



# Cornell Feline Health Center Information Bulletin

## Control of Feline Infectious Diseases within Multicat Facilities

**Fred W. Scott, D.V.M., Ph.D.**  
**John E. Saidla, D.V.M.**

Infectious diseases are a potentially serious problem whenever numerous cats are housed together. Infectious agents such as viruses, bacteria, and protozoa, cause mild to serious, and even fatal, infections in cats. While some infections are difficult to control, in most cases knowledge about the disease and the infectious agent involved, proper management of the cats, and appropriate preventive health measures including vaccinations are useful in a control program. This bulletin addresses the problem of infectious diseases that can exist in catteries, shelters, multicat households, and farms.

*Catteries* are facilities where three or more breeding queens are maintained for the purpose of rearing kittens. The cattery is often within an individual household, or the cats may be housed in a separate building. There are also several large, commercial catteries, or cat colonies, where hundreds and even thousands of cats are raised each year.

*Shelters* are public or private facilities that exist to find homes for unwanted pets. Shelters are often municipal facilities of a city, town, or county. There are numerous private shelters in the United States, and many individuals have established a "shelter" within their home, in an attempt to find homes for rescued stray cats.

*Multicat households* are those homes that have three or more cats present at any given time. In most households the cats have free access to all or most of the house. In some situations, the cats are restricted to individual rooms, a converted garage or barn, or a specially

built facility. A multicat household differs from a cattery in that cats are usually neutered, and thus kittens are not raised.

On *farms* cats have free access to the buildings and land, and they may even be feral. The cats provide rodent control; often they are not neutered; and preventive care and general care may be minimal or nonexistent.

### GENERAL PRINCIPLES OF CONTROL OF INFECTIOUS DISEASES

Transmission of infectious diseases from a diseased or carrier cat to a susceptible cat can occur several different ways. The most common method is by direct contact, or nose-to-nose transmission. A second method is by obtaining the infectious agent from contaminated feed dishes, water bowls, litter pans, floors, resting boards, or furniture. A third method, which may occur in respiratory diseases, is by aerosol transmission, whereby the infectious agent is carried through the air on moisture droplets, usually from sneezing, much like the way human cold viruses are spread. The periodic introduction of litters of susceptible kittens presents special problems for control of infectious diseases.

Certain feline viruses are transmitted vertically from a carrier or latently infected queen to her kittens. In special circumstances, a virus or other agent may be transmitted from the infected mother to the unborn fetus while the fetus is still within the uterus.

Cats that are persistently or latently infected with certain agents—feline herpesvirus, feline calicivirus, feline leukemia virus, and feline immuno-

deficiency virus—are frequently a source of infection to kittens and other cats. Small quantities of infectious virus or other agent are shed into the saliva and respiratory secretions, feces, or urine. Viruses may be shed continually, as in the case of feline calicivirus and feline leukemia virus, or intermittently, as in the case of latent feline herpesvirus infection. Once an acute or primary infection occurs, large quantities of virus are shed by the infected cat. The virus then spreads rapidly to other susceptible contact cats, thus creating a disease outbreak within that cat population.

Barriers against transmitting infectious agents include distance, physical walls, cages, and fences. The greater the degree of separation, or the better the physical barrier, between an infected cat and a susceptible cat, the less the chance that the infectious agent will be transmitted. Separate buildings are better than separate rooms within the same building, separate rooms are better than separate cages within the same room, and individual cages in turn are better than having cats within the same run or cage. Wire cages that allow nose-to-nose contact through the wire may prevent those diseases that usually are transmitted by biting, such as feline immunodeficiency virus, but these wire cages will do little to prevent the rapid transmission of infectious respiratory agents, such as feline herpesvirus and feline calicivirus.

Transmission of infectious agents by people is often the weak link in controlling infectious diseases in animals. Anyone working with cats must constantly be aware of the potential for transmission of viruses or other agents

from an infected cat to a susceptible cat via contaminated hands, shoes, or clothing. The source of the virus may be an acutely ill cat, an infectious cat during the incubation period, or a healthy-appearing chronic carrier cat. Simple procedures, if routinely applied, can greatly reduce the risk of a disease outbreak within a population of cats. These procedures include (1) handling and caring for clean or noninfected cats before caring for infected cats, (2) washing hands thoroughly after handling infected cats, (3) changing shoes or disinfecting footwear as one leaves a contaminated room or building, and (4) changing outer clothing after handling infected cats.

