VOL. 1 ISSUE 9 · NOVEMBER 2021

# CATTLECAL NEWSLETTER

## ANNOUNCEMENTS

Welcome to the CattleCal newsletter for November 2021! In this issue we have exciting information on forage inclusion in feedlot diets, the career and research of veterinary epidemiologist Dr. Wendi Jackson, and a look at a study examining the effect of implant strategy on Holstein steer performance and carcass characteristics. If you would like to hear more detailed conversations about the articles in this issue look for our CattleCal podcast on Spotify. Descriptions of this month's episodes and a link to the podcast can be found on page 3. If you have any questions, comments, or would like to submit a question for our Quiz Zinn segment, feel free to contact us. Our contact information can be found on the last page of the newsletter.


## This issue:

# THIS MONTH IN RESEARCH

This month we continued our two research projects as well as collecting respiration rate data and mud depth measurements. Cattle had a greater DMI and ADG as the weather improved and heat dissipated compared to September. In October we saw average maximum temperatures of 88° F and average minimum temperature of 56° F.

## PERFORMANCE SUMMARY

| | |
|---|---|
| Body weight (d 223) | 1039 lbs |
| Body weight (d 251) | 1116 lbs |
| ADG | 2.73 lbs/d |
| DMI | 18.8 lbs/d |
| F:G | 6.90 |

**October 2021**

**November 2021**

# CATTLECAL PODCAST NOVEMBER EPISODES

## Quiz Zinn - CCP#034

In this episode, we asked Dr. Richard Zinn about recommended forage inclusion rates for a feedlot diet.

## Career Call - CCP#035

This week Brooke Latack and Pedro Carvalho called Dr. Wendi Jackson the Leader of the Surveys and Studies section of the antimicrobial use and stewardship program for the California Department of Food and Agriculture. She talks with us about her career and her extensive travel experienced as a veterinarian.

## Research Call - CCP#036

This week Brooke Latack and Pedro Carvalho speak Dr. Wendi Jackson. This week they discuss her work looking at how management at the calf-ranch affects liver abscess incidence in calf-fed Holstein steers.

## Feedlot Research Call - CCP#037

This week, Pedro Carvalho and Brooke Latack discuss research looking at the effect of implant strategy on performance and carcass characteristics of calf-fed Holstein steers in the feedlot.

**Listen on Spotify at this link:**
https://open.spotify.com/show/6PR02gPnmTSHEgsv09ghjY?si=2zV59nGbSE2mf8DiOqZLhw

**Have any questions, comments, or suggestions? Want to send in a Quiz Zinn question? Contact the creators through the below email or through their social media profiles.**

- Email: cattlecalucd@gmail.com
- Website: cattlecal.sf.ucdavis.edu
- Instagram: @cattlecal

# QUIZ ZINN

## What is the recommended forage inclusion rate for feedlot cattle?

This is a very important question that I often receive. It's actually a little bit controversial. There are a lot of factors involved. This could be a very long answer, but we will give a short answer here.

### *Forage as a functional feed*

At the very beginning what we need to understand is that forage is a functional feed. We put forage in the diet not so much for energy value but for it's function. In that context we should understand that saliva production is very closely associated with dietary effective fiber. Because of this the National Research Council uses the pit equation which estimates ruminal pH based on effective fiber inclusion rate in the diet. Basically, based on the Pit equation, for every 1% increase in dietary effective fiber you have a 0.04 unit increase in ruminal pH. This is the critical factor involved in fiber. We should put as much fiber in the diet as we could to optimize ruminal pH, but there are limits, which is what we've run into in the feedlot.

### *Effect of forage on dry matter intake and performance*

There are some practical considerations. First, maximum dry matter intake for feedlot cattle averages about 1.9% of their average body weight (the average from the initial weight to the harvest weight) during the feedlot period. If anything, we do would reduce that dry matter intake will have potential impact on animal performance. Dietary energy density is a major factor. As a generalization for feedlot cattle, the minimum net energy for maintenance value of the finishing diet should not be less than 2.05 Mcal/kg. When that net energy for maintenance goes below that number, you are going to have a decrease in average daily gain. This is especially critical for cattle that have a high genetic potential for growth. Diet energy density is going to be an important factor. As we dilute the diet with forage, we have a potential effect of hitting that minimum value of 2.05 Mcal/kg. The maximum dry matter intake is going to be affected by the forage NDF of the diet. Galleon and his group developed a generalized equation indicating that for every 1% increase in forage NDF, then dry matter intake will decrease by about 0.0275%. We can see that as we move up in forage NDF, then we are going to have an impact on dry matter intake. This is going to be especially critical for diets that may have lower energy density to start out with.

