CURRENT RECOMMENDATIONS FOR TESTING & VACCINATION IN CATS

FELINE

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Vaccination is a key component of preventing infectious disease in individuals as well as reducing the risk of exposure to (and by) others. Similarly, testing for the presence of feline leukemia virus (FeLV), feline immunodeficiency virus (FIV), heartworms, and intestinal parasites allows us to treat and/or protect individuals and others, including human companions, from infection by some of these agents. The American Association of Feline Practitioners (AAFP) has produced and updated guidelines addressing vaccination recommendations as well as retroviral testing and management (www.catvets.com). In partnership with the American Heartworm Society, the AAFP has also created the KNOW Heartworms campaign to educate about the disease, its prevention, testing, and treatment (www.knowheartworms.org). The Companion Animal Parasite Council (CAPC) provides a comprehensive discussion of testing, prevention, and treatment for external and internal parasites of cats (and dogs) (www.capcvet.org). These documents and programs are the basis for this presentation. (Also recommended are the tools found in the AAFP's Healthy Cats for Life program, which can be found online at www.healthycatsforlife.com.)

Vaccination Guidelines, AAFP 2006

Immunization may be described as a method of enhancing or influencing the immune system and developing resistance to infectious disease by inducing the body to produce antibodies and/or immunologically sensitized cells. A vaccine consists of material administered to induce immunity and is a preparation of weakened (attenuated), killed, or immunologically active subunits of active virus or bacteria, which are unable or unlikely to cause the disease against which they are designed to protect. Vaccines are usually administered parenterally by injection or by a mucosal route.

The following is an attempt to summarize the key points of the 2006 document.

1. Vaccines continue to play an important role in the control of feline infectious diseases in an overall preventative health care program for cats.
2. Vaccinations should be selected for each patient based on risk of exposure to specific pathogenic agents.
3. *Core* vaccines are those recommended for administration to every cat because of a) severity of disease, b) transmissibility between animals, and/or c) zoonotic potential. As such, panleukopenia (FPV), feline viral rhinotracheitis virus (FHV-1), feline calicivirus (FCV), and rabies are considered core vaccines for cats. In the newest version of the guidelines, FeLV is highly recommended in kittens.
4. *Non-core* vaccines are those whose use should be restricted to individual cats deemed to be at a reasonable risk of exposure based on their lifestyle or environment. These would include FeLV in adult cats, chlamydophyla, feline infectious peritonitis (FIPV), FIV, bordetella, and giardia vaccines.
5. While vaccine administration is not an innocuous procedure, the benefits of vaccination far outweigh the risks for the majority of cats. We must continue to vaccinate our patients to prevent recrudescence of infectious diseases we now control. The objective of feline vaccination protocols should be to vaccinate more cats in the population, vaccinate individuals less frequently, and vaccinate them only for the diseases for which there is a risk of exposure and disease.

In other words, rather than being viewed as a routine, annual requirement and the driving force behind the annual exam, vaccination should be a carefully considered medical procedure discussed thoroughly with the client. At each visit, vaccination requirements should be revisited as the risk factors for that patient change throughout life.

When developing a vaccination protocol for an individual cat, the following questions may be considered. Is this individual at risk for this disease? Does this disease have high morbidity? Is it readily treatable? Realistically, could this agent cause fatal illness? It may be inappropriate to use a vaccine against a disease that is rare or against a disease that is not associated with a high morbidity. What kind of protection do I expect from this vaccine (prevention vs. decreased severity of illness)? What side effects or adverse reactions might this vaccine cause? How long does immunity last, and when did this cat last receive this vaccine? Each infectious agent is different; in general those that cause severe systemic disease result in lifelong immunity (e.g., panleukopenia), whereas those that cause superficial infections produce more transient immunity or a carrier state following recovery (e.g., FHV-1).