### PRINCIPLES OF DISEASE CONTROL

**Establish a population of immune cats through appropriate vaccination.** An acute infection in a population of susceptible cats results in large quantities of virus being shed into the environment, thus contaminating food and water dishes, litter pans, pens or cages, and floors. This contaminated environment, and not just the infected cats, serves as an additional source of virus to infect other cats. Immune cats will resist infection and hence aid in blocking this cycle of infections.

**Separate infected and susceptible cats.** New cats to be introduced into a group must be isolated or quarantined for a period of at least three weeks, during which they should be monitored carefully and tested for infectious diseases. Only after they have been shown to be free from infectious diseases should they be introduced into the main group of cats. Cats within the population that develop an infectious disease must be immediately isolated from all other cats, and then either treated until no longer infectious or culled from the population.

**Reduce the number of latently infected and persistently infected cats within the population.** Latent and persistent infection in cats result in a nidus of virus that can serve as a source for an infectious disease outbreak within a population of cats. Efforts must be made to identify these "healthy"

carrier cats whenever possible and to prevent them from coming in close contact with susceptible cats, especially young nonvaccinated kittens.

**Eliminate or reduce the amount of infectious agent in the environment.** This is done through proper disinfection of floors, cages, resting boards, litter pans, and food and water dishes. Adequate ventilation to remove virus particles from the air is also necessary.

### INFECTIOUS DISEASES INVOLVED

Several infectious diseases of cats are common problems in multicat facilities. The following briefly summarizes the more serious of these diseases.

*Feline leukemia virus (FeLV) infection* is caused by a virus belonging to the retrovirus family. This virus causes a wide variety of clinical diseases including tumors (lymphosarcoma), chronic enteritis, anemia, and immunosuppression with increased susceptibility to other pathogenic agents. [7, 12, 15, 23] Approximately 30 percent of exposed cats become persistently infected [7, 15] and continually shed virus in their saliva. These cats can transmit the virus to other cats in close contact.

*Feline immunodeficiency virus (FIV) infection* is caused by another retrovirus, and may produce persistent infections resulting in immunosuppression and an AIDS-like disease after several years of infection. [9, 12, 23, 25] The infection appears to be transmitted primarily by cat bites.

*Feline herpesvirus (FHV) infection, feline viral rhinotracheitis (FVR), or "rhino,"* is a common and serious upper respiratory infection of cats. [5, 8, 12, 23] Clinical disease produced by FHV includes sneezing, ocular and nasal discharge, crusty eyes, fever, occasional ulceration of the cornea of the eye, and depression. The virus is highly contagious and especially common and troublesome in breeding catteries. Cats recovered from FHV infection are latently infected with the herpesvirus, and, during periods of stress, a recrudescence of infection can occur with shed of virus. This virus can infect susceptible cats, especially nursing kittens, that come in contact with the carrier cat.

*Feline calicivirus (FCV) infection* may produce one or more of several clinical manifestations, including mild upper respiratory infection (ocular and nasal discharge), ulcerations (on the tongue, in the mouth, and possibly on the nose), pneumonia (sometimes fatal), acute arthritis with joint pain, high fever, and enteritis. [5, 8, 12, 23] FCV is highly contagious during acute infections, and recovered cats are persistently infected and continually shed small quantities of virus in the saliva.

*Feline chlamydiosis, or feline pneumonitis,* is an upper respiratory infection or pneumonia caused by a bacterial agent called *Chlamydia psittaci*. [5, 8, 23] Chronic ocular or nasal discharge and signs of chronic bronchitis and pneumonia are frequently seen with this infection after an incubation period of six to ten days. This infectious agent is spread by direct contact, by contaminated areas or dishes, and by aerosol transmissions.

