

# Canine Vaccines & Vaccinology

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### 1. Vaccinology

#### **a. How the Immune System Responds to Vaccines:**

Vaccines have saved more lives than any other medical advancement. Regardless, there has been a recent push back in human and animal vaccine acceptance – called “vaccine hesitancy”.

Vaccines are one of the strongest medications our dogs (or cats or us) can receive. They should be selected carefully with appropriate timing to receive the greatest benefit and minimize risks. Understanding how vaccines work is essential in this process.

It is important to know what vaccines can do and what they cannot do – in other words, how the immune system works and responds to vaccines. You also need to know how vaccines work, which vaccines are appropriate for your pet’s lifestyle, how to select the right vaccines, and how vaccines should be handled and administered. Vaccines are an important but not solitary key to preventing infectious diseases. We need to practice good hygiene in bitch and kennel management as well.

There are 4 general kinds of vaccines: modified live (attenuated), inactivated (killed), recombinant immunizing agents and toxoid. The modified live means the disease-causing organism is altered and weakened so it can be administered to a patient, creating an immune response but not causing disease. A killed vaccine contains only bacteria or viruses that are dead, allowing the immune system to see and create immunity but not cause disease. Recombinant agents are made of a live attenuated (weakened) viral or bacterial strain used as a vector to carry the gene or genes encoding the desired vaccine antigens. Toxoids protect against the toxin produced by the offending bacteria. Another way to classify vaccines are whether they are to protect against viral diseases, or bacterial diseases, called bacterins.

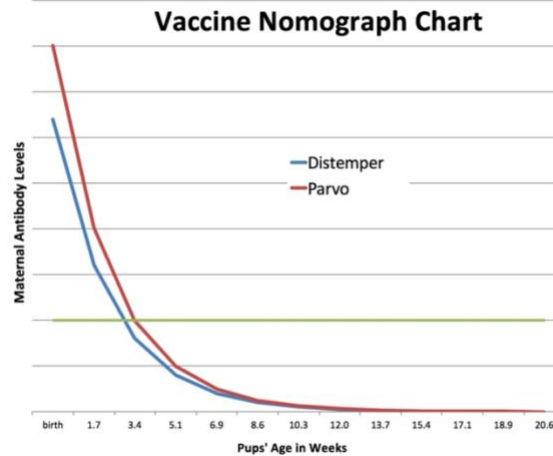
**b. Maternally Derived Antibodies (MDA)**

The immune system in puppies is born “naive”, meaning when a puppy is born, they have virtually no immunity to the viruses and bacteria that will soon populate their world and bodies. Initially, their only immunity comes from their mother’s colostrum that they must receive by nursing in their 1<sup>st</sup> 24 hours or less. Failure to receive colostrum in an adequate quantity will lead to “failure of passive immunity”. This sets up pups for likely illness when exposed to the viruses and bacteria in their environment and in dogs they will associate with. The only way around this in very young pups is to administer colostrum, plasma or serum from a donor dog. Should you have a dam with excessive colostrum, it can be collected manually, and stored in the freezer for up to 1 year. Plasma or serum can be collected from a healthy, hyperimmunized dog, and purchased from Animal Blood Resources in Michigan. Colostrum can be administered by a feeding tube after thawing within 24 hours of birth. Plasma or serum can be administered via feeding tube after thawing within 24 hours of birth or given SQ or IV slowly at any age. The standard published dose for plasma is 16 cc per pup.

Pups that have received adequate amounts of colostrum when under 24 hours old will have immunity to what their mothers are immune to – this is called “passive” immunity. As pups mature, the maternal antibodies slowly degrade. As the antibodies drop, the pup’s immune system can begin to mount its own response – this is called “active” immunity.

