MEASURING ACUTE STRESS IN *CTENOMYS SOCIABILIS*

H196 Proposal

(Metadata project)

I. Objective

This study will examine evidence that fecal glucocorticoid metabolite (FGM) concentrations can be used as measures of stress in free-living mammals. Although stress has been measured for multiple mammals using blood plasma samples, the ability to detect such response in fecal samples is less well understood. Because fecal samples provide a non-invasive method of obtaining material from captive and free-living animals, validation of FGMs as measures of response to stress will provide an important tool for studying physiological responses to environmental challenges.

II. Hypothesis

Members of multiple mammal species display elevated levels of FGMs in response to external stressors.

III. Predictions

Within species, individuals exposed to stressors will show higher levels of FGMs than will conspecifics not exposed to those stressors.

IV. Background

Stress is a critical physiological event that has pervasive effects on an animal's ability to function and, potentially, its survival and fitness. To date, plasma sampling is the most widely utilized method for measuring changing glucocorticoid levels in response to acute stress. Though the sensitivity, precision and ability to capture changes in hormone levels make this an attractive method, the invasive nature of drawing blood samples is counterproductive, as it can induce acute stress in animals. Moreover, plasma monitoring is impossible for endangered or elusive species that cannot easily be captured. FGM monitoring offers a potentially important, non-invasive alternative method of measuring acute stress.

This study seeks to determine if increased FGM levels are a general response to stress in mammals. Fecal samples integrate hormone levels over many hours and consequently may represent an important source of information regarding response to stressors. As a first step toward assessing the utility of FGM levels as measures of physiological stress, I will examine published data regarding stress an FGM responses in captive and free-living mammals.

III. Methods

To test the hypothesis that increases in FGMs represent a general mammalian response to external stressors, I will examine a minimum of 50 peer-reviewed, published papers that examine stress and glucocorticoid levels in mammals. Search words to be used to locate relevant papers will include glucocorticoid, fecal, stress, and mammal. Additionally, I will examine the literature cited section of all papers reviewed for additional publications on these topics.

For each paper examined, I will extract information regarding the species studied, whether data were collected in a captive or natural setting, the type of stressor examined, the type of sample used to quantify glucocorticoid levels, and whether a change in FGM levels was detected in response to stress. From the resulting metadata, I will use statistical analyses to test for a relationship between exposure to an external stressor and an increased in FGM levels. If my hypothesis is correct, I should find a positive relationship between these variables across a wide range of mammal species included in my data set.

IV. Broader Impacts

Glucocorticoid levels are often used as a metric of ecological health, fitness and stability for threatened populations. A significant association between exposure to external stressors and FGM levels would provide the basis for non-invasive measures of physiological stress in a wide range of mammal species.