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Feline Leukemia Virus (FELV)

This information handout is designed as a method of communication between veterinarians and clients who own cats with Feline Leukemia Virus (FELV). The causes, metabolic changes and diagnosis of this disease are discussed, and possible treatments are presented. If you have any questions, be sure to ask your veterinarian to answer them for you.

The Virus

Feline leukemia virus (FELV) can cause many different diseases in domestic cats -- from an immunosuppressive syndrome to cancer. While many cats are able to resist the infection or show minimal side effects, about one-third of infected cats become sick and die from it. As a result, many experts consider FELV the most important infectious disease of cats.

Feline leukemia virus belongs to a unique family of viruses called the retroviruses. This group includes the viruses responsible for AIDS and equine infectious anemia. Like all viruses, FeLV is an obligate parasite--it can grow and multiply only within living cells.

The feline leukemia virus and other retroviruses use a particularly devious method to fool the cell into producing more virus; when FeLV infects a cell, it may make a copy of its own genetic information and inserts it into the cat's chromosomes. The virus is now part of the cell's genetic make-up (latent infection). These cells may start to produce new viruses at any time, and those new viruses then go on to infect other cells. The presence of the virus may severely suppress the immune system and/or lead to tumor formation.

Hosts

The range of animals (host) susceptible or affected by FeLV infectious appears to be restricted to members of the cat family. Domestic breeds, as well as certain small exotic cats such as sand cats, European wild cats, jungle cats, and possibly Leopard cats, are susceptible.

Transmission

FeLV is shed primarily in the saliva and may also be present in respiratory secretions, feces and urine of cats. The social grooming habits of cats, as well as licking, biting, sneezing, and the practice of sharing litter boxes and feeding bowls, probably represent the major modes of spread of FeLV among pet cats.

Also, in utero transfer of FeLV across the placenta and excretion of FeLV in colostrum and milk are known to occur. Therefore, kittens may become infected, either through an infected mother or by close contact with other persistently FeLV-infected cats.

Prolonged close contact (days to weeks) with an infected cat seems to be required for effective virus transmission. The virus can also be spread in blood transfusions from infected cats.

FeLV Infection and Disease

Viremia is a virus in the bloodstream. A low-grade transient viremia involving small numbers of

white blood cells occurs within 2 weeks after initial contact of a cat with FeLV and infection of local tissues (usually in the mouth or throat). This facilitates the spread of the virus to other areas of the body, such as the lymph nodes, intestine and bone marrow.

Infection of white blood cells and other types of cells in the bone marrow, with the subsequent release of infected cells into the circulation, produces a second, more profound and long-lasting viremia, called a persistent viremia.

In cats destined to become persistently viremic, the infection involves the bone marrow, pharynx, esophagus, stomach, bladder, respiratory tract and salivary glands. In cats that resist infection with FeLV, containment of the virus may occur in the early stage of infection.

All persistently viremic cats excrete FeLV and probably do so for the rest of their lives. These cats are a serious health hazard for uninfected, susceptible cats with which they come in contact.

Cats that develop immunity to the FeLV virus experience an initial transient viremia lasting from a few days to as long as 8 weeks, during which time they too may shed FeLV. In some of these cats, the virus remains sequestered somewhere in the body. Some mothers with sequestered infection may transmit FeLV to their kittens through their milk, and the possibility of reactivation of the latent infection to a viremic state as a result of immunosuppression can occur. These cats do not normally transmit FeLV and do not seem to be especially susceptible to developing any of the FeLV-associated diseases. The duration of a sequestered infection varies; however, most cats appear to become truly FeLV-free 2 or years after infection. No test is readily available to identify cats with either sequestered or latent infection.

The FeLV-Associated Diseases

Cats persistently infected with FeLV may develop one or more of a number of diseases that are caused, either directly or indirectly, by the virus.

