



CORNELL FELINE HEALTH CENTER NEWS

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Feline behavioral problems: social causes and practical solutions

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As with most aspects of clinical practice, prevention is the best treatment when dealing with feline behavioral problems.

Problem behaviors rarely occur by themselves; if pressed, the client may reveal that the cat which has started urinating on his pillow is also more reclusive lately and nasty to his other cat. Calling this simply a case of inappropriate urination does nothing to solve the problem or help the client understand the cause. Crating the cat or boobytrapping the pillow may take care of the most pressing problem, but perhaps a more thorough understanding of the social situation would point to a more satisfying and farther-reaching solution.

A Cornell University study of the lives of barn cats over a 3½-year period has provided a basis for evaluating the behavior of pet cats in the biologically unnatural, in-home setting. The free-ranging rural cat lives in a manner not unlike its ancestor, the African wildcat, which began scavenging around early human settlements between 6,000 and 10,000 years ago.

Barn cats, which are either completely or partially self-provisioning, nearly always maintain a population density of well under 100 per square kilometer; a typical rural population density may be closer to 25 cats per square kilometer, as opposed to a typical urban density of 1,000 or more. The low rural density allows each cat a comfortable range of territory exclusively his or her own, in which to hunt and reign. Cats in the natural setting also keep regular, if not rigid, schedules in their daily activities as a way of spacing themselves over the available habitat and avoiding confrontations.

The relatively recent trend of taking cats into our houses as pets, with the outcome of high density, limited movement and population instability, sometimes puts excessive stress on the cat's social makeup. This stress erupts into a variety of abnormal behaviors.

House cats will often divide a house, creating the farm situation in miniature; a kitchen or backyard may be the common or core area, while the back stairs or a bedroom may be the inviolate territory of one cat. A workable situation such as this could easily become difficult with the addition of a new cat, and many households do consist of several cats introduced to one another as adults.

Just as disruptive may be the removal of a long-term companion. The emotional
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Behavior (Cont. from page 1)
reactions our clients sometimes report in their cats are not usually noted following the death of a companion or parent in the naturalistic environment. The business of survival is much more pressing in the field, however, and it would seem that a companion is much more emotionally significant in the simpler world of the house cat.

A house cat's schedule becomes entrained to its owner's. People lead busy lives, and cannot keep a set routine at all times. Vacations, late meetings, and the like are disruptions we take in stride, but which may not be handled in the same manner by our pet cat.

Aggression

Aggression is one of the most common outlets for social stress. Fighting may occur between two recently introduced cats, and even between two long-acquainted, friendly cats. A new cat in the neighborhood may be a source of frustration to a house pet if it cannot get to this cat; the pet may attack any cat (or person) nearby, as a displacement activity. One cat returning from a stay at a clinic or kennel, or returning to a companion after an encounter with a strange cat outdoors, may evoke aggression by the companion. Presumably the odor of the strange place or cat is disconcerting.

New household members may provoke aggression toward that person or another cat. The intrusion onto the cat's territory may be enough cause, but often a new person also means a disruption in the cat's established routine.

Feline dominance hierarchies often never stabilize, and cats of equal abilities may never cease exchanging attacks as they compete for food or attention. Owners themselves may be attacked if they have not established

a clear dominance over the cat.

Another target may be the home furnishings - the couch, drapes, rug, or pillow. Similar frenzied, intermittent activity can be normal for an unstimulated, bored cat. But true stress displacement attacks are more likely to cause real damage, start suddenly, correspond with a specific event, occur at specific times, and be coupled with other changes in the cat's behavior.

Soiling

House soiling may be an attention-getting activity or emotional reaction, as with the cat whose owner has taken a second job or acquired a boyfriend and ignores the cat. It can also be a scent marking activity. Uncastrated males are notorious for this, but females and castrated males also mark ownership with urine especially if the ownership is threatened.

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FeLV vaccine: update on Cornell research

J.E. Barlough, D.V.M. & F.M. deNoronha, D.V.M.

All diseases in which the etiologic agents are viruses are difficult to treat, and this is especially true for the diseases induced by oncogenic viruses such as the feline leukemia virus (FeLV). Because FeLV has been used as a model for the understanding of human leukemias, a great deal of effort has been expended in this country and abroad to find an effective treatment and/or preventative.

Research into development of an effective vaccine for the prevention of FeLV infection has progressed slowly over the past several years. Despite an increased knowledge of the biological behavior and pathogenetic mechanisms of FeLV, development of a highly protective vaccine has been elusive. Killed FeLV, killed or live infected tumor cells, and modified viral structural antigens (subunit vaccines) have all been utilized with varying degrees of success.

