other limb causes

The Urth list — 2 messages, 2 voices, 20 Mar 2002

https://urth.darkrealm.vip/thread/urth/3056

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maa32 — 20 Mar 2002, 02:44

Hey, Jerry. Thanks for looking into that stuff more thouroughly. Here is something else: trematodes that cause extra limbs in X Leavis. (Anyone not interested in this should definitely skip this - it just involves extra limbs in frogs)

Of especial note is the statement:

"The predominant observed limb deformity in both amphibian species was mirror-image duplication"

(skip if not interested)
Evidence that Trematodes Cause
Deformities, including Extra Limbs, in
Amphibians

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The occasional occurrence of high frequencies of limb abnormalities, including missing limbs and extra limbs, in natural populations of amphibians has long been a puzzle. Recent reports suggest an "epidemic" of such anomalies in natural populations of amphibians from the central United States. Here I report the discovery of a population from northern California in which such limb abnormalities appear to be caused by a parasitic flatworm (trematode: Manodistomum syntomentera, family Plagiorchiidae) that uses amphibians as second intermediate hosts in a complex life cycle (Fig. 1).

The primary host is a vertebrate carnivore (especially garter snakes, genus Thamnophis) which releases trematode eggs in its feces. The eggs are eaten by pond snails (e.g. Physa sp.), which serves as the first intermediate host. Within the pond snail, each egg undergoes at least two rounds of "polyembryonic amplification", generating hundreds or thousands of free-swimming cercarial trematode larvae. The cercariae attack larval amphibians (in this case, Pacific treefrogs, Hyla regilla, and Long-toed Salamanders, Ambystoma macrodactylum), aggressively boring into the skin to form cysts (metacercariae, (Fig. 2)), but are apparently unable to penetrate the skin of adult metamorphosed Hyla. The cysts are nonrandomly localized around the mouth, the cloaca, and the exposed developing hind limb buds of the amphibian larvae (Fig. 3).

Approximately 72% of a total of 280 tadpoles and young froglets, presented a wide range of limb, including missing limbs or parts of limbs, fused skin, ectopic limb structures, and

duplicated limb structures ranging from extra digits to several extra whole limbs (Fig. 4), Table 1). A similar range of deformities was observed in approximately 40% of a sample of 4,148 captured and released larval and newly metamorphosed salamanders, and approximately 5% of a sample of 1,778 captured and released adult salamanders (Tables 3,4,&5).

The predominant observed limb deformity in both amphibian species was mirror-image duplication (Fig. 5), suggesting massive disruption of the positional relationships of cells in the developing limb bud (Fig. 6). I hypothesized that these limb abnormalities result from localized regulatory responses of developing and regenerating limb tissues to mechanical disruption of normal limb pattern forming mechanisms caused by the trematode cysts. This idea was experimentally confirmed by microsurgically implanting inert resin beads into developing limb buds of lab-raised frogs (Xenopus laevis) and salamanders (Ambystoma mexicanum), a treatment that causes the development of supernumerary limb structures and other deformities (Fig. 7).

I conclude that trematode cyst infestation is sufficient to cause the majority of observed deformities in natural populations of amphibians. I think that the occurrence of such phenotypic anomalies in natural populations of amphibians probably reflects a sporadic and localized natural phenomenon, especially fluctuations in pond snail populations (Fig. 8). Frogs and trematodes have probably been co-evolving through shifts in the timing of their developmental stages, an ancient phenomenon dating back millions of years. These possibilities should be explored in all reported but unexplained occurrences of a high frequency of limb deformities in natural populations of amphibians.

http://www.mp1-pwrc.usgs.gov/naamp3/papers/54/54df.html

Hopefully he won't mind me ripping off his paper ...

Marc

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matthew.malthouse — 20 Mar 2002, 12:19 · follows maa32

> On 20/03/2002 02:44:21 maa32 wrote:
> I hypothesized that these limb abnormalities result from
> localized regulatory responses of developing and regenerating limb
> tissues to mechanical
> disruption of normal limb pattern forming mechanisms caused by the
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> mexicanum), a treatment that causes the development of supernumerary limb
> structures and other deformities

How does this mechanical intervention support your theories of polyploidy?
It seems irrelevant to either the support of or refutation of the theories you have advanced.

Matthew