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Prolific Cats: The Impact of Their Fertility on the Welfare of the Species*

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KEY FACTS

- Parturition usually occurs at night, and (although complications are rare) delays of up to 48 hours between kittens sometimes occur and should not be confused with dystocia.
- Maternal behavior is the primary social pattern of female cats, and most queens will readily share or accept the care of another queen's kittens.
- Euthanasia of healthy unwanted cats is the leading cause of death of the species.
- Gonadotropin-releasing hormone and zona pellucida vaccines are promising new methods of contraception that are being investigated.

ABSTRACT: Domestic cats are highly precocious and prolific breeders. Uncontrolled reproduction and lack of consistent public attitudes regarding responsible cat ownership have led to serious welfare issues for the species, including overpopulation, orphan kittens, and free-roaming/feral cats. To date, public policy has focused on mass euthanasia as a means of population control. Promoting the value of sterility and veterinary care for cats and developing and implementing inexpensive nonsurgical means of sterilization are critical to improving the welfare of the species.

Domestic cats are a remarkably prolific species. Female cats (called queens) typically bear two to three litters in a single reproductive season. This article will discuss normal parturition in queens and the impact of its frequent occurrence.

PARTURITION (QUEENING)

Parturition usually occurs at night, and most queens prefer seclusion.¹ In free-roaming cats, queening often occurs in isolated locations; therefore, most births go unwitnessed. A few housecats, however, prefer human companionship and may seek out the owners' bed or another communal location to deliver kittens. In this case, the owner should stay with the queen until the newborn kittens arrive to avoid stressing her and complicating parturition.

Behavioral and physical changes accompany impending parturition. One week before queening, females seek out dark, dry areas suitable for nesting. An increase in self-grooming and irritability may be noted. Two to three days before parturition, mammary glands enlarge and milk may be expressed.

A decrease in body temperature usually precedes delivery by 12 hours; however, this is not a consistent finding in all queens.^{1,2} Most litters are delivered

*A companion article entitled "Prolific Cats: The Estrous Cycle" appears on page 1049.

within 2 hours with 15- to 30-minute intervals between kittens, but intervals may range from seconds to hours.¹ Occasionally, a delay of 12 to 48 hours may be noted between kittens. This is usually secondary to disturbances, which may result in delayed parturition and/or moving of the kittens by the queen. Alternatively, the queen may elect to rest during parturition. This should not be confused with dystocia, which is rare in the cat.³

As in other domestic species, there are three stages of labor in the cat^{1,2}:

- The **first stage** is characterized by nesting behavior and may last 1 to 24 hours. The queen appears restless, may pace, posture to defecate, vocalize, groom excessively, refuse food, and paw or dig at the ground or floor. Uterine contractions and cervical dilatation occur during this time.
- The **second stage** of labor is delivery of the kittens. Abdominal press and uterine contractions occur and last from a few seconds to 1.5 hours. During this time, queens may appear uncomfortable and frequently squat, scratch, circle, or rearrange their bedding. Kittens emerge into the vulva and are quickly delivered (Figure 1). Anterior and posterior (breech) presentations are normal.^{1,2} Queens often lick excessively during this stage, ingesting expelled uterine fluids, stimulating the kittens to breathe, and directing them toward the nipples to nurse. On average, one stillborn kitten per litter is considered normal. The stillborn rate is frequently higher in certain breeds, such as Manx, Persians, and Himalayans.¹
- The **final stage** of labor is the expulsion of the placenta. Other kittens may be born before the placenta of a previous kitten is expelled.

The queen usually eats the placenta, probably for nutritional and hygienic reasons. The queen and her new family require warmth, peace, and solitude.

Maternal behavior is the primary social pattern of the female cat.^{1,4} Most queens are excellent mothers and exhibit strong maternal instincts. Free-roaming queens nest communally and care for each other's kittens.⁴ Cooperative nursing is common (Figure 2). Kittens raised in communal nests develop faster and leave the nest sooner than kittens raised by solitary mothers.⁴ Many free-roaming queens are malnourished; although they reproduce successfully, their kitten mortality is high.⁵ Many kittens do not survive to weaning due to malnutrition, parasitism, exposure, and infectious disease.



