Molecular ontogeny of larval immunity in European eel at increasing temperatures - DTU Orbit (16/08/2019)

**Molecular ontogeny of larval immunity in European eel at increasing temperatures**

Temperature is a major factor that modulates the development and reactivity of the immune system. Only limited knowledge exists regarding the immune system of the catadromous European eel, Anguilla anguilla, especially during the oceanic early life history stages. Thus, a new molecular toolbox was developed, involving tissue specific characterisation of 3 housekeeping genes, 9 genes from the innate and 3 genes from the adaptive immune system of this species. The spatial pattern of immune genes reflected their function, e.g. complement component c3 was mainly produced in liver and il10 in the head kidney. Subsequently, the ontogeny of the immune system was studied in larvae reared from hatch to first-feeding at four temperatures, spanning their thermal tolerance range (16, 18, 20, and 22°C). Expression of some genes (c3 and igm) declined post hatch, whilst expression of most other genes (mhc2, trl2, il1β, irf3, irf7) increased with larval age. At the optimal temperature, 18°C, this pattern of immune-gene expression revealed an immunocompromised phase between hatch (0 dph) and teeth-development (8 dph). The expression of two of the studied genes (mhc2, lyc) was temperature dependent, leading to increased mRNA levels at 22°C. Additionally, at the lower end of the thermal spectrum (16°C) immune competency appeared reduced, whilst close to the upper thermal limit (22°C) larvae showed signs of thermal stress. Thus, protection against pathogens is probably impaired at temperatures close to the critical thermal maximum (CTmax), impacting survival and productivity in hatcheries and natural recruitment.

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