

life-cycle, they too become a nutrient source for cattle. Then the feed moves on into the omasum, a very muscular chamber that works to "squeeze" water out of the feed. The final chamber in the stomach, the abomasum. This is the chamber most similar to the human stomach. The abomasum is the acidic area where the protein breakdown takes place before the material moves on into the intestinal tract.

Why do we do this? Because the rumen makes the cattle's digestive tract so specialized, most of the interest in research lies here. By having animals with ruminal cannulas, researchers are able to perform extensive nutritional studies that would otherwise be impossible. Researchers may, for example:

Measure microbial digestibility of plant and feed materials.

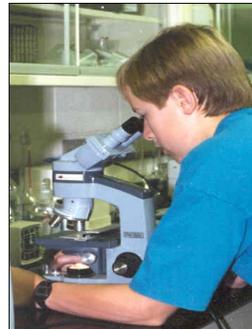
This is done by using nylon bags or by invitro (in a tube) digestion trials. The nylon bags have a pore size that is so small that the feed materials put in them cannot escape but the microscopic microbes in the rumen can travel in and out of the bag. By knowing the dry weight of the nylon bag and the weight of the sample, we can determine how much the microbial population digested by leaving the bags in the rumen for a set amount of time, washing them, weighing them back, and subtracting the differences in the weights.



Help us determine what cattle select to eat and the quality of their diet. We can completely empty the rumen of its contents, then turn the steer out to graze. We can then bring the steer back in, and remove the contents of the rumen, which will tell us what he ate and the quality of the forage. After that, all of the original material is returned to the rumen. We can also weigh the contents to determine how much feed is in his rumen.

Study microbial populations and what they can do. Research with cannulated animals has shown that the rumen has a diverse population with numerous microbial species, each performing different, but important functions.

Provide an educational tool for children and those interested in agriculture. As an educational facility, we provide tours for school children and interested groups who often get to meet Pincushion, and feel inside the his rumen. Our intent is to educate the public on the humane use of animals in research and the benefits this research provides to the agricultural community and its consumers.



Holey Cow!

Pincushion the Cannulated Steer



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Frequently Asked Questions

What's wrong with that steer? Nothing is wrong with the steer. He has a surgical fistula with a cannula inserted that allows for a permanent opening or entrance into his stomach.

What is that on his side? The flexible plastic ring you see is the outside of the cannula insertion. It is duplicated on the inside, making it look similar to a donut.

Where does the hole go? The fistula goes directly into the largest compartment of the steer's stomach, the rumen.

How did it get there? The fistulation surgery is a simple procedure that requires only a local anaesthetic similar to what a dentist would give you for inserting a filling. The stomach wall lays next to the animal's skin or hide. A hole is cut through the hide and the stomach wall and the two are sewn together. The cannula is then inserted into the hole. The animal is given antibiotics to prevent any infections from setting in, and aspirin to help with any post-surgery discomfort.

Does it hurt him? After the surgery, he will require a healing time, just as you would. After healing the incision will become a scar and does not cause him any pain. The cannula is not connected to him in any way, but provides him with a seal or cover to protect his stomach environment. The cannula can be removed and replaced if needed.

Can he lay down on that side? He can and will lay on which ever side he feels like at the time. The cannula does not prevent him from laying on one side or the other.

Does it get infected? While the incision is in the healing process, it is monitored very carefully to make sure no infection occurs. After the incision has healed, the chances of an infection are very small. The animals are inspected regularly to make sure that nothing has collected under the cannula that might rub and cause a sore, which could potentially cause problems.

How long has he had it and will he have it for his whole life? The cannulated animals we use are typically 6 to 9 months of age when they are fistulated. The animal will have the cannula in for his entire life. Pincushion is 11 years old, so has had the cannula for about 10 $\frac{1}{2}$ years.

Why does he smell bad? The smell is from the gasses produced by bacteria, protozoa, and fungi that live in his rumen. The gasses are by-products of the microbes digestion of the fiber in his stomach.

Do you feed him through it? For normal, day to day feeding, the cannulated animal will feed himself in the traditional way...through his mouth. When digestion experiments are being conducted, specific feed samples in special

cloth bags will be placed in the rumen via the cannula.

What is a ruminant? A ruminant is an animal that has a multiple chambered stomach and regurgitates its food. Well known domestic ruminants are cows, sheep, and goats. Familiar wild ruminants are elk, buffalo, antelope, deer, moose, mountain goats, and big horn sheep. A horse is not a ruminant. Horses have a simple stomach.

How many stomachs do cattle have? Contrary to popular belief, cattle has only one stomach. That one stomach, however, has four compartments. The four compartments are the reticulum, rumen, omasum, and abomasum. The reticulum is the first chamber that the food enters after swallowing. This is where food is regurgitated. This allows cattle to re-chew (chewing cud) their feed into smaller, more digestible pieces. The rumen is the largest compartment, and the most important for fiber digestion. The rumen takes up the majority of the left side of the body and can be as large as a 55 gallon drum. This is where cellulose, or fiber, breakdown takes place. Bacteria, protozoa and fungi make up the microbial population that functions in a symbiotic relationship with cattle and digests fiber. Cattle get their food broken down into nutrients they can digest and utilize, while the microbes get their own nutrient requirements met. They also receive a stable, anaerobic, warm environment. Once the microbes have completed their