

Keep Your Pups Safer

Use Canine Nomographs
to Better Time
Puppy Vaccinations



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Changing The Future Of Dogs
One Puppy At A Time

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INTRODUCTION

I was introduced to canine nomographs 16 years ago by Dr. Ronald Schultz from the University of Wisconsin's School of Veterinary Medicine. Since then, my breeding partners, students and I have used them to keep our puppies safe and time our vaccination protocols. This simple, inexpensive tool has enabled us to overcome the two conflicting pressures that dog breeders and puppy owners face—how do we ensure every puppy is fully socialized during its first 16 weeks of age while keeping them safe from distemper and parvovirus?



Nomographs have proven to be the answer for us and thousands of our colleagues and students. So, with the help of Dr. Laurie Larson at the Companion Animal Vaccines and Immuno-Diagnostic Service Laboratory (CAVIDS Lab), we have written this ebook for other dog breeders. We hope it will be useful to you!

Please note that I am simply a dog breeder, not a veterinarian, so be sure to discuss this process with your vet and feel free to share this booklet with them.

Gayle Watkins, PhD
Avidog International

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Our thanks to the CAVIDS Lab, Dr. Ron Schultz and Dr. Laurie Larson for providing this invaluable service to dog breeders and puppy owners across North America!! Please visit the lab's website for more information and details.

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

WHY NOMOGRAPHS?

One of the biggest challenges faced by dog breeders and puppy owners is properly socializing and developing puppies while keeping them safe from diseases, such as parvovirus and distemper. Why is this hard? Because puppies **must** be socialized during the very time, the first 16 weeks of life, that they are at the greatest risk for these serious and potentially fatal diseases.

The early months of a puppy's life is the critical time during which it learns about the world around it, including people, other dogs, sights, sounds and more. These months, particularly three to 16 weeks, is a unique time in a dog's cognitive development when it is particularly sensitive to new experiences. If these experiences are broad and positive, this sensitivity helps puppies develop into resilient, stable adult dogs. Conversely, if a puppy is cloistered and doesn't get exposed the world, it will often develop into an anxious, fearful adult with lifelong behavioral problems.

However, this introduction to the world brings with it risk of exposure to disease, especially parvo and distemper. These viruses remain prevalent in environments around the world so are a risk to many puppies. Wildlife continue to be a reservoir for these diseases and the movement of dogs around the world, continues to spread them despite excellent and safe vaccines.

Many, if not most, bitches are vaccinated against distemper and parvo so have immunity that they pass on to their puppies through their colostrum or first milk. However, this immunity fades with time, leaving puppies vulnerable. Although it would make sense that we could solve this problem by vaccinating our puppies, the problem is not that simple for several reasons.

First, vaccinated bitches vary widely in the amount of immunity they have to distemper and parvo. An individual dog's immunity level is not a factor of how many shots it has received, it is a characteristic of the dog herself. So, two bitches, both of which have received four distemper-parvo vaccinations, could have widely different amounts of antibodies to pass on to their puppies. Even bitches living in the same house, heck, even littermates, can have completely different antibody levels. Thus, we cannot judge how much immunity a bitch can pass on to her pups by the number of shots we have given her.

Second, if high enough, the protection a puppy received from its dam or mother will render any distemper-parvo vaccination we give it completely ineffective. Any distemper-parvo shot given while the pup's maternal immunity is this high will be

useless. In fact, we could give one, two or even three shots during this period and none of them would work. We might assume the pup is protected because it's "had a shot" but we would be wrong. That pup could be vaccinated one day and come down with parvo the next and it would not be the fault of the vaccine, it would be because its mother's immunity interfered with the pup's ability to respond to the vaccination.

It isn't until a pup's maternal antibodies drop low enough that it will be able to respond to a vaccine and develop individual protection against distemper and parvo. Longstanding research has given us a good idea of how low its immunity must go before a vaccination will work for puppy but that important date varies for every litter.

Between the time when the pup's maternal antibodies drop too low to protect it and when they are low enough to allow it to respond to a vaccine, the pup is at greatest risk for disease. Nothing we can do will shorten that period so all we can do is protect our pups through biosecurity and careful socialization.

