UC Davis VX Recommendations

I. Canine (Dog) Vaccination Guidelines

Canine Core Vaccines

Core vaccines are recommended for all puppies and dogs with an unknown vaccination history. The diseases involved have significant morbidity and mortality and are widely distributed, and in general, vaccination results in relatively good protection from disease. These include vaccines for canine parvovirus (CPV), canine distemper virus (CDV), canine adenovirus (CAV), and rabies. In addition, the leptospirosis vaccine is now recommended as a core vaccine for dogs in California because the disease has the potential to occur in any dog (even in urban environments), can be life-threatening, and the vaccines are considered safe and efficacious, with recent improvements in safety over the last decade.

Canine Parvovirus, Distemper Virus, and Adenovirus-2 Vaccines

For initial puppy vaccination (< 16 weeks), one dose of vaccine containing modified live virus (MLV) CPV, CDV, and CAV-2 is recommended every 3-4 weeks from 6-8 weeks of age, with the final booster being given no sooner than 16 weeks of age. For dogs older than 16 weeks of age, two doses of vaccine containing modified live virus (MLV) CPV, CDV, and CAV-2 given 3-4 weeks apart are recommended. After a booster at 6 months to one year, re-vaccination is recommended every 3 years thereafter, ideally using a product approved for 3-year administration, unless there are special circumstances that warrant more or less frequent revaccination. Note that recommendations for killed parvovirus vaccines and recombinant CDV vaccines are different from the above. These vaccines are not currently stocked by our drug room or routinely used at the UC Davis veterinary hospital. We do not recommend vaccination with CAV-1 vaccines, since vaccination with CAV-2 results in immunity to CAV-1, and the use of CAV-2 vaccines results in less frequent adverse events.

Canine Rabies Virus Vaccines

In accordance with California state law, we recommend that puppies receive a single dose of killed rabies vaccine at 12 weeks or 3 months of age. Adult dogs with unknown vaccination history should also receive a single dose of killed rabies vaccine. A booster is required one year later, and thereafter, rabies vaccination should be performed every 3 years using a vaccine approved for 3-year administration.

Canine Leptospira Vaccines

Multiple leptospiral serovars are capable of causing disease in dogs, and minimal cross-protection is induced by each serovar. Currently available vaccines do not contain all serovars, and duration of immunity is probably about 1 year. However, leptospirosis is not uncommon in northern Californian dogs both from urban backyards and also with exposure histories involving livestock and areas frequented by wild mammals. In addition, the disease can be fatal or have high morbidity, and also has zoonotic potential. Therefore, we suggest annual vaccination of all dogs with vaccines containing all four Leptospira serovars (Grippotyphosa, Pomona, Canicola and Icterohaemorrhagiae). The initial vaccination should be followed by a booster 2-4 weeks later, and the first vaccine be given no earlier than 12 weeks of age. In general, Leptospira vaccines have been associated with more severe postvaccinal reactions (acute anaphylaxis) than other vaccines. The recent introduction of vaccines with reduced amounts of foreign protein has reduced this problem. Reaction rates for vaccines containing Leptospira, while higher than those for vaccines that do not contain Leptospira, are still low in incidence (in one study, < 0.6%). Vaccination of dogs that have had previous reactions to Leptospira vaccines should be avoided if possible. The UC Davis veterinary hospital does not recommend administering different vaccine antigens at separate time points because it reduces the chance that vaccines will be administered and there is poor evidence that it decreases the risk of reactions occurring.

Canine Non-Core Vaccines

Non-core vaccines are optional vaccines that should be considered in light of the exposure risk of the animal, ie. based on geographic distribution and the lifestyle of the pet. Several of the diseases involved are often self-limiting or respond readily to treatment. Vaccines considered as non-core vaccines are canine parainfluenza virus (CPiV), canine influenza virus H3N8, canine influenza virus H3N2 distemper-measles combination vaccine, Bordetella bronchiseptica, and Borrelia burgdorferi. Vaccination with these vaccines is generally less effective in protecting against disease than vaccination with the core vaccines.

Canine Parainfluenza Virus and Bordetella bronchiseptica

These are both agents associated with 'kennel cough' or canine infectious respiratory disease complex (CIRDC) in dogs. For Bordetella bronchiseptica, mucosal vaccination with live avirulent bacteria is recommended for dogs expected to board, be shown, or to enter a kennel situation within 6 months of the time of vaccination. We currently stock the intranasal vaccine containing both B. bronchiseptica and CPiV. For puppies and previously unvaccinated dogs, only one dose of this vaccine is required (recommendations differ for the parenteral, killed form of this vaccine). Most boarding kennels require that this vaccine be given within 6 months of boarding; the vaccine should be administered at least one week prior to the anticipated boarding date for maximum effect. Although

some kennels require immunization every 6 months, annual booster vaccination with B. bronchiseptica vaccines is considered adequate for protection.

Canine Influenza Virus (CIV)

Canine influenza virus H3N8 emerged in the United States in greyhounds in Florida in 2003. The virus is now enzootic in many dog populations in Colorado, Florida, Pennsylvania, New Jersey and New York. The virus causes upper respiratory signs including a cough, nasal discharge, and a low-grade fever followed by recovery. A small percentage of dogs develop more severe signs in association with hemorrhagic pneumonia. Canine influenza virus H3N2 emerged in 2015 in Illinois and has spread to several other states, including California. Several affected dogs have recently (December 2017/January 2018) been identified in the south bay area in Northern California. Disease caused by CIV H3N2 may be slightly more severe than that caused by CIV H3N8, and the virus has affected more dogs in veterinary hospitals and the community (H3N8 has largely remained confined to shelters). Vaccines for both infections are commercially available, including a combination H3N8/H3N2 vaccine. In Northern California, use of the H3N2 vaccine may be warranted for dogs that contact other dogs, such as those that board. Vaccines may reduce clinical signs and virus shedding in dogs infected by CIV. Vaccination may have the potential to interfere with the results of serological testing, which in non-endemic areas are useful to assist diagnosis.

