VOL. 2 ISSUE 5 · JUNE 2022

CATTLECAL NEWSLETTER

ANNOUNCEMENTS

Welcome to the CattleCal newsletter for June 2022! In this issue we have exciting information on the type of fat that should be in a feedlot diet, the career and research of Dr. Steve Loerch, Senior Associate Dean and Animal Science Professor at Penn State, about his career and education, and a look at a study examining the relationship between fat supplementation and fatty acid digestion in feedlot cattle. 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:

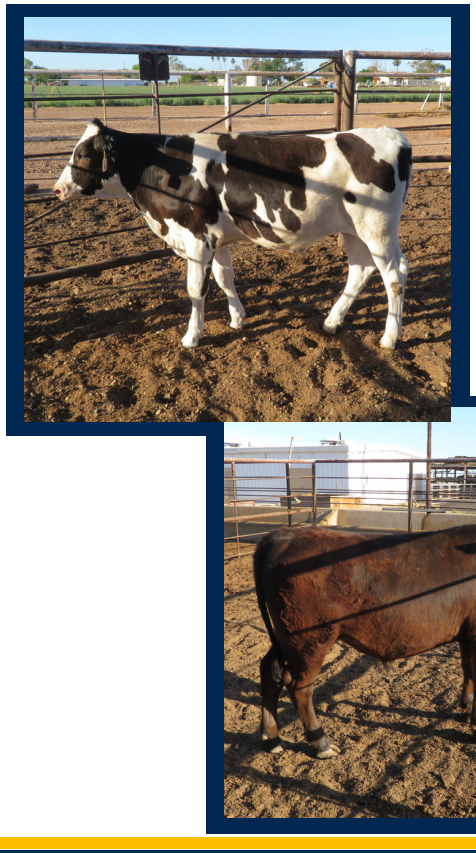
THIS MONTH IN RESEARCH

In May we continued our two projects. While weighing cattle, we bolused one animal from each pen with a temperature probe that will continuously monitor rumen temperature throughout the summer. For May, average temperature was 77.9° F (6° F greater than April), average maximum temperature was 95.0° F (8° F greater than April), and average minimum temperature was 58.9° F (5° F greater than April).

DAYS 84-112 PERFORMANCE SUMMARY

	Holstein	Crossbred
Body weight (d 84)	559 lbs	572 lbs
Body weight (d 112)	654 lbs	673 lbs
ADG	3.45 lbs/d	3.60 lbs/d
DMI	15.4 lbs/d	15.3 lbs/d
F:G	4.47	4.26

April 2022



May 2022

CATTLECAL PODCAST JUNE EPISODES

Quiz Zinn - CCP#057

In this episode, we asked Dr. Richard Zinn about the type of fat that is included in feedlot diets.

Career Call - CCP#058

This week Brooke Latack and Pedro Carvalho called Dr. Steve Loerch, Senior Associate Dean and Animal Science Professor at Penn State, about his lifelong passion to be a cowboy scientist and the path he took to get there.

Research Call - CCP#059

This week Brooke Latack and Pedro Carvalho speak to Dr. Steve Loerch, Senior Associate Dean and Animal Science Professor at Penn State, again to discuss his research with limited feeding for beef cattle and the impacts limit feeding has on performance.

Feedlot Research Call - CCP#060

This week, Pedro Carvalho and Brooke Latack discuss research looking at the relationship between fat supplementation and fatty acid digestion in feedlot cattle.

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

This month we're continuing our conversation about fat. The question is what type of fat should be fed in a feedlot diet?

Yellow Grease and Tallow

That's a very important question. The conventional fat sources that have been fed over the years is either tallow or yellow grease/kitchen grease. The yellow grease designation is mostly because of the color. It's yellow, so it's called yellow grease. Those are the conventional fats that are fed. When I say conventional, I just mean that historically they're either feeding that or the other. The main supplemental fat that has been fed is yellow grease. Yellow grease is recovered from restaurants and cafeterias and so forth. They take it to a centrifuge. They spin it down. Then the top part, the part that doesn't have sediment, is siphoned off. That would be what we would feed the cattle. This material is especially controlled. It's very low in moisture and unsaponifiable matter. It has a fairly low titer, so it's easy to handle in the feed mill. I would say that yellow grease would be the standard. Everything would be compared with yellow grease. Tallow is also very standardized and very low moisture and unsaponifiable matter as well. It has a high titer so it’s not as easy to handle, especially in cold areas where you have times of the year when the temperature is low. This material can be difficult to handle in the feed mill and can result in variation in the amount of fat that actually goes into the formulation. That would be a disadvantage for tallow. Tallow and yellow grease are highly palatable/acceptable to cattle. The nice thing about tallow and yellow grease is that they are consistent. If you're going to order yellow grease, you are going to get the same stuff over and over and over again. One of the problems that you have with fat is that the cattle will detect the change. If you suddenly change from grease to tallow there would be and obvious rejection of the feed and some bloat. Everyone should be aware that it's important that whatever fat you're using is consistent. That you're getting the same source, same supplier, etc.

Soap Stocks

As you move away from those two conventional fats sources, then you run into some, let's say, less expensive sources of fat. This would be what we call the acidulated soap stocks. These are more variable in composition because it will depend on the source of the soap stock itself.

