates or older kittens become necessary. Review the material in the Appendix to aid in your decision making and for reference. Supplement this information by referring to pages 37-39 of this volume, as well as the AZA Animal Health Committee Infant Diet Notebook. Each kitten and litter will differ somewhat, but the basics remain the same and can be adjusted and modified for all situations. Practical experience is the best teacher, as is the ability to know when to ask for help.

The data given in this text has been compiled from consistently successful hand-rearing procedures used over the years by a number of institutions with a wide range of felid species. All contributors' use the same basic protocols, and from experience concur that "if it works, stay with it."

"Neonate" will be defined in this text as the first three weeks of life and all references and information will be for normal, healthy animals. If caregivers have problems or concerns, a veterinarian should be consulted immediately. There is very little margin for error in a severely compromised neonate and no substitute for knowledge and experience in addressing the issues quickly and effectively. Mortality is the highest during the first few days of life. The neonatal period is a critical transition phase from fetal to adult life.

Basic Equipment Needs

Housing

Top choices are a small under seat transport carrier, isolette/incubator or ThermoCare warmer. All are draft-free, and temperature can be easily controlled and regulated. The isolette, incubator and warmer provide the added convenience of enabling neonates to be observed, fed and cleaned without removing them from their environment. Large carriers may be substituted as animals grow and need more space.

Sheepskins, synthetic fleece pads or flannel blankets are preferred bedding, as small claws can become easily snagged in toweling. All are easily kept sterile by laundering.

A heating pad is necessary for the small carrier and should be set on LOW, with a double thickness of bedding placed over half of the pad, enabling neonates to move if they become too warm. A lightweight blanket or towel can be placed loosely over the carrier.

Isoletes, incubators and warmers are usually kept at 85 degrees Fahrenheit in the first few weeks. For those not familiar with the warmer, the sides and bottom of the lower half are filled with water and maintain a constant temperature.

Bottles and Nipples

When selecting a nipple, try to match it with the teat size of the natural mother. Either small rounded or the more elongated Pet Nurser nipples work well for all of the small felid neonates. After the first few weeks, some caregivers prefer the blue Evenflo preemie nipples for the larger species of small felids.

Put a hole directly in the center of the nipple. This is best done using a heated needle. The size should allow ease of sucking at a slow, steady rate. To test size, fill the bottle with hot water and hold upside down. Only a small drop should come out each time the bottle is squeezed. Anything more will cause milk to be ingested too rapidly and increase the chances of aspiration into the lungs. The hole size can be enlarged as needed.

Pet Nurser bottles are available in 1 ³/₄ and 4-oz sizes (also marked with teaspoon and cc equivalents). If a preemie nipple is used, a wider mouthed bottle such as a 4 oz Evenflo or Pet Ag (using TBS measures) is needed. Bottle brushes are also available and should be used as part of your sterilization protocol. Be sure to have an adequate number of nipples and bottles on hand.

Milk Replacers

There are many brands available, in both powdered and liquid forms. Most popular of these over the years have been Pet-Ag's KMR (kitten milk replacer) and Esbilac (puppy milk replacer). Although KMR is formulated to most closely meet the felid requirements for a diet high in carbohydrates and protein and low in fat, some neonates have demonstrated an inability to absorb this well, resulting in excessive diarrhea. For this reason, Esbilac has become the milk substitute of choice for many institutions.

Powder versus liquid formula is also an individual preference. Both are easily stored. While the liquid is ready to use straight from the can (with some water dilution necessary on occasion), unused portions must be discarded after 72 hours. Powders must be mixed with water, by hand, or with a blender and any unmixed powder can be sealed and frozen for up to six months.

Before making a decision, it is important to note the following:

All data prior to 1995 regarding formulas using KMR and Esbilac are based on different ingredient content than currently in use. Butterfat replaced coconut oil (listed as vegetable oil on labels). While this works well for domestic dogs and cats (for whom the products are intended) in a number of non-domestic species, including felids, **sudden constipation resulted in death. Blockages caused by undigested butterfat were found in the stomach during necropsies.**

This does not seem to be species-specific and occurs randomly, but concerns have prompted most institutions to switch to a new Borden/Pet-Ag line of products available in powder form. Called ZOOLOGIC MILK MATRIX, the original (and safe) KMR and Esbilac are now marketed as 42/25 and 33/40, respectively.