Why should we have concerns about over-vaccinating? Arguably, the most alarming one is the risk of *vaccine site associated sarcoma* (VAS) development; however, valid concerns have been raised that over-exposure of the immune system to antigens may over-sensitize a predisposed individual to the risks of hypersensitivity reactions. Administration of any vaccine or other "medication" is never completely without risk. The benefits of the procedure must be weighed against the possible risks. The most common vaccine reactions are local ones such as pain, local swelling, or hair loss at the site of injection. Malaise with low-grade fever and lethargy are not uncommon. Hypersensitivity reactions may occur, from the most severe and life-threatening, anaphylaxis (Type I, more common with killed vaccines), to a local inflammatory reaction (Type III), to a Type IV reaction with granuloma formation. The use of multiple antigens may also cause a transient immunosuppression during the post-vaccinal period, the same period during which one is attempting to induce immunity!

The incidence of soft tissue sarcomas has increased in cats since the late 1980s and parallels the introduction of widespread FeLV vaccination as well as the mandatory use of longer acting, more potent rabies vaccines. In epidemiological studies it was shown that cats receiving FeLV vaccines had a 5.5-fold increased likelihood of developing a sarcoma at an injection site, and that cats receiving rabies vaccine had a twofold increase in risk compared to cats receiving no vaccines. It was calculated in the initial study by Kass, that 1 to 3 sarcomas developed per 10,000 doses of FeLV and rabies vaccine administered. Other studies place the rate of risk lower or higher, but numerous studies have confirmed the causal relationship between vaccination and sarcoma formation in cats. Additionally it was observed that the risk increased with the number of doses of vaccine administered to a given cat at one time: a 50% increase following 1 vaccine, a 127% increase after 2 doses, and a 175% increase following 3 or 4 vaccines given simultaneously. It should not be concluded that only FeLV and rabies are involved, however, as other antigens have been implicated as well. The Vaccine Associated Fibrosarcoma Task Force (VAFSTF) investigated the pathogenesis of these dreadful reactions. One component appears to be malignant transformation of reactive fibroblasts in the presence of adjuvant. Meticulous investigation has confirmed that neither FeLV, FIV, nor feline sarcoma viruses are present in these tumors. Nevertheless, the risks of developing a VAS are still lower than the risk of developing FeLV or rabies if exposed. Clients have a right to be informed of the risks of vaccinating *and* of *not* vaccinating. The following websites are helpful for informing the concerned client about VAS: www.catshots.com, www.avma.org/vafstf/default.asp.

What guidelines can we use to minimize the risk of the development of a VAS, and what protocol can be used in their management?

1) Use a minimum number of vaccines for an individual and base the selection on risk assessment.
2) Use the least reactive products available, i.e. use MLV, recombinant, or other nonadjuvanted products.
3) Follow the AAFP vaccine administration site recommendations (FVRCP: lower R fore limb, rabies lower R hind limb, FeLV lower L hind limb).
4) Use single dose vials rather than multidose tanks to ensure that all doses of vaccine are uniform.
5) Follow the "3-2-"guidelines for handling post-vaccination masses. Biopsy any post-vaccination mass if it continues to be present 3 months after vaccination, if it is larger than 2 cm in diameter, or if it is increasing in size 1 month after vaccination.
6) Biopsy, rather than remove the mass initially, because if the mass turns out to be a sarcoma, then excision of the mass is not sufficient, and the opportunity for an aggressive first surgery has been missed (survival is highly associated with the completeness of the first attempt at surgical excision).

What about the virulent strain feline calicivirus (VS-FCV) vaccine? The American Association of Feline Practitioners suggests in the Virulent Calicivirus Information Brief that veterinarians consider the information provided in the Feline Vaccine Advisory Panel Report and the following information when making a decision concerning use of FCV-containing vaccines:

- The incidence of VS-FCV–associated disease in the United States or other countries is unknown.
- In part because of the difficulties associated with achieving a clinical diagnosis, it is currently unknown whether VS-FCV outbreaks are increasing over time.
- VS-FCV strains appear to arise from mutations; so far, each of the outbreak strains appears to be genetically and antigenically distinct from others.
- It is currently unknown whether administration of CaliciVax™ results in protection against heterologous VS-FCV strains on challenge.