### *How much forage to put in the diet?*

Based on what I've mentioned, for diets that have a lower energy density to start out with (dry processed corn diets, for example) then we would want to have a minimum of 4% forage NDF. For diets with a high energy density to start out with (flaked corn diets, for example) we will want to have a minimum of 7% forage NDF in the diet. As we increase the amount of forage in the feedlot operation, especially large feedlot operations, forage processing can become a bottleneck in production of feed.

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**Example**: We have the calf-fed Holsteins. The Holstein has a great capacity for feed. Their digestive tract is slightly different than typical beef breeds. We can feed up to 20% forage NDF to calf-fed Holstein steers and have improved carcass adjusted average daily gain. Their carcass adjusted average daily gain would be about 5% greater by increasing the amount of forage in the diet.

### *Cost of forage*

Typically, forage is very costly due to it's low energy density, but with these very high corn prices we are seeing, that might not be the case. It may be possible to economically include greater forage in the diet and improve performance for long fed cattle.

### *Forage quality*

Forage quality matters. You might have forages that differ considerably in effective NDF, some forages are very difficult for the animal to reduce in particle size to leave the rumen. The efficiency of reducing the particle size of that forage in the rumen may be reduced. An example of that would be sugar cane bagasse. This forage is very difficult for the animal based on chewing and rumination to reduce the particle size. Because of this very low digestibility, rumen retention time can be very high. This can be a very serious problem affecting performance of feedlot cattle. We have to be careful and understand the limitations of certain types of forages and their impact on animal performance. This impact increases as energy density of the diet decreases. If you're feeding a dry processed grain, the impact of forage inclusion will be extremely important.

### *Important note:*

It is important to look at forage as forage NDF.

# CAREER CALL WITH WENDI JACKSON

**This month we talk to Dr. Wendi Jackson, a veterinary epidemiologist surveys and studies lead for the Antimicrobial Stewardship branch for CDFA.**

***Where are you from and what do you do?***

I grew up in Southern California, specifically in Orange County in the city of Lake Forest which is south of Irvine. I did not grow up in agriculture. I think the closest I had gotten to cattle prior to my undergraduate studies was the beef herds that used to graze some of the open land in Irvine or at the Orange County Fair. I quickly found an interest in working with cattle once I went to Cal Poly San Luis Obispo as an undergrad animal science pre-vet major. Today I am a veterinary epidemiologist, so I've had a rather circuitous path to where I've ended up today as a Surveys and Studies lead for the Antimicrobial Stewardship branch for CDFA. It's a really dynamic position that incorporates research but also policy and guiding antibiotic stewardship practices in the state and also monitoring trends in antibiotic susceptibility across the various livestock industries in the state. It's essentially a nexus of a lot of the previous work I've done, and I guess interact with great researchers like Pedro who we work with through our research contracts in the program.

***How and when did you decide to go into animal science and vet school?***

I think early on, like a lot of people that become veterinarians, I had an affinity to animals. I grew up mostly with just domestic companion animals like cats and rabbits. My twin sister and I wanted to both be veterinarians. We went together to Cal Poly because they had one of the preeminent pre-vet programs and they were well known for feeding students into that veterinary program at UC Davis because Cal Poly has their hands on learning motto. Students come out with a lot of practical skills, especially with regards to working with food animals that are definitely beneficial as you move into your veterinary studies. It was a bit intimidating when my sister and I arrived because we literally didn't know anything about working with cattle. But we had the benefit of some really great mentors and instructors that had been in the beef industry for many years. One of which was Doctor John Beckett, Mike Hall, and Joel Judge who are all very well known in the beef industry now and they really provided us with a lot of guidance and opportunities through enterprise projects that allow students to manage herds of cattle. I was involved in managing a first calf heifer enterprise project, where we would go out in the middle of the night and ensure calvings were going normal. I also helped to manage the Escuela Enterprise Project, which is a cow calf operation just north of San Luis Obispo and a stocker cattle enterprise at Pacific ranch that overlooks the Pacific Ocean north of Santa Cruz. That ranch, unfortunately, burned last year in the fire. They have plans to rebuild, but it was a huge loss for the campus because it's a really important location for a lot of different learning experiences for students in the Cal State system.