Figure 1A



Figure 1B



Figure 1C

Figure 1—A queen delivers a newborn kitten. Complications at parturition are rare in cats.



Figure 2—Two queens share the care of a litter of kittens. Most queens readily accept and care for the kittens of other queens.

ORPHAN KITTENS

Although queens are excellent mothers, certain circumstances may arise that necessitate care of orphan kittens. On rare occasions, a queen may die following parturition, reject her kittens, become too ill to care for them, fail to produce sufficient milk, or develop postparturient hypocalcemia or mastitis. In breeding colonies, pregnant queens due to deliver at approximately the same time can be paired and housed together to facilitate shared care of kittens. Most orphan kittens arise from free-roaming queens that are separated from their kittens out of necessity as they search for food or to escape human or other interference. Fortunately, most queens will readily foster the kittens of another queen.¹⁻³

Raising orphan kittens is best accomplished by adopting a lactating queen from a humane shelter. The introduction should take place in a nonstressful setting: a quiet, warm nest away from people and other pets. Selecting a queen whose own kittens are younger than 1 week of age or are recently weaned prevents competition between kittens of different sizes.¹

Foster mothers should be screened for feline leukemia virus (FeLV) and feline immunodeficiency virus (FIV) before being introduced to the kittens. Orphan kittens from mothers of unknown viral status should also be tested for these viruses whenever possible. Vertical transmission of FeLV is common; however, seroconversion is usually delayed for several weeks. Nevertheless, some kittens test positive before 4 weeks of age and would pose a risk to the foster queen and her kittens.⁶

Newborn kittens rely on passive transfer of maternal

antibodies for protection against infectious agents.⁷ In kittens, passive immunity results primarily from transplacental immunoglobulin transfer rather than transfer in utero. Intestinal absorption of immunoglobulins ceases after the first 16 hours of life, so newborns must begin nursing within 12 hours of birth to receive protective quantities.⁷ Orphans of free-roaming queens may have received colostrum and some degree of passive immunity before being separated from their mothers. Kittens that fail to nurse within 12 hours of birth should be isolated and can be vaccinated (using a killed product) at 2 to 4 weeks of age.⁸ After 4 weeks of age, modified-live products may be used.⁸ Alternatively, SQ or IP injection of newborns with a total of 15 ml serum over 24 hours from an FeLV/FIV-negative, thoroughly immunized adult cat provides adequate passive immunity.⁹

If a foster mother is unavailable, kittens may be hand raised. Hand raising kittens is time consuming and sometimes difficult. Kittens should be kept together in a warm nesting box (80°F to 90°F). Because commercial milk-replacement formulas for human infants and puppies do not supply the high levels of fat and protein that kittens require, formulas designed for rearing orphan kittens should be used.^{2,10} Warmed milk replacer (98°F to 99°F) should be fed via a bottle, or, if they fail to suckle, a gastric tube may be used.^{2,10} Table 1 provides general guidelines for feeding. The kittens and their environment must be kept clean. After each feeding, the anogenital area of each kitten should be gently stroked with a soft cotton ball or tissue moistened with warm water to stimulate urination and defecation. See Table 3 for additional resources.

The mother-kitten relationship is very important for normal social and emotional development, and orphans may fail to develop normal social skills and/or may have maladaptive responses to stress.¹ Suckling may occur among orphan littermates and can occasionally traumatize the skin or genitalia.^{1,10} Nonlactating queens may accept a litter of kittens, and although hand-feeding is necessary, the kittens may benefit from the standpoint of behavioral and social development. This may be especially important for singleton orphans that would otherwise be deprived of both maternal and sibling relationships.