The challenge to using vaccines is to time the administration so the immune system can produce its own antibodies, but before there is an exposure to a serious disease. Dr. Ron Schulz and Dr. Laurie Larsen have developed a graph and testing system known as a nomogram/nomograph. Pups immunity drops 50% every 2 weeks from birth to maturity. The higher the maternal antibodies, the longer they last, blocking the pup’s response to vaccines. The lower the maternal antibodies, the earlier the pups need to be vaccinated. The challenge is that it is not practical to blood test each and every pup in a litter to determine when the ideal time to administer a vaccine to the pup.

Just as in human medicine, most of our pups will receive a series of vaccines. By administering the vaccines repeatedly, we are playing the odds that somewhere in between the 1<sup>st</sup> and last vaccination, the maternal antibodies will disappear, allowing the pup's immune system to "see" the vaccine and develop active immunity.



### c. Titers and Nomograms

Some breeders prefer to use a nomogram to giving a series of vaccines to their pups. The advantage to using a nomogram is that the pups can receive fewer vaccines, reducing potential adverse reactions to "too many" vaccines. The disadvantages are the cost of the test and that you are assuming that all the pups in the litter received the same amount of colostrum and were able to absorb it. The reality is that not all pups in all litters receive protective amounts of colostrum. This can occur if a pup was weak and an ineffective nurser, if the pup was pushed off a good spot at the nursing bar, if the pup was born late in a large litter and missed out on the good stuff, and so on. Cost is usually under \$200 to test the dam. Should you decide to do a nomogram, the blood should not be collected in the 2 weeks prior to or just after whelping as the antibodies in the blood at this time will be artificially low, because they were all sequestered in the mammary glands for the pups. The lab at the U of Wisconsin Veterinary Immunology Department CAVID lab is where we recommend you submit samples for titers and nomograms.

<https://www.vetmed.wisc.edu/lab/cavids/> .

Submission form: <https://www.vetmed.wisc.edu/lab/wp-content/uploads/sites/12/2023/07/2023-July-CAVIDS-Serum-Submission-Form.pdf>

### d. Vaccine Failures

Most pups will mount an adequate immune response to a series of 2 vaccines, administered 2 to 4 weeks apart. The 1<sup>st</sup> vaccination a pup or adult dog receives will allow the pups' immune system to see a foreign protein and start the formation of antibodies. The 2<sup>nd</sup> and additional vaccines, or boosters, will create a stronger immune response, called an anamnestic response. In patients with a healthy immune system, they will have memory of these vaccines, sometimes lasting a lifetime.

It is important to understand that administering the booster in less than 14 days from the 1<sup>st</sup> vaccination can do more harm than good. The immune system needs at least 2



weeks to respond to an additional vaccine. Administering a booster in less time can suppress the immune system. Keep good records and work with veterinary professionals who follow these guidelines.

After the 1<sup>st</sup> series of Distemper and [Parvovirus vaccines](#) are administered, you can assess the pup's response to the vaccine by following the last vaccine with a blood test called a titer. A nomogram is a titer, interpreted for use to predict when pups will respond to their 1<sup>st</sup> vaccines for Distemper, [Parvovirus](#), and Adenovirus. A titer is the same blood test, but used to assess an individual dog's response to these vaccines.

Some breeds and some individuals within a breed (up to 10%) may not respond adequately to a vaccine. These include Rottweilers, Dobermans, and some of the Bullie Breeds. Knowing this failure to respond to vaccines will allow the owners to request additional vaccines be administered to these patients. Often, changing the manufacturer of the vaccine and repeating the titer will allow for these low or no-responders to safely interact with other dogs. Should you have a dog or line of dogs who do not adequately respond to vaccines, you need to be extra vigilant to protect these dogs.

Although titers can be run to assess vaccine responses to the rabies vaccines, most states and municipalities will not accept a protective titer as an alternative to rabies vaccines. While it is possible that many dogs have protection for longer than 3 years, the 3 year interval is still required to have a dog considered a vaccinated dog. Only in rare circumstances would it be recommended that you use a titer as an alternative to triannual rabies boosters. Don't take a chance. [Rabies vaccines](#) for our dogs is as much for the protection of human health as it is for canine health.

