In this activity, you will examine data that provide information about digestion in a variety of animals. Each question asks you to apply and analyze this information. For each question you should write your group's answer and be prepared to share it and associated reasoning with the class.

For Questions 1-8, use the data on the overhead labeled "Characteristics of Peromyscus (mice) species and their habitats."

1) Is there a relationship between average body mass and habitat? Summarize the relationship in 15 words or less. How did you determine if a relationship exists between these two factors?

2) Is there a relationship between productivity and BMR? Summarize the relationship in 15 words or less. How did you determine if a relationship exists between these two factors? Predict the BMR of *P. californicus* and *P. maniculatu*s.

3) There is a relationship between productivity and length of intestine. Describe it and provide a rationale for this relationship. Estimate the length of the intestine of *P. californicus*.

4) Is there a relationship between body mass and length of intestine? Describe the relationship, if any, and prepare a 15 word or less suggestion as to why the relationship does or does not exist. Based on the relationship between body mass and length of intestine, estimate the length of the intestine of *P. californicus*.

5) Do your estimates for the intestine length of P. californicus in #3 and #4 above match? If they match, which factor do you think has a greater influence on intestine length? If they don't match, describe how you might reconcile your two competing estimate.

6) List three abiotic or environmental factors that could alter any of the data above.

7) Is the information you've gathered from above useful in studying plants? Explain.

8) Is the information you've gathered from above useful in studying humans? Explain.

Use the table labeled "Comparison of regulatory spans of pythons and mammals" on the overhead to answer Questions 9-12.

9) In complete sentences, explain the information in the table regarding intestinal maltase activity in pythons and mammals.

10) Choose any of the intestinal data listed above. Describe why there would be differences between fasting periods and feeding periods for these data. Consider both pythons and mammals

11) After a meal, python kidney mass increases 2.1 times its pre-food (fasting) level ($\bar{x}$ = 4.5g) and mammals increase by 1.1 times (mice $\bar{x}$ = 0.35g). Do you consider these to be small or substantial changes? Why? Give two possible reasons why kidney mass might increase after eating a meal.

12) Burmese pythons usually eat once every 1-2 months, but can live for over a year without a meal. When they do eat, their prey weigh between 25% - 150% of the snake's total mass. (This is analogous to you eating something the size of yourself in one gulp.) After eating its prey, the snake curls up and stays motionless for 5-11 days to complete digestion. According to the table above, python metabolism increases 44 times after eating. If the snake is just lying there, how is this possible? Describe three ways in which metabolism could increase in a non-moving digesting animal.

Use the figure labeled "Beck's depression score in fructose and lactose malabsorbtion in females" on the overhead to answer Questions 13-17.

13) Summarize the results shown in this figure using complete sentences.

14) The boxes and lines surrounding the mean value (small square) indicate the variation or variability in the results. Suggest two reasons to explain why the authors found more variability in the FL-MA group than in the other groups.

15) Describe the effects that carbohydrate malabsorbtion may have on the physiology of an individual. In other words, if one cannot absorb carbohydrates, what happens?

16) Suggest an explanation for how depression and carbohydrate malabsorbtion are connected. You explanation should reflect your understanding of respiration, digestion, and neurobiology.

17) The data represented here were collected from females. Describe the results you would expect data from the same variables were collected from males. Defend your suggested results.

Use the tables on the overhead labeled Table 6 and Table 8 from the US CDC to answer Questions 18-21.

18) Summarize the major results presented in these tables in complete sentences. Your summary should not include numbers (percentages) or ages. Write two sentences of summary for each table.

19) In the northeast, 29% of white individuals and 19% of black individuals aged 55-64 reported eating fruits and vegetables five or more times per day. Why is the total (27%) not equal to the sum of these two percents? Be sure each member of your group can explain why.

20) Suggest two explanations for the regional differences in fruit and vegetable consumption. Could your suggestions reasonably explain the differences between age groups as well?

21) How is Table 8 different from Table 6? What is the value presenting this data two different ways? What do you think the author (i.e. the CDC) was trying to demonstrate by providing two tables?

Table 1. Characteristics of *Peromyscus* (mice) species and their habitats.				
	Approximate body mass (g)	Productivity of natural habitat	Average BMR	Length of intestine
P. eremicus	22	48	0.75	Short
P. melanophrys	45	67	0.85	Short
P. californicus	44	340	?	?
P. maniculatus	19	600	?	Long
P. leucopus	19	604	1.03	Long
Productivity is a measure of the amount of available carbon (g) per m^2 per year. Productivity also is an indication of available calories. BMR = basal metabolic rate.				