Immunosuppression, which is the prevention of the formation of immune response, is the most common outcome of FeLV infection and the underlying cause of many related conditions. Disease indirectly caused by FeLV are the result of FeLV-induced immunosuppression and present some of the most frequent manifestations of FeLV infection. Among these secondary disease are:

- chronic mouth and gum infections
- skin and ear infections
- chronic respiratory disease
- intestinal infections
- feline infectious peritonitis (FIP)

Diseases directly caused by FeLV include:

- *Lymphosarcomas*. Tumors composed of white blood cells called lymphocytes. These cancers may take several forms, depending on their location in the body. For example, the thymic form of lymphosarcoma develops in the thymus gland in the chest.
- *Myeloproliferative disorders*. These arise in the bone marrow and are characterized by the production of abnormally large numbers of cells of certain bloodforming cell lines.
- *Nonregenerative anemia*. A severe reduction in the number of red blood cell-forming elements in the bone marrow. This results in the failure to produce numbers of circulating red blood cells sufficient to oxygenate the tissues.
- *Panleukopenia-like syndrome*. This disease mimics panleukopenia ("feline distemper"). It involves gastrointestinal disturbances and a fall in the white blood cell count.
- *Thymic atrophy syndrome*. This affects young kittens and involves wasting and

- underdevelopment of the thymus gland.
- *Reproductive disorders.* These are observed in FeLV-infected females and can include fetal death, abortion, infertility, endometritis and birth of fading kittens.

Diagnosis

Identification of FeLV-infected cats is usually made by detection of the virus in a blood sample. Two types of tests are in routine use; the enzyme-linked immunosorbent assay (ELISA), which can be performed in the veterinarian's office; and the immunofluorescent assay (IFA), which must be sent out to a testing laboratory. Both tests detect the core protein of FeLV as it circulates in the bloodstream. An ELISA test is also available for detecting FeLV in saliva.

FeLV can be found in the bloodstream at two different stages of the infection. The ELISA test can detect the primary (transient) viremia stage, when the immune system still has a chance to ward off the virus. Cats that test transiently positive characteristically become negative within 2-8 weeks. The ELISA test also can identify virus in the bloodstream of persistently infected cats, or those in which the virus has infected the bone marrow. Therefore, it is important to repeat a positive ELISA test in 12 weeks in order to determine whether the viremia is transient or persistent.

The IFA test detects FeLV primarily during the second, bone marrow stage of infection. Almost all cats testing positive by the IFA test will remain positive for life. These cats, as well as most of those that are ELISA positive, are excreting infectious FeLV in the saliva and thus are a health hazard for uninfected, susceptible cats.

Treatment and Control

TUMORS

Several therapies are available for the attempted treatment of FeLV-induced tumors. In certain cases, these therapies can produce a remission. Cats in remission may appear healthy for a period of weeks to months (some for longer). However, in most cases, these remissions are temporary and the virus is not eliminated from the cat's body.

Drugs used to treat tumors are very potent and their effects must be monitored carefully. Several supposed "cures" for FeLV have been touted, including a variety of pseudoscientific extracts and megavitamin preparations. There is no evidence that these potions are effective in treating FeLV.

TEST-AND-REMOVAL PROGRAMS

Removal of FeLV from a household containing infected cats can be achieved by implementing the FeLV test-and-removal program based on the IFA test. FeLV test-and-removal has been shown to be extremely effective in eliminating carrier cats from infected multi-cat households and catteries. Routine testing following the elimination of positive cats and test-and-quarantine of all incoming cats are also recommended in order to avoid introduction of new infected cats.

To implement FeLV test-and-removal, all cats in a household or cattery should first be tested. Cats found to be positive should be isolated from the FeLV-negative cats and the household premises cleaned with a commercial detergent or disinfectant. A solution containing 4 ounces of household bleach per gallon of water can be used. Litter boxes and food bowls should be thoroughly cleaned or replaced.

Cats initially testing negative should be retested at least twice over the next 8-12 months. During

this initial period of testing, a quarantine should be established and no new cats introduced into the household or cattery. In order for the household to be considered "free" of FeLV, all resident cats should test negative for FeLV on two tests performed at least 3 months apart.