Although it's hard to understand, vaccination does not equal protection for puppies! Only vaccination at the right time results in protection. So how do we figure out when the right time is? By using canine nomographs!

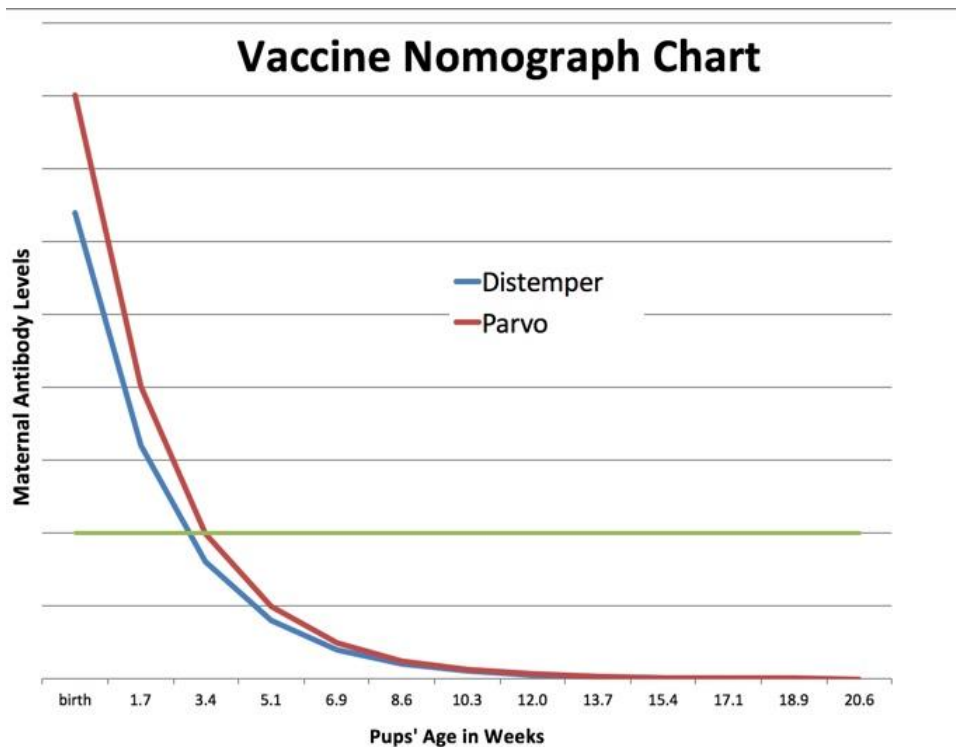
WHAT ARE CANINE VACCINE NOMOGRAPHS?

Nomographs or nomograms are graphs drawn using a simple blood test that estimates the amount of distemper and parvovirus antibodies passed from a dam to her puppies via her colostrum during the first 12 hours of the pups' lives. Nomographs are useful for breeders and puppy owners because they can help predict when pups:

- are no longer protected by maternal antibodies and
- will be able to respond to distemper and/or parvo vaccines.

During a puppy's first 12 hours of life, its intestinal tract allows distemper and parvo antibodies in its mother's colostrum to pass into its bloodstream and start protecting it from these diseases. As the puppy grows up, maternal antibodies break down in approximately two-week "half-lives" until they are no longer present in the pup.

While a puppy's maternal antibodies are high, they neutralize viruses such as parvo and distemper. This keeps the pup safe from these potentially fatal diseases. However, this same neutralization also blocks vaccines so the puppy will not be able to be immunized if vaccinated.



Maternal antibodies against distemper and parvo are independent of each other; a bitch can and often will have different levels of protection against these diseases. In our fifteen years' experience, bitches' titers can range from as low as 4 and as high as 5280. These levels mean a pup's maternal antibodies can disappear as soon as a few days after birth to as late as 18 weeks of age. With these last pups, if we had stopped vaccinating them at 16 weeks, as is commonly done, the pups would not have been protected!

In fact, maternal antibody interference is one of the most common causes of vaccine failure in puppies. Traditionally, owners give pups multiple doses of vaccine every two to three weeks during puppyhood because there was no way to know when their maternal antibodies ran out. No one knew which shot would be effective so we had to keep giving them. That meant that pups receive many vaccinations that don't work but owners often think they were safe. If a shot didn't work, the pup was at risk for coming down with parvo or distemper.

