



**We are so excited that you have chosen our hospital for your pet's needs!**

Here is some basic information about our hospital.

**Care to Share Program** - Refer a new client and receive a \$25 credit on your account.

**We offer boarding for our canine, feline and exotic friends** - Your canine friend will be pampered at our hospital with daily walks in our fenced in play yard. If you want to give them something extra special, consider signing up for extra playtime or treat times. Your feline friend will be provided a hiding spot and toys for enrichment during their stay. We encourage you to bring your pets own food to reduce the risk of dietary upset.

**Canine and Feline boarding requirements:**

A current physical exam performed by a Fullwood doctor, Rabies vaccine, canine and feline Distemper vaccine, Canine Influenza (canines only) Bordetella vaccine (canines only), intestinal worm check and being free from external parasites (fleas and ticks) are required for boarding, hospitalization and grooming. Any friends with fleas or ticks present will be administered a preventative at the owner's expense.

**Pets taking medications while boarding** – We will administer 1-2 medications at \$3/day or 3+ medications at \$6/day to our furry friends. Injectable medications or more than 3 medications will be charged \$5.00 per day.

Canine Pricing \$45.00 per night  
Feline Pricing \$35.00 per night  
Exotic Boarding \$35.00 per night

**Drop off/Pick up times**

Monday-Friday 8:30am-11:00am, 2:30pm-5pm  
Saturday/Sunday 7:30am-9:00am, 4:30pm-6:00pm

**There are no after hour pickups or drop offs**

**Billing** - We do not offer payment plans but we do accept Care Credit and Scratch Pay. Care Credit is a medical credit card that offers a 6 month, no interest payment option for charges over \$200. Please be aware, if the balance is not paid in full within the 6 months, you will be charged interest on the entire balance at a high rate.

Scratch Pay is a short term loan that is repaid over an agreed upon time frame.

**Laser Therapy** - Laser Therapy is used to reduce pain, inflammation and speed up healing time. Treatment protocols are different for each condition and patient. We offer laser packages at a reduced cost for those friends that need multiple treatments.

**Spa & Grooming** – We offer full service grooming and bathing for all of our canine and feline friends.

**Wellness Exams & Vaccinations**

**Canine companions** - A physical exam is recommended every 6 months to maintain your pets health. We recommend the Canine Distemper vaccine, Rabies vaccine, Bordetella and Leptospirosis vaccines, intestinal worm checks and heartworm tests yearly. Depending on lifestyle, other vaccinations may be recommended by our doctors.

**Feline Friends** - A physical exam is recommended every 6 months to maintain your pets health. We recommend a Feline Distemper vaccine and Rabies vaccine yearly for all cats. For our feline friends that spend time outdoors, we also recommend the Feline Leukemia vaccine and an intestinal worm check yearly.

Annual blood work is encouraged for all of our younger friends and every 6 months for our senior friends since pets age much faster than we do.

**Membership Plans** - We offer 3 different membership plans for our canine and feline friends to help minimize the cost of yearly preventative medicine.

**Surgery** - Surgeries are performed Tuesday-Friday. All of our patients will need to be fasted the morning of surgery. Drop off time is 7:30am and pick up times are between 2-5:00pm. We require blood work prior to all surgeries and will also place an IV catheter in each patient. Patients are monitored closely while under anesthesia.



## What First Time Puppy Owners Should Know

Phyllis DeGioia, Veterinary Partner Editor

Published: June 28, 2021

The best age to bring a puppy home is at 8-10 weeks. That's the best possible timeframe, although bringing one home later than that hardly means your dog won't have any social skills; it just means that everything in the puppy's mind and body at 8-10 weeks is at a prime time for bonding and learning.

The primary socialization period for puppies is between the 3rd and 12th week. An increase in social play is seen around 7-8 weeks, with hypersensitivity to unknowns happening between 6 and 8 weeks of age. Puppies should be introduced to most of the situations they will encounter as adults before the end of weeks 3-14.

### Housetraining and House Rules

One of the first things your puppy must learn is housetraining. Some puppies will have been trained by the breeder, some will not; it depends on the breed and breeder. Their bladders are tiny. You need to take the puppy outside to the area where you expect dogs to do their business the moment the puppy wakes up in the morning and after every nap, after every meal, after indoor playtime, and last thing at night. The more often you go outside and praise the puppy for going there, the faster your housetraining is more likely to occur. Do not punish a puppy in any way for an indoors accident; it just teaches a puppy not to eliminate in front of you. It's a learning curve, just as it is for human babies. It may take longer than you think is necessary or possible, but it will happen with enough effort on your part. For the rest of the dog's life, your time will be ruled by their bladder, but especially now.

Just as puppies must learn housetraining, they also need to learn your household rules. If you do not want your adult dog on the furniture, don't let the puppy on the couch even once. Of course, you do not want your puppy running out the front door at full speed, so it's up to you to teach them to be in an alternative location other than the door when it opens. Reinforce the behaviors you want to see, redirect the ones that you don't want to see, and reinforce behaviors that are incompatible with the undesirable one (i.e., go to a mat instead of your lap during meals, chasing other pets, etc.).

Whatever puppies perceive as acceptable behavior, even if you've said "just this once," will be sure to continue. They don't speak English. The entire family must be on board with the rules or the puppy will be confused.

### Social Skills

Puppy kindergarten is an excellent starting point so that your puppy gets used to other dogs, although you usually have to wait until the puppy is up to date in [the series vaccine](#) and [Bordetella](#). They learn how to play with dogs that are not litter mates, and how to meet other dogs. Some will be more timid or outgoing than others, but being timid is a red flag and needs to be addressed sooner rather than later. If your puppy is fearful at 12 weeks, you are going to have a fearful adult.

Basic social skills are an absolute must unless you are willing to live with a dog that jumps on your grandmother, steals food from your plate, slurps up your dropped medication, takes over the couch, grabs the barbecue tongs out of your hand, and runs away with your wallet. Generally speaking, the behavior of such a puppy gets worse as they get bigger and older, sometimes to the point where veterinary staff cannot handle the dog and your neighbors are afraid of them, so it needs to be addressed sooner rather than later. Going to training classes and regularly doing the exercises at home is your best bet towards having a dog that you can handle. Understand that training doesn't train the dog so much as it trains you to train your dog.

Puppies explore the world with their mouths. They have tiny, sharp teeth that can't do much damage but which can be annoying and somewhat painful if they sink into your hand during "play." Mouthy adults are far more annoying.

Although roughhousing will be taken by some children and puppies as a ton of fun, it can lead to the puppy thinking it's okay to be rough and bite you whereas the opposite is true. Keep the play gentle.

Puppies need appropriate socialization to grow into dogs that are good with people, children, and other dogs. Some dogs will always be reactive to other dogs no matter what. Remember that socialization is about exposure and, from the dog's perspective, good experiences. Puppies should encounter something new every day. Between 8-12 weeks of age, the puppy should be around people wearing all kinds of things, including hats, beards, large purses, sunglasses, and noisy shoes; puppies; adult dogs; dogs that don't want to play with puppies and say so; people of different color; children of different ages and sounds; and so on. The more positive experiences the puppy has, the more confident they are as adults. They don't have to meet people, they can be just sitting away from people, and you can click and treat as people go past.



Photo courtesy of Depositphotos

The problem with this time frame is that it should happen while the puppy is still receiving parts of the vaccination series, which lasts until 4 months of age (your veterinarian will determine part of your puppy's schedule based on geographic location). Those vaccinations are necessary for health and cannot be skipped or delayed. One solution to the vaccination/socialization issue is play dates with puppies and dogs you know are vaccinated (perhaps from puppy kindergarten or obedience classes, or friends and neighbors); and staying away from places that do not require current vaccinations, like dog parks.

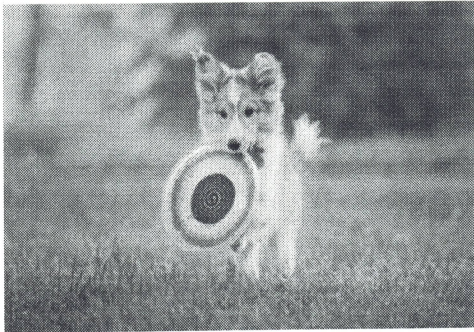


Photo courtesy of Depositphotos

Puppies are either awake or moving around, playing, running, getting into mischief. They are a ton of work as well as enormous fun. There will be times when you think you are too tired to handle it all, but you can.

Eventually that little round belly you love to kiss and the puppy breath you love to smell will be replaced by an adolescent whose visible ribs make it look like you are starving your dog. Adolescents sleep less, play more, usually have houstraining under their belts, and need ever so much exercise. Before you know it, your puppy will be an adult, and you'll never be able to hold that tiny paw again. Enjoy it while you can!

### What You Need on Day One

Since you will likely have been talking to the people who have the puppy, you have a better chance of having the right equipment at home on Day 1 because you will have had time to prepare, unlike finding a stray. Also, if you shop before the puppy comes home, you won't bring an immature immune system into the pet supply store where a lot of other dogs have been, giving them a better shot at remaining healthy before their vaccination series is over. Still, what is necessary on Day 1?

- **Cleaning supplies.** Your puppy may or may not be houstrained, and even if they are, they may get nervous or play too long to remember they are not supposed to go on your floors. Whether you have carpeted floors or otherwise, an enzymatic cleaner available at any pet supply store is a much better bet than vinegar and water because if the smell remains, the puppy will think that is an okay place to go. Read the directions on the cleaner to make sure you understand how to eliminate the odor at the source.
- **Food.** Puppies need puppy food, not adult food. Your breeder should tell you what the puppy has been eating so you can get the same thing. Changing food without mixing in the previous one will increase the possibility of an upset tummy and the accidents that can result from a digestive upset.
- **Food and water bowls.** While you can certainly use any bowls at home for food and water in the first week, eventually you will want food puzzles and toys. If you want bowls too, get some stainless steel or ceramic bowls because unlike plastic, they do not harbor bacteria.
- **Crate.** Houstraining a puppy is a lot easier with a crate because dogs naturally do not want to sit in their own mess. Actually, a crate is helpful, but an exercise pen with a crate, feeding station and elimination station is better. A puppy crate is meant for houstraining, not for tossing in the puppy when you're tired of playing (and you will be, at some point – puppies are a lot of work!). Remember, you are using their natural instinct not to soil their den, and if you leave them in so long that they have no choice but to soil it, you are defeating your purpose. However, if the puppy gets wildly overexcited, don't toss them into the crate to cool down because they will think that is punishment. Give them a long-lasting treat, food or puzzle toy to work on, or take them for a walk. The crate should be big enough for the puppy to stand up in, turn around, and stretch out. Consider one of the crates designed to grow with the puppy by using moving dividers to accommodate growth.
- **Collar or harness and leash.** A literal line between life and death, a leash and something to connect it to is necessary.
- **Toys** are invaluable to puppies, but you need to be careful to get safe toys that the puppy cannot get hurt by or bite off pieces. Puppies and adults can either fracture teeth from a toy that's too hard, or need surgery to remove a soft toy chewed into pieces and swallowed. Don't let puppies play with your old shoes or they will think all shoes are toys. Like babies, puppies examine the world with their mouths, and they will chew on anything they can. Make sure it's not something important to you!

### What you will need eventually, but do not have to have on Day One

- **ID tag.** You can order these at a pet supply store or numerous online sites. Put your cell phone number on the dog's collar or harness.
- Depending on your local ordinances, your dog may need a *city license*. For the license, you will need to provide proof that your dog has been vaccinated for rabies, which should occur during your puppy's vaccination series.
- **Medications:** flea and tick preventive, heartworm preventive if you live in heartworm territory, potential deworming or antibiotics for infections. Your veterinarian will guide you.

- *Poop bags.* It's up to you to carry their poop back to your home or other acceptable deposit area (ugh). You can use plain old plastic bags or buy one of a large variety of bags designed for that purpose: with or without handles, compostable, scented, perforated on a roll, sized for big dogs, decorated with paw prints on them, and so on.
- You will also need to establish a *relationship with a veterinarian* for the puppy, which means the puppy has to meet the veterinarian in person as per the Veterinary-Client-Patient-Relationship (called VCPR). To remain valid, the puppy must see the doctor once a year in person.



Photo courtesy of DepositPhotos

- *Medical issues* are cleared up most easily and with the least cost early on, especially with puppies because they have an immature immune system. If you're concerned about something, go to the veterinarian, not Dr. Google.
- Identify the veterinary *emergency/critical care hospitals* in your area and know how to get there.
- Puppies and adult dogs need *exercise*, but tiny puppies only need supervised play time. Realize that for these puppies, all time spent not sleeping or eating is play time. This time is perfect to start teaching them to follow you, and you can use targeting for this. Later you can attach a leash. You do need to teach them to walk properly on a leash so that the dog does not drag you for the rest of their life.
- *Flat-faced breeds* (brachycephalic), such as bulldogs, pugs, Pekingnese, lhasa apso, bull mastiffs, and English toy spaniels do not do well in heat and should not be exercised outdoors when it's hot. Be careful to keep them cool enough to prevent heat stroke. Learn the signs of [heat stroke](#). Other breeds can also get heat stroke.

While individual dogs prefer less affection than others, puppies want it. They want everything from your family: time, affection, love, gentleness, play, exercise. They must be supervised to see that they don't ingest ant bait, don't fall off the deck, are being treated well by family members (no one is pulling the puppy's tail), aren't getting out of the yard, and aren't making a habit of chewing on the couch or peeing behind it. If you find that the puppy is destructive when you leave the house, keep the puppy in the crate when you do leave until the puppy learns the house rules.

What you do now for and with your new family member will pay off in significant dividends for the rest of the dog's life, whether that's 6-10 years (average life span of a mastiff) or 14-16 (Chihuahua). Your life will be changed for the better. If you think after your puppy has been home for two days that you would do anything to save them, think about how you'll feel in a decade after the human-animal bond has deepened every passing day.

#### Toxic Substances for Dogs

Dogs are a different species, so some things we can eat or ingest may essentially poison them. There's no need to panic if your 120-lb dog eats two M&Ms, but you do need to be concerned if your 20-lb dog eats half of a chocolate cake. If you know what your dog has ingested, you can call [ASPCA Poison Control Center](#) for a fee, at (888) 426-4435, or contact a veterinarian immediately.

- [Alcohol](#)
- Antifreeze
- Caffeine
- [Chocolate](#)
- [Cigarettes](#), nicotine, [e-liquid for electronic cigarettes](#)
- Compost
- Dishwashing liquid, detergent/dishwasher tablets
- Fabric softener sheets
- [Grapes and raisins](#)
- [Ibuprofen](#) and naproxen
- [Cannabis](#)
- Minoxidil (Rogaine)
- Mosquito repellent with DEET
- Nasal decongestants
- Nuts (particularly Macadamia nuts)
- Onions, garlic, chives
- Pesticides and [rodenticides](#)
- Topical medications
- Wild mushrooms
- [Xylitol](#)

- Yeast dough

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Print



## Preparing Puppies for Veterinary Visits

Published: January 17, 2023

Christine D. Calder, DVM, DACVB

The veterinary hospital can be a scary environment for puppies. Everything from the waiting room full of people and animals to handling and restraint during physical exams can be overwhelming. Vaccinations are unexpected and often painful, and stepping on the scale results in panic. It doesn't have to be this way. With a little bit of preparation at home, you can make veterinary visits low stress.

