

PhD Dissertation Defense

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Title: Investigating Ulcerative Lesions in Captive Black Rhinoceros, *Diceros bicornis*

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ABSTRACT

The sustainability of the captive black rhino (*Diceros bicornis*) population is compromised by problems of high morbidity and mortality, skewed sex ratios and several poorly understood disease syndromes. Due to the prevalence and severity of ulcerative oral and skin lesions, a disease often referred to as superficial necrolytic dermatitis (SND) has become of increasing concern for the health management of this species. One symptom in dogs with SND is severe hypoaminoacidemia (decreased plasma amino acid concentrations), and nearly all cases are fatal. Plasma was collected monthly for 1 year and amino acid concentrations were measured in captive black rhinos with ($n = 4.0$) and without ($n = 20.14$) lesions clinically consistent with SND. None of the affected black rhinos exhibited hypoaminoacidemia for any of the amino acids evaluated, or for total amino acid concentrations ($P > 0.05$). Based on the lack of plasma hypoaminoacidemia and comparatively low mortality rate in captive rhinos with lesions, this study concluded that this syndrome is not classical SND. Previous studies identified captive variables that related to decreased health in black rhino. To examine whether captive variables were associated with lesions in black rhinos, facility and socio-environmental surveys were completed for 25.20 black rhinos from 18 AZA accredited U.S. institutions between 2005 and 2007. Of the 45 total rhinos, 40 were of the eastern subspecies, *D. b. michaeli*, and five were of the southern subspecies, *D. b. minor*. Forty-two were captive born, three were wild caught, and the mean age was 14.6 (range: 2 – 38) years. None of the variables measured were associated ($P > 0.05$) with black rhinos having lesions. To examine the relationship between adrenal

activity and lesion status, twice-weekly fecal samples were collected from these same 25.20 black rhinos for 1 year. During the collection period, 5.1 rhinos exhibited skin lesions, 1.0 had oral lesions only and 1.0 had both (age 2 – 25 y). Baseline mean (\pm SEM) corticoid metabolite concentrations were lower ($P < 0.05$) in rhinos with ($n = 5.1$, baseline mean = 29.9 ± 3.3 ng/g) than without lesions ($n = 19.19$, baseline mean = 40.0 ± 2.4 ng/g). For a single male rhino that developed skin lesions during the study, the mean corticoid concentrations were lower ($P < 0.01$) when lesions were present (overall = 30.1 ± 2.4 ng/g, baseline = 28.7 ± 2.2 ng/g) than absent (overall = 36.5 ± 1.0 ng/g, baseline 35.3 ± 0.8 ng/g). These data suggest that ulcerative skin and oral lesions may be associated with suppressed adrenal activity, although it is not known if this is a precursor or a by-product of lesion manifestation. More research examining symptoms of stress, such as abnormal behavior, adrenal hyper or hypoplasia and measures of immunosuppression, would help determine if black rhino health is truly compromised by captivity related stress. Future studies should also examine other common physiological measurements, such as gonadal hormones and serum chemistry, among rhinos with all disease manifestations, lesions, idiopathic hemorrhagic vasculopathy, anemias and hepatopathys. These types of studies may reveal additional underlying physiological similarities lead to identifying common factors that negatively impact black rhino population health.