

A Comparative Study of the Small Intestine in the Domestic Pig (*Sus scrofa*) and Domestic Cat (*Felis catus*)

I. Introduction Form fits function is a tenet of anatomists and physiologists. In other words, the form, or structure, of a particular organ, (or cell, or organelle) is related to its function. Since the digestive systems of omnivores and carnivores have to digest and absorb different arrays of foodstuffs (i.e. function differently), we will see if they have different structures. The particular aspect of structure we will look at is length.

1. Make a hypothesis about which organism, an omnivore or a carnivore, will have a longer small intestine. _____

Explain the basis for the hypothesis you made. _____

II. Methods We will comparing adult cats with fetal pigs. Since we are comparing animals of two different life stages and sizes, we'll look at **relative lengths** of small intestines. In this study, the term **relative length** refers to the **ratio** of the length of the small intestine to the length of animal. (For the purpose of this study, we'll assume that relative lengths in the fetus is that same as that of an adult.)

Relative lengths of small intestines in cats (*Felis catus*) have already been measured. They were measured in a Zoology class at RU in 1996. Lengths of the small intestine were measured after the intestine was removed from the body. To remove the small intestine from the body, it was first cut at the points it is attached to the stomach and large intestine. Scissors were used to remove as much mesentery as one could without damaging the small intestine itself, and gently the small intestine was extracted from the coelom, i.e. the body cavity. Once free from the coelom, more mesentery was cut from the small intestine, so the small intestine could be straightened as much as possible. The small intestine was straightened and, without stretching, laid out on a table top, and measured from end to end with a meter stick. The body length was measured from the most anterior point of the nose to the most posterior point on the torso; i.e. just before the most anterior portion of the tail. (It was assumed that tail length had no affect on the length of the small intestine.)

The mean relative length (small intestine length / body length) for the domestic cat was 2.53 with a standard error of 0.09. That is, for the 8 cats measured, the small intestine averaged 2.53 times longer than the cats' body length.

2. a. Make a prediction (a deduction based on your hypothesis) about what the results of your experiment will show if the hypothesis you made above is true. (i.e., which species should have the longest relative length) _____

b. Make a prediction (a deduction based on your hypothesis) about what the results of your experiment will show if your hypothesis is false. _____

3. Test your hypothesis by collecting the data from your pig, pooling your data with the rest of the class, and analyzing it with the appropriate statistical test.

4. Present your results with the appropriate graph.

5. Make a conclusion about whether your hypothesis was supported or not. In your conclusion you should:

a. say whether the data supports your original hypothesis or not. If the data does not support your hypothesis, you may write about how your original hypothesis should be modified to reflect the results of the study.

b. you should mention specifically how your statistical test was used to support or refute your hypothesis.

c. you should discuss any problems with the study that might have occurred. If you think problems with the study are so great that the conclusions are not to be trusted, you should say so, and tell how a future study could be done better.

6. What do you think (approximately) the relative length of the human small intestine would be if it were measured in the same way? Why? _____

7. Is the human digestive system best adapted for an omnivorous, carnivorous, or herbivorous diet? What parts of the digestive system apparently show this?
