Introduction

Before reading this article, I would like to give you our thoughts about vaccinations spacing and frequency. We believe that although it is important to make sure your puppy is properly vaccinated, we agree with UC Davis – less is more. The reason for this is that it is our opinion that too many shots and shots spaced too close together damages the immune system of the dog and is one reason for the rise in cancer in our dogs.

We never vaccinate our puppies until they are 8 weeks old. The first shot is a 4-way DHPP (Distemper, Hepatitis (also called Canine Adreino Virus-2 or CAV-2), Parvo and Parainfluenza) in modified live virus form. We do not insist on Parainfluenza but as of today, we have been unable to find only a 3-way shot. Never add Corona or Leptospirosis to this shot. Corona is not life threatening and Leptospirosis should not be given to a young puppy. The second shot is Rabies in killed virus form. The third shot is Leptospirosis (as a single shot – not included with DHPP). It has been only last year that UC Davis has recommended Lepto as a core vaccine. This is because of the rise they have seen in this disease. Lepto is fatal. Below is our recommended schedule:

Week 8 – DHPP or DHP (your breeder should be responsible for this shot)
Week 12 – DHPP or DHP
Week 16 – DHPP or DHP
Week 20 or later – Rabies
2 months after Rabies – first Lepto
Four weeks after first Lepto – second Lepto

1 year after third puppy DHPP - DHPP booster
1 year after puppy Rabies shot - Rabies booster
1 year after second Lepto – Annual Lepto

Once your dog has received its 1-year booster of DHPP or DHP, we recommend having a titer performed beginning the third year after the booster and going forward. This is a blood test that measures the immunity level against these diseases within your dog's system. It has been found that after the 1 year booster, a dog could easily remain protected for a minimum of 3 years of age. Titers prevent over-vaccinating your dog, resulting in a healthier animal for life. Unfortunately it is required by law that rabies must be given every three years. We look forward to the day when this timeframe is extended.

Bordetella should be given if you are planning to participate in activities where your dog will be in close contact with other dogs (i.e. dog shows, boarding, kennels and perhaps dog parks).

Introduction

The UC Davis veterinary hospital vaccination guidelines below have been based on published studies and recommendations made by task forces (including 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, as 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 hosptial 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.