

Two Strategies of Digestion in Hoofed Mammals

| | Ruminant | Non-ruminant |
|--|--|---|
| Representative species | Buffalo , cows, sheep, goats, antelope, camels, giraffes, deer | Zebra , pigs, horses, asses, hippopotamus, rhinoceros |
| Does the animal regurgitate its cud to chew material again? | Yes, regurgitation Grass is better prepared for digestion, as grinding motion forms small particles fit for bacteria. | No regurgitation Bacteria can not completely digest cell walls as material passes quickly through, so stool is fibrous. |
| Where in the system do you find the bacteria that digest cellulose? | At the beginning, in the rumen This first chamber of its four-part stomach is large, and serves to store food between rumination and as site of digestion by bacteria. | Near the end, in the cecum In this sac between the two intestines, bacteria digest plant material, the products of which pass to the bloodstream. |
| How would you compare the nutrition obtained via digestion? | Higher Nutrition Reaps benefits of immediately absorbing the products of bacterial digestion, such as sugars and vitamins, via the small intestine. | Lower Nutrition The digestive products made by the bacteria are produced nearer the end of the line, after the small intestine, the classic organ of nutrient absorption. |
| Which animal spends more time each day actually picking grass? | Less Time Foraging Has a large stomach for storage, and can regurgitate as needed. Also able to efficiently extract nutrients from plant material. | More Time Foraging A single stomach means many small meals a day. Also, system needs to process higher volume to gain adequate nutrition due to low quality feed. |
| How would you compare the speed of digestion? | Slower Digestion Takes more time to regurgitate, re-chew, digest, and absorb all parts of plant. | Faster Digestion No regurgitation leads to lower efficiency in obtaining nutrients. Must eat about twice as much as ruminants at approximately twice the speed. |

| COMPARISON BY LENGTH (m) | | |
|--------------------------|--|---------------|
| Buffalo | | Zebra |
| Ruminant | | Non-Ruminant |
| 1 | | 1 |
| 48 | | 20 |
| 1 | | 1 |
| 10 | | 8 |
| 60 | | totals |

| COMPARISON BY VOLUME (L) | | |
|--------------------------|-----------------|--------------|
| Buffalo | | Zebra |
| Ruminant | | Non-Ruminant |
| 160 | stomach | 10 |
| 65 | small intestine | 65 |
| 10 | cecum | 30 |
| 25 | large intestine | 95 |
| 260 | totals | 200 |

(NOTE: Data is estimated from measurements of domestic cattle and horses, respectively)

Discussion Questions:

- ❖ Why does the Buffalo's stomach hold so much food?
- ❖ Why does the small intestine need to be so long? How does this contrast with the esophagus?
- ❖ Why does the large intestine need to be so long?
- ❖ How is the Zebra stomach different, and what does this mean for the animal?
- ❖ Why is the Zebra cecum more full than that of the Buffalo, even though it's the same size?
- ❖ How might the plant matter in the large intestine of the Zebra be different than that in the Buffalo?
- ❖ What is the role of the small intestine? Why is this organ so much longer in the Buffalo?