#### **e. Why We Administer Multiple Vaccines**

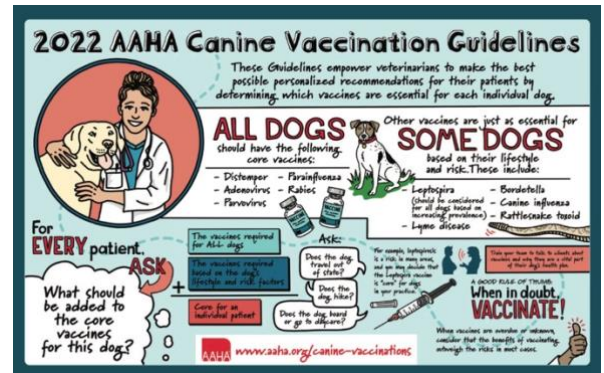
Puppies need a series of vaccines when young to mount an adequate protective vaccine response. Since most of us don't do titers on each pup in the litter, we need to repeatedly expose the pups to the antigens, the proteins, that allow the immune system to develop antibodies. By starting to vaccinate between 6 and 8 weeks of age, and repeatedly administering vaccines till the pups are 18 to 20 weeks old, we can give our pups protection. Somewhere in the 6 week to 20 week age range, almost every pup will have their maternal antibodies bottom out and be exposed to the vaccine antigens, producing their own active immunity. If you start vaccinating too late or stop too early, you are putting your pups at risk of being exposed to a disease they are not prepared to fight off.

Over time, even pups with competent immune systems will have their antibody levels wane. For this reason, we need to booster our adult dogs. In general, we booster young adults approximately 1 year after they complete their vaccine series for appropriate life-style and core based diseases. After the 15 month age, we booster for some diseases annually and some diseases tri-annually. In general bacterial diseases need annual

boosters ([Leptospirosis](#), [Lyme disease](#), Bordetella) and viral diseases need tri-annual boosters ([Rabies](#), Distemper, Adenovirus, Parvovirus, Parainfluenza virus). [Distemper](#), Parvovirus, and Adenovirus are the only viral diseases routinely titered for in dogs. The Leptospirosis test is used to diagnose exposure to the disease, not to determine if a booster vaccine is indicated.

#### f. **Core Vaccines**

Core vaccines are vaccines to protect dogs against diseases that are prevalent and common enough that veterinary experts have determined all dogs should be protected from. These include rabies, canine distemper, canine parvovirus, canine adenovirus, and parainfluenza vaccine. Recently leptospirosis has been included in this category by ACVIM (American College of Veterinary Internal Medicine) and AVMA (American Veterinary Medical Association). AAHA (American Animal Hospital Association) is leaning toward considering Leptospirosis vaccine a core vaccine as it is considered endemic in the US.



#### g. **Non-Core or Life-Style Vaccines**

Life-style vaccines are vaccines recommended based on each individual dog's lifestyle, endemic conditions and exposure. These include Lyme disease and the respiratory diseases canine influenza (2 strains), Bordetella, respiratory parainfluenza, and adenovirus. Using the AAHA questionnaire and/or a conversation with your veterinary professional can assist you in determining which vaccines are indicated for your individual dogs. Lifestyle assessments include your dog's exposure to other dogs at boarding, dog shows and other events, groomers, dog parks, family members, and so on. Be sure to bring up lifestyle when you visit your veterinary clinic. Breeding kennels have an increased risk of exposure based on numbers of dogs, dogs moving in and out of the kennel, pregnancy causing immunosuppression and the age of younger pups.

In some breeding kennels, canine coronavirus vaccine may be indicated for dams prior to breeding. This is only recommended if coronavirus has been diagnosed definitively in the breeding facility.

