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Strigea robusta causes polydactyly and severe forms of Rostand's anomaly P in water frogs

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Аннотация

BackgroundCases of polydactyly in natural populations of amphibians have attracted great interest from biologists. At the end of the 1940s, the French biologist Jean Rostand discovered a polymorphic syndrome in some water frog (Anura: Pelophylax) populations that included polydactyly and some severe morphological anomalies (he called it 'anomaly P'). The cause of this anomaly remains unknown for 70 years. In a previous study, we obtained anomaly P in the laboratory in tadpoles of water frogs that developed together with molluscs *Planorbarius corneus* (Mollusca: Gastropoda) collected in the field. We thus proposed the 'trematode hypothesis', according to which the infectious agent responsible for anomaly P is a trematode species. **Methods**Metacercariae from tadpoles with anomaly P were identified using ITS2 gene sequencing as *Strigea robusta* (Trematoda: Strigeidae). To verify teratogenic features of the species, cercariae of *S. robusta* were tested for the possibility to cause anomalies. Identification of cercariae species was made using morphological and molecular methods (sequencing of ITS2 and 28S rRNA). The tadpoles were exposed to parasites at four doses of cercariae (control, low, medium and high) and divided into two groups: "early" (at 25-27 Gosner stages) and "late" (at 29-34 Gosner stages) exposure. **Results**A total of 58 (72.5%) tadpoles survived until metamorphosis under the dose-dependent experiment with the trematode *S. robusta*. Differences in the survival rates were observed between the exposed and unexposed tadpoles both in the group of "early" tadpoles and "late" tadpoles. The exposure of tadpoles to the cercariae of *S. robusta* induced anomaly P in 82% of surviving tadpoles. The severe forms developed only in "early" stages under all doses of cercariae exposure. Polydactyly predominantly developed in the "late" stages; under a light exposure dose, polydactyly also developed in "early" tadpoles. Laboratory-hatched tadpoles reared together with infected snails had different rates of survival and complexity of deformations associated with the period of coexistence. **Conclusions**The experiments with direct cercariae exposure provide compelling evidence that *S. robusta* leads to anomaly P in tadpoles of water frogs. The manifestation of anomaly P turned out to be dependent on the stage of development, cercariae dose, and the location of the cysts.

Ключевые слова

Ключевые слова автора: Anomaly P; Pelophylax; Trematodes; *Strigea robusta*

KeyWords Plus: LIMB MALFORMATIONS; PELOPHYLAX-RIDIBUNDUS; TREMATODE INFECTION; RIBEIROIA-ONDATRAE; HOST-RESISTANCE; DIGENEA; DISEASE; INFESTATION; PATTERNS; TADPOLES

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