Digestive physiology of carnivores

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Belo Horizonte 2019
Carnivory ...

- ... is no physiological challenge
- ... but a biomechanical and logistical one!

- **Digesting prey is easy - catching prey is the hard part!**
Insectivores

from Stevens und Hume (1995)
Carnivores

from Stevens und Hume (1995)
Piscivores

from Stevens und Hume (1995)
Bears

from Stevens und Hume (1995)
RESEARCH ARTICLE

Carnivorous Mammals: Nutrient Digestibility and Energy Evaluation

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Estimating the energy content is the first step in diet formulation, as it determines the amount of food eaten and hence the concentration of nutrients required to meet the animal's requirements. Additionally, being able to estimate the energy content of a diet empirically known to maintain body condition in an animal will facilitate an estimation of maintenance energy requirements. We collated data on nutrient composition of diets fed to captive wild canids, felids, hyenids, mustelids, pinnipeds, and ursids and the digestive coefficients from the literature (45 species, 74 publications) to test whether differences in protein and fat digestibility could be detected between species groups, and whether approaches suggested for the estimation of dietary metabolizable energy (ME) content in domestic carnivores (NRC [2006] Nutrient requirements of dogs and cats. Washington, DC: National Academy Press.) can be applied to wild carnivores as well. Regressions of digestible protein or fat content vs. the crude protein (CP) or fat content indicated no relevant differences in the digestive physiology between the carnivore groups. For diets based on raw meat, fish, or whole prey, applying the calculation of ME using “Atwater factors” (16.7 kJ/g CP; 16.7 kJ/g nitrogen-free extracts; 37.7 kJ/g crude fat) provided estimates that compared well to experimental results. This study suggests that ME estimation in such diets is feasible without additional digestion trials. For comparative nutrition research, the study implies that highly digestible diets typically fed in zoos offer little potential to elucidate differences between species or carnivore groups, but research on diets with higher proportions of difficult-to-digest components (fiber, connective tissues) is lacking. Zoo Biol 29:687–704, 2010. © 2010 Wiley-Liss, Inc.

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Received 20 February 2009; Revised 3 September 2009; Accepted 23 November 2009

DOI 10.1002/zoo.20302
Published online 13 January 2010 in Wiley Online Library (wileynl.com).
# Comparison of carnivores

**Literature research**

<table>
<thead>
<tr>
<th>Category</th>
<th>Publications</th>
<th>Species</th>
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<tbody>
<tr>
<td>Canids</td>
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<td>Ursids</td>
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<tr>
<td>Viverrids</td>
<td>1 / 2</td>
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</table>

**Control data:** domestic cats/dogs

From Clauss et al. (2010)
Material and Methods

Data collection in EXCEL spreadsheet
Species
Body mass
Food
Nutrient composition
- Crude protein CP
- Ether extracts EE
- Crude fibre CF / Total dietary fibre TDF (Prosky)
- Gross energy GE
- Nitrogen-free extracts NfE

... and the corresponding intake and apparent digestibility (aD) data

from Clauss et al. (2010)
Material and Methods

Evaluation of physiological differences

‘Lucas-Test’: plotting of digestible nutrient content vs. nutrient content

from Clauss et al. (2010)
Protein digestion

from Clauss et al. (2010)
Protein digestion

![Graph showing protein digestion for domestic cat and domestic dog](image)

- **Domestic cat**
- **Domestic dog**

from Clauss et al. (2010)
Protein digestion

from Clauss et al. (2010)
Fat digestion

from Clauss et al. (2010)
Fat digestion

from Clauss et al. (2010)
Fat digestion

from Clauss et al. (2010)
Effect of fibre on digestion

from Clauss et al. (2010)
Conclusion

• Carnivores do not differ much in terms of ‘digestive physiology’
• You can use dog/cat equations to estimate digestibility and energy content in wild carnivores
Digestive physiology of captive giant anteaters (Myrmecophaga tridactyla): determinants of faecal dry matter content

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