

# ENERGETIC COSTS OF AGGRESSION IN THE NORTHERN CARDINAL.



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## ABSTRACT

There is a lack of work studying territorial aggression during the nonbreeding season, especially in a natural system. There has been some evidence to suggest that the steroid hormone precursor, dehydroepiandrosterone (DHEA) may regulate male aggression during the nonbreeding season, rather than testosterone. This study aimed to investigate the effects of energy status (through food supplementation) on nonbreeding aggression in the Northern Cardinal and add to the pre-existing evidence of a DHEA-mediated mechanism of aggression. This study demonstrated that while metabolite and CORT concentrations did not vary significantly between groups, DHEA did suggesting that food security does affect aggression.

## INTRODUCTION

It is well known that males of many species establish and defend territories during the breeding season. Males establish such territories in order to secure resources, such as food and shelter, for breeding and the provisioning of offspring. The territory also functions in mate guarding of the resident male's female partner. Most of the information we have regarding territorial behavior and its underlying physiological mechanism comes from studies conducted during the breeding season. Testosterone produced by the testes is a steroid hormone that is primarily responsible for eliciting territorial aggression during the breeding season. However, some species exhibit the same behaviors in the nonbreeding season when testosterone levels are very low suggesting an alternative mechanism may regulate aggression outside of the breeding season. Dehydroepiandrosterone (DHEA) is a likely candidate for this alternate mechanism.

## HYPOTHESIS

*Birds with greater food security will exhibit more aggression, and hence more DHEA and less corticosterone, while expending more energy than CON birds with less food security, and will possess a better energy status than CON birds.*

## METHODS

### Field Work

Cardinals were identified at three locations including Rollins College. Half were food supplemented for four or more weeks. Birds were then exposed to conspecific song playback and captured using mist nets. Blood samples were taken immediately after capture and then thirty minutes later.

### Metabolites

An endpoint assay was used to quantify both free glycerol and free triglyceride concentrations directly from plasma samples, which were previously centrifuged.

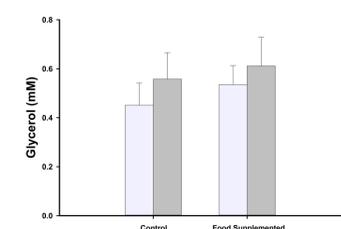
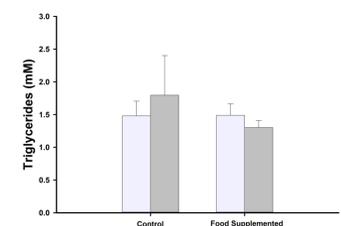
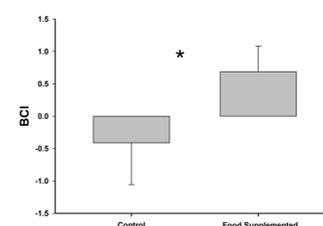
### Hormones

Plasma corticosterone concentration was quantified using a commercial enzyme-linked immunoassay (ELISA) using kit instructions.

Since DHEA concentrations are lower than corticosterone, samples were purified using solid phase extraction. Then, DHEA concentration was quantified using a commercial DHEA ELISA kit.

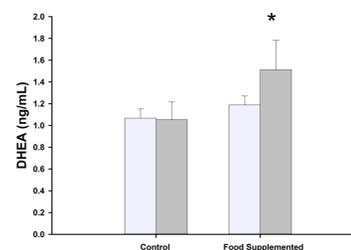
## RESULTS

### Does food security improve energetic status?

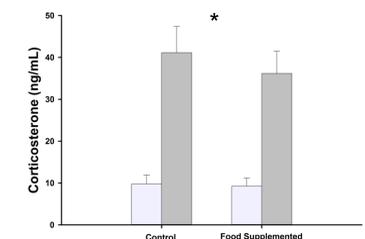


**Yes.** Food-supplemented (FS) birds were significantly larger than control (CON) birds, which can be seen by comparison of body condition, which was generated from wing length vs. mass regression. Food security did not appear to have an effect on metabolite concentrations, which likely only reflected recent dietary intake.

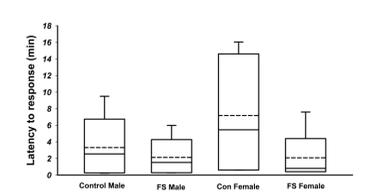
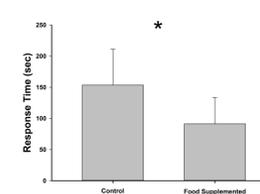
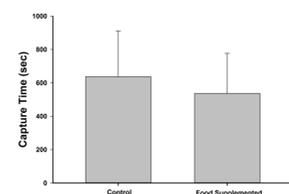
### Does food security affect plasma DHEA or CORT?



**YES.** DHEA concentrations increased with stress in FS birds, while remaining constant in CON birds. Stress elicited a CORT response in both treatment groups, but concentrations did not vary significantly between groups.



### Does food security alter territorial behavior?



**Possibly.** Food-supplementation resulted in faster response times in both male and female birds, which suggests a greater motivation to defend food. However, both treatment groups had similar capture times and DHEA concentrations were not statistically different between groups. The ability of FS birds to secrete more DHEA during a period of stress may indicate some differences in behavioral response.

## IN THE FIELD



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