Comparison of The Antiphospholipid Syndrome to Medical Syndromes of Captive Black Rhinos (Diceros bicornis)

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Black rhinos in captivity have been plagued by a host of clinical entities. These include superficial necrotic dermatitis (SND), hemosiderosis, hemolytic and non-hemolytic anemias, and most recently the idiopathic hemorrhagic vasculopathy syndrome (IHVS) has been described in a group of black rhinos. Other conditions affecting black rhinos include encephalomalacia and necrotic laminar disease. Infectious conditions ranging from Salmonella, Aspergillus pneumonia, and leptospirosis have all been documented. Recurrent embryonic/fetal loss has been seen in one female by the author and in captive Sumatran rhinos (T. Roth, pers.comm.). The antiphospholipid syndrome (APS) is defined as the occurrence of venous and arterial thrombosis, recurrent fetal losses, and frequently lupus anticoagulant (aLA), anticyctodiulin antibodies (aCL), or both. The pathogenesis of APS is quite simply thrombosis regardless of the organ system involved.

Comparisons between APS and black rhino syndromes may not be obvious at first but there may be some parallels (Table 1). Other manifestations and criteria that constitute APS in rhinos have been seen sporadically. Thrombocytopenia is a hallmark of the condition. Coagulation profiles and the development of black rhinoceros specific ELISA for APS related antibodies will be described.

<table>
<thead>
<tr>
<th>System/Digits</th>
<th>APS</th>
<th>Black Rhino Syndrome</th>
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<tbody>
<tr>
<td>Skin/Digits</td>
<td>Cutaneous necrosis, livedo reticularis</td>
<td>Superficial necrotic dermatitis, laminar necrosis, IHVS</td>
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<td>Pulmonary</td>
<td>Pulmonary embolism</td>
<td>IVHS, hemosiderosis</td>
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<td>Cardiovascular</td>
<td>Valvular lesions</td>
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<td>Embryonic/fetal loss</td>
<td>Embryonic/fetal loss</td>
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<tr>
<td>Neurological</td>
<td>Cerebral ischemia</td>
<td>Encephalomalacia</td>
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</table>

Table 1. Comparisons within organ systems between APS and black rhino syndromes

Multiple Isoflurane Anesthesia in a Captive Black Rhinoceros (Diceros bicornis).

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Inhalant anesthesia in rhinoceros has been reported on a couple of occasions. In all instances reported, euthanasia was performed or the rhino expired in the perineal period from surgical complications. A four-year male black rhinoceros estimated at 1000kg was anesthetized twice and maintained on isoflurane and ventilated on two separate occasions for diagnostics evaluation of a fractured maxillary sinus. Combinations of detomidine, butorphanol, haloperidol, xenazine, ketamine, and etorphine were used for pre-medication and inductions. A 28mm endotracheal tube was placed with the aid of a 1.7m colonoscope and isoflurane was administered with intermittent positive pressure ventilation. Serial blood gas taken from an auricular artery, non-invasive blood pressure monitoring with the cuff on the base of the tail, oxygen saturation via pulse oximetry, and base apex electrocardiogram (ECG) monitoring were followed during the procedure when feasible. The rhino was maintained in sternal recumbency for the entire procedure. The elapsed time of isoflurane anesthesia for the first anesthesia was 172 minutes and 230 minutes for the second procedure. Recoveries were smooth and uncomplicated with the animal exhibiting normal behaviors within 2 hours of each event.

Vocal Communication of the Black Rhino Diceros bicornis ssp.

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Although rhinos have been the focus of many studies not much is known about their communication. A more detailed study has been done on the vocalizations of the Indian Rhino but not on the other rhino species. It was also suspected that all rhino species use infrasound signals for their communication but there is no detailed scientific investigation with a sufficient number of rhinos. This study investigates the audible vocal communication of the Black rhino Diceros bicornis ssp. and if there is evidence for the use of infrasound signals. The project also tests if individual identification by acoustic means is possible. Following zoos were visited for the investigations: Zoo Frankfurt with 1,1 Diceros bicornis minor, Dvur Kralove with 4,8 Diceros bicornis michaeli and Berlin with 2,7 Diceros bicornis michaeli. Recordings were performed with a Sony DAT recorder TCD D100 and a Semheiser directional microphone. Acoustic data were evaluated with the help of the
Feeding Tannins to Captive Black Rhinoceroses (*Diceros bicornis*):
Results of a Pilot Study

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It has been postulated that the lack of tannins in captive diets for black rhinoceroses (*Diceros bicornis*) might be responsible for the occurrence of iron overload in captive specimens. In theory, the presence of iron-chelating tannins in natural diets might have induced the evolution of an especially effective iron absorption mechanism in the species, which would lead to excessive iron uptake in the absence of such chelators. In order to investigate this problem, 5 captive rhinos were fed two diets, one with and one without a tannic acid supplement. Feed intake and faecal output were measured for two 5-day periods, respectively. Additionally, the use of several markers (Co-EDTA, Cr-mordanted fibre, n-alkane C36) as pulse-dose and steady state markers was assessed. The animals accepted the tannic acid-supplemented food without hesitation. Measured passage rates suggest that a 4-day collection period should result in total recovery of a pulse-dose marker. Iron concentration of faeces did not differ significantly between treatments and was apparently influenced by soil intake from the enclosure. We conclude that it is feasible to produce tannin-containing feeds for the further evaluation of iron metabolism in black rhinos. Either animals should be kept indoors during trials to prevent soil intake, or an iron isotope should be applied as a pulse-dose marker to compare recoveries between treatments. Additionally, we will present data on digestibilities and marker recoveries.

Feeding Ecology of Desert Dwelling Black Rhinoceroses

*Diceros bicornis* L. in Kunene Region, Namibia

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Feeding ecology of black rhinoceros was studied in extreme arid Kunene region Northwest of Namibia (mean rainfall <150 mm/year), during the dry season from June to October 2000. Using the feeding track method showed, that rhinos were browsed on (about) *65 of (about) *140 encountered species (Loutit et al. 1987) 70 feeding species out of the total of 101 species). After the very good rain season 1999/2000 rhinos were feeding beside shrubs and woody species also on a high variety of herbs. The most heavily used feeding specie was the herb *Chamaecyparissus glauca* (Euphorbiaceae).

In comparison to the examination of Loutit et al. the study area varied slightly in a higher population density of black rhino and lower desert influence.

*Please note: At submission date identification of plants and data evaluation was still in progress.*
Recent Research on Elephants and Rhinos

Abstracts of the International Elephant and Rhino Research Symposium, Vienna, June 7-11, 2001

Harald M. Schwammer
Thomas J. Foose
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Deborah Olson