However, there might be a better way. Today, we can measure the antibodies that a bitch has to pass on to her puppies using antibody titers, a simple blood test. If that test is done at the CAVIDS Laboratory at the University of Wisconsin Veterinary School, the lab will run a nomograph on those results, allowing us to predict the optimal time to vaccinate her puppies.

This nomograph also gives us an idea when the pup is at greatest risk, the At-Risk period, that time when it no longer has enough maternal protection to protect it from disease but it has too much to respond to a vaccine. Although we are always very careful to practice good biosecurity and Savvy Socialization with our puppies, this is the time that we are most vigilant.

USING A NOMOGRAPH FOR YOUR LITTER

To use a nomograph to better time your litter's distemper and parvo vaccinations, you will need to ship serum from your bitch to the CAVIDS Lab. The ideal time for the blood draw is either two weeks before or two weeks after the puppies are whelped. You may find it more convenient to do the blood draw when your bitch is at your veterinarian's for progesterone testing or a pregnancy ultrasound. Similarly, bitches that are bred more than once a year do not have to have a second nomograph that year. However, the further from whelping the blood is drawn, the more risk you take that your bitch has come in contact with distemper or parvo and mounted an immune response that won't be revealed in her titer. You'll have to decide how great that risk is based on your bitch's activities and the occurrence of parvo or distemper in your area. Personally, we stick with drawing blood either two weeks before or two weeks after whelping.

Prepare and ship the blood according to the Blood Preparation Procedures in the next section and the Nomograph Submission Form on page 13. Follow the example submission form on page 14. It is particularly helpful to the lab if you provide your dam's vaccination history. At a minimum, fill out her distemper (CDV) and parvovirus (CPV-2) vaccination history.

Nomograph Report. In about a week, you will receive an email report from the lab similar to the one on page 15. The report will give you your bitch's parvo and distemper titers in the box, and then below that is the protective standard for this lab. A little further down the page will be the nomograph information for the litter, indicating the age at which the pups can be vaccinated and for which diseases. On these reports, **D** indicates a distemper vaccine, **A** indicates an

adenovirus-2 vaccine, and **P** indicates a parvovirus-2 vaccine. The report then goes on to give further information about confirming the pups' immune response.

Pups' "At-Risk" Period. Prior to the recommended vaccination dates, the pups are at risk for getting distemper or parvo if they come in contact with the viruses.

At the same time, it is critical that we fully socialize and develop our pups prior to 16 weeks of age. Thus, breeders and owners must practice Savvy Socialization and good biosecurity to properly develop puppies during the weeks prior to the vaccination. If you want to know more about how to do this, [become an Avidog Breeder College Member](#).

Send Reports to New Homes. Breeders should provide a copy of their bitch's nomograph report along with each pup's vaccination record to its new owners so they can provide them to their veterinarian on the first visit. This enables the pup's vet to tailor the pup's vaccines to its individual needs.

Confirming Pups' Responses to DP Vaccines. Every pup, no matter what vaccination protocol it receives, should have a confirmatory distemper-parvo vaccine antibody titer drawn two weeks following its last DP or DAP shot to ensure that it is protected. We have personally bred litters that could and did not respond to the parvo vaccine until after 17 weeks of age. If their owners had stopped vaccinating at the typical 16 weeks, those pups would have been left unprotected against parvo. They would have had a good chance of coming down with the disease in their first year, since they were competition dogs and thus out and about.

Breeders and owners can use the CAVIDS Lab for pups' confirmatory titers. Use the same submission form and blood draw instructions but this time, do not check the nomograph block. Attach a copy of the dam's nomograph with the submission form, if you have one. You will receive a report like the one on page 16.

If an owner doesn't do a confirmatory titer after the puppy series, that pup should be revaccinated against distemper, parvo and adeno at a year of age, when all chance of maternal antibodies is gone.

High Risk Conditions. In high risk situations, such as kennels that have had parvo outbreaks, breeders should take the additional step of running a titer on at least one pup in a litter BEFORE vaccination is begun. The nomograph on the dam is

helpful, but a pup's actual antibody level provides even better information in this risky situation.

