



Effects of reproductive condition on HPG-HPA axis interaction

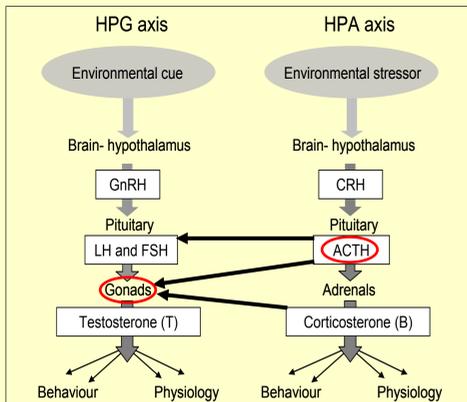
Rosemary Hohnen and Ashley Edwards, School of Zoology, UTAS

Background

In vertebrates, activation of the stress response (HPA axis) often results in the down regulation of processes not immediately necessary for that individual's survival including reproduction (HPG axis) (Dong et al. 2004, DeNardo and Sinervo 1994).

Furthermore, some species with only a short season in which to breed exhibit the ability to down regulate their stress response, so as to prevent the inhibition of reproduction (Wingfield et al. 1995).

We investigated in male blotched blue-tongue lizards, *Tiliqua nigrolutea*, how the stress response simulated by an ACTH injection alters testosterone (T) and corticosterone (b) concentrations during the breeding season in spring, and reproductive quiescence in summer.



Methods

Adult male *T. nigrolutea* (N=25) were blood sampled (0.5 ml) (T_1), injected with 50 μ g synthetic ACTH and blood sampled 30 (T_2) and 60 (T_3) min later. Haematocrit, and plasma T and C were measured at all three times, and blood glucose was measured at T_1 and T_3 .

Results

Haematocrit

- No change with sample period (individuals did not become haemodilute)

Plasma testosterone

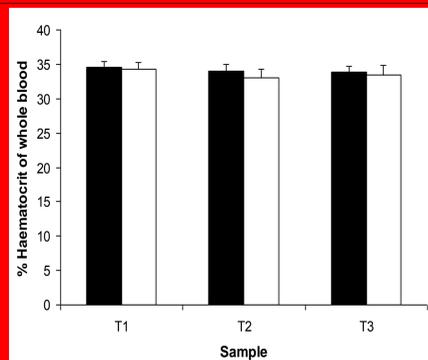
- T concentration decreased significantly between by T_3 ($F_{(1,24)} = 9.54, p < 0.0001$)
- T concentrations were significantly lower in spring breeding than summer quiescence ($F_{(1,24)} = 50.98, p < 0.0001$)

Plasma corticosterone

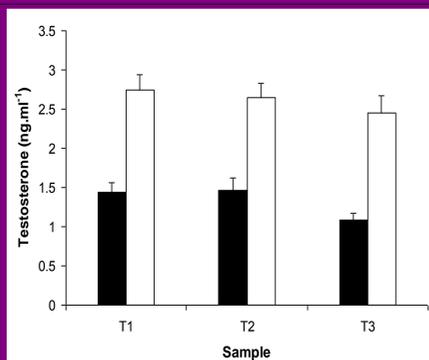
- Concentrations of B significantly increased between each sample time ($F_{(1,24)} = 518.18, p < 0.0001$), but increased differently between reproductive condition

Blood glucose

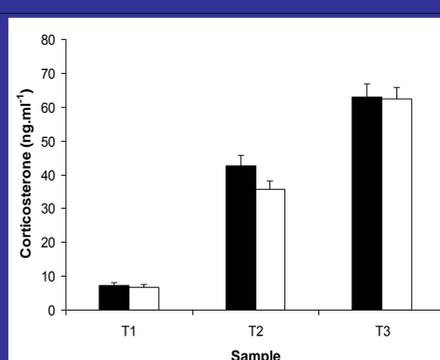
- Significant increase from T_1 to T_3 in blood glucose levels in response to ACTH injection during both spring breeding and summer quiescence ($F_{(1,25)} = 19.45, p = 0.0002$)



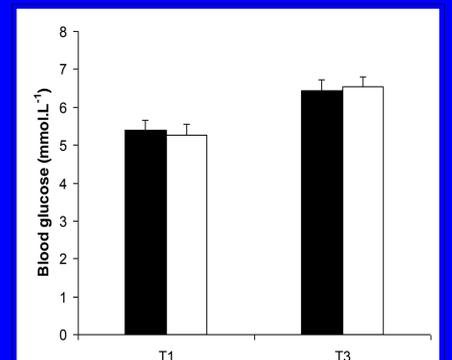
Mean (\pm SE) haematocrit in male *Tiliqua nigrolutea* (N=25) before (T_1), 30 min (T_2), and 1 hr (T_3) after ACTH injection during spring breeding (black) and summer quiescence (white).



Mean (\pm SE) testosterone (ng.ml^{-1}) in male *Tiliqua nigrolutea* (N=25), before (T_1) and 30 (T_2) and 60 (T_3) min after ACTH injection during spring breeding (black) and summer quiescence (white).



Mean (\pm SE) corticosterone (ng.ml^{-1}) in male *Tiliqua nigrolutea* N=25 before (T_1) and 30 (T_2) and 60 (T_3) min after ACTH injection during spring breeding (black) and summer quiescence (white).



Mean (\pm SE) glucose (mmol.L^{-1}) in male *Tiliqua nigrolutea* (N=25) before (T_1) and 30 (T_2) and 60 min (T_3) after ACTH injection during spring breeding (black) and summer quiescence (white).

Discussion

- The increase in B and blood glucose levels following ACTH injection support the role of the HPA axis in facilitating a response to stress, acting to mobilise energy reserves

- A decrease in plasma T in response to activation of the HPA axis suggests ACTH suppresses, directly or indirectly, concentrations of T, a critical reproductive hormone, in both spring breeding and summer quiescence

- A T decrease and C increase evident in both seasons suggests seasonal suppression of the HPA axis does not occur in this species

References

- DeNardo, D. F. & Sinervo, B. (1994) Effects of corticosterone on activity and home-range size of free-ranging male lizards. *Hormones and Behavior*, **28**, 53-65.
- Dong, Q., Salva, A., Sottas, C. M., Niu, E., Holmes, M. & Hardy, M. P. (2004) Rapid glucocorticoid mediation of suppressed testosterone biosynthesis in male mice subjected to immobilization stress. *Journal of Andrology*, **25**, 973-981.
- Wingfield, J. C., O'Reilly, K. M. & Astheimer, L. (1995) Modulation of the adrenocortical responses to acute stress in arctic birds: a possible ecological basis. *Integrative and Comparative Biology*, **35**, 285-294.