FELINE OVERPOPULATION

Euthanasia of healthy unwanted cats remains the number one cause of death of this species.¹¹ In the United States, an estimated 3 to 4 million cats are euthanized annually.¹² Cats outnumber dogs entering many shelters,^{13,a} and more cats than dogs are euthanized

^aPersonal communication: Luke C, Massachusetts Society for the Prevention of Cruelty to Animals, Boston, 2001.

Table 1. Guidelines for Hand-Feeding Orphan Kittens

<i>Week of Life</i>	<i>Frequency of Feedings</i>	<i>Amount of Warm Milk Replacer per Feeding</i>
First	Every 2 hr	1.5–2 ml
Second	Every 2 hr	3–4 ml
Third ^a	Every 4 hr	8–10 ml
Fourth ^a	Every 4 hr	10–12 ml
Fifth–sixth ^b	Every 4–6 hr	Decrease volume and frequency of milk replacer feedings as intake of solid food increases

^aBegin introducing soft-solid commercial kitten food at 3–4 wk of age.

^bComplete weaning at approximately 6 wk of age.

Note: Kittens should gain approximately 0.25 lb/wk.

in shelters^{14,15} (Figure 3). Although the overpopulation problem is complex and multifaceted, certain unique features of the feline reproductive cycle dramatically predispose cats to overpopulation (Table 2).

Lack of knowledge concerning the precocious nature of queens contributes to the problem. A survey of individuals who had placed newspaper advertisements for free kittens asked why the owners had the litters of kittens.¹⁶ Nearly two thirds responded that either their indoor cat had gotten out or that she had become pregnant before they thought she could, either at a young age or while she was still nursing. Surveys of cat owners relinquishing their cats to shelters reveal that most owners do not know how often cats come in heat and believe that they are better off if allowed to have a litter before being altered.¹⁷

In addition to the fact that cats are prolific breeders, the problem of feline overpopulation is exacerbated by the lack of consistent public attitudes and policies concerning what constitutes responsible cat ownership,



Figure 3—Impounded cats at the Lee County Humane Society in Auburn, Alabama. Cats outnumber dogs entering many shelters in the United States.

including such issues as licensing, vaccinating, and control of cats.^{13,16,18} Not only is responsible cat ownership poorly defined, cat ownership itself is poorly defined. A survey of cat owners revealed that only 24% acquired their cats deliberately.¹⁶ (Most cats appear at the doorstep or are received unsolicited from a friend whose cat had kittens.) Given that so many cats are acquired unintentionally, it is not surprising that they receive a lower level of care than dogs do. In fact, surveys reveal that cats receive significantly less veterinary care than dogs.¹⁹

DEMOGRAPHICS

There are an estimated 60 million owned cats in 30 million American homes, currently making them the most popular pet in this country.²⁰ Surveys of cat owners reveal that 33% of owned cats are the offspring of the owner's cat, compared with 18% of dogs.¹⁹ It is not surprising that the most frequent reason given for relinquishment of cats is that there are "too many in the house."²¹ The top three risk factors for relinquishment of cats to shelters are being sexually intact, being allowed outdoors, and never receiving any veterinary care.²¹

Surveys have been performed in some states to determine the percentage of owned cats that are sterilized. In Texas, which has the second largest cat population in the United States (4.5 million cats),²⁰

Table 2. Unique Reproductive Features That Predispose Cats to Overpopulation

- Polyestrous
- Early onset of puberty
- Extreme fertility
- Lactation may not suppress estrus
- Estrous behavior may not be recognized
- Short luteal phase

only 32.6% of owned cats are sterilized.²² Some states report higher sterilization rates. For example, in Massachusetts 82% of owned cats are sterilized¹⁶; however, 20% of these produce a mean of 2.43 litters (with an average litter size of 4.3 kittens) prior to sterilization. Surveys of cat owners reveal that most litters are unintentional and result from queens conceiving before ovariohysterectomy.¹⁶ The most common response from owners who were asked why their cats were not sterilized was that the cat was too young to have surgery.¹⁶

THE WELFARE OF SURPLUS CATS

Millions of cats are killed in shelters every year simply because there are not enough homes for them all. Mass euthanasia is not an acceptable means of population control (Figure 4). In addition to the moral issue, the surplus of cats can create public health and nuisance problems. Finding homes is not a realistic or achievable solution. Not allowing the surplus to develop is the only effective way to ensure the welfare of this species.¹³



Figure 4—Euthanized cats on a typical day at a county shelter in the United States. To date, public policy has focused on impounding and euthanizing cats as a means of population control. New methods of control that focus on prevention are needed.

