VOL. 1 ISSUE 10 · DECEMBER 2021

CATTLECAL NEWSLETTER

ANNOUNCEMENTS

Welcome to the CattleCal newsletter for December 2021! In this issue we have exciting information on using steam flaked corn in feedlot diets, the career and research of UCCE Animal Management Systems Specialist Jim Oltjen, 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 compared to October. We plan to finish these steers in mid-December. Look for a summary of the entire trial in our January edition. In November we saw average maximum temperatures of 84° F and average minimum temperature of 52° F.

PERFORMANCE SUMMARY

Body weight (d 251)	1116 lbs
Body weight (d 279)	1239 lbs
ADG	4.23 lbs/d
DMI	23.0 lbs/d
F:G	5.20

November 2021

December 2021

CATTLECAL PODCAST DECEMBER EPISODES

Quiz Zinn - CCP#038

In this episode, we asked Dr. Richard Zinn about feeding steam-flaked corn in feedlot diets.

Career Call - CCP#039

This week Brooke Latack and Pedro Carvalho called Dr. James Oltjen. Dr. Oltjen is the Cooperative Extension Animal Management Systems Specialist. In the current episode, Dr. Oltjen talked about his background in mathematics, physics, and music, and how it helped him during his career. He also talked about his work in California, his sabbatical in different places of the world, and a lot of things about cattle and career as an extension professional in agriculture.

Research Call - CCP#040

This week Brooke Latack and Pedro Carvalho speak to Dr. Jim Oltjen again. This week he explains his work creating the Davis growth model.

Feedlot Research Call - CCP#041

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 fed in excess of 300 days 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

Can you briefly explain steam-flaked corn, including the benefits, cautions, and things to think about when including it in a feedlot diet?

This is a broad question. For the sake of time, we'll have to try to compress this little bit. To begin with, we need to understand that that for any feed ingredient, any ingredient we use in the diet, the feeding value of that ingredient is a reflection of the uniformity or consistency of the ingredient. One of the advantages of flaking is that it takes almost any type of corn variety and makes it uniformly higher in feed value. The feed value of steam flaked corn is very consistent if it's done properly. The feed value of other varieties of corn can vary considerably. This is something to always remember. Feeding value consistency is important. Often times we think of flaking when we think of energy value.

Another aspect is associative interactions of the feed ingredient itself and how it influences other aspects of digestion function and animal performance. We're going to see that flaking has some very positive associate effects, but there can also be some negative aspects.

Another aspect to consider is acceptability or palatability of the diet. There's always some concern, because as you flake the grain there can be some production of fines. And this may appear to affect the acceptability of the diet. It doesn't actually, but there's that appearance because there is a greater production of fines. We talked about that in the previous Quiz Zinn episode.

Processing corn will increase cost. That increase in cost will be variable. In my experience for feedlot operations flaking operations range in cost from 350 BTU/ton to 550 BTU/ton. You can see a twofold range in energy cost of flaking the grain. There are a lot of factors involved in that. Operations have to be very concerned about all those variables. The cost of flaking can be quite variable.

Based on a 12 trial summary that was published comparing dry road corn and steam flaked corn we found that flaking increases the net energy value for maintenance of corn by 12.8% on average. The increase of net energy for gain is 16.4%. These are huge improvements and to not flake the grain with these high corn prices can be almost disastrous. The relative improvement due to flaking is going to depend on the comparison (what we're comparing flaked corn with). If we have a hard endosperm type corn, then the improvement will be great. Even greater than what I've talked about. On the other hand, if the corn we are comparing has a higher portion of floury endosperm, the relative improvement can be significantly less. These are some things to consider when comparing. Is it high moisture corn or rolled or ground. There are all sorts of things that affect the comparative value of flaked corn.

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QUIZ ZINN

Corn has about a 72% start content on a dry matter basis on average. Most (about 83%) of that is in the endosperm. When we flake the grain, the purpose is to disrupt the protein matrix that surrounds the starch in the endosperm. The degree of disruption and the benefit of that is most apparent when you look at measurements of digestion. It has been falsely assumed that the value of flaking is just due to increased starch digestion. This resulted in some real misunderstandings about the improvement of flaking early on. If we look at starch alone we would only see a 7.4% improvement in net energy for maintenance as opposed to the 12.8% that I mentioned. Numerous studies demonstrate that flaking improves organic matter digestion to the same extent that increases starch digestion. It's increasing the digestion of everything (fat and protein as well as starch). This improvement perfectly explains the improvement we are seeing in the feeding trials. It's consistent with the 12-13% NEm and 16% or greater NEg improvement.

