

Lernaea cyprinacea Infestation in an Axolotl

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A pet axolotl (*Ambystoma mexicanum*) was presented for white finger-like structures extending out of the body wall (Fig 1). According to the owner, these projections had increased in number during the previous 4 weeks. The appetite and attitude of the axolotl were unaffected.

The axolotl was housed in an aquarium with a water purifier, small stones on the bottom of the aquarium and a small light source (not UVA-UVB lamp). No heat source was provided (optimal temperature for axolotls is 14-20°C [57-68°F]). The axolotl had been in the home for 3 months and had been fed only mealworms. During the first office visit, whole small fish were recommended for the diet.

The parasites were removed manually using surgical forceps (Fig 2). The only parasites that could not be removed were those that were too small or too deeply attached to the skin.

Following the removal of most of the parasites from the external surface, ivermectin (Ivomec® - Merial) was administered orally at a dose of 0.2 mg/kg, which was repeated in 2

weeks. The owner was advised to place the axolotl in a new clean aquarium to eliminate the potential for reinfection.

The parasite was sent to the Department of Parasitic Disease, School of Veterinary Medicine, University of Perugia for analysis, where it was identified as *Lernaea cyprinacea* Linnaeus (Crustacea: Copepoda). *Lernaea cyprinacea*, the anchor worm, is a widely distributed copepod parasite of freshwater fish and frogs. It can reach epidemic proportions in restricted environments, and heavy infestations may be fatal. Secondary bacterial infections may develop at attachment sites.

No antibiotics were administered to the axolotl nor were any local antiseptic solutions used. The axolotl was kept under observation for 1 week to monitor for bacterial overgrowth. After 15 days, when the axolotl was presented for a recheck, it was almost completely free of parasites. One parasite was found on the dorsum, but it was dead and readily detached from the skin.

The axolotl owner had not seen any parasites on the animal when she

bought it, and the parasites did not start to appear until 2 months later. Eggs may have been present in the water used to transport the axolotl from the pet store, or perhaps the parasites were too small to be noticed. On a follow-up visit, the parasites were seen on a fish that had been housed in the same pet shop aquarium as the axolotl. This parasite is common in cold water fish, but it is not common in amphibians.

Although it is thought by some that ivermectin may not be effective in treating an infestation of *L. cyprinacea* in axolotls, the author believes that the ivermectin in combination with

About Anchor Worms

During the life cycle of *Lernaea*, the young are free swimming but they need a temporary host. The parasites copulate while they are still in the larval stage. After copulation, the male dies and the female abandons the temporary host to become a free-swimming form again. Metamorphosis occurs when the female finds and becomes attached to a definitive host. Hemorrhage and ulcers can occur at the site of penetration.



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About Axolotls†

The axolotl (*Ambystoma mexicanum*) is a large salamander native to Lake Xochimilco, Mexico. It belongs to a group known as mole salamanders, which includes the tiger salamander (*Ambystoma tigrinum*) and the spotted salamander (*Ambystoma maculatum*).

The wild-type axolotl is dark colored with greenish mottling. Sometimes there are silvery patches on the skin. The eyes have yellow, iridescent irises. Adult axolotls can reach 30 cm (about 12 inches) or more in length from nose to tail tip,

and they can weigh as much as 300 g. They are known for their blunt snouts and large mouths.

Axolotls are neotenic, keeping their feathery external gills and tail fin their entire lives and maintaining their aquatic lifestyle.

In their native habitat, axolotls eat small fauna, including snails, worms, crustaceans, various small invertebrates such as *Daphnia*, and small fish and amphibia. In the laboratory, young are fed larvae brine shrimp and juveniles and adults are fed pelleted food.

† From The Indiana University Axolotl Colony Web Site (www.indiana.edu/~axolotl)



Fig. 1. On physical examination, the axolotl was bright, alert and responsive and had good overall muscle tone. The animal's oral cavity appeared normal. The only physical abnormality noted was the presence of white, elongated projections extending from the lateral cephalic region, dorsum, gills and all 4 limbs.



Fig. 2. Several of the growths were manually removed. On microscopic examination at 15x magnification, the structures appeared to be parasites. The elongated bodies were divided into a cephalic region and an abdominal region with 2 appendages full of eggs attached to the abdomen.



Fig. 3. Four weeks after treatment no parasites were visible, and the axolotl's skin was intact. The only observation that could be made was mechanical damage to the gills caused by the presence of the parasites.

environmental cleaning and disruption of the anchor worm life cycle contributed to the resolution of this disease in such a relatively short period of time.

References and Further Reading

1. Carpenter JW, Mashima TY, Rupiper DJ: *Exotic Animal Formulary* 2nd ed. Philadelphia, WB Saunders Co, 2001.
2. Bear JG: Parasitic crustaceans, adaptation to parasitism. *In* *Animal Parasites*. World University Library, McGraw-Hill, New York, 1971, pp 40-66
3. Wright KM, Whitaker BR (eds) *Amphibian Medicine and Captive Husbandry*. Melbourne, FL, Krieger Publishing, 2003.

Treatment for *L. cyprinacea* in Fish¹

Because ivermectin cannot be used in fish, the following drugs are recommended for treatment of an aquarium housing fish infested with *L. cyprinacea*.

1. Diflubenzuron: 0.01 mg/ml tank water for 48 hours every 6 days for 3 treatments. (Inhibits chitin synthesis; drug persists in the water for long-term, see page 26).
2. Potassium permanganate: 100 mg/L for 30-60 minute bath (For freshwater fish/protozoan crustacean ectoparasites; toxic in water with high pH; do not mix with formalin; can be toxic for goldfish.)
3. Trichlorfon: 0.5 mg/L tank water every 10 days for 3 treatments. (Crustacean ectoparasites; change 20-30% of water 24-48 hours following each treatment.)

Recommended Resources for More Information

According to Kevin Wright, DVM, co-editor of *Amphibian Medicine and Husbandry*, the following website is the best single information source about axolotls:

- www.indiana.edu/~axolotl
- A short husbandry guide is available at www.indiana.edu/~axolotl/axolotls/shortguide/guide.html

Dr. Wright's recommended books include:

- Indiviglio F, Earle-Bridges M, Bartlett RD: *Newts and Salamanders: Everything About*

Selection, Care, Nutrition, Diseases, Breeding, and Behavior. Barron's Educational Series, 1997.

- Duellman WE, Trueb L: *Biology of Amphibians*, Johns Hopkins University Press, 1994 ("Must-have book for anyone treating amphibians.")
- Petranka, James W: *Salamanders of the United States and Canada*, Smithsonian Institution Press, 1998. ("Nothing on axolotls but plenty on related ambystomatid salamanders including some

neotenic forms. Great book for people interested in amphibians.")

- Armstrong JB, Malacinski GH (eds): *Developmental Biology of the Axolotl*, Oxford University Press, 1989. ("More suited to embryologists and toxicologists than clinical veterinarians.")
- de Vosjoli P: *Popular Amphibians*. Irvine, CA, Bow Tie Press, 2004. ("I haven't seen this new book, but it does include axolotls and he usually has spot-on information.")