<https://www.aaaha.org/resources/2022-aaaha-canine-vaccination-guidelines/>  
<https://onlinelibrary.wiley.com/doi/10.1111/jvim.16903>

#### h. **Contraindications for Vaccines**

There are times that either temporarily or permanently, vaccines may not be a good idea for your dog. Temporary pauses would include [pregnancy](#) or short-term medications or illnesses. Permanent pauses would include patients suffering from immune mediated



diseases such as Auto-immune hemolytic anemia or thrombocytopenia, sterile meningitis, lupus, and immune mediated polyarthritis. Be sure to give a complete medical history prior to anyone administering vaccines to your dog. Remember, vaccines are one of the strongest medications you can give to your dog. Avoid low cost vaccine clinics, going to a veterinary clinic that does not know or have your dog's entire medical history, or "do it yourself" vaccines if your dog has any medical condition that could put them at risk to an adverse vaccine reaction.

#### **i. Adverse Vaccine Reactions**

Adverse vaccine reactions can come in several forms.

You may want to discuss limiting the number of antigens your pup or dog receives at any one given time. Too many vaccines at one visit can overwhelm the immune system. If you are doing your own vaccinations, this is easy. If you are having your veterinary professional vaccinate your dog, consider splitting the vaccines up across more than 1 visit. You may have to pay for an additional office visit, or your veterinary clinic may allow these split vaccines to be given by one of their technicians. Even if your dog has previously handled many antigens at one time, it could backfire at an upcoming visit. When discussing this, count the number of antigens given. For example, the DAPPv vaccine has 4 antigens. The Leptospirosis vaccine has 4 antigens. Rabies has 1 antigen. Count up the total. Some vaccines play nicer with other vaccines, such as the 3 way Bordetella vaccine. Although it contains 3 antigens (Bordetella/Parainfluenza/Adenovirus), because it is intranasal and not injectable, it creates a very small ripple systemically and can easily be combined with any other vaccine.

An anaphylactic reaction is the most acute and life-threatening reaction. In this case, the dog will suddenly, within seconds to minutes, collapse. His or her gums will be pale, may vomit, and you will be terrified. This reaction requires IV fluids and drugs. In most cases, the dog will make a rapid recovery with supportive care.

A 2<sup>nd</sup> and more common reaction will occur about 45 minutes to a few hours after the vaccination. The dog will have significant facial swelling starting at the lips and moving back to the eyes and ears. There may also be vomiting. Rarely, there can be difficulty breathing. These patients will respond well to diphenhydramine (Benadryl) and/or prednisone.

A 3<sup>rd</sup> reaction can be swelling and pain at the injection site, starting a few hours to a few days after the vaccine is administered. This generally requires little to no treatment.

Because you cannot predict which dogs and when a dog will react, it is best to vaccinate your dog, should you do it yourself, when there is a nearby veterinary clinic open and



available to manage adverse reactions. Many vaccine manufacturers will cover the cost of supportive care if the vaccine was administered at a veterinary clinic.

Rarely, we can see long-term vaccine adverse events including immune mediated diseases.

If your dog has had an adverse reaction, you should discuss which vaccines should be given individually, with a pre-medication, or at all, with your veterinary professional. In some cases, your veterinarian may suggest you eliminate some vaccines altogether.

**j. Selecting a Vaccine Manufacturer**

Not all vaccines are created equal. Use high quality vaccines that have been shipped and stored at refrigerator temperatures, mixed immediately before use, and administered at recommended ages and frequencies. Vaccine manufacturers that we recommend include: Merck, Zoetis, Elanco, BI, and Solvay.

**k. Handling and Administering Vaccines**

Upon receipt of your order, check the shipping box for temperature – the ice packs may be soft but should be cool. Refrigerate the vaccines immediately upon receipt.

If expired, made up too far in advance, or not shipped and refrigerated correctly, discard vaccines. Vaccines contain living virus and bacteria – they are fragile and ineffective if not handled with care.

Vaccines should be stored in a refrigerator, on a back shelf, not on the door where there are temperature swings. Use a thermometer to monitor the temperature stored. Vaccines that are too warm or too cold in storage may have increased risk of adverse vaccine reactions or failure. Keep the vaccines refrigerated until just prior to use.