### Early Socialization

The ideal age to purchase or adopt a puppy is somewhere between eight and ten weeks of age. This gives ample time for your puppy to adjust to their new environment and form relationships with people, dogs, and other animals that share their home. If adopted later in life, puppies will still have opportunities for socialization; however, the process may take longer or never happen at all.

During the socialization period, puppies need a variety of good experiences however, the quality rather than quantity of these experiences is important. Interactions should never be forced, and the puppy should be closely monitored to make sure they are having fun and want to interact. Food and play are great ways to keep a puppy engaged while positive associations are developing in their mind.

### Socialization with Other Dogs

Dogs are not born instinctively knowing how to "speak dog." Puppies learn this critical skill through interactions with their mother, littermates, and other dogs living in the home. Giving your puppy opportunities to interact with dogs of all ages, shapes, and sizes will help them master these skills into adulthood. During these interactions, direct supervision is a must. Adult humans should be on hand to make sure all dogs continue to have fun, and frequent play breaks are taken when needed. Dog parks are not an ideal place to learn these skills therefore, "play dates" should only take place with other dogs that are up to date on their vaccines and know how to play politely with other dogs.

### Socialization Classes

Puppy socialization classes, or "Puppy Kindergarten", provide a great opportunity to socialize your dog in a safe environment. Puppies in these classes are often similar in age, and their vaccine status is known. Classes offered at veterinary hospitals, training facilities, or local shelters will have strict sanitation protocols in place to reduce the spread of disease and keep your puppy safe and healthy.

When taught by a trained professional, these classes often provide enriched environments full of fun toys that make noise, objects to explore, different surfaces to walk on, and people to interact with. A family affair, children are often encouraged to attend and interact with the dogs while supervised. Basic social skills are introduced, and house-training strategies are discussed. Learning about "normal" puppy behaviors while troubleshooting solutions to common nuisance-type behaviors like play biting, jumping, and nipping is included. Overall, these classes are a great way to learn from professionals and socialize your puppy at the same time.



Photo Courtesy of Christine Calder, DVM, DACVB

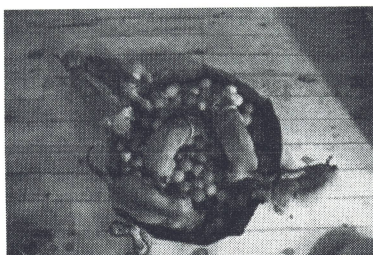


Photo Courtesy of Christine Calder, DVM, DACVB

### Handling Exercises

Handling your puppy's feet, legs, individual toes, and nails while rewarding constantly using high-value treats can help prepare your puppy for future veterinary exams, nail trims, and grooming procedures. The same is true for touching their mouth and ears. When doing these exercises, it is important to constantly monitor your dog to make sure they are not stressed by these interactions.

Never force your dog to accept your touch, and always give them a choice to walk away when they are uncomfortable or not willing to participate.

### Teaching Choice and Problem-Solving Skills

When young, it is impossible to expose your dog to everything they may encounter later in life. Teaching your puppy critical problem-solving skills is important. Food dispensing and puzzle toys are a great way to engage your dog's brain, build confidence, and teach independence from you. These tools reduce destructive behaviors and help your dog remain calm and quiet while you watch television, take a phone call, or are stuck on a zoom call. They also reduce frustration and help your dog work through problems they may encounter later in life.

Training is another way to encourage your dog to use problem-solving skills while building strong relationships with their humans. Positive reinforcement training improves communication between you and your dogs. Learned behaviors such as touch, chin rest, go to a mat, and stationing on side and front feet up on a platform are all behaviors that encourage choice and are the basic foundations for cooperative veterinary and husbandry care.

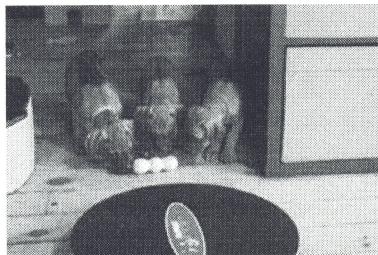


Photo Courtesy of Christine Calder, DVM, DACVB

### The Car Ride

Car rides can be scary for puppies, and many will get carsick. Taking your puppy for short frequent rides can be helpful to acclimate your puppy to the car. Treats given at drive-thru windows and rides that end at fun places are all ways to help your puppy associate the car with something fun and exciting. If your puppy does get car sick, talking with your veterinarian about anti-nausea medication can help make the ride more pleasant for you and your puppy.



Photo Courtesy of Christine Calder, DVM, DACVB

### Putting it all Together: The Veterinary Hospital

Veterinary visits will never be free of fear but preparing your puppy using the techniques and strategies listed above will make these visits less stressful for all. Dogs that are comfortable riding in cars and have been well-socialized as puppies are less likely to become overwhelmed, anxious, and fearful when arriving at the hospital and entering a crowded waiting room. Due to the positive associations your dog has now formed, handling and restraint by the veterinary team will result in a calm and relaxed dog instead of hiding, trembling, growling, or trying to bite.

Consent for procedures such as blood draws is freely given because your dog knows what touch and chin rest mean, which makes it easy to position your dog without force. Bringing snuffle mats, licking mats, and frozen feeders from home can be used to encourage your dog to willingly step on the scale, sniff and explore the exam room, and provide distractions when needed during the physical exam and vaccination process.

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## Safe Toys for Puppies

Phyllis DeGioia, Veterinary Partner Editor

Published: June 03, 2021



Photo courtesy of Depositphotos

Puppies need to play, and they really enjoy toys. However, hard toys risk fracturing teeth while soft toys risk ingestion and gastrointestinal obstruction, so which toys are safe for them to play with?

Your area of concern is safety, but the answer depends on what your dog likes to play with and which type of veterinarian you're asking because there is no across-the-board consensus. Just as individual dogs prefer different types and textures, different veterinarians prefer the type that doesn't cause damage seen most commonly in their practice.

Play time with toys should always be supervised when you are dealing with a puppy because you never know if they will manage to choke on it, swallow part of it, or ruin their incoming permanent teeth. With puppies, it's mostly about what they should not play with rather than what they should.

Puppies like to chew, especially when they are teething, around age 3-7 months, a bit longer for small breeds. Many toys are available for help with

teething. Chewing helps relieve teething pain, which lasts for months, plus it keeps them busy and happy whether you are involved or not. Chewing also helps avoid boredom and can relieve some apprehension.

Interacting during play time with your puppy is one of the easiest ways to establish a bond with your puppy, but let common sense dictate what you let them play with.

### Better Toys

Generally speaking, these types of toys are considered to be safe for puppies:

- Toys made from hard nylon.
- Balls and chew toys made of hard rubber.
- Vinyl or plastic chew toys for light chewers unless part is bitten off, but not hard chewers
- Food puzzle toys can be used at 6-8 weeks of age

Broadly, according to veterinary dentist Dr. Fraser Hale, you can just remember the Kneecap Rule: "If you wouldn't want me to hit you in the kneecap with it, don't let your dog chew on it! For very small dogs, I say 'If your dog wouldn't want me to hit them in the kneecap with it, don't let them chew on it.'"

An ER specialist says not to give them anything but Kongs and Nylabones. A dentist says not to give them hard toys or tennis balls because of what the tennis ball surface can do to teeth, but does not consider Kongs to be hard toys. A general practitioner says she uses stuffed toys (stuffedies) before the puppies are weaned, and then takes them away if the puppy starts destroying it. Squeaker toys can be given to dogs who do not destroy the stuffedies, but if they disembowel it in 30 seconds or 30 days, they should not have access to squeaky toys because they may try, perhaps successfully, to swallow the squeaker or stuffing. Food puzzle toys can be used at 6-8 weeks.

Rope toys are not approved of or disapproved of across the board from veterinary dentists. Some veterinary dentists like rope toys, and some dentists disapprove of them. One concern is that puppies can stick their long, sharp canines into the rope, get caught, and then snap off a canine tooth while trying to get unstuck. You can try one and see what your puppy does with it.

### Tips to Remember

Toys made for the small mouths of an 8-to-10-week-old puppy may cause a 6-to-9-month-old to choke. Keep the size of the toy appropriate for your puppy's size.

Letting puppies chew on old shoes means they will think all shoes are fair game. He cannot tell the difference between which shoes you care about and which you don't.

Keep interest up by rotating your puppy's toys every few days so that the old toys seem new again.

Toys should always be big enough that the puppy cannot swallow them.

Marketing is not necessarily truthful. Just because the package says it's good for your puppy doesn't mean it is and doesn't mean it isn't. If you question a toy's safety, ask your veterinarian about it.

Just because the toy is deemed "safe" does not mean it can't cause a problem of some kind. Puppies should be supervised when playing with toys.

## Toys to Avoid

Toys that are generally not safe – and much of this depends on your puppy's personal preferences – include:

- The hardest of hard toys (the "softer" hard toys are acceptable)
- Rawhide or pressed chews (choking or surgery to remove it from their stomach)
- Long thin strips of anything from yarn to ribbon (linear foreign object)
- Toys stuffed with foam (foam can be swallowed)
- Antlers, pig's ears, dried cow hooves (those can splinter)
- Toys with small or sharp metal parts such as eyes, pins, springs, or batteries.
- No cooked bones, EVER, throughout the dog's lifetime. These are not toys, but should be mentioned.

## Tips to Remember

Don't let puppies hang from a toy by their teeth.

If a piece of a hard toy is chewed off, throw it away because those rubber bits are not digestible.

Some dedicated hard chewers can destroy large hard toys surprisingly fast.

So-called "scarf-n-choke" dogs who inhale food seemingly at light speed need to be supervised carefully so that they don't swallow something even while you're watching. They might anyway.

Hooves, antlers, and bones are a risk to any pet's health. However, they can be a risk trade-off for the dog proven to chew **absolutely everything**, particularly metal and rocks, and therefore the dog is already going to be at risk of tooth damage and ingesting foreign bodies.

Hard chewers are not confined to specific breeds, although you can assume some terriers will be heavy chewers. Remember that members of other breeds can also chomp right through toys designed for hard chewers.

If you think you can avoid the whole safety concern by not giving them any toys, think again: they will find their own "toys," all of which will most likely be your belongings, such as your shoes and furniture, because they will find something to play with. Your best bet is to give them something appropriate and supervise their play time. You can look for other ways to stimulate and exercise your puppy, though, such as food puzzles, and actively engaging with your puppy by playing fetch with a safe plastic ball, for instance.

What works best for an individual puppy depends on what they like and how hard they chew. It's a learning process for you and your puppy.

## The Bottom Line

Whatever toy you give a puppy or an adult can – but won't necessarily - cause various negative consequences. Hard toys risk fracturing delicate primary and immature/erupting adult teeth, whereas soft toys risk ingestion and GI obstruction. Given how many toys cannot be generalized as acceptable or not by veterinary dentists, your safest approach is to talk to your veterinarian about your dog. Your veterinarian knows your dog and is in the best position to help.

Remember, however, that you should supervise puppies while they play with toys in case something happens. Plus, playing with puppies is a lot of fun!

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# Canine parvovirus



Canine parvovirus infection is a highly contagious disease caused by canine parvovirus type 2 (CPV-2). There are several strains of CPV-2, and all produce similar signs. The disease they cause is commonly called "parvo."

The virus attacks white blood cells and the gastrointestinal tract of dogs and other canids like coyotes, wolves, and foxes. In puppies, the virus also can damage the heart muscle.

All dogs are susceptible to canine parvovirus, although some dogs are at greater risk than others. These include puppies between 6 and 20 weeks of age, unvaccinated or incompletely vaccinated dogs, and certain breeds, such as the following:

- Rottweilers
- Doberman pinschers
- Bull terrier breeds
- German shepherds
- English springer spaniels

## What are the signs of canine parvovirus?

The signs of parvovirus infection vary from dog to dog, depending on the severity of the infection. These are some important signs to watch out for:

- Lethargy
- Loss of appetite
- Vomiting
- Severe, often bloody, diarrhea
- Abdominal pain and bloating
- Fever or low body temperature (hypothermia)

**If your dog shows any of these signs, immediately contact your veterinarian.** Persistent vomiting and diarrhea can quickly cause dehydration, and damage to the intestines and immune system can cause septic shock. This can lead to death, with most deaths occurring within 48 to 72 hours after signs first appear.

## How is canine parvovirus spread?

Canine parvovirus is easily spread by direct contact with infected dogs, contact with feces (stool) from infected dogs, or contact with virus-contaminated surfaces. Such surfaces can include kennels, food and water bowls, collars and leashes, and the hands and clothing of people who handle infected dogs. Contact between domestic dogs, feral dogs, and wild canids also may play a role in spreading the disease.

The virus is resistant to heat, cold, humidity, and drying, and can survive in the environment for long periods. Even trace amounts of feces from an infected dog can contain the virus and infect other dogs. This makes proper disinfection practices critical.

Because canine parvovirus is highly contagious, dogs suspected or confirmed to be infected need to be isolated from other dogs to minimize spread of infection. Other strict infection control protocols also must be followed, including thorough cleaning and disinfection of any areas where the dog has been with products capable of killing the virus. If your dog has parvovirus infection, your veterinarian can recommend things you can do to help prevent parvovirus from spreading at home and elsewhere.

### **How is canine parvovirus diagnosed and treated?**

Your veterinarian may suspect parvovirus infection based on the signs your dog is showing, your dog's history, and other factors. Fecal testing can confirm the diagnosis.

Dogs with severe infection need immediate, intensive treatment and 24/7 monitoring—which often involves several days of hospitalization. Supportive care is provided to correct dehydration and physiological imbalances caused by vomiting and diarrhea, control nausea and pain, keep the dog warm, prevent other infections from happening, and provide nutritional support. Additional treatment may be recommended to help fight the infection and/or combat diarrhea. This can all be very expensive, and the dog may die despite treatment. Prompt, intensive treatment improves the chance of survival.

### **How can I protect my dog against canine parvovirus?**

Vaccination and other preventive measures—including good hygiene—are key to avoiding canine parvovirus infection.

Young puppies are especially vulnerable to canine parvovirus. If a mother dog has antibodies against parvovirus, as can occur when she's been vaccinated, then she may pass those antibodies to her newborn puppies through her milk. However, this natural immunity may wear off before the puppies' own immune systems are mature enough to fight off infection. And, if a puppy is exposed to the virus during this gap in protection, the dog may become ill. An additional concern is that immunity provided by a mother's milk may interfere with an effective response to vaccination. This means that occasionally even vaccinated puppies may become infected and become ill.

To reduce gaps in immunity and provide the best protection against canine parvovirus during the first few months of life, a series of vaccinations is recommended. The parvovirus vaccine is included in a combination vaccine (sometimes abbreviated DAPP, DA2PP, or similarly) that also protects dogs against some other common canine viruses. This vaccine is considered "core," and is recommended for all dogs. Puppies younger than 16 weeks should receive their first dose at between 6 and 8 weeks of age, then two more doses 2-4 weeks apart. Dogs older than 16 weeks with no previous vaccination or an unknown history should receive two doses 2-4 weeks apart.

