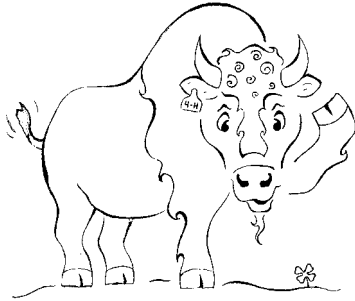


# Digestion of the Bison



**Roll Call:**

Name an animal.

\_\_\_\_\_

Is this animal ruminant or monogastric?

\_\_\_\_\_

**Now, name as many ruminant and monogastric animals as you can.**

Ruminant

Monogastric

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Because your diet is so different from that of the bison, it is logical that your digestive system would be very different also.

How is your stomach like the bison's stomach?

\_\_\_\_\_

How is your stomach different from the beef animal's stomach?

\_\_\_\_\_

\_\_\_\_\_

(The information on the next few pages will help you answer these questions!)

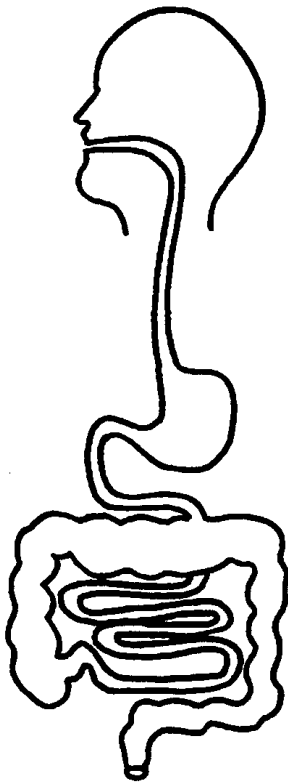
## Activity: let's compare



Draw a line from the labels in the center of the page to the diagrams on either side. On the right is the digestive system of the beef animal and on the left is your digestive system.

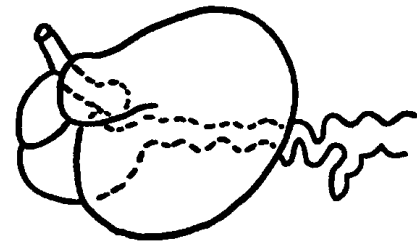
### The human

You have a monogastric (single stomach) digestive system.



### The bison

The bison has a ruminant digestive system. (four compartment stomach)



- mouth •
- esophagus •
- stomach •
- rumen •
- reticulum •
- omasum •
- abomasum •
- small intestine •
- large intestine •
- anus •

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**Let's compare** We have looked at the parts of the digestive system, and already know about the role each part plays in digestion. The digestive tract of the bison is most similar in size to that of cattle; therefore it is important to consider this when you read the following chart.

Volume as a % of the total digestive tract					
Digestive Compartment	Cattle	Sheep	Horse	Pig	Man
Total stomach (%)	70.8	66.6	8.6	29.2	18.8
Small intestine (%)	18.5	20.5	30.2	33.3	62.4
Cecum (%)	2.8	2.6	15.9	5.6	-----
Large intestine (%)	7.9	10.3	45.3	32.9	28.8
Total capacity	356.0	44.0	211.0	28.0	6.0

**From this information, there are several interesting things to note.**

- Look at the stomach as a total percentage of the digestive tract in the ruminant animals – sheep and cattle. Their stomachs make up a large part of their digestive system. The stomachs of the monogastrics - horse, pig and man make up a much smaller percentage of the digestive system.
- Look at the percentage occupied by the stomach in the ruminants – sheep and cattle. Look at the total capacity of the digestive system. Figure out the capacity of the ruminant stomachs – 29.3 liters in sheep 252 liters in the cow. Those are tremendous capacities, especially when you consider them in relation to the size of the animal.
- Note the percentage of the total digestive tract that is occupied by the large and the small intestines in comparison between the ruminants and the non-ruminants.

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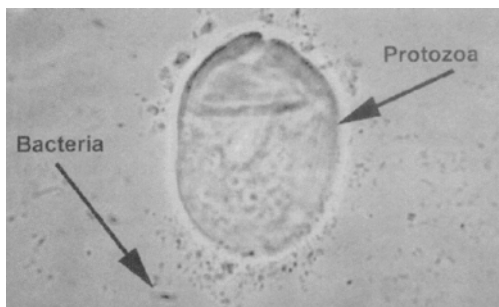
- The horse has a large cecum, the ruminants have a smaller one, and the human has no cecum. The cecum is a small part of the large intestine and aids slightly in digestion.
- Note that the animals that use their food for growth, fat and muscle production, and reproduction have more capacity than man, who uses his food primarily for maintenance and energy.

These are all very interesting and important points, especially for understanding how the different types of animals can utilize such different feeds. Although the bison is most comparable to cattle, the following chart shows us a comparison between the retention time and dry matter digestibility of forages between bison and cattle.