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You have animal-vegetable soap stock, pure vegetable soap stock, corn soap stock, soy soapstock, sunflower seed soap stock, etc. You have all these different types. These soap stocks are high in free fatty acids. Initially when we were first looking at it as an alternative to the conventional grease or tallow, the concern was the high free fatty acid content. An animal-vegetable soap stock might be 50% free fatty acids, but some pure vegetable soap stocks may be as high as 70% free fatty acids. The question was will it be more toxic or would there be more problems. The research was conducted and demonstrated that it did not cause more issues. Biohydrogenation in the rumen is a rate limiting step in the transformation of the free fatty acids. You may have a sense of greater biohydrogenation, but also you may have greater toxicity. We don't see that. If you're feeding fat at the recommended level, which means that the total dietary fat doesn't exceed 7%, then the differences start to go down. When you talk about soap stocks, one of the real issue is that now we're talking about something that can have a lot of other material in it besides fat. The main one would be moisture. It can be much higher in moisture and unsaponifiable matter. It can have all kinds of stuff in it. Whenever you buy a soap stock then you need to think of it not so much on how much it costs per ton, but how much it costs per unit of total fatty acids.

Cotton Seed

There are other sources of fat that go into the diet that that we sometimes don't think about, but because of the level of inclusion of those products, they are providing a significant amount of fat. One of them is cotton seed. Cotton seed can be as high as 20% fat. The energy value of cotton seed is basically the fat content of cotton seed. It's a method to get fat in the diet.

Distillers Grains plus Solubles and Condensed Corn Distillers Solubles

Another source is distillers grains plus solubles. You have a significant amount of fat coming into the diet, maybe 11%. This is significant. We should always appreciate the added fat that's coming in through that. Another source of fat is condensed corn distillers solubles. When distillers grains are produced in the process of alcohol production, sometimes the solubles are not added back, but they're just condensed and sold separately as condensed solubles. That material is about 65-67% moisture. On a dry basis, it has about 10% fat. It's very palatable. This can be added to the diet in large amounts. It's another source of fat.

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Palm Oil

Another source of fat is palm oil. Palm oil is an economical alternative to grease. Palm oil is highly saturated. Maybe 50-55% saturated fatty acids with C-16, or palmitic acid being the main fatty acid component. The nice thing about palm oil is that C-16 is by far more digestible in the rumen than steric acid (C-18). This higher level of palmitic acid is actually benefit to that fat. However, because of its high saturated fatty acid content, it has a high titer. In some areas it may be less easily moved through your feed mill pumping system. In some of the called protected fats they're using palm oil. That's what they're protecting.

Fatty Acid Content

These are some fat sources that probably most everyone is aware of. In all of the studies that we've done comparing fats, the main issue is total fatty acid content. You're interested in how much fatty acid material that the fat source has altogether and the level of fat in the diet. There is some indication that when fatty acids are fed as free fatty acids, you have a greater amount of trans fatty acid production. If they're fed as triglyceride fatty acids, which will be the case with grease, tallow, palm oil, and cotton seed, then you would have a lower production of trans fatty acids.. I don't know how significant that is because most of the fat sources we feed are not high in polyunsaturated fatty acids, which would be candidates for trans fatty acid production. An exception would be corn oil. Corn oil itself, which obviously would be a part of condensed distillers solubles and a component of distillers grains, is very high in polyunsaturated fatty acids. The main fatty acid being C 18-2. You would have a potentially greater production of trans fatty acids with those types of oils. Total fatty acid content is always an issue with any fat source. Tallows and greases would be about 90% total fatty acids, but soap stocks can be 85% or less. Then you have other material in there and that dilutes its energy value. If you look at it as and "as is" product, the energy values for soap stock is less. Where you might have an energy value for yellow grease 6 Mcal/kg NEm, it might be 5.2-5.4 Mcal/kg NEm for soap stock. We have to really pay attention to the free fatty acid content.

Animal Performance

As far as animal performance, the main issue with this is the total fatty acid content and the level of fat in the diet.

CAREER CALL WITH STEVE LOERCH

This week we speak to Dr. Steve Loerch, Senior Associate Dean and Animal Science Professor at Penn State, about his career and education.

Where you're from and what do you do?
Well, where I'm from is a little bit of a tricky question. I lived in 13 states including my current state, Pennsylvania and your home state of California. I grew up here in Happy Valley and in State College, PA. I spent most of my career working for Big 10 universities. My parents were Spartans and we moved here to Penn State from East Lansing, where my mom and dad went to Michigan State.

How did you start working with agriculture and when did you decide you wanted to pursue a career in animal science?
My father is a biochemist. He has his PhD in biochemistry from Michigan State. He was on the faculty here at Penn State. I'm a little bit chagrined to admit that biochemistry is not a very highly heritable trait. It was a subject that I struggled in. Even though I became a nutritionist, and biochemistry is the foundation of nutrition, it's always been something I've had to overcome. My grandfather raised Simmental cattle in Michigan. My dad grew up on a farm. I had that connection and that relationship growing up with my grandfather. When I was 16 years old, I had an opportunity to work for a cattle producer here. He had a cow-calf herd. The owner was a biology teacher in high school, so he farmed part time and he needed a strong back to help him on the farm. It was kind of interesting because my love for cattle and beef nutrition grew out of that. This biology teacher that I had always approached his beef production scientifically because he was a biologist. Obviously, my father was a scientist and he approached life that way, too. My dad was always trying to find the unanswered question and that was a very important part of my career. As I was approaching that time when I needed to think about college, I found out that there were these things called beef cattle scientists. I really married my upbringing from my father in his scientific outlook with information from the beef producer/biology teacher. I learned at a very young age, which was really important for me, that I wanted to be a cowboy scientist. To be a beef scientist.