Some vaccines are in a single vial, liquid. Some require reconstitution – mixing the lyophilized (freeze dried) cake with the matching liquid portion. In these cases, the liquid may be just a diluent or it may contain vaccine antigens. Only use the diluent that comes in the same tray or package as the cake – do not mix and match. Some vaccines come in multidose vials. Use only a 1 use sterile needle, drawing up the recommended volume. Roll or shake these multidose vials before drawing the vaccine into the syringe.

Do not mix vaccines together unless the manufacturer has them paired up.

Using a new needle and syringe – usually a 3 cc syringe with a 22 g needle, push the needle into the vial with the liquid and aspirate the entire contents of the vial. If you need to reconstitute the vaccine with the diluent, push the needle into the vial with the dried cake, let the fluid enter the vial, roll to mix, then aspirate the entire 1 cc contents



back into the syringe. Keep the needle sterile until use. Administer within a few minutes after reconstitution. Do not make up in advance of administration.

Some vaccines are intended to be given as a subcutaneous (SQ) injection, some for intramuscular (IM) injection, and some as oral or nasal administration. Take great care to administer by the route intended by the manufacturer. Do not give intranasal (IN) vaccines or intraoral (IO) by injection.

Administering vaccines in specific locations has the advantage of making tracking adverse local events more easily. In our practice, we administer DAPPv and Leptospirosis over the right shoulder, Canine influenza and Lyme disease over the left shoulder and Rabies in the right rear leg. Avoid injecting into the scruff of the neck; instead vaccinate over the shoulder off the center of the dogs back or neck. As long as you track and are consistent with the administration site, you will better be able to report reactions to the manufacturer. All adverse reactions should be reported either to USDA or the manufacturer.

When handling litters for vaccines, place all pups in 1 enclosure, then as they are vaccinated, transfer them to a 2<sup>nd</sup> enclosure. In this way, you will be certain you have vaccinated each pup once – that you have not lost track of who is and is not vaccinated.

Most single dose vaccines have a label that can be peeled off and saved to record the manufacturer, lot and serial number. This is important for the future owner to share with their vet and to use if there is a need to contact the vaccine manufacturer (vaccine failure or adverse event).

### **I. Vaccine Schedule for Puppies**

***ALL puppies need to be vaccinated!***

Unless otherwise instructed, administer the first vaccine between 6 and 8 weeks of age – either Parvovirus alone or a Distemper/Parvo (DAPPv) combination vaccine. Again, unless otherwise instructed, do not vaccinate more often than every 3 weeks. Repeat DAPPv boosters every 3 to 4 weeks until the pups are 16 to 20 weeks of age. Booster DAPPv 1 year after the last puppy DAPPv vaccination.

Leptospirosis 4 way should not start until the pups are 12 weeks of age, unless otherwise instructed due to an outbreak. Two Leptospirosis vaccines should be administered 3 to 4 weeks apart, with an annual booster.

Rabies vaccines should be administered to all puppies, timed according to state law.

Bordetella, parainfluenza, and canine influenza ( 2 strains – H3N8 and H3N2) cause upper respiratory disease. Consider vaccinating annually for all listed organisms. The





intranasal Bordetella/parainfluenza/adenovirus vaccine has created stronger immunity in our practice. The 3 way Bordetella vaccination and canine influenza vaccines should be boosted annually.

Lyme disease is recommended in parts of the country where Lyme disease, white-tailed deer, white-footed mice, and Ixodes ticks are prevalent. Lyme disease is thought to cause infertility in male and female dogs with active or chronic infections.

#### **m. Vaccine Schedule for Adult Dogs**

After the puppy vaccine series, adolescent dogs require boosters on most vaccines. A titer to assess vaccine response is an alternative to boosting DAPPv.