Electrolytes

Electrolyte products contain dextrose, and while they do not provide long term nourishment, they do supply energy on a short-term basis and are easily digestible at any body temperature. For the newly pulled neonate, particularly one that is cold and/or weak, this is a good source of sustaining fluids for the first few feedings or used as a water substitute to mix with the first milk replacer feedings. It is also an excellent gut stabilizer during bouts with debilitating diarrhea.

Electrolytes are available in several forms; some can be reconstituted with water, others are bottled in several ready-to-use sizes. A product called PEDIALYTE is easily found in the baby supply section of supermarkets and drug stores. Always have a supply on hand.

Infant Data Chart

A data chart is a MUST for daily recordings of all hand-rearing information and will serve as your reference base for any day-to-day changes as well as a source for future hand-rearing experiences. A sample is given in the Appendix.

Daily weight gain, amount eaten per feeding, notes on formula additions or changes, any medications give, urination and defecation (frequency, consistency, color changes, etc.) developmental and behavioral information are all basic and valuable items to record. In short, record everything involving each animal being cared for.

Scale

An accurate scale with a basket to contain kittens should always be on hand. Preferably, it should weigh in both grams and ounces with size and weight capacity sufficient for use through first few months.

Review the APPENDIX to this chapter for listings and availability of other basic needs and protocols. Familiarize yourself with items that you will need to stock and review all information thoroughly.

HAND-REARING PROCEDURES AND FACTS TO KNOW

What to do after removing kittens from mother

Assess general condition, seeking professional help if needed; WARMTH is the first priority;

If kitten is cold and/or wet, dry completely using a blow dryer set on LOW and held several inches from body and away from face. Alternately, rub briskly with a towel as you blow with the hair dryer;

Be sure that the nasal passages are clear and that the amniotic sac is completely removed;

If the umbilical cord is too long, tie 1/2" from body with unwaxed dental floss, cut just the other side of the knot and treat the end with Betadine solution;

When body is warm and foot pads and inside of mouth no longer feel cold to the touch (tongue and mucous membranes should be pink), place neonate(s) in the warm, draft-free enclosure of choice and leave undisturbed for several hours to stabilize;

Siblings are best left together, for warmth and comfort, unless a distinct need for separation occurs (sucking on each other, weakness or illness);

If there is only a single kitten, provide a small stuffed toy, rolled up hand towel or other form of surrogate for the kitten to lie against.

Colostrum

Colostrum is produced by the mother in the first 24 hours post-partum; this special milk provides antibodies, since neonates' immune systems are not fully developed at birth;

It appears that a large percentage of antibodies are transmitted transplacentally to felids in utero;

If serum is to be given to neonate that have not received colostrum, do this after kitten has been stabilized (i.e., at time of first feeding).

Body Temperature

Neonates are unable to regulate their own body temperature in the first few weeks; therefore, caregivers must carefully control the kittens' temperature environment;

Avoid tendency to keep too warm (if insides of ears feel hot, pads are sweaty or a neonate is urinating on itself, it is TOO HOT);

The kitten should feel warm to the touch, with no distinct feeling of hot or cold when picked up;

Normal rectal temperatures:

- First week 95° F
- Weeks 2-4 97° - 99° F
- 6mos-adult 101° - 102.5° F

If kitten is removed from enclosure to feed and clean, drape lightly with blanket to maintain body temperature.

Weight

Weigh kitten before first feeding, record weight;

Continue to weigh at same time daily;

A loss of not less than 10% in the first 24 hours is normal;

Steady weight gain is the sign of a normal, healthy kitten;

Consult veterinarian if weight loss occurs for no apparent reason.

Behavior

The first two weeks of a kitten's life are spent just sleeping and eating;

Handle kitten only to clean and feed during this period;

Expect movement from first day; this will increase rapidly

Enlarge enclosure space by end of Week 3 to accommodate movement, exploration and development;

Normal kittens should sleep and eat well, gain weight steadily, produce good stools, and are increasingly active.