From the start of your undergraduate education, did you know you wanted to be faculty and do research?
Yeah, when I started college, I knew I wanted a faculty position where I could do research and teaching about beef cattle. I was working on the farm in the summers and after school I worked for a professor here at Penn State in the entomology department all through college and through my last two years of high school. In the summer, I would work 70 hours a week. When I went through college, I paid my own way through college. I was working both jobs maybe 30 hours a week. The professor I worked for was an entomologist. He really taught me in the business of how to be a scientist from a business perspective. How to manage grad students, how to write grants, etc. My first publication was on metabolism of 2,4-D in Jack Bean. He was a chemical ecologist working with pesticides. Those two mentors, plus my father, had a huge impact on me. I met my wife in college, and she was very studious. If I wanted to hang out with her, I'd have to spend a lot of time studying. That really helped my grade point average, which allowed me to get accepted into grad schools at the University of Illinois.

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CAREER CALL WITH STEVE LOERCH

Did you do any research in animal science during your undergraduate work?
I worked with the entomology professor all through undergrad washing dishes and helping grad students do their research. All of my research experiences in college were within entomology. I didn't work for Penn State in any animal science facilities. I worked on the farm Saturdays and Sundays. If he had a situation where he needed emergency help, I would help. The rest of the time in the summers and during college during the Semester I worked for the entomologist.

Why did you decide to go to the University of Illinois for grad school?
I was taking an animal selection livestock evaluation class at Penn State. It was taught by a guy named Erskine Cash, who was my undergraduate advisor. He took us out to Illinois my junior year for spring judging contests. I had an opportunity to go to Illinois and visit the campus and participate in that conference. When it became time to decide on graduate programs, I knew Illinois had a strong animal science department. Especially in research. I was very interested in research. Erskine Cash, my advisor, encouraged me to apply there. I was accepted by a guy named George Fahey. George Fahey is a fiber chemist, and he was doing work across a whole range of species at the time. At the time he was mostly working with ruminants. He had a USDA project looking at grazing crop residues during the winter to meet the nutrient requirements for gestating beef cows.

After you finished your Master's work, you switched to a different advisor for your PhD, right?
I was fortunate that while I was at Illinois working on my Master's degree, we interviewed and eventually hired a guy named Larry Berger from University of Nebraska. He was a feedlot nutritionist. I always felt a little guilty leaving George Fahey's program to go work in feedlot nutrition because George Fahey was a tremendous mentor of mine. He's hugely successful. He's the godfather of my first-born son. We're very close family members. He encouraged me to work with Larry. Larry was a rock star in his own right. I was his first PhD student. I was very fortunate all along the way with the mentors that I've had. They have been incredibly important in guiding my career path and my approach to what I do.

After finishing your PhD in Illinois you went to Ohio, correct?
I was really fortunate. I had such good training in Illinois. I credit them rather any ability that I have in terms of what I was able to accomplish during graduate school. I had job offers at Virginia Tech, University of Florida, and Ohio State University coming out of grad school. After I interviewed at Ohio State, I got off the plane and George and Karen met me at the plane to take me home. George asked what I was going to do and where I wanted to go. I told him about the opportunities at Ohio State. He said that at Ohio State, I would have the ability to achieve to your potential. I thought about that and knew he was right. There was the infrastructure there that would allow me to achieve to my potential. I didn't know what that potential would be, but at the time I was satisfied that I could be successful at Ohio State.

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CAREER CALL WITH STEVE LOERCH

You were at Ohio State for 32 years and were a mentor to many students. Can you talk about how to be a mentor?

There's a philosophy of research that I think is really important. They are the characteristics of a good scientist that I think are consistent. I'm an old guy. I graduated from Penn State 45 years ago. I started as an assistant professor at Ohio State in 1981 (41 years ago). I've been doing this for a while. One of the things I learned early on was that if you want to be a good scientist, you have to be comfortable in your ignorance. I know that there is so much that I don't know. And it doesn't intimidate me. I think it's because my mentors when I was growing up were brilliant people. My father got his PhD in biochemistry in 2 1/2 years from Michigan State. He worked on RNA before they knew what RNA was. He's a very, very brilliant man. I have 3 siblings and they're always smarter than me. I was always comfortable not being the smartest person in the room. Hugh Hodge, my mentor and biology teacher, was a very smart man. My mentor in the entomology department - they have scholarships named after him and plaques on the wall. He's a very accomplished scientist. It was never intimidating for me to say, "I don't know," "I don't understand," and "Let's see if we can figure this out." To be a scientist, it's about the discovery of the unknown. If you can't admit your ignorance, then all you're doing is repeating something that somebody else already knows. Our goal is to discover the unknown. In my view, there's a lot more that we don't know than what we actually do know. I tried to create that philosophy with my students. I always struggled with these strategic research plans. Asking me to tell them what my five-year plan is for research. How could I possibly do that? The next question I ask is going to be based on what I learned in the last experiment I did. I can't have a five-year plan for my research program. That's crazy. Corn prices may go to $7 a bushel. That's going to change the way I'm approaching what I do. I might have just discovered something from an experiment that a grad student just did that's going to drive my next hypothesis. One of the great scientists at Ohio State that I had the privilege to work with was a rumen microbiologist. He had a sign on the wall in his lab that said, "If I knew what I was doing, it wouldn't be research." I think that's profound. That philosophy is one aspect.