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# CAREER CALL WITH WENDI JACKSON

***Can you talk about going from undergrad to your master's program?***

When I was in undergrad I moved to Germany for a year to do a study abroad program. Halfway through the year I moved to an agriculture school called the University of Hohenheim, which is outside of Stuttgart in southern Germany. It's a world renowned agriculture school. There I got to meet a lot of different students from other countries who were studying animal agriculture in the tropics and subtropics and International Development. It just opened my eyes to the possibility of other aspects of animal science outside of preparation for vet school that I was interested in. The topic of cattle production across different landscapes was really interesting. When I returned for my final year at Cal Poly, Dr. Beckett had created another type of experimental course. It was more oriented toward international animal agriculture. Having just traveled a bunch and really seeing the intersection of my interest in cattle production and International Development I wanted to pursue more research oriented topics. I was put into communication with Doctor Frank Mitloehner who happens to be from Germany. Maybe that was our initial connection. I really appreciated the burgeoning topic of air quality related to dairy production in the state and ways to evaluate the environmental aspects of our different intensive livestock production systems so that we can addressed issues that will make them more sustainable moving forward. I ended up being accepted into the Master's program at UC Davis after working for a year as a Veterinary Technician. Then I worked with Frank on a lot of the early projects that we had in collaboration with Berkeley about monitoring real time greenhouse gas emissions from dairy cattle under controlled conditions. For my actual Master's project I was looking at different levels of crude protein and the impact on ammonia emissions from dairy heifers in his "bio bubbles" which have a directional air flow and we can measure ammonia missions with the chemistry set up. It was really great because I got to use my applyed knowledge of working with cattle but also bring in that knowledge base how cattle can potentially affect different emissions that we all know and care about today and ways that we can try and mitigate those moving forward.

***What was your experience studying and living abroad? How much did it affect your life?***

That's a very important question because it completely re-directed me in my life and my interests. I think being an outsider makes you feel very vulnerable at first when you're living abroad because you're trying to get used to this new culture and are not very familiar with the language quite yet. There are nuances that are lost in translation. I established some really close friends. One of my best friends is French. She worked with beef cattle. We met on our first day of class because I had no idea what the teacher was speaking because he was speaking in a German dialect called Swabish. I was at a loss and she was too. Over that confusion we bonded and we're still friends to this day. It made me more aware of the different issues going on in the world, especially with animal agriculture and how those issues vary from country to country. It also just gave me a better perspective on the importance of global connection and understanding other countries' perspectives and approaches to agriculture and different aspects of culture. That really stimulated me into wanting to go into the research that I've conducted. I've also traveled extensively since that point because once get past this threshold of fear in terms of what you can and can't do as an outsider living in a foreign country you feel like the world is your oyster. I've also done work in India for six months and then I lived in the Netherlands for six months.

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# CAREER CALL WITH WENDI JACKSON

***How was living in India? How was that experiences?***

It's almost shocking how different things are when you first arrive. For that project I organized with Dr. Peter Robinson at the Animal Science Department and Jim Fatal because I was interested in potentially going into ruminant nutrition and a PhD. There was an opportunity to look at using rice straw, which is a  low quality byproduct feed that's also abundant in California as it is in India looking at ways to adjust the concentrate portion of diets to make it better utilized. I did an invitro fermentation study, a 24 hour metabolism study where I collected all of the feces and urine and then I did proximate analysis. There is obviously some hiccups. I was at the Agriculture School in Bangalore, India which is in the South. They had issues with power outages related to the monsoon season and so we had to be inventive shuffling samples around to make sure things didn't get ruined during those outages. I had great labmates who really helped me out in the field because it was a very intensive project. Overall I loved it. I've been back to India four or five other times since then. You learn so much being in that culture. It's such a dynamic place to live. The smells, the colors, the religion is just a really unique environment that's quite different from the US and something that I really grew to love.

***What was it like finishing that international work and coming back to attend vet school and start a PhD program?***

There was a rather large gap. I finished the project in India in June, came back, presented at ADSA, and then I started vet school in September. I applied the vet school when I was living in the Netherlands. I did my interview at midnight while living in India because of the time differences. I was sort of on the fence, retrospectively, in terms of whether I wanted to go to that school or not. I wanted to do PhD in ruminant nutrition. Ultimately, I got into UC Davis vet school in my first round so I felt like it was a sign that I should pursue it, so I jumped into that. I studied in the mixed animal tracks. I took courses in both companion animal medicine and food animal medicine, and a few in equine, but equine was never my strong suit. I took many opportunities during those four years to do externships in the summer with food animal clinicians. I actually returned to Germany for one rotation. I got to see the differences in how veterinarians practice there versus here. I did a public health externship in Chile and one with Vets Without Borders in Liberia. It was a diverse experience and one that I sort of catered to my interests. I had to convince some of my professors and mentors in vet school to approve, but really were beneficial to my learning process overall.