*Feline parvovirus (FPV) infection, or feline panleukopenia (FP)* (also known as feline "distemper" or feline infectious enteritis), is a highly contagious viral disease of cats, and is the disease most often fatal in unvaccinated populations of cats. FP is characterized by a sudden onset, complete inappetence, severe depression, severe dehydration with sunken eyes, and acute diarrhea. [13, 18, 20, 23] The mortality in young kittens during an outbreak in a shelter or on a farm may be 50 to 90 percent. Fortunately, excellent vaccines for FP are available, and properly vaccinated cats are completely protected against this devastating virus. Transmission is by direct contact of infected and susceptible animals, or by contact with a contaminated environment. The virus is extremely stable and will remain infectious for years in a contaminated environment unless inactivated with appropriate disinfectants.

*Feline rabies* is a fatal neurological disease of cats which is always of serious concern because of the transmissibility to humans. [2, 6, 12] More cases of rabies are now reported in cats than in any other species of domestic animal in the United States. Infection in cats usually occurs as a result of a cat's contact with infected wildlife, such as a



skunk or raccoon. Any outdoor cat showing abnormal behavior—either aggressiveness or unusual friendliness—should be handled with extreme caution, immediately isolated, and examined by a veterinarian. Shelter personnel and farm workers, especially in areas where rabies is endemic in wildlife, must be constantly aware of possible rabies in cats as well as dogs.

*Feline infectious peritonitis (FIP)* is a common coronavirus infection of cats that often is subclinical, but which may develop into a slowly progressing disease that is nearly 100 percent fatal. [11, 12, 19, 23, 24] Clinical disease is characterized by an incubation period of a few days to two or three weeks (but sometimes as long as several months) followed by an insidious onset of clinical signs, including a persistent fever and inappetence with progressive weight loss. Some cats will have a progressive accumulation of fluid in the abdomen (ascites) or the chest cavity, and some will develop neurological disease, enteric disease, or various other clinical signs. FIP is especially troublesome in breeding catteries, and it is the disease most feared by cattery owners. Currently there is no accurate diagnostic test, no effective treatment, and no vaccine available; the only effective measure is to prevent infection. If cats are tested and found to be negative for antibodies to coronavirus, then strict measures of isolation and testing should be established to keep this population free from FIP virus.

## TYPES OF FACILITIES

**Catteries.** Control of infectious diseases in catteries presents special problems associated with the raising of kittens. Latently infected or persistently infected queens can transmit viruses to their kittens. This occurs with FHV, FCV, FeLV, and presumably FIV and FIP. Acute respiratory disease frequently occurs in kittens five to eight weeks of age, and FeLV and FIP may occur in kittens several months after they have left the infected cattery as apparently healthy kittens. Kitten mortality complex may occur in certain catteries, with mortality ranging from 40 to nearly 100

percent; many of these kitten losses are due to various infectious diseases. [22]

All cats within a breeding cattery, and any cats introduced into the cattery, should test negative for FeLV and FIV. Because these two viruses must not be present in a breeding cattery, the cat population should be screened for FeLV and FIV every six to twelve months. In addition, some cattery owners are beginning to test all cats in an attempt to prevent FIP. Cats that have any antibody titer against coronavirus should be isolated from the breeding cattery. This procedure to control FIP is drastic and should only be attempted where there are actual losses caused by FIP.

All cats should be routinely vaccinated against FPV, FHV, and FCV. Depending upon circumstances—for example, outdoor access—cats should also be vaccinated against feline chlamydiosis, FeLV, and rabies. When respiratory disease is a problem in the cattery, all kittens should be vaccinated against FHV, FCV, and feline chlamydiosis starting at four weeks of age and again at eight and twelve weeks of age. All cats should be vaccinated annually, and it may be advantageous to revaccinate breeding queens one month before mating in order to transfer as much passive immunity as possible to the kittens through the colostrum or early milk. [23]

Breeding catteries will have five distinct populations, which should be housed in separate rooms or facilities: (1) the main cattery, (2) a “maternity ward” for pregnant queens and queens with nursing kittens, (3) a “nursery” for weaned kittens, (4) a quarantine room for incoming cats, and (5) an isolation room for any infected cats. [3, 4]