The second aspect is the human aspect. That part of it is the part that's actually the most rewarding. It's the relationship that you develop with the people you work with. This could be your colleagues as a faculty member, the colleagues that I became friends with and worked with. But, most importantly, it's the students that I had the opportunity to mentor. To become part of my family. I appreciate my wife, Karen, for embracing all of these students and helping me in that process of creating this family bond. That is really the most satisfying, impactful thing in my career. It is the relationships that I've stablished.

How did you develop the research you did? How did you develop the ideas and make it a project?

It comes in different ways. Those things are partly developed by reading the literature and trying to figure out what the next question to ask is. I try to do that with my students. When I ask them to review a manuscript, I tell them not to tell me what they found. I don't care what they discovered. I don't care what the summary says for this paper. Tell me what the next experiment should be. Tell me what they didn't discover in this paper. Tell me what the most important, compelling next experiment is to run. How would you develop a hypothesis and test that hypothesis for that experiment. That's one approach that.

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CAREER CALL WITH STEVE LOERCH

Sometimes it's communication with friends across the country. Or maybe my colleagues at Ohio State. I'll give you an example. In 1982, corn prices were less than $2 a bushel. We had a local drought in Ohio and hay prices were like $200 a ton. And the cost of hay per pound was double the cost of corn. The cost of calories from hey was four times the cost of calories from corn. There was a swine nutritionist who's office was just down the hall from mine. I was listening to one of his students present a talk on gestating sow nutrition. I thought, how do they feed these pregnant pigs? They don't feed them alfalfa hay and adlib high fiber byproducts. To control so that they don't get fat, they control their intake. The pregnant sow would love to eat 10 lbs a day but they control their intake and they feed them three or four pounds a day with a high grain diet. The lowest cost per nutrient ingredients is what they use. I wondered why don't we feed beef cows that way? Why are we harvesting hay? I spent a lot of time harvesting hay on the farm when I was a boy. It's a hot, labor-intensive practice. You can't haul it very far because it doesn't have any bulk density, so it has high local value. Why are we doing that instead of limit feeding a high grain diet to these beef cows, just like they do for a pregnant sow? I was doing some work with receiving calves. The biggest challenge in meeting the nutrient requirements of receiving calves in the feedlot is that they don't want to eat. The first couple of days they don't eat anything. The first week they're starting to eat a couple of pounds of feed per day. It takes three to four weeks before they're eating their normal intake of nutrients. If receiving calves require minerals and protein for immune response, and they're only eating two or three pounds a day, maybe we should increase the concentration of those nutrients. This was a philosophy of my career that I never let go of. I'm a simple person. It's a concept that is so simple that most people miss it. If you think about human nutrition, what do they always advocate? What should you eat? Eat more vegetables. Eat fewer dairy products or more dairy products. Eat this. Eat that. Your nutrition is all dictated or recommended by what you eat. I remember from introductory nutrition that nutrient intake is the product of the composition times the amount. Everybody focuses on the composition, and nobody focuses on the amount. Composition is not consumption. The nutrients that you consume are the product of the composition times the amount of consumption. It's a simple concept. I've used it for receiving calves. I've used it for growing replacement heifers. I've used it for pregnant cows. Anytime an animal does not require maximum intake, this works very well. The cost of the nutrients dictates the nutrients you should choose. That evolved into kind of a prescription intake philosophy where you could rearrange or manipulate the growth curve the way you wanted it to look to achieve maximum efficiency, maximum body composition, and product composition. Improving efficiency and reducing feed intake along the way. All of these things can be manipulated. What's one of the challenges in feedlot nutrition? Having consistent bunk calls or a bunk reader that's consistent seven days a week, maybe 14 times a day. Maybe more. How do you get that consistency calling bunks? My philosophy is that those cattle don't have to eat adlib every day of their life in the feedlot. I was sitting in Wooster, OH, making feed calls for a friend of mine who ran a feedlot in eastern Iowa. Tell me how much how much they weigh. Tell me what your target end weight is. We will devise a nutrition program where I can tell you how much to feed them every day until the last 80 day. Then last 80 days we are going to feed them ad lib.

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CAREER CALL WITH STEVE LOERCH

What did you learn at the beginning of your career as a young faculty member that you didn't learn in school?

I was kind of impatient. Dr. Doherty called me into his office one day and he told me I need to need to choose your battles wisely. I was fighting everything in the whole system that I thought was inappropriate. I was impatient and I had to learn to choose my battles wisely. Another thing I had to learn was that in science, we are trained to be very critical. We are critical of the paper we just read, we're critical of the tests that a student gives us when we're giving an exam, we're critical of a great proposal that we've reviewed. Were critical of everybody else's work. We're trained to be critical thinkers, and that's not the way you interact with people. It took me a little time in my maturity to learn that we should be 90% affirming in our relationships with our colleagues and our students to encourage that good behavior. And maybe only 10% critical to discourage bad behavior. I actually learned that from Karen, my wife. We raise four kids. My oldest son is very strong willed and bullheaded. He's like his old man. I found myself always criticizing his behavior. Karen is an elementary school teacher, so she understands the development of the brain and personality. She said that this cannot be my relationship with my son. Our relationship needs to be balanced and with more positive encouragement rather than just negative. It took me a lot to learn that professionally. It's really important at home. I've been married 45 years and so I take this critical mindset home and I start being critical around the house. It's not a good idea.