Adult dogs can receive boosters after their 15 month vaccines for some diseases every 3 years. Rabies, Distemper, Adenovirus, and Parvovirus are recommended every 3 years. Leptospirosis, Lyme disease, Canine bivalent influenza, and Bordetella/Parainfluenza/Adenovirus respiratory vaccines should be administered annually.

In some parts of the country, the rattlesnake toxoid vaccination is recommended.

#### **n. Rabies Vaccines**

Rabies vaccines should only be administered by a licensed veterinarian or in some states, a licensed or certified veterinary technician. In many states, owner-administered rabies vaccinations are not considered legal vaccinations.

Veterinarians take rabies vaccines seriously. Not only are we protecting our dogs, we are protecting the humans our dogs come in contact with. For this reason, rabies vaccines should be administered by veterinary professionals.

#### **o. Owner Versus Veterinary Team Vaccinations**

Many owners prefer to administer vaccines to their own pups. While you may save some money doing these yourself, you run the risk of not having the vaccine manufacturer support that you would have if the vaccine was purchased and administered by a veterinary professional. In the long run, you may save money by including your veterinary professionals in your vaccine program.

Some veterinarians will not “respect” the vaccines that are owner/breeder administered or the nomograms done to time puppy vaccines.

#### **p. Conclusion**

Discuss the frequency of infectious diseases and appropriate vaccination protocols with your veterinarian.



Along with vaccines, practicing good hygiene, [appropriate deworming protocols](#), and great nutrition all contribute to a healthy immune system with minimal viral, bacterial and parasitic challenges.

Additional resources – although breeding kennels are different than shelters, both manage large groups of dogs, some very young. There is valuable and timely information in these reference libraries.

1. <https://www.revivalanimal.com/learning-center> - Revival Animal Health Learning Center
2. <https://sheltermedicine.wisc.edu> – University of Wisconsin Shelter Medicine
3. <https://forum.maddiesfund.org/home> - Maddie's Pet Forum

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[www.revivalanimal.com/category/all-pet-supplies-vaccines](http://www.revivalanimal.com/category/all-pet-supplies-vaccines)