Formula

Composition of mother's milk changes during the course of lactation and is much diluted in the first 2-3 days; keep this in mind when beginning formula feeding;

Begin with mix of 1 part 33/40 powder to 4 parts distilled water and gradually increase this to a 1:2 ratio by the end of 3rd day;

Mix only enough for a 24 hour period, based on a DAILY CONSUMPTION NOT TO EXCEED 30% of body weight (per kitten) divided by number of feedings;

Mix formula ahead of time to allow any air bubbles to settle prior to feeding;

Never reheat and/or reuse formula after feeding for which it is intended;

Always clean, rinse and store empty bottles sanitarily;

Begin vitamins or other additives (lactaid etc.) on fourth day.

Feeding

A kitten's intestine is usually filled at birth, so feeding is not necessary in first few hours after removing from the mother;

If rectal temperature is below 90° F, digestion of food will not be possible;

First few feedings should be straight electrolytes, followed by several more feedings using electrolytes in place of distilled water when mixing formula;

NEVER OVERFEED;

Allow stomach enough time to empty between feedings;

Heat bottle to 100° F and maintain this temperature during the course of the feeding and test milk temperature on wrist before feeding;

Neonates will often suck until tired, rather than full; give them time to rest during the feeding in the first few days;

After each feeding, stomach should feel comfortably full, never tight, to the touch;

Always have more formula in the bottle than needed, allowing for better flow;

Make any food changes GRADUALLY, giving digestive system time to adjust.

Feeding Position

Always keep kitten on its stomach with head slightly elevated

Tilt bottle so that there is always milk in the nipple

Allow kitten to push and knead your hand or towel with its front paws as it sucks; this is instinctively how it stimulates milk flow while nursing;

Strong kittens show a strong sucking action.

Some common factors adversely affecting sucking

If sucking action is not strong enough, place thumb and index finger on either side of mouth (to create better suction);

Temperature - some kittens will not drink if milk is too cool;

Tilt of bottle - the slightest variation can make the difference;

A new person feeding - force of habit and "feel" can cause a kitten to fuss unnecessarily.

Sample Feeding Schedule

1st week feed every 3 hours/6x daily sleep 4-6 hours at night

2nd-3rd week every 4 hours/5x daily sleep 8 hours nightly

4th week every 4-5 hours/4x daily add baby food

5 weeks to weaning every 5 hours/4x daily

weaning to 6 months 3x daily

6 months to 1 year 2x daily

Weaning

At 4 weeks, begin adding turkey baby food to formula at a rate of 1 TBS per cup formula, gradually increasing to 1/2 jar per cup;

If stool remain normal, continue to gradually increase to 2 jars per 1 1/2 cups formula;

If change in stool occurs, go back to proportion last used;

At 7-8 weeks, begin introducing solid food on saucer with some formula poured over it; alternately, try to hand feed small pieces of solid food*;

Some kittens are slower to wean than others, but kittens should normally be off the bottle and eating solid food between 10-12 weeks of age;

Remember to make all food changes gradually;

ALWAYS HAVE A SMALL BOWL OF WATER AVAILABLE once a kitten is eating only solids.

*Solid food can be introduced as canned ZUPREEM, or meat product to be eaten as an adult, with all large hunks, gristle, fat, etc. removed, or with adult food mixed 2:1 with ground round that has been cooked just until no longer pink. Poultry should also be cooked to avoid salmonella, and finally diced.

Baby food turkey is a favorite choice to add to formula, as poultry tends to keep stools firm. If kittens tend towards hard stools or constipation during introduction of baby food, switch to beef, veal or liver.

Remember that felids are attracted to food by ODOR, TEXTURE, and TASTE, in that order.

Urination and Defecation

Kittens must be stimulated after each meal to urinate and defecate;

Use several pieces of toilet paper or wet cotton balls to stimulate the kitten;

Always keep ano-genital area clean;

STIMULATE BEFORE GIVING FIRST BOTTLE;

Do not be alarmed if first few urinations are pink tinged;

If neonate has not nursed from mother, expect it to pass meconium stools (dark black) for the first few times (mother's milk will produce a sticky, yellow stool)

While on formula, stools will be the consistency of mustard or pudding ("milk stool")

Stool color is a good indicator of digestion

- yellow-brown - normal
- greenish - too much food
- white - not digesting milk

Diarrhea

Severe diarrhea, the consistency of water, sometimes tinged with blood, can dehydrate a neonate very rapidly and result in death if not treated;

Most diarrhea is diet related and easily corrected; some is due to bacterial or parasitological infection or other causes;

Take kitten off formula completely and give only electrolytes for 12-24 hours, using the same amount and feeding schedule as with formula;

Gradually reintroduce formula, beginning with half the strength of what it was before withdrawing, then slowly work up to original strength as stools firm;

Bene-Bac by Pet-Ag, a thin lactobacillus paste, given at 1 drop directly into kitten's mouth prior to feeding, is very effective and also a good product to use in conjunction with antibiotic therapy to stabilize the natural gut flora;

Consult a veterinarian if diarrhea persists.