After 32 years as a professor, you then moved to administration. What was that transition like?

I never strived to be an administrator. I had 13 department chairs when I was at Ohio State, so I saw a lot of department leadership. Much of it was not real strong. I had a couple of really, really good department heads. One was Jim Kinder, who was my department head for 12 years. I got a call from Doug Parrett at the University of Illinois. He was a friend of mine from grad school days. If I hadn't gone to grad school at Illinois or Erskine Cash hadn't taken our judging team there, then this never would have happened. I never would have ended up at Ohio State. I never would have met him. I do believe in divine intervention. I do believe that I've been guided in my career and blessed in my career. Doug Parrett called me five times and I told him no four times. I was standing in the parking lot at the beef center in Wooster, OH. Finally, he convinced me that Karen and I should come out and visit the University of Illinois. I went out there and I got so excited about the facilities they have there and the people they have. The way they were geared and set up. It's really a preeminent department. I was very proud to have the opportunity to lead that department. I had 11 assistant professors at the time. I thought it was a great opportunity. I really enjoyed my time at Illinois. I had 32 years under my boots at Ohio State. I was going to give him five years and then I was going to retire.

Pedro and I moved there at the same time. We were roommates. Pedro and I lived together for three months while Karen was back in Ohio finishing up the school year. I told Pedro when schools over and Karen comes in June, you have to find another place to live. Pedro's advisor was Tara Felix, who worked for me at Ohio State. She got her PhD with me. She got her first job out of grad school at the University of Illinois. I followed Tara to Illinois. I became her boss again. She became Pedro's boss again. We had a really good time there. Tara had an opportunity to return to Penn State, which was her home. I had been in Illinois 2.5-3 years.

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She took a job at Penn State. Tara found out about this job in the Deans office here at Penn State. It was for a senior associate Dean in charge of operations and management of the college. I get all the HR stuff: hiring, firing, good behavior, bad behavior, awards, etc. Budgets. Where do we get our money? How do we spend our money? Facilities. Remember, I told you I'm not very strategic. Everything I do is result driven. What just happened yesterday dictates my decision for today and tomorrow. The job seemed like it was a really good opportunity. Tara sent me the job announcement and told me I should apply for this. And I thought since Tara is at Penn State and my mom lives in State College, maybe I should consider that. When I got on the plane to come to Penn State, Karen said don't screw this up. Throughout my whole career at Ohio State she asked me how come I wasn't not good enough to get a job back home at Penn State. It worked out really well. I was glad to be able to come back here.

From your experience managing so many assistant professors and young faculty, what are some strong characteristics you see in successful people?

One of one of my philosophies to success is to find out what your boss wants. And then give it to them. Find out what is valued in in your position and give it to them. As a graduate student or post doc, the thing that you need to focus on is doing activities that are going to build your CV so that you can market yourself when you're going for a job. My own abilities and talents are very limited, but one thing I have been very successful at is attracting really good people and then taking credit for everything they accomplish. My former students are running the beef nutrition programs here with Tara Felix and in Ohio State. Alejandro Relling, one of my students, took my job. Jon Schoonmaker at Purdue. And Carrie Pickworth at North Carolina State. Francis Fluharty is department headed animal science at the University of Georgia. The list goes on and on. What you need to do as a graduate student is you need to identify those things that are going to be valued on a job application. Whether it's industry or whether it's academia, you need to spend your time devoted to those things. It's time management, its priorities. You need to have publications before you graduate. You can't wait till your dissertation is in the grad school before you start publishing. You're going to be looking for a job and not have any track record. You need to participate in writing grants with your advisor. It may be industry grants. It may be relationships with industry. You need to go to meetings and make yourself known. There are three kinds of people in the world there. There are people that watch things happen. There are people that make things happen. And there are people that say, "What happened?" You need to be the person that makes things happen. You have to control your destiny, so you need to volunteer for teaching is assignments. Volunteer to go out and make presentations at producer meetings. Be diligent about going to meetings and meeting people. Don't just be passive and go to the bars with your colleagues. Seek out people that are well known and respected in the industry, whether it's academia or industry. Ask them questions about what they do. When you're sitting in a scientific session, be that person that hears the paper and asks that question.

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CAREER CALL WITH STEVE LOERCH

What is something you would like to tell your younger self?

There are so many different kinds of intelligence. Some people are just absolutely brilliant. They have total recall. They can remember everything they read or heard. That's not me. Some people are very creative. They may be artistic or they may be creative in the way they think. Some people are really good problem solvers. They can puzzle out a solution to a question. Some people are just flat out really hard workers. They bust their butt seven days a week and they stayed focused. They don't get distracted. What I learned along the way is that you can't be all those kinds of things. You need to accentuate your positives and minimize your negatives. As a student you may not excel in in the classroom. Maybe you don't have a 4.0. That's OK, but you need to find the things that you're really good at and excel in those. It took me a while to figure that out as I was an assistant professor going through the ranks. I've interviewed 50 people for faculty positions in the last six weeks. It's been taking a lot of time. I tell these people that are interviewing for these faculty positions that they have an elite set of accomplishments, otherwise they wouldn't be sitting here talking to me. They've achieved a tremendous amount to be to be where they are, and they don't need to worry about tenure. If they continue to achieve at that level and meet their own expectations (because obviously they have high expectations) they will achieve to their expectations. Young faculty members are very worried about this tenure thing. We make so much of it. In my eyes, if you meet your own expectations, which obviously are high, then tenure is going to happen. You don't need to worry.