	Bison	Cattle
Total tract retention time (h)	78.8	68.7
Dry matter digestibility (%)		
Sedge Hay	64	58
Grass Hay	74	62
Alfalfa/brome Hay	50	52

### What do you think this says about the digestibility of the bison?

The longer feed retention means that bison have more time to digest the fibre in feeds such as sedges and grasses. However, notice that when the bison is consuming alfalfa or alfalfa brome hay there is virtually no difference in digestibility. This is because the fibre level of alfalfa-based forages is typically lower than in grasses and sedges.

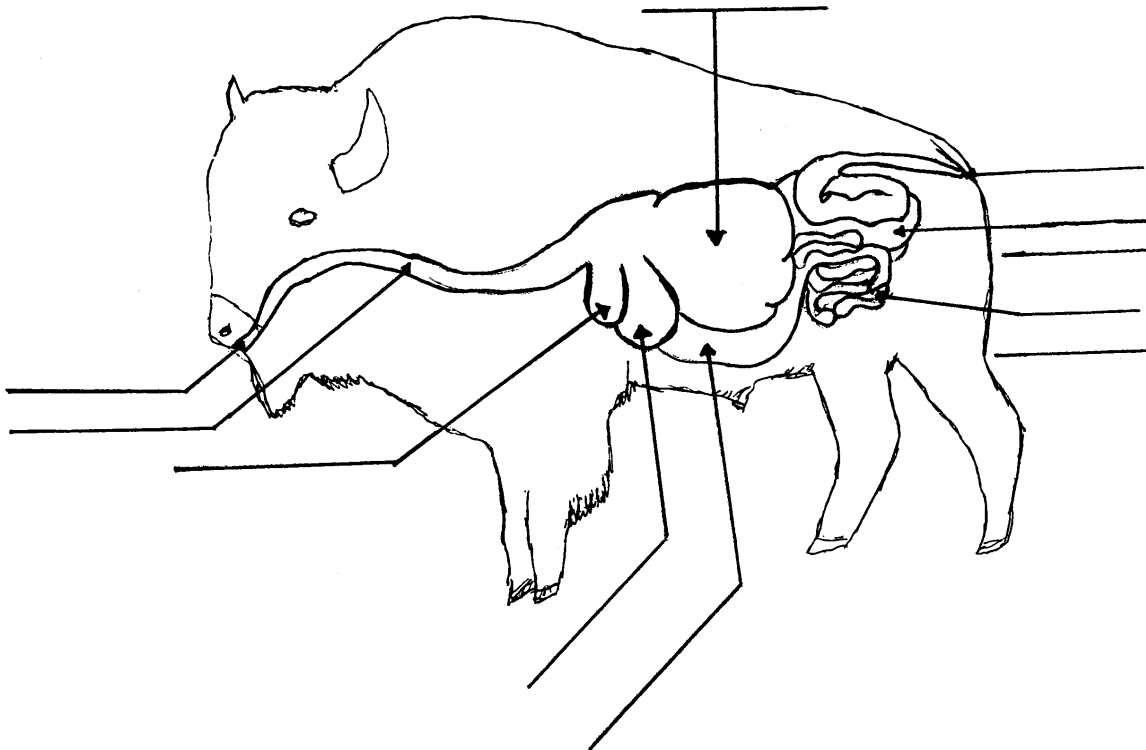


Like all ruminants, there are thousands of bacteria and protozoa that make their homes in the rumen and reticulum of the bison. These tiny organisms utilize the fibres in forages and the starches in grains to produce acetic, propionic and butyric acids. These acids are then absorbed through the wall of the rumen into the blood stream to be converted into energy by the liver.

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Review activity:

Can you label all of the parts?



### Activity: Matching



In the blanks, put the number and the letter that correspond to the description and function of the part of the ruminant digestive system.

Part of the digestive system	Description	Function
Mouth	_____	_____
Esophagus	_____	_____
Rumen	_____	_____
Reticulum	_____	_____
Omasum	_____	_____
Abomasum	_____	_____
Small intestine	_____	_____
Large intestine	_____	_____
Anus	_____	_____

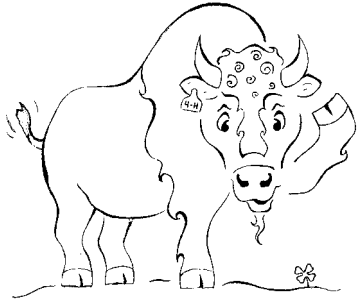
#### Description

- 1 - body opening through which food enters
- 2 - wider, shorter tube
- 3 - very similar to the human stomach
- 4 - compartment with many folds or "leaves" in the lining
- 5 - long, narrow, coiled tube
- 6 - large compartment referred to as the "paunch"
- 7 - compartment lined with many "honeycomb-like" projections
- 8 - body opening through which the material exits
- 9 - long muscular tube

#### Function

- A - adds digestive juices
- B - allows the food to enter the body
- C - tunnels food from the mouth to the stomach
- D - allows the undigested materials to leave the body
- E - place where the microbes begin to attack the food
- F - absorbs water and adds mucus to help materials move
- G - moves finer material on to next stomach, regurgitates coarser materials
- H - more juices added to help digest the material
- I - contractions squeeze out fluid and grind food

# Nutrient Requirements of the Bison



**Roll Call:**

Name a nutrient. \_\_\_\_\_

Name a feed item that is a good source of this nutrient.