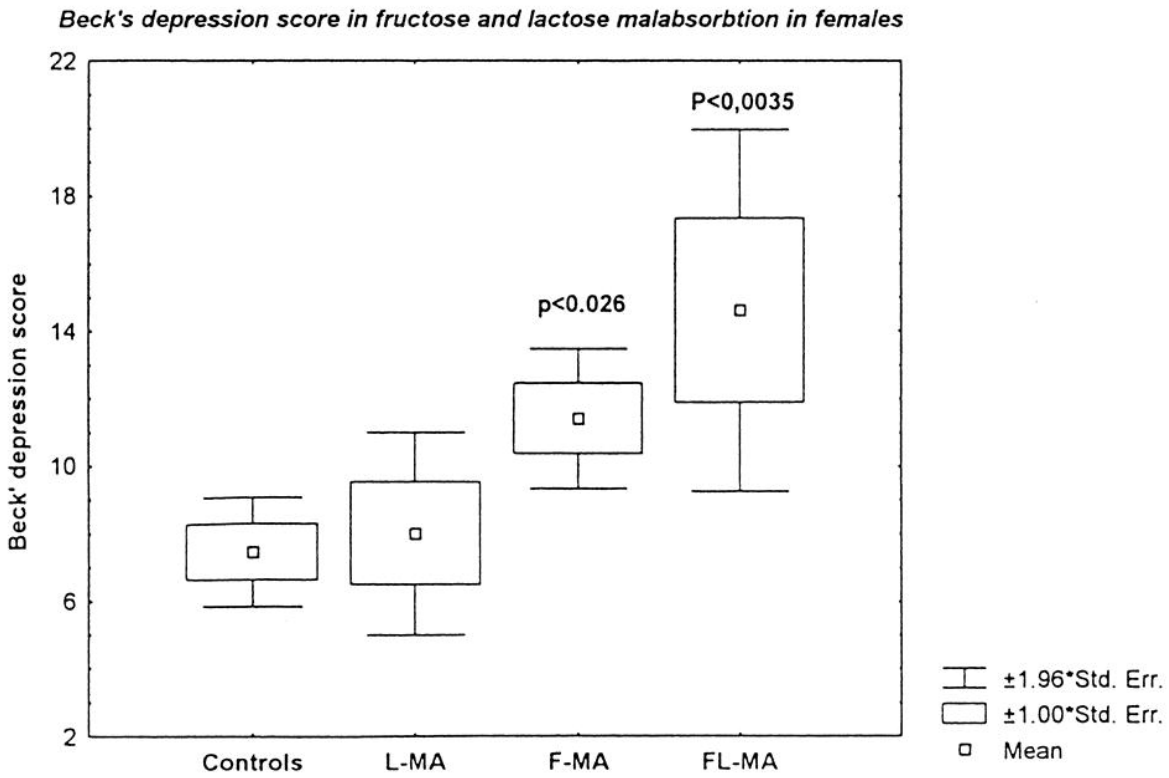
Data taken from Muller and Diamond for educational purposes. Proc. Natl. Acad. Sci. 98(22):12550-12554. Ingram and Polacek acknowledge full credit of material to authors.

Table 1 Comparison of regulatory spans in pythons and mammals

	Factorial increase	
Post-feeding response	Pythons	Mammals
Kidney mass	2.1	1.1 (m)
Intestinal mucosal mass	2.2	1.6 (m)
Plasma glucose	2.3	1.2 (h)
Plasma free fatty acids	2.5	1.5 (h)
Intestinal maltase activity	3.0	1.3 (r)
Intestinal peptidase activity	5.0	1.8 (r)
Intestinal microvillus length	6.0	1.6 (ha)
Intestinal amino acid transport rates	10	2.0 (m)
Intestinal glucose transport rates	41	1.7 (m)
Plasma insulin	41	5.0 (h)
Metabolic rate	44	1.5 (h)
Plasma cholecystokinin	52	6.5 (h)
Plasma triglycerides	160	1.7 (h)

Numbers are post-feeding regulatory spans of various quantities: that is, the factorial increase from fasting levels to peak levels after feeding. For instance, plasma triglyceride levels rise by a factor of 160 in pythons but by only 1.7 times in humans. Note that all regulatory spans are much greater in pythons than in well studied mammal species (m, mice; ha, hamsters; r, rat; h, humans). Sources: for pythons, refs 4 and 8 and personal observations; for mammals, published references available upon request.

Data taken from Secor and Diamond for educational purposes. Nature 395:659-662. Ingram and Polacek acknowledge full credit of material to authors.



Note: L-MA=lactose malabsorbtion; F-MA=fructose malabsorbtion; FL-MA=fructose and lactose malabsorbtion.

Data taken from Ledochowski et al. for educational purposes. Digestive Diseases & Sciences 45(7):1255-1259. Ingram and Polacek acknowledge full credit of materials to authors.

TABLE 6. Percentage of persons aged 55 years or older who ate fruits and vegetables five or more times daily, by region, age group, and race -- United States, Behavioral Risk Factor Surveillance System (BRFSS), 1994 and 1996

Age (yrs)/ Race	North East %	Mid West %	South %	West %
55-64				
White	29	24	28	29
Black	19	18	22	31
Total	**27**	**24**	**27**	**30**
65-74				
White	35	31	31	38
Black	27	20	25	--
Total	**34**	**31**	**30**	**37**
>=75				
White	35	37	33	39
Black	21	27	21	--
Total	**34**	**36**	**32**	**38**

TABLE 8. Percentage of persons aged 55 years or older who ate fruits and vegetables 5 or more times daily, by race, age group, and sex -- United States, Behavioral Risk Factor Surveillance System (BRFSS), 1994 and 1996

	Race	
	White	Black
Age (yrs)/Sex	%	%
55-64		
Men	22	18
Women	33	24
Total	**28**	**21**
65-74		
Men	28	17
Women	37	29
Total	**33**	**24**
>=75		
Men	30	21
Women	39	24
Total	**35**	**23**

Data taken from Kamimoto et al for educational purposes. MMWR 48(SS08):89-130. Ingram and Polacek acknowledge full credit to author.