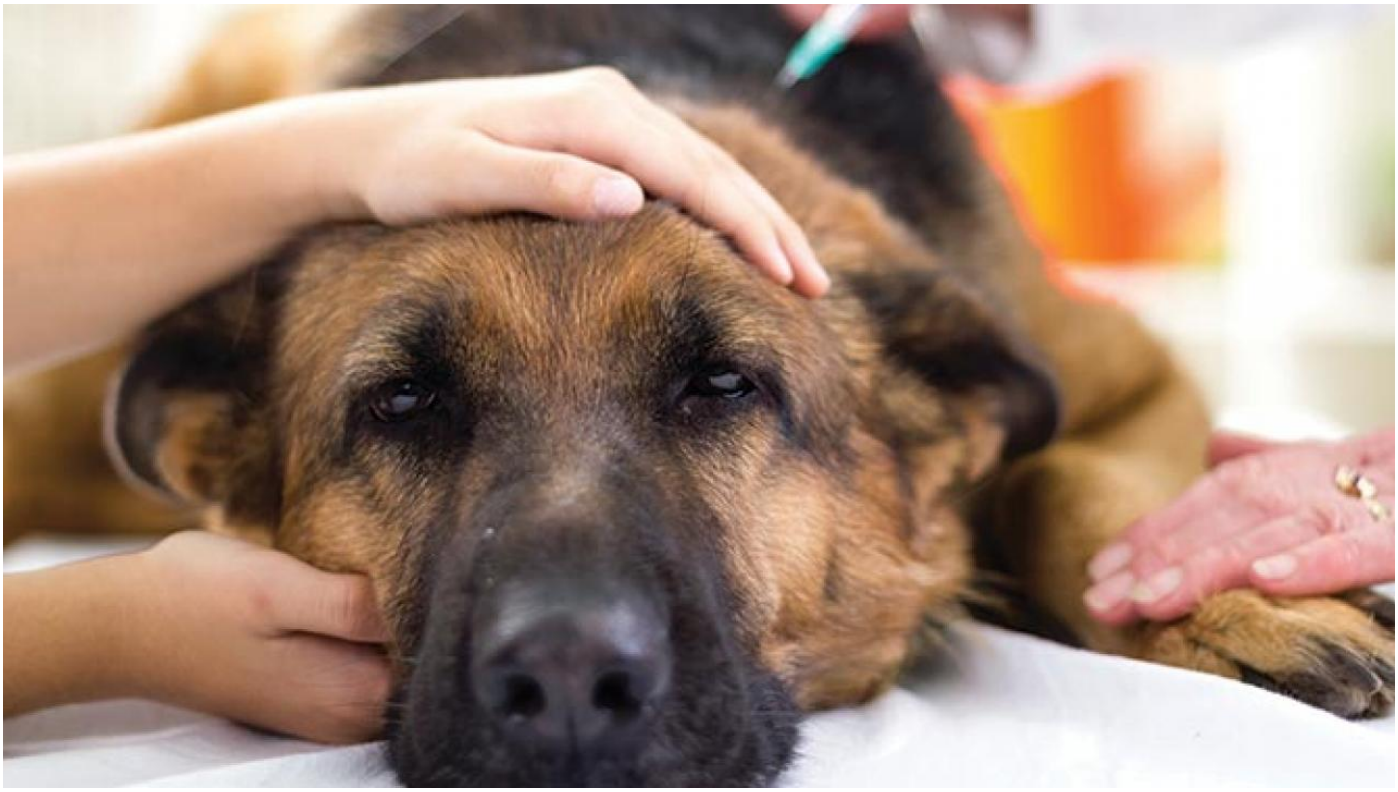
Vaccination Guidelines for Dogs and Cats



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Posted by John Gardiner

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Introduction

The UC Davis veterinary hospital vaccination guidelines below have been based on published studies and recommendations made by task forces. These include the AAFP/AFM Advisory Panel on Feline Vaccines, AAHA Canine Vaccine Task Force, and World Small Animal Veterinary Association, which include representatives from academia, private practices, governmental regulatory bodies, and industry. These groups have evaluated the benefits versus risks of the vaccines currently available on the market. Interested readers are referred to documents published by these groups for further information (see References and Resources listed at the end of this document). The document below has been generated by a group of faculty and staff at UC Davis School of Veterinary Medicine for the purposes of veterinary student education and as a reference for referring veterinarians. These are only general guidelines. The vaccine types recommended and the frequency of vaccination vary depending on the lifestyle of the pet being vaccinated (i.e. indoor vs outdoor pets, travel plans, kennel/boarding plans, and underlying disease conditions such as immune-mediated diseases or pre-existing infections such as FIV infection). Because these factors may change over time, we recommend the vaccination plan for each individual pet be decided by the owner at routine annual examinations, following a discussion between the veterinarian and the client regarding the animal's lifestyle in the year ahead. Guidelines for vaccination in shelter situations can be accessed at the UC Davis Center for Companion Animal Health's shelter medicine website. A previous history of vaccination reactions in an individual pet will also affect recommendations for vaccination. For all vaccines given, the product, expiration date, lot number, route and location of injection must be documented in the record.

It should also be noted that much research in the area of companion animal vaccinology is required to generate optimal recommendations for vaccination of dogs and cats. As further research is performed, and as new vaccines become available on the market, this document will be continuously updated and modified.

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, revaccination 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.