What is your favorite food?

My favorite food is steak. A rib eye steak. One that I produced and one that I cooked. When I go out to a restaurant, I hardly ever order steak. It's a lot more satisfying if I grew the steak and then cook them.

Coors or wine?

I'm in transition here. When I lived in California, the drinking age was 18 and the drinking age in Pennsylvania was 21. I was 19 when I moved to California and took a little break from my college career and did some honest work outside of San Diego. I developed a taste for original Coors, the banquet beer. I gradually switched at Coors Light. Now I'm starting to transition back to my roots, to the banquet beer. It's important that you hydrate. Coors Light is 96% water. It's very important that you hydrate on a hot summer day.

What is the type of music you like to listen to?

I'm an Eagles fan. Hotel California. Desperado, Take It Easy. I grew up in the 60's and 70's. The Eagles have always been one of my favorites. I like their country rock style.

What is your CattleCal top tip?

There's an author called W. E. B. Griffin. He has several series of books. They're historical fiction. He's one of my favorite authors. He has a series that spends a lot of time in between Argentina and United States. He has a series on the Marines that covers pre World War Two. Mostly in the Pacific Theater of Operations and all the way through to the Korean War.

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I like reading those books just to relax. They're historical fictions and do give you some context about historical events in the United States. They don't stretch my brain. When I go home, I don't like to exercise my brain too much. I'd rather do a little yard work or shovel some snow.

What do you see as what is next in beef cattle nutrition?

That's a tough question to answer with any specificity. The year I graduated from college in 1977, there were 220 million people in this country. Now there are 339 million people. We literally are feeding 110 million more people in this country since I went to college and we're doing that on 20% less farmland. Those people have an environmental footprint. A big one. Their appetite for consumables is much greater than our appetite when I was a kid in terms of energy, cars, toys, houses, all of those things. How do we meet that food production? How do we provide a safe, nutritious, affordable food supply going forward for the next generation? The next 45 years? How do we do that? In my view, the way we do that is through the land grant mission. Teaching, research, and extension. We have to train up and educate those undergraduates and graduates that will go out there in the world, in the industry, and do great things. We have to make those discoveries that are going to drive our knowledge base forward. When I was an assistant professor, we were happy if our cattle gained 3.2 pounds a day. The last trial that Tara Felix did at Illinois, her cattle gained 4.2 pounds per day. What will the future bring? When I was feeding cattle, we finished them at 1050 lbs. It took another 60 days on feed to get them fed and feed efficiency was 7.5:1 instead of 5.3:1 now. So what's the future hold? I think, we will be growing cattle so they gain a quarter of a pound an hour. Do you know how much that is a day at a quarter of a pound, an hour? Six pounds a day. I think that could easily happen in the next 45 years. It'll be genetics. It'll be nutrition. It'll be physiology and reproductive physiology and muscle biology. It'll be metabolomics. It'll be the microbiome and manipulating the gut. It'll be animal health and disease. A huge one will be management and simple management strategies. I'm not going to give you a specific discovery, but what I will tell you is that society will limit how fast we grow. They will limit that by how much money we get to do this research and train these students and take that information out and share it with the world as we do in extension. Society will dictate that by the money that they're willing to invest in this process and in this land grant mission. They will also be dictated by the regulations they impose and the things they value. We've seen that recently just with FDA and implants. BST for milk production. Totally safe, totally effective, reduces greenhouse gases per pound of milk produced significantly. And yet society decided no, we don't want that technology. Those things will limit what we can achieve in the future. When I was here as an undergraduate, the dairy cows across from the stadium here were producing 15,000 pounds of milk per year. When I got here five years ago, they were producing 24,000 pounds of milk per cow per year. In the five years I've been here, they bumped it to 27,000 pounds of milk per cow per year. We've had a 10% increase in milk production per cow in the five years I've been here. How do we continue that trajectory? Have we discovered everything that there is to be known? I say no. We go back to the beginning of this.

RESEARCH CALL WITH STEVE LOERCH

This week we speak to Dr. Steve Loerch, Senior Associate Dean and Animal Science Professor at Penn State, about his work looking at limited feeding for cattle and the impacts on performance.

Can you tell us about your research with programmed intake and how that idea was formed?
This started a long time ago and it really evolved from several different aspects. One of them dealt with human nutrition. It always kind of annoyed me that all the focus on human nutrition is on what you eat. What's the composition? Namely, eat more vegetables. You need to eat all protein and no carbohydrates. You need to eat this type of food or that type of food. Nobody talks about the number one nutrition problem in human nutrition in the United States. It doesn't have anything to do with the composition of what you eat. It's the quantity that you eat. Still today, 45 years after I graduated from college, people still spend all their time on the composition of what they eat. What I learned when I was an undergraduate was the intake of any nutrient, the final milligrams or calories that you consume, is the product of the composition of that food or feed times the amount that you eat. It's a very simple process. I'm a very simple thinker. I built multiple lines of research based on that simple concept. You can use that to drive the economic efficiency, biological efficiency, or the composition of growth and gain measure you're trying to reach.