Another thing to remember about flaking that is really important is starch digestion in the rumen for dry rolled corn is about 65-70% while starch digestion in the rumen for steam flaked corn is 80-85%. It's not such a huge difference in ruminal starch digestion. The big difference is in intestinal digestion of everything, including starch. There we see an large improvement due to flaking. With dry rolled corn, intestinal digestion of starch is only 60-65%. I've seen studies where it's even less than that depending on rate of passage. With flaked corn it's 90-95% digestion. The big change is the availability of organic matter to be digested in the small intestine. This is relevant when we look at another misunderstanding, which is when you look at the greater solubility of the starch, or the reactivity scores that nutritionists often look at, the greater the number it is thought that there will be greater starch digestibility. No. Be very careful because all we are trying to do is disrupt that protein matrix. We don't want to make ruminal starch digestion too great. We want to keep it in that 80-85% range and let that starch be digested post-ruminaly since that would be so much more efficient environmentally as well as energetically. The degree of processing is going to be important. Under-processing and over-processing. I see cases of both situations. What I try to do with feedlots that I visit is to encourage them to keep the fecal starch value between 1-3%. By doing that they are going to be close to all of the other factors I mentioned. This is a good way of keeping yourself in between under and over-processing the starch. For a lot of the feedlots, the number is around 2.5% consistently, which is excellent. I think they're doing a great job if they can hang around that number. The careful thing is to not be over 3%. For every 1% increase in starch digestibility, net energy for maintenance increases by 0.033 Mcal/kg. This is huge. We can see the great importance of keeping the starch digestion as close as possible to 99%. You can see how important this is in countries where you have a high portion of horny endosperm and very hard corn. Then this really shows up. I've visited feedlots where they are flaking the corn and still starch digestion is only 92-93%. Improvement in value is very small compared to what you would expect. This is a very important number to keep in mind.

When we look at the consistent feeding value of flaked corn compared to other corn (high moisture or dry processed), for either one flaking increased ADG by 6%. There is a whole bunch of studies that show that. This improvement in ADG is very important. That is most notable the longer the days on feed.

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Another thing we often don't consider is that flaking corn enhances the efficiency of energy utilization of urea. Years ago in comparative studies looking at supplementing steam-flaked, corn-based diets, it was observed that with steam-flaked corn, urea resulted in greater performance than intact protein. With flaked corn we have to be sure we have enough urea in the diet to maximize the utilization of that urea. That is a big advantage of flaked corn. You can cheapen back the diet by using more urea.

With flaked corn you have a lower heat increment. With these cattle that are fed steam-flaked, corn-based diets, the efficiency of energy utilization is greater even in the summertime when you have high ambient conditions. This is another important consideration.

Something that isn't getting much attention that I want to point out today is that there's a lot of interest in decreasing methane energy loss. With flaking you definitely decrease the methane lost. Flaking corn is a method of decreasing our methane emissions.

What are some cautions for steam flaked corn?

There are a few cautions when flaking corn. One caution is forage level. In my experience and in summaries of trials conducted, I can see that when we use steam-flaked corn in the diet it's a good idea to increase the forage in the diet. I recommend 7% forage NDF. Steam-flaked, corn-based diets with that level of forage NDF will have better overall cattle performance. Also, flaking is going to increase the cost. The uniformity of the of the flake and processing of the flake are very important, but cost is up there in consideration. Where the variation of flaking comes in to the greater extent is when the boiler is running but they're not processing grain. When we look at the processing tons/hour from the feedmill, as that goes up, the cost goes down. When you have a feedmill, you want to make sure that when they are flaking grain they are flaking grain.

How many lbs/bushel should they aim for to optimize fecal starch? Should they just rely on fecal starch?

Running fecal starch takes a while to process. You cannot regulate the flaker based on that because those are laboratory assays and best case scenario they come back within a day. Most feedlots do not react to fecal starch. When we look at bushel weight, that is something that is measured immediately beneath the rolls. For quality control, I recommend that bushel weight be measured every hour during the flaking time for each flaker. A feedlot will have a target bushel weight. With the bigger rolls we have now, maybe 28 lbs/bushel results in a nice quality flake. Whatever it is, you need to do testing to make sure the rolls are adjusted properly so you get 1-3% fecal starch. I recommend they start at 29-30 lbs/bushel. Go through that for a week and measure fecal starch. Drop a degree until they get what they are looking for. Now they have their rollers calibrated to their operation.

CAREER CALL WITH JIM OLTJEN

This week we spoke to Dr. Jim Oltjen, UC Cooperative Extension Animal Management Systems Specialist, about his education and career.

Where are you from and what do you do?