**PUPPY WELLNESS SCHEDULED MEDICAL CARE:**

Pet's name \_\_\_\_\_ Owner \_\_\_\_\_

Vaccines and Wormings previously administered: \_\_\_\_\_

AGE/DATE NEXT VISIT	EXAMINATION DUE	VACCINATIONS DUE	LAB TESTS DUE	MEDICATIONS RECOMMENDED	OTHER RECOMMENDATIONS
<input type="checkbox"/> 6 TO 8 weeks	Puppy biography #1	DAPP (No Lepto) Benadryl/aspirin	Fecal	Heartworm Wormer Flea control	Microchip
<input type="checkbox"/> 9 TO 11 weeks due on _____	Puppy biography #2	DAPP (no Lepto) Bordetella Benadryl/aspirin?	Fecal	Heartworm Wormer Flea control	
<input type="checkbox"/> 12 TO 16 weeks due on _____	Puppy biography #3	DAPP/Lepto x 4 Rabies Benadryl/aspirin?	Fecal if has had a positive	Heartworm Flea control	Large Breed: X-ray hips for laxity
<input type="checkbox"/> 16 TO 20 weeks due on _____	Comprehensive	DALPP Final puppy booster Other _____		Heartworm Flea control	
<input type="checkbox"/> 22 weeks due on _____	Distemper/Parvo Titer Blood test		Distemper/ Parvo titer	To assess response to vaccination	Repeat boosters if low or no response to previous vaccinations
<input type="checkbox"/> 15 months due on _____	Comprehensive	DALPP due _____ RABIES due _____ BORDETELLA _____	Fecal	Heartworm flea control	
<b>PHYSICAL EXAMINATION</b> <input type="checkbox"/> Recommended, due on _____		A comprehensive physical examination is recommended at least annually. Just as with people, a physical examination may be the single most important component of an office visit allowing the veterinarian to detect and discuss any medical problem noted.			
<b>RABIES*:</b> <input type="checkbox"/> Recommended, due on _____ <input type="checkbox"/> Recommendation accepted _____ <input type="checkbox"/> Recommendation declined _____		A vaccination that is required by the State of Wisconsin for all dogs over 3 months of age. Vaccinations help prevent this deadly disease from being transmitted to humans. The first vaccination is valid for 1 year. Thereafter, the vaccine is valid for 3 years in Wisconsin. More frequent vaccinations may be required for travel.			
<b>DA2LP/PARVO*:</b> <input type="checkbox"/> Recommended, due on _____ (DAPP) <input type="checkbox"/> Recommended, due on _____ (Lepto) <input type="checkbox"/> Recommendation accepted _____ (DAPP) <input type="checkbox"/> Recommendation accepted _____ (Lepto) <input type="checkbox"/> Recommendation declined _____ <input type="checkbox"/> Not indicated at this visit		A vaccination that helps protect your dog from the 5 contagious diseases: Distemper, Adenovirus, Parainfluenza, and Parvovirus, which cause viral disease in the respiratory and gastrointestinal tracts and Leptospirosis, a bacterial disease which infects the liver and kidneys. All of these can cause illness and potentially death, particularly in young puppies. Recent research has suggested a change from annual recommendations to boosting at less frequent intervals for adult dogs (see Consent Form for Vaccine Frequency). Give several times to puppies, again at 15 months of age, thereafter boosters are due every 1 to 3 years based on risk assessment. Leptospirosis should be boosted annually.			
<b>BORDETELLA COMPLEX*/Influenza</b> <input type="checkbox"/> Recommended, due on _____ <input type="checkbox"/> Recommendation accepted _____ <input type="checkbox"/> Recommendation declined _____ <input type="checkbox"/> Not indicated at this visit		A combination of Bordetella, Adenovirus, and Parainfluenza in an intranasal vaccine. This is given annually or semiannually to dogs at risk to prevent Tracheobronchitis (kennel cough) which is a highly contagious viral and bacterial infection causing a dry hacking cough that can persist for 6 weeks or more. Dogs at risk are those who are boarded, go to training classes or competitions, are groomed, or meet other dogs. This is recommended for all puppies. It is also recommended for dogs with shortened noses (brachycephalic breeds) like shih tzus and pugs. Rarely this can be transmitted to people – but if any family member is immunocompromised, this vaccine is strongly recommended.			
<b>LYME DISEASE*:</b> <input type="checkbox"/> Recommended, due on _____ <input type="checkbox"/> Recommendation accepted _____ <input type="checkbox"/> Recommendation declined _____ <input type="checkbox"/> Not indicated at this visit		A bacterial disease transmitted by the deer tick which affects both humans and dogs. It is a very debilitating disease to dogs, causing fever and arthritis. Your dog is at risk if exposed to fields of tall grass or wooded areas. Hunting dogs or dogs who travel to the north woods of Wisconsin are at risk. Tick control measures such as Vectra 3D should also be used to reduce the risk to the dogs and people in close association with the dogs. Blood tests are available to screen for exposure to this disease.			
<b>FECAL/STOOL TEST:</b> <input type="checkbox"/> Recommended, due on _____ <input type="checkbox"/> Recommendation accepted _____ <input type="checkbox"/> Recommendation declined _____		A bi-annual stool test to detect intestinal parasites that threaten your pet's and family's health. Regular microscopic examination of your pet's stool should be done for early detection and treatment. Most intestinal parasites cannot be seen by visual inspection of the stool without concentration and magnification techniques. This recommendation comes from the Center for Disease Control (CDC) in Atlanta.			



2. Phlebotomy:
  - a. Cephalic vein
  - b. Jugular vein

Rubbing alcohol helps the vein to stand up.  
Avoid barrier tubes for progesterone testing.

## Free Animal Health Resources from Revival

Scan QR code to use [Revival's Vaccine Finder](#) or visit [www.revivalanimal.com/vaccine-finder](http://www.revivalanimal.com/vaccine-finder)



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