How did this evolve to be a concept that you could apply to cattle?
The first evolution of this came from a situation where we had very cheap corn in the United States. $1.65 a bushel. In Ohio, we had a summer drought, and our hay production was compromised. I was very fortunate in Ohio State. I had three beef cow herds I had available to do research with and then a small 350 head feedlot. I was listening to an auction report on the radio over lunch in my office and they were talking about the price of hay and the price of corn. I thought this is ridiculous. We measure hay usually in tons and we measure corn in bushels. I wonder what these things are if you price them per pound, both of them on the same unit of weight. I realized that the hay was more than twice as expensive per pound as the corn. The hay also has half the calories that corn does, so why are we feeding all this hay to just getting beef cows, developing heifers, or backgrounding steers through in the winter time. Why are we feeding all this hay? What we're trying to achieve is a chloric intake. And we can achieve that with corn if we feed them half as much corn. Then we can do that at half of the cost. That's really how it evolved. It was on the cow side. I moved from gestating cow nutrition to heifer development. What if we limit fed a corn-based diet to growing heifers to meet their desired growth rate in terms of heifer development, which was 2 pounds a day.

From a practical standpoint, what are the major things farmers should know when implementing a limit fed program?
There are a couple of principles. One of them is that you need to know what the requirements are for the animal. You would think that would not be too difficult. We have this thing called the NRC for beef cattle and it's actually quite good. I look at the NRC and I'd say how many grams of protein do we need?

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RESEARCH CALL WITH STEVE LOERCH

How many mega cals of energy do we need? How many grams of calcium, phosphorus and that sort of thing. Then I would feed a corn based diet and a protein mineral supplement to meet those needs. You feed the pounds per day that's required or kilograms per day required to meet those nutrient intakes. It's not what you eat, it's how much you eat. It worked really well except when we got into really cold winter weather. All of a sudden, the maintenance requirements of these animals caught me off guard because I didn't realize if they were out there eating add libitum hay in December that they actually had the capacity to consume more calories in January when it was maybe 5 degrees or zero degrees. You have to know the maintenance requirements of the animals as affected by the environment. Another thing that evolved from that is you have to have enough bunk space so that the timid animals can consume their ration at the same time that the more aggressive animals are. There's some behavioral components. I learned that manure output is significantly less. If you feed 12 pounds of corn instead of 30 pounds of hay to a gestating beef cow, your manure is going to come out in a very, very small quantity. Manure management becomes easy. Why should I pay $200 a ton for hay? Hay digestibility is 60%. Do the math. This isn't rocket science. This is animal science. 40% of that hay is going to end up on the ground. If I'm limit feeding corn, I'm only losing 10%. Another tip that I would add has to do with feeding rumen protected starch, because they're going consume these rations very quickly. You have to spend a little time transitioning a growing heifer or a beef cow or gestating cow. You have to transition them to that grain-based diet. It's not as big of a problem as if they were feeding ad lib because the amount of starch is less, but you still have to adjust them. My solution for that was feeding rumen protected corn (whole shell corn). That delays the release of that starch. If you're limit feeding you get very, very efficient use of that whole shell corn. It works really well for small producers.

What are the main challenges that someone who is trying to implement limit feeding would face? How can they overcome those challenges?

I think part of it is psychological, because we always have in our mind that that animals should be eating adlib. They should be eating free choice. There's a little bit of ego involved. I think I'm smarter than a Holstein steer. I think I know better what they should eat than they know themselves. Pick the breed. I think I'm smarter than a feedlot steer and I can dictate what they eat. This whole idea of how much you eat transitioned into two other lines of research. One of them was with receiving cattle. I was doing a lot of receiving research and struggling trying to get calves on feed after they come to the feedlot. Typically, there's great variation in intake. Some animals might eat half of their maximum average daily feed. Some of them don't eat at all for three or four days. By and large, the average would be that the first week they're going to eat maybe 35-40% of adlib what their normal intake would be. The second week is usually about 60% of their normal intake. We're trying to meet the protein requirements for these animals. We're trying to meet the mineral requirements. Zinc, copper, selenium, and all those things that are important for immune response. And they're not eating. So how do we adjust for that? They don't require pounds of feed or milligrams of calcium and micro grams of zinc. They require an intake of that. Not a composition, not parts per million, but milligrams per day. We looked at phase feeding these receiving calves. We start them out with a very high concentrate diet, nutrient dense diet the first week. The second week we go to phase two.

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The third week, phase three. Guess what, they've been doing that in the swine industry forever. I thought about why we are doing this with baby pigs. They do it after weaning. The reason they do it isn't because baby pigs have this really high 23% protein requirement. It's because they aren't eating and it takes them awhile to start eating and adjust. We adapted that in the feedlot with a lot of great successes. Then I thought, now we have them on feed and it's all working good. We're calling bunks and trying to figure out how we can maximize intake. I had this thought about metabolic efficiency and gut size. I had this friend who was quite overweight. He would go on a diet and he cut back his intake and he wouldn't eat. He'd go on a diet for maybe two months and the weight came off so slowly. His body got very efficient in the use of calories. It's a sort of it's a survival mechanism. It's genetic selection. It's true in all animals. Your gut shrinks. Your metabolism slows down. Your thyroid doesn't kick out as much thyroxine and you get very efficient in the use of calories. Then here comes Christmas and all of a sudden he says the heck with my diet. I'm going to eat normally. And the 20 pounds he lost over two months, he gains back in a week. Because he's got this lean, mean metabolic machine that grabs onto those calories and turns them into growth. Maintenance costs are so reduced in that scenario. I developed that into a phase feeding program, a prescription intake program where we limited intake early for the first 90 days in the feedlot. We fed those cattle at about a 20% reduction in intake. Because they were not eating adlib, they had some metabolic efficiency that they achieved. They didn't waste any feed. I didn't have to throw feed away. They became very, very efficient. Then I would step up their intake and they'd respond, just like my friend. They would have this accelerated growth rate, way more than we would have projected based on their caloric intake. At the end of the feeding (the last 60 days or so), we fed them adlib and we found that we had reduced the amount of feed required to get them to a targeted end weight, improved feed efficiency, reduced feedlot manure, nutrient export, and all those sorts of things. It's three different lines of research all around the philosophy. It's not what you eat that matters, is how much.

