Xenotoca eiseni (Cyprinodontiformes, Goodeidae) as a Potential New Model for Studies on Maternal Transfer of Environmental Contaminants

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Abstracts:
This thesis studies aspects of the reproductive physiology and embryogenesis in the viviparous fish Xenotoca eiseni with a view to increasing the knowledge on its basic biology and development of the species as a model for studying maternal transfer and embryo susceptibility to toxicants. The ontogeny of gonad development was studied via histology to identify sex, stage of gonadal development, structure of the gravid ovary and stage of embryonal development. In males, the testis was comprised of two lobes merged at the anterior end. Spermatogenesis started around four weeks after birth and spermatozeugmata were first seen at between four and eight weeks. In females, there was a single hollow ovary divided into two compartments by a highly folded septum. Oogenesis was first observed between two and four weeks after birth and females reached full sexual maturity at around twelve weeks, when their total body length was at least 3 cm. Fertilisation and gestation took place in the ovary. Two weeks after fertilisation, embryos hatched within the ovarian lumen, at which time part of the yolk reserve had been depleted and trophotaeniae (hindgut extensions) had started to grow in the fish larvae. The trophotaenial placenta is typical for goodeids, but there was also evidence of a branchial placenta in a number of the embryos studied. Gestation normally took around six weeks and under the appropriate conditions breeding was possible at any time of year, with an interval of less than two months between pregnancies for females. In a four-week exposure to 17α-ethinyloestradiol (EE2, nominal 1 ng/L and 5 ng/L) there were no discernible effects on morphological endpoints in the exposed female fish or on somatic growth, gonadal development or sex partitioning in their developing offspring. Exposures of the adult females to EE2 (at the highest exposure concentration) however, did induce a 10-fold up-regulation of hepatic vitellogenin (vtg B). The studies presented provide a foundation of data for the use of X. eiseni as a new model for studies on maternal transfer in ecotoxicology. However, further work is required to elucidate more about sensitivity and maternal transfer efficacy in this species.