I'm at University of California, Davis and Animal Science Department now, but if you really ask where I'm from, I always say I'm from a small farm (or a maybe a large farm in that area, small farm in California standards) from northeastern Kansas. We had corn, soybeans, pigs and a feedlot. I've always liked to be with the animals instead of driving the tractor all day long, and so that's why I got into animal science. After being at Oklahoma State for seven years, I've been at Davis for a little over 30 years now.

Could you tell us about your undergraduate degree and how that went?

I was a farm kid but I always liked music, mathematics, and science. I did a lot of musical things at high school and then even marching band when I went to Kansas State. My Bachelor's degree was in physics. I started off in mathematics and I thought that was too theoretical. I was always impressed with my father being able to sit there at a cattle sale and calculate break-evens and numbers on the fly. He could multiply 2 digit times 2 digit numbers in his head. I guess I inherited a little bit of that. All of our relatives have always been in cattle feeding. That's pretty quantitative. I was kind of good at it, and so that's why I started off in math. I like science, so that's why I went with physics. I worked hard at it and got a job in a physics lab at Kansas State. Most animal scientists are surprised to find out when they read my publication list that my first three publications are actually in physics journals.

You got your Master's degree in Kansas as well, right?

I did. At that time Kansas State has a cooperative agreement with a university in Germany. Six students each year come for a year from Germany to go to Kansas State and six students from Kansas State go to the university in Germany. You had to have taken two years of German and be somewhat proficient at it. My relatives are all from Northern Germany, so that's partially why I did that. I took a year off after my physics degree. I got accepted into Yale and Caltech in physics, and then came back and realized after being in Germany, I was catching myself reading the Journal of Animal science more than the physics journals in the library. I think I really realized that after being away for a little bit, that was really what I loved doing. I came back and went back Kansas State to get a Master's degree in animal science.

What was the application process like for grad school since your undergrad degree was in physics?

I told them my background was in agriculture when I was in college. I was in a fraternity farmhouse and I always would take at least one animal science course each semester. I wasn't exactly divorced from animal science. In fact, my family has been very active at Kansas State in animal science.

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CAREER CALL WITH JIM OLTJEN

So, after you finished your Master's degree you came to California?

Yes. That's an interesting story. In animal science, Dr. Benny Brandt was in charge of the analytical laboratory, but he was just a good scientist at Kansas State. He and I hit it off. I remember one time I overheard that he had told some other students, "In my class we do all the analytics and we actually have a student there that understands all the science behind how this stuff works." He was talking about me, but that's because my physics background. He liked to fly, so we would fly. He talked me into getting my pilots license while I was there. He took me under his wing and he looked around the country. I was a naive Master's student. I really didn't know much about who at animal science at the at the academic level was about. He told me about a guy in California that was doing mathematical modeling of biological systems and animal science. A guy by name of Lee Baldwin. He said I should go check him out for graduate school. At that time I didn't know whether I wanted to go be an extension advisor or maybe even go run a ranch. I went out and checked out Lee Baldwin. I also went to Kentucky, but I liked the idea of integrating the mathematics, the modeling, with the biology, and that's why I went to Davis. At that time they had several professors who were doing mathematical modeling of different animal systems. I went there and did my PhD.

Why did you decide to stay in academia instead of something else like running a farm?

The PhD program at Davis is a pretty rigorous one. Most places you after masters you go for a PhD. I thought it was two or three years. The average time for a PhD at Davis is five years. It's a little more rigorous and at least the first two years are fairly defined in which courses you need to take, what qualifying exam you have to pass. You develop a good relationship with your cohort of people that go through the classes with you. I realized that an awful lot of folks from Davis ended up going somewhere to be a professor right after they finished, and it was probably because of the preparation. I'm currently chair of our animal biology graduate program here, which is what I graduated in many years ago. It just prepared you much better to be an academic than I ever realized. and so. After the qualifying exam I had three of what I consider the best years of my life. That's the time when you don't really have any classes you have to take. You can really concentrate on the research you're doing. I went to the National Cattlemen's Beef Association. I'm still interested in that. I tried to do things with the cattle producers in California. I went to the Imperial Valley and gave talks several times. Even when they had their meetings in Bakersfield. You have time to be an intellectual. You could sit around and think about what you wanted to do. We were running trials doing things, but it wasn't like you had so much animal work to do that you didn't have time to have sometimes a week of time where nothing was going on other than just thinking about what you're doing and writing it, putting things together. It's the period of time where I met my future wife.

What was your decision process like when you took the job in Oklahoma?

That became an easy decision, but it wasn't direct. After your 4th year of your PhD you're getting your thesis put together. You have all the data collected and you're writing it up and submitting it. I started interviewing at a few places. My first interview was for a range science position at Utah State, which was a round peg in a square hole.

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It didn't really fit, but it was good experience to do an interview. I did a few others and went to Colorