

# Endocrine disruption affects the physiological ontogeny of a wide-spread European anuran

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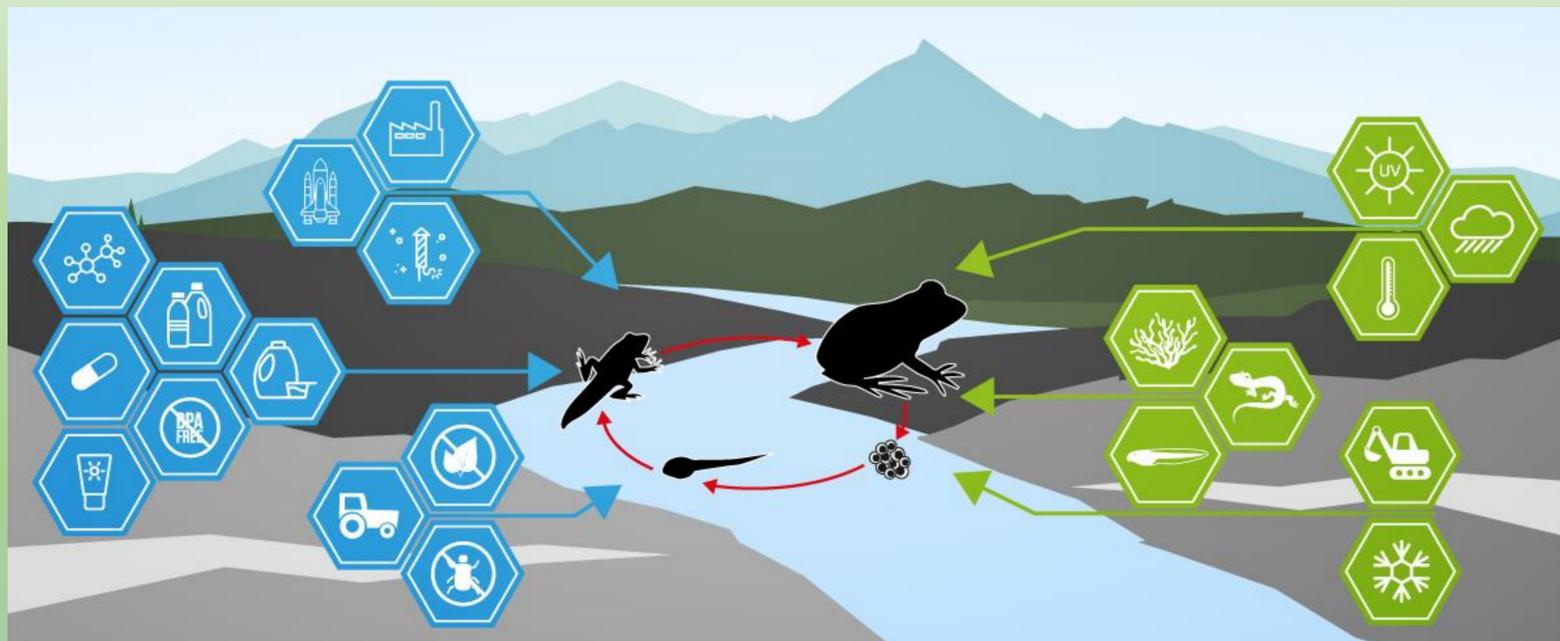


## Objectives

1. Do altered thyroid hormone (TH) levels as caused by the endocrine-disruptive effect of environmental stressors affect the ontogeny of physiological traits in *Rana temporaria*?
2. Do effects of endocrine disruption during larval stage persist across the metamorphic boundary?

## Conclusions

1. Altered TH levels significantly affected age, size, and energetics at all developmental stages throughout ontogeny.
2. Endocrine disruption during larval stage leads to carry-over effects in metabolism and energy storages in froglets of *Rana temporaria*.



**Fig. 1: Environmental stressors in the larval habitat of anuran larvae affecting metamorphosis and energetics by influencing endogenous thyroid hormones (TH).** Blue symbols: stressors acting as endocrine disruptors inhibiting TH production pathways resulting in low endogenous TH levels. Green symbols: stressors increasing TH production by the activation of the neuroendocrine stress axis. **A** Household chemicals and pharmaceuticals: Artificial steroid hormones (testosterone) and hormonal contraceptives, analgetic agents (e.g., ibuprofen, diclofenac), chemicals from sunscreen, microplastics and bisphenol A (BPA) from packaging and clothes, phosphates from washing agents. **B** Byproducts of industry (persistent organic products), aerospace, and fireworks. **C** Chemicals from agriculture: fertilizer (NO<sub>3</sub>), herbicides, pesticides (e.g., Atrazine, Glyphosate, Malathion). **D** Habitat fragmentation and road salt. **E** Biotic stressors: Food availability, competition (i.e. crowding), predator pressure. **F** Climatic stressors: UV-radiation, temperature variation, precipitation and desiccation risk.