PREGNANCY PREVENTION

There are various means of suppressing estrus and preventing pregnancy in the queen. The method used must be reliable, safe, inexpensive, and convenient. Both nonsurgical and surgical methods of contraception exist.

Nonsurgical methods include induction of pseudopregnancy and administration of medical contraceptives, such as progestogens and androgenic compounds. Ovulation may be induced medically with human chorionic gonadotropin (hCG; 250 IU IM on days 1 and 2 of estrus) or manually with repeated mechanical stimulation of the vagina (using a glass rod or cotton swab).² Successful stimulation of ovulation does not shorten estrus, but delays the return to estrus by resulting in pseudopregnancy.²

Previous methods of medical contraception in cats have proven to be unsafe. Progestogens, such as megestrol acetate (Ovaban®, Schering-Plough, Union, NJ), can induce diabetes mellitus, severe mammary hyperplasia, pyometra, and adrenocortical atrophy.^{2,23} Similarly, androgenic compounds, such as mibolerone (Cheque®, Upjohn, Kalamazoo, MI), are not recommended because of the risk for hepatotoxicity and thyrotoxicosis.² Melatonin has recently been evaluated by the author as a potential contraceptive but was found to be associated with uterine pathology and cannot be recommended as a safe contraceptive in cats.²⁴

Newer methods of nonsurgical contraception are under development. The most promising are immun contraceptive vaccines targeted against gonadotropin-releasing hormone (GnRH) and zona pellucida (ZP). As its name implies, GnRH supports the development and function of the male and female gonads. Since GnRH is at the pinnacle of the reproductive hormone cascade, production of anti-GnRH antibodies would ultimately result in suppression of testosterone and estradiol production, blocking both fertility and breeding behaviors in males and females.

The ZP is the extracellular matrix that surrounds all mammalian eggs and regulates sperm-egg interaction during fertilization. It is specific to the female reproductive system. Antibodies against ZP prevent binding of spermatozoa and thus fertilization and conception. Immunization against ZP may result in infertility, but it is not believed to prevent estrous cycling and behavior.^{25,26}

Surgical sterilization (ovariohysterectomy) remains the most common and reliable method of pregnancy prevention. It is safe, effective, and associated with no known deleterious effects in cats.

To prevent pregnancy and avoid contributing to overpopulation, sterilization should ideally be performed before puberty. This approach is especially

important for animal shelters because owner compliance with neutering programs is low and many owners allow a litter to be born before neutering.²⁷

The ideal age at which a cat should be neutered is unknown. Many studies have been done to assess the effects of early age neutering on cats. Concerns include risk of anesthesia, stunted growth, obesity, urologic disease, endocrine and dermatologic abnormalities, and behavioral changes.²⁶ There is no evidence in the literature to substantiate claims that early age neutering increases the risk of these conditions. On the contrary, studies reveal these problems are not related to early age neutering.^{26,28-33}

Prepubertal gonadectomy is safe and effective and is supported by the American Veterinary Medical Association (AVMA).³⁴ Studies documenting the long-term effects of prepubertal gonadectomy are ongoing and are expected to further document the safety of this procedure. The author recommends spaying and neutering client-owned cats at 4 months of age following standard vaccination, and sterilizing all shelter cats before adoption as early as 6 weeks of age.