Canine Distemper-Measles Combination Vaccine

This vaccine has been used between 4 and 12 weeks of age to protect dogs against distemper in the face of maternal antibodies directed at CDV. Protection occurs within 72 hours of vaccination. It is indicated only for use in households/kennels/shelters where CDV is a recognized problem. Only one dose of the vaccine should be given, after which pups are boostered with the CDV vaccine to minimize the transfer of anti-measles virus maternal antibodies to pups of the next generation. The UC Davis veterinary hospital does not stock this vaccine as situations requiring their use do not arise commonly in our hospital population.

Canine Borrelia burgdorferi (Lyme) Vaccine

The incidence of Lyme disease in California is currently considered extremely low. Furthermore, use of the vaccine even in endemic areas (such as the east coast of the US) has been controversial because of anecdotal reports of vaccine-associated adverse events. Most infected dogs show no clinical signs, and the majority of dogs contracting Lyme disease

respond to treatment with antimicrobials. Furthermore, prophylaxis may be effectively achieved by preventing exposure to the tick vector. If travel to endemic areas (i.e. the East Coast) is anticipated, vaccination could be considered, followed by boosters at intervals in line with risk of exposure. The UC Davis veterinary hospital does not stock the Lyme vaccine or recommend it for use in dogs residing solely in Northern California.

Other Canine Vaccines

Several other canine vaccines are currently available on the market. These are vaccines for canine coronavirus, canine adenovirus-1, and rattlesnake envenomation. The reports of the AVMA and the AAHA canine vaccine task force have listed these three vaccines as not generally recommended because 'the diseases are either of little clinical significance or respond readily to treatment'. Evidence for efficacy of these vaccines is minimal, and they may 'produce adverse events with limited benefit'. Currently, information regarding the efficacy of the canine rattlesnake vaccine is insufficient. The UC Davis veterinary hospital does not stock or routinely recommend use of these vaccines.

Canine Enteric Coronavirus Vaccine

Infection with canine enteric coronavirus (CCV) alone has been associated with mild disease only, and only in dogs < 6 weeks of age. It has not been possible to reproduce the infection experimentally, unless immunosuppressive doses of glucocorticoids are administered. Serum antibodies do not correlate with resistance to infection, and duration of immunity is unknown. In mixed infections with CCV and canine parvovirus (CPV), CPV is the major pathogen. Vaccination against CPV therefore protects puppies from disease following challenge with both canine enteric coronavirus and CPV. Thus, the UC Davis veterinary hospital does not routinely recommend vaccination against canine enteric coronavirus and the vaccine is not stocked by our drug room.

Canine Rattlesnake Vaccine

The canine rattlesnake vaccine comprises venom components from Crotalus atrox (western diamondback). Although a rattlesnake vaccine may be potentially useful for dogs that frequently encounter rattlesnakes, currently we are unable to recommend this vaccine because of insufficient information regarding the efficacy of the vaccine in dogs. Dogs develop neutralizing antibody titers to C. atrox venom, and may also develop antibody titers to components of other rattlesnake venoms, but research in this area is ongoing. Owners of vaccinated dogs must still seek veterinary care immediately in the event of a bite, because 1) the type of snake is often unknown; 2) antibody titers may be overwhelmed in the face of

severe envenomation, and 3) an individual dog may lack sufficient protection depending on its response to the vaccine and the time elapsed since vaccination. According to the manufacturer, to date, rare vaccinated dogs have died following a bite when there were substantial delays (12-24 hours) in seeking treatment. Boosters are recommended at least annually while dogs remain at risk. Adverse reactions appear to be low and consistent with those resulting from vaccination with other products available on the market. Based on existing evidence, the UC Davis veterinary hospital does not currently recommend routine vaccination of dogs for rattlesnake envenomation, and the vaccine is not stocked by our drug room.

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.

Feline Chlamydia felis Vaccine

Chlamydia felis causes conjunctivitis in cats that generally responds readily to antimicrobial treatment. Immunity induced by vaccination is probably of short duration and the vaccine provides only incomplete protection. The use of this vaccine could be considered for cats entering a population of cats where infection is known to be endemic. However, the vaccine has been associated with adverse reactions in 3% of vaccinated cats, and we do not recommend routine vaccination of low-risk cats with this vaccine. The C. felis vaccine is therefore not stocked by the UC Davis veterinary hospital drug room.

Feline Bordetella bronchiseptica Vaccine

This is a modified live intranasal vaccine. Bordetella bronchiseptica is primarily a problem of very young kittens, where it can cause severe lower respiratory tract disease. It appears to

be uncommon in adult cats and pet cats in general. For these reasons, the UC Davis veterinary hospital does not recommend routine vaccination of pet cats for Bordetella bronchiseptica. The vaccine could be considered for young cats at high risk of exposure in large, multiple cat environments. The UC Davis veterinary hospital drug room does not stock this vaccine.

Other Feline Vaccines

The feline infectious peritonitis (FIP) vaccine has been listed as 'Not Generally Recommended' by the AAFP.

Feline Infectious Peritonitis Vaccine

The FIP vaccine is an intranasal modified live virus product. The efficacy of this vaccine is controversial, and duration of immunity may be short, although the vaccine appears to be safe. Although exposure to feline coronaviruses in cat populations is high, the incidence of FIP is very low, especially in single-cat households (where it is 1 in 5000). Most cats in cattery situations where FIP is a problem become infected with coronaviruses prior to 16 weeks of age, which is the age at which vaccination is first recommended. Vaccination could be considered for seronegative cats entering a cattery where FIP is common. We do not routinely recommend vaccinating household cats with the FIP vaccine, and the vaccine is not stocked by our drug room.

(Revised Jan 2018)

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