To maintain protection, a booster dose of the combination vaccine is recommended within one year after the last dose in the initial vaccination series. Afterward, boosters are recommended every three years.

If your adult dog hasn't been vaccinated yet, or is overdue or missing some vaccinations, it's not too late. Ask your veterinarian about a recommended vaccination program based on your dog's age and needs.

These additional measures also can help protect your dog and other animals from canine parvovirus and other infectious agents:

- Until the initial vaccination series is complete, use caution when bringing puppies to places where dogs gather. This includes pet shops, parks, puppy and obedience classes, doggy day cares, kennels, and groomers.
- Choose establishments and training programs that require up-to-date vaccinations, health examinations, good hygiene, and isolation of sick puppies and dogs.
- Keep your dog away from other dogs when sick, including other dogs within your home.
- Avoid contact with known infected dogs and their premises.
- Keep your dog away from other dogs' feces.
- Routinely collect and properly dispose of your dog's feces.
- If you've been in contact with dogs with or exposed to parvovirus, avoid handling other dogs, or wash your hands and change your clothes before doing so.



## Distemper in Dogs

Becky Lundgren, DVM

Published: September 15, 2023

Canine distemper virus, also referred to as CDV, canine morbillivirus, and hardpad disease, is a highly contagious disease affecting not just dogs but many animals. Distemper occurs worldwide, and dogs are the primary carriers of the disease.

Canine distemper virus can sometimes occur along with other respiratory infections, including bacterial diseases such as *Bordetella bronchiseptica*, and *Streptococcus equi* sub. *zooepidemicus*, fungal diseases like *Mycoplasma* spp., and viruses, including canine influenza virus, respiratory coronavirus, parainfluenza virus, adenovirus, and herpesvirus.

CDV is commonly spread through droplets or spray from the nose and mouth, such as through sneezing or coughing. However, infected dogs can shed the virus in nearly all bodily fluids. CDV is carried to local lymph nodes within 24 hours of contact with cells in the airways and lungs. Within a few days, the virus spreads to the spleen and abdominal lymph nodes, then spreads through the blood to cells of the gastrointestinal (GI) tract, urogenital tract, and central nervous system (CNS). The CNS tissues are typically infected by day eight or nine when neurological signs can be seen.

When the body's immune system is triggered by exposure to disease, it reacts by producing antibodies. These antibodies are made up of proteins that attack the virus or bacteria causing the infection, hopefully protecting the body from getting sick. How strong your dog's immune system is will play a big part in how sick they become after exposure.

If an animal's immune system can be activated to begin making antibodies to fight CVD by the 14<sup>th</sup> day after exposure, the signs of the illness may not be noticed.

Dogs with mild to intermediate immune responses and delayed antibody titers (this means your dog may test negative on distemper tests but still have the infection) will develop clinical signs. While the virus can eventually be cleared as antibody levels rise, it may persist for extended periods in the eye, the central nervous system (including the brain, brainstem, and spinal cord), and some skin tissues (e.g., footpads).

By days nine to 14, dogs without good immune responses tend to experience severe clinical signs and can die suddenly.

### Diagnosis

Diagnostic testing starts with a physical exam and includes bloodwork, antibody tests, cytology/histopathology of affected tissues, X-rays, cerebral spinal fluid analysis, eye exams, and PCR testing. Sometimes, unfortunately, a CDV diagnosis can't be made prior to death, and a final diagnosis can be determined only after a veterinary pathologist has examined the body.

### Health History and Signs

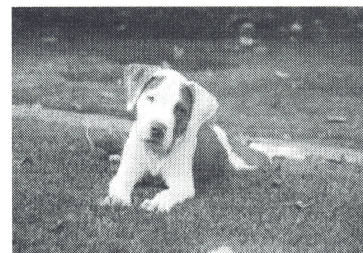
Dogs with mild distemper cases may exhibit a lack of energy, decreased appetite, fever, coughing, shortness of breath, and nasal discharge.

Dogs with more severe clinical disease may show fever, nasal discharge, conjunctivitis, coughing, difficulty breathing, vomiting, diarrhea, weight loss, and dehydration. Secondary bacterial infections can occur and can make the signs worse.

Your dog may also experience signs that the central nervous system is involved, such as ataxia (incoordination), limb weakness, myoclonus (involuntary rhythmic muscle twitching), stiff neck, and hyperesthesia (skin sensitivity). These signs can occur at the same time or up to three weeks after the onset of CVD and typically get worse over time. Older dogs that have some immunity are more likely to have no signs or just mild disease.

Eye problems include keratoconjunctivitis sicca (dry eye), anterior uveitis (inflammation of the front part of the eye), and damage to the retina (which allows the brain to process sight). The optic nerves, which carry information to the brain from each eye, may develop optic neuritis (swelling and inflammation), leading to blindness.

Skin problems in puppies include pustular dermatitis (blister-like sores that can be chronic), and the skin of the nose or toe pad can develop hyperkeratosis (skin thickening). When this happens in the toe pads, it is referred to as hardpad.




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#### Animals Affected By Distemper

- cat
  - jackal
  - coyote
  - hyena
  - lion
  - tiger
  - leopard
  - ferret
  - fox
  - weasel
  - raccoon
  - seal
  - sea lion
  - dolphin
  - Giant panda
  - certain primates
-

Infections in puppies can cause enamel hypoplasia (damage to the developing teeth). Cardiomyopathy, or enlargement of the heart muscles, which may lead to cardiac issues, is possible. Growing puppies have developed hypertrophic osteodystrophy, (when bones in the legs grow abnormally), causing pain.

Abortion and stillbirths can occur in pregnant dogs.

Ulcers of the mouth can occur, but they tend to be rare.

Clinical signs will vary, depending on which strain of the distemper virus is involved and how well your dog's immune system responds to the infection. Older dogs that have some immunities are more likely to have no signs or just mild disease. Puppies and animals with no immunity are more likely to have severe clinical signs.

### **Treatment And Management**

Currently, no specific treatments are available for CDV.

Supportive care can include fluid therapy, antibiotics for secondary bacterial infections, lung treatments for bronchopneumonia, anti-nausea and vomiting medications, steroids, anti-seizure medications, etc. Supportive care will vary, depending on which parts of your dog's body have been affected.

### **Prognosis**

The prognosis depends on the viral strain and your dog's immune response. Older dogs with a good immune response may not have symptoms or a mild disease. Puppies or those with a poor immune response tend to develop more severe disease.

The most important factors affecting your dog's prognosis are neurologic. The prognosis for dogs that have neurological problems (the brain, spinal cord, and other nerves are affected) is guarded to poor, and there is a 50% chance of death. Dogs that recover may be immune to reinfection for long periods and may be immune for life.

### **Prevention**

Hospitalized dogs with CVD must be isolated from other dogs. Dogs usually shed the virus in urine, stool, saliva, nasal mucus, etc., for one to two weeks after the initial infection. Dogs with neurologic signs can shed the virus for longer periods of time. Extended quarantine may be necessary to prevent the spread to uninfected animals.

CDV is susceptible to many disinfectants. Talk with your veterinarian about how to best disinfect areas, dishes, and toys when your dog comes home. Good hygiene practices (e.g., handwashing, wearing gloves/protective clothing) are recommended when handling infected dogs.

### **Vaccination**

Vaccination is crucial in preventing your dog from getting CDV. Current guidelines recommend vaccinating dogs at six to eight weeks of age and repeating the vaccine every three to four weeks until the puppy is 14 to 16 weeks of age. Dogs would then receive another vaccine one year after the initial series and then every three years afterward.

Distemper antibodies that puppies could have received from their mother's milk (colostrum) in the first few feedings, and that could prevent the vaccinations from working, are typically gone by 12-14 weeks of age. In dogs that are more than 16 weeks old, the initial vaccination series can consist of two vaccines given two to four weeks apart.

The majority of dogs develop protective antibody levels within one to two weeks following vaccination.

### **Zoonotic Potential**

A zoonotic is a disease that can be transferred from animals to humans. There is some concern that humans might be susceptible to the canine distemper virus because of recent CDV infections in primates. Because CDV is similar to the human measles virus, additional concern has been raised because of the decrease in routine measles vaccination by many humans. However, at the time of this writing, no evidence exists that CDV can infect humans.

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## Kennel Cough in Dogs

Wendy Brooks, DVM, DABVP

Revised: October 24, 2024

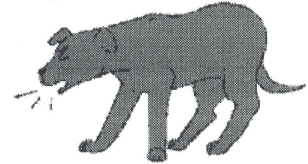
Published: January 01, 2001

(Also called *Canine Infectious Respiratory Disease, CIRRD, or Infectious Tracheobronchitis*)

What is it?

Kennel cough is an infectious bronchitis of dogs characterized by a harsh, hacking cough that most people describe as sounding like "something stuck in my dog's throat." This bronchitis may not last long and be mild enough not to need any treatment, or it may progress to life-threatening pneumonia depending on which infectious agents are involved and the patient's immunological strength. An uncomplicated kennel cough runs a week or two and entails frequent fits of coughing in a patient who otherwise feels active and normal. Uncomplicated cases do not involve fever or listlessness, just lots of coughing. Happily, most cases are uncomplicated. Appetite loss, labored breathing, and reduced activity can indicate progression to pneumonia. Again, it depends on the vigor of the patient versus the vigor of the infectious organisms.

Dog with Kennel Cough



Graphic courtesy MarVistaVet.

Numerous organisms (some of which may be prevented by vaccination) may be involved in a case of kennel cough; it would be unusual for only one agent to be involved. Infections with the following organisms frequently occur concurrently to create a case of kennel cough:

- *Bordetella bronchiseptica* (bacteria)
- Parainfluenza virus
- Adenovirus type 2
- Canine distemper virus
- Canine influenza virus
- Canine herpesvirus (very young puppies)
- *Mycoplasma canis* (a single-cell organism that is neither virus nor bacterium)
- Canine reovirus
- Canine respiratory coronavirus.

The classical combination for uncomplicated kennel cough is infection with parainfluenza or adenovirus type 2 in combination with *Bordetella bronchiseptica*. Infections involving the distemper virus, *Mycoplasma* species, or canine influenza are more likely to progress to pneumonia, and pneumonia can readily result in any dog or puppy that is sufficiently young, stressed, or debilitated.

Not sure what a Coughing Dog sounds like?

Dogs can make assorted respiratory sounds. Usually, a cough is recognizable but it is important to be aware of another sound called a reverse sneeze. The reverse sneeze is often mistaken for a cough, a choking fit, sneezing, retching, or even for some sort of respiratory distress. In fact, the reverse sneeze is more like the sound of clearing the throat, and usually stems from a post-nasal drip or "tickle in the throat."

It is considered normal, especially for small dogs, and only requires attention if it is felt to be "excessive". The point here is to know a cough when you hear one. A cough can be dry or productive, meaning it is followed by a gag, swallowing motion, and the production of foamy mucus (not to be confused with vomiting). Here are some videos that might help.

**Coughing Dog (with Productive Cough):** [Dixon has kennel cough](#)

**Note:** People who have viewed this video have compared it to what their own dog is doing, and concluded their dog has kennel cough. This video is meant to demonstrate coughing in general. It is important to note that there are many causes of coughing, and the nature of the cough does not generally reflect on its cause.

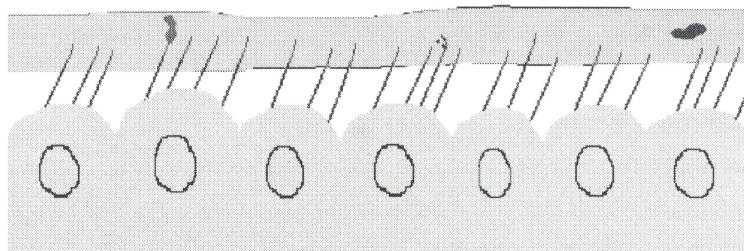
**Reverse Sneezing Dog:** [Maggie reverse sneezes](#)

How Infection Occurs

An infected dog sheds infectious bacteria and/or viruses in respiratory secretions. These secretions become aerosolized and float in the air, where they can be inhaled by a healthy dog. Obviously, crowded housing and suboptimal ventilation play important roles in the likelihood of transmission but organisms may also be transmitted on toys, food bowls, or other objects.

The normal respiratory tract has substantial safeguards against invading infectious agents. Probably the most important of these is what is called the mucociliary escalator. This safeguard consists of tiny hair-like structures called cilia that protrude from the cells lining the respiratory tract and extend into a coat of mucus above them. The cilia beat in a coordinated fashion through the lower and more watery mucus layer called the sol. A thicker mucus layer called the gel floats on top of the sol. Debris, including infectious agents, gets trapped in the sticky gel and the cilia move them upward toward the throat where the collection of debris and mucus may be coughed up and/or swallowed.

Mucociliary Escalator



Graphic courtesy MarVistaVet

The mucociliary escalator is damaged by the following:

- shipping stress
- crowding stress
- heavy dust exposure
- cigarette smoke exposure
- infectious agents (as listed previously)
- cold temperature
- poor ventilation.

Without this, a fully functional mucociliary escalator or invading bacteria, especially *Bordetella bronchiseptica*, the chief agent of kennel cough, may simply march down the airways unimpeded.

*Bordetella bronchiseptica* organisms have some tricks of their own as well:

- They can bind directly to cilia, rendering them unable to function within 3 hours of first contact.
- They secrete substances that disable the immune cells normally responsible for consuming and destroying bacteria.

Because it is common for *Bordetella* to be accompanied by at least one other infectious agent (such as one of the viruses listed below), kennel cough is a complex of infections rather than infection by one agent.

Classically, dogs get infected when they are kept in a crowded situation with poor air circulation and lots of warm air (i.e., a boarding kennel, vaccination clinic, obedience class, local park, animal shelter, animal hospital waiting room, or grooming parlor). In reality, most causes of coughing that begin acutely in dogs are due to infectious causes and usually represent some form of kennel cough.

**The incubation period is two to 14 days. Dogs are typically sick for one to two weeks. Infected dogs shed *Bordetella* organisms for one to three months following infection.**

#### How is a Diagnosis Made?

A coughing dog with poor appetite, fever, and/or listlessness should be evaluated for pneumonia.

Usually, the history of exposure to a crowd of dogs within the proper time frame, plus typical examination findings (coughing dog that otherwise feels well) is adequate to make the diagnosis. Radiographs show bronchitis and are particularly helpful in determining if there is a complicated pneumonia.

Recently, PCR (polymerase chain reaction) panels have become available in many reference laboratories. Using technology to amplify the presence of DNA in a swab, the lab is able to test for most of the kennel cough infectious agents listed. This knowledge is helpful in guiding therapy and understanding expectations.

#### How is Kennel Cough Treated?

An uncomplicated case of kennel cough will go away by itself. Cough suppressants can improve patient comfort while the infection is resolving. The dog should be clearly improved, if not recovered, after about a week. That said, several infectious agents in the kennel cough complex are more intense and can cause minor bronchitis to progress to pneumonia, which is a potentially life-threatening disease. Given this possibility, antibiotics are frequently prescribed to kennel cough patients to prevent or curtail pneumonia before it warrants hospitalization.

