

## PRELIMINARY IMPACTS OF DIETARY PHYTATE SUPPLEMENTATION ON IRON AND PHOSPHORUS IN BLACK RHINOCEROS (*DICEROS BICORNIS*)

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### **Abstract**

Black rhinoceroses (*Diceros bicornis*) under human care are susceptible to health issues associated with diet management, including iron overload disorder, hypophosphatemia, renal and gastrointestinal disorders. As browse diets for free-ranging rhinos cannot be replicated under human care, we do not understand the exact nutrient needs that optimize physiological wellness. Current recommendations under human care include supplementation of vitamin E and phosphorus and limiting bioavailable iron (Sullivan & Valdes, 2019; Sullivan *et al.*, 2020). Inositol hexaphosphate (IP6) has been demonstrated to serve as an iron chelator, antioxidant, and anti-inflammatory reactant across species, but it is also a potential source of dietary phosphorus in hindgut-fermenting rhinos. We hypothesized diet supplementation with IP6 would have benefits including decreased iron availability and improved circulating phosphorus for black rhinos. Four male black rhinos at Disney's Animal Kingdom® and Fort Worth Zoo ( $n = 2/\text{institution}$ ), were enrolled in a randomized crossover study with two 21-d experimental periods with and without IP6 supplementation fed at 190% of the estimated horse-based phosphorus recommendation. Multiple-month washouts occurred between treatment periods and animals served as their own controls. Serum measurements collected on d0 and during d15-21 included iron biomarkers, CBC, and chemistry panels. All animals consumed 100% of IP6 offered with no change in animal health throughout the study. While iron parameters did not demonstrate changes ( $P > 0.3$ ) there were numerical decreases; and serum phosphorus, shown to be protective against hemolytic crises, was increased with IP6 supplementation ( $P = 0.02$ ; Table 1; Sullivan *et al.*, 2020). Understanding the importance, optimal diet forms, and interplay of iron and phosphorus in black rhino physiology are critical to maintain a healthy sustainable population.

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### **Literature Cited**

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**Table 1.** Serum measurements (Mean (SE)) for black rhinoceros supplemented with IP6 for 21 days compared to the same animals on a control diet.

<b>Treatment Group</b>	<b><i>n</i></b>	<b>Phosphorus</b>	<b>Transferrin saturation</b>	<b>Ferritin</b>
		<b>mg/dL</b>	<b>%</b>	<b>ng/mL</b>
Control	4	3.6 (0.4)	59.7 (6.8)	1695 (948)
IP6 supplement	4	4.9 (0.4)	57.6 (11.1)	844 (254)