

## Documentation of the Hormonal Cycle of Female Black Rhinoceroses (*Diceros bicornis*) Using Ultrasonic Diagnosis and Subsequent Computational Analysis.

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The aim of our study is to develop computer software which allows to determine the cycling status of free-living, adolescent rhinoceroses during transrectal ultrasonic examinations. Preparation for the development of the software mentioned above started in the Leipzig Zoological Garden on

June 2, 1999. At present, we have access to two female rhinos for preparation of the required image data. Extensive construction work in and around the enclosure was carried though to be able to perform the intended examinations. Analyses of hormone levels in droppings have been performed and documented for several months. For the development of image interpretation software, we work on ultrasonic video material produced with female horses to test the validity of the approach. It is planned to exchange video material with them as soon as data on the rhinos has been collected. The ultrasonic video documentation is analysed and annotated using gynaecological literature.

### Example:

Formation of a corpus luteum, or ovulation, have been tentatively recognized. In this case, a technical term like „oestrus“, and the presumed time point within the ovarian cycle can be added to the material. This assignment can later be checked based on the measured levels of the sexual hormones. The completely assigned video material is stored in chronological order, following the ovarian cycle. The video material which is transformed into the computer software is ready to be used. In future applications, free-living female rhinos exactly like those performed on the trained rhinos in Leipzig (defined procedural order and defined spatial orientation, for example relative to the cervix, etc.). The images of the female reproductive organs obtained in the field study are fed into a laptop computer, which compares the data to the scientifically evaluated images of the trained rhinos using the diagnostic software. This software should enable the researcher to obtain reliable data on the ovarian cycle of both free-living and captive female black rhinos. The new diagnostic tool is expected to make accessible biotechnological reproductive techniques which have been extensively tested and optimized with domesticated mammals.

### Potential applications

- detection of ovarian cycle anomalies and the resulting cycling changes

- determination of ovarian cycle phase and definition of optimal time for artificial insemination
- obtaining precise data on periodic changes of the ovary
- detection of pathologically altered female reproductive organs
- early detection of pregnancy
- rational selection of rhinos for breeding
- diagnostic support for embryo transfers

We hope that this short summary has given you an impression of our current and future work in Leipzig Zoological Garden. We always welcome suggestions and ideas which might benefit the project. Large Animal Clinic for Theriogenology and Ambulatory Services / An den Tierkliniken 29; 04103 Leipzig, Leipzig Zoological Garden / Pfaffendorfer Straße 29; D-04105 Leipzig

## Diet of black rhinoceros in zoological gardens: composition, intake and digestibility

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This dissertation will be about the nutrition of black rhinos (*Diceros bicornis*) in captivity.

Rhinoceros (family: Rhinocerotidae) as well as tapirs (family: Tapiridae) and equids (suborder: Hippomorpha) be-

long to the odd-toed mammals (order: Perissodactyla).

There are four genera and five species of rhinoceros. In Asia there are the greater one-horned rhinoceros, the Javan and the Sumatran rhinoceros. In Africa it's the white or square-lipped rhinoceros and the black or hook-lipped rhinoceros. All of them are endangered species and more or the less close to extinction. Therefore all of these animals are of extraordinary significance, especially the ones kept by humans.

There are only about 2500 black rhinos left in the wild, in captivity there's about 200. Black rhinos are browsers, in the wild their diet consists of leaves and stems of woody plants. There's not much known about their nutrition in captivity yet.

It's supposed that malnutrition and stress are the cause for diseases and bad reproduction in black rhinos kept by humans. So there's a lot to be found out about their feeding in captivity.

For this thesis the diet of rhinos in different zoological gardens is going to be observed, the results will be compared in an international study.

The black rhinos for this study are kept in the zoological gardens of Berlin and Leipzig. It'll be two animals out of each group, being observed for a period of five consecutive days.

It'll be protocolled what kind of food the rhinos get and how much of it they'll eat. Also the fecal output will be measured. There'll be taken samples of the food as well as of the feces,