***Did you start your PhD right after vet school?***

I went into practice right after vet school because I had the desire to cement my clinical skills and practical knowledge by being in clinical practice. I worked in Mendicino County for three years in a small animal practice. On occasion I got the opportunity to do some pig surgeries, but those were pretty rare. I did eventually miss being outside working with cattle and the dynamic nature of research where you get to pursue research questions and find solutions to problems that exist within veterinary medicine. After three years I applied to the MPVM program at Davis, which is a Master's in preventative veterinary medicine.

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# CAREER CALL WITH WENDI JACKSON

It's a 1-2 year program oriented towards veterinary professionals to solidify skills in epidemiology, disease surveillance, and risk assessment to apply to populations such as cattle, pigs, poultry, etc. Halfway into the first year of the program, I realized how close I was to just being done with a PhD in epidemiology, so I applied to the PhD program. I was accepted and transitioned into that program during my second year. I just had a few courses to complete before moving into the research aspect of my PhD. What I really enjoyed about it is that I could incorporate all of my previous production and vet med knowledge into what I did with my applied studies by being able to evaluate different risk factors and looking for patterns for disease in different populations and how to reduce that. It was a good way to incorporate my different interests. Even though it wasn't all ruminant nutrition, it was still pretty interesting.

***Can you tell us about your current job? What is it your favorite part of your job?***

I started working as a veterinarian specialist, my specialty being epidemiology as the surveys and studies lead for the antimicrobial use and stewardship program for CDFA in May of 2021. Part of the year while I was finishing my PhD, I also worked as a veterinary diagnostician at CAHFS, which is a California Animal Health and Food Safety lab at UC Davis that also has branches in Tulare, Turlock, and San Bernardino. The lab has a unique set up in that it's operated through the school of Vet Med, but the funding comes from CDFA. I was familiar with the program through the relationship that they had with them. There was an individual bacteriologist that essentially works for CAHFS, but also partners with us to do a lot of our susceptibility testing that is related to research contracts at UC Davis and other programs. When the position opened up around the time I graduated, I hesitated to apply right away because I had just renewed my contract with CAHFS, but eventually decided to apply because the objectives and focus of the position were very much in line with my interests and what I had focused on in my own dissertation, which is looking antimicrobial susceptibility trends in different livestock industries and also working with researchers like Pedro to potentially develop projects looking at different feed and diet related interventions that can be implemented to potentially reduce resistance (AMR) that we're monitoring in feces. There's a lot of dynamic aspects to the position. I get to still remain in the research arena by reading a lot of the current literature on the topics of AMR. The nice aspect is that although I definitely love working with cattle this position mandates that we set up surveys and also coordinate studies with research contractors across all industries related to food animals. So recently we worked with a student in animal science to complete an aquaculture survey. I think he'll start conducting that survey in the next couple of weeks. I'm learning a lot about other industries that I didn't necessarily have a focus on prior to this point. Other great aspects are that our team has taken on some more primary projects where we are the ones to do the sampling. In one project we just completed was to help develop antibiograms for sheep respiratory disease. CAHFS is also working on potentially developing antibiograms that veterinarians in practice could request. Antibiograms are essentially cumulative susceptibility testing tables so that producers have a guide for empiric therapy related to antibiotic usage in different species. The ones that we've developed so far are primarily for respiratory disease in cattle and sheep, as I mentioned.

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# CAREER CALL WITH WENDI JACKSON

In the future we may be able to do more and more work on our own, but right now we enjoy the opportunity to foster collaborative relationships with producers and stakeholders like the researchers at UC Davis, Chico, Cal Poly, and the different state schools across California. Another great aspect is I have a really good team. A lot of enthusiasm for this topic and skill set related to infectious disease. There's three other epidemiologists on my team. On the stewardship side we have three veterinarians who utilize the data collected through some of our studies to develop best management practices and guidelines to promote the judicious use of antibiotics in livestock.

This program is the only one in the in US that is actively funded and monitoring these trends in susceptibility. It's really important. California is such a critical player in agricultural production, especially animal ag. It's good that we're trying to get in front of this topic for the sustainability of antibiotic usage within these industries and also to minimize our usage as much as possible because we see the consequences of what AMR impacts there are in human health. The public perception of antibiotic usage in livestock is always a concern as well.

