

# IOD IN RHINOS—VETERINARY GROUP REPORT: REPORT FROM THE CLINICAL MEDICINE AND PATHOLOGY WORKING GROUP OF THE INTERNATIONAL WORKSHOP ON IRON OVERLOAD DISORDER IN BROWSING RHINOCEROS (FEBRUARY 2011)

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## INTRODUCTION

This report summarizes what is known and unknown of iron overload disorder in browsing rhinoceros, sets priorities for research, and recommends developing selected resources.

## WHAT IS KNOWN

- 1) Excess iron stores are present in captive Black rhino but not in free-ranging Black rhino (*Diceros bicornis*).
- 2) Iron stores increase over time in captive Black rhino.
- 3) The best measures of iron status in Black rhino are transferrin saturation, ferritin, and tissue iron concentration.
- 4) Iron is found primarily in macrophages (Kupffer cells) within the tissues of Black rhino.
- 5) Browsers—selective feeders overall are much more difficult to keep healthy in captivity.

## WHAT IS NOT KNOWN

- 1) A good definition of this “iron storage syndrome” with biomarker correlates

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- a) Hemosiderosis versus hemochromatosis
- 2) Reference parameters for a “healthy Black rhino”
- 3) Improved biomarkers of health and disease in Black rhino
  - a) Good markers of inflammation
  - b) Body condition scores
- 4) The association of iron storage with other disease syndromes in Black rhino
  - a) A better understanding of the role of iron storage in development of disease in Black rhino
- 5) The relationship of “stress” to iron storage in Black rhino
- 6) Behavioral profiles of healthy versus sick captive Black rhinos—behavioral markers of health and disease
- 7) Comparative data on worldwide Black rhino management
- 8) An explanation of the waxing and waning of disease syndromes in captive Black rhino
- 9) Why are browsers—selective feeders more difficult to keep in captivity?
- 10) Does iron storage have a negative effect on the longevity of the captive population and its sustainability?
- 11) Ultimately, is the Black rhino suited for maintenance in captivity?
- 12) Does the conservation potential of the captive Black rhino population outweigh the health and welfare tolls on the animals + the costs of trying to maintain them healthy?
- 13) The best methods of prevention and treatment
- 14) Criteria for treatment
- 15) Centralized data center
- 16) Standardized lab testing and pathology review
- 17) Involvement of all holding institutions
- 18) Disease correlate of iron score by specific criteria by 1+ pathologists

- 19) How to move samples across borders—The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) blanket permit

### PRIORITIES

- 1) Definition of “iron storage disorder”
- 2) “Iron storage syndrome” versus “iron storage disorder” versus “iron storage disease” (by end of workshop)
  - a) Avoid the term hemochromatosis
- 3) Comparative data on worldwide browsing of rhino health and management
- 4) Collate current iron analyte data, liver enzymes, inflammatory markers, and hematology data from current population and analyze to health status to establish baseline data on population
  - a) Start with U.S. population (Michele Miller, Robin Radcliffe) (January 2012)
  - b) Make contacts with other regional organizations (European Association of Zoos and Aquaria [EAZA], etc.) to determine state of data and to collect and correlate regional data (Eric Miller, Michele Miller, Robin Radcliffe, Benn Bryant, Greg Fleming) (September 2011)
- 5) Better biomarkers of inflammation and health in rhinos
  - a) Inflammatory biomarkers and protein electrophoresis (Scott Citino and Natalie Mylniczenko, Carolyn Cray, University of Miami, Comparative Pathology) (January 2012)
  - b) Body condition scoring—current systems (Robin Radcliffe and Markus Hofmeyr) (January 2012)
  - c) Anti-phospholipid enzyme-linked immunosorbent assay (Ray Ball) (June 2011)
  - d) Development of new iron assays (Patricia Sue Chavey) (open)
  - e) Ferritin, transferrin saturation
  - f) Molecular markers of iron homeostasis (Tomas Ganz, Ella Nemeth, Rose Linzmeier, and Don Paglia) (open)
- 6) Centralized data center (open)
  - a) Explore models of similar programs (Great Ape, etc.)
  - b) Develop resources and funding (will need a staff position)
  - c) Compilation of data, tissue, serum, etc.
- 7) Study animals moving between institutions and regions
  - a) Species Survival Plan (SSP) Coordinators to notify veterinary advisor (ongoing)
- 8) Availability and standardization of assays worldwide and ease of sample movement (CITES–U.S. Department of Agriculture)
  - a) Explore permitting (blanket) options with Association of Zoos and Aquariums [AZA], World Association of Zoos and Aquaria [WAZA], etc. (Eric Miller and Benn Bryant) (June 2011)
  - b) Program for facilitated scientific exchange (CITES) (Benn Bryant) (June 2011)
- 9) Develop recommendations for health, treatment, and pathology evaluation to standardize future approaches to iron storage syndrome
  - a) Body condition—See above
  - b) Clinical and pathologic findings correlated to iron level
- 10) Develop monitoring recommendations and treatment protocols based on data analysis from the population (open)
- 11) Standardized histopathology and iron scoring system (Mary Duncan and Don Paglia) (January 2012)
- 12) Correlate with other diseases seen in browsing rhinos (Vet and Pathology Advisors) (June 2012)
- 13) Behavioral profiles (ethograms) of healthy versus sick captive Black rhinos—behavioral markers of health and disease (Jill Mellen, Natalie Mylniczenko, Markus Hofmeyr, Rhino Keeper Association) (January 2012)
  - a) Response to training cues or behavioral testing systems
- 14) Epidemiology (Epi Group)
  - a) Role of social environment and physical activity in development of clinical disease
  - b) Browsing rhino suitability and sustainability for captivity
  - c) Changing pattern of disease over time (waxing and waning)
  - d) Assess current and historic Black rhino life histories
- 15) Current and historic average life spans, quality of life

### DEVELOP RESOURCES

- 1) Grant
  - a) Institute of Museum and Library Services (IMLS)

- b) United States Fish and Wildlife Services (USFWS) Rhino–Tiger Fund
- c) Associations of Zoos and Aquariums Conservation Endowment Fund (AZA CEF)
- d) LB Research and Education Foundation
- e) Turner Endangered Species Foundation
- f) Busch–Sea World Conservation Endowment Fund
- g) Morris Animal Foundation (MAF)—assay development, epi, etc.