\_\_\_\_\_

From the answers to the roll call in your club, complete this chart. Once your roll call is finished, work together with other members to add as many items as you can think of.

Nutrients	Good sources of this nutrient	

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### What is?

There are five nutrients that are essential for the bison. An essential nutrient is one that performs a special function in the body. Therefore, it must be available in the body if the animal is to live and function.

### The essential nutrients are

- Water
- Protein
- Energy
- Vitamins
- Minerals

### How much of a nutrient is required?

Animals have different requirements for nutrients depending upon their body activities. We can divide the animals into the following groups. Match the animal to the appropriate group.

Maintenance	the growing calf
Maintenance plus reproduction fattening steer	the lactating cow and the
Maintenance plus growth	the bull after breeding season is complete
Maintenance plus production	the pregnant cow

The normal body functioning or maintenance requirements of the animal must be met first. Only then can reproduction, growth or production occur.

Remember, the bottom of the bucket must be filled before you can begin to fill the top.



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There are other factors that affect the amount of each nutrient the animal needs.  
**Some of these are**

- environment
- temperature
- room for exercise
- stress
- age
- sex

Once bison reach 18 months of age, they begin a lifetime cycle of winter weight loss followed by spring/summer weight gain. This weight loss in the wintering is a result of a reduced metabolic rate and cannot be changed; hence the importance placed on prior planning for autumn weight gain.

## Vitamins for Bison

This chart provides a summary of information on the vitamins bison require. After reading through the chart, answer the questions that follow.



Vitamin	Source	Importance
A	<ul style="list-style-type: none"> <li>- added to diet</li> <li>- green forage</li> </ul>	<ul style="list-style-type: none"> <li>- most important vitamin for bison</li> <li>- needed for vision, bone development, healthy skin and tissue, reproduction</li> <li>- content in feed declines as feed ages</li> <li>- forages contain carotenes which the body uses to make vitamin A</li> <li>- stored in the body up to six months</li> </ul>
B	<ul style="list-style-type: none"> <li>- made in rumen</li> </ul>	<ul style="list-style-type: none"> <li>- not stored in the body, water soluble</li> <li>- there are many B vitamins (riboflavin, thiamine, niacin and so on)</li> </ul>
C	<ul style="list-style-type: none"> <li>- made in body</li> </ul>	<ul style="list-style-type: none"> <li>- not stored in the body, water soluble</li> <li>- man can not make his own</li> </ul>
D	<ul style="list-style-type: none"> <li>- sunshine</li> <li>- sun-cured forages</li> </ul>	<ul style="list-style-type: none"> <li>- need for strong bones and growth</li> <li>- animals kept inside and fed silage may need Vitamin D supplements</li> <li>- stored in the body, fat soluble</li> </ul>
E	<ul style="list-style-type: none"> <li>- green forages</li> <li>- whole grains</li> </ul>	<ul style="list-style-type: none"> <li>- works with selenium in muscle action</li> <li>- stored in the body, fat soluble</li> </ul>
K	<ul style="list-style-type: none"> <li>- green forages</li> <li>- made in rumen</li> </ul>	<ul style="list-style-type: none"> <li>- needed for blood clotting</li> <li>- moldy sweet clover restricts K action</li> <li>- stored in the body, fat soluble</li> </ul>

## Activity: "Which Vitamin(s)..."



- \_\_\_\_\_ is made by the bison but not by the human?
- \_\_\_\_\_ is the sunshine vitamin?
- \_\_\_\_\_ is most often deficient?
- \_\_\_\_\_ would be supplied if you fed leafy, green forages?
- \_\_\_\_\_ works together with selenium to cause muscle action?
- \_\_\_\_\_ is made in the rumen?
- \_\_\_\_\_ is needed for good vision?
- \_\_\_\_\_ is needed for strong bones?
- \_\_\_\_\_ is deficient if your animal bleeds heavily from a minor wound?
- \_\_\_\_\_ is not stored in the body?

## Minerals for Bison

### Macro minerals

Unscramble the letters to name the macro minerals.

There are seven macro minerals known to be essential to the bison. These minerals are required in fairly large amounts.

MI DOUS \_\_\_\_\_

LI NORCHE \_\_\_\_\_

CAMCULI \_\_\_\_\_

RUPHOSSOPH \_\_\_\_\_

MI EMI GAUNS \_\_\_\_\_

MATPI SOSUY \_\_\_\_\_

FULRUS \_\_\_\_\_

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### Micro minerals

There are many micro minerals known to be essential to the beef animal. Micro minerals are those minerals required in very small or trace amounts.

NEDIOI \_\_\_\_\_

LATBOC \_\_\_\_\_

NOIR \_\_\_\_\_

GEMANSENA \_\_\_\_\_

CI ZN \_\_\_\_\_

LUMI SENE \_\_\_\_\_

PORPEC \_\_\_\_\_

DYNMULEBOM \_\_\_\_\_

What is the difference between macro minerals and micro minerals?

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**NOTE:** Although the micro minerals are required in smaller amounts than the macro minerals, they are NOT any less important.