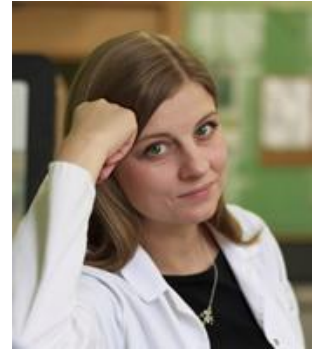


IZS Colloquium

University of Hamburg, Department of Biology
Institute for Animal Cell and Systems Biology (IZS)

Date: 15.07.2026, 17:00

Location: Kosswig Saal / IZS (Martin-Luther-King-Platz 3)



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Unfolding the ontogenetic trajectories of adaptive immunity in salamanders

Host: Joanna Malukiewicz / Tobias Lenz

Abstract:

The adaptive immune system (AIS) of jawed vertebrates is a major evolutionary innovation. It enables the recognition of virtually any non-self (including pathogen-derived) antigen and possesses immunological memory, allowing rapid, specific, and robust responses upon re-exposure. However, these benefits come at the cost of generating a vast anticipatory repertoire of antigen receptors (ARs) early in life, making AIS development both time- and resource-intensive. This developmental constraint may be particularly pronounced in small amphibian larvae that hatch into pathogen-rich aquatic environments. Moreover, metamorphosis extensively remodels tissues, altering the antigenic landscape of "self" and potentially increasing the risk of autoimmune responses from an AIS educated during larval stages. Consequently, early investment in AIS may be inefficient. Indeed, studies in *Xenopus* have suggested that complete AIS maturation is delayed until after metamorphosis. However, developmental trajectories of AIS remain poorly understood across amphibians, particularly in salamanders, where existing evidence comes largely from the atypical neotenic model, the axolotl.

Here, we investigate AIS development in the emerging urodele model, the Iberian ribbed newt (*Pleurodeles waltl*). We show a gradual increase in the expression of key AIS components, including the major histocompatibility complex (MHC) and T-cell receptors (TCRs), throughout larval development and metamorphosis. We further characterize TCR repertoire, revealing a progressive expansion of repertoire diversity. Finally, using comparative transcriptomics across 18 salamander species representing four families, we place these findings in a broader phylogenetic context. Our analyses suggest that the gradual developmental trajectory observed in *Pleurodeles* is likely exceptional and may be restricted to the largest-bodied species. In contrast, most salamanders appear to delay AIS development until around or after metamorphosis, pointing to a

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potential life-history trade-off governing the timing of adaptive immune system maturation.