FATTY ACID STATUS OF FREE-RANGING AND CAPTIVE BLACK RHINOCEROS (*DICEROS BICORNIS*): CORRELATION TO THE USE OF GRAIN-BASED PRODUCTS

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Extended Abstract

It has been suspected that the fatty acid (FA) status of captive black rhinoceroses (*Diceros bicornis*) differs drastically from their free-ranging conspecifics, due to the difference in FA pattern between the natural forage and the captive diet. Natural forage of black rhinoceros, and temperate browse, contains a n-6/n-3 FA ratio (expressed as % of total FA) of 0.1-0.3.[2,4] In contrast, zoo diets, assuming a hay:concentrate ratio of 61:28, have a n-6/n-3 ratio of 1.2.[4] Therefore, significant differences in FA body composition between free-ranging and captive black rhinoceroses can be suspected.

As an increased n-6/n-3 ratio has been reported to be associated with alterations of the immune status, inflammatory response, skin health and reproductive potential, amongst other physiological reactions,[8] such a potential difference is of concern in the black rhinoceros, particularly in regards to a common skin problem in this species, necrolytic dermatitis.[6]

In order to investigate this difference, the fatty acid (FA) pattern of plasma/serum triglycerides (TG), phospholipids (PL) and cholesterol esters (CE) of captive and free-ranging black rhinoceroses (*Diceros bicornis*) were analysed using standard methods.[3] Free-ranging animals (n=28) from four different regions were sampled. Captive animals in this investigation included specimens from North American (n=13) and three different European facilities (n=6). The European animals were tested on 1-4 different diets, resulting in a total of 15 blood samples. In these animals, a consistent diet was fed 3 months prior to blood sampling, and within one week of blood sampling, intake of all diet items was quantified during a one-week intake study. All diet items were sampled and dried at 103°C to constant weight to determine dry matter (DM) content. All further descriptions of these diets are on a DM basis.

Regardless of differences between the free-ranging animals from different regions, differences between captive and free-ranging animals were relatively uniform: captive animals had higher overall PUFA proportions, and a higher unsaturation index. These findings were due to proportions of linoleic acid (LA, 18:2n-6) that were drastically increased as compared to free-ranging animals. In contrast, levels of linolenic acid (ALA, 18:3n-3) were consistently lower on conventional zoo diets. n6/n3 ratios for TG, PL and CE were 1.6, 10 and 8 in free-ranging animals, respectively, as compared to 4.1-16.3, 16-148 and 40-277 in captive animals. There was a distinct correlation between the proportion of grain-based products (commercial concentrates, plain grains, and bread) in the diets of the European animals and the measured levels of LA. One animal from a facility with a very low proportion of grain products in the diet nevertheless had high LA readings, most probably due to the use of sunflower oil that represented 2 % of its diet. One animal that could not process hay due to an oral abscess and therefore received a high proportion of green meal pellets[5] had increased ALA contents after the introduction of the new diet item.

These results allow conclusions on the suitability of diets fed in captivity: the black rhinoceros is prone to several uncommon diseases that have been suspected to be linked to oxidative damage, possibly due to the disposition of this species to excessive iron storage.[7] An unnatural diet loaded with unsaturated FA (which are a prime target for oxidants) would exacerbate this problem. Additionally, n-6 FA are known as precursors of pro-inflammatory mediators, and their overrepresentation could therefore exacerbate any inflammatory processes. Thus, from the point of view of the FA status, the current practice of using grain-based feeds as major ingredients in captive rhinoceros diets should be discouraged. Diet items containing ALA (a precursor of anti-inflammatory mediators) such as fresh grass, fresh browse, and the respective silages should be included at higher levels in diets for captive black rhinoceroses. Linseed products have been shown to be effective in increasing ALA status of captive specimens.[9] Forage meals, either pelleted as such or as major ingredients in formulated pelleted feeds, although a good source of ALA and linked with high levels of ALA in one animal of this study, must be chosen with care and may not be suitable for black rhinoceroses as these products may contain particularly high levels of iron.[1,5]

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