It is important to distinguish an uncomplicated case of kennel cough from one complicated by pneumonia for obvious reasons. The uncomplicated cases will not have a fever or appetite loss, nor will they be listless. As mentioned, they will seem normal except for coughing. Dogs with pneumonia appear sick.

#### Prevention through Vaccination

Vaccination is only available for *Bordetella bronchiseptica*, canine adenovirus type 2, canine parainfluenza virus, canine distemper, and canine influenza. Infections with other members of the kennel cough complex cannot be prevented. Vaccine against adenovirus type 2, parainfluenza, and canine distemper is generally

Intranasal Vaccine

included in the basic puppy series and subsequent boosters (the DHPP or distemper-parvo shot). For *Bordetella bronchiseptica*, vaccination can either be given as a separate injection or as a nasal immunization. There is some controversy regarding which method provides a better immunization or if a combination of both formats is best.

#### *Nasal Vaccine*

Intranasal vaccination may be given as early as 3 weeks of age, and immunity generally lasts 12 to 13 months. The advantage is that local immunity is stimulated right at the site where the natural infection would try to take hold.

It takes four days to generate a solid immune response after intranasal vaccination, so it is best if vaccination is given at least four days prior to the exposure. Some dogs will have some sneezing or nasal discharge in the week following intranasal vaccination; this should clear up on its own. As a general rule, nasal vaccination provides faster immunity than injectable vaccination.

Nasal vaccines for *Bordetella* generally also include a vaccine against parainfluenza virus and some also include a vaccine against adenovirus type 2.

#### *Oral Vaccine*

An oral vaccine is available for *Bordetella bronchiseptica* (but not adenovirus or parainfluenza). The idea is that it is easier to give the vaccine with a syringe in the mouth - just inside the cheek - and there is no concern about sneezing out some of the vaccine. The oral vaccine can be given to puppies as young as eight weeks of age. The vaccine is given annually.

#### *Injectable Vaccine*

Injectable vaccination is a good choice for aggressive dogs who may bite if their muzzle is approached. For puppies, injectable vaccination provides good systemic immunity as long as two doses are given (approximately one month apart) after age 4 months. Boosters are generally given annually. Some dogs experience a small lump under the skin at the injection site. This should resolve without treatment.

*Vaccination is not useful in a dog already incubating kennel cough.*

*Bordetella bronchiseptica* vaccination may not prevent infection. In some cases, vaccination minimizes symptoms of illness but does not entirely prevent infection. This is true whether nasal, oral or injectable vaccine is used.

*Dogs that have recovered from Bordetella bronchiseptica are typically immune to reinfection for six to 12 months.*

**What if Kennel Cough doesn't Improve?**

As previously noted, this infection is generally self-limiting. It should be at least improved partially after one week of treatment. If no improvement is seen after that week, a re-check exam (possibly including chest radiographs) would be a good idea. Failure of kennel cough to resolve suggests an underlying condition. Kennel cough can activate a previously asymptomatic collapsing trachea, or the condition may have progressed to pneumonia. Alternatively, there may be another disease afoot entirely, such as non-infectious bronchitis, congestive heart failure, or some other condition that causes coughing.

If you have questions about a coughing dog, do not hesitate to bring them to your veterinarian.



Photo courtesy MarVistaVet

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## Leptospirosis in Dogs

Wendy Brooks, DVM, DABVP

Revised: February 22, 2024

Published: January 01, 2001

### About the Organism

*Leptospira* organisms are spiral-shaped bacteria called spirochetes. There are several species of leptospires, but the ones that cause disease have been grouped into one particular species called *Leptospira interrogans sensu lato*. From here, *Leptospira interrogans sensu lato* has been sub-classified into smaller related groups called serovars. Over 250 serovars have been named, and at least 10 are important for pets. A vaccine for dogs, however, exists against only four serovars. Different serovars produce different types of disease and are in different geographical areas.

**Canicola** - This serovar is the most common in Mexico. It produces primarily kidney disease. With a constant influx of dogs across the border, watch out for this serovar in states near the Mexican border.

**Pomona**—This serovar is associated with livestock and tends to produce severe kidney and liver disease.

**Grippotyphosa**—In a survey of over 1,200 healthy dogs in Michigan, 24% tested as exposed to *Leptospira*, and the Grippotyphosa serovar was the most common.

**Icterohaemorrhagiae** -This serovar is mostly associated with exposure to rats and rat urine in standing water. It tends to attack the liver.

Leptospires live best in warm, slow-moving water, such as after heavy rains or flooding. After the water clears, they contaminate the soil for many months. Wildlife are common carriers of infection. A survey in Connecticut found 36% of raccoons had been exposed, while a survey in Illinois found 48% of raccoons had been. Another survey found 50% of rats had been exposed. Classically, infection of dogs and humans stems from the urine of infected animals getting into environmental water. Leptospirosis is a common human disease in tropical areas, especially where rice is farmed, and rats infest the paddies. Health authorities believe that rat populations are involved in the rising incidence of canine leptospirosis in urban areas, and leptospirosis is no longer considered a rural disease. Leptospires can survive for months in contaminated soil.

This all sounds outdoorsy, but the 2021 leptospirosis outbreak in Los Angeles started in boarding facilities where dogs are commonly exposed to the urine of other dogs in play yards and kennel drainage pathways. Anywhere with potential urine contact is a potential home for *Leptospira* organisms.

### Canine Infection

Dogs become infected by leptospires when irritated or cut skin comes into contact with infected urine or water contaminated with infected urine. Alternatively, bite wounds, exposure to reproductive secretions, and even eating infected tissues can transmit this infection. The organisms quickly spread through the bloodstream, leading first to inflaming the blood vessels: fever, abnormal bleeding, abnormal bruising, and tissue edema appear after an approximately seven-day incubation period. By two weeks post-infection, the leptospires have set up shop in the kidneys, where they continue to generate inflammation, pain, and potentially total kidney failure and the inability to produce urine. Some serovars also go to the liver and generate inflammation there, though the liver disease is generally not as severe as that of the kidney.

A particularly devastating situation occurs if the organism gets into the lungs where the leptospire toxins produce what is termed "*Leptospira* Pulmonary Hemorrhage Syndrome." The lung bleeding that results is associated with a 70% mortality rate and bodes especially poorly.

If the dog is able to keep the acute illness at bay, a chronic form may emerge. There can be more chronic kidney insufficiency and/or hepatitis. Furthermore, long-term immune stimulation can lead to a deep eye inflammation called uveitis that can cause the eyes to look cloudy or even change color. If the disease is treated in this form, it may not be possible to reverse the long-term damage that has already set in.

### The Different Clinical Pictures of Leptospirosis

As you might gather, leptospirosis can look different: fever with bruising and bleeding; fever with different degrees of kidney failure; liver disease and kidney disease together; chronic hepatitis; and eye inflammation, etc. Another way to look at leptospirosis is to look at the time frame of the illness and how quickly or slowly it came on.

Leptospira spirochetes

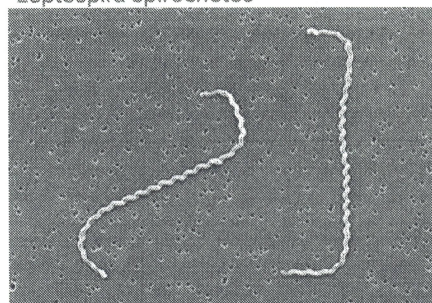


Photo by Janice Haney Carr, courtesy of CDC

**Peracute Disease:** Peracute disease means super-sudden onset. These are usually younger dogs with an overwhelming exposure. The large amount of leptospire toxin causes rapid death before the kidney or liver disease even happens.

**Acute Disease and Subacute Disease:** This is more of the classic form described above—fever with bruising and bleeding, general muscle pain, and a painful belly from kidney and/or liver disease. There may be jaundice and inflammation in the eyes that makes them look cloudy.

**Chronic Disease:** Recurring fevers, chronic hepatitis, chronic kidney disease, uveitis, poor appetite, weight loss.

**Younger dogs (less than one year of age) tend to get the most severe forms of leptospirosis.**

**87-100% of infected dogs will have some degree of azotemia, which means renal parameters will be elevated on routine blood testing.**

**Excessive water consumption is frequently seen at home when this happens.**

## Testing

### PCR Testing

PCR testing is used to detect leptospire DNA. A blood sample is best in the first 10 days after infection, but after that, a urine sample is more likely to be positive. It may be prudent to submit both blood and urine samples. Past vaccination will not interfere with this test, although antibiotic exposure certainly will, and results can be back in a matter of days. PCR testing will not determine which serovar is present.

### MAT Testing (the Traditional Test)

The Microscopic Agglutination Test, or MAT titer, is still considered the test of choice, though it has some disadvantages. It measures antibody levels against different leptospirosis serovars, with the idea that the one with the highest level is most likely the serovar causing the disease.

Antibody levels are expressed as titers, which are ratios reflecting how much dilution is needed before it is too dilute to detect antibodies. For example, a titer of 1:32 means a serum diluted out 32 times still had detectable antibodies. A titer of 1:32 may sound pretty high but it is actually pretty low; an MAT titer must be at least 1:800 to be considered positive. If the serovar under consideration is one that might have been included in a past vaccination, the titer must be higher (1:3200) to be considered positive.

To really obtain high confidence in the diagnosis of Leptospirosis, a second titer is submitted two to four weeks later, showing at least a four-fold increase in antibody production. Treatment with antibiotics should not interfere with the validity of the second (or "convalescent") titer level.

There are two problems with this testing:

- No one wants to wait two to four weeks to confirm the diagnosis, especially with a disease contagious to humans. PCR testing gets results much faster.
- Vaccination interferes with results (remember, the entire goal of vaccination is to generate an antibody titer). Vaccination history can make interpretation difficult.

### In-House Test Kits and Other General Antibody ELISA Tests

Recently in-house screening tests have become available so that a result can be obtained in 20 minutes or so. These tests screen for antibodies against *Leptospira* organisms. They are either positive or negative. They will not tell you which serovar is involved nor how high the titer is. They will not distinguish antibodies from vaccination versus those from true infection. Clearly a positive test needs to be followed by another test. A negative test, however, is very helpful (see below).

### Other Tests

In the past, cultures and darkfield microscopy were used to detect leptospires. This technology is now considered old-fashioned.

### Which Tests to Use?

A good approach to begin with is a general antibody test combined with urine and blood PCR testing. If any PCR test detects *Leptospira* DNA either in blood or urine, infection is confirmed. A MAT test will determine which serovar is afoot and the antibody level can be tracked to be sure the treatment is working.

If the PCR tests are negative (meaning *Leptospira* DNA was not detected) but a general antibody test is positive, the MAT test will determine if the antibodies are related to prior vaccination or active infection.

If PCR tests are negative (*Leptospira* DNA not found) and no antibodies are found either, then it should be safe to cross leptospirosis off the list of possible diagnoses.

### Treatment

Fortunately, *Leptospira interrogans sensu lato* is sensitive to doxycycline, a readily available antibiotic. Leptospires are cleared from the blood within 24 hours of starting it, but it takes about a week for them to clear from the urine, so it is important to wear gloves, goggles, etc., and be conscious of contamination during urine cleanup. Infected animals should be isolated from other animals at least until their antibiotic course is complete and probably for a couple of weeks after. Check with your veterinarian for instructions.

Intravenous fluids are crucial to support blood flow through the damaged kidneys so that recovery is possible. Any areas at home that have been contaminated with urine should be disinfected with an iodine-based product and you should wear gloves while cleaning any urine. Prognosis is guarded depending on the extent of organ damage; with appropriate treatment 80-90% survival rates are reported.

This sounds wonderful, but it is important to keep in mind factors that can interfere with this rosy outcome. While most leptospirosis-related kidney injury responds to fluid therapy which can be given by most animal hospitals, more severe cases can require dialysis, which has limited availability. As mentioned, lung involvement has poor survivability. Infection with the *Pomona* serovar is associated with more severe disease.

A good two weeks of doxycycline is generally needed. If this antibiotic is not tolerated, [amoxicillin](#) may also work.

Previously infected dogs may become re-infected. Past infection does not confer future immunity.

#### Prevention

Vaccination against *Leptospira interrogans sensu lato* is only available for the serovars called *Canicola*, *Grippotyphosa*, *Pomona*, and *Icterohaemorrhagiae*. (Some vaccines cover all four serovars, while others cover only two out of four.) As a result of the long-standing use of this vaccine, it is hard to assess how important it is to vaccinate against leptospirosis. As you might imagine, most recent outbreaks involve serovars for which vaccination does not exist, which suggests that the vaccine is working.

Vaccination against *Canicola* and *Icterohaemorrhagiae* has been traditional for dogs as it is included in the basic distemper shot (DHLPP - the "L" stands for leptospirosis). The American Animal Hospital Association vaccine guidelines consider vaccination against leptospirosis to be optional but recommend that if you are going to vaccinate for leptospirosis, use a vaccine covering all four serovars.

In the past, the leptospirosis vaccine was thought to be associated with a higher chance of immunological vaccine reactions, but vaccines made from leptospires grown in protein-free media have made vaccination reactions less likely. Reactions considered to be normal to vaccination include fever, swelling at the injection site, and joint/muscle pain. These symptoms should resolve after a day or so. Small dogs are more likely to experience reactions. Consider pre-treatment with antihistamines prior to vaccination.

Vaccination will reduce the severity of the disease but will not prevent infected dogs from becoming carriers.

Other important aspects of prevention include controlling rodents in the pet's environment and removing standing water.

#### The Infection in Humans

The Centers for Disease Control and Prevention monitors leptospirosis cases in people. Humans can be infected by direct contact with urine from an infected animal or food, soil, or water contaminated with urine from an infected animal. The most common species to transmit leptospirosis to humans are dogs, rats, raccoons, skunks, opossums, and other marsupials, cows, pigs, and mice. Recreational activities involving water and exposure to flood waters are also associated with human outbreaks. Other human risk factors include farm work, animal care work, camping, and sewer work. Remember, leptospires come from contaminated urine, which, in turn, contaminates environmental water and soil.

The same symptoms occur in humans as would be seen in dogs.

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## Canine Infectious Respiratory Disease Complex (CIRDC)

J. Scott Weese, DVM, DVSc, DACVIM

Revised: November 20, 2024

Published: November 29, 2023

*The following article has been adapted from the [Worms & Germs Blog](#), by Dr. Scott Weese, DVM, DVSc, DACVIM.*

Canine Infectious Respiratory Disease Complex or CIRDC is an endemic disease (always present in populations), with various known bacterial and viral causes.

Each year, more and more dog owners ask, "What's going on with this reported outbreak of respiratory disease in dogs in the US? What new disease is this?"

Veterinarians actually don't expect a new disease in this situation, and it can be hard to tell the extent of "outbreaks" because of many factors. Various groups have reported respiratory disease, which we refer to as CIRDC in dogs in various parts of the US.

### CIRDC signs include:

- A "honking" cough that may sound like retching
- Sneezing, and discharge from the eyes and/or nose
- Lethargy, decreased appetite, and labored breathing
- Not all dogs show all of these signs, and each case can be slightly different.