Constipation

A kitten who has not defecated in 36 hours is considered to be constipated;

A few drops of like KARO syrup added to each bottle for 2-3 feedings will usually clear this up, otherwise consult a veterinarian.

Bloat

This condition is usually due to gas or overfeeding;

Use electrolyte therapy as for diarrhea;

Or use NUTRICAL at rate of 4cc daily divided by number of feedings.

Umbilical Cord Off and Eyes Opening

The dried cord will drop off at between 3-7 days;

If site appears raw or not totally dry, apply PANALOG 3 times daily until well healed;

Eyes usually open between 8-14 days;

During this time, it is not uncommon to see slight crusting around the eyes; gently apply warm water compresses 2-3 times daily and treat with Mycitracin or other ophthalmic ointment.

Claws

Claws should be trimmed in first few days and thereafter on an as-needed basis;

Kept too long, claws are easily snagged in bedding, umbilical cords and other siblings;

As eyes open and kittens become more active, claws can cause injury to corneas and other body parts if left untrimmed.

Miscellaneous

Signs of in utero ascarid exposure can be seen as early as 4 days;

Internal parasites can be a cause of diarrhea;

Ear mites and fleas can also be causes for concern and should be watched for;

Antibiotic therapy is often the only treatment effective in resolving some problems and should only be used after consultation with your veterinarian;

Immunization is usually begun at 8 weeks of age, with a series of 3 shots given at 4 week intervals (8 wks, 12 wks, 16 wks) - if kittens have received no colostrum this series is often begun at 6 weeks or less- vaccine of choice is Fel-O-Vax by Fort Dodge;

Rabies and other vaccinations are an option of individual institutions and their veterinary protocols.

HAND-REARING WEIGHTS

Weights are rounded to the nearest gram (1 oz = 28.35 grams) n= number of individuals represented

<u>Species</u>	<u>Birth</u>	<u>1 week</u>	<u>2 weeks</u>	<u>3 weeks</u>	<u>4 weeks</u>	<u>5 weeks</u>
Rusted spotted cat (n=2)	70	131	185	255	308	363
Pallas cat (n=1)	79	100	172	278	386	563
Leopard cat (n=3)	81	124	210	307	398	504
Black-footed cat (n=2)	85	153	215	262	320	397
Sandcat (n=9)	93	130	202	293	391	508
Amur Leo. cat (n=1)	95	190	300	425	565	670
Margay (n=2)	99	161	237	334	425	511
Scottish wildcat (n=3)	102	142	227			
Jungle Cat (n=2)	190	202 _a				
Jaguarundi (n=10)	134	247	359	485	544	615
Pampas cat (n=1)	140	243	382	500	643	776
Fishing cat (n=6)	177	288-300	491	598-682	777-803	940

<u>Species</u>	<u>Birth</u>	<u>1 week</u>	<u>2 weeks</u>	<u>3 weeks</u>	<u>4 weeks</u>	<u>5 weeks</u>
Asian golden cat (n=4)	188	272	432	619	777	880
Bobcat (n=18)	198	413	552	731	871	920
Canada lynx (n=3)	198	312	397	568	794	907
Caracal (n=15)	213	424	518	610	717	988
Ocelot (n=2)	217	357	496	678	832	920
Serval (n=19)	261	514	594	807	966	1174
Eurasion lynx (n=10)	397	638	747	1021	1323	1625

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Rusty spotted cat CZ

Pallas cat BZ

Leopard cat CZ

Black-footed cat NZ

Sand cat LD, CZ, HF

Amur leopard cat CZ

Margay SDZ

Scottish wildcat SDZ, HF

Jungle Cat SFZ_a (pulled from dam)

Jaguarundi CZ

Pampas cat CZ

Fishing cat CZ, SFZ

Asian golden cat CZ, HF

Bobcat HF

Canada lynx HF

Caracal CZ, HF

Ocelot CZ

Serval HF

Eurasian lynx HF

