

NEOTENY IN AMPHIBIANS

Neoteny is the delaying or slowing of the physiological development of an organism - typically an animal. Neoteny describes a form of paedomorphosis or the retention of ancestral juvenile features in descendants (adult) of a lineage. In amphibians some species show neoteny.

Paedogenesis or paedomorphosis refers to development of gonads or production of young ones by an ~~immature~~ immature, larval or pre-adult animal.

Classical and most informative examples of neoteny and paedogenesis among amphibians are furnished by *Ambystoma*. *A. mexicanum* lives in lakes of Mexico. Ordinarily they go through typical gilled aquatic larval stages then metamorphose to transform into adult air breathing land forms. Under certain circumstances the larvae do not metamorphose, retain their gills and aquatic habitat but become sexually mature. This sexually mature but morphologically immature, larval stage with external gills is called an axolotl.

Causes of neoteny - The significant cause of neoteny is not certain but it seems that environmental factors affect metamorphosis in several ways. Abundance of food, cold temperature or insufficient iodine may cause failure of metamorphosis and retention of larval features, which is indicated by the fact that drying up of swamps and decrease in temperature, lack of food in surrounding

water induce the axoltl larva to metamorphose.

Similarly if they are treated with thyroxine or TSH, these axoltls lose their gills, assume lungs and become air breathing adults. The main causes of neoteny in amphibians may be as follows

- (1) Abundance of food and other favourable requirements in the aquatic life.
- (2) Deepwater and cold water inhibit the secretion of thyroxine
- (3) Saline nature of water.
- (4) Low temperature of water is responsible for arrest of metamorphosis.

Many experimental processes were done by different scientists - recent research reveals that metamorphosis is primarily influenced by

- (i) Varying threshold levels of thyroxin and its analogues and
- (ii) by the degree of responsiveness of the larval tissues to the hormones.

Et Kin (1968) established the role of hormones in amphibian development. They have shown that the level of prolactin acts as an inhibitor in the overall control of metamorphosis. It may be possible that during structural gene on and the genes for producing thyroxin are switched off. In such condition hypothalamus becomes sensitive to the available level of thyroid hormone in the blood stream. The hypothalamus produces thyrotropic releasing factor (TRF) which stimulates the anterior lobe of

pituitary to produce thyroid stimulating hormone (TSH) which in turn enhances the rate of thyroxine secretion. The poor secretion of thyroid glands and irresponsiveness of the larval tissues to the hormone are responsible for neoteny.

Significance of neoteny - Weismann (1875) is regarded as secondary specialization, a physiological adaptation of advantage. Neoteny is partial when it is delayed and temporary.

Intermediate neoteny refers to the larval stage in which favourable condition results in metamorphosis for eg - Axolotls

The total neoteny is shown by Neotenes, Sierran and proteus which remain in larval stage throughout their life, even treatment with thyroxine fails to induce metamorphosis.

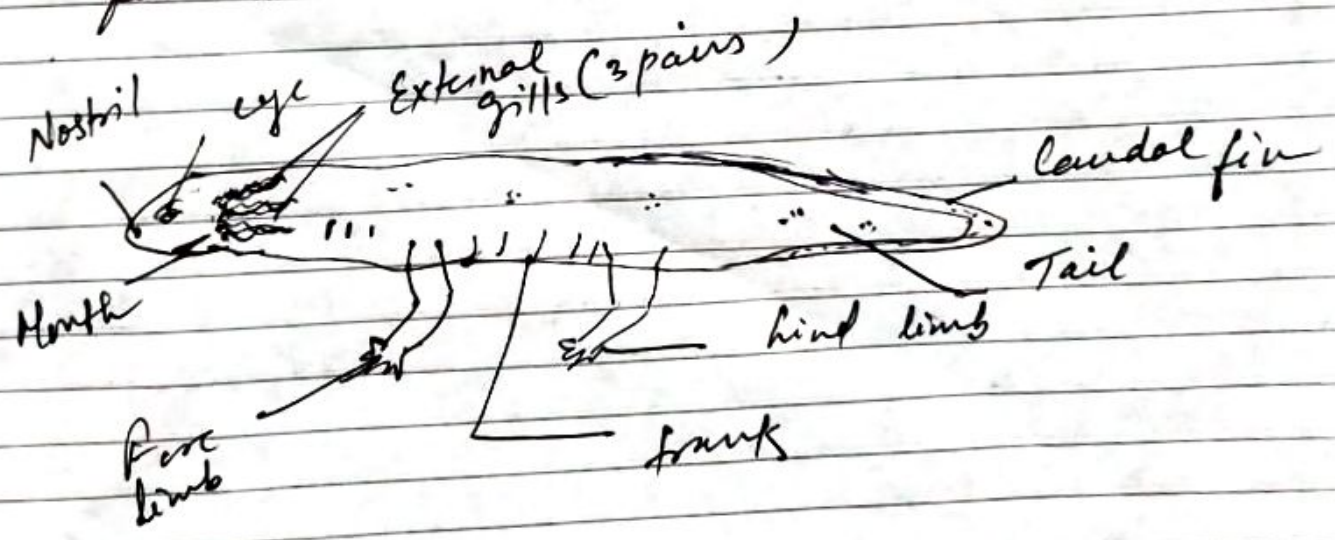


fig - Axolotl larva of tiger Salamander *Ambystoma tigrinum*.

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