***How have mentors impacted your career?***

I think it was probably the number one reason that I decided to continue on in my work with cattle and to pursue research. Dr. John Beckett, who is now a feedlot nutritionist, was one of my first beef production instructors at Cal Poly. He was very motivated in teaching and developing new coursework to engage students. The camaraderie that we all developed through our enterprise projects that these faculty would oversee allowed us to get to know one another outside of the school environment while we were working cattle. It's just a different type of relationship than one that you may have the opportunity to develop when you only see a person in a classroom. That relationship has been 20 plus years and was a huge part in my developing the ideas for my PhD dissertation. Along the way there has always been someone who stood out or provided insight into things that really opened my eyes to other possibilities. Frank Mitloehner was a great mentor who had so much to offer with regards to research ideas and really starting this important discussion about greenhouse gas emissions and the role of cars vs cattle in smog forming gases that is such an important topic today. It’s not that I sought out a mentor so much as I learned that I could understand and learn so much more by having those relationships with faculty members. They steered me in ways that I might not have known the path to and the research that I ended up pursuing. Meet and get to know the different faculty in your department. Sit down with them. Ask them questions. There is a wide spectrum of mentorship and some people are better mentors than others. You will come to learn who those better mentors are by just talking to people and hearing about their mentorship experience from other students in your program.

***What is your favorite food?***

Definitely Mexican food. Crispy tacos and breakfast burritos. Mexican food is always my go to.

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# CAREER CALL WITH WENDI JACKSON

***What is our favorite music to listen to?***

I have very eclectic music tastes. Right now if I turn the radio on and have to drive somewhere and I need it to be upbeat, I listen to reggaeton. I like dance music. If I want to study I like bluegrass. Right now I've been listening to a lot of reggaeton. Its more popular now so you hear it more on the radio.

***What would you go back and tell your younger self?***

Internalize what student debt will do to your financial future and plan as much as possible to deal with it while you're accruing it concrete plan how to pay it back. Tuition for college is expensive and it's even more expensive for professional school. For UC Davis tuition is over $30,000 a year excluding living cost. Student debt is something that creates a lot of anxiety along with the other stressors in the veterinary field. As you may have heard, there's a very high suicide rate because practicing veterinary medicine isn't like it used to be. There's a lot of social media oriented attacks and judgement. It's not just you practicing medicine, it's all of these other opinions weighing in. Managing those other stressors as best as you can, and having a plan is very useful. Thankfully my husband and I put together a plan and I'm only a few months from paying off vet school debt but it means I have a very low balance every month after I paid off my loan statements.

***What is your top tip for our audience?***

I'll give a plug to Dr. Mitloehner's CLEAR center as far as their unbiased approach to messaging on different topics of animal agriculture and livestock production. I think I have a fairly unique perspective in seeing both sides of the line regards to concerns over livestock production coming from a non ag background and understanding consumer concerns but also choosing to and remain in agriculture because I really respect and understand the reason producers do what they do. The difficulty, the work they put into it, their amount of knowledge. They also have concerns like the rest of us about the sustainability of production, the climate, and antibiotic suceptability. If they can't use antibiotics to treat common diseases then they are at a loss just as much as human medicine is. Trying to be aware and informing oneself on these important topics. If you don't feel like you understand the whole picture, reaching out to researchers like myself or someone in the industry to try and understand a little bit better so you have an informed perspective on the topic versus just reading memes or other things that may be floating through social media.

***How can our audience learn more about what you do or ask questions?***

**Email**: wendi.jackson@cdfa.ca.gov
**Website**: https://www.cdfa.ca.gov/ahfss/aus/

# RESEARCH CALL WITH WENDI JACKSON

**We speak to Dr. Wendi Jackson about her work looking at liver abscess incidence in calf-fed Holstein steers in from the calf-ranch to the feedlot.**

***Can you just tell us about this project and how you came up with the idea to do it?***

I had three chapters in my dissertation. Two of the three pertained to a liver abscess study that primarily was conducted across three different feedlots in the Imperial Valley that represented different management styles. You might be wondering why liver abscesses and how I happened upon that topic. When I started my PhD, I was very interested in doing livestock infectious disease work and something that would be very applied to address a current problem in one of the livestock industries. In my discussions with Dr. John Beckett, who I mentioned in the previous podcast, we spoke about the growing concern about increased prevalence of liver abscesses in feedlot steers. Specifically Holstein steers, which are bull calves that originate from the dairy industry and then go through the calf-fed Holstein industry. They are raised on calf ranches for four months to be adapted and backgrounded in preparation for the feedlot environment. Then they are fed out usually for about 320 days in the feedlots in the Imperial Valley. They have a very successful industry down there utilizing these types of animals. One of the issues that has arisen, at least in the raising of calf-fed Holsteins and other aspects of the US in the High Plains and Panhandle, is this increase in liver abscesses. The reason it's important for producers, for welfare, and also for Packers is that the condemnation of livers as a result of abscesses is very prevalent and issues can arise during the processing of cattle with abscesses where those abscesses may open and contaminate the working environment. The chain has to stop, things have to be disinfected. It's inconvenient, but it also represents a loss of carcass value because the liver has to be condemned. Other studies have shown that it can impact average daily gain in cases of severe abscesses. The liver has a vital role in metabolism, so when a large portion of the liver is diseased the animal cannot metabolize feed and put on the same amount of weight and muscling as other animals without abscesses or without severe abscesses.