II.Feline (Cat) Vaccination Guidelines

In general, guidelines for vaccination of cats have been strongly influenced by the appearance of vaccine-associated sarcomas in cats, and in particular their epidemiologic association with feline leukemia virus vaccines and killed rabies virus vaccines. Thus, there is clear evidence for minimizing frequency of vaccination in cats. The recommendations below have been made in light of the AVMA/AAHA/AAFP/VCS task force recommendations on vaccine-associated sarcomas in cats. Risk factors for sarcomas should be discussed with cat owners at the time of examination. If a cat develops a palpable granuloma at the site of previous vaccination, the benefits vs risks of future vaccinations should be carefully considered. All vaccine-associated sarcomas should be reported to the vaccine manufacturer.

Feline Core Vaccines

The definitions of core and non-core vaccines described in the canine vaccination guidelines above also apply to the feline vaccines. The core feline vaccines are those for feline herpesvirus 1 (FHV1), feline calicivirus (FCV), feline panleukopenia virus (FPV), feline leukemia virus (FeLV - kittens) and rabies.

Feline Herpesvirus 1, Feline Calicivirus and Feline Panleukopenia Virus Vaccines

For initial kitten vaccination (< 16 weeks), one dose of parenteral vaccine containing modified live virus (MLV) FHV1, FCV, and FPV is recommended every 3-4 weeks from 6-8 weeks of age, with the final booster being given no sooner than 16 weeks of age. For cats older than 16 weeks of age, two doses of vaccine containing modified live virus (MLV) FHV1, FCV, and FPV given 3-4 weeks apart are recommended. After a booster at 6 months to one year, revaccination is suggested every 3 years thereafter for cats at low risk of exposure. It is recommended that these vaccines be administered on the right thoracic limb as distally as possible. Note that recommendations for killed and intranasal FHV1 and FCV vaccines are different from the above. Killed and intranasal varieties of these vaccines are not routinely used at the UC Davis veterinary hospital, but there may be some advantages to the use of non-adjuvanted vaccines that that include two inactivated FCV strains over those that contain one strain. The use of FPV MLV vaccines should be avoided in pregnant queens and kittens less than one month of age.

Feline Rabies Virus Vaccines

Cats are important in the epidemiology of rabies in the United States. In general we recommend that kittens receive a single dose of killed or recombinant rabies vaccine at 12-16 weeks of age. Adult cats with unknown vaccination history should also receive a single dose of killed or recombinant rabies vaccine. For the recombinant vaccines, boosters are recommended at yearly intervals. We currently stock and suggest the use of the recombinant rabies vaccine, because there is some evidence that it is associated with a decreased risk of sarcoma formation (Srivastav et al, 2012). For the killed rabies vaccines, a booster is required at one year, and thereafter, rabies vaccination should be performed every 3 years using a vaccine approved for 3-year administration. According to recommendations of the vaccine-associated sarcoma task force, rabies vaccines are administered subcutaneously as distally as possible in the right rear limb.

Feline Leukemia Virus Vaccine

A number of FeLV vaccines are available on the market. The whole inactivated viral vaccines have recently been shown to be highly efficacious based on the results of molecular detection methods for FeLV, even producing sterilizing immunity, although this was not found to be the case for an inactivated mixed subunit vaccine (Torres et al, 2009). We recommend vaccination of all FeLV-negative kittens and any FeLV-negative adult cats allowed to go outdoors or cats having direct contact with other cats of unknown FeLV status. Vaccination is most likely to be useful in kittens and young adult cats, because acquired resistance to infection develops beyond 16 weeks of age. Vaccination is not recommended for FeLV-positive cats and indoor cats with no likelihood of exposure to FeLV.

Use of the recombinant FeLV vaccine offers the potential advantage of a decreased risk of sarcoma formation (Srivastav et al, 2012). However, there is

some evidence that the inactivated vaccines may be more efficacious (Patel et al, 2015). Until further supporting evidence is available from independent investigators that supports improved efficacy of the inactivated over the recombinant vaccine, the UC Davis veterinary hospital does not have a preference over whether inactivated or recombinant vaccines are used, but we currently stock the recombinant vaccine.

Initially, two doses of FeLV vaccine are given at 2-4 week intervals, after which annual boosters (recombinant vaccine) or 3-yearly boosters (inactivated vaccine) are recommended depending on risk. According to recommendations of the vaccine-associated sarcoma task force, parenteral FeLV vaccines are administered subcutaneously as distally as possible in the left rear limb.

Feline Non-Core Vaccines

Optional or non-core vaccines for cats consist of the vaccines for feline immunodeficiency virus, Chlamydia felis, and Bordetella bronchiseptica.

Feline Immunodeficiency Virus Vaccine

The FIV vaccine was an inactivated, adjuvented dual subtype vaccine that was released in July 2002. It is no longer being made or distributed in North America. Unfortunately, vaccination of FIV-negative cats rendered currently available serologic tests (ELISA and Western blot) positive for at least a year following vaccination, and polymerase chain reaction (PCR)-based tests do not reliably identify cats with natural infection. Previous vaccination does not prevent infection, and the significance of a positive test result in a vaccinated cat cannot be assessed. Questions remained regarding the vaccine's ability to protect against all of the FIV subtypes and strains to which cats might be exposed. The UC Davis veterinary hospital drug room did not stock this vaccine, and its routine use in indoor cats is not recommended.