- The maximal duration of immunity of CaliciVax™ for homologous or heterologous VS-FCV strains is unknown.
- Use of multiple FCV strains in feline vaccines may increase cross-protection capabilities, but the results of serum neutralization tests of FCV strains in vitro may not necessarily correlate to protection on challenge.
- Inactivated vaccines may induce protection more slowly than modified live vaccines, so if an inactivated FCV-containing vaccine is to be used in the primary immunization period for cats at high risk of exposure to feline panleukopenia virus, it should be used in combination with a parentally administered modified live feline panleukopenia virus–containing vaccine.

Unfortunately, the length of these notes precludes the inclusion of the Vaccine Advisory Panel Summary Table, which the author recommends that you download and print from www.catvets.com => Veterinary Professionals => Practice Guidelines => Guidelines Publications.

AAFP Feline Retrovirus Management, Key Points from the 2008 Document
FeLV and FIV are among the most common infectious diseases of cats. Although vaccines are available for both viruses, identification and segregation of infected cats form the cornerstone for preventing new infections. Currently, the majority of cats are never tested for FeLV or FIV, resulting in thousands of new cases each year.

Testing for FeLV and FIV: *All* cats should be tested at appropriate intervals, based on risk assessment.

- Test new cats entering a household or group housing as in shelter or cattery settings. Test again at least 60 days later, limiting exposure to other cats if possible during that time.
- Test if exposed to a retrovirus-infected cat at least once, 60 days after exposure.
- Test all sick cats, regardless of previous test results.
- Test before initial vaccination for FeLV or FIV.
- Consider annual retesting of cats that remain at risk for infection, regardless of vaccination status.
- *Always confirm an initial positive retrovirus test.*
- Cats that donate blood or tissue should be tested for FeLV by real-time PCR to rule out regressive infection that may be transmissible via transfusion or transplantation.
- Testing healthy feral cats in trap–neuter–return programs is optional depending on resources and program goals.

Vaccination and Other Preventative Measures
When to Consider FeLV Vaccination:
- Vaccination of all kittens is highly recommended.
- Vaccinate cats that have direct contact with cats of known positive or uncertain status, such as outdoor cats and group housing foster or shelter situations.

When to Consider FIV Vaccination:
- Cats living with FIV-positive cats, particularly if there is fighting.
- Cats that go outside and fight.
- It is unknown whether the vaccine provides cross-protection against the many heterologous strains of the virus.
- NOTE! Cats vaccinated with the current FIV vaccine will test positive for FIV antibodies. Visible (collar) and permanent (microchip) identification is recommended for all cats to facilitate reunification should cats become lost. This is especially important for cats vaccinated against FIV, since a positive test in an animal shelter may result in euthanasia.

Isolation of infected cats using screen or chain link fence barriers is adequate to prevent the transmission of retroviruses. Detergents and common hospital disinfectants effectively inactivate retroviruses. Using sterile or single-use items will deter iatrogenic infections. All blood donors should be tested at least annually.

Management Considerations
Retrovirus-positive cats may live many years without related illness. A decision about euthanasia should not be made based on a positive test alone.

- Retrovirus-positive cats should be evaluated by a veterinarian twice a year. In addition to a thorough physical exam, a minimum database including a complete blood count, chemistry panel, and urinalysis should be performed at least yearly. Cats with FeLV may have complete blood counts performed twice yearly due to their increased risk of hematological diseases.
- Utilize aggressive diagnostic and treatment plans early in the course of any illness.
- Retrovirus positive cats should be spayed or neutered, housed indoors, and should avoid raw food diets.
- Few large controlled studies have been performed using antiviral or immunomodulating drugs for the treatment of naturally infected cats. More research is needed to identify best practices to improve long-term outcomes following retroviral infections in cats.

Recommendations specific to cattery, shelter, and rescue situations may be found within the full text of the guidelines. The author recommends that you download and print them from www.catvets.com => Veterinary Professionals => Practice Guidelines => Guidelines Publications.

