

IMPACT OF DIETARY PHYTATE SUPPLEMENTATION ON IRON AND PHOSPHORUS UTILIZATION IN BLACK RHINOCEROS (*DICEROS BICORNIS*)

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Abstract

Mineral binding reactions of diet within the gut as well as interactions within the body can change the paths of inflammation and oxidation. As supported by the International Rhino Foundation, we studied the impact of increased phosphorus in the form of phytate (inositol hexaphosphate: IP6), a natural chelator of iron and other minerals, in black rhinoceros' diets on digestion and inflammation. Nutrient digestibility and serum micronutrients were measured with and without the supplement over 21 d in eight animals at three institutions (Disney's Animal Kingdom®, Blank Park Zoo, and Fort Worth Zoo). Black rhinos demonstrated they were able to utilize the IP6 form of phosphorus at 50 mg/kg BW/day without a negative impact on the absorption of zinc, copper, and other minerals and without significant changes in digestibility. Serum phosphorus was elevated with IP6 supplementation ($P = 0.013$). IP6 did not impact iron biomarkers in this short-term study. Inflammatory markers serum amyloid A, tumor necrosis factor- α (TNF α), as well as interleukins IL-4, IL-8, and IL-10 were measured in rhino serum without significant effects of treatment. These assays resulted in reasonable cross-reactivity and parallelism, though additional biological validations are needed including evaluation of biomarker response during acute versus chronic inflammatory events. IP6 is recommended for use in black rhinos as a phosphorus supplement. Maintaining circulating phosphorus through dietary supplementation in black rhinos serves their physiological sensitivities. Monitoring mineral content of diet and concurrent blood in black rhinos serve to support long-term health in this critically endangered species.

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