My objective primarily was trying to understand potential risk factors for liver abscess development beyond what we already know may be precursors, which are the high grain diet fed on feedlots and potentially the long days on feed that are common in the calf-fed Holstein industry. To address that, I wanted to do a longitudinal study, which means I followed animals over time through the entire production system to monitor different things and to understand different risk factors. I enrolled calves on the first day of arrival at a calf ranch (usually around 24-36 hours old). I wanted to look at their immunoglobulin level, which is an indicator of the success of colostrum as an exposure and potential risk factor for abscess development later on in the production cycle. Colostrum is very vital to the health of bovine animals and calves because they don't have the transfer of maternal antibodies across the placenta in utero. Those first 24 hours are very critical to gaining maternal antibodies that then protect the calf while its immune system is developing during the first 14-30 days at the calf-ranch. I enrolled those calves, measured IgG levels using radial immunodiffusion, which is the gold standard for IgG measurement. They got to be managed as they usually were at the calf ranch for four months and I let them be.

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# RESEARCH CALL WITH WENDI JACKSON

At the time that they were ready to be shipped to the feedlot, I arranged to have them divided across six different loads to arrive at three different feedlots that represented different management styles and that also had different liver abscess prevalence based on records provided by the slaughterhouse.The rest of the study entailed me driving down to those feedlots and ultrasounding them at enrollment and then every three months through the finishing cycle to try and detect abscesses. Abscesses are not easily detected prior to slaughter because a lot of animals are subclinical or asymptomatic. Transabdominal hepatic ultrasound, where we scan between the 8th and 13th rib on the right side, is one of the only diagnostic tools we have, but it also is plagued with a lack of sensitivity because the liver and the confirmation of the animal can really impede your ability to see the deeper margins of the liver. I wanted to see if I could detect those abscesses as they were developing during the production cycle.

I also monitored serum biomarkers related to hepatic enzymes to see if there were any sort of blood parameters that could be used as a predictor of abscesses. I followed them all the way through to finishing to collect liver abscess scores at the slaughterhouse and also submitted those abscesses to Dr. Nagaraja's lab at Kansas State for anaerobic susceptibility testing. It was a very long project, 13 months. I spent a lot of time in the middle of the night ultrasounding steers because it was the coolest part of the day and the least stressful for handling them in that environment. I had a really great experience.

***Can you talk a little bit about the results?***

My primary interest was in understanding if there was an association with the immunoglobulin level and the presence of liver abscesses at any point during the production cycle. Having a low immunoglobulin concentration was considered an exposed group versus having a high immunoglobulin level was considered unexposed. I did not find an association between that immunoglobulin level and liver abscess prevalence, but it doesn't necessarily mean that calf immunity isn't somehow linked to their susceptibility for developing abscesses. A more granular health parameter would need to be longitudinally followed because there are so many different stressors during those four months at the calf ranch that can influence the developing immunity in addition to colostrum. Colostrum remains the number one management technique to minimize disease incidents in neonatal calves, and I think it plays into that. But for me to capture that more granular information, I would have had to have greater access to some of the treatment records of the calf ranch, which I didn't have access to. The liver abscesses were still very much an issue. There was quite a variation in the prevalence across the three feedlots that I studied. One of them had the highest with 25% of the steers from that feedlot had abscesses. The highest prevalence of Tylosin resistant abscesses also came from steers that had had exposure to Tylosin during the finishing period, which could speak to potential resistance building or there being an location dependent pattern in resistance, which we know can happen based on some other studies that have been done with liver abscesses. We also saw that A+ abscesses were highly prevalent. Those are the most severe abscesses. Those abscesses can be sometimes upwards of 10 to 15 centimeters in size.