Research at Cornell University in conjunction with Dr. C.K. Grant of the Harvard University School of Public Health has also focused on aspects of FeLV vaccination. In a recent report¹, specific-pathogen-free kittens were vaccinated with either live or inactivated cat lymphoma cells and subsequently challenged with oncogenic feline sarcoma virus (containing "helper" FeLV). Development (or lack of development) of fibrosarcomas in vaccinates was then followed.

Best protection was provided by subcutaneous inoculation of low-dose (5×10^5 cells) freeze-thawed tumor cells, or low-dose (5×10^6 cells) live tumor cells. Although the number of vaccinated cats was low, paraformaldehyde-fixed tumor cells also provided statistically significant protection when compared to the control group (cats vaccinated with

normal feline fibroblasts).

In these groups, no progressive fibrosarcomas developed following FeSV challenge, 35-75% of cats developed small tumors which later spontaneously regressed, and 28-63% developed no tumors at all. Higher concentrations of infectious FeLV were detected in cats with progressive tumors or no tumors. In addition, subcutaneous vaccination with live tumor cells was found to prevent development of persistent FeLV viremia.

The relationship of transient viremia to antibody development in kittens vaccinated subcutaneously with live cells was also investigated. It was found that by day 9 postimmunization, both infectious virus and virus-neutralizing antibodies were present in the circulation. The viremia peaked by day 12 and by day 21 no infectious FeLV could be detected. Disappearance of virus from the blood coincided with peak neutralizing antibody levels and also with the first appearance of complement-dependent FOCMA antibody, which proceeded to increase in titer steadily over the next three months.

Further studies of FeLV vaccination are currently in progress. It is our opinion that only a live, attenuated FeLV vaccine will be practical and effective for the prevention of FeLV infection in the future.

¹Grant, C.K., F. deNoronha, C. Tusch, M.T. Michalek, M.F. McLane:

Protection of cats against progressive fibrosarcomas and persistent leukemia virus infection by vaccination with feline leukemia cells. *Journal of the National Cancer Institute* 65:1285-1292, 1980.

Behavior (Cont. from page 2)

Inappropriate defecation may have the same motivations. The clinician should investigate the location of the elimination; whose pillow or shoes are being marked may provide clues as to the source of the stress. Cats may stop sharing a litter box as part of a social stress situation, or may start "missing" the box. They will also do the same if they get tired of using a litter box which is not cleaned frequently. A first step might be just cleaning it daily instead of weekly.

Excessively timid cats may be poorly socialized. The orphan kitten or runt is often isolated or abused and may always be afraid of other cats. Introducing a dog, a child, or a man (if the cat has been socialized only to women) may be just as difficult in the otherwise normal cat if the cat has not been exposed to these as a kitten.

Symptoms of stress

The range of social stress symptoms is remarkably diverse: aggression, withdrawal, failure to bury feces, house soiling, insufficient to excessive grooming, overeating, anorexia, diarrhea, constipation, vomiting, and chronic piloerection. The signs will depend on the individual cat, owner and environment.

Social stress works as any physical stress does in lowering the immunologic competency of the animal. There are direct effects as well. Prolonged fear or aggression may affect gastrointestinal motility, the former producing chronically increased and the latter chronically decreased motility. Abortions seen in one group of farm cats were possibly due to social stress produced when a young male challenged his father for control of the farm, or because population levels had grown too high.

Prevention

Preventing problems is often the

easiest approach. Male cats are more aggressive and mark more than females; males kept as pets should be castrated. Intact males raised as "lap cats" often become almost wild as they mature, and it is not unusual for them to simply desert their owners. Castrated males do not roam nearly as far, thus limiting their social contacts, fights, and contact with automobiles. Females may be as protective of an area as males, and an owner concerned about fighting should be advised to keep his cats indoors. A neutered female will not attract free-ranging males, and there will be fewer fights in the backyard during the breeding season.

If someone wants to keep several cats in one house, the ideal would be to duplicate the naturalistic setting and raise them together as kittens. It is not necessary that they be littermates. An adult cat will be much more likely to accept a kitten as a companion than another adult, and will usually find another adult of the same sex more threatening than one of the opposite sex.

Introduction of a new cat should be done gradually, confining it to a room for the first few days, then to a cage in the doorway of the room, which the resident cats may investigate for another few days, and only after this, allowing direct contact. The new cat should continue to have a room or cage to which it may retreat.

Resident cats especially socialized to people should receive extra attention from their owners during this period. Progestins given to the resident and/or new cat (see below) may help alleviate some of the anxiety developed during this introduction. If the resident cat displays persistent aggression, starts soiling or withdraws, it might be wise to advise the owners against keeping the second cat. While two cats may keep each other from being bored, there is no apparent

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benefit to the cats of keeping three, four, or more in one house; the veterinarian might remind the owner of the stresses caused by overcrowding.