When Not to Use Nomographs. Nomographs are useful tools to help breeders predict when vaccinations can be successful in their pups. However, to successfully use nomographs to schedule a puppy's distemper and parvovirus vaccines, that puppy must have **ingested colostrum from its dam during its first 12 hours of life**. If for some reason that did not happen, either due to issues with the puppy or its mother, then a nomograph cannot be used and the puppy should be vaccinated using the more standard vaccination protocols, like those recommended by the World Small Animal Veterinary Association, which can be found at www.wsava.org/guidelines/vaccination-guidelines.



BLOOD PREPARATION PROCEDURES FOR A NOMOGRAPH

- Plan to draw your bitch's blood **two weeks prior to or two weeks after whelping**. Avoid drawing blood closer to whelping than these dates because the bitch's body is creating colostrum and the nomograph will be less accurate. At the same time, if you draw her blood too far from whelping, you risk her coming in contact with distemper or parvo closer to whelping, which will change the antibody levels the pups get in her colostrum.
- Ship your bitch's blood to arrive at the lab Monday through Friday. Drawing and shipping blood **Monday, Tuesday or Wednesday** is usually best.
- Collect 1 to 3 mls of blood from your bitch in a **sterile, red top or serum separator tube** and allow it to clot.
- Spin down the blood to separate the serum. Send at least **½ ml of serum** for the testing.
- Wrap the tube with the serum in **padding**, such as paper towel, and place it in a plastic zip-lock bag.
- Fill out the **submission form** (see sample form) and place it with a **\$40 check made payable to the University of Wisconsin** in a SECOND plastic zip-lock bag. [To fill out the submission form on your computer, click here to download the Canine Nomograph Fillable Form 2017.](#) Then follow these instructions:
 - Directions for using fillable form
 1. **Download** [THIS form/pdf](#) to your computer. Don't worry, it's safe!
 2. **Open** the downloaded form/pdf using, [Adobe Reader](#) or [Apple Preview](#).
 3. **Fill out** the form with your info.
 4. Go to – **File > Save As**, then save your completed form/pdf to your computer with **your name and date**.
 5. **Print** completed form and send with sample.
- Place both plastic bags in a **sturdy shipping container**, either a padded envelope or box. If the ambient temperature might go above 80°F during shipping, include a cold pack wrapped with some newspaper to keep it from crushing the serum vial. Freezing temperatures aren't a concern when shipping separated serum.
- Send the shipping container via **USPS 2-day Priority Mail** to this address. Overnight shipping is not necessary. ([Click here for label](#))

CAVIDS - Titer Testing Laboratory
University of Wisconsin-Madison School of Veterinary Medicine
2015 Linden Drive West

Madison, WI 53706
(608) 263-4648

- ❑ The lab usually runs tests on Fridays and will send you and your vet a report via email (see sample report) about a week after receiving the blood sample that gives you the following information:
 - your bitch's quantitative titers for distemper and parvo,
 - an interpretation of these results for her, and
 - recommendations for which weeks to vaccinate her puppies.

RESOURCES

American Veterinary Society of Animal Behavior. 2008. *AVSAB Position Statement On Puppy Socialization*. Available at <https://courses.avidog.com/wp-content/courses/AVSAB-Position-on-Puppy-Socialization.pdf>

Baker JA, Robson DS, Gillespie JH, Burgher JA, Doughty MF. 1959. A nomograph that predicts the age to vaccinate puppies against distemper. *Cornell Vet*. 1959 Jan;49(1):158–167. Available at <https://courses.avidog.com/wp-content/courses/Nomograph Paper.pdf>

Ronald D Schultz Lab. 2016. *Canine Nomograph – What is it?* Available at <https://www.vetmed.wisc.edu/lab/cavids/canine-nomograph-what-is-it/>

WSAVA Vaccination Guidelines Group. 2015. *World Small Animal Veterinary Association 2015 Vaccination Guidelines for The Owners and Breeders of Dogs and Cats*. Available at <https://courses.avidog.com/wp-content/courses/WSAVA-Owner-Breeder-Guidelines-14-October-2015-FINAL-1.pdf>