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# RESEARCH CALL WITH WENDI JACKSON

Sometimes they can adhere to the diaphragm and cause a lot of potential risk for the abscess opening and causing peritonitis in that animal. The steers with A+ abscesses also had the worst quality grade. They were the ones grading select so we know that there is an impact on carcass quality with liver abscesses across these different production systems. With regards to the biomarkers, there was a pattern in serum globulin levels being predictive of A+ severe abscesses. That makes biological sense because globulin levels will increase in relation to chronic antigenic stimulation in an animal overtime if these abscesses are there for potentially months. They do wall of them off in this very large capsule, but the body is still being exposed to the bacteria to a degree. There is potential predictive ability in assessing the presence of severe abscesses in animals with high globulin levels, but that still needs to be followed up on in future work. I have not solved the mystery as to why calf-fed Holsteins have this increased prevalence, but we do know that diet, days on feed, and potentially previous exposure to metaphylactic antibiotics may all play a role, but I don't have enough data on that to really make a generalization. It just was present in this study. Overall, lots of work to still be done that hopefully Pedro can solve. It is an intriguing topic and one that has pulled together my interest in ruminant nutrition, disease, and epidemiology to try and to elucidate some answers.

***Were you able to detect liver abscesses using the ultrasound? What was the ultrasound technique?***

The first few months the steers are pretty small so your visibility and ability to penetrate pretty much all aspects of the liver is really good. The problem with ultrasound as a diagnostic tool is that you never know when day one is that the abscess is seeding. When they're so small, they're there, but they haven't damaged enough of the liver to be visible to a degree that you would have the sensitivity to pick it up. Usually with the ultrasound they have to be bigger than 1.5 to 2 centimeters to really detect and rule out other potential abnormalities in the liver. There are definite landmarks with regards to the portal vein and hepatic arteries that you can differentiate what's normal and abnormal. My clear syndication was around 180 days on feed is when I really started to see them showing up. I missed all of summer because it was too hot and stressful to run the cattle at that time, but I feel like there was quite a lot that could have changed in those four months. The interesting thing with abscesses that you'll realize when you are there to see the livers at the processing plant is that they come and they go. There will be a liver with one or two small abscesses and then a big abscess scar, which is a giant divot. There will be a little bit of capsule, but most of the bacteria is gone. The body is able to address them. I don't know what causes one animal to be able to resolve it versus another one just blows up. There's a lot of interesting things that go on. It would be good to incorporate a veterinary pathologist to evaluate the structural changes in the liver and also what could be going on concurrently with rumenitis in the rumen itself, which has been seen in some previous studies, but I wasn't able to do in this study.

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For ultrasounding I would say after summer when they're really large Holsteins, you can't run through the chute. They're so tall. It's hard to get contact because the fat between the ribs is so thick. I had to use a much stronger ultrasound machine at that point. It's really exhausting because you're having to press really hard to try and get good contact. Plus the liver is huge. You lose sensitivity over time. The first six months of their time at the feedlot is your best opportunity to try and use it as a diagnostic tool.

***You measured IgG when the calves first arrived at the calf ranch. Did you know any of the historical data of the calves before they arrived?***

No. So the calf ranch will typically pay a premium if the serum total protein, which is measured at the calf ranch, is above approximately 5.5. That is used as a proxy for colostrum feeding and IgG transfer. And the reason I used the radial immunodiffusion technique was that it's the gold standard. It's only measuring IgG, where serum total protein is measuring the total protein in the blood. That value could potentially deviate up or down based on hydration level of the calf on arrival. They do try to assess it, but serum total protein is a far faster and easier technique and more cost effective than having to buy plates to do the IgG measurement. If they've had colostrum at the dairy before arriving at the calf ranch, then they should have absorbed most of that into the bloodstream by then.

***What do you expect to see or what would you like to see in the future related to this research?***

I think there's a lot more that we can do to try and understand. As you know, antimicrobial resistant genes can exist in the soil, they can be transferred from feces into that environment. How those genes influence or change this susceptibility patterns for new animals that are arriving into those premises is important. It's in an obvious exposure. The cattle eat off the ground or just lick and can be exposed to the soil that they're laying in.
With the abscess topic there is a lot more to explore with regards to the role of this specific diets. Potentially bunk management, stocking density, how weather and heat stress may impair the usual eating cycle so that animals may be more susceptible to developing ruminal acidosis during the high heat months of the summer. There's a large role for precision monitoring to be involved in future research related to liver abscess. I think so much of behavior could potentially play into that and we just don't have enough data to really make those connections right now. The longitudinal studies are really important because managing a calf that comes from a dairy that then goes to a calf ranch that then is transitioned to a feedlot. There's a lot of different management that goes on along the way. Understanding how each of those stages impacts long term production is really critical to having the full picture of health in these animals.

