

Impact of diet type on fermentation rate of cheetahs in captivity

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Objectives: As a means of optimizing the health status of captive cheetahs, research on feeding management is required. Yet, to date, data on the influence of the diet type on the intestinal microbiota and fermentation are scarce. A preliminary study on cheetahs showed a high variability in fecal bacterial protein, indicating possible differences in fermentative activity. Therefore, our hypothesis was that fermentation can depend on the provided diet (e.g. chunk meat or small whole carcasses), likely because of differences in indigestible animal tissue such as connective tissue, bones and hair. Since the optimal balance of fermentation products and the microbial composition are indispensable for gut health (Zuccato et al., 1933; Pedersen et al., 2002; Wong et al., 2006; Hamer et al. 2008), but also modulates the immune system (McKay et al., 1993; Swanson et al., 2002; Tannock et al., 2002, Verlinden et al. 2006), the lack of detailed information on fermentation processes could be an important drawback in optimizing feeding management and as a result general health of cheetahs. Therefore this study focused on the impact of diet type on fermentation in captive cheetahs.

Materials en methods: A cross-over study with 14 cheetahs was performed at Ree Park. Each group was given one of two diets: whole rabbit (R) or beef supplemented (B) with 10 g Carnizoo®, at intervals of four weeks. During week four of each testing period individual fresh fecal samples were collected within 15 min of defecation. A score for consistency (1= hard pellets, 5= watery diarrhea) was immediately noted and pH was determined. In addition feces per enclosure were collected and scored on a daily basis for 5 days. Fresh fecal samples were analysed for bacterial protein content (estimation according to the method of Hesta et al. 2003), short chain fatty acids (SCFA), branched chain fatty acids (BCFA), indol, phenol and p-cresol. In addition, blood samples were obtained from 10 cheetahs on an opportunistic basis. Acylcarnitine profile was measured in serum samples as an indicator of fermentation rate (Verbrugghe et al., 2009).

Results and discussion: Cheetahs fed whole rabbit showed a significantly decreased fecal score (mean score=2.07) opposed to cheetahs fed chunk beef (mean score=3.13). On the contrary, fecal pH was not significantly different between the given diets. Concentrations of the SCFA, BCFA, indole, phenol, and p-cresol were significantly lower for cheetahs fed R compared to B. In accordance with these results, serum acylcarnitine profile followed numerically the same trend. Moreover B induced a higher isovaleryl carnitine level and a trend for higher propionyl carnitine level compared to R. Fecal phenol and indole levels showed a positive correlation with fecal propionate and butyrate levels in both diets. These results provide evidence that feeding cheetahs B results in a higher fermentation rate. Moreover, the significantly lower ratio of acetate to propionate and acetate to butyrate when feeding B, confirms that pure meat diets also ferment faster. Although high concentration of SCFA are often related to fermentation of carbohydrates, this study reveals that in these strict carnivores, fermentation of undigested protein results in comparable concentrations of SCFA. When feeding whole rabbit, the high amount of indigestible and hardly fermentable material in the hindgut, e.g. hair, might decrease the fermentation rate and as a result, the formation of harmful products such as indole and phenol. On the contrary, fecal bacterial protein proved to be higher when feeding whole rabbit. This could be an indication of changes in the composition of the microbial population in the hindgut when feeding whole rabbit.

Conclusion: Intestinal fermentation clearly differs between cheetahs fed chunk meat or whole rabbit. This finding emphasizes the need for further research on the impact of the provided diet on fermentation processes and possible links to the inflammatory status of cheetahs.

Keywords: cheetah, carcass feeding, fermentation rate