What's next for programmed or prescribed feeding? Do you see a future for this in the industry and who do you think would be best able to adopt this sort of program?

In the swine industry, they have used this for decades in terms of rearing breeding animals. I actually have a couple papers looking at it in the poultry industry for improving efficiency in the poultry industry. They're already pretty darn efficient. In the cattle industry, I think there's some intake limiters that might be able to be developed that could do this. For animals on pasture, for instance, you could control it that way. I think that as we get changes in the value of cattle in terms of their body composition, yield, and environmental consequences of these kinds of programs may drive it. I think it just takes more research to try to find solutions to these things. Greenhouse gases would be another one. If I'm feeding a hay-based diet, I'm producing a lot more methane and CO_2 and a lot more manure than I find in limit feeding or grain-based diets.

FEEDLOT RESEARCH BRIEF

Relationship between body weight and level of fat supplementation on fatty acid digestion in feedlot cattle

Introduction

- NEm and NEg for supplemental fats are 6.00 and 4.50 Mcal/kg, respectively. (NRC, 1996)
- These values are consistent when total fat intake did not exceed 0.96 g/kg BW.
- When feeding greater than o.96 g/kg BW of total fat, NE value of supplemental fat decreased.
- Estimates of fatty acid digestion, which decreases as total fat intake is greater than 0.96 g/kg BW, were in agreement with lightweight cattle. Estimates tended to underestimate fat digestion in heavier cattle fed high fat diets.
- The objective of this study was to evaluate the interaction of body weigh and fat supplementation on postruminal fatty acid digestion.

Methods

- 8 cannulated Holstein steers
  - 4 lightweight steers (385 ±32 lbs)
  - 4 heavyweight steers (814 ±15 lbs)
- 4 treatments
  1. 0% supplemental fat
  2. 3% supplemental fat
  3. 6% supplemental fat
  4. 9% supplemental fat
- Each steer received each treatment over 4 feeding periods
  - Periods were 10 d of acclimation and 4 d of sample collection.
  - 1 treatment fed per period per animal.
- Duodenal and fecal samples collected for analysis.

Results

- No interactions between BW and fat level on ruminal or total tract digestion.
  - Heavy steers had a lower proportion of digested starch
- Increasing supplemental fat from 0% to 9%:
  - Decreased organic matter and NDF digestion.
  - Increased ruminal N efficiency.
- No treatment effects on post ruminal digestion of organic matter, NDF, and N.
  - Tended to be an interaction between BW and level of fat supplementation on post ruminal starch digestion.
- No interactions between BW and level of fat supplementation on fatty acid digestion.
  - Across all BW, microbial fatty acid synthesis decreased as level of supplemental fat increased.
  - Linear decrease in prostruminal fatty acid supplementation as supplementation increased.
    - 82.6% digestion with 0% supplemental fat.
    - 67.4% digestion with 0% supplemental fat.
  - Post ruminal difestion of unsaturated fatty acids were not affected by level of fat supplementation.
  - Post ruminal difestion of saturated fatty acids declined as level of fat supplementation increased.

Table 1. Ingredient and nutrient composition of experimental diets

	Fatty acids intake, g/kg BW			
Item	0.47	1.17	1.62	2.14
Ingredient, g/kg (DM basis)				
Alfalfa hay	60	60	60	60
Sorghum sudan hay	60	60	60	60
Steam-flaked corn	786	756	726	696
Yellow grease	—	30	60	90
Urea	11	11	11	11
Molasses	60	60	60	60
Limestone	15	15	15	15
Trace mineral salt[a]	4	4	4	4
Chromic oxide[b]	4	4	4	4
Nutrient composition (DM basis)				
NE, Mcal/kg[c]				
Maintenance	2.11	2.20	2.30	2.40
Gain	1.44	1.52	1.61	1.70
Crude protein, %	12.53	13.26	13.65	14.22
Ether extract, %	3.7	6.5	9.3	12.2
Calcium, %	0.80	0.80	0.80	0.80
Phosphorus, %	0.47	0.48	0.49	0.49

Implications

Differences in FFA content of yellow grease will not negatively affect diet acceptability or growth performance of feedlot cattle.

CONTACT

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

Creator contact:

Dr. Pedro Carvalho, Assistant CE Specialist in Feedlot Management at UC Davis

- Email: pcarvalho@ucdavis.edu

Brooke Latack, UCCE Livestock Advisor - Imperial, Riverside, and San Bernardino Counties

- Email: bclatack@ucanr.edu

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