FERAL CATS

In addition to the 60 million owned cats in this country, there are an estimated 30 to 60 million homeless cats: free-roaming, stray, and feral cats.³⁵ A continuum of lifestyles exists between socialized housecats, free-roaming cats, previously socialized ("loosely owned") neighborhood strays, and true unowned, unsocialized feral cats.³⁶ Feral cats are "wild" offspring of domestic cats and result from pet owners abandoning or failing to sterilize their pets.³⁶⁻³⁸ Free-roaming and feral cats form colonies surrounding a "home base," which includes a source of food and shelter. Areas with garbage dumpsters and/or livestock barns are prime locations in which colonies form because they offer a supply of rodents and discarded foodstuffs. Cats typically seek shelter in crawlspaces beneath buildings or other nearby structures.

Like wildlife species, when raised without human contact, cats remain extremely wary of humans and flee if approached. Unlike wildlife species, however, cats cannot fully fend for themselves. Unattended, they breed prolifically and lead short, meager lives, frequently suffering from malnutrition, trauma, and exposure. The mortality rate of kittens in unattended colonies is high.^{5,38} Free-roaming and feral cats can become public nuisances, and they make up a large portion of the cats euthanized at animal shelters each year.^{35,39-41}

An estimated 15 million Americans feed free-roaming and feral cats.⁴¹ In the past decade, the appropriate response to these cats has been the subject

of much debate. The traditional approach to controlling feral and stray cats is extermination by trapping and euthanasia. Extermination of cats from a location is rarely successful because other cats replace the killed animals and reproduction continues.^{38,42-44}

TRAP-NEUTER-RETURN

Alley Cat Allies is a national nonprofit organization dedicated to promoting humane treatment of stray and feral cats. They advocate a safe, humane, and effective method of controlling existing colonies of feral cats called "trap, neuter, return" (TNR). Cats are trapped by caretakers, vaccinated, neutered, and then returned to their "home" for release. The tip of the left ear is cropped to identify cats as having been sterilized. This is the universal symbol for a sterilized free-roaming/feral cat (Figure 5). Caretakers take responsibility for feeding and monitoring the health of the cats in the future. This method is not used for colonies without caretakers.

TNR is based on the premise that the presence of feral cats in a particular location indicates an ecological niche and that removal of cats from that colony will result in migration of new cats to fill the niche.⁴⁵ In other words, extermination of cats increases turnover within an existing colony but does not diminish the size of the colony. Increased turnover leads to "nuisance" behaviors, such as breeding, spraying, and fighting. In addition, it has been suggested that because cats are territorial, cats within a colony will defend that territory against other cats. Based on these tenets, if cats are



Figure 5—A feral cat on the Auburn University campus. Note the tipped left ear—the universal symbol for a sterilized, free-roaming/feral cat. Ears are tipped rather than notched since notching may occur as the result of fighting.

neutered and returned rather than removed, they will guard their food source, keep other cats away, display fewer nuisance behaviors, and not reproduce.⁴⁵ Over time, colony size should decrease due to attrition.⁴⁵

Studies have demonstrated that TNR is a successful method of controlling carefully monitored colonies by preventing growth due to reproduction.^{5,37,45} On the other hand, there are no studies that demonstrate that cats defend their territory against others, thereby preventing migration of new cats and stabilizing colony size. In the author's experience, the effects of TNR on migration of new cats varies from colony to colony and at least partially depends on the social behavior and hierarchy of the colony members.⁴⁶ In some instances, neutered cats exhibit marked territorial aggression and the admission of new cats to a colony is not tolerated, whereas others frequently permit new cats to join.⁴⁶ Other factors affecting colony size likely include the population density of cats in the area, availability of food and shelter, and other factors yet to be determined. Ongoing vigilance and monitoring are essential for successful control and welfare of cats. In addition, in the author's experience, trapping and euthanasia have not been successful at eliminating cats from an area, as it is invariably repopulated with new cats.

