THE I. U. AXOLOTL COLONY'S

SHORT GUIDE TO THE CARE AND FEEDING OF AXOLOTLS

An overview of the methods used
at the Indiana University Axolotl Colony

Revised by Susan Duhon
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Temperature: Axolotl eggs and larvae are best raised at a temperature between 20 and 22° C. Adults are kept optimally at approximately 18° C year-round. The developmental rate of eggs and larvae can be controlled by modulating the temperature--the tolerance range being from about 8 to 24° C. Lower temperatures will slow the growth of embryos. Thus, temperature manipulation may enable one to use an entire spawning efficiently by holding back eggs or embryos so that they are at the proper stage for experimental procedures or for screening for mutant characteristics at a convenient time. Please note, however, that the conditions of both eggs and larvae deteriorate rapidly if held at either temperature extreme for extended periods of time.

Water Supply: At the Indiana University Axolotl Colony, we currently use a 50% modified Holtfreter's solution (see recipe below) for all hatched animals, from larvae to mature adults. Eggs and developing embryos are kept in a 20% Holtfreter's solution--2 parts 50% Holtfreter's water to 3 parts distilled or dechlorinated tap water. We make our 50% solution with tap water from which any chlorine, ammonia, or chloramines have been removed. Tap water may be dechlorinated by adding a few crystals of sodium thiosulfate per gallon of water and allowing it to sit overnight. In some localities (including Bloomington), both ammonia and chlorine are added to tap water and chloramine compounds are formed. In these localities, steps must be taken to remove all three. There are zeolite-type filters which may be used, or an Amquel-type chloramine remover may be added directly. We add, in addition to the salts, Amquel and ProNovaqua (from AquaVet). The latter provides a temporary buffer, removes heavy metals, and coats animals with a polymer designed to provide an extra slime layer for the axolotls. We do not recommend keeping axolotls in plain distilled water. Water quality is extremely important. Further information can be found in the Guidelines for

Amphibians published by the National Academy of Sciences (see below). The recipe for 50% modified Holtfreter's solution follows:

	Per 140 liter (37 gal)	Grams per liter
KCl	1 teaspoon--5.0 grams	0.036
CaCl2	2 teaspoons--9.4 grams	0.067
MgSO4 7H2O	2 tablespoons--19.5 grams	0.139
NaCl	240 milliliters--277.0 grams	1.980

Note--We make up our Holtfreter's solution in large plastic trash barrels, hence the large volume made at one time. We use NaCl (table salt) without iodine. We also do not buffer our solutions, nor do we adjust pH. The final pH, however, should be between 6 and 8.

Accommodations: Eggs, developing embryos, and small larvae are kept in large shallow "finger bowls" (Carolina culture dishes from Carolina Biological Supply Company) 20 centimeters in diameter and 8 centimeters deep. The water level should be kept at approximately 4 centimeters to allow for proper aeration. Avoid overcrowding, allowing about 50-100 eggs or unhatched embryos per bowl, and discard any excess jelly. Do not allow the embryos to clump, as embryos in the interior of a large clump may not receive enough oxygen. As the larvae hatch, carefully remove the discarded jelly capsules with a wide-mouthed pipette. At times, some larvae may be delayed and remain in jelly coats after the majority of the spawn in the bowl has hatched. Remove the jelly coats from these by gently puncturing the capsules with forceps and allowing the larvae to escape. After the larvae hatch, the number per bowl should be progressively reduced as the larvae increase in size. Their rate of growth depends upon temperature, frequency of feeding and amount of food, and number of animals per bowl. Larvae should be about 2 centimeters long by the time they are 1 1/2 to 2 months old. Crowding will also foster cannabilism. If some larvae grow much faster than others in the same bowl, the larger will pick on the smaller, so they should be promptly separated when this occurs. Larvae are put in individual one quart bowls at about 4 centimeters length. As they grow they are moved into 1/2 gallon bowls. Adults are kept in 1 gallon bowls. Note: Consult the NAS Guidelines for other suggestions on

housing for axolotls.

Feeding and Routine Care: After hatching, feed larvae freshly hatched brine shrimp daily. Change the water first, using a net to hold the larvae while the bowl is being rinsed and refilled. Strain the shrimp out of the brine and resuspend them in axolotl water before feeding. The amount of shrimp fed should be adjusted so that all the larvae have orange bellies the next day, but only a few uneaten shrimp are left. Do not fail to change the water within 24 hours after feeding shrimp. Scrub each bowl about once a week with a scrub mixture composed of a 2:1 mixture of baking soda and table salt.

When the larvae are about 4 centimeters long, we wean them to soft-moist salmon pellets (obtained from Rangen, Inc. of Buhl, Idaho). Small larvae eat the 1/8 inch diameter pellet. Newly weaned larvae eat only a few pellets apiece. As they grow, increase the number, always seeking to fill the larvae up without leaving a lot of extra food to foul the water. The larvae will catch some of the pellets as they fall through the water, but they also will quickly learn to locate and eat those pellets which fall to the bottom of the bowl. Pellet-fed axolotls also have their water changed before being fed. Axolotls this size may be held in a plastic colander while the water is being changed. Small, pellet-eating larvae are best fed daily, but as they mature the frequency of feeding can be gradually decreased. The water should be changed, however, at least every 48 hours. Continue to scrub the bowls each week with the scrub mixture described above.

When the young axolotls reach about 20-25 centimeters length, we begin feeding them 3/16" sized salmon pellets. By the time the axolotls are 10-12 months old, they are fed 5 pellets per feeding, three feedings per week.

Juvenile axolotl larvae and axolotl adults will accept a wide variety of foods and do very well on a variety of diets. Other feeding possibilities include axolotl larvae, Xenopus tadpoles, Daphnia, earthworms, beef liver, beef heart, guppies, goldfish, and a variety of soft "meaty" pet foods of the Gainesburger type. Any live fish or amphibia used as food should be aquarium bred in order to avoid the introduction of harmful parasites. Never, for example, feed fresh water minnows obtained from bait shops because they carry parasites.

Sources:

AquaVet--2242 Davis Court, Hayward, CA 94545
(415) 782-4058
(800) 227-1210 (except in California, Alaska, Hawaii, and Canada)

Rangen Inc.--P.O. Box 706, 115 13 Ave. So., Buhl, Idaho 83316
(208) 543-6421

Carolina Biological Supply Co.--Burlington, NC 27215
(919) 584-0381

National Academy of Sciences. 1974. Amphibians: Guidelines for the breeding, care, and management of laboratory animals. A report of the Subcommittee on Amphibian Standards, Committee on Standards, Institute of Laboratory Animal Resources, National Research Council. Washington, D.C. 153 p.
Available from: Printing and Publishing Office, National Academy of Sciences, 2101 Constitution Avenue, N.W., Washington, D.C. 20418.