# FEEDLOT RESEARCH BRIEF

## Effect of a implant strategy on calf-fed Holstein feedlot performance and carcass characteristics

## Introduction

- Holsteins typically enter the feedlot at lighter weights than typical beef breeds and stay on feed in excess of 300 days.
- Previous work showed that delaying first implant had little effect on performance.
- There is little work on different dosages and implant scheduling on performance and carcass characteristics of calf-fed Holsteins.
- This study aimed to assess the influence the influence of type of initial implant (short vs. long duration) and reimplant schedule on growth performance and carcass characteristics of calf-fed Holstein steers.

## Methods

- 240 calf-fed Holstein steers (250 ± 14 lbs) were blocked by weight and sorted into 40 pens (6 steers/pen) for a 349 day feeding trial.
- Treatments:
  1. **2 Implant Strategy** - Implanted on arrival with Encore (long duration; 43.9 mg estradiol) and reimplanted on d 224 with Revalor-S (120 mg TBA + 24 mg estradiol)
  2. **3 Implant Strategy** - Implanted on arrival with Synovex-C (100 mg progesterone + 10 mg estradiol benzoate) and reimplanted with Revalor-S on days 112 + 224.
- During the initial 112 days calves were fed a diet containing 14% crude protein to meet amino acid requirements. The remainder of the trial the diet contained 13% crude protein
- Performance and carcass data collected.

## Results

- Days 0-112
  - No difference in ADG, DMI, and feed efficiency.
- Days 113-224
  - **3 Implant Strategy** increased ADG, DMI, and gain efficiency.
- Days 225-349
  - ADG not different between treatments.
  - **3 Implant Strategy** increase DMI resulting in decreased gain efficiency.
- Overall
  - **3 Implant Strategy** had greater DMI and tended to increase live weight and ADG.
  - Gain efficiency between treatments was not different.
  - **3 Implant Strategy** increased LM area.
  - No impact of strategy on dressing percentage, KPH, fat thickness, or estimated carcass yield.

**Table 1.** Composition of receiving and finishing diets

| Item | Days on feed: 1–112, Receiving diet | 112–349, Finishing diet |
|---|---|---|
| Ingredient composition, % DM (unless noted) | | |
| Alfalfa hay | 20.00 | 12.00 |
| Steam-flaked corn | 64.94 | 75.26 |
| Fishmeal[1] | 3.00 | 0 |
| Yellow grease | 3.00 | 3.50 |
| Cane molasses | 7.00 | 6.00 |
| Limestone | 0.70 | 1.19 |
| Urea | 0.50 | 1.00 |
| Trace mineral salt[2] | 0.40 | 0.40 |
| Magnesium oxide | 0.20 | 0.25 |
| Dicalcium phosphate | 0.26 | 0.40 |
| Monensin,[3] mg/kg | 25 | 25 |
| Nutrient composition[4] | | |
| NE, Mcal/kg | | |
| Maintenance | 2.14 | 2.23 |
| Gain | 1.47 | 1.55 |
| CP, % | 14.0 | 12.7 |
| Rumen undegradable CP | 38.3 | 35.1 |
| Rumen degradable CP | 61.7 | 64.9 |
| Ether extract, % | 6.67 | 7.05 |
| Calcium, % | 0.90 | 0.80 |
| Phosphorous, % | 0.40 | 0.35 |
| Potassium, % | 1.03 | 0.80 |
| Magnesium, % | 0.28 | 0.30 |
| Sulfur, % | 0.25 | 0.20 |

[1]Menhaden.

[2]Trace mineral salt contained $CoSO_4$, 0.068%; $CuSO_4$, 1.04%; $FeSO_4$, 3.57%; ZnO, 0.75%; $MnSO_4$, 1.07%; KI, 0.052%; and NaCl, 93.4%.

[3]Rumensin, Elanco Animal Health (Indianapolis, IN).

[4]Based on tabular values for individual feed ingredients (NRC, 2000) with the exception of supplemental fat, which was assigned $NE_m$ and $NE_g$ values of 6.03 and 4.79 Mcal/kg, respectively (Zinn, 1988).

## Implications

Implanting with a longer duration initial implant and reimplanting with a combination implant on day 224 may result in slightly lower ADG than implanting at 3 intervals.

# CONTACT

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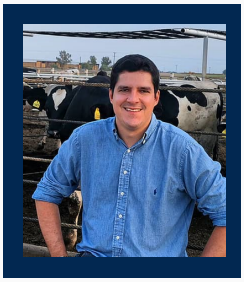

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