Epidemiologic study of populations of cats in communities across the United States indicates that TNR can be an effective method of control,³⁸ and when performed on a large scale, the success of such programs has an impact on animal shelters in that fewer cats are admitted for euthanasia.^{39,47} In addition, TNR has been shown to be more cost effective than trapping and euthanizing feral cats since (1) most states

require impoundment and holding before euthanasia and (2) private individuals frequently volunteer to trap cats for sterilization but not for euthanasia.³⁹ The AVMA supports the use of TNR to control carefully supervised colonies of cats.⁴⁸ Relocation of feral cat colonies is almost always unsuccessful and is not advised because cats possess strong homing instincts and will try to return to the original home base. Table 3 lists Web sites that provide detailed information on TNR procedures for veterinarians and caretakers.

It is important to recognize that TNR programs alone cannot solve the problem of free-roaming cats because of continuous emigration from the owned-cat population.⁴⁹ They do, however, hold great merit as a legitimate response to existing colonies of cats with caretakers and raise public awareness of the welfare issues surrounding cats in this country. TNR programs emphasize to communities that cats require and deserve responsible care, including sterilization; vaccination; identification; and regular feeding, watering, and shelter as well.

TNR programs have been the focus of great criticism and controversy regarding the effects of feline predation on wildlife species, particularly songbirds. Although it is a widely held belief that free-roaming cats are detrimental to bird populations, no scientific studies support this belief, with the exception of isolated island habitats where cats have contributed significantly to bird mortality.^{3,44,49} Studies to determine the extent of feline predation on wildlife in mainland ecosystems in relation to population dynamics and size are needed. When considering this controversial issue, it is important to keep in mind that the goal of TNR is to control the free-roaming cat population.

Table 3. Resources

<i>Organization/Author</i>	<i>Web Address</i>
Trap-Neuter-Return Method for Feral Cats Scott-Ritchey Research Center, Auburn University, College of Veterinary Medicine	www.vetmed.auburn.edu/srrc
Alley Cat Allies	www.alleycat.org
Alliance for Contraception in Cats and Dogs	www.vetmed.vt.edu/accd
California Veterinary Medical Association	www.cvma.net
Feral Cat Coalition	www.feralcat.com
Operation Catnip	www.operationcatnip.org
Raising Orphan Kittens Susan Little, DVM	www.catvet.homestead.com

CONCLUSION

The domestic cat is indeed a prolific creature. The uncontrolled queen is almost always pregnant, nursing, or both. Overpopulation and the problem of feral and stray, "loosely-owned," free-roaming cats are the most serious welfare issues surrounding cats in this country. Despite their seeming popularity, cats are frequently regarded as second-class pets.¹⁶ The belief that they do not need significant regular care is a common misconception.¹⁶ Many are allowed to run freely and breed indiscriminately. They seldom have identifi-

cation, are not licensed, and receive less veterinary care than dogs.

Clearly, the bulk of the effort in combating these problems must focus on prevention. First and foremost, responsible cat ownership must be promoted, emphasizing the importance of early sterilization, identification, preventive healthcare, and keeping cats safe at home.¹⁶ Practitioners must educate owners regarding the reproductive capabilities of cats and the value of sterilization. By promoting the value of cats as companion animals and by educating owners about their needs, practitioners can raise the standard of care for cats. This will serve to enhance the welfare of the feline species and that of veterinary practice as well.

The AVMA advocates strictly enforcing existing animal-control laws, developing more comprehensive and improved laws, requiring licensing for cats, discouraging free-roaming cats, supporting public humane education, and requiring sterilization of all animals adopted from shelters.^{48,50} In addition, the AVMA advises cooperation between veterinary associations, individual veterinarians, animal-control officials, breeders, and humane organizations in effective efforts for population control.⁵⁰

Ultimately, mass euthanasia must be replaced by more humane methods of population control. Despite tremendous effort, shelters adopt out enough potential breeders to repopulate and even increase the pet population in this country. In addition to educating cat owners, addressing the free-roaming and feral cat population is crucial for overcoming feline overpopulation.^{38,40,49}

The AVMA encourages surgical sterilization until an inexpensive means of nonsurgical sterilization can be developed.⁵⁰ The AVMA has concluded that development of an effective, inexpensive nonsurgical sterilization method is a more promising solution that would be faster, safer, and used by more segments of society. Nonsurgical methods of sterilization would be particularly well suited for use in animal shelters and humane societies that would otherwise be unable to provide contraception for female cats because of the lack of funds and technical expertise required for surgical sterilization. Table 4 lists suggested roles for practitioners in overcoming feline overpopulation.

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Table 4. Suggested Roles for Veterinarians in Overcoming Feline Overpopulation

- Recognize the magnitude of the problem.
- Be a humane educator both in practice and within the profession.
- Collaborate with animal control officials, humane societies, and other concerned groups.
- Take leadership roles in creating public policies to control and protect cats.
- Promote the value of cats as companion animals.
- Promote the value of sterilization and identification for all cats.
- Facilitate spaying and neutering.
- Participate in neuter-before-adoption programs.
- Perform surgical sterilization before puberty.
- When available, use nonsurgical means of sterilization.

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ARTICLE #2 CE TEST

The article you have read qualifies for 1.5 contact hours of Continuing Education Credit from the Auburn University College of Veterinary Medicine. Choose the best answer to each of the following questions; then mark your answers on the postage-paid envelope inserted in *Compendium*.

1. Which of the following statements regarding parturition in cats is true?
 - a. It usually occurs at night.
 - b. Anterior and posterior presentations are normal.
 - c. Dystocia is common.
 - d. a and b
 - e. a and c
2. Which of the following statements regarding feline social behavior is true?
 - a. Maternal behavior is the primary social pattern in female cats.
 - b. Cooperative nursing is common among queens.
 - c. Kittens raised in communal nests develop faster than those raised by a single queen.
 - d. a and b
 - e. all of the above
3. Which of the following statements regarding the care of orphan kittens is true?
 - a. Introduction to a foster mother is often unsuccessful.
 - b. Kittens should be kept separately in individual warm nests.
 - c. Queens frequently reject their own kittens.
 - d. a and c
 - e. none of the above
4. Reproductive features that predispose cats to overpopulation include
 - a. seasonally polyestrous, long luteal phase, extremely fertile, overt estrous behavior
 - b. seasonally polyestrous, extremely fertile, lactation may not suppress estrus, late onset of puberty
 - c. seasonally polyestrous, early onset of puberty, lactation may not suppress estrus, short luteal phase
 - d. spring anestrus, short luteal phase, early onset of puberty
 - e. none of the above
5. The leading cause of death of domestic cats is
 - a. euthanasia.
 - b. hypertrophic cardiomyopathy.
 - c. FeLV.
 - d. trauma (hit by car).
 - e. catnip overdose.
6. Which of the following statements regarding zona pellucida vaccines is true?
 - a. They are effective in both males and females.
 - b. They eliminate reproductive cycling and behavior.
 - c. Antibodies against zona pellucida prevent binding of spermatozoa and thus fertilization and conception.
 - d. b and c
 - e. none of the above
7. Which of the following statements regarding GnRH vaccines is true?
 - a. They are effective in both males and females.
 - b. They eliminate reproductive cycling and behavior.
 - c. Antibodies against this hormone prevent binding of spermatozoa and thus fertilization and conception.
 - d. a and b
 - e. b and c
8. Which of the following statements regarding the premise of TNR of free-roaming/feral cats is true?
 - a. The presence of feral cats in a location indicates an ecological niche.
 - b. Removal of cats results in migration of new cats to fill the niche.
 - c. Extermination increases turnover within an existing colony but does not decrease the size of the colony.
 - d. Neutered cats exhibit fewer "nuisance behaviors," including breeding, spraying, and fighting.
 - e. all of the above
9. The most serious welfare issue surrounding cats in this country is
 - a. overpopulation.
 - b. free-roaming/feral cats.
 - c. exposure to rabies virus.
 - d. lack of hybrid vigor.
 - e. a and b
10. Which of the following contributes to feline welfare issues?
 - a. unique reproductive feature
 - b. second-class status
 - c. lack of consistent public policies regarding responsible cat ownership
 - d. lack of owner understanding of feline reproduction
 - e. all of the above