Heartworm Associated Respiratory Disease (HARD)
Dirofilaria immitis infection in cats causes a completely different disease than in dogs. Wherever dogs are considered to be at risk for heartworms, cats are at risk as well. Research has shown that signs such as coughing and difficulty breathing, which are often diagnosed as feline asthma or allergic bronchitis, can be caused by the presence of heartworms in either larval or adult stages. Heartworm associated respiratory disease (HARD) is the term for this condition. In cats, heartworm larvae arrive in the heart by 75–90 days after initial infection. These tiny L5 forms travel to the distal pulmonary arteries, where most larvae die around 90–120 days post infection (p.i.). Their presence may incite a marked inflammatory response, resulting in an eosinophilic endarteritis with intimal fibrosis and in thickening of the arterial walls. The smallest vessels may become occluded from the thickened walls (occlusal hypertrophy). Cats with acute disease may present for cough, dyspnea, collapse, or death similar to an acute asthmatic attack. With less severe response and over time, cough, dyspnea, lethargy, anorexia, vomiting, and weight loss may be the clinical concerns. Other cats live comfortably for several years even with significant pulmonary pathology.

As this occurs before establishment of adult heartworm infestation (and in most cats, worms do not achieve adulthood), the clinical signs associated with this pathologic response may occur as early as 90 days p.i. Diagnostically, this is significant because tests relying on the presence of adult worms will be negative in cats. A positive antigen test requires the presence of at least three adult female worms; thus this type of test is limited by its lack of sensitivity. If an antigen test is positive, however, a mature infection is present. A positive antibody test, on the other hand, measures the cat's response or exposure to larvae or adults, which have been present for 2–3 months. 85 to 95 percent of cats with mature heartworm infection are antibody-positive.

Radiographic changes are not specific for HARD and are bronchointerstitial in character. The inflammatory pattern in the lung parenchyma is peribronchial but may be severe enough to be a diffuse alveolar pattern. Pulmonary arterial patterns may be normal, although if the periarterial inflammation is severe, the right and/or caudal pulmonary arteries may appear enlarged. These signs could just as well reflect asthma or other small airway or vascular disease. Some cats show pulmonary artery enlargement. Heartworms may present in the pulmonary artery on echocardiographic evaluation; however, that will not be the case in over 50% of infected cats as well as all cats who have successfully terminated infection (abbreviated infection) before the worms reach adulthood. Yet these cats will suffer from inflammation-induced changes. BAL or tracheal washings may be eosinophilic in nature just as with lungworm and with true allergies. Thus, the diagnostic challenge requires an index of suspicion and putting multiple pieces of the puzzle together.

When heartworm preventatives are used in cats within 30 days of exposure to heartworm-infected mosquitoes, larval forms do not reach the pulmonary vasculature. Whether indoors or indoors and out, cats with signs of small airway disease, residing in heartworm endemic regions or travelling through these areas, should have heartworm associated respiratory disease on the list of differentials.

Testing and Controlling Internal and External Parasites, CAPC
The stated purpose of the CAPC Guidelines is to protect the health of pets, enhance the safety of the public, and preserve the bond between pets and people. Fecal examinations should be performed in order to identify intestinal

parasites. In kittens, testing can be coordinated with vaccine administration so that 2 to 4 tests are run during the first year of life. In adult cats, depending on health and lifestyle, once or twice a year is adequate. Three points to note are that:

1. These recommendations refer to cats in whom year-round heartworm preventive/intestinal parasite combination products are being used rather than other, less broadly protective products.
2. Fecal examinations are performed using at least 1 gram of feces and centrifugal flotation technique, augmented by other methods (direct exams, sedimentation, stained smears, etc.) as needed.
3. Cats should be fed cooked or prepared food (they should not be fed raw meat) and be provided fresh, potable water.

This allows monitoring of compliance with monthly preventive medication while facilitating diagnosis and treatment of parasites not covered by broad-spectrum preventives.

Cats should be initially tested for heartworm infection to identify the disease in those with clinical signs suggesting infection, to determine whether infection is present before starting prevention and to monitor the exposure rate or prevalence of the area. Year-round prevention is recommended for cats in areas where canine heartworm is recognized.

Finally, recognizing that geographic, seasonal, and lifestyle factors substantially affect parasite prevalence, your prevention program should be adapted to suit the needs of individual patients in your region.