

Patent Ductus Arteriosus

ABOUT THE DIAGNOSIS

CAUSE: Patent ductus arteriosus (also called PDA) is a birth defect in the heart. It is caused by an incomplete transition in the heart's circulation when a dog or cat is born.

Before birth, in the mother's womb (uterus), a fetus's lungs are nonfunctional; they are collapsed and full of amniotic fluid. The lungs do not need to function in the womb because the fetus receives blood that is already oxygenated by the mother. The *ductus arteriosus* is an important blood vessel that ensures that blood does not go to the lungs unnecessarily as the fetus is developing in the uterus. During the first few hours after birth, this blood vessel naturally closes off; this allows blood to travel normally through the lungs for oxygenation as the lungs begin to function when the puppy or kitten takes its first breath. In some puppies and kittens, the ductus arteriosus remains open (patent). This results in serious, life-threatening changes in the way that the heart pumps blood through the heart and to the rest of the body. In most instances, no symptoms are apparent at first, and the puppy or kitten is still just as playful and active as normal for the first few months or sometimes the first year or two of life. However, the excess workload imposed on the heart by the patent ductus arteriosus leads to irreversible damage to the heart, and eventually, symptoms occur. Symptoms include coughing and shortness of breath, and they indicate fluid accumulation in the lungs (pulmonary edema), a serious complication that can quickly become life-threatening. Symptoms occur most commonly sometime during the first 2 years of life.

This disorder occurs more commonly in puppies than kittens. The cause is genetic and is generally passed within lines (families) and certain breeds. Many dog breeds have more cases of PDA than the average dog population, including the Maltese, Pomeranian, English springer spaniel, bichon frisé, toy and miniature poodles, and others. Female dogs are affected three times more commonly than males.

DIAGNOSIS: Fortunately, virtually all cases of patent ductus arteriosus produce a heart murmur that allows them to be detected by your veterinarian. Almost all cases of patent ductus arteriosus are found when a perfectly healthy-looking puppy or kitten is brought to the veterinarian for a routine examination, and that examination reveals a heart murmur. A heart murmur is the sound produced by blood moving through the heart in a turbulent fashion, as it does in patent ductus arteriosus and many other heart conditions of varying degrees of severity. A heart murmur is heard by the veterinarian using a stethoscope.

If a heart murmur is detected, your veterinarian may recommend simply reexamining the puppy or kitten after 2 to 3 weeks because some heart murmurs are harmless occurrences during normal growth. However, if there is a concern that the murmur may indicate a patent ductus arteriosus (these PDA murmurs produce a very distinctive sound), then tests are warranted immediately to evaluate the possibility of patent ductus arteriosus. Usually, x-rays are taken of the chest to evaluate the size and shape of the heart and the state of the lungs, all of which may be altered in patent ductus arteriosus (even as the puppy or kitten seems perfectly normal). Echocardiography, commonly called cardiac ultrasound, is always recommended in order to identify the extent of damage, if any, caused by patent ductus arteriosus, and to identify any other additional birth defects affecting the heart. The

diagnosis of patent ductus arteriosus comes from a combination of all of these sources of information.

LIVING WITH THE DIAGNOSIS

Having a patent ductus arteriosus is not usually compatible with a normal life span unless the patent ductus arteriosus is corrected with surgery. Ideally, pets with patent ductus arteriosus are identified before any symptoms occur and when pets are at a young age (<6 months old), at which time the surgery can be undertaken and the problem resolved. These patients have a good prognosis; the expected life span and quality of life are normal in the vast majority of dogs and cats in which it is corrected early on. If patent ductus arteriosus is not detected until later in life, even surgical correction may not be enough to restore the heart to normal. Nevertheless, surgery is always recommended, since correction helps reduce further damage to the heart. The sooner in life a patent ductus arteriosus is confirmed and repaired, the lesser the likelihood of long-term complications and the better the chance of a normal life expectancy.

The treatment of choice is surgery (see below). If surgery is not chosen, talk to your veterinarian about medications that you can give to make your pet as comfortable as possible, and give them exactly as directed. Without surgery, the long-term outlook for these puppies and kittens is generally poor; with rare exceptions, most die within the first 2-3 years of life.

TREATMENT

The goal of treatment is to close the ductus arteriosus, which corrects the defect and normalizes the circulation through the body. This can be accomplished through thoracotomy (an open-chest surgery) or through cardiac catheter-based (minimally invasive) surgery. Thoracotomy is more invasive because the chest is opened, but unlike humans, most dogs lose all outward signs of pain within 2-3 days after chest surgery. Ductal occlusion is a minimally invasive approach where the surgery takes place through catheterization of a blood vessel in the leg (similar to angioplasty or stent placement in a person). It requires specialized equipment, may not be appropriate for cats and smaller dogs, and in some cases, the procedure is unsuccessful, and the patient still requires a thoracotomy afterward. However, in a majority of dogs, minimally invasive surgery can be done successfully and is vastly less painful: instead of an open-chest procedure, the dog simply has a superficial skin incision on the thigh (or the neck). For this reason, the minimally invasive approach is now the treatment of choice for patent ductus arteriosus in dogs. It is important that one of these two procedures is performed as soon as possible after patent ductus arteriosus is found. In some cases, waiting too long allows other very serious complications to develop and creates the need for even more extensive treatment, or the problem can become inoperable. Your veterinarian can recommend a veterinary cardiologist (directories: www.acvim.org [North America] or www.ecvim-ca.org [Europe]) or surgical specialist (directory: www.acvs.org) to perform either of these procedures. Exercise restriction is essential before surgery to minimize stress on the heart.

DOs

- Realize that this condition is present since birth, and time simply adds unnecessarily to the workload of the heart. There is no benefit to a "wait-and-see" approach once patent ductus

arteriosus is known to be present, and surgery to repair it should be performed without delay.

- Understand the benefit of a second opinion if there is any uncertainty about your pet's heart murmur. Skilled examinations can identify a patent ductus arteriosus murmur in most cases. Specialists trained in veterinary cardiology are called Diplomates of the American College of Veterinary Internal Medicine (Specialty of Cardiology) and can be located by referral in most large United States and European cities. Ask your veterinarian to recommend a specialist if you wish a second opinion.
- Give medication exactly as directed by your veterinarian, and if you are concerned about possible negative effects, discuss them with your veterinarian immediately rather than simply discontinuing the treatment.
- Make sure bandages, chest wraps, and stitched incisions (sutures) stay clean and dry after surgery. If they become wet, are chewed at or damaged by the pet, or otherwise seem abnormal, contact your veterinarian for a recheck to reduce the risk of infection or other problems.

DON'Ts

- Do not underestimate the seriousness of a heart murmur in a puppy or kitten. A heart murmur is the main abnormality detected by veterinarians when examining dogs or cats with patent ductus arteriosus. Once overt symptoms such as shortness of breath have occurred, some degree of damage to the heart has occurred.
- Conversely, do not overreact to all heart murmurs in growing pups and kittens. Your veterinarian will often be able to tell whether a heart murmur might indicate patent ductus arteriosus (and warrant tests such as x-rays or an ultrasound scan of the heart for confirmation) or whether it may be an "innocent" murmur, which is the term given to heart murmurs that are harmless and which healthy kittens and puppies outgrow by the age of 16 weeks.
- Do not breed a dog or cat that has been diagnosed with patent ductus arteriosus.
- Do not postpone visiting your veterinarian if you observe any symptoms of patent ductus arteriosus. Prompt diagnosis and treatment can save your dog or cat's life.

- Do not give medication that you have at home that has been prescribed for human use; some of these may interfere with treatment and cause even more severe problems.

WHEN TO CALL YOUR VETERINARIAN

- If weakness, loss of appetite, labored breathing, discharge from the surgical incision site, or any other symptom that arouses your suspicion occurs after your pet undergoes surgical correction of patent ductus arteriosus.
- If you cannot keep a scheduled appointment.
- If you are unable to give medication as directed.

SIGNS TO WATCH FOR

- Watch for signs of advanced, severe patent ductus arteriosus, which include shortness of breath, coughing, weakness, and exercise intolerance.

ROUTINE FOLLOW-UP

- After repair (surgery or catheterization) of the patent ductus arteriosus, an appointment may be scheduled to remove sutures and monitor progress. Long-term follow-up appointments may occasionally be needed if there is any possibility of long-standing effects (permanent damage) to the heart.