**Shelters.** Adoption shelters run the complete spectrum from the small, private shelter within a home run by a single person to the very large corporate shelter with numerous personnel and large facilities. The degree and quality of control of infectious diseases, unfortunately, also runs the complete spectrum from almost nonexistent to very effective. People operating small, private shelters with inadequate facilities and financial resources, however noble

their intentions, may do more harm than good for the cat population within that neighborhood. We have interacted with numerous individuals who are attempting to run a private adoption shelter from their home, and, unfortunately, end up with forty or fifty cats living in conditions with no vaccination or disease-control programs in existence. The most effective disease control these individuals could establish would be to reduce the cat population to a reasonable number for their facilities and financial resources and to refrain from taking in additional strays.

Shelters with multiple personnel should establish a written policy or procedure for operation of the shelter that includes detailed procedures aimed at control of infectious disease. No shelter will control and prevent infectious diseases 100 percent of the time, but the best workable procedures possible should be clearly established, given the limitations of facilities, monies, and personnel. The director of each facility should critically evaluate the operations of the facility monthly or every few months to see if shortcuts have crept into the operation of the facility that will compromise the control of infectious diseases. Accurate records should be kept of the number and type of infectious diseases encountered each month within the facility.

Each shelter should have a minimum of three rooms or areas for housing cats. The main room or rooms will house healthy kittens and adult cats that are ready for adoption. If possible, this adoptable population should be divided into units of no more than ten cats per run or room. The second area is the quarantine room. This should be as isolated as possible and should only contain healthy-appearing cats that are entering the facility. Cats in the quarantine room should be caged individually or as litters of kittens. Cats entering the facility should be examined as soon as possible, tested for FeLV, vaccinated, and placed in recently disinfected cages. New cats should remain within the quarantine area as long as possible—at least fourteen days is recommended, although not always possible in public shelters—before entering the main adoption facility. One must realize that

the shorter the quarantine period, the poorer the disease control within the facility; vaccinated cats will not have time to develop the full degree of immunity from the vaccine, and some cats will be incubating disease at the time of entry (but this may not be evident for several days). The third area necessary is an isolation room for housing sick cats. The isolation room must *not* be used for the quarantine room for entering healthy cats, a procedure mistakenly used in some shelters. Sick cats should be treated and held in isolation until they are judged healthy and ready for adoption, when they may be returned to the main adoption area. Incurably ill cats and those judged to be persistently positive for FeLV should be humanely euthanized.

**Multicat Households.** Homes having three or more cats but without an active breeding program classify as a multicat household. In these homes, infectious diseases are not as prevalent as in the other multicat facilities as long as

the cat population is stable. When problems occur it is usually because a stray cat is introduced into the household, often without proper quarantine and testing for infectious diseases like FeLV. This Good Samaritan syndrome is all too familiar to veterinarians: an owner with three or four cats states emphatically that she or he will not be adopting another cat, but a stray, pathetic kitten appears on this owner's doorstep; the kitten then "adopts" this household and in the process can expose the rest of the cats to FeLV, respiratory viruses, or even FIP or FIV. Prevention of infectious diseases in a multicat household should be aimed at maintaining a properly vaccinated group of cats and introducing new cats only after they have been isolated in quarantine for at least four weeks and have tested negative for FeLV, FIV, and FIP.

**Farms.** Farms present a unique set of disease-control difficulties. Cats on farms are outdoor and free roaming

and therefore readily come in contact with other outdoor cats as well as wildlife. Prevention of infectious diseases on farms generally is limited to establishing at least a minimal vaccination program against FPV, FHV, and FCV in kittens at eight and twelve weeks of age. All kittens should be vaccinated for rabies at twelve to sixteen weeks of age. Above this minimal program, one should consider annual revaccinations, FeLV testing, and vaccination. Population control—using a spay and neuter program—is often necessary.

### VACCINATIONS

An appropriate vaccination program diligently carried out is an absolute necessity for any multicat facility. Vaccination recommendations can be found in various publications. [1, 10, 12, 23] Table 1 gives general recommendations for vaccination of cats.

