Discussion Week6

Animal Physiology
Discussion Questions and Reading Assignments

The basic digestive system

Skim Withers Ch. 18 pp. 902-928: The generalized digestive tract with the following questions in mind.

Know:

- ☐ The basic types of food molecules
- ☐ How animals accomplish food acquisition, oral transport, digestion (mechanical and chemical breakdown, and absorption, and respective regions of the digestive tract.

Discuss:

1. What are the advantages and disadvantages of glucose, glycogen and lipids as metabolic substrates? What are the major types of animal food (e.g., grass, leaves, meat, etc. and their molecular composition)? Discuss which are easy (or hard) for animals to digest and why, how/where each type of food eaten gets broken down chemically and mechanically, and which macromolecules need to be transported across the gut wall.

2. Why do animals have regionalized digestive tracts? What are the functions of each region? What moves food through the digestive tract (be specific)? Why is the rate of movement important?

   a. Draw the ways in which animals have increased surface area of the gut?

   b. What is more conserved, gut diameter or gut length? What might be the functional reason for this? Can you think of examples to illustrate this?

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Specialized Digestive Systems

Reading assignment Withers Ch. 18 pp. 924-938: supplement 18-1: Specialized Digestive systems.

Know:

- ☐ How herbivores digest cellulose.
- ☐ How digestive systems vary with respect to diet or functional needs.

Discuss:

1. Discuss the advantages and disadvantages of foregut and hindgut fermentation. What kinds of animals do each, what are their differences in terms of food eaten (including rate of feeding), morphological differences, energy and nutrition recovered. Which nutrients are limiting, and how can they be obtained?

2. What is corporophagy, and how does it help ameliorate potential disadvantages?

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Maximal attainable body size

Read the article Clauss et al 2003 - find under "Supplemental Readings" tab on website.

1. What is the central argument of the paper? How do herbivores get larger in size? (i.e., how do they eat more food or increase digestive efficiency?) Why would there be different limits on maximal body size for foregut versus hindgut fermentors? (food quality, rate of passage, intake, limits on digestion)

2. What is the Jarman-Bell Principle? What is a reason to doubt it? If not true, what would it imply?

3. How do elephants deviate from the expected pattern discussed in (1)? Why is it so weird?

4. What is the evidence for limits on digestion (hindgut ingestia passage rate, ruminant capacity, passage rate, intake rate, etc)

5. What is so interesting about the examples at the end of the article (discuss as many as you can)? For example, why are macropod marsupials an interesting exception? What significance does the fact that they are independently evolved have to do with it?