

Influence Of Diet On Characteristics Of Nutrient Digestion In Fossa

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INTRODUCTION

Few data are available regarding the nutrition of fossa (*Cryptoprocta ferox*) in captivity. Additionally, few data are known about nutrient digestive efficiency in this carnivorous species. *Cryptoprocta ferox* are one of few carnivore species endemic to the island of Madagascar, found in woodlands or savannas. Although considered opportunistic carnivores, lemur species constitute a significant portion of the fossa diet, as well as small mammals, birds, reptiles and insects¹⁻². Average body lengths of fossa, range from 65-80 cm in addition to a 60-80 cm tail. Fossa are nocturnal, solitary animals with the exception of the mating season. In the wild fossa can live more than 20 years. Similar to most captive species studied, a model species was used to establish nutrient requirements and formulation of diets. Due to similarities in carnivorous behavioral idiosyncrasies and gastrointestinal tract anatomies^{1,3,4}, the domestic cat appeared to be the most logical nutrition model.



OBJECTIVE

The primary objective of this study was to characterize nutrient digestibility in four captive fossa housed at Omaha's Henry Doorly Zoo, when fed their standard commercial raw diet and whole prey. The second objective was to compare nutrient digestibility between the domestic cat and fossa when fed a similar raw beef diet.

MATERIALS & METHODS

EXPERIMENT 1

- Four fossa (3.1), average weight and age of 8.5 kg and 6.5 years, respectively, and two domestic cats (0.2) average weight and age of 5.2 kg and 6.0 years, were fed a raw beef based commercial diet formulated to meet nutrient requirements of the cat (Nebraska Brand Special Beef, Central Nebraska Packing, North Platte, NE).
- The diet (Table 1) contained 3.38 kcal/gram DM and was fed to all animal subjects based on weight maintenance.
- Animals were fed the diet for a 14-day adaptation phase, followed by a 4-day total fecal collection phase.
- Diet intake was measured and recorded daily.

EXPERIMENT 2

- Four fossa (3.1) were fed their standard zoo diet consisting of the commercial raw beef diet or the beef diet plus whole prey, offered as a rat, on alternating days.
- Diet intake was measured and recorded daily.

CHEMICAL ANALYSES

-All diet and fecal samples were analyzed for dry matter (DM), organic matter (OM), crude protein (CP) and crude fat (CF) according to AOAC methodology⁵. All chemical analyses were conducted in duplicate and values were required to be within 5% of each other.

STATISTICAL ANALYSES

- Data were analyzed using the proc GLM procedure of SAS[®] (SAS Institute, Inc., Cary, NC).
- A probability of P <0.05 was accepted as statistically significant.

RESULTS

Dry matter intake was 60% lower for cats compared with fossa, and this resulted in only a 13% reduction in DM digestibility (Table 2). On average, both fossa and cats digested OM (86.3%) and CP (87.2%) from the raw diet, effectively. Dry matter intake was 27% higher (Table 3) when fossa were offered whole rodents in addition to meat. The result was an increase in DM digestibility of 9%. Although numerically higher, digestibility of OM and CP failed to reach statistical significance (Table 3) when fossa were offered rodents.

Table 1. Dry matter, organic matter, and protein concentrations of diets fed in Experiments 1 and 2^{a,b}

| Variable | Beef diet | Beef-rodent |
|----------|-----------|-------------|
| DM, % | 32.6 | 32.1 |
| OM, % | 95.0 | 93.9 |
| CP, % | 48.9 | 48.6 |

^a Abbreviations used: DM = dry matter, OM = organic matter, CP = crude protein.

^b Beef diet was Nebraska Brand Special Beef Feline diet, and Beef-rodent diet included beef diet plus one whole rat with an average as-fed weight of 102.1 g.

Table 2. Dry matter intake, and digestibility of dry matter, organic matter, and protein between cats and fossa fed a raw beef-based diet.^{a,b}

| Variable | Fossa | Cat | P value |
|---------------------|--------------|-------------|---------|
| DM intake, g/d | 129.0 ± 10.1 | 48.6 ± 8.01 | 0.02 |
| DM digestibility, % | 87.3 ± 0.96 | 76.2 ± 0.23 | 0.05 |
| OM, % | 90.5 ± 0.75 | 82.0 ± 0.69 | 0.07 |
| CP, % | 90.6 ± 1.53 | 83.8 ± 0.14 | 0.05 |

^a Abbreviations used: DM = dry matter, OM = organic matter, CP = crude protein.

^b Least squares means ± SEM.

Table 3. Dry matter intake, and digestibility of dry matter, organic matter, and protein of fossa fed either a raw beef-based diet or beef diet supplemented with whole prey^{a,b,c}

| Variable | Beef diet | Beef-rodent diet | P value |
|---------------------|--------------|------------------|---------|
| DM intake, g/d | 113.6 ± 12.1 | 144.5 ± 12.6 | 0.0001 |
| DM digestibility, % | 83.1 ± 3.94 | 90.8 ± 1.89 | 0.05 |
| OM digestibility, % | 88.3 ± 2.58 | 92.7 ± 1.29 | 0.06 |
| CP digestibility, % | 89.4 ± 2.98 | 94.1 ± 0.97 | 0.10 |

^a Abbreviations used: DM = dry matter, OM = organic matter, CP = crude protein.

^b Beef diet was Nebraska Brand Special Beef Feline diet, and Beef-rodent diet included beef diet plus one whole rat with an average as-fed weight of 102.1 g.

^c Least squares means ± SEM.



DISCUSSION

Few data are published regarding diet digestibility characteristics of fossa. Additionally, digestibility characteristics of domestic cats fed raw meat diets, similar to those fed in zoo's, are not well documented. This study was designed to present preliminary comparisons, and establish groundwork for future research efforts with this species. According to the 2006 NRC for domestic cats, energy requirements would indicate the cats in this study receive approximately 300 kcal per day (100 kcal x BW kg^{0.67}). In the current study they received approximately 45% fewer calories (164 kcal/day) to maintain ideal body condition. Current reports suggest, approximately 30% of domestic cats in the US are considered overweight and (or) obese; therefore, current recommendations may still be high⁶. In contrast, the 2006 domestic cat NRC presents energy requirements of 55-260 kcal x BW kg^{0.75} for exotic felids. In the current study, fossa consumed approximately 88 kcal x BW kg^{0.75}, falling within the range of the published values. Expressed in similar units (BW kg^{0.67}), caloric intake to maintain body weight was 104 and 54.6 kcal x BW kg^{0.67} for fossa and cats, respectively, resulting in DM intakes of 1.50 and 0.93% of body weight. Overall, cats and fossa digested the raw meat diet effectively. Raw meat diets have traditionally not been recommended in the petfood sector for domestic cats; however, they may serve as viable alternatives for high protein, low grain diets. Additionally, it appears that although differences are evident, the cat serves as a potentially adequate nutrition model for fossa.

FUTURE RESEARCH

While these studies described digestibility characteristics of captive fossa on their standard diet, further research is needed with this species to determine specific responses to various diets and determination of optimal dietary options for captive fossa. Continued nutrition research is planned to compare diet and fatty acid digestibility of diets containing either beef, horsemeat, rodents, or bison in fossa.

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