**TABLE 1. FELINE VACCINATION RECOMMENDATIONS**

DISEASE	Type of Vaccine	Route of Administration	Age at First Vaccination (weeks)	Age at Second Vaccination (weeks)	Revaccination intervals (months)
Panleukopenia	MLV	SC or IM	8-10	12-16	12
	Inactivated	SC or IM	8-10	12-16	12
	MLV-IN	IN	8-10	12-16	12
Viral rhinotracheitis	MLV	SC or IM	8-10 ^	12-16	12
	Inactivated	SC or IM	8-10	12-16	12
	MLV-IN	IN	8-10	12-16	12
Caliciviral disease	MLV	SC or IM	8-10 ^	12-16	12
	Inactivated	SC or IM	8-10	12-16	12
	MLV-IN	IN	8-10	12-16	12
X Pneumonitis (Chlamydiosis)	MLV	SC or IM	8-10	12-16	12
Rabies*	Inactivated	IM	12	64	12 or 36
Feline leukemia	Inactivated subunit	SC or IM	9	12 and 24	12
	Inactivated whole virus	IM	10	13-14	12

MLV=modified live virus, SC=subcutaneous, IM=intramuscular, IN=intranasal

\*For details see the 1990 compendium of animal rabies vaccines, *Journal of the American Veterinary Medical Association*.

^ May be performed earlier but at the risk of increased maternal antibody interference.

(Modified from: Canine and feline immunization guidelines. *Journal of the American Veterinary Medical Association* 195: 314-317, 1989.)

All cats must be vaccinated against FPV, FHV, and FCV. [1, 5, 16, 18] Kittens should be vaccinated at eight to ten weeks of age and again at twelve weeks of age or older and revaccinated annually. In breeding catteries where respiratory disease is endemic, vaccination of kittens should begin at four weeks of age, with repeat vaccinations at eight and twelve weeks of age. In shelters or other facilities with a rapid influx of cats, modified live-virus vaccines will give faster protection and therefore are preferred over inactivated vaccines.

Additionally, cats can be vaccinated for feline chlamydia, feline leukemia, and feline rabies if the conditions warrant. Cats that may be exposed to wildlife, including all farm cats and all outdoor cats, should be vaccinated against rabies. [1, 10, 14, 23]

## DISINFECTION

Proper daily disinfection of areas frequented by cats is essential to control infectious disease in facilities where many cats are housed together. Each type of facility will vary in the amount and type of disinfection possible, but as much as practical, all areas should be disinfected daily.

The type of disinfectant used should be selected carefully. [17] Not all disinfectants that are sold as "virucidal disinfectants" will inactivate or kill all viruses. FPV and FCV are particularly difficult to inactivate, while some viruses, like FHV, are easily inactivated by almost any disinfectant. The most practical and effective disinfectant is ordinary household bleach diluted 1:32 in water (4 ounces per gallon of water). A cleaning solution or other disinfectant/soap preparation may be carefully added to the bleach solution just before use.

All food and water dishes should be washed, soaked for five to ten minutes in the bleach solution, and then thoroughly rinsed in clear water before reuse. Litter pans should be cleaned and disinfected daily, or as often as practical,

and the litter should be disposed of properly.

Hard surfaces such as cages, floors, and exposed walls, should be disinfected daily. Towels, rugs, and pads should be frequently washed in hot water. Rugs and upholstered furniture cannot be adequately disinfected, however. In such situations—where routine disinfection cannot be done—the degree of control of infectious diseases will be compromised.

## SUMMARY

Feline infectious diseases caused by viruses and other pathogens are serious and common problems in facilities housing multiple cats, especially in facilities that have a rapid turnover or in breeding catteries raising kittens. A basic knowledge of controlling infectious diseases, plus a dedicated protocol for operation of the facility combined with a stringent vaccination program can greatly reduce the incidence of infectious disease outbreaks within that facility.

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## About the Cornell Feline Health Center

The ultimate purpose of the Cornell Feline Health Center is to improve the health of cats by developing methods to prevent or cure feline diseases and by providing continuing education to veterinarians and cat owners. The Cornell Feline Health Center is a nonprofit organization supported primarily by private contributions. Correspondence may be directed to:

Cornell Feline Health Center  
Cornell University  
College of Veterinary Medicine  
Ithaca, NY 14853-6401

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