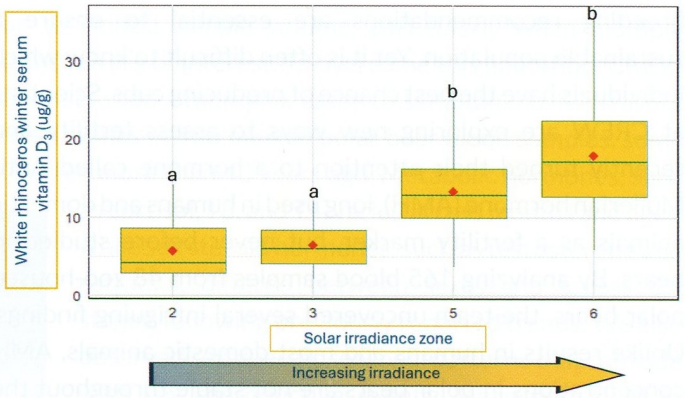
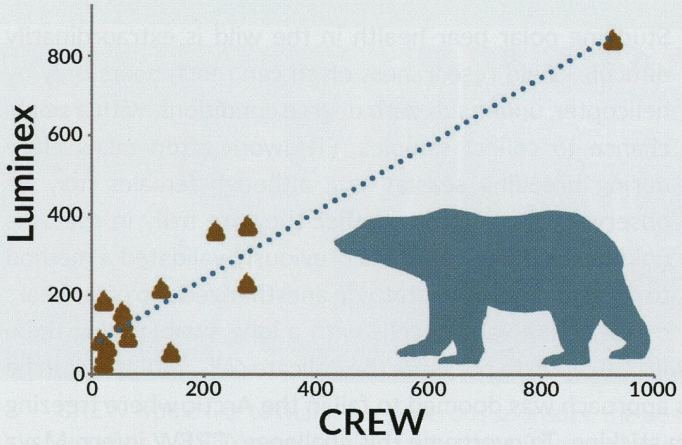
Basking in the Sun: Reduced Ultraviolet Irradiation Impacts Vitamin D but not Reproduction in White and Black Rhinos

Black and white rhinos in managed care, particularly those in Europe and North America, experience substantially less ultraviolet (UV) exposure than their wild counterparts. In many zoo-managed species, reduced UV availability can limit cutaneous production of vitamin D, a key regulator of calcium and phosphorus absorption, bone health, and other physiological processes including reproduction. Because reproductive challenges remain a concern in some managed rhino populations, we investigated whether reduced UV exposure and associated vitamin D status might be a contributing factor. As part of AIRS, we measured serum concentrations of vitamin D2 and D3 in black and white rhinos across North America and assessed their correlation to reproductive parameters. Neither vitamin D2 nor D3 were significantly associated with reproductive status, pregnancy, or lactation, and no effects of age or species were observed. However, clear differences emerged between the two vitamin D forms. Plant-derived vitamin D2 was consistently low, often falling below detectable limits, and showed no seasonal variation. In contrast, vitamin D3, primarily synthesized in the skin following UV exposure, declined significantly during winter months and was positively correlated with regional UV irradiation levels. These findings demonstrate that black and white rhinos likely rely on endogenous vitamin D synthesis rather than dietary plant sources, and although UV exposure is reduced in managed care, diminished vitamin D is not associated with reproductive challenges. *This project was funded, in part, by the Institute of Museum and Library Services National Leadership Grant #MG-249011-OMS-21.*



Making the Most of Every Fecal Sample: The "Doing More with Less" Approach



Fecal samples are goldmines of information. They're easy to collect, available daily, and packed with clues about health, reproduction, and stress. However, labor intensive processing is required to access that valuable biological data within them, and traditional hormone assays measure only one hormone at a time. That means multiple rounds of preparation, reagents, plastics, and staff time are required to obtain all the desired data. Enter Luminex technology, an innovative tool designed for blood samples that can measure up to 100 hormones in a single round. We asked a simple but important question: if serum isn't available, can this same efficient approach work with feces, urine, or saliva? This past year, our team put the technology to the test using samples from polar bear, black and white rhino, okapi, aye-aye, domestic cat, caracal, Amur leopard, Andean bear, and sloth bear. The specific assay we used focused on six hormones tied to reproduction, stress, and metabolism — all measured at once. Across rhinos, polar bears, and several cat species, the Luminex results closely mirrored our trusted in-house assay results, and even urine from aye-ayes and saliva from rhinos produced reliable hormone patterns. These findings show that one test can now reveal multiple layers of information from a single non-invasively collected sample. By reducing time, consumables, and the number of separate tests needed, we can maximize the data gathered across many species — helping CREW do more with less. *This project was made possible by funding from the Basis Foundation.*