NOMOGRAPH SUBMISSION FORM



Companion Animal Vaccines and
Immuno-Diagnostic Service Laboratory
CAVIDS - Titer Testing Lab
University of Wisconsin-Madison School of Veterinary Medicine
2015 Linden Drive West
Madison, WI 53706
(608) 263-4648

This Space for Laboratory Use Only

Canine/Feline Serum Submission Form

Veterinary Clinic: _____
 Pet Owner name: _____
 City/Town, State: _____
 Owner's email: _____ Veterinarian's email: _____

Serology results will be sent to the emails listed

Pet name: _____ DOB : _____ Breed: _____
 Sex (please circle): Male Male/Neutered Female Female/Spayed
 Health Status? Generally Healthy Chronic or Systemic Health Issues

Date of last CDV, CPV-2 (FPV) vaccination: _____ CAVIDS tested previously? _____

Test Requested: Date of blood draw _____

CDV/CPV-2 titer CAV titer (extra fee) Feline Panleukopenia (FPV) titer

Nomograph on dam Expected whelp date? _____

Puppy pre-vaccination baseline How many in litter? _____ High CPV Risk?

Puppy nomograph follow up (dam's full name _____)

Please list if/when your dog received the following, and if known, please list brand(s)/manufacturer(s) of vaccine

Vaccination History	Yes	No	Date (if known)	Info. Not Available
Combination (CDV, CPV-2, CAV-1&2 with/without CPiV)				
Canine Parvo Virus (CPV-2)				
Canine Distemper Virus (CDV)				
Leptospira 4-way				
Canine Corona Virus				
Rabies				
Canine Influenza H3N8 H3N2				
Others				
Bordetella (kennel cough) *				
For cats: date of most recent FPV vaccine				

* If yes, please indicate if intranasal (IN), oral (PO) vaccine or injectable (IJ) vaccine.

~Submitted serum samples will become the property of CAVIDS Laboratory~

SAMPLE NOMOGRAPH SUBMISSION FORM



Companion Animal Vaccines and
Immuno-Diagnostic Service Laboratory
CAVIDS - Titer Testing Lab
University of Wisconsin-Madison School of Veterinary Medicine
2015 Linden Drive West
Madison, WI 53706
(608) 263-4648

This Space for Laboratory Use Only

EXAMPLE

Canine/Feline Serum Submission Form

Veterinary Clinic: My Vet's Office
 Pet Owner name: Gayle Watkins
 City/Town, State: Somewhere, NC
 Owner's email: info@avidog.com Veterinarian's email: vet@avidog.com

Serology results will be sent to the emails listed

Pet name: Glee DOB: 5/11/14 Breed: Golden Retriever
 Sex (please circle): Male Male/Neutered **Female** Female/Spayed
 Health Status? Generally Healthy Chronic or Systemic Health Issues

Date of last CDV, CPV-2 (FPV) vaccination: 4/28/12 CAVIDS tested previously? No

Test Requested: Date of blood draw 11/2/15

CDV/CPV-2 titer CAV titer (extra fee) Feline Panleukopenia (FPV) titer

Nomograph on dam Expected whelp date? _____

Puppy pre-vaccination baseline How many in litter? _____ High CPV Risk?

Puppy nomograph follow up (dam's full name _____)

Please list if/when your dog received the following, and if known, please list brand(s)/manufacturer(s) of vaccine

Vaccination History	Yes	No	Date (if known)	Info. Not Available
Combination (CDV, CPV-2, CAV-1&2 with/without CPiV)				
Canine Parvo Virus (CPV-2)	<input checked="" type="checkbox"/>		4/28/12	
Canine Distemper Virus (CDV)	<input checked="" type="checkbox"/>		4/28/12	
Leptospira 4-way				
Canine Corona Virus				
Rabies	<input checked="" type="checkbox"/>		5/28/12	
Canine Influenza H3N8 H3N2				
Others				
Bordetella (kennel cough) *				
For cats: date of most recent FPV vaccine				

* If yes, please indicate if intranasal (IN), oral (PO) vaccine or injectable (IJ) vaccine.