There's always limited info about the number of dogs with this illness due to a lack of funding for research, no real surveillance system, and testing that doesn't necessarily change treatment for these dogs. Also, the disease description is usually vague... coughing dogs, some that get pneumonia, and unfortunately, a few that die.

The issue is that this largely describes the normal state. Again, CIRDC is endemic (i.e. always present in dog populations), with various pathogens at play including canine parainfluenza virus, *Bordetella bronchiseptica*, canine respiratory coronavirus, canine pneumovirus, canine influenza virus, *Streptococcus zooepidemicus*... roughly in that order of occurrence, and maybe the mysterious bacteria, *Mycoplasma*. There are also likely a range of viruses that have been present for a long time that we don't diagnose.



CIRDC is endemic (i.e. always present in dog populations), with various known bacterial and viral causes.

**We see CIRDC all the time, everywhere. There's a background level of disease that usually flies under the radar, alongside periodic clusters. Media and social media can drive outbreak concerns which can be great to get the word out and help sort out issues, but often, they lead to false alarms.**

As Dr. Scott Weese explains in his blog, Worms & Germs, "For example, we might have 100 dogs with CIRDC every week in Guelph (Ontario, Canada), a city of about 150,000 people (a complete guess since we have no way to track this). Usually, few people hear about it. The dogs typically get better, and life goes on. However, if someone starts talking about it on social media, we might hear about 50 of those 100 cases. All of a sudden, we have an 'outbreak of a disease affecting dozens of dogs' when in reality, we might just have our normal background level of disease that people are noticing."

The same thing happens more broadly. There are thousands of coughing dogs in the US every day since there are millions of dogs. Once people start talking about it, some of these comments go from, "Oh, my dog is coughing. I guess he picked up something at the park." to comments like, "My dog has this new disease that's sweeping the nation."

With the first approach, it's likely that no one but the owner usually knows or is concerned. When people are very worried about their beloved pets, panic, and post on social media, it can lead to further assumptions that things are much scarier or that a "new disease" is developing.

### So, what are these reports reflecting?

- A multistate outbreak caused by some new bacterium/virus
- A multistate outbreak caused by our usual suspects, for some reason
- Unconnected sporadic local outbreaks caused by usual suspects
- A slight increase in baseline disease
- Our normal disease activity has resulted in an outbreak of media attention.

Dr. Weese suspects it's one of the last two and that veterinarians have been seeing a bit more CIRDC activity over the past couple of years, with a somewhat greater incidence of severe cases.

**Other factors to consider:**

- With more cases, veterinarians see more severe disease.
- Brachycephalic or short-nosed breeds (French bulldogs, pugs, etc.) with a higher likelihood of dysfunctional breathing are very popular and much more likely to have severe outcomes from any respiratory disease.
- Increases in deaths could be linked to the dogs' physiology, not disease factors.

Things are still unfolding for the veterinary community with CIRDC, but right now there does not appear to be a need for increased concern.

**What can you do to protect your dog?**

- Limit your dog's contacts, especially traveling family or friends with dogs of unknown health status.
- Keep your dog away from sick dogs.
- If your dog is sick, keep it away from other dogs.
- Talk to your vet about vaccination against causes of CIRDC including canine parainfluenza (CPIV), *Bordetella bronchiseptica*, and canine influenza (which is more sporadic and vaccine availability is still an issue).

Overall, if you are concerned that your dog may have CIRDC or that they may be exposed due to certain activities, talk to your veterinarian. They can tell you what may increase their chances of contracting CIRDC and what to look out for based on your pet's health status.

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## Canine Heartworms and Preventing Disease

Mark Rishniw, BVSc, MS, PhD, DACVIM (Internal Medicine and Cardiology)

Published: February 20, 2024

Canine heartworms, *Dirofilaria immitis*, are parasitic worms that pose a serious threat to dogs. These long, slender worms live in the pulmonary arteries (and, occasionally, within the heart) of dogs and can measure up to a foot in length. They can cause substantial damage to the lungs and heart.

Adult heartworms cause inflammation of the blood vessels in the lungs, resulting in respiratory issues and pulmonary hypertension. In some cases, this leads to weight loss, weakness, right-sided congestive heart failure, reduced quality of life, and even death.

The prevention of heartworms and early detection are crucial in managing heartworm disease.

### Mosquitoes and the Heartworm Lifecycle

Mosquitos are vectors of heartworm disease. A vector is a carrier and transmitter of disease from an infected individual to a non-infected individual. Certain species of mosquito can ingest young heartworms, called microfilariae when they feed on an infected animal. Once inside the mosquito, the microfilariae develop into third-stage larvae (known as L3) over a few weeks, provided that the environmental conditions are conducive (temperatures above 58°F). The larvae pass through the puncture wound the mosquito makes when it bites another animal.

The larvae grow under the skin of the newly infected animal over several weeks, progressing through additional larval stages. At a certain point, the larvae enter the bloodstream and float into the pulmonary arteries (the arteries carrying blood from the heart to the lungs). Here, they mature into adults. It takes about six to seven months for the larvae to reach adulthood. Adult heartworms mate, and then the females begin to release tiny larvae, the microfilariae, back into the bloodstream, continuing their lifecycle.

### Prevention is Key

Preventing heartworms is much easier (especially for your dog) than having to treat an active heartworm infection.

Studies show that exposure to heartworm depends on factors such as:

- The presence of wild canine populations (foxes, coyotes, wolves) in the surrounding area can continue the spread of heartworm.
- Regional differences in climate and ecosystems (elevation, humidity, rainfall, temperature)

### The Prevalence of Heartworms Around the World

Heartworms exist in many parts of the world, but the prevalence greatly varies. In warmer climates with higher mosquito populations, such as tropical and subtropical areas, the risk of heartworm transmission is higher. These areas make excellent habitats for mosquitoes and the development of heartworm larvae, so dogs living in these regions are at a greater risk of heartworms. On the other hand, there are fewer heartworm infections in cooler or drier regions with smaller mosquito populations.

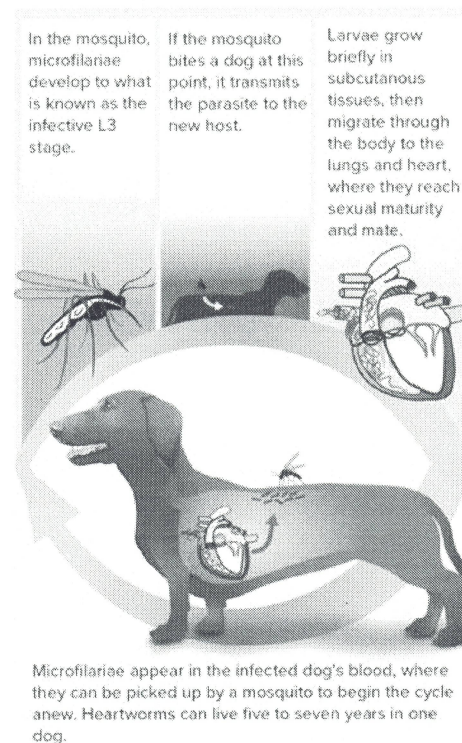
The travel, relocation, and presence of infected animals can allow heartworms to start infecting animals where they are less common. Climate change (and temperature increase) is also expanding mosquito ranges, creating longer active seasons and better environmental conditions for larvae.

### Environmental Considerations

More recent recommendations for preventing heartworm infections advise reducing mosquito bites. This can be done by avoiding places with heavy mosquito populations-when possible to reduce the chances of being bitten and contracting heartworms (for example, some studies have shown that indoor dogs in high-risk areas tend to have fewer infections than outdoor dogs). Avoid visiting permanent and semi-permanent (seasonal) bodies of water like lakes, streams, and floodplain

### Heartworm life cycle complex

Heartworms take six to seven months to develop into adults and reproduce. The process of disease transmission begins with a mosquito feeding on the blood of an infected animal, picking up heartworm offspring known as microfilariae.



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areas with your dog, especially when large mosquito hatches are taking place (usually in warmer, humid weather). Check around your home for areas with standing water and eliminate containers or reservoirs that may be prime real estate for mosquito larvae.

There may always be an ideal climate for mosquitoes, and other preventative methods such as lawn alteration, porch nets, and other mosquito barriers may be helpful, depending on your location. Talk to your local health department if you have concerns about mosquitoes on your property and what you can do to help control them.

### Preventative Medications

Heartworm preventatives are prescribed by your veterinarian and come in oral, topical, and injectable forms. As mentioned before, preventing heartworms is much easier than treating them, and the American Heartworm Society recommends FDA-approved heartworm preventatives year-round.

In areas where mosquitoes are endemic (native or regularly present), your dog can be infected if just one preventative dose is missed. The risk varies depending on your location, and even people who live in places with cold winters should give heartworm preventatives year-round for the best possible prevention.

### Detecting Heartworm Infection

Blood tests for heartworm infections are recommended yearly for all dogs over seven months. If you do not give preventatives regularly every month or if you switch preventatives, more frequent testing may be recommended. If your dog has tested positive for heartworms, your veterinarian will discuss the treatment options available.

Talk to your veterinarian about heartworm preventative options and recommended testing frequency.

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## Lyme Disease in Dogs

Wendy Brooks, DVM, DABVP

Revised: April 21, 2022

Published: December 06, 2003

[See the article summary below.](#)

While the infection we know today as Lyme disease (named for the Connecticut town of Lyme) has been around for at least a century, public awareness and confusion did not occur until the late 1980s. Media exposure of this infection virtually exploded, leaving most of the general public with some basic knowledge and concern about this infection as it pertains to themselves as well as to their dogs. The canine experience of Lyme disease is very different from the human infection and we hope to sort out confusion here.

### Human Lyme Disease vs. Canine Lyme Disease

After exposure to the Lyme organism, 90% of humans will ultimately develop symptoms but only about 5% of dogs will experience the disease.

The first lesson to be learned about Lyme disease infection is that, as mentioned, it manifests completely differently in man's best friend compared with the human experience. After being bitten by a tick that has transmitted *Borrelia burgdorferi*, 90% of humans will develop a rash and flu-like symptoms. In the next few weeks, for 60% of people, joint pain ensues with 15% of people developing actual neurologic abnormalities associated with Lyme disease and 5% of people developing a heart rhythm disturbance called "A-V block." At this same point in the infection timeline, dogs have yet to develop any symptoms at all and 95% of infected dogs never will. In humans, Lyme disease presents with the potential for serious long-term illness while this is a possibility for only a small number of dogs.

When canine illness does occur, it does not begin to manifest for weeks to months after infection at which point arthritis signs are noticed.

Sometimes there is a fever. Most canine Lyme patients will respond rapidly to a simple course of proper antibiotics but there will be some unlucky dogs that develop an associated kidney disease so some related screening tests will be recommended for dogs testing positive. Heart and neurologic issues are exceedingly rare.

The *Borrelia burgdorferi* organism is fairly well suited to live in the canine body without causing trouble. Most exposed dogs harbor the organism uneventfully. Still, it is important not to discount Lyme disease in dogs completely lest you overlook an easily eliminated cause of chronic joint disease, especially in dogs of the Northeast U.S.

The infected dog's most serious long-term potential regards glomerular disease. This is a type of kidney damage that occurs when the immune system is stimulated over a long time by a latent infectious organism or other immune stimuli in hiding. This is a much more insidious problem for which specific testing is needed (see below).

### The Tick and Its Control

An organism that serves to transport and deliver an infectious organism from one host to another is called a vector. The vector of Lyme disease in the Northeastern United States is the deer tick, *Ixodes scapularis*. The female tick lays a clump of approximately 2,000 eggs in the spring. A small six-legged larva hatches and attaches to a host as soon as it is able. Since the larva is small, it typically can only reach a small host, usually a white-footed mouse.



This spirochete is the agent of Lyme disease.  
Photo by CDC



*Ixodes scapularis* is the main carrier of the *Borrelia burgdorferi*. Photo by USDA.

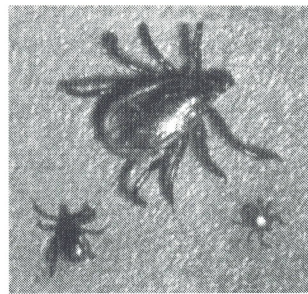


This is the characteristic skin rash shown by humans shortly after *Borrelia burgdorferi* infection. Dogs only rarely exhibit a similar rash with Lyme disease. Photo by CDC.

If the mouse is carrying the Lyme disease spirochete, the baby tick will become infected when it drinks the mouse's blood. The tick won't get sick but it will carry the Lyme organism with it throughout its life.

When the larva is full of blood, it will drop off the host and lie dormant until the following spring, about a year later. At this point, the larva molts and becomes a nymph. The nymph is a bit larger and may select another mouse as a host or may approach a larger game such as a dog or human. The nymph feeds for three to five days and when it is full it drops off and remains dormant until late summer. It then molts into an adult tick. When the nymph is feeding, it may infect its host with the Lyme spirochete. If the nymph was not already infected from its larval stage, it may become infected now during its spring feeding.

The adult tick seeks a larger host, hence its name the deer tick; however, with man encroaching upon the range of the deer, there are often plenty of dogs or humans for the tick to attack. The adult ticks mate on their new host, feed, and transmit the Lyme spirochete if they are carrying it. The male tick remains attached through the winter but the female, once engorged with the host's blood, drops off, hides under leaves and other debris through the winter, and in spring lays her eggs for the two-year cycle to begin again.



The larva (bottom right), nymph (bottom left), and adult female (top). Photo by CDC

**This process of transmitting *Borrelia burgdorferi* from the tick to the new mammal host requires a minimum of 48 hours, which means that if the tick is removed within 48 hours of attachment, the spirochete cannot be transmitted and the host will not get the disease.**

Tick control on the host is an effective means of preventing infection. There are numerous effective tick control products available in assorted formats including chewable treats, collars, and topical spot-on treatments. All of these products either kill the tick or cause it to drop off before the 48-hour deadline.

On the west coast of the United States, there is far less Lyme disease than in the east, although the northern coast of California is considered to have moderate risk. This is because the Lyme vector in these areas is primarily *Ixodes pacificus*, a tick whose nymphal and larval stages strongly prefer to feed on reptiles rather than mammals. Reptile blood has natural anti-*Borrelia* factors that kill the Lyme spirochete and prevent further transmission.

There are several subspecies of *Borrelia burgdorferi* in different parts of the world, so Lyme disease is not unique to the United States.

#### *Borrelia burgdorferi*: The Spirochete and Its Detection

The spirochete that causes Lyme disease cannot live outside the body of a host. It must live within either a mammal or a tick.

In the mammal's body, the spirochete is especially adept at binding to connective tissue. If you are doing additional reading on this organism, you will encounter references to the spirochete's surface proteins called Osp (Osp stands for outer surface protein). Different Osps are expressed depending on whether the spirochete is attached to the tick midgut (OspA, OspB, and OspD) or the mammal's connective tissue (OspC). By modifying its Osps, the spirochete can change its presentation to the mammalian host's immune system thus escaping immune destruction. In addition to changing Osps, the spirochete can change its presentation to the mammalian host's immune system, thus escaping immune destruction. In addition to changing Osps, the spirochete can change its shape into at least three different forms and can hide within cellular folds. The Lyme spirochete is a master of disguise and camouflage.

**This camouflage presents an enormous diagnostic challenge: if the actual host's immune system can't even find the organism, how are we supposed to detect it?**

#### Antibody Levels

A dog with symptoms of Lyme disease ideally should have a test to confirm or rule out Lyme disease. Since it is almost impossible to culture the Lyme spirochete, efforts have centered on the detection of antibodies against the Osps. The problems encountered with this method are:

- In a Lyme endemic area, as many as 90% of the dogs will have antibodies against the Lyme spirochete. Most exposed dogs never get sick but almost all of them will develop antibodies and these antibodies persist for years.
- How do we tell the dogs that have an active infection from those that have been exposed and are not sick from their exposure? (In other words, is our sick dog sick because of his Lyme disease infection, or is the Lyme infection incidental and he's sick from something else?).
- Vaccine has been available for Lyme disease for decades. How do we distinguish antibodies generated by the vaccine from those generated by natural infection?
- How do we distinguish antibodies generated by similar organisms (*Leptospira*, for example, or harmless other *Borrelia* species)?

The solution to some of these problems has come about in the form of the "C6 Antibody test." This is an immunological test for antibodies against the "C6 peptide," a very unique section of the *Borrelia burgdorferi* surface antigens. It is only displayed by the organism after transmission into the mammal host's body.

As the spirochete changes its configuration to escape the host's immune system, the C6 peptide remains constant and always detectable. The vaccine does not contain the C6 peptide so vaccinated dogs will not test positive. Dogs with other infections will not erroneously test positive. Furthermore, this test is simple enough to be available as an in-house test kit that can be run in most veterinary hospitals, with results in approximately 10 minutes.

This still does not address distinguishing active infection from exposure. Dogs will test C6 positive within 3-5 weeks of infection. They stay positive for over a year. Putting together a clinical diagnosis based on the test results and symptoms of the pet remains in the realm of the veterinarian in charge.

#### Testing Apparently Healthy Dogs

The American College of Veterinary Internal Medicine Consensus Statement on Lyme disease recommends testing any dog living in or recently visiting a Lyme endemic area for C6 antibodies. In areas where Lyme disease is common, this is typically done as part of the annual wellness visit along with heartworm testing. The idea is to identify infected dogs and then screen them for urinary protein loss to catch the diagnosis of Lyme Nephritis early. Since dogs do not generally get sick from their Lyme *Borrelia* infection, most experts do not recommend treating dogs for Lyme disease simply because they are positive for C6 antibodies but owners should be aware of the potential for Lyme disease symptoms in the future.

#### Treatment and Its Goals

Which of these dogs get sick and which do not? Does the dog with joint pain, fever, and a positive C6 test need medication? This is where the news is particularly good.

Treatment of Lyme disease utilizes a two to four-week course of doxycycline or its cousin minocycline. Oral amoxicillin or injectable cefovecin (Convenia®) can also be used as effective alternatives.

If Lyme disease is a consideration, many veterinarians simply prescribe the medication. An obvious improvement is seen within 48 hours. Furthermore, most tick-borne infections capable of causing joint pain, fever, and signs similar to Lyme disease generally all respond to doxycycline so a simple course of medication covers several types of infection.

Complete elimination of the Lyme spirochete is not a reasonable expectation with treatment; the organism is simply too good at hiding. The goal instead is to bring the patient into what is called a premunitive state, or when the immune system is in a protective mode. This is the state that 90% of infected dogs achieve when they get infected but never get ill: the organism is in their bodies latently but is not causing active infection or disease.

#### Glomerular Disease (Lyme Nephritis)

It is important to discuss a particularly serious complication of *Borrelia burgdorferi* infection: Lyme nephritis. While this occurs in a small portion of infected dogs, the consequences to the kidneys are frequently severe. While, as noted, a good 90 percent of dogs infected with *Borrelia burgdorferi* never get sick, some infected dogs are harmed by the long-time presence of an infectious organism in their bodies. The immune system is constantly active in its attempt to remove the invading spirochete, and over the years these complexes of antibodies may deposit in the kidney and cause damage that can be severe. This group of dogs will likely require medication for their kidney disease: antibiotics, treatments to reduce protein loss in urine, and potentially immune suppressive therapy. It has been recommended that dogs with positive *Borrelia burgdorferi* antibody levels be regularly screened for significant protein loss in their urine with a test called a "urine protein to creatinine ratio" so as not to miss these patients while their disease is still treatable.

#### Vaccination: Lyme Disease Vaccination

The object of vaccination is to prevent infection in dogs vaccinated before any exposure to Lyme spirochetes. A series of two vaccines is given with one dose 2-4 weeks apart followed by annual boosters. Some experts recommend a 6-month booster before going to the annual booster schedule. Dogs living or visiting Lyme areas will definitely need tick prevention and vaccination should be considered for additional protection.

Virtually all the vaccines act by blocking OspA. Basically the tick drinks in the vaccinated host's blood full of anti-OspA antibodies. The *Borrelia* organism needs OspA to effectively move into the tick's mouth parts for transmission to the host but with the tick's belly full of OspA antibodies, OspA is blocked and the spirochete is quarantined inside the tick.

Some vaccines also include OspC which is expressed.

Several types of vaccines have been marketed and all of them are effective:

##### Killed Whole Bacterin

The killed whole spirochete vaccine uses intact dead spirochetes injected into the host. By using the entire spirochete, the host is exposed to parts of the organism that are not useful in immunization and has more potential to lead to vaccine reactions.

##### Recombinant OspA Vaccine

The next type of vaccine is felt to be superior in preventing reactions and that is the recombinant vaccine against OspA. This vaccine generates antibodies specifically against OspA, the surface protein the spirochete uses to attach to its tick host. When the tick bites and sucks blood full of Anti-OspA antibodies, the spirochete's migration sequence is blocked and the spirochete is prevented from even exiting the tick. The vaccine utilizes DNA for OspA cloned into a harmless virus so that the entire Lyme spirochete is not used; only the OspA DNA is used.

##### OspA and OspC Vaccine

The third type of vaccine targets both OspA as above but also OspC. OspC is the surface protein the *Borrelia* organism expresses inside the dog. The idea is that the OspC antibodies target *Borrelia* organisms that make it inside the dog's body, theoretically providing enhanced protection.

### Recombinant OspA plus Chimerized OspC Vaccine

This vaccine has all the advantages of the OspA attack as well as the advantages of recombinant technology. Taking things a step further is the Chimerized OspC portion. The idea here is that *Borrelia burgdorferi* expresses OspC in the dog's body and generating antibodies against OspC enables the immune system to find the organism where ever it is hiding. The problem is that OspC is not one protein; there are many forms of OspC. The chimerized OspC used in the vaccine takes pieces from seven different versions of OspC and binds them into an amalgamation. In this way, the immune system can be directed against multiple versions of OspC rather than only one.

### Should Healthy Dogs Testing Positive Still Get Vaccinated?

Prevention of Lyme disease in the dog is based on the following principles: Vaccination, Education, and Tick control. Hopefully, we have covered all of this in this article.

This is a controversial subject and every veterinarian will have a perspective. Here are the pros and cons:

#### Argument For Vaccination

- Vaccines work by preventing new *Borrelia* organisms from entering the host. Whether or not a given dog develops actual symptoms of Lyme disease (nephritis in particular) will depend on how many organisms the dog has to deal with. Vaccination will minimize the number of organisms in the dog's body by preventing the entry of new organisms.

#### Argument Against Vaccination

- The idea that more organisms = more chance of disease is still theoretical.
- Unnecessary vaccine, especially if a "whole cell" vaccine is used, increases the chance of vaccination reaction.
- Some experts feel a 2-week course of antibiotics should be given to a positive dog before vaccination to reduce the load of organisms and reduce the chance of vaccination reaction. This practice is not likely to have side effects but any medication has that potential.

Dogs that are Lyme positive and sick (including having urinary protein loss) should not be vaccinated for Lyme disease.

**When it comes to prevention, there is nothing controversial about tick control. It is crucial in Lyme-endemic areas to use tick-controlling products.**

Lyme disease is a regional problem. For more guidance regarding this infection in your area, or areas where you will be traveling, see your veterinarian.

#### Additional Links

[CDC](#)

[AVMA](#)

#### In Summary:

- Lyme disease in dogs is quite different than in humans.
- 95% of infected dogs never will show symptoms.
- Weeks to months after infection, there may be signs of joint pain or a fever.
- Most serious long-term potential complication affects the kidneys - called glomerular disease or Lyme Nephritis.
- If the tick is removed before it has been attached for 48 hours, your dog cannot get Lyme disease. It takes 48 hours for the bacteria to transmit.
- It is recommended that any dog living in or recently visiting a high-risk area have a C6 antibody test to identify those dogs to monitor for future Lyme disease signs. That test is typically done during a wellness appointment, just like heartworm testing.
- Treatment usually consists of the antibiotic doxycycline or minocycline.
- Prevention includes vaccines and dedicated tick control.
- Many effective vaccines are available, each with its advantages and disadvantages. Vaccination prevents more of the organism from entering but the idea that more organism equals more chance of disease is still being researched. Your veterinarian will have advice as to which is best for your dog. [Back to top](#)

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## 5 Steps to Successfully Housetrain Your Puppy or Adult Dog

Christine D. Calder, DVM, DACVB

Published: April 23, 2024

Using and being consistent with a few simple tips can help you successfully housetrain your new puppy.

### Always Supervise:

- Use crates, gates, ex-pens, and tethers to ensure your dog is never out of sight.
- If you cannot directly supervise, then your dog needs to be secured in a safe place.

### Clean, Clean, Clean:

- If your dog has gone to the bathroom somewhere inappropriate, clean it thoroughly with an enzymatic cleaner. Dogs have a better sense of smell than humans, so even if it smells clean to you, they could be attracted back to the same spot.
- Enzyme cleaners may need to be injected into the carpet pad. You can purchase an injection kit with the cleaner.
- Use a black light to locate areas where your dog has urinated.



### Schedule:

- Puppies less than four months old urinate more frequently.
- Put them on a schedule to take them outside regularly.
  - Every hour
  - Every 15 minutes when playing
  - Within 20 minutes of eating
- Feed regular meals (three times a day for puppies under four months and twice a day if over four months) so that you can predict a bowel movement (usually within 20 minutes of eating) and get them outside.
- Puppies under four months old need to eliminate at least every couple of hours. Consider hiring someone to let your dog out or make arrangements to return home regularly.

### Reward:

- Set your dog up for success and reward them each time they urinate or have a bowel movement outside.
- Immediately reward them after elimination rather than waiting until you get back inside.
- Take them out on a leash and supervise them each time.
- You can also use a cue word such as "potty".
- Pair this cue with the act of elimination then reward when finished.

### Avoid Punishment:

- Punishment increases the likelihood that your dog will not eliminate in front of you but will not necessarily stop them from soiling in other places in the house. Using punishment also causes them to see you as unpredictable.
- You can gently interrupt your dog but never punish.

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## Destructive Chewing by Puppies and Dogs

Becky Lundgren, DVM

Revised: September 04, 2019

Published: May 09, 2017

Destructive chewing is a common problem in puppies and adult dogs.

Chewing by puppies is a natural, normal behavior. Puppies chew because they're teething, they're playing, they're learning about their environment, they're trying to escape from their kennel, etc.

One of the main ways puppies learn about their world is to put things in their mouths and chew on them. It is unlikely that you will be able to stop normal chewing behavior completely in puppies. Trying to stop a normal but unwanted behavior can cause stress and anxiety, and lead to more serious behavior problems.

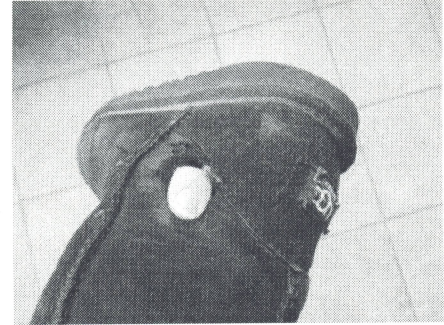
Teething occurs in puppies up to eight months of age. That means chewing problems can be worse in younger animals than in older ones.

Adult dogs may be destructive chewers because they have separation anxiety, they're playing, they're hungry, they don't get enough exercise, they weren't properly trained as puppies, etc.

How can you minimize the damage to your home and household?

The basic methods are to keep your puppy/dog busy, prevent access to things that you don't want damaged, and provide your pet with acceptable things to chew.

1. Keep your dog busy. Exercise, fun, reward-based training sessions, playtime, feeding from food dispensing toys rather than bowls, etc., allow your dog to use her brain and muscles.
2. Dog proof your house. In other words, keeping things (clothes, children's toys, small objects, etc.) that can be destroyed off the floor and out of the dog's reach. Keep closets, drawers, and toy boxes closed. Take objects off of any surface the dog can reach.
3. Supervise your dog. If there are times you cannot watch the dog while she's running loose in the house, put her in a secure area (dog kennel, crate, enclosed room, etc.) or leash her to your belt. If you decide to use a kennel or crate, you'll have to acclimatize her to it or she may develop other behavior problems.
4. If there are items that you cannot prevent your dog from having access to, you may decide to try deterrents, such as making the area around the object unpleasant (plastic rug runners or motion/vibration detectors).
5. If you catch your dog chewing an inappropriate object, don't scare her or try to punish her. Use the treat-in-trade method by offering her a treat or something else worth trading for; when the pup is clearly invested in the new item, pick up the discarded one. With swapping, the pup will not fear an owner's approach when she has something she values because the owner's approach is generally associated with getting something better! Start using this technique early in her training and encourage swapping for lots of items so that she can learn the technique and will learn to readily give up even a highly prized object. It's always better to reinforce positive behavior than to punish your pet because punishment can cause anxiety and other undesirable behaviors to develop. Dr Sophia Yin's book *Perfect Puppy in 7 days* has more training tips.
6. Provide plenty of acceptable chew toys. What is acceptable depends on the size of your dog, what she finds appealing, etc. Many items have been commonly used (large bones, rawhide chews, plastic bones, hooves, Kong toys, rubber toys, puzzle/foraging toys, dental treats, and so on). However, some are no longer as acceptable as they once were. Cattle hooves, sterilized large bones, plastic bones, etc. can damage teeth. Rawhide chews may become choking hazards if the dog isn't supervised and the rawhide taken away when it becomes small enough to be swallowed. Ask your veterinarian or veterinary dentist for professional preferences on what are safe, acceptable chew toys. Always raise/reward your dog for chewing appropriate things. Remember that toys will be destroyed;



Leaving things on the floor where the dog or puppy can reach it gives the dog easy access to things to chew.  
Photo by VIN

that's how you know it's a toy your dog likes.

7. Do not give your dog old shoes, clothes, or children's toys for her to chew on. Dogs really can't tell the difference between those items and your "good" shoes, clothes, etc.
8. If an animal is protecting resources and showing aggression, the animal should be avoided when it has those items and should have a veterinary behavior consultation because there may be a more complex problem going on.
9. If these things don't help, or if the destructiveness gets worse, consult your veterinarian for help.

Destructive behaviors (chewing, barking, digging, etc.) are not only damaging to your home and possessions, but they can also lead to injury to your dog. Plus, they are a major reason dogs are taken to animal shelters and humane societies. With a little time and work, you and your dog should be able to have a good life together and could avoid being part of those statistics.

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Print



## Nutrition and Exercise for Growing Puppies

Jennifer A. Larsen, DVM, PhD, DACVN

Revised: April 26, 2023

Published: October 14, 2013

Some owners of a new puppy might not have had a puppy in many years, or it might be their first puppy, and veterinary recommendations about nutrition and exercise for the puppy's best long-term health can change over the years. With the proliferation of large breed-specific and all-life-stage diets, it's sometimes difficult to know what is marketing hype from pet food manufacturers, what level of exercise is safe, and what the veterinary community recommends. The choices can impact the puppy's health in years to come, so it's best to understand the recommendations so you can make an informed choice.

First and foremost, talk to your veterinarian with any questions about your puppy. Your veterinarian is likely to become your puppy's healthcare specialist for years to come, and getting to know you and your puppy is important.

### Nutrition

**Q:** What are the recommendations of veterinary nutritionists for switching pups and growing dogs onto adult maintenance diets?

**A:** Dietary requirements of puppies differ from those of adult dogs. Mostly, they have different requirements for amino acids and for vitamins and minerals, especially calcium and phosphorus, which are required for bone growth. Of course, puppies also have a higher calorie requirement than adult dogs of a similar size — pups simply burn more energy!

In order to meet the specialized nutritional needs of a puppy, it is important to feed a diet formulated for growth. Diets can be assessed for suitability by checking the Nutritional Adequacy Statement on the pet food label. This should indicate that it is appropriate for growing puppies or for all life stages. Pet foods can be proven to be complete and balanced for specific life stages based on the formulation method or by feeding tests. If the manufacturer is making a complete and balanced claim for the product based on the formulation method, the Nutritional Adequacy Statement will specify if the diet is adequate or not for puppies expected to be > 70 lb adults. Similarly, a diet may be marketed for large breed puppies and have a complete and balanced claim based on feeding tests. In that case, the manufacturer must use large breed puppies in the test (expected to be > 70 lb adults) or they can use any size puppies as long as the calcium and phosphorus concentrations are below the maximum limits in the Dog Food Nutrient Profiles established by the Association of American Feed Control Officials (AAFCO). This label information is very helpful for evaluating whether a puppy diet is appropriate for larger breeds.

An appropriate diet for growth should be fed until the dog reaches approximately 80% of the anticipated adult size. This generally occurs by 12 months of age for small and medium-breed dogs, and by 18-24 months for large and giant-breed dogs. Current conventional recommendations are to feed growth diets until this time, but feeding such a diet for a longer period will not be harmful. Care should be taken to ensure the dog maintains an ideal (lean) body condition, so keep in mind that growth diets may be fairly energy dense and could contribute to unwanted weight gain. As such, a controlled food intake is typically needed.

**Q:** Is it necessary to feed puppies "puppy food" and adult dogs "adult maintenance food?"

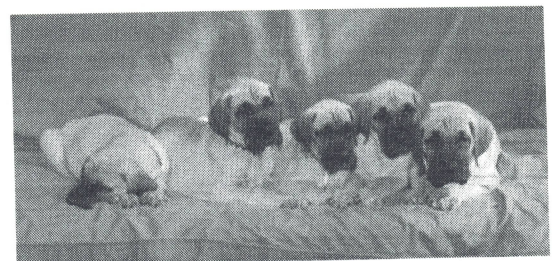
**A:** Yes — puppies have distinct nutritional needs. However, checking the Nutritional Adequacy Statement on the label is the best way to determine if the diet is appropriate for the specified life stage. Some foods marketed as maintenance diets based on the name or other front panel information are appropriate for "all life stages" as specified by the Nutritional Adequacy Statement on the back or side of the package.

**Q:** What is the difference between "regular" and "large-breed" growth diets?

**A:** The major difference is that large-breed growth diets are typically lower in calories, calcium, and phosphorus. This is to avoid excessive intake of minerals and to reduce the risk of overfeeding, which will lead to obesity — an all-too-common problem in today's pets. Being overweight is an important risk factor for developmental orthopedic disease. In most cases, nutritionists recommend food that has passed AAFCO feeding tests for growth and that is made by a large, reputable pet-food company



Sheldon is a 5-month old Irish setter. Photo by Louisa Johnson.



and marketed specifically for large-breed or giant-breed growth. All puppies should be kept lean throughout growth and beyond to promote health and longevity.

A litter of Great Dane puppies. Photo courtesy of Sharon Gwaltney-Brant.

**Q:** Can I harm my puppy by feeding an adult diet earlier than recommended? I need to limit calories by switching my giant-breed dog over to adult food at 6 months of age to reduce the growth rate.

**A:** Puppies require growth diets to meet their needs. The broad category of “adult” diets encompasses a wide range of energy densities and nutrient profiles, so this advice is too vague to be useful and may be harmful.

There are two specific reasons why this approach is not recommended. The first is that adult diets often have calcium-phosphorus ratios, or absolute amounts of these minerals (as well as other essential nutrients), that are inappropriate for growing giant-breed dogs. This can affect bone development in these breeds, who are still undergoing rapid growth at 6 months and beyond.

The second reason is that diets marketed as adult foods may be as (or more!) energy-dense as those marketed as puppy diets, especially if they are formulated to meet AAFCO nutrient profiles for all life stages (which is the same as growth/gestation/lactation formulations). It is best to simply control the calories consumed by regularly assessing the puppy's body condition and appropriately adjusting the amount fed to maintain leanness.

The recommendation to switch to adult foods at 6 months of age, or to use adult foods for large and giant breed puppies, is outdated and potentially very harmful. Large-breed growth diets, which have been specifically created to help reduce overfeeding as well as meet the requirements of growing large-breed dogs, should be used.

**Q:** How can I limit calorie intake in my growing giant-breed puppy to reduce the growth rate?

**A:** The easiest way is to adjust the amount of the growth diet. The correct amount of food is the amount that allows the growing dog to maintain a lean body condition score of 4/9 based on the guide originally developed by Purina. Learn to assess your puppy's body condition score (BCS) regularly and adjust the amount fed accordingly. This ensures that nutritional requirements are met but that growth is controlled to reduce the risk of developmental orthopedic disease. Not only do calorie needs change throughout growth, but growth rates and energy needs also vary between individual dogs, even siblings, so it's best to choose a starting point and then adjust the diet to an individual puppy based on BCS.

**Q:** What should I do if my puppy already has developmental orthopedic disease?

**A:** If you are concerned your puppy has developmental orthopedic disease, the diet should be carefully evaluated and adjusted if necessary. Your veterinarian will be able to help discuss your concerns and can consult or recommend a consultation with a board-certified veterinary nutritionist for advice if necessary. Your veterinarian is also best able to help correct the orthopedic problem.

**Q:** What should I do if my puppy is overweight or obese?

**A:** Feed slightly less and increase low-impact activity such as swimming or leash walking. In most cases, reducing calorie intake while continuing to feed the large-breed growth diet should allow the dog to return to a normal body condition while maintaining appropriate balances of other nutrients. Specifically designed weight-loss diets are generally only recommended for adult dogs. If severe calorie restriction is necessary, this should be done in consultation with a board-certified veterinary nutritionist or your veterinarian. For these reasons, prevention is preferred.

**Q:** Are there any homemade diets that I can give to my large-breed puppy?

**A:** Not if you are looking for an off-the-shelf or out-of-the-book homemade diet. There is too much potential for error in estimating calcium and phosphorus as well as other essential nutrients. Several studies have shown that general recipes found in books or online are nutritionally inadequate which may result in potentially severe orthopedic disease and permanent disfigurement when fed during growth. In addition, homemade diets are more expensive compared to commercial options and require significant investments in time, effort, and space. If you are serious about feeding a balanced and appropriate homemade diet, consult with a board-certified veterinary nutritionist to formulate a customized recipe for your specific pet. Using a generic diet recipe is a recipe for disaster!

## Exercise

**Q:** I want to take my large-breed puppy jogging or running. When is it safe for the puppy to go running?

**A:** There are no hard and fast rules for exercising growing large-breed puppies. And there is even less scientific data supporting specific exercise loads in growing dogs. Therefore, common sense should prevail.

Most young dogs (5-12 months) have enough energy to keep up with a person jogging, but not enough brains to know when to stop, so they would just keep going until they dropped – they're like teenagers! Running and jogging is forced exercise for dogs; forced exercise is anything beyond what the puppy would do when playing with dogs of the same age.

Unfortunately, the stresses that forced exercise places on a growing and immature skeletal system may result in long-term damage. Dogs with a predisposition to orthopedic disease such as hip dysplasia and that are restricted in their level of exercise during development have less severe issues than those given unlimited exercise. Since many of the larger breeds suffer from



Chihuahua puppy

these joint diseases, it seems prudent to wait until growth plates close before subjecting them to vigorous and especially forced exercise.

In most of these breeds, the growth plates close around 12 months. Waiting until these dogs are 12-15 months old, which allows adequate skeletal development, will allow you to enjoy many more years of exercising with your dog than you would if you allow risky activities such as excessive running and jumping.

One reasonable analogy is that a 5 to 6-month-old dog is biologically equivalent to an 8 to 12-year-old child (i.e., a pre-pubescent). It is unreasonable to expect an 8-year-old child to run 3 to 5 miles per day with an adult at a pace of 8 minutes per mile. Another similar analogy is the horse industry, which races 2-year-old horses. The risk of carpal and other injuries in horses forced to gallop as 2-year-olds is substantially higher than in 3-year-olds because of immature growth plates and cartilage.

**Q:** What exercise is appropriate for my growing large-breed puppy?

**A:** Puppies and growing dogs should not be forced to exercise. Remember, forced exercise is anything beyond what the puppy would do when playing with dogs of the same age. Thus, a 4-month-old dog running fences with adult dogs would be considered forced exercise. Similarly, running with people is forced exercise, as is excessive stick-chasing or disc-catching. Swimming, however, is not stressful on joints or bones, so dogs can be physically conditioned by appropriate and supervised swimming sessions. Also, remember that mental effort is very rewarding to a puppy and can be tiring as well – allowing exploration by scent (dogs love to sniff!) and of course, training are good ways to enrich and entertain your puppy.

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## Spaying Your Female Dog

Wendy Brooks, DVM, DABVP

Revised: February 07, 2023

Published: January 01, 2001

Surgical sterilization of the female dog, commonly referred to as spaying, is one of the most significant aspects of care an owner can provide for their female dog. The benefits to the dog far outweigh simply not having puppies, though as pet overpopulation is a wide-spread societal problem, it is important to consider the bigger picture as well and be part of the solution rather than part of the problem.

Spaying involves the removal of the uterus *and* ovaries. It is a major surgery but a very commonly performed one, most safely performed while a female dog is still in puppyhood, prior to her first heat cycle.

### All the Reasons you Should Spay your Female Dog

#### *Mammary Cancer Prevention*

A female dog spayed before her first heat will have a near-zero chance of developing mammary cancer.

After the first heat, the incidence of tumor development climbs to 7% and after the second heat, the risk is 25% (one in four!). It is easy to see that an early spay can completely prevent what is frequently a difficult and potentially fatal form of cancer.

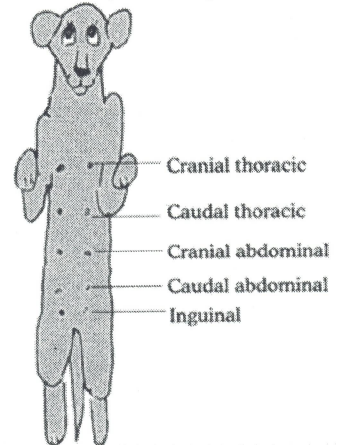
But is it too late if a dog is already past her second heat? No, in fact, spaying is important even in female dogs who already have obvious tumors. This is because many mammary tumors are stimulated by estrogens; removing the ovaries, the source of estrogens will help retard tumor spread.

Spaying removes the uterus and both ovaries and is crucial in preventing as well as treating mammary cancer.

#### *Pyometra Prevention*

Pyometra is a life-threatening infection of the uterus that generally occurs in middle-aged to older female dogs in the six weeks following heat. The hormone progesterone, which primes the uterus for potential pregnancy, does so by causing the proliferation of the blood-filled uterine lining and suppressing uterine immune function. In heat, it is thus easy for bacteria in the vagina to ascend to the uterus to cause infection. The uterus with pyometra swells dramatically and is filled with pus, bacteria, dying tissue, and toxins. Without treatment, the dog is expected to die. Despite her serious medical state, emergency spay is the usual recommendation if her life is to be saved.

Mammary cancer graphic



Graphic by MarVistaVet

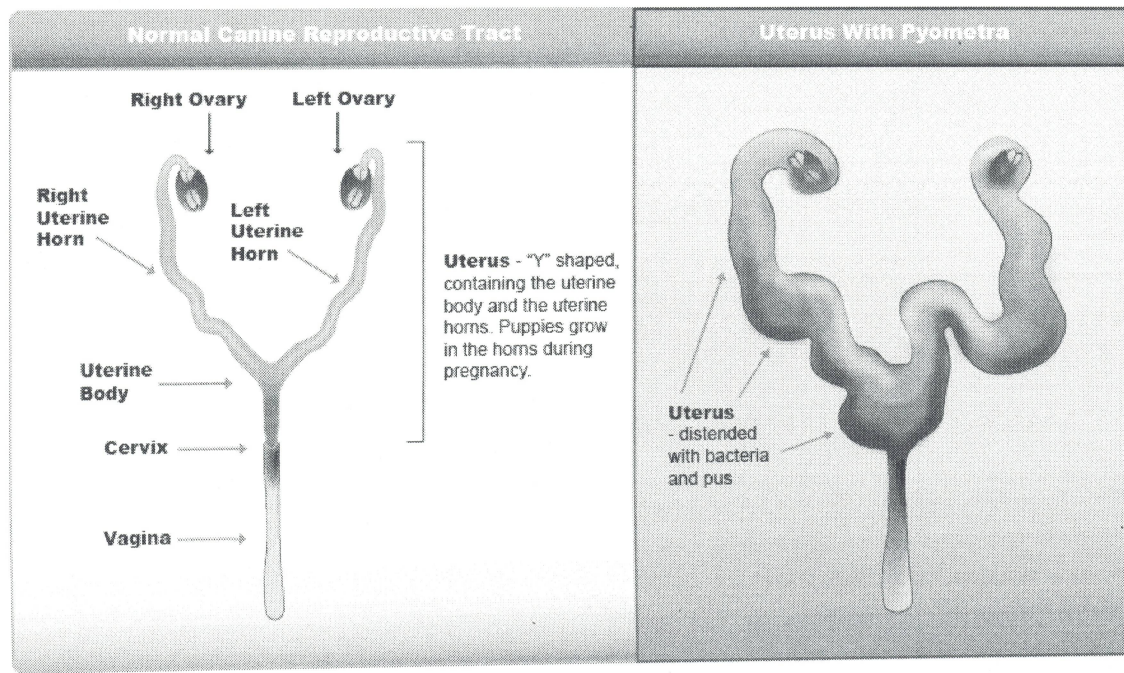


Illustration by Tamara Rees of VIN

- Pyometra is a very common and serious disease of unspayed female dogs. One in four unspayed female dogs who have survived to age 10 will get it.
- **Without treatment, the dog will die.**
- Treatment involves surgery on a potentially unstable patient. Mortality rates with surgery have been reported as high as 17%.
- Spaying prevents the whole thing.

Older, unspayed female dogs have an irregular heat cycle. There is no end of cycling comparable to human menopause. If you still decide against spaying, be familiar with the signs of pyometra, which include loss of appetite, lethargy, vomiting, excessive thirst, and usually (but not always) obvious vaginal discharge.

#### Simple Convenience

Female dogs come into heat every eight months or so. There is a bloody vaginal discharge and local male dogs are attracted. Often there is an offensive odor. All of this disappears with spaying, not to mention the inconvenience of an unplanned litter of puppies to house, clean, feed, and adopt out.

It's Not Just a Good Idea; in Some Places, It's the Law

For instance, the spaying of female dogs has been mandatory in the city of Los Angeles since 2008, which means it is not legal to own an unspayed female dog in that city. Exceptions include law enforcement dogs, dogs currently in competition training, service dogs, and dogs with a medical exemption. Fines begin at \$100. The city came to this resolution largely because of the huge expenses associated with its overcrowded shelter system and its euthanasia rate of approximately 4,000 unwanted dogs and cats per month. This problem comes down to one of population control; education has been inadequate to solve the problem as has simply charging \$100 vs \$10 to license unsterilized dogs. Spaying provides irreplaceable health benefits to the pet, convenience to the pet owner, benefit to the community, and it is now legally required.

Check the laws in your area, or ask your veterinarian.

#### Now That We Know Why it is a Good Idea to Spay, What Exactly Happens?

It is important that the patient has not been fed for at least eight hours prior to surgery. Anesthetic medications commonly induce nausea and vomiting can be dangerous in a sedated patient (vomit can be inhaled/aspirated leading to pneumonia).

A preoperative evaluation is performed; blood work is recommended for older females and may be recommended as a normal pre-anesthetic consideration. An intravenous catheter may be placed to facilitate the administration of anesthetic drugs, for any fluid administration, and for use in case of emergency. This necessitates shaving a small patch of skin on one of the legs.

A tranquilizer or other pre-anesthetic medication may be administered to ease the induction of anesthesia.



A medication is given intravenously to induce sleep. This medication is called an induction agent and lasts only long enough to establish the maintenance of anesthesia by the inhalant anesthetic (gas). Once the dog is asleep, a tube is placed in her throat to ensure that a clear airway is maintained throughout the procedure.

Sometimes a cough is noted for a couple of days after surgery. This may have been caused by the tube in the throat. Such coughs only last a couple of days; anything that persists longer should be re-evaluated.

The tube is hooked up to a machine that delivers a specific concentration of inhalant gas mixed with 100% oxygen. A technician is assigned to monitor this pet so that the concentration of inhalant gas can be changed as needed and the patient's mucous membrane color, heart rate, respiration, and other parameters are followed.

In the surgical prep area, the abdomen is shaved and scrubbed. The bladder is emptied and the patient is moved to a surgical suite, where she is draped with surgical cloths or papers to isolate the area where the surgery will take place.

An incision is made on the midline of the abdomen, and the three points where the ovaries and uterus attach are tied off and cut. The abdomen is checked for bleeding and two or three layers of stitches are placed to close the incision.

It is helpful to know that should the skin stitches come out, there are two layers below holding everything closed. Sometimes skin stitches are not placed but if they are present, you will need to return in 10-14 days to have them removed. Sometimes the skin layer is omitted in which case returning will be unnecessary unless there is a problem.

The anesthesia technician continues monitoring until the dog wakes up and coughs out the throat tube.

The patient is kept in an observation room until she can walk.

Some veterinarians feel strongly that a night in the hospital is important to an uneventful recovery. This night in the hospital is similar to strict bed rest, just what you would expect to be needed after a major abdominal surgery. This night also allows for the proper administration of pain medication for a longer time as well as a post-operative check-up with the doctor the morning after surgery. As with all things medical, other veterinarians may have a different opinion and your veterinarian may send your dog home at the end of the day as long as they are deemed stable.

#### What to Expect at Home

Most spay surgery patients go home the same day or the next as if nothing had happened though pain medication will be provided to cover the next few days.

Some nausea may occur in the first couple of days after surgery and it would not be unusual for the pet to refuse food for a day after surgery.

As noted above, a cough may persist for a couple of days as a result of the throat tube. This should not persist for longer than a couple of days.

Dogs who show a propensity to lick their stitches will need an Elizabethan or "E" collar to restrict access to the stitches. This is not comfortable for the dog but it must be used strictly until the stitches are out and the incision is healed.

Activity should be restricted during the week following surgery. Excessive activity can lead to swelling or fluid accumulation under the incision or even worse, a tear in the internal incision line. If a fluid pocket forms, it should resolve on its own after a few weeks. If something has torn inside, obviously the situation is more serious so it is wise to have any incision swelling inspected at the veterinarian's office. Fluid drainage from the incision would also be a reason for a recheck.

#### What About Behavioral Changes?

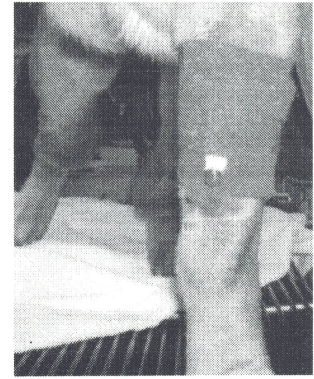
The female dog's reproductive tract is dormant for most of the year. It only activates for the three-week period of heat. This means that from a behavioral standpoint, the female dog acts spayed most of the time. This said, there has been a documented slowing of metabolism after spays and it may be necessary to use a reduced-calorie food in an adult dog. Check with your veterinarian about nutritional recommendations.

#### What Age to Spay?

A lot of factors go into this question. As mentioned, dogs have a huge problem with mammary cancer development, and spaying before the first heat cycle (generally before the ages of six to eight months) removes this problem as a consideration. Spaying before the first heat is protective against an extremely common form of cancer and there is no question about it. Further, spaying while the dog is of a smaller size makes for less trouble with bleeding in surgery and an easier recovery after surgery. Larger dogs are a more difficult surgery and are generally more costly to spay. That said, research has shown that there is an increased incidence of some other problems in some breeds when they are spayed young.

For some breeds, there is an increased incidence of urinary incontinence associated with spaying before the age of one year.

For larger breeds, the situation becomes more complicated. The problem for large-breed female dogs is that some breeds have a higher incidence of joint and bone issues or increased incidence (albeit small increases) in other types of cancers when they are spayed young.



The patient may have an intravenous catheter placed. Photo by MarVistaVet



The plastic cone is the traditional E-collar, but there are other types that may be more comfortable for your dog and your shins. Photo courtesy of Depositphotos.

Issues regarding joint and bone problems, urinary incontinence, and cancers other than mammary cancer are highly dependent on breed such that findings for one breed do not hold true for another. To help clarify recommendations for different breeds, this research from UC Davis may be helpful: <https://www.frontiersin.org/articles/10.3389/fvets.2020.00388/full>. Field those questions to your regular veterinarian to find the best pathway for your own pet.

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## Neutering Your Male Dog

Wendy Brooks, DVM, DABVP

Revised: February 02, 2023

Published: January 01, 2001

### Why Should I Neuter my Dog?

Aside from helping control the current overpopulation of dogs, neutering a pet dog generally makes for a healthier dog and better pet. Neutered dogs tend to live longer and have fewer behavior problems (see below). They are less likely to be relinquished to the shelter and do not contribute to overcrowding in community animal shelters with their offspring. The local government is more interested in having fewer roaming dogs that could be dangerous and having less burden on the animal services budget. Pet owners are more interested in having a well-behaved and long-lived family pet.

### What Are the Health Benefits to the Dog?

There are several health benefits to neutering. One of the most important concerns is the prostate gland, which under the influence of testosterone will gradually enlarge over the course of the dog's life. By age five years, it is usually significantly enlarged in an unneutered male dog. As the dog continues to age, his prostate is likely to become uncomfortable, possibly being large enough to interfere with defecation. The prostate under the influence of testosterone is also predisposed to infection, which is almost impossible to clear up without neutering. Neutering causes the prostate to shrink into insignificance, thus preventing both prostatitis as well as the uncomfortable benign hyperplasia (enlargement) that occurs with aging. It is often erroneously held that neutering prevents prostate cancer but this is not true; the benefits of neutering on the prostate are about preventing enlargement and infection.

Other health benefits of neutering include the prevention of certain types of hernias and tumors of the testicles and anus. Excessive preputial discharge is also reduced by neutering.

### What Behavioral Changes Can be Expected After Neutering?

Numerous studies on the effects of neutering have been performed evaluating playfulness, fear of strangers, territorial aggression, mounting, urine-marking, roaming, and other behaviors. The behaviors that are most consistently altered after neutering are inappropriate mounting, urine marking, and fighting. These behaviors were significantly reduced or completely eliminated in 50-60 percent of male dogs after neutering. Most pet owners look forward to curtailing these actions and thereby improving their relationship with their dog.

### What Exactly is Done Surgically?

An incision is made, generally just forward from the scrotum. The testicles are removed through this incision. The stalks are tied off and cut. Castration is achieved. If the testicles are not removed, the desirable benefits listed above cannot be realized. The skin incision may or may not have stitches.

### What Can I Expect Upon Discharge From the Hospital?

The scrotum is often swollen in the first few days after surgery, leading some people to wonder if the procedure was really performed. If the dog is immature at the time of neutering, the empty scrotum will flatten out as he grows. If he is mature at the time of neuter, the empty scrotum will remain as a flap of skin. Sometimes the incision is mildly bruised. Most male dogs are eager to play by the day after surgery but, to keep the incision intact, it is best to restrict the dog from boisterous activity.

### At What Age Can Neutering Be Performed?

Male dogs can be neutered at just about any age, although the traditional age is still before puberty at six to nine months old. There is some controversy regarding when the best age for neutering should be: after puberty, traditional age, or "early" which can mean any age from eight weeks up to six months. Shelters have had problems with adopters of young puppies failing to return for neutering at the traditional age; a common solution is to neuter prior to adoption to preclude the pup's ability to contribute to pet overpopulation when he is older. It turns out there may be negative ramifications to this depending on the dog's breed.

Long bones continue to grow for a longer period of time in dogs neutered before puberty, making for a taller adult dog. There can be joint problems associated with this, especially in larger breeds. Not all breeds, even large breeds, seem to have negative consequences when it comes to neutering before the age of one year so it is best to consult your regular veterinarian with regards to when to neuter your individual male dog.

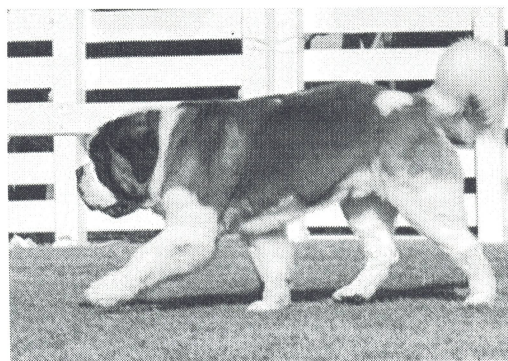
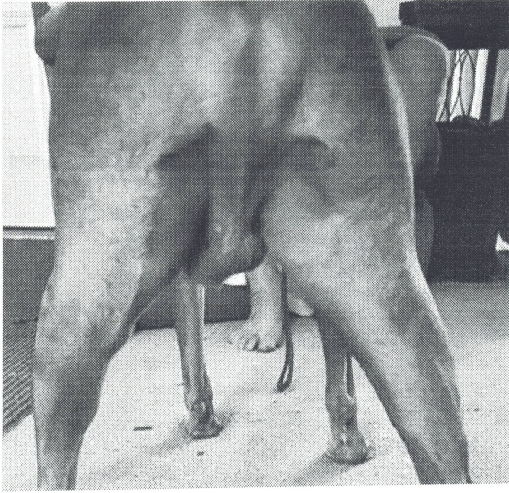


Photo courtesy of Depositphotos



Elton is an intact vizsla. Photo by Adrienne Freyer, used with permission.

Senior dogs can also benefit from neutering. A diseased, enlarged prostate will still shrink down to a comfortable size even in an older dog. The neuter is a relatively simple low-risk surgery, which means that even an older dog can still benefit.

For more information, [this study from UC Davis](#) has provided clarification on the best neutering ages for 35 common dog breeds.

#### Will He Become Over-Weight or Lethargic?

Metabolism changes with neutering in such a way that there is a moderate risk of becoming overweight after neutering. The dog owner should be prepared to make adjustments in diet or exercise if the dog seems to be gaining too much weight.

#### Will He Still be Interested in Females?

His interest will be reduced but if he is around a female dog in heat, he will become aroused by her. Mounting behavior often has roots in the expression of dominance and may be expressed by a neutered male in a variety of circumstances that are not motivated by sexuality.

#### What if a Dog Has an Undescended Testicle?

Undescended testicles have an increased tendency to grow tumors. They may also twist on their stalks and cause life-threatening inflammation. For these reasons, neutering is recommended for dogs with undescended testicles. This procedure is more complicated than a routine neuter; the missing testicle can be under the skin along the path upon which it should have descended to the scrotum, or it may be even inside the abdomen. Some exploration may be needed to find it; thus there is often an incision for each testicle. The retained testicle is sterile and underdeveloped. If there is one descended testicle, the dog will be able to breed but since retaining a testicle is a hereditary trait, it is important that the male dog not be bred before he is neutered. It is not a good idea to pass on the retained testicle trait.

#### What are the Negative Aspects of Neutering?

This turns out to be a more complicated subject to study than one might think. The issues that are typically studied are orthopedic/joint-related problems and different types of cancers and whether neutering a male dog truly changes the incidences of these. The Hoffman study of 2013 looked at over 70,000 canine medical records and found that neutering increases a dog's lifespan by 14 percent. They found that neutered dogs were less likely to die of infectious diseases, degenerative diseases, or trauma but were more likely to die of cancer or immune-mediated disease than their unneutered cohorts. Upon scrutinizing different cancers, incidences are still low. For example, the risk of developing prostate cancer is several times higher in neutered dogs vs. unneutered dogs but still less than one percent in both groups. Cancer development is more about environmental exposures and heredity/breed predispositions than about testosterone, so it has been difficult to draw conclusions.

With regard to hip dysplasia and cruciate ligament rupture, probably the most common joint problems of dogs, body condition/obesity, the general size of the dog, and genetics are likely to be the major risk factors but there does seem to be an increased risk of these issues in dogs neutered before puberty when their bones are still growing and conformation is not set.

#### Is Neutering Legally Required?

In some areas, neutering may be required as municipalities attempt to prevent pet overpopulation. Check with your local city or county officials.

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