ACTH Challenge: Stress Response Across Tadpole Development

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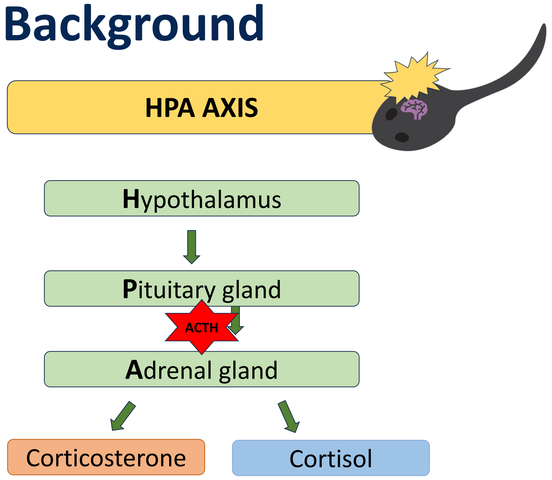
Background

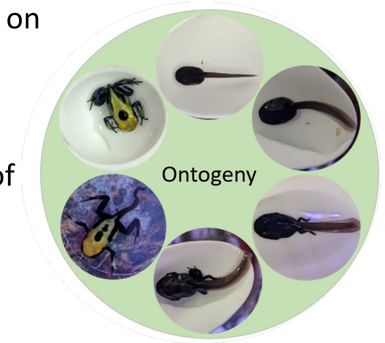


HPA axis: the pathway that the body takes in response to stress

Adrenocorticotropic hormone (ACTH) tells the adrenal gland to release glucocorticoids which are considered "stress" hormones[1]

Glucocorticoids **(GCs, cortisol and corticosterone)** move energy in the body to facilitate flight or flight responses

Prolonged increase of GCs can have a long-term impact on morphology, immune response, and overall survival



In amphibians, **glucocorticoids have a role in metamorphosis**, so we predicted that different stages of development have a different response in the HPA Axis

Some stressors of **Dyeing Poison Frog** (*Dendrobates tinctorious)* tadpoles are predators, cannibalistic conspecifics, temperature and salinity changes

Research Questions

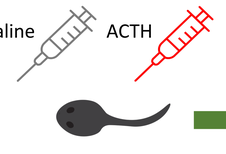
1) **Do tadpoles excrete more cortisol or corticosterone?**
2) **Do tadpoles excrete more corticosterone after ACTH injections?**
3) **Does the ACTH stress response change across development?**

Methods

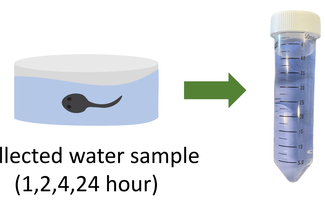
ACTH challenge: a test used across vertebrates in which the HPA axis is stimulated via ACTH injection to find the primary glucocorticoid and to generally look at the HPA-axis response[2]

Weighed, measured, and determined stage of development

Collected pre-hormone sample

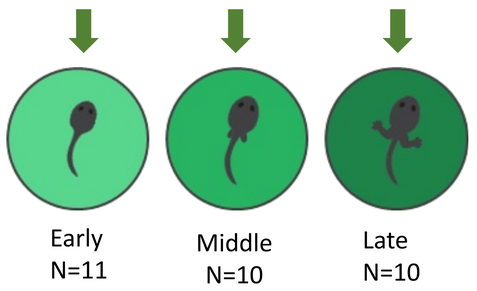


Injections

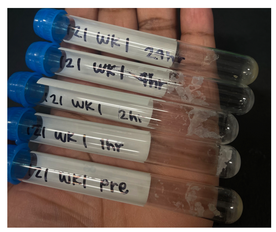


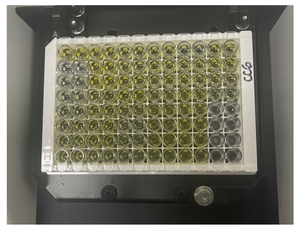
Collected water sample (1,2,4,24 hour)

Tadpoles experienced both treatments in a randomized order one week apart



Collected and analyzed 299 waterborne hormones samples

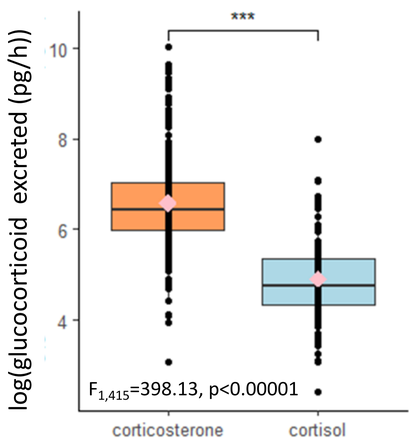




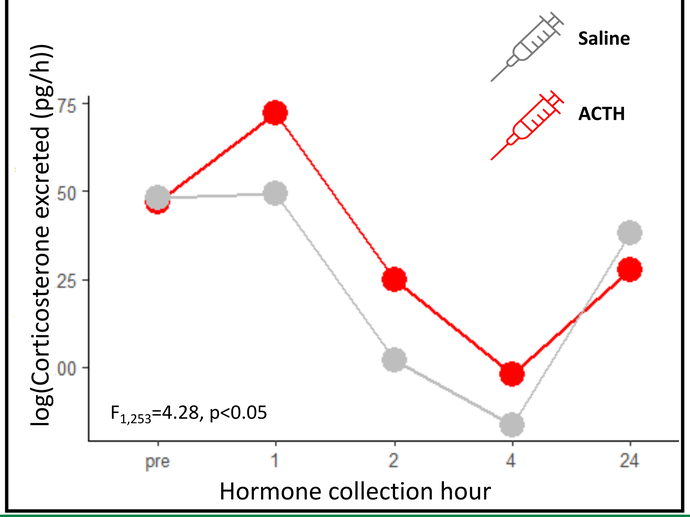
Analyzed hormones with ELISA Plate

Results

1. Tadpoles excrete more corticosterone than cortisol



2. Tadpoles increase corticosterone after ACTH injection compared to saline control



3. ACTH stress response does not differ across developmental stages

Discussion

Tadpoles produced both glucocorticoids and corticosterone is more abundant

Corticosterone increased in response to an ACTH challenge

We found no difference in stress response across development stages

WHY?

- More variation in stress response among individuals than between developmental stages
- Stress response through HPA is important for all the life stages

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References
[1] Becker, Jill B. *Behavioral Endocrinology*. A Bradford Book, 2002.
[2] McClelland, S. J., & Woodley, S. K. (2021). Water-borne corticosterone assay is a valid method in some but not all life-stages in Northern Leopard Frogs. *General and comparative endocrinology*, *312*, 113858history .