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SAMPLE NOMOGRAPH REPORT (DAM)



Companion Animal Vaccines
And Immuno-Diagnostic
Service Laboratory - CAVIDS
University of Wisconsin-Madison
School of Veterinary Medicine

9 July 2018

Owner name: **Gayle Watkins**

Pet name: **Glee**

Please find below the results of the serologic (antibody) test for your dog.

Animal ID	CPV HI	CDV SN
Glee	320	512

Nomograph for **Glee's puppies:**

A dose of DP or DAP should be given at 9 and 13 weeks of age

This nomograph is unique to this dam and is an estimate of the age at which the maternal antibody that this mother passes to her pups will be dissipated and no longer capable of interfering with pup vaccination. This estimate is based on her antibody titers against each virus, CDV and CPV-2, which decrease in roughly 2 week half-lives in her pups. Due to potential failure of passive transfer, the nomograph is not to be used as an indication of protection from wild-type virus for the litter.

It is strongly recommended to titer test pups at approximately 15 weeks (at least two weeks after vaccination is completed) to determine that they have responded. Please include dam information when submitting pup titers. We recommend that, unless an adverse reaction has been observed, all dogs be given DAPP combo vaccine at one year of age, and then no more frequently than every three years.

There is a small percentage of "non-responder" dogs that are unable to develop an antibody response to CPV-2 (estimated 1 per 1,000 dogs) or CDV (estimated 1 per 5,000 dogs). These dogs will not develop detectable antibody after vaccination. A dog will be a non-responder to one virus or the other (but very rarely to both) and will remain susceptible, most likely for life. When the non-responder dog is exposed and infected with the virus, it will very likely get diseased and die. Non-responsiveness is genetically determined; therefore certain breeds or especially families of dogs will have a higher number of non-responders than would be found in the general population of dogs (estimated above). (Schultz, RD and Larson, LJ, unpublished data.)

SAMPLE NOMOGRAPH REPORT (FINAL FOR PUPPY)



Companion Animal Vaccines and
Immuno-Diagnostic Service Laboratory
CAVIDS - Titer Testing Lab
University of Wisconsin-Madison School of Veterinary Medicine
2015 Linden Drive West
Madison, WI 53706
(608) 263-4648

5 November 2018

Owner name: **Gayle Watkins**

Pet name: “ **Ready** ” at 14 weeks of age

Dam: **Glee**

Animal ID	CPV HI assay	CDV SN assay
Ready	320	128
Glee (dam)	320	512

Canine Distemper Virus (CDV) antibody titer was determined by the serum neutralization (SN) test.

Canine Parvovirus Type 2 (CPV-2) antibody titer was determined by the hemagglutination inhibition (HI) test.

An SN titer for CDV > 8 and an HI titer for CPV-2 > 40 are considered protective when:

- 1) The dog is 18 weeks of age or older (unless puppy baseline or dam nomograph titers are known) AND
- 2) The dog was vaccinated 2 or more weeks prior to the time the blood sample was collected.
- 3) What if the titer is less than 8 (SN) for CDV and/or less than 40 (HI) for CPV-2?

Revaccination with either a monovalent vaccine [specific for the virus (e.g. CDV, CPV-2) for which there is low or no antibody titer] or a combination vaccine (e.g. CDV, CPV-2, CAV-2, etc.) is highly recommended!

Dam Name	Glee		Puppy	Ready							
Sample drawn	1-Jul-18		age	14 weeks							
CDV Titer	512		CDV Titer	128							
CPV-2 Titer	320		CPV-2 Titer	320							
Maternal Antibody Degradation, with standard variation											
Distemper	256	128	64	32	16	8	4	2	Ready		
	512	256	128	64	32	16	8	4	128		
	1024	512	256	128	64	32	16	8			
Parvo	160	80	40	20	10	5	3	1			
	320	160	80	40	20	10	5	3	320		
	640	320	160	80	40	20	10	5			
Vaccination				9 wks		12 wks		test			
0 days	12	24	36	48	60	72	84	96	108	120	132
0 weeks	2	3	5	7	9	10	12	14	15	17	19
Birth											

Avidog International provides continuing professional education for dog breeders based on current and past research, as well as nearly 40 years of breeding experience. Take a course or become a [member of our Breeder College](#) for access to our courses, resources, ebooks, products, and more.

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