All new cats introduced into an FeLV-negative household should be tested for FeLV prior to entry. FeLV-positive cats should not be allowed to enter the household. New cats testing negative should be quarantined in separate quarters for several months and retested negative one or two times before being allowed to enter the household.

Some modification of the test-and-removal program may be made for households or catteries in which FeLV-positive cats are retained in separate quarters. These animals should be isolated from contact with all other cats. This simple procedure will not only break the transmission cycle of FeLV but will also decrease exposure of the infected cats to other feline infectious disease agents. Cats that are persistently viremic should never be used for breeding purposes.

FeLV is rapidly inactivated by drying and by most common household soaps and disinfectants. Even though FeLV is a relatively fragile virus outside the host, a routine, thorough cleansing of the premises with diluted bleach or soap and water will help ensure that the amount of infectious virus left in the environment remains negligible.

Prevention

Several vaccines are available commercially to aid in the prevention of FeLV. These vaccines have been shown to be effective in laboratory and clinical studies. Most veterinarians are routinely vaccinating cats for FeLV infection. Kittens are given 2 vaccinations 3-4 weeks apart, and they are vaccinated annually. You should discuss the need for vaccination with your veterinarian.

Glossary

Atrophy- wasting due to lack of nutrition of any part

Chronic- cases that are longstanding

Endometritis- inflammation of the uterine lining

Esophagus- a muscular tube that passes from the throat to the stomach

Feline Panleukopenia- a highly contagious and fatal disease of cats, particularly of young cats, caused by a virus,; also called distemper

Immunosuppression- prevention of formation of immune response

In utero- within the womb; not yet born

Latent- lying hidden; quiet; not active

Lymph- transparent sometime faintly yellow fluid that is collected from the body's tissues.

Traveling through the lymph nodes, lymph is eventually added to the venous blood circulation.

Lymphocytes- lymph cell

Lymphosarcoma- a malignant disease of lymphatic tissue

Metabolic- tissue change; the sum of the chemical changes whereby the function of nutrition is affected

Myeloproliferative- unusual proliferation of myelopoietic (bone marrow) tissue

Obligate Parasite- one that cannot lead an independent nonparasitic existence

Pharynx- passageway for air from nasal cavity to larynx and food from mouth to esophagus

Protozoal- pertaining to unicellular organism

Thymus Gland- lymphoid organ in the lower neck; structure of early life, necessary for the normal development of immunological function

Toxoplasmosis- disease due to infection with the protozoa *Toxoplasma gondii*

Viremia- presence of a virus in the blood stream

Wasting- loss of body weight

Review

About one-third of infected cats become sick and die from feline leukemia virus (FeLV). When this retrovirus infects a cell, it makes a copy of its own genetic make-up and inserts it into the cat's chromosomes. Now part of the cat's genetic make-up, the cell produces a new virus and infects other cells.

FeLV is shed primarily in the saliva, and may also be present in respiratory secretions, feces and urine of cats. Also, kittens may become infected through their mother. Prolonged close contact with an infected cat seems to be required for effective transmission of FeLV.

FeLV infections result in either a transient or persistent viremia. All persistently viremic cats excrete FeLV and are a health hazard to uninfected, susceptible cats.

Immunosuppression is the most common outcome of FeLV infection and the underlying cause of many related conditions. Diseases directly caused by FeLV include lymphosarcomas, nonregenerative anemia and thymic atrophy syndrome.

The ELISA and IFA tests are conducted to detect the virus in a cat's blood sample. Several therapies for the attempted treatment of FeLV-induced tumors are available which can produce a remission. Removal of FeLV from a household containing infected cats can be achieved by implementing the FeLV test-and-removal program based on the IFA test. Although several vaccines are available commercially, none can provide 100% protection from FeLV. All cats that are potentially at risk of contact with FeLV should be routinely vaccinated against FeLV.