

MULTIPLE STRESSORS IN LARVAL ANURANS: RANAVIRUS AND CHRONIC COPPER EXPOSURE

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Amphibians are experiencing global declines due to a variety of natural and anthropogenic stressors. The causes of many declines are complex; however emerging infectious diseases, including ranavirus (RV), and contaminants have both been implicated. Heavy metals are common environmental contaminants due to human activities and can negatively affect growth, development, and survival at levels commonly found in the environment. RV is an emerging infectious disease implicated in die-offs globally, but how these commonly occurring stressors interact is still largely unknown. To determine how metals could influence susceptibility and interact with disease, we exposed southern toad (*Anaxyrus terrestris*) and eastern narrowmouth toad (*Gastrophryne carolinensis*) larvae to environmentally relevant levels of copper (Cu) in combination with a local RV strain. We obtained larvae by breeding adults collected from known metal-contaminated and reference wetlands on the Savannah River Site. Viable embryos were collected and exposed to a range of Cu levels for the duration of the experiment. To assess potential lethal and sublethal impacts on larvae we

measured growth rates, survivorship, and RV loads. While survival probability was not affected by Cu in either species, Cu did have a significant negative effect on growth rates for both species. RV exposure negatively affected growth rates in both species, however survival probability was only reduced in narrow-mouth toads. Across both species, larvae exposed to both Cu and RV had lower mean viral loads than those not exposed to Cu, though the differences are not statistically different. We did not detect any interactions between RV and Cu on survival and growth. These results highlight the difficulty in predicting interactions between environmental stressors in amphibians and suggest that RV can negatively impact amphibians even in the absence of increases in mortality.



Sheldon in the lab.