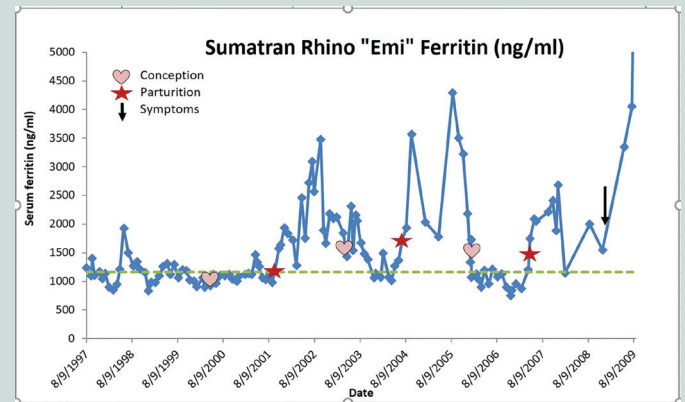


# NON-TRADITIONAL PROJECT UPDATES

## Ferretting Out the Ferritin Relationship with Iron Storage Disease in Rhinos

### Sumatran Rhinos

Iron overload disorder (IOD; the excessive absorption and storage of iron in organ tissues) affects a wide variety of wildlife species maintained in captivity ranging from birds to marine mammals and including two rhino species, the Sumatran rhino and the African black rhino. In some cases, it appears to be fairly benign, whereas in other cases, it leads to hemochromatosis and proves fatal, as it did in two of the Cincinnati Zoo's Sumatran rhinos. In several species, serum ferritin concentration is a useful biomarker of total body iron stores. Therefore, CREW scientists developed a rhino ferritin specific assay for accurately measuring Sumatran rhino ferritin to determine if serum concentrations can be used to diagnose hemochromatosis in this species. Historical Sumatran rhino serum samples collected from 1997 to 2014 from six rhinos in the U.S. were analyzed as well as individual samples from seven rhinos in Malaysia. As is often the case in science, results were surprising. The profiles of some rhinos were very dynamic. All rhinos exhibited spikes in ferritin during their sampling period, and pregnancy appeared to impact ferritin concentrations. The rhino with the highest mean ferritin concentration did not die of hemochromatosis. Although serum ferritin was elevated in both rhinos that did die of hemochromatosis, there was no distinct increase prior to onset of symptoms. Perhaps most surprising, serum from rhinos in Malaysia contained more than twice as much ferritin as serum from U.S. zoo rhinos. The fact that serum ferritin concentrations cannot be used to diagnose hemochromatosis in Sumatran rhinos is a significant finding since veterinarians currently rely heavily on this measure of body iron for monitoring the progression of IOD in rhinos. However, monitoring this protein is not without value. Consistently low concentrations of serum ferritin detected via this species-specific assay would indicate an individual is at low risk of developing hemochromatosis. (Funded by a grant from Mr. and Mrs. Jeremy S. Hilton and Family with supplemental support from Dr. Thomas and Rita Bell.)



### Black Rhinos

Although black rhinos tend to breed well in captivity if managed appropriately, their median longevity is half of that for white rhinos due to their susceptibility to a number of diseases seldom observed in the other rhino species. Iron overload disorder (IOD) was first identified in African black rhinos in the 1990's and was later noted in the other browsing rhino species, the Sumatran rhino. In contrast, it rarely affects Indian or white rhinos, which are primarily grazers. CREW scientists are working to develop ways to monitor iron storage and to help diagnose the transition from IOD to the diseased state of hemochromatosis. Traditionally, an assay made for horses was used to measure black rhino ferritin concentrations; however, ferritin is species-specific. Therefore, it seemed plausible that the rhino ferritin specific assay recently developed at CREW to analyze Sumatran rhino serum samples would reveal new findings when used to assess black rhino samples. The assay exhibited high cross-reactivity with black rhino ferritin and was fully validated prior to study commencement. Fourteen zoos across the U.S. sent 900 serum samples from 36 black rhinos to be analyzed using the new assay. Ferritin values were highly variable and different than those reported with the horse assay. Ferritin was higher in males than females, in adults than juveniles, and in Southern black rhinos than the Eastern sub-species. In contrast to previously published results, ferritin did not increase with age or years in captivity. Results demonstrate that ferritin can be influenced by many factors which must be considered when trying to monitor IOD. Furthermore, the accurate diagnosis of hemochromatosis may require input from other measures of body iron stores. (PI supported by a generous gift from an anonymous donor, and the study was supported by Michael and Tucker Coombe.)

