# Undergraduate Research: Studying In-Situ Ruminal Fiber Digestibility in Dairy Cows

COLLEGE OF AGRICULTURE AND LIFE SCIENCES
VIRGINIA TECH

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## Introduction and Overview

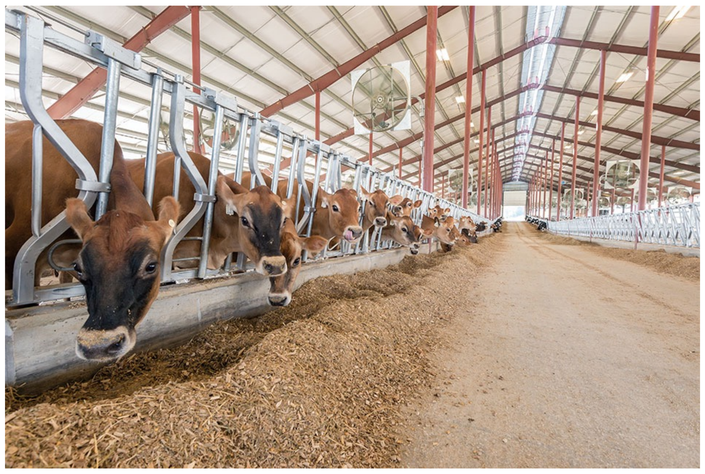
**Where:** My capstone project has been primarily located in the *Dairy Nutrition Laboratory in Litton-Reaves Hall*, located on the Virginia Tech campus. I also had the opportunity to spend time working at the *Dairy Science Complex at Kentland Farm*, located about 20 minutes from Tech's primary campus.

**Who:** *Dr. Gonzalo Ferreira* and his extensive team. I began a job working with associate professor and experienced extension dairy scientist, Gonzalo Ferreira.

**When:** I began this job in October of 2022, and am still presently working in this position.

**What:** The project Dr. Ferreira is currently heading is a multiple year research project concerning fiber digestibility in dairy cows, focusing on a variety of forages harvested at different maturities. I have been working in the dairy nutrition laboratory to analyze rumen digestion kinetics.

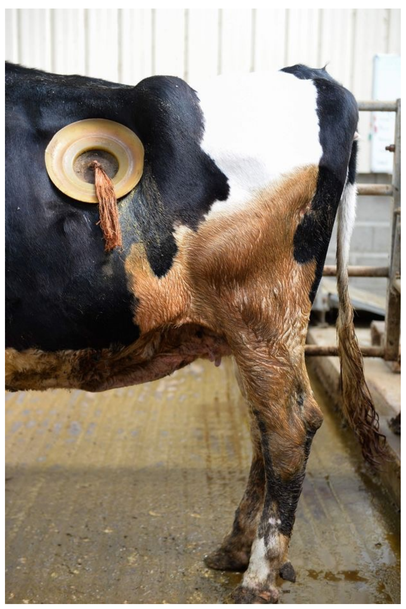
**Why:** This research project is funded by grants from dairy farmers who are hoping to better understand rumen fiber digestibility in their livestock. This would subsequently allow the optimally digestible forage to be utilized in a more efficient feed, enhancing growth and production in dairy cattle.



**Above:** Dairy Cattle at the Kentland Farm Dairy Science Complex

## My Capstone Objectives

- ✓ Obtain Hands-On Lab Experience for Future Career Endeavors
- ✓ Learn How to Perform In-Situ Procedures
- ✓ Learn How to Utilize Software to Analyze Large Sets of Data
- ✓ Perform Statistical Analyses
- ✓ Become Competent with a Wide Variety of Lab Equipment
- ✓ Explore a New Side of Animal Science!

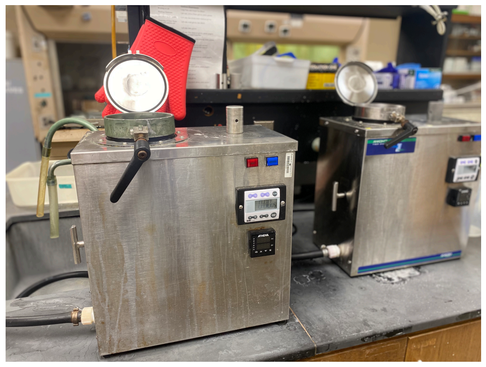


**Above:** Example of a Rubber Canula Inserted into the Rumen of a Dairy Cow

## The Lab Work

I spend the majority of time in the Dairy Nutrition Laboratory. My tasks within the lab primarily consist of:

1. Running Neutral Detergent Fibers
2. Preparing Forage Samples for In-Situ Experiments
3. Weighing Back Fiber Samples Post In-Situ and NDF
4. Recording Data for Analysis



**Left:** ANKOM 200 Fiber Analyzer
I utilize this machine consistently to run fiber analyses using neutral detergent to wash 144 different forage samples post in-situ digestion.

**Left:** The main area of the Dairy Nutrition Lab where I spend the majority of my time.

## What is an In-Situ Study?

**What In-Situ Means in Dairy Cows**: In-Situ research in dairy cows entails the use of one or more cannulated cows in order to insert material directly into the rumen of the animal to allow studies pertaining to digestion.

**What is a Cannulated Cow:** A cow that is "cannulated" means that a large rubber canula has been surgically implanted into the side of the animal. This allows farmers and scientists direct access to the rumen of the cow. The canula is painless and is tightly sealed from outside contact when not in use.

**Left:** Here I am removing some of the bags of fibers from one of our cannulated cows at Kentland Farm, after which I rinsed and dried them. These fibers were analyzed shortly after.
I was initially intimidated when it came to working with cannulated cows. As you can imagine, the stomach contents of a cow do not smell great. Luckily, the two cows I worked with were very patient.

## In-Situ Materials and Methods

**Materials:**

- 3000+ forage samples, weighed, placed into filter bags, and sorted into their respective 144 categories
- Permeable laundry bags in order to organize filter bags by in-situ digestion time
- Two Canulated Cows

**Methods:**

- Nine laundry bags, filled with fiber samples in filter bags, were assembled and labeled by color to differentiate each by their time. This process was repeated to have one for each cow.
- All nine bags were placed within the rumen of both Cow 1 and Cow 2, and the canula was resealed
- The laundry bags were then removed at 0 hours, 3 hours, 6 hours, 9 hours, 12 hours, 24 hours, 36 hours, 72 hours, and 144 hours of digestion time within the rumen
- After each removal, the bags were rinsed 3 times, sorted, and fully dried in an oven
- The bags were then taken to the lab to be ran and analyzed

## Results

As this is an ongoing research project, no conclusive results have been determined as of yet. However, through my continued analyses of the bags, it is clear that there are forages which had been digested much more effectively than others. I am looking forward to the conclusion of the research project to see the final results of years of Dr. Ferreira's work.

## Conclusion

Overall, my capstone experience has been a rewarding, informative, and exciting experience. When I first took this job and began my capstone project, I had no idea I would be working hands-on with the actual dairy cows until Dr. Ferreira asked me to participate. I am so happy to have had such invaluable experience working with animals I usually do not get to. I was looking forward to working in a lab, and though I initially did not know much about nutrition, I have found a new interest of study for my future endeavors. I have learned how to operate a multitude of laboratory equipment, use software to analyze data, and have networked with a variety of professionals in the research field. This project has me considering a future career working in a lab in the field of nutrition.

## Contact information

If you would like to learn more about my capstone experience, feel free to contact me at bridgeth19@vt.edu and I would be happy to answer any questions you may have!

**Left:** Litton-Reaves Hall, where I conduct the majority of my research