

Your complete guide to natural dog care and training

Whole Dog Journal™



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Going Long

We hope you won't need the in-depth information, but we recommend you keep issues like this one indefinitely.

Summer is for reading, yes? These long summer days are a perfect time to relax and enjoy a good, long read that improves your dog's life. For starters, get completely absorbed in a new training technique, such as Pat Miller's introduction to "Nose Games" that starts on page 6. It's an enjoyable, effective way to improve his behavior and responsiveness to you. Advocates say that using their noses



channels dogs' energy in a productive way. Interest in this activity is growing rapidly nationwide. Step-by-step instructions follow her article (which starts on page 3) about the benefits of putting your dog's amazing nose to work.

The record-setter for a long read in this issue, however, is Barbara Dobbins' article about canine lymphoma. It's the latest in a series she's been producing for us about the most common canine cancers. It's a lengthy piece. While you might be tempted to skip by this chunk of our issue, because your dog doesn't have lymphoma and you don't know anyone whose dog has lymphoma, reconsider. When a dog is diagnosed with lymphoma, quick action is needed; with this cancer, treatment should commence within a day or two at most following its diagnosis. That's not the time to try to understand the complexities of canine oncology.

If lymphoma does strike your dog, or a dog in your extended family, having this detailed article on hand will save you countless hours of online research, sorting through terrible website after misinformed website. We've compiled all the information that you or anyone would need in order to make fast, good decisions about the dog's treatment and health management. All the information you (and even your general veterinarian!) would need, all in one spot. Frankly, articles like this are the reason I recommend keeping print versions of WDJ indefinitely.

I realize current subscribers have access to the digital form of all past articles (all you have to do is register). However, even our search engine doesn't always immediately point you to the most comprehensive article first, and no website can present the information in a reader-friendly fashion, with sidebars in appropriate positions and meaningful photos and side stories (like the one about Scout).

Now you know I'd rather turn a page than scroll down a screen! But I find that when I'm in a panic about my dog's health, I want paper in my hand; I want to be able to mark it up with questions, so I don't forget anything.

I sincerely hope that neither you nor I ever *need* this article. But if any of our dogs is ever diagnosed with some iteration of lymphoma, it will be early, because we are informed about the early signs of disease and know what to ask for in terms of cutting-edge diagnostic tools and the latest treatment protocols.

NK



Everyone Nose That

Putting your dog's nose to work is a fun and effective way to improve his behavior and responsiveness to you.

All dogs have noses – and they all know how to use them. Our awareness of our dog's nose capabilities is nothing new. We humans have long taken advantage of our dogs' scenting prowess in a variety of ways – hounds who track game, rescue dogs who search for missing persons, narcotics detection dogs who find hidden drugs, and much more. Recently, however, both science and the dog-training world have taken a new look at and developed a new respect for the dog's olfactory abilities, and what putting them to use can do for your dog's mental and behavioral health!

KNOW THIS ABOUT DOG NOSES

First, some basic biology. According to Alexandra Horowitz, Ph.D., psychology professor and head of Barnard College's Horowitz Dog

Cognition Lab at Columbia University in New York, while humans have about 5 million olfactory cells, dogs have between 200 million and 1 billion. Did you get that? Between 200 million and 1 billion. So even the dogs at the low end of that range have 1,000 times as many olfactory cells as we humans!

Dogs also have a "second nose" – the vomeronasal organ (also called Jacobson's organ), which enhances the dog's ability to detect and identify scent. These two factors combined help to explain why our dog's sense of smell is so much better than our own.

NOSING AROUND

Today, dog noses are employed in a long list of activities that go far beyond hunting for game. The list is ever expanding, and we are just beginning to recognize the benefits the

Most people are aware that dogs have far more olfactory cells in their noses than we humans do. Dogs also have a far larger area in the brain devoted to analyzing the things that they smell. It's been estimated that this area in the dog's brain is 40 times greater than ours. It makes sense, then, that employing the dog's nose is a great way to engage his brain!



dogs themselves reap from being allowed and encouraged to use their super-noses.

The rapidly growing popularity of K9 Nose Work competition and titling has brought revelations to the dog-training world about the behavioral advantages of encouraging dogs to use their noses. A growing number of shelters and rescue groups are also realizing the benefits of allowing/encouraging their canine charges to engage in scenting activities to make their dogs more adoptable. Many previously fearful dogs have come out of their shells and gained confidence in leaps and bounds as a result of doing scent work – perhaps because it is so innately reinforcing to them, and they are so capable of success.

Most humans recognize how immensely success contributes to our self-confidence. The same is true of dogs (and other species). Even something as simple as the “Find it!” game (described on the next page) can do wonders to help a shy or fearful

dog adjust to the scary world. If you are interested in enrolling your dog in K9 Nose Work classes and/or competition there are certified trainers all over the country who can help you; see “Sniff Out These Resources,” above.

SNIFF OUT THESE RESOURCES

Being a Dog: Following the Dog into a World of Smell

by Alexandra Horowitz (Scribner, 2016)

“Science Says Nose Work is Good For Your Dog”

by Linda P. Case tinyurl.com/Case-nose

Scent, Science, and the Amazing Ways Dogs Perceive the World

by Cat Warren (Touchstone, 2013)

Missing Animal Response Network (Information on how to train your dog to find missing pets): missinganimalresponse.com

K9 Nose Work (Information on scent work classes and competition, and how to find trainers who teach K9 Nose Work): k9nosework.com

Search and Rescue Dogs (provides certification, training, and education for search and rescue dog teams): sardogsus.org

Nose Jobs

Here are just some of the things you might find dog noses detecting these days in addition to hunting game, drugs, and lost persons:

- Diabetic alert
- Seizure alert
- Cancer
- Explosives
- Bed bugs, fire ants, termites, red palm weevils
- Missing pets
- Truffles (yes, that expensive mushroom)
- Invasive knapweed (Montana)
- Invasive brown tree snakes (Guam)
- Feces of endangered species
- Illegal currency
- Human cadavers
- Dead birds on wind farms
- Smuggled agricultural products
- Illegal animal and plant exports/imports (ivory, etc.)
- Counterfeit items
- Environmental contaminants and toxic products

SCENT AND COGNITION

Horowitz has been exploring the connection between a dog’s sense of smell and his cognition. A “sense of self” or self-recognition is one of the elements of cognition, and the long-held test for self-recognition has been an animal’s ability to recognize himself in a mirror. The way this is usually tested is to put a dot of colored paint on the face of the subject and hold up a mirror. If the subject touches the dot on his own forehead, the conclusion is that he realizes it’s him in the mirror – he has a sense of self. If he touches the dot on the reflection instead, he supposedly does not recognize himself.

As of 2015, only great apes (including humans), a single Asiatic elephant, dolphins, orcas, and the Eurasian magpie had passed this test. A wide range of species have reportedly failed the test, including several species of monkey, giant pandas, sea lions, and dogs.

Recognizing that dogs may have a stronger self-recognition through *scent* rather than sight, Horowitz devised a study to test this, by allowing them to smell the scent of their own urine and another dog’s urine. The results of her study seem to confirm her hypothesis. Her subject dogs spent more time sniffing another dog’s pee than their own, indicating a self-association with their own scent, hence a sense of self.

SCENT AS A REINFORCER: "PREMACK" IT!

Switching from science back to practical (with a touch of science) if you are frustrated by your dog's constant sniffing on walks, here are a couple of things to consider:

- As humans we really rely on our sense of vision. Imagine if you were walking along a path with gorgeous vistas, beautiful scenery, and amazing wildlife, and your guide kept grabbing your hand and dragging you along every time you wanted to stop, take in the view, and maybe take some pictures. That's how your dog feels.

- When you take your dog for a walk, who is the walk for, anyway? If it's so she has an enjoyable experience, consider her preferences, and let her stop and sniff!

- You can use the Premack Principle to teach your dog to walk more willingly with you even when there are tempting scents present.

To employ the Premack Principle, you use a more likely/more desirable behavior as the reinforcer for a less likely/less desirable behavior. (Some people call this "Grandma's Law": You have to eat your vegetables before you can eat your dessert.)

You can click-and-treat your dog for walking nicely with you, but if you occasionally tell her to "Go sniff!" as the reinforcer for polite walking, you'll score big points in her eyes. Do it frequently and you'll likely end up with a much more willing walking partner who trots happily next to you in eager anticipation of the next "Go sniff!" cue.

THE BOND

There is one more incredibly important

benefit of encouraging your dog to use her nose: Your presence during her highly reinforcing, very enjoyable scent activities will enhance your relationship with her, and strengthen the bond that you already have. What's not to like about that?

So, consider the various options for playing with your dog's nose, from the very simple "Find It!" to finding lost pets and humans, and everything in-between, decide what you want to do, and start getting nosy. Your dog will love you for it! 🐾

Author Pat Miller, CBCC-KA, CPDT-KA, is WDJ's Training Editor. She lives in Fairplay, Maryland, site of her Peaceable Paws training center. Miller is also the author of many books on positive training. Her newest is Beware of the Dog: Positive Solutions for Aggressive Behavior in Dogs. See page 24 for information on her books and classes for dog owners and trainers.

A Nose Game All Dogs Enjoy: Find It!

"Find it" is a ridiculously easy and delightful game that any dog can play, as well as a game you can play to change behavior in the presence of a fear- or arousal-causing stimulus, eventually changing your dog's emotional response from frightened to happy.

Start with your dog in front of you, and handful of tasty treats behind your back. Say "Find it!" in a cheerful tone of voice and toss one treat at your feet. Click just before your dog eats it. (Tap your foot or point if necessary, to draw your dog's attention to the treat.)

When he's done eating the treat, say "Find it!" again, and toss a second treat at your feet. Click as he eats the treat. Repeat multiple times until your dog's face lights up when he hears the "Find it!" cue and he orients to your feet in anticipation of the treat. (Use a different "search" cue if you want to toss treats farther away, so "Find it!" will always orient your dog to your feet.)

Now if a scary skateboarder or some other arousal-causing stimulus appears while you're walking your dog around the block on his leash, play "Find it!" and keep the tossed treats close to you. Your dog will take his eyes off the scary thing and switch into happy-treat mode. You've changed his emotions by changing his behavior.



HOW TO TEACH YOUR DOG TO PLAY “NOSE GAMES”

If competition isn't your thing, you can do a simpler activity at home with your dog that we call Nose Games. You can do just the easy parts – hiding treats in a room while your dog watches – or go all the way to the advanced stages, where your dog can find missing pets and people.

Not long ago we had a client in our Nose Games class with her 8-year-old son. The family's enthusiastic 20-pound Terrier mix ultimately learned to find the boy when he hid in the woods!

In Nose Games, you teach your dog to look for and find hidden objects when you ask her to. This is an exceptionally useful activity, as it uses lots of energy and can tire out even a very active dog. Also, it has very practical applications as well – including helping shy or fearful dogs gain confidence. And dogs love it!

We start with treats, since most dogs will happily look for food. You can eventually ask your dog to look for hidden objects (such as favorite toys, or your lost keys) and even hidden or missing humans and other animals!

1 START BY “HIDING” TREATS AS THE DOG WATCHES, IN THE DOG’S PLAIN VIEW.



- Have your dog sit and wait/stay. (If she doesn't know wait/stay, have someone hold her leash.)

- Walk about six feet away, show her a treat, remind her to stay, and place the treat on the ground.

- Return to her side (remind her to stay!). Turn and face the treat, then tell her “Search!” (If she won't get up until you release her from the stay, say “Search!” and then give your release cue.) She should run right out and eat the treat. Repeat a half-dozen times.



2 NEXT, “HIDE” THE TREATS IN REALLY EASY PLACES, WHILE YOUR DOG WATCHES.

- Have your dog sit and stay. Let her watch you “hide” a treat in plain view (behind the leg of a chair, by a waste basket, etc.).



- Return to her side (reminder her to stay!). Turn and face the treat, then tell her “Search!” She should run right out and eat the treat. Repeat six or so times.

3 ASK HER TO SNIFF AN ITEM THAT HAS THE SCENT OF A TREAT AND ADD A CUE, SUCH AS “SCENT!”

- Have your dog sit and stay. Let her watch you hide several treats in plain view.



- Return to her side (remind her to stay!). Turn and face the treats, rub one of the treats you're using on a paper towel, hold the towel in front of her nose (don't let her eat it!) and tell her “Scent!” (Don't worry if she doesn't appear to sniff it.)

- Then tell her “Search!” She should run right out and eat the treats. Repeat six or seven times, asking her to sniff the item that contains the treat scent and giving her the “Scent” cue before each attempt.

4 HIDE TREATS IN LOCATIONS THAT REQUIRE A LITTLE MORE EFFORT TO DETECT.

- Have your dog sit and stay. Let her watch you hide a treat in a harder place (behind a chair leg, etc.).

- Return to her side (don't let her get up!). Turn and face the treat, do “Scent!”, then tell her “Search!” She may have more difficulty finding this treat. Don't help her! This is where she starts learning to use her nose. If you help her, she won't use her nose – she'll learn to wait for you to tell her where it is. If she truly can't find it, reset, and hide it in an easier spot. Make sure she watches you! Repeat a half-dozen times.

- Gradually hide the treat in harder places, having her



“Scent!” before each set. “Harder” spots are on top of things, inside of other things (like a shoe, or on a shelf in a partially opened cupboard or closet), or inside open containers on raised surfaces.

- Now hide *multiple* treats, in easy *and* challenging spots. Have your dog sit and stay. Let her watch you hide two to three treats in somewhat easy places (behind a chair leg, etc.).

- Return to her side (don’t let her get up!). Turn and face the treats, do “Scent!,” then tell her “Search!” She may have more difficulty finding multiple treats. If necessary, indicate an area by spreading your arms and saying “Search here!” Don’t point to the treat! This is where she really starts using her nose. If she truly can’t find it, reset, and hide it in a slightly easier spot. Make sure she is watching you! Repeat a half-dozen times.



- Gradually hide treats in harder spots, having her “Scent” each time before you send her.

5 HIDE THE TREATS WHEN THE DOG IS OUT OF THE ROOM; NOW IT GETS REALLY FUN!

- Put your dog in another room. Hide two or three treats in somewhat easy places.

- Bring her back to the room, have her “Scent!” then tell her “Search!” She may have more difficulty finding multiple treats. If necessary, indicate an area by spreading your arms and saying “Search here!” Don’t point to the treat! If you help her, she won’t use her nose. If she truly can’t find it, reset, and hide it in a slightly easier spot. Repeat a half-dozen times, doing “Scent!” each time.

- Gradually hide treats in harder spots.

6 GENERALIZE “SEARCH” TO OTHER OBJECTS. START WITH HER FAVORITE TOY!

- Generalize her “Search” behavior to other objects as you desire, starting with a favorite toy. Rub the toy on the paper towel, and start back at Step 1, placing the toy in plain view and move quickly through to Step 5.



- Next, use less favorite or neutral objects. For humans, rub the human’s scent on a paper towel (have them rub their neck with the paper towel). Then have the human hide, in an easy spot at first (let the dog find the human in plain view, then watch the human hide behind a barrier, or around a corner, then through Step 5.)

7 TEACH YOUR DOG TO PERFORM A SPECIFIC BEHAVIOR THAT WILL INDICATE WHEN SHE HAS FOUND SOMETHING.

- Pick a behavior that your dog already knows well, or teach her a new behavior like “Speak,” “Down,” “Touch with your paw,” etc., that you want to be the indicator behavior. Teach her a new cue for that behavior, by saying (for example) “Mark!” and then cueing the behavior.



- With your dog watching, put a treat in a box with holes in it, or out of her reach, so she can find it but not get to it.

- Tell her “Scent!” and “Search.” Follow her to the treat, and when you can tell she has found it, tell her “Mark!” and cue her indicator behavior if necessary (if she doesn’t do it on the “Mark” cue). Repeat until she starts to automatically offer her indicator behavior when she gets to a treat that she cannot access herself.

- Stop following her to the treat, and invite her to come back to you to offer the mark behavior, until she comes to you automatically to mark.

- Then add other objects, and eventually increase the difficulty by having her out of the room when you hide your objects or humans.

Now you have a dog who can find a lost child in the woods, and come back and use her mark to you to tell you she has found him! 🐾



HEALTH

A Southwestern Hazard

Valley Fever is an often-devastating fungal infection that can infect dogs who live in (or once traveled through) the American Southwest.



*This unfortunate pup, picked up as a stray, has a severe fungal skin infection. The only positive thing one can say about this is that it's easy to get a smear from the draining skin lesions to examine under a microscope in order to confirm a diagnosis of a *Coccidioides* infection.*

If you live in or travel to the Southwest, particularly Texas, California, or Arizona, it is important that you know about a fungal infection called coccidioidomycosis. It is also known as San Joaquin Fever or Valley Fever (VF). This fungus can pose a significant threat to our canine companions, as well as to their human counterparts. There are two well-known species *Coccidioides immitis* and *C. posadasii*.

Coccidioides species are a hardy fungus that live in the soil. The dry, hot atmosphere of the Sonoran life zone are perfect for it. High winds, dust storms, and earthquakes encourage the release and spread of spores. Infection occurs when the spores (called arthroconidia) are inhaled. Lung disease develops and then spreads throughout the body to the lymph nodes and organs. Every system from the brain, skin, eyes, and bones can be involved. This is known as systemic or disseminated infection. Coccidioidomycosis can be a devastating disease. It is important to know the progression, symptoms, and treatment for this condition.

Valley Fever typically incubates in the body for one to three weeks, but it can lie dormant for years before symptoms develop. This makes it absolutely critical to always let your veterinarian know any travel histo-

ry (including if your dog was adopted from another area of the United States). It may not seem like important information, but it could be life-saving.

Research indicates that most dogs living in endemic areas are exposed to *Coccidioides* species and clear the infection without significant illness. They may develop mild respiratory disease from which they recover without specific treatment. A 2005 study showed that outdoor dogs were about five times more likely to contract this condition than indoor pets. Another study showed that dogs with greater than one acre of land on which to roam were at increased risk. Walking dogs on a sidewalk was protective.

LIFE CYCLE

In the desert, *Coccidioides* species exist as a mold. The mold is in long, partitioned chains called hyphae. These fragment into tiny, individual arthroconidia, which are aerosolized under the right conditions (hot, dry, and windy) and inhaled by hosts including dogs, cats, and humans, settling in the lungs.

This new environment induces them to undergo a change. They turn into spherules that fill with endospores. Once full, the spherules rupture and release the spores into surrounding tissue. The endospores can then turn into spherules themselves and propagate the infection. This is why every system in the body can be involved.

SYMPTOMS

The associated symptoms are seen in every system from the brain to the bones. Initially, the fungus replicates in the lungs, leading to pulmonary disease. In cases where the disease does not spread beyond the lungs, the infection is considered to be localized. It can be mild or develop into pneumonia. Once the infection spreads beyond the lungs and infects other systems, it becomes disseminated.

The most common initial symptoms are lack of appetite, weight loss, malaise, fever,

and limping. The limping may shift from leg to leg. These are non-specific signs and can be seen with other fungal infections such as blastomycosis, histoplasmosis, tick-borne diseases like Ehrlichia and Rocky Mountain spotted fever, and bone cancers such as osteosarcoma.

The following organ changes can be seen:

■ **Lungs.** As mentioned above, a fungal infection in the lungs can cause pulmonary disease and pneumonia.

■ **Central nervous system (brain/spinal cord).** *Coccidioides* in the central nervous system can lead to seizures, behavioral changes, and lethargy.

■ **Ocular.** Uveitis is common with VF. The spores replicate in the eye tissue causing marked inflammation and discomfort. Outwardly, you may notice a whitish or reddish haze over your dog's eye, the white of the eye (sclera) may appear red, and weeping may occur. The eye may appear sunken/smaller than normal.

■ **Bones.** Valley Fever is particularly damaging to the bones. Osteomyelitis (destruction of the bone as a result of the spores and inflammation) can occur. It typically occurs in the long bones (the limbs), but it can affect any bone in the body. Radiographs (x-rays) usually reveal a destructive lesion and a periosteal reaction – when the bone begins to try to heal the lesion by producing more bone.

It is impossible to differentiate between metastatic cancer and Valley Fever changes on x-rays, so this is when travel history, further diagnostic testing, and other information such as signalment (age and breed) become absolutely essential.

■ **Cardiac.** *Coccidioides* can affect the heart tissue, leading to pericarditis, a generalized term for inflammation of the heart muscle. It can also cause an accumulation of fluid in the pericardium (the sac around the heart). This is called pericardial effusion. It can cause heart failure quickly because the heart cannot contract properly.

■ **Skin.** Skin lesions are common with Valley Fever. These can look like open, weeping sores and bumps. They may form anywhere on the body. There may be many or a few.

■ **Liver and kidney.** Outward symptoms of liver problems caused by Valley Fever can include jaundice (yellow tint to the skin), abdominal distention, and vomiting; symptoms of kidney problems can include increased drinking and urinating.

DIAGNOSIS

Like many things with Valley Fever, diagnosis isn't straightforward. Any time a patient presents with signs of significant illness, the first step in determining the cause is a thorough physical exam and history; the latter should always include any travel and adoption/purchase history.

A physical examination should proceed in a systematic manner from nose to tail. This exam should include full vitals, including weight and temperature.

*An x-ray of a two-year-old Bloodhound with a veritable (and helpfully diagnostic) "fungal snowstorm" in his lungs, caused by a *Coccidioides* infection.*

Once these are accomplished, a "minimum database" – a set of tests that will provide the doctor with enough information to get him on the right track – is usually recommended. This generally includes a complete blood count (CBC), chemistry panel, and urinalysis. A complete blood count evaluates the red blood cell, white blood cell, and platelet counts, as well as whether the cells are normal in size and morphology.

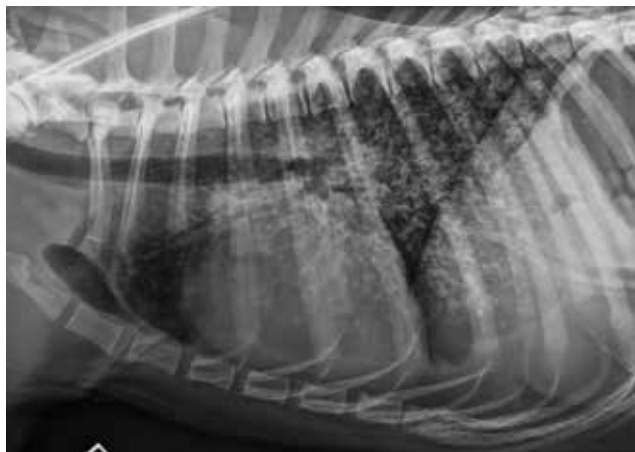
In dogs with coccidioidomycosis, blood work changes can include anemia, elevated white blood cells, and low platelets. These findings indicate systemic inflammation and infection but are not specific to Valley Fever. A chemistry panel may show low albumin, an important carrier protein, elevated globulins (proteins that fight infection), and alterations in liver and kidney values, if those organs are involved. Again, these findings are not specific to Valley Fever.

If limping or coughing is present, x-rays are usually recommended. Both the lungs and bones can have marked changes that are very difficult to differentiate from cancer. In the lungs, large, "fluffy" infiltrates can be seen. It is often described as a snowstorm pattern. Again, these look very similar to cancer. The lymph nodes in the chest may also be enlarged (called perihilar lymphadenomegaly). Again, this can be caused by both fungal disease and cancer. In the bones, the changes may include destruction of the bone cortex with extra bone proliferation as discussed above.

Urinalysis may show elevated protein in the urine, but as with blood tests, this is very non-specific.

As a result, if your veterinarian suspects Valley Fever, more specific testing needs to be conducted to make this diagnosis.

If draining skin lesions are present, your veterinarian may take impression smears and aspirates. This is relatively simple and non-invasive. A microscope slide can be pressed directly onto skin lesions that are oozing. A small needle can



also be introduced and a sample taken (called a fine needle aspirate or FNA). Sometimes, the actual *Coccidioides* spores can be seen in these samples, along with severe inflammation.

If bone involvement is present, aspirates or biopsies of the bone can be taken and submitted to a pathologist. This is more invasive than a skin FNA and can be painful, so it should be done under sedation

or anesthesia. Bones affected with Valley Fever are weakened and at risk for fracture during this procedure. They may also fracture with normal activity such as walking and running. This is called a pathologic fracture.

A fungal culture can also be done. This is when the fungus is grown on a culture medium. Ironically, *Coccidioides* can be difficult to grow in the lab, and this test can take up

to two weeks to indicate a positive result. As a result, it is not the most useful test when trying to make a rapid diagnosis. Since *Coccidioides* is contagious to people, it must be grown in a specialized, biohazard laboratory. It is rarely utilized for diagnosis.

ANTIBODIES

Serologic testing is more specific for

VF: Difficult to Diagnose

Judd is a 10-year-old Labrador. He's also a K9 Nose Work superstar. K9 Nose Work is a fast-growing dog sport, and Judd travels all over the U.S. and Canada to compete in K9 Nose W

ork trials with his owner and trainer, Stacy Barnett.

Stacy is dedicated to her canine friend and pays close attention to his health. That's why when a lump popped up on Judd's jaw, she immediately called Judd's veterinarian. During his check-up, a heart murmur was also noticed. Judd's veterinarian thought it was a good idea to have the lump removed, but with a new heart murmur – now what?

The plan was simple. Check out Judd's heart with an echocardiogram to make sure he could handle anesthesia, and then have surgery to remove the lump. The echocardiogram report cleared him for surgery. Off to the surgeon! Beforehand, the veterinarian recommended chest x-rays. This is common procedure for older dogs undergoing surgery. Cancer is a frequent cause of illness in elderly dogs, and it often spreads to the lungs. Chest x-rays can determine if this is the case before expensive and invasive surgery is done. They should always be considered prior to anesthesia in older animals.

Stacy was not prepared for what came next. The surgeon called with devastating news. Judd's chest looked like "a snowstorm." It had to be cancer. Or did it?

The surgeon recommended that the suspicious jaw lump be aspirated rather than removed. Maybe it was cancer, and it had spread to the lungs. She also mentioned the possibility of fungal diseases but thought this was less likely. Stacy was quick to pipe up with the information that she had traveled to the Southwest many times, and could this be Valley Fever? After listening to Stacy and doing some quick research, the surgeon agreed that this was an important rule-out.

The mass turned out to be a lipoma – a benign, fatty tumor. And the Valley Fever titer came back weakly positive. Stacy was elated. But does this mean that Judd has Valley Fever? Or could he still have cancer?



There's no simple answer. Because Judd had a positive titer (albeit very weak), he was started on itraconazole. The positive titer means that his immune system has been exposed to *Coccidioides* before – but he was not necessarily currently "infected." That's the problem with antibody titer tests! Some very sick dogs have low titers, and some healthy dogs have high titers. Other ways to diagnose Judd would include trying to aspirate the nodules in his chest or any draining skin lesions, conducting an enzyme immunoassay (EIA) test, or gauging his response to antifungal therapy.

So far, Judd seems to be doing okay, but he still isn't himself. He's working slower, and his appetite is down (a common side effect of itraconazole). He's been taking the antifungal for two weeks, so the jury is still out. Stacy is anxiously waiting to see if he responds. She speaks with her veterinarian frequently as they monitor his progress. In the meantime, she gives him all the love and snuggles and

Coccidioides. Serologic testing evaluates for the presence of antibodies produced by the immune system. Antibody production is a complex process, but it is fascinating.

Any time a dog is exposed to an attacker like a fungus, the immune system responds quickly. Because the offending organism is not from the body, it lacks familiar markers on the cell surfaces. The immune system recognizes this and attacks. Two particular cells are very important. B-cells attack the fungus directly by coating it with antibodies and preventing replication. It also tags the fungal bodies so that other immune system cells will recognize and destroy them.

Antigen-presenting cells (APCs) and T-cells are also important. APCs break up the organism and then show the fragments to the T-cells, which then destroy them. After the threat has been neutralized, most of the immune cells disappear. The only exception is memory cells, which hang around. These help the immune system respond much faster the next time this organism is encountered.

Serologic testing takes advantage of our understanding of this process. Your veterinarian will submit a blood sample to a laboratory that can search for antibodies that are specific for *Coccidioides*. The earliest antibodies produced are called immunoglobulin M (IgM). These are found at high levels in blood and lymph and respond earliest and fastest to infections. The results are reported as a ratio.

A ratio of greater than 1:8 is considered evidence of infection. A ratio that is greater than 1:32 likely indicates an active, systemic infection. IgM levels rise within two to four weeks of exposure and then quickly wane. They can be gone by four weeks.

Immunoglobulin G (IgG) is the second responding immunoglobulin and will last longer than IgM – sometimes, it's detectable for years after infection. Often veterinarians recommend “paired” titers in which an early sample is taken, and then another is taken two weeks later to

evaluate how the immune system is responding. This can also indicate active infection. Oddly enough, it is not always clear cut. Dogs have can negative titers (the immune system doesn't react) and still be infected. They can also have high titers with a relatively mild infection. This is part of what makes the diagnosis of this fungal invader so tricky.

Titer tests for antibodies formed in response to *Coccidioides* are not 100% accurate. No test is. Other options include the EIA (antibody enzyme immunoassay) from MiraVista Diagnostics. This can be conducted on samples as varied as cerebrospinal fluid and urine. Unfortunately, it cross reacts with other fungal infections like blastomycosis and histoplasmosis, which also have similar symptoms, so an exact diagnosis may not be possible. This is when the dog's travel history becomes critical.

TREATMENT

Antifungal drugs are used to target the *Coccidioides* fungus specifically. While antifungals are often very effective, they can cause side effects, such as loss of appetite, vomiting, lethargy, and increased liver enzymes. The drugs that are most commonly used to treat VF are:

- **Itraconazole.** This medicine is considered the drug of choice. It's a good bit more expensive than the second-best drug, however.
- **Ketoconazole.** Usually the most cost-effective treatment choice. Treatment is generally a minimum of three months and at least two months beyond the resolution of obvious symptoms. With extended therapy, it can cause cataract formation.
- **Fluconazole.** Studies on the efficacy of this drug for Coccidioidomycosis are lacking, but if other drugs fail, it is an option.
- **Amphotericin B.** This drug is often used as a last resort in cases when the other drugs listed were ineffective.

For dogs with systemic involvement, therapy must also be targeted at the affected organs.

In dogs with severe lung disease, treatment may involve hospitalization for oxygen therapy, intravenous (IV) fluids to maintain hydration, IV antibiotics to combat secondary bacterial infections, steroids to minimize inflammation secondary to fungal die-off (this may occur when antifungals are given and incite an overwhelming inflammation response in the lungs).

In dogs with bone involvement, therapy must sometimes be very aggressive. If the fungus has destroyed bone enough to lead to pathologic fractures, amputation may be the only option. In cases where the bone is damaged but not destroyed, the lesions will sometimes improve with antifungal treatment, as the body regenerates the damaged bone.

In cases of ocular involvement with uveitis, prognosis for vision is guarded. Antifungals do not penetrate into eye tissue very well, and the eyes can serve as a permanent nidus for infection. This is painful. In these cases, enucleation (removal of the affected eye or eyes) is often the only way to rid the body of Coccidioidomycosis.

PROGNOSIS

In cases where only the lungs are involved (localized infection), response rates to therapy are as high as 90%. When other systems are involved, the prognosis drops to around 60%. Response to therapy is dependent on each dog's immune system and can be very hard to predict. The prognosis is worse if multiple bones and/or the central nervous system are involved.

Once treatment is discontinued, Valley Fever can recur. It is very hard to kill the organism entirely and reports of recurrence years later and in different body systems are common. 🐾

After nine years in emergency medicine, Catherine Ashe, DVM, now works as a relief veterinarian in Asheville, NC, and loves the GP side of medicine.



Blind Love

There are any number of things that might cause a dog to lose her ability to see – but a loss of vision doesn't have to affect a dog's quality of life! Tips on living with and training a blind dog.



Photo credit: @orbiseeswithheart

Orbit and his people excelled in the puppy classes offered by the author's training business, "Good Dog Santa Cruz" – so much so, that she decided Orbit and his family should be the inspiration for this article about training and living with blind dogs.

When Orbit came into one of the classes I offer for puppies and their owners, in Santa Cruz, California, he was in most ways just like all of the other puppies. He bounced around excitedly, wanted to sniff the other pups, and was thrilled with the treat tidbits that were offered for certain behaviors. But Orbit did one thing just a little differently. He would make tight circles near his people, Melissa and Arielle, gradually spiraling outward.

Orbit, a Havanese-mix who was born blind, couldn't visually scan his surroundings. Instead of sight, Orbit was using cognitive mapping, sounds, and scent to figure out what was going on in his immediate environment. Like many animals, dogs possess the ability to develop a mental map of their surroundings, even when they cannot see. Through exploration of the space, they learn where things are and how to navigate safely.

Orbit was born without sight due to retinal dysplasia and optic nerve coloboma. Dogs who are born blind may have a genetic component or may have developed the problem while in the womb. Dogs can also lose

their sight later in life due to genetic conditions, diseases, injuries, and other changes in the eye as they get older. Some of the more common causes of vision issues include cataracts, glaucoma, progressive retinal atrophy, and suddenly acquired retinal degeneration (SARDS).

DOGS = DOGS, SIGHTED OR NOT

There is a belief that blind dogs will be more prone to behavior problems. But this really is a myth. Blind dogs are dogs first, and blind second. Some are happy, some are serious. Some are easy going, some are more easily stressed. Some like to play, others prefer to cuddle. Many love their walks, car rides, hanging out with friends, and a good chew.

Pups who are born blind may have an easier time because they do not have to adjust to a change. Being blind is their norm. A dog who becomes blind later in life may need some time and help with the adjustment, but most dogs who are blind adapt well, perhaps in part because they already rely heavily on other senses.

"Orbit is a happy-go-lucky guy," says Melissa. "He is trusting and approaches life with gusto." Melissa said that her family's first consideration when thinking of adopting Orbit was whether they were really ready for a puppy. Their second consideration was how would having a blind pup be different from having a sighted pup.

"What would a blind puppy need that a sighted puppy might not need? What would be different? Could we keep him safe?" Melissa says that in some ways he's actually been easier than the pups she's had in foster care. For example, he doesn't get into stuff as much as other puppies, maybe because he can't see the things to get into. But in other ways, they have had to think differently.

WHAT'S DIFFERENT?

One of the big differences has been in their awareness of ambient noise. Orbit uses his

hearing to orient himself in new environments and to keep track of Melissa. For example, Melissa wears keys on her belt that jingle, giving him a sound to orient to as they move through life. If there is traffic noise, he may have a harder time following her footsteps or the jingle of the keys.

Melissa recalls going to new locations to socialize Orbit – a friend's backyard and a downtown shopping area. What Melissa considered to be a normal amount of noise – such as dogs barking in the background or cars going by on the street nearby – was a symphony of sound for Orbit. The sounds created an environment that was disorienting and overwhelming.

“We learned that we have to take him out in gradients. Slowly increasing the challenges. But he likes going places. He is very friendly, social, and gregarious. I think he would be sad if he wasn't allowed to go out and embrace life the way he does. You just have to modify it a bit.” Melissa notes that Orbit will usually have a new place mapped and be comfortable within three or four visits.

Socializing Orbit with other dogs has also been a little different. He will not see the other dog's social cues. And when he attempts to give cues, they may be a little awkward. “He does some of the right things, but in the wrong way,” Melissa says. For example, he may do play bows facing away from the other dog or walk up to sniff a dog and instead bump into their side. Dogs he interacts with have to be patient and unflappable.

Physical safety is another big concern. For example, the family has guards on their stairs and baby gates

Orbit is independent and intrepid, not afraid to try new things or explore new places.



Since Orbit can't see another dog's body language, he can miss some social cues that would otherwise warn him that the other dog is not friendly – or that his friend isn't in the mood for fun.

ample, you might use a treat lure to prompt a “sit.” You can capture the dog orienting to a sound such as the dog's name or a touch such as a shoulder tap. These can be introduced much the same way you might introduce them

to a sighted dog.

to prevent accidents. When walking down the street, Melissa has to be very aware of things that Orbit could run into, such as bushes or poles.

TRAINING MODIFICATIONS

When using methods such as lure and reward or reward-marker (clicker) training, teaching a blind dog is remarkably similar to working with a sighted dog, though you may obviously rely more heavily on verbal cues (or touch cues for dogs that are both deaf and blind) than on hand signals or body language.

■ A new behavior may be initially lured, captured, or shaped. For ex-

■ Using a reward marker, such as a clicker or the word “yes,” to let the dog know what behavior is being rewarded already relies on sound rather than sight. For a dog that is both deaf and blind, a specific signal such as a touch on the chest can be used for the reward marker.

■ You can reinforce behaviors with food, praise, touch, play, or other things that the dog finds rewarding, just as you would with a sighted dog.

Training is similar enough that Orbit attended my puppy, beginning life skills, and intermediate life skills classes and excelled at all of the exercises with only a few minor modifications.

In puppy class, where the pups interacted with each other, we made sure that approaches were done slowly and carefully (something that is really a good idea for all pups!). When teaching impulse-control behaviors such as stay and leave it, we quickly discovered that adding a verbal cue immediately (rather than waiting until we had the finished behavior) actually accelerated the training, as he couldn't respond to the initial body language cues.

With a blind dog, using multiple cues (which goes against conventional training



advice) can be very helpful for certain behaviors, notably orienting skills such as attention and recall. Melissa will call Orbit repeatedly when he is at a distance so that he can follow the sound of her voice to find her.

While most of us strive to have our dogs walk on a leash while the leash is loose, with Orbit, Melissa uses gentle tension on the leash to help him navigate around objects. She trained him to follow the leash pressure.

In addition, when training a blind dog, you might consider teaching some cues that you might not need with a sighted dog. Here are a few examples:

■ **Careful.** “Careful!” can be used to let a dog know if there is something in front of him. This can be helpful in new environments or if there is

Photo credit: @orbitseeswithhisheart



A seeing eye cat? Orbit loves his kitty housemates, and they seem to understand and accept him perfectly.

something that has changed in an environment that the pup has already mapped. While there are several ways to train a dog to stop in motion, one simple way with a blind dog is to use a physical prompt.

Have your dog on a leash next

to you. Walk forward with your dog toward an object such as a piece of furniture. Say, “Careful!” and then with either gentle pressure on the leash or your hand on your dog’s chest, stop his forward motion. Click and reward the stop. Then pat the item in front of your dog so that he will walk toward it and investigate. With repetition, your dog will soon understand that the cue “Careful!” means slow down or stop and look for something in front of him.

■ **Go see.** This cue can be used to help a dog know there is someone or

Assistive Devices for Blind Dogs

Many blind dogs adapt to life with few if any assistive devices, but there are some things that may be helpful.

Using mats and rugs. Mats can be used to help designate specific areas in the home, such as doorways and the tops and bottoms of stairs. They can help orient a dog to a change in the terrain. Likewise, carpet runners can designate paths in a home, making it easier for a dog to navigate.

Marked garden paths. Using mulch, gravel, or another specific texture can help dog more easily follow garden paths, especially in larger spaces.

Scents and sounds. Using scents such as lemon or vanilla to mark dog doors, crates, and bedding may be helpful for some dogs. Sounds, such as the running water in fountain-type water dishes, may also help some blind dogs. Toys that are scented and those that squeak or crinkle may be helpful.

Safety barriers. Baby gates at the tops and bottom of stairs, railing guards, as well as fencing around ponds and pools can help make the environment safe for a dog who cannot see or who has limited vision.

Halos. Halos are devices that are usually attached to a harness and provide a circle-shaped bumper above a dog’s head. If a dog is going towards a wall or object, the bumper will touch first before the dog bumps into it, giving them time to stop or adjust their path.

Echolocation devices.

Sometimes called sonar devices, these are relatively new. There are several types. One collar device gives a warning beep if a dog approaches a solid surface. Another uses echolocation by sending ultrasonic sounds out, helping a dog determine how close or far away something is.



This is the “Walkin’ Blind Dog Halo Harness.” There are a number of similar products on the market.



something in front of him that is safe to check out. You might start this with a friend. Walk your dog toward the friend, say, “Go see!,” and then your friend will encourage your dog to come closer to say hello.

Another easy way to train it is to have a small box or platform in front of your dog. Place one or more treats on the platform. Say, “Go see!,” and then encourage your dog to go up and explore the box. Within a few repetitions, most dogs will get the idea that “Go see!” means there is something in front of them that is interesting and safe to explore.

■ **Step up and step down.** Using a single small step, a curb, or a training platform, encourage your pup to explore going up and down, on and off the step. Using treats to prompt or lure your dog may be helpful. When your dog is happily going up and down on the step, you can click and treat each time he offers the behavior.

Once he is predictably going up and down, you can add the cue just before he does the behavior. Say, “Step up!” just before he goes up, then click and treat. Say, “Step down!” just before he goes down, then click and treat.

Practice in a few locations with different steps. Once he understands it in several locations, you can practice with two or more steps, eventually adding the cue “Stairs!” to mean there are multiple steps in front of you.

■ **Run (or Go).** This is a good cue to let your dog know that he is safe to run, and may be an especially important cue for a young or high-energy dog. You can practice this in your yard or another safe open area. Just before releasing your dog to run, say the word “Go!” or “Run!” Your dog will soon learn to associate the word with a wide-open space, free of obstacles and dangers.

■ **Names of things.** You might consider teaching a blind dog the names of things such as specific pieces of furniture, toys, people, or other



Photo credit: @orbitseeswithhisheart

animals. While this is something that many people also do with sighted dogs, many of us rely more on pointing, patting, looking, and other body-language cues.

Teaching the name of a person, animal, or item is a simple matter of creating an association. For example, to teach the name of a person, you might say the person’s name, then that person can talk to the dog in a happy voice. Repeated pairings and the dog will likely hear the person’s name and check to see if that person is nearby.

With items, you can start with pairing the name in everyday occurrences. Say, “Squeaky!” before playing with a specific squeaky toy, and soon your pup may associate the word with that particular item or action.

LIVING A FULL LIFE

Blind dogs, like all dogs, can live full, active lives. With a little modification, blind dogs can participate in many of the same activities sighted dogs enjoy. Dogs who have lost their sight later in life may enjoy similar activities as before losing their sight. For example, a dog who enjoys retrieve games may

still enjoy fetch, finding their toys by sound and smell. Scented toys and toys that make noises may be particularly attractive for a blind dog.

Scent discrimination games are also a great option for blind dogs. From casual “Find the treat!” games in your living room, to hide and seek in the garden, to formal or competitive K9 Nose Work, scenting activities can enhance a blind dog’s life by encouraging the use of another sense.

Many blind dogs also enjoy adventures outside of the home. Orbit has gone to training classes, travels with Melissa through her day-to-day life, and even goes to work with her. “I would encourage people not to limit their blind dog’s life,” Melissa says. “Orbit loves being out, visiting with people, and going on a ‘sniffari.’” 🐾

A long-time contributor to WDJ, Mardi Richmond is a dog trainer, writer, and the owner of Good Dog Santa Cruz in Santa Cruz, California.

Special thanks to Melissa for sharing her experiences with Orbit. You can follow Orbit on Instagram @orbitseeswithhisheart.



Canine Lymphoma

Cancer is never “good news” – but this is one of the few malignancies that can go into remission, sometimes for years or even for the rest of the dog’s life.

There are many types of canine lymphoma, with highly varying prognoses. With some types, dogs can experience long periods of remission after treatment, so a precise diagnosis can help you determine what course of action you should take for your dog.

Lymphoma accounts for 7 to 24% of all canine cancers and approximately 85% of all the blood-based malignancies that occur, making it one of the most common cancers found in dogs. Lymphoma – also referred to as lymphosarcoma – is not a singular type of cancer but rather a category of systemic cancers with over 30 described types.

Lymphoma occurs when there is a genetic mutation or series of mutations within a lymphocyte that causes the cells to grow abnormally and become malignant, ultimately affecting organs and body functions. Lymphocytes are the infection-fighting white blood cells of the immune system and are produced by the lymphoid stem cells in the bone marrow and lymphoid tissue in the bowel. Their role is to prevent the spread of disease, to provide long term immunity against viruses, aid in wound healing, and provide surveillance against tumors.

Lymphocytes are part of the lymphatic system – a network of tissues and organs that help rid the body of toxins, waste, and other unwanted materials. The primary function of

the lymphatic system is to transport lymph, a fluid containing lymphocytes, throughout the body. Unfortunately, cancerous lymphocytes circulate through the body just as the normal lymphocytes do.

Although lymphoma can affect virtually any organ in the body, it most commonly becomes evident in organs that function as part of the immune system – the locations where lymphocytes are found in high concentrations – such as the lymph nodes, spleen, thymus, and bone marrow. Swelling occurs when the numbers of cancerous lymphocytes increase; one of the most common sites of accumulation are in the lymph nodes themselves, resulting in an increased size of these structures.

Canine lymphomas are similar in many ways to the non-Hodgkin’s lymphomas (NHL) which occur in humans, though dogs are two to five times more likely than people to develop lymphoma. The two diseases are so similar that almost the same chemotherapy protocols are used to treat both, with similar responses reported. NHL has been featured recently in the high-profile cases involving individuals who developed non-Hodgkin’s lymphoma after using the weed killer glyphosate (most highly recognized under its best-selling brand name, Roundup).

Because of its similarity to the human form, canine lymphoma is one of the best understood and well-researched cancers in dogs. It is one of the few cancers that can have long periods of remission, even lasting years, and although rare, complete remission has been known to occur.

CAUSE

The cause of canine lymphoma is not known. It is suspected that the cause may be multifactorial. In an effort to determine what factors affect the possibility of developing the disease, researchers are looking at the role of environmental components such as exposure to paints, solvents, pesticides, herbicides, and insecticides; exposure to ra-

CANCER TERMINOLOGY

Lymphoma is not to be confused with lymphocytic leukemia. While this disease also starts in the lymphocytes, lymphocytic leukemia results in an invasion of cancerous white blood cells in the bone marrow and blood, rather than in the lymph nodes and other tissues like lymphoma. Leukemia tends to be pretty rare in dogs, though at times dogs can be diagnosed with both leukemia and lymphoma; at Stage V, lymphoma is technically leukemic lymphoma, meaning the cancer is both in organ tissue and in the bone marrow or blood.

Other similar sounding but unrelated conditions include lymphangiosarcoma, a cancer that originates in the lymphatic endothelial cells; lymphadenopathy/ lymphadenomegaly, lymph nodes smaller than normal or abnormal in texture or shape / abnormal enlargement of the lymph glands; and lymphadenitis, which refers to an inflammation of the lymph nodes typically due to infection from bacteria, viruses, fungi, or parasites, or from toxic or chemical exposures.

diation or electromagnetic fields; the influence of viruses, bacteria, and immunosuppression; and genetics and chromosomal factors (changes in the normal structure of chromosomes has been reported). It is thought that dogs living in industrial areas could be at a higher risk for developing lymphoma.

BREED DISPOSITION AND RISK FACTORS

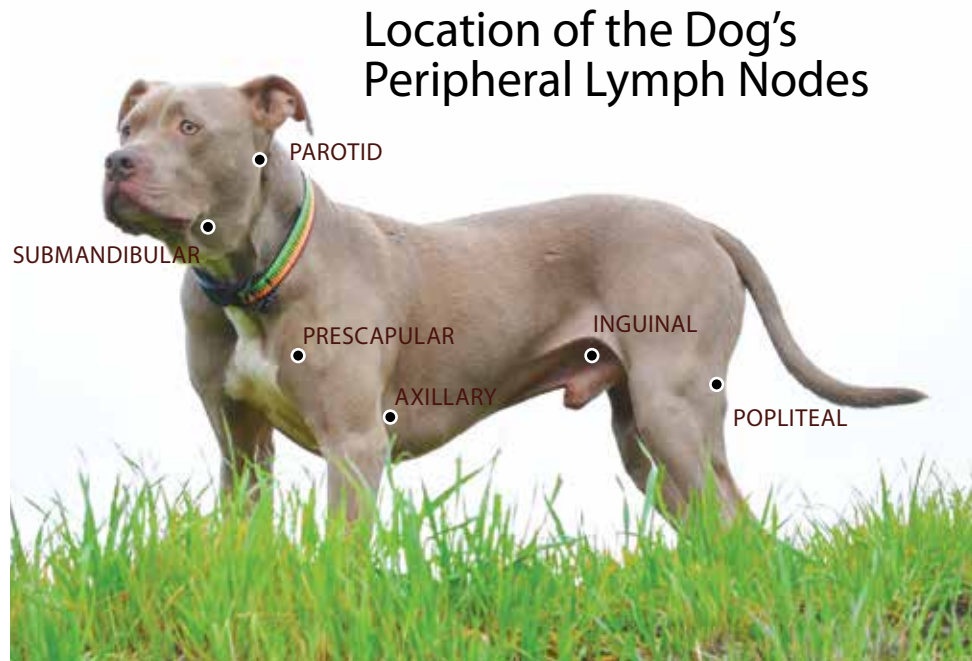
Although the direct cause of lymphoma cannot be identified, studies have found that there are certain breeds that are at higher risk of developing the disease. The most commonly affected breed is the Golden Retriever, equally represented by B-cell and T-cell lymphomas (see below).

Other breeds showing increased incidence include the Airedale, Bas-set Hound, Beagle, Boxer, Bulldog, Bull Mastiff, Chow Chow, German Shepherd Dog, Poodle, Rottweiler, Saint Bernard, and Scottish Terrier. Dachshunds and Pomeranians have been reported as having a decreased risk of developing canine lymphoma.

Lymphoma can affect dogs of any breed or age, but it generally affects middle-aged or older dogs (with a median age of 6 to 9 years). There has been no gender predisposition noted, but there are reports that spayed females may have a better prognosis.

A recent large scale study published in the *Journal of Internal Veterinary Medicine* (Volume 32, Issue 6, November/December 2018) and conducted by the University of Sydney School of Veterinary Science in Australia, examined veterinary records for breed, gender, and neuter status as risk factors for developing lymphoma. A number of breeds were observed to be at risk that had not been previously identified as being in that category.

The study also demonstrated the opposite: Several breeds previously documented to have an increased risk of lymphoma failed to show an increased risk. Additionally, the study found males had a higher risk overall across breeds, as did both males and females that had been neutered or spayed. Mixed breeds



Lymph nodes are located throughout the inside and outside of the body. Those on the outside (indicated above) are called peripheral lymph nodes and can be palpated. Normal lymph nodes are small bean-shaped structures that you usually don't feel or barely feel when petting your dog. The size of lymph nodes depends on the size and type of dog; in general, they should typically be less than ½ inch in size. The most common initial symptom of multicentric lymphoma in dogs is firm, enlarged, non-painful lymph nodes. A lymph node affected by lymphoma will feel like a hard, rubbery lump under your dog's skin.

generally had a decreased risk when compared with purebred dogs. While these findings may be inconsistent with other generally accepted risk factors, the study states, "These three factors need to be considered when evaluating lymphoma risk and can be used to plan studies to identify the underlying etiology of these diseases."

LYMPHOMA TYPES AND SYMPTOMS

Typically, a dog who gets diagnosed with lymphoma will initially be taken to a veterinarian because one or more lumps have been found under the neck, around the shoulders, or behind the knee. These lumps turn out to be swollen lymph nodes. The majority of dogs (60 to 80%) do not show any other symptoms and generally feel well at the time of diagnosis.

Advanced symptoms depend on the type of lymphoma and the stage and can include swelling/edema of the extremities and face (occurs when swollen lymph nodes blocks drainage), loss of appetite, weight loss, lethargy,

excessive thirst and urination, rashes, and other skin conditions. Breathing or digestive issues may be present if the lymph nodes in the chest or abdomen are affected.

Because the lymphatic system aids in fighting infection, fevers are often one of the first indicators of the disease. Additionally, since lymphoma affects and weakens the immune system, dogs may be more susceptible to illnesses, which can lead to complicated health issues. Lymphoma itself, however, is not thought to be painful to dogs.

Lymphoma can occur anywhere in the body where lymph tissue resides and is classified by the anatomic area affected. The four most common types are multicentric, alimentary, mediastinal, and extranodal. Each type has its own set of characteristics that determine the clinical signs and symptoms, rate of progression, treatment options, and prognosis. Furthermore, there are more than 30 different subtypes of canine lymphoma.

■ **Multicentric Lymphoma.** This is the most predominant type of lymphoma, accounting for 80 to 85% of all canine cases. It is similar to non-Hodgkin's lymphoma in humans. The first noticeable sign of this form is usually enlargement of the lymph nodes in the dog's neck, chest, or behind the knees, sometimes up to 10 times their normal size, with the patient not showing any other distinctive signs of illness.

Multicentric lymphoma tends to have a rapid onset and affects the external lymph nodes and immune system; involvement of the spleen, liver, and bone marrow are also common. The disease may or may not involve other organs at the time of diagnosis, but it eventually tends to infiltrate other organs, causing dysfunction and eventually leading to organ failure.

As it progresses, additional symptoms including lethargy, weakness, dehydration, inappetence, weight loss, difficulty breathing, fever, anemia, sepsis, and depression may be observed. This form can also metastasize into central nervous system (CNS) lymphoma in later stages, which can cause seizures and/or paralysis.

■ **Alimentary (Gastrointestinal) Lymphoma.** This is the second most prevalent form of canine lymphoma, however it is much less common, accounting for only about 10% of lymphoma cases.

Because it is in the digestive tract, it is more difficult to diagnose than the multicentric form. It is reported to be more common in male dogs than females. This type forms intestinal lesions, typically resulting in the manifestation of gastrointestinal-related signs, including excessive urinating or thirst, anorexia, abdominal pain, vomiting, diarrhea (dark in color), and weight loss due to malabsorption and maldigestion of nutrients.

The disease affects the small or large intestine, and it has the potential to restrict or block the passage of the bowels, resulting in serious and complicated health risks or fatality.

■ **Mediastinal Lymphoma.** This is the third most common type of canine lymphoma, but it is still a fairly rare form. Malignant lesions develop in the lymphoid tissues of a dog's chest, primarily around the cardiothoracic region. This form is characterized by enlargement of the mediastinal lymph nodes and/or the thymus. The thymus serves as the central organ for maturing T lymphocytes; as a result, many mediastinal lymphomas are a malignancy of T lymphocytes.

The symptoms of mediastinal lymphoma tend to be fairly apparent, involving enlargement of the cranial mediastinal lymph nodes, thymus, or both. It can also cause swelling and abnormal growth of the head, neck, and front legs.

Dogs manifesting with this disease may have respiratory problems, such as difficulty breathing or coughing and swelling of the front legs or face. Increased thirst resulting in increased urination can also occur; if it does, hypercalcemia (life-threatening metabolic disorder) should be tested for as it seen in 40% of dogs with mediastinal lymphoma.

■ **Extranodal Lymphoma.** This is the rarest form of canine lymphoma. "Extranodal" refers to how it manifests in a location in the body other than in the lymph nodes. Organs typically affected by this type include eyes, kidneys, lungs, skin (cutaneous lymphoma), and central nervous system; other areas that can be invaded include the mammary tissue, liver, bones, and mouth.

Symptoms of extranodal lymphoma will vary greatly depending on which organ is impacted; for example, blindness can occur if the disease is in the eyes; renal failure if in the kidneys, seizures if in the central nervous system, bone fractures if in the bones, and respiratory issues if in the lungs.

The most common form of extranodal lymphoma is cutaneous (skin) lymphoma, which is categorized as either epitheliotropic (malignancy of T lymphocytes) or nonepitheliotropic (malignancy of B lymphocytes.) In the

early stages, it usually presents as a skin rash with dry, red, itchy bumps or solitary or generalized scaly lesions and is fairly noticeable as the condition causes discomfort.

Because of this presentation, it is sometimes initially mistaken for allergies or fungal infections. As it becomes more severe, the skin will become redder, thickened, ulcerated, and might ooze fluids; large masses or tumors can develop. Cutaneous lymphoma can also affect the oral cavity causing ulcers, lesions, and nodules on the gums, lips, and roof of the mouth (sometimes mistaken at first as periodontal disease or gingivitis).

SUBTYPES

Within each of the four types described above, the disease can be categorized further into subtypes. There are more than 30 different histologic subtypes of canine lymphoma identified; some researchers theorize that there may be hundreds of subtypes, based on molecular analysis of markers, classifications, and subtypes of lymphocytes.

At the moment, further knowledge about the various subtypes would probably not result in significant changes in treatment protocols. In the future, targeted therapies for subtypes could lead to more effective treatments and improved prognosis.

The two primary and especially relevant subtypes are B-cell lymphoma and T-cell lymphoma. Approximately 60 to 80% of lymphoma cases are of the B-cell lymphoma subtype, which is a positive predictor; dogs with B-cell lymphoma tend to respond positively to treatment with a higher rate of complete remission, longer remission times, and increased survival times. T-cell lymphoma constitutes about 10 to 40% of lymphoma cases and has a negative predictive value based on not responding as well to treatment and for being at a higher risk for hypercalcemia.

DIAGNOSING CANINE LYMPHOMA

Early detection and treatment are essential to ensuring the best pos-

sible outcome for lymphoma cases. Because dogs generally feel well and there are often only swollen lymph nodes (with no pain exhibited) as a symptom, catching the disease early can sometimes be quite difficult. As a result, the cancer can be quite advanced by the time a diagnosis is made. (Lymphoma is not the only the disease that creates swollen lymph nodes; this symptom does not guarantee your dog has lymphoma.)

Because multicentric lymphoma accounts for the majority of cases, an aspirate of an enlarged peripheral lymph node is usually sufficient to reach a presumptive diagnosis of the most common types of lymphomas.

Although diagnosis from cytology is fairly easily obtained, it does not differentiate the immunophenotype (B versus T lymphocyte). Histopathologic tissue evaluation (biopsy) is required in order to identify the type with the process of immunophenotyping.

Immunophenotyping is a molecular test usually performed by flow cytometry (a sophisticated laser technology that measures the amount of DNA in cancer cells) that classifies lymphomas by determining if the malignancy originates from B lymphocytes or T lymphocytes. Determining whether a lymphoma is B-cell or T-cell is invaluable as it provides the best predictive value; the adage “B is better, T is terrible” reflects this in its simplest form.

Diffuse large B-cell lymphoma (DLBCL) is the most common histologic subtype of lymphoma occurring in dogs. Most intermediate to high grade lymphomas are B-cell lymphomas – they tend to respond better and longer to chemotherapy than T-cell lymphomas; however, dogs with T-cell lymphoma have been known to go into remission for several months.

Another phenotyping test, the PCR antigen receptor rearrangement (PARR), can determine whether the cells are indicative of cancer or more consistent with a reactive process. For example, because the lymph nodes in the area of the jaw are reactive, the PARR test can help determine if

cancer is present or if the dog just badly needs his teeth cleaned. The PARR test can also be used to detect minimal residual disease. Research is continuing to determine if this will be a useful clinical marker of early recurrence.

To ascertain the patient’s overall health, a complete physical exam will be performed; additional diagnostics often include a blood chemistry panel, urinalysis, x-rays, ultrasounds, and other forms of diagnostic imaging (these tests are also used for staging the disease).

In particular, it is important to screen for hypercalcemia. Hypercalcemia is a condition in which the hormone PTHrP (parathyroid hormone-related peptide) creates dangerous elevations in the blood calcium level. This well-documented syndrome is associated with lymphoma in dogs and is most often seen in T-cell lymphomas.

About 15% of dogs with lymphoma overall will have elevated blood calcium levels at diagnosis; this increases to 40% in dogs who have T-cell lymphoma. The condition causes additional clinical signs including increased thirst and urination, and, if left untreated, can cause serious damage to the kidneys and other organs and be life-threatening.

Unfortunately, due to the rapidly progressive nature of lymphoma, decisions regarding treatment need to be made as soon as possible after diagnosis. Unlike most other forms of cancer, lymphoma requires urgent care; without treatment, the median survival time is one month after diagnosis. Therefore, owners should be prepared to start treatment on the day of diagnosis, or within a day or two at most.

STAGING

Once a diagnosis of lymphoma has been made, the stage (extent) of the lymphoid malignancy should be determined, and to assess this, several tests are recommended: lymph node aspirate, complete blood count, chemistry panel, urinalysis, phenotype, thoracic and chest radiographs,

abdominal ultrasound, and a bone marrow aspirate.

Staging is prognostically significant; in general, the more extensive the spread, the higher the stage, the poorer the prognosis. However, even dogs with advanced disease can be successfully treated and experience remission. These tests also provide information about other conditions that may affect treatment or prognosis. The World Health Organization (WHO) five-tier staging system is the standard used to stage lymphoma in dogs:

- Stage I: Single lymph node is involved.
- Stage II: Multiple lymph nodes within in the same region are affected.
- Stage III: Multiple lymph nodes in multiple regions involved.
- Stage IV: Involvement of liver and/or spleen (in most cases lymph nodes are affected but it is possible that *no* lymph nodes are involved).
- Stage V: Bone marrow or blood involvement, regardless of other areas affected and/or other organs other than liver, spleen and lymph nodes affected.

In addition, there are two categories of clinical substages. Dogs are categorized with substage A if clinical signs related to the disease are absent, and categorized as substage B if clinical signs related to the disease are present (systemic signs of illness).

TREATMENT

Although canine lymphoma is a complex and challenging cancer, it is one of the most highly treatable cancers and most dogs respond to treatment. In fact, many dogs with lymphoma outlive animals with other diseases such as kidney, heart, and liver disease. While lymphoma is not curable, the goal with treatment is to quickly achieve remission for the longest period possible thus giving

dogs and their owners more quality time together. It is essential that the type of lymphoma is identified as the type impacts treatment and prognosis. And because lymphoma is a very aggressive cancer, it is important to begin treatment as soon as possible.

Since lymphoma is a systemic disease that affects the whole body, the most effective treatment is also sys-

temic in the form of chemotherapy, which provides many dogs with prolonged survival times and excellent quality of life, with little or no side effects.

The specific type of chemotherapy treatment used will vary based on the type of lymphoma. Other factors to consider when choosing a protocol are the disease-free interval, survival

time, typical duration of remission, scheduling, and expense. Again, dogs with B-cell lymphoma tend to respond much more favorably to treatment than those with T-cell.

Because lymphoma is so common in dogs, there has been a substantial amount of research and testing of many different combinations of chemotherapy treatments. Multiagent chemotherapy protocols are considered the gold standard of treatment and have shown to provide the best response in terms of length of disease control and survival rates, as compared to single agent protocols.

The Madison Wisconsin Protocol, also known as UW-25 or CHOP, is a cocktail of drugs modeled after human lymphoma treatments and is widely considered to be the most effective treatment for intermediate- to high-grade canine lymphomas. This protocol utilizes three cytotoxic chemotherapy drugs – cyclophosphamide, doxorubicin (hydroxydaunrubicin), and vincristine (brand name Oncovin) – in combination with prednisone (CHOP). The prednisone is typically given daily at home as a tablet with the remainder of the protocol agents administered by an oncology specialist.

On average, 70 to 90% of dogs treated with CHOP experience partial or complete remission. For dogs with B-cell lymphomas, 80 to 90% can be expected to achieve remission within the first month. The median survival time is 12 months with 25% of patients still alive at two years. For T-cell lymphoma, about 70% will achieve remission with an average of six to eight months survival.

Other treatment options include the COP chemotherapy protocol (cyclophosphamide, doxorubicin, vincristine and prednisone), vincristine and Cytoxan; single-agent doxorubicin; and and lomustine/CCNU. As a primary treatment, single-agent doxorubicin can result in a complete remission in up to 75% of

Quality of Life for Your Dog and You

In August 2011 my friend Tory felt a couple of small lumps on the throat of her 13-year-old mixed-breed dog, Scout. Within a couple of days of discovery, Scout was diagnosed with lymphoma.

While Scout was still relatively healthy, Tory's veterinarian guided her to define what Scout's quality of life should be so that there were clear guidelines in place as the disease progressed, preempting any "bargaining" that could occur if he declined past those non-negotiable limits. Scout was started on prednisone and underwent the CHOP protocol (with a few breaks between treatments for gastric upset); the lymphoma was successfully put into remission.

At the end of the year, five months after diagnosis, the lumps had reappeared and Scout was panting, lethargic, and generally uncomfortable. Those guidelines Tory had put in place earlier allowed her to be clear in her decision not to pursue any further treatment. Scout enjoyed two weeks of bucket-list adventures, including his favorite meal of a Thanksgiving dinner, before he was assisted with his passing.

Not long after, my friend shared the following observation with me:

"After Scout's diagnosis, I became way more lenient with his loud mouth. In fact, I began embracing his 'stand in the middle of the dog park and bark' antics. I would just watch him and laugh rather than ignore him or try to stop him. When I realized he was at the end of the line, he was allowed to eat at the kitchen table with us. He demanded food and got it served to him on a fork – while we were eating. Although he often ate whatever I was eating

anyway, he had always waited until I was finished and then he'd be given some leftovers.

"The most interesting behavior change, though, took place within me. Before Scout's illness, I wouldn't let him do those types of things, those things that used to annoy me. After diagnosis, I viewed those behaviors from a different perspective; I found them hilarious and I embraced them."



After his diagnosis of lymphoma, Scout was given greater latitude to do the things he enjoyed, consequences be darned.



patients with median survival time of up to eight months, though cumulative treatment with doxorubicin may result in cardiotoxicity, so the protocol may be contraindicated in any dog with evidence of or a history of pre-existing heart disease. Lomustine/CCNU is reported to be the most effective treatment for cutaneous lymphoma.

REMISSION

Remission is the condition in which the cancer has regressed. Partial remission means that the overall evidence of cancer has been reduced by at least 50%; complete remission indicates that the cancer has become undetectable to any readily available diagnostic screening (but it does not mean that the lymphoma has left the dog's body, only that it has been treated into dormancy).

A dog in remission is essentially indistinguishable from a cancer-free dog. The lymph nodes will return to normal size and any illness related to the cancer usually resolves. Overall, there is approximately a 60 to 75% chance of achieving remission regardless of the protocol selected.

Studies show that the average time for a dog to be in remission the first time is eight to 10 months, including the period of chemotherapy administration. Remission status is continually monitored; for dogs with enlarged lymph nodes it typically involves checking the size of the lymph nodes. For dogs with other types of lymphoma, periodic imaging may be recommended. The Lymphoma Blood Test (LBT) from Avacta Animal Health can also be used to monitor status since LBT levels can increase less than eight weeks before relapse.

Unfortunately, remission eventually relapses in most cases, but many dogs can restart chemotherapy with the hope of regaining remission status. At times, the same chemotherapy protocol may be used. For dogs successfully treated initially with the CHOP protocol, restarting CHOP at the time of the first relapse is typically recommended. About 90% of those treated with a second CHOP protocol

A Note About Prednisone

Prednisone, a commonly used corticosteroid, is often used for its anti-inflammatory effects and anti-cancer-properties (it can kill malignant lymphoma cells). When prednisone is administered to a dog with lymphoma, cancer treatment has essentially begun. However, the administration of prednisone can complicate diagnosis, staging, and treatment of lymphoma. Therefore, it is strongly advised that prednisone not be administered until after diagnostics have been completed, results received, and a course of action decided upon.

Specifically, prednisone can interfere with obtaining an accurate diagnosis from aspirate cytology, thus causing a delay in treatment. It can also affect the test for the lymphoma phenotype (subtypes B and T). Staging the cancer involves identifying how far the cancer has spread, provides information for treatment, provides a baseline for monitoring response, and allows for a more accurate prognosis. If prednisone has been started prior to staging, the data obtained may be influenced and inaccurate.

Also, it has been found that dogs with lymphoma who have been pretreated with prednisone prior to chemotherapy don't respond as well. In particular, it can trigger Multidrug Resistance (MDR), a mechanism that enables cancer cells to resist the chemotherapy drugs being administered to the dog (this can also occur during chemo treatment without prednisone as well); accordingly, dogs with MDR have a worse prognosis. Furthermore, it can cause resistance to other agents of chemotherapy so that it will be especially difficult to get a second remission after the first remission is lost.



Bottom line: Wait to start prednisone.

will achieve another complete remission, however, the duration is usually shorter than the first time.

If a patient does not respond to the first CHOP protocol before completion or the treatment fails during the second protocol, the use of rescue protocols can be attempted; these consist of drugs that are not found in the standard chemotherapy protocols and kept in reserve for later use.

Commonly used rescue protocols include LAP (L-asparaginase, lomustine/CCNU, and prednisone) and MOPP (mechlorethamine, vincristine, procarbazine and prednisone). These are less likely to result in complete remission and some dogs will only achieve a partial remission, with an overall response rate of about 40 to 50%, and a median survival rate of 1.5 to 2.5 months.

Because cancer cells evolve over time, the disease can become resistant to certain drugs. Further treatments can be given, but it can become more difficult to achieve remission a second or third time and there does not appear to be any substantial effect on survival times.

OTHER TREATMENT OPTIONS

Here are some compelling alternatives to consider in addition to the standard protocols described above:

■ **Prednisone.** This is usually a component of most lymphoma treatment protocols because it actually destroys lymphoma cells. It can even be administered as a standalone treatment. The average survival time without chemotherapy

is about one month but treating with prednisone alone can increase this to about two to three months, with an average of 50% responding.

■ **Tanovea-CA1 (rabacfosadine).** This is a promising new advancement in treating canine lymphoma. This drug has been conditionally approved for use by the U.S. Food and Drug Administration (FDA), pending a full demonstration of its effectiveness (additional field studies are currently taking place to obtain full approval).

Tanovea-CA1 is designed to target and destroy malignant lymphocytes and can be used not only to treat dogs that have never received any treatment but also those no longer responding to chemotherapy. It has demonstrated a 77% overall response and a 45% complete response rate. It is administered by veterinarians in five treatments every three weeks via intravenous infusion and is shown to be generally well-tolerated.

■ **Bone Marrow Transplant.** One of the newest approaches to treating canine lymphoma is the bone marrow transplant – a form of stem cell therapy – modeled after a method used in human medicine. The process involves the dog receiving and completing CHOP therapy (which puts the cancer in remission); the harvesting and preservation of healthy stem cells from the patient; the administration of radiation to destroy any remaining cancer cells; and the returning of healthy cells to repopulate and restore blood cells.

In humans, the cure rate is about 40 to 60%; the procedure has been determined to be safe for use in dogs with cure rates of 33% for B-cell lymphomas and 15% for T-cell lymphomas. The process is expensive (\$19,000 to \$25,000) and requires about two weeks of hospitalization. Currently there are only two locations in the U.S. offering the procedure: the North Carolina State College of Veterinary Medicine (in Raleigh) and Bellingham (Washington) Veterinary Critical Care.

At some point lymphomas

become resistant to treatment and no further remissions can be obtained. Eventually the uncontrolled cancer will infiltrate an organ (often the bone marrow or the liver) to such an extent that the organ fails. Under those circumstances, it is best to focus on high quality of life for the longest possible survival time.

PROGNOSIS

Like most cancers, the eventual prognosis for dogs with lymphoma isn't very uplifting. But it is a very treatable cancer, and dogs live well and longer with treatment. Several prognostic factors have been identified for estimating a dog's response to treatment and survival time:

- Dogs with signs of systemic illness (substage B) tend to have a worse prognosis than dogs with substage A.
- Dogs with lymphoma histologically classified as being either intermediate- or high-grade tend to be highly responsive to chemotherapy, but early relapse is common with shorter survival times.
- Dogs with lymphoma histologically classified as being low-grade have a lower response rate to systemic chemotherapy yet experience a positive survival length advantage when compared to intermediate- or high-grade tumors.
- Dogs with T-cell lymphomas have a shorter survival time when compared with dogs with B-cell based malignancies.
- Dogs with diffuse alimentary, central nervous system, or cutaneous lymphoma tend to have shorter survival times when compared to dogs with other anatomic forms of lymphoma.
- Presence of hypercalcemia or anemia or a mediastinal mass are all associated with a poorer prognosis.
- Intestinal lymphoma has a very poor prognosis.
- Expectations for cases with Stage V lymphoma are much lower than those assigned to Stages I to IV.
- Prolonged pre-treatment with corticosteroids is often a negative prognostic factor.
- Ultimately, the estimates for survival times depend on the type of lymphoma combined with the stage and the treatment option selected (if any).
- In the absence of treatment, most of the dogs diagnosed with lymphoma succumb to the disease in four to six weeks.
- The median survival time with a multi-agent chemotherapy protocol is 13 to 14 months.
- Traditional chemotherapy results in total remission in approximately 60 to 90% of cases with a median survival time of six to 12 months.
- In about 20 to 25% cases, dogs live two years or longer after initiation of standard chemotherapy treatment.
- Dogs treated with rescue protocols have a survival rate of 1.5 to 2.5 months.
- Studies indicate that dogs who underwent splenectomy show a median survival rate of 14 months.
- Complete cure is rare, but not unheard of. Bone marrow transplants show promise and potential for increased cure rates.

Above all, remember that prognoses are only guidelines based on average accumulative experiences. They are numbers, and as a dear friend and veterinary oncologist has said to me many times, "Treat the dog, not the numbers." 🐾

Having lost two dogs to cancer, long-time WDJ contributor Barbara Dobbins follows cancer research news closely.

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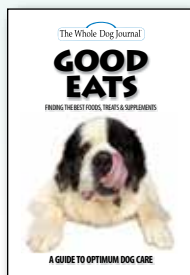
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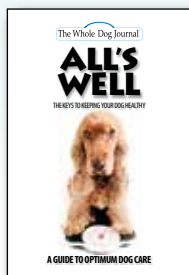
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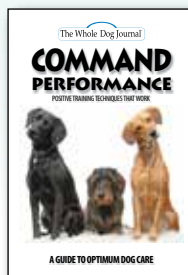
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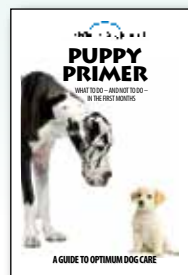
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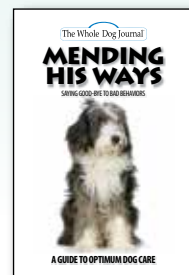
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