Kittens

Kittens should perhaps remain with their mothers for three to four months rather than four to six weeks as is routine now, especially if the queen is a good mouser and the kittens are expected to be also. Farm cats routinely nurse for three to five months, and one queen weaned one litter at ten months just after becoming pregnant with the next litter.

A longer maternal care and litter interaction period would improve socialization with other cats, but of course would rely on the breeder or owner to ensure adequate human socialization. Owners taking young kittens should be advised of the harmful effects of isolation. Exposure to people of both sexes, children, other cats and kittens, dogs, even rodents, would be best if any of these figured to be important to the owner or cat later on in the cat's life.

Changes in daily routine or a move may be anticipated. Cats may require extra attention from the owners during the changeover, or the change made gradually. Anecdotal accounts of cats returning to homes up to hundreds of miles from their owner's new residence are numerous. Whether or not all of these are true, cats do show remarkable ties to their home range, starting when they are quite young. A cat should be confined at the new home for a week or more in a comfortable, safe area (a room or cage) with food and water easily available. The cat should then be let out to explore the rest of the house for several more days before letting it outside if it is an outdoors cat.

Realistically, however, problems are presented which need treatment.

Cats unable to tolerate one another may require physical separation, kept in different areas of the house, one or both crated, or one removed completely. Problems with the use of the litter box may be solved by providing two litter boxes. Separate food bowls may also be needed.

Hormone treatment

Injections of medroxyprogesterone acetate (Depo Provera) (50-100mg IM) repeated once or twice at two to four week intervals, or oral megestrol acetate (Ovaban) (2mg/kg daily for two weeks, followed by 1mg/kg daily for one week, followed by 1mg/kg every other day for one week or longer as needed) have helped to reduce aggression, eliminate marking, and decrease fear associated with social stress while the cat becomes more accustomed to the new feature of its environment or the change in routine. Both drugs have worked in eliminating spraying when it persists after castration. Either drug may be used for longer periods in low doses if the problem persists, but the aim of the owner and veterinarian should be to eliminate the cause of stress.

A recent comparison of medroxyprogesterone acetate (MPA) and megestrol acetate (MA) in the treatment of urine marking showed fewer side effects of the progestins (depression, increased appetite) with MPA. (B.L. Hart, JAVMA 177(6):529-533, 1980.) MPA is thus recommended as the drug to be used initially, and MA tried subsequently. Up to 50% of cases of objectionable urination not responding to MPA will respond to MA. The effect of either drug is most reliable if the initiating factors are eliminated as treatment begins.

Some owners are very much antidrug, and hormones seem to offend people even more. One client had a three-year-old spayed female as a pet since

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it was a kitten. She described the cat as aloof, but not unfriendly. The cat spent about half its time at a neighbor's apartment. A new kitten, introduced suddenly, prompted a call and a plea to help her with her older cat's "nervous breakdown." An almost rage-like aggression was directed first toward the kitten, and later toward the owner. The cat growled whenever the owner approached and physical contact was out of the question. The cat was spending almost all its time away from home.

The treatment regime was to be administration of one of the progestins coupled with a period in which the cat was confined to the apartment, and in which lavish attention was given to it; this was to be followed by a gradual reintroduction of the kitten, this time using separate food bowls and litter boxes.

The owner, however, would not hear of drugs of any sort, but she did try the rest of the therapy. It took several weeks to calm the cat down and to reestablish a good relationship between the cat and the owner. Reintroduction of the kitten did not produce any overt problems, although one would not say the two cats are friendly.

The important point is that it is necessary to work with the owner's wishes and ideas as much as possible. Although treatment would have been easier with the progestins, rather than discourage this owner when she refused to go along with this part of the therapy she was told changes might just be a little more difficult to bring about and that she would have to be that much more conscientious about the rest of the suggested therapy.

Drug therapy

Poorly socialized animals may never overcome their fears. A gradual desensitization to the most distressful stimuli may be aided by the oral administration of diazepam (Valium) (0.5 to

2mg) over the course of the desensitization. If the source of stress is a new cat next door, the drug may be given for a week, removed, the cat's reaction evaluated, and the drug discontinued or continued as needed. Extra attention from the owner is important.

If the stress is inside the household, the cat may be exposed to the stimulus slowly for increasing periods. A new member of the household might, for example, sit calmly talking to the cat across the same room for short periods several times a day for several days, then sit closer to the cat, eventually petting and holding it. Of course, this regime will only be successful if the person really does want to become friendly with the cat. If the problem is a dog, the dog must simultaneously receive some social training. An aggressive cat being introduced should be calmed with one of the progestins during this period.

Caging a cat might be a useful adjunct part of therapy. Separating two aggressive cats, or a cat from the sight of a rival outdoors, or confining a spray urinating cat, will mechanically accomplish a disruption of the behaviors associated with the social problem. The behavioral methods already discussed may then be started after several days or a week; by this time the owner may also be more able to rationally approach a particularly vexing problem.

It is hoped the previous discussion provides a base upon which the practitioner may make a knowledgeable evaluation of a set of behavior problems and then work within the limits of the social structure in effecting a solution. Both the cat and the environment must be considered, and the veterinarian must make his suggestions in light of his own evaluation of the needs, wishes and abilities of the most important component of the environment, the owner.

Transmission of feline leukemia virus and its survival in the environment

J.E. Barlough, D.V.M. & F.M. deNoronha, D.V.M.

The feline leukemia virus (FeLV) is the causative agent of the most common neoplasms in cats, leukemias and lymphosarcomas, and of several other diseases that are the leading causes of death in the cat population. Persistently viremic cats are shedders of infectious FeLV and probably remain so for the rest of their lives. Thus they serve as a reservoir of infection for healthy, unexposed, susceptible cats.

Excretion of FeLV occurs primarily by way of salivary secretions, although infectious virus may also be shed in respiratory secretion, feces, and urine. Infection probably occurs principally by ingestion of virus. FeLV-infected healthy cats excrete levels of virus in their saliva that are as high or higher than levels found in the general circulation. In addition, in utero transfer across the placenta and colostral excretion are known to occur.

Thus the social grooming habits of cats, licking and biting, and the urban practice of sharing litter boxes and feeding bowls, probably represent the major methods of spread of FeLV

among pet cats. Kittens may become infected either through an infected queen, or by close contact with other infected cats. Prolonged close contact between cats is considered to be necessary for the most efficient transmission of virus. The latent period between initial exposure to FeLV and the development of either infection or immunity is variable, and may be dependent upon the route of virus transmission.

Studies have demonstrated that age at time of exposure to FeLV, and amount and strain of infective dose, are important determinants of the outcome of an FeLV challenge.

In one study of 173 cats from six FeLV-problem catteries in California and the Northeast, 20-50% of cats in individual catteries were FeLV-positive, with an overall average of positivity of 30%¹. Tracer kittens and adult cats placed into these households were then observed for up to two years.

It was demonstrated that within seven months of continuous exposure to

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Transmission of FeLV (Cont. from page 7)

FeLV shedders, 55% of kittens three to four months of age became persistently viremic, 16% became transiently viremic, while the remainder were aviremic. In contrast only 11% of adult cats had seroconverted after seven months, but 43% of adults were FeLV-positive after two years.

Preliminary data indicated that cats 12 to 17 months of age required the longest exposure before becoming either infected or immune. Even more prolonged exposure to shedders might result in a higher proportion of infected (or immune) cats. Two cats were reported to have become FOCMA antibody-positive and one cat FeLV-positive after three to four years in an FeLV-problem cattery.

Different laboratory strains of FeLV have been shown to cause different disease patterns in experimental animals. The Rickard strain of FeLV, for example, which contains exclusively FeLV subgroup A, is highly oncogenic for neonatal kittens and will regularly induce lymphosarcoma in most inoculated kittens. By contrast the Kawakami-Theilen strain of FeLV, which contains FeLV subgroups A, B, and C, is capable of inducing erythroid hypoplasia and nonregenerative anemias. It is thought that subgroup make-up of individual field strains of FeLV is important in determining their pathogenic potential.

Like some of its related viruses,

and like the coronavirus of feline infectious peritonitis, FeLV is rapidly inactivated by most common household cleansers, such as hypochlorite (Clorox®), diluted 1:32 in water. The envelopes of these viruses are the key to their susceptibility to cleaning agents.

Following removal of FeLV-infected cats, it is recommended that the household be thoroughly cleansed with an agent such as hypochlorite, and that a "waiting period" of approximately 90 days be observed prior to repopulation with FeLV-negative cats. New cats should be tested for the presence of FeLV at least three times (at one-month intervals) before being considered "FeLV-free." Periodic retesting (at six- to 12-month intervals) is also recommended.

It is our goal that vaccination of cats with an attenuated FeLV vaccine will become a routine preventative measure for the control of FeLV infection in the future. Studies to determine the optimal method of vaccine preparation are currently underway at Cornell in conjunction with Harvard University's School of Public Health.

¹Grant, C.K., M. Essex, M.B. Gardner, W.D. Hardy Jr.: Natural feline leukemia virus infection and the immune response of cats of different ages. *Cancer Research* 40:823-829, 1980.

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