How to detect and distinct *Demodex* mites in dogs

Demodicosis is a common skin mite infection in dogs and is now a more recognized problem in cats (*Demodex cati* and *Demodex gatoi*).

Dogs have three recognized species of *Demodex* mites. The most common is *Demodex canis*, the mite that inhabits the hair follicle and sometimes the sebaceous gland.

*Demodex injai*, the long-bodied mite that is larger in all life stages than *D. canis* resides within the sebaceous glands.

Short-bodied *Demodex* species mite *D. cornei* resides in the most superficial layer of the epidermis.

**FIVE USEFUL METHODS**

**Skin scrapings.** Skin scrapings can be performed with a blunt end of a metal spatula. The skin can be squeezed before or during the scrapings to promote extrusion of mites from the hair follicles. The skin and the scraping instrument should be wetted with mineral oil to better collect the sample.

**Hair plucks.** Hair plucks can be performed with mosquito hemostat forceps. It is useful to squeeze the skin in order to extrude the mites from follicles.

**Exudative samples.** In cases of canine demodicosis with concurrent deep pyoderma, direct examination of the exudate is also useful.

**Acetate tape preparations.** Acetate tape can be used to detect the superficial canine mite *D. cornei*. Once pressed to the skin and fur, the acetate tape is laid on the glass slide for microscopic examination.

**Otic swabs.** Demodectic otitis externa is best detected by collecting samples from the ears with cotton swabs.

---

**Upgrade to a new definition with NexGard™**

- The soft chewable dog treat that really treats!
- Contains afoxolaner, a new molecule from isoxazoline family, dedicated to veterinary medicine.
- Kills fleas fast for at least five weeks.
- Kills the main species of ticks infesting dogs for up to one month.
- Excellent safety profile.
- Highly palatable formulation to favour compliance.

**The tasty bite of innovation that kills fleas and ticks**
**Demodex mites in cats**

**How to recognize them?**

*D. gatoi* is a shorter mite, about half the length of *D. cati* and more rounded at the tail end. *D. cati* is longer with pointed tail end.

**Site of infection**

*D. gatoi* lives in the stratum corneum while *D. cati* lives in the hair follicles.

**Clinical signs**

Infection with *D. gatoi* is often pruritic, resulting in alopecia from excessive grooming of limbs, flanks and ventrum areas. Cats may present also with other signs like hyperpigmentation, scaling, excoriations or crusting. Dermal lesions associated with *D. cati* tend to be localized to the head, pinnae, neck and eyelids with crusting, alopecia and miliary dermatitis. *D. cati* can be also found in the ear canals. Cats with *D. cati*, often have an underlying metabolic illness or are immunocompromised. Some breed predisposition for generalized disease with *D. cati* has also been described in Siamese and Burmese cats.

**Usage of steroids**

A cat with *D. gatoi* infection may respond to steroids, which help control the pruritus. Current experience indicates that steroid usage does not exacerbate the disease, in contrast to *D. cati* infection.

**Superficial and deep skin scrapes**

*Demodex gatoi* may be best found on superficial skin scrapes, especially unaffected areas with broad coverage since cats often groom off the mites they can reach. It is also recommended to perform skin scrapes on all in-contact cats. In contrast, *D. cati* diagnosis would require deep skin scrapes in the affected areas. Since the mites are commonly removed during grooming by the cat, multiple scrapes, conducted at five or six different times, are recommended. It has also been reported that *D. gatoi* can be found on acetate tape preparations, which might be helpful in a multiple cat household situation.

**How to treat?**

Lime sulfur dips (1.6 percent to 2 percent) every five to seven days for four to six weeks on all in-contact cats for both *Demodex* species in cats are recommended as effective treatment. Other treatments are subcutaneous doramectin injections given weekly for up to three treatments, selamectin applied topically for multiple treatments and ivermectin given orally for varying time periods. However, for both safety and efficacy reasons, most veterinary dermatologists recommend lime sulfur dips as the best treatment option.

**IMPORTANT TO REMEMBER**

*D. gatoi* appears to be contagious, so suspicion should increase if there are multiple cats in a household with similar clinical signs. It has to be noted that cats can harbor *D. gatoi* without significant clinical signs. Both species of *Demodex* can be found in the feces of affected cats due to their intensive grooming.

As with any dermatologic case presentation, a minimum database including deep and superficial skin scrapes, cytology and acetate tape preparations are useful to diagnose demodicosis in cats.

**LIFE CYCLE OF THE DEMODEX MITE (Demodex cati)**

**Acarids (adults with 8 legs)**

- **Eggs**
- **Larvae**
- **Nymphs**
- **Adults**

All stages reside within the lumen of hair follicles and the ducts of sebaceous glands. Cats may act as asymptomatic carriers. The clinical infection develops when the cat is immunocompromised.

**Kittens become infected by direct skin contact while nursing.**

**Total lifecycle: ~3 weeks.**
Heartworm removal in a dog with naturally acquired caval syndrome.

An intriguing case on life threatening complication of heartworm disease in the dog is presented by Dr. sc. Luigi Venco, clinical parasitologist and co-owner of the Veterinary Hospital “City of Pavia” in Italy.

Venco L. DVM, SCPA, EVPC Dipl.1.
Laurenti R. DVM1
Fagioli P. DVM2
1 Veterinary Hospital “Città di Pavia” Italy
2 Veterinary Clinic “Cava Manara” Italy

“Pitt” A 3 year-old Cross breed male weighing 9 kg was referred to the emergency service of the Veterinary Hospital “City of Pavia” with dyspnea, hemoptysis and hematuria. The dog didn’t receive any prevention against. Physical examination showed tachypnoea (60 breaths/min), tachycardia (176 beats/min), pale mucous membranes, and IV/6 right-sided systolic heart murmur. The rest of the physical examination was unremarkable. Further evaluation included complete blood cell count (CBC), serum biochemical and coagulation profiles as urinalysis. CBC revealed a moderate regenerative anaemia (RBC 3,3 x 10⁶/μl [reference range, 6-9 x 10⁶/μl]; Hb 9 g/dl [reference range, 15-19 g/dl]; reticulocytes 152810/μl [reference range, 10000-110000/μl]. Schistocytes, keratocytes, and Howell-Jolly bodies were also evident. Serum biochemistry showed increase of aspartate aminotransferase, gamma-glutamyl transpeptidase, and blood urea. Urine contained high concentration of blood and bilirubin. Thoracic radiographs (lateral and dorso - ventral view) identified a right side cardiomegaly associated with right pulmonary artery (PA) enlargement and a multifocal interstitial/alveolar pulmonary pattern. Sinus tachycardia was diagnosed by electrocardiography (EKG). Echocardiographically, right atrium (RA) and main PA were mildly dilated while right ventricular walls appeared hypertrophied. Moreover, an echogenic mass consisting of several linear echoes characterized by two parallel hyperechoic lines separated by a very thin hypoechoic area was evident within the chambers of the right heart (Fig. 1A). The mass was noticed to move through the tricuspid annulus. No HW could be visualized in pulmonary arteries. According to guidelines of the American Heartworm Society, the clinical, laboratory and imaging results were indicative for Caval Syndrome. In accordance with the owner, the heartworm removal was performed following the Ishihara technique. The left external jugular vein was exteriorized and a Fujion Flexible-alligator forceps were introduced into the vein. Under continuous fluoroscopic guidance, 50 heartworms were extracted from the right atrium. The procedure was considered successfully completed since no intra procedural complications were noticed and no residual heartworms were imaged within the pulmonary arteries or right cardiac chambers. After the surgery, the dog recovered uneventfully from anaesthesia. In the intensive care unit, oxygen-therapy was set up. Prednisolone (0.5 mg / kg SC q24h), heparin (150 IU / kg SC q12h), and cefazoline (20 mg / kg, IM q8h) were administered too. Progressive improvement of its clinical condition, was observed and the dog was discharged after 72 hours with prescription of cage rest.
Maybe you didn’t know that a cat is a perfect host of one of the few zoonotic trematodes in Europe, *Opistorchis felineus*. This cat liver alien is a fluke that is transmitted from freshwater snails to fish and then to fish eating mammals, including humans.

**Clinical manifestation**

The disease in humans is characterized by acute (fever, abdominal pain, headache, astenia, artralgia, nausea, diarrhoea, increased liver enzymes and eosinophilia) and chronic (recurrent cholangitis, hepatic abscesses, acute pancreatitis and bile peritonitis) symptoms.

**Trematode infective stages in the fish tissue**

Adult hermaphrodite worms (7-12 mm x 1,5- x2,5 mm) parasitize the liver bile ducts of cats but also other fish eating mammals. Infected animal shed eggs that are ingested by the snails of the genus *Bythimia*. In snails, eggs hatch and the miracidia develops in sporocysts, rediae and cercariae. The free-swimming cercariae leave the snail, and penetrate fish tissue (mainly near the fins) and encyst forming infective metacercariae. When infected fish are ingested by mammals, the metacercariae excyst in the duodenum, migrate through the Ampulla of Vater and the common bile duct into the hepatic bile ducts where they develop into adults.

**Fishermen’s role**

Humans probably play an important role in the epidemiology of this parasite; in particular fishermen throw tenches away on the shores of lakes because of their low economic values. Furthermore, many restaurants in lake areas improperly dispose of leftovers too.

**Cats also suffer from infection**

Clinical signs in cats are variable, and infection with a moderate number of parasites is usually asymptomatic, however with a high quantity of parasites it may lead to hepatic insufficiency. In massive infections the young forms play a predominant role due to their cuticular spines, which are abrasive to the bile ducts, causing thickening with papilloma formations and cysts containing parasites. In these situations the clinical findings are: emaciation, diarrhoea, vomiting, fever, jaundice, hepato-megaly, weight loss, abdominal pain, anorexia, ascites and death. Diagnosis of infection is based on the identification of the operculated eggs in the feces.

To treat a cat, a daily dose of praziquantel for three consecutive days is suggested.
IN LAB

Routine fecal examinations are important

Normal behaviors such as eating directly off the ground, drinking out of puddles, grooming and playing, biting items on the ground, predispose pet dogs and cats to parasitic infections. Pets also acquire infections from infected prey or fleas that serve as intermediate hosts. Besides health implications for the pet itself, some of the parasite stages shed in dog and cat feces are zoonotic too.

HOW TO PERFORM A STANDARD CENTRIFUGATION FECAL EXAMINATION

1. Weigh out 2-5 gram of feces
2. Mix feces with approximately 10 ml flotation solution
3. Pour mixture through a tea strainer into a beaker and then into a 15 ml centrifuge tube
4. Fill tube with flotation solution until a slight positive meniscus forms.
5. Place a coverslip on the tube and put in the centrifuge
6. Centrifuge at 1200 rpm for 5 minutes
7. Remove the tube and let it stand for 10 minutes
8. Remove the coverslip and place on a glass slide. Examine the complete slide under 10 x magnification.

FLOTATION SOLUTIONS FOR HELMINTH OVA

<table>
<thead>
<tr>
<th>FLATATION SOLUTION</th>
<th>SPECIFIC GRAVITY</th>
<th>AMOUNT OF INGREDIENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magnesium Sulphate</td>
<td>1.20</td>
<td>450 g MgSO4, 1000 ml tap water</td>
</tr>
<tr>
<td>Zinc Sulphate</td>
<td>1.18-1.20</td>
<td>331 g ZnSO4, 1000 ml warm tap water</td>
</tr>
<tr>
<td>Sodium Nitrate</td>
<td>1.18-1.20</td>
<td>338 g NaNO3, 1000 ml tap water</td>
</tr>
<tr>
<td>Saturated Salt</td>
<td>1.18-1.20</td>
<td>350 g NaCl, 1000 ml tap water</td>
</tr>
<tr>
<td>Modified Sheather</td>
<td>1.27</td>
<td>454 g granulated sugar, 355 ml tap water, 6 ml formaldehyde</td>
</tr>
</tbody>
</table>

HOW TO RECOGNIZE TRICHUROID EGGS

So you decide to implement fecal examinations in your lab. Your first sample is a dog fecal specimen. Let us remind you on all kinds of worms eggs you will be able to find. Beside the easily recognizable ascarid eggs (Toxocara catti, Toxascaris leonina) type you will be able to find trichuroid eggs sometimes. In this case you have to be careful because two quite distinct parasites (Capillaria and Trichuris) have very similar eggs. So let us define the difference between them. The eggs of Capillaria (Capillaria aerophila syn. Eucoleus aerophilus) are rougher in texture compared to the smooth yellowish eggs of Trichuris. Capillaria ova often have straighter side. Bipolar plugs of Trichuris resemble screws of a light bulb. In dogs, certainly, most common are trichuroid eggs from a large intestine worm (Trichuris vulpis). Beside feces, Capillaria aerophila, eggs can be found in the sputum. Eucoleus boehmi (syn. Capillaria boehmi) eggs contain a partially developed embryo when passed.

WHAT ABOUT TRICHUROID EGGS IN CATS

Pearsonema (syn. Capillaria) plica and Pearsonema (syn. Capillaria) feliscati eggs have characteristic flattened bipolar plugs and can be present in feces contaminated with urine. Although feline whipworms (Trichuris campanula, Trichuris serrata) occur in tropical areas, they appear to be rare in domestic cats in North America and Europe. Putative whipworm eggs in feline fecal samples are more likely to be a capillarid other than Trichuris sp.

Pearsonema plica (Syn. Capillaria plica) inhabits the urinary bladder of the cat but also other wild carnivores e.g. foxes. The eggs are passed out with the urine from the definitive host and are ingested by earthworms. Once the earthworm is eaten by the definitive host, the first stage larvae moult to the second stage within the wall of the small intestine. Third stage larvae are found in the urinary bladder on or about the 30th day of infection and it is assumed that they migrate through the blood vessels to the urinary bladder.

Pearsonema feliscati Pearsonema feliscati inhabit the urinary bladder of the cat and it is supposed that the life cycle is similar to that of Pearsonema plica.
A potent tick neurotoxin can cause death

Tick paralysis (toxicity) is an acute, progressive, symmetrical, ascending motor paralysis caused by salivary neurotoxin(s) produced by certain species of ticks. People (usually children) and a wide variety of other mammals, birds, and reptiles may be affected. Human cases of tick paralysis caused by the genera *Ixodes*, *Dermacentor*, and *Amblyomma* have been reported from Australia, North America, Europe, and South Africa; these three plus *Rhipicephalus*, *Haemaphysalis*, *Otobius*, and *Argas* have been associated with paralysis to varying degrees in animals.

The toxin is presumed to travel from the attachment site via the lymph to the systemic circulation and thus to all areas of the body, where it has a direct effect on cellular potassium channels and thus on intracellular calcium levels. However, primary hypoventilation is the main cause of death in most severe cases, in which alveolar disease may also be present. A four-stage classification system based on systemic limb activity may enable clinical prognosis in dogs.

**STAGE 1** Dog is weakened and its voice is changed.

**STAGE 2** Dog is no table to walk but still stand.

**STAGE 3** The dog cannot stand but can right (poor prognosis).

**STAGE 4** The dog cannot right (poor prognosis).

Cats with moderate to severe toxicity can be anxious. It is important not to interfere with these animals until they have settled in their cage.

Treatment must address primary tick toxemia and paralysis, secondary issues (eg, esophageal reflux, aspiration pneumonia), and potential tertiary factors (eg, chronic weakness, esophageal stricture). In endangered Australia, a commercial antivenom is also available.

*Rhipicephalus sanguineus:*

A perfect vector

The brown dog tick, *Rhipicephalus sanguineus*, is an endophytic (adapted to indoor living) species of tick which is found worldwide, but more commonly in warmer climates.

This tick is one of the most important vectors of diseases in dogs worldwide since it is a vector of canine erlichiosis (*Ehrlichia canis*), canine babesiosis (*Babesia canis vogelli*) and *Coxiella burnetti*. In parts of Europe, Asia and Africa, it is a vector of *Rickettsia conori*, known locally as Mediterranean spotted fever, boutonneuse fever, or tick typhus and *Rickettsia rickettsia*.

**About the life stages of the tick**

Brown dog ticks have a world-wide distribution. The tick is encountered predominantly in and around human settlements and infest homes, animal pens, and dog kennels. Under optimal conditions, brown dog ticks complete their life cycle in as few as three months.

**Adults**

Adult males and females can be found at all times of the year and can survive for 18 months without feeding. They prefer to feed on dogs but will feed on other mammals, and occasionally humans. Males only feed for short periods of time before mating but females feed for about a week before becoming engorged. After digesting the blood meal, female brown dog ticks can lay up to 4,000 eggs. Larvae hatch from eggs in 2 to 5 weeks.

**Nymphs**

Nymphs also can be found at all times of the year and survive for 6 to 9 months without a blood meal. Nymphs also prefer to feed on dogs but will feed on other mammals, and occasionally humans. Nymphs blood feed for about a week before becoming engorged. After digesting the blood meal, nymphs can lay up to 4,000 eggs. Larvae hatch from eggs in 2 to 5 weeks.

**Larvae**

The six-legged larvae can be active at all times of the year, and can survive for 6 to 9 months without feeding. Like the adult and nymphal stages, larvae prefer to feed on dogs but will feed on other mammals and occasionally humans. Larvae blood feed for three to seven days before detaching from the host and take about two weeks to develop into nymphs. Engorged larvae typically hide in and around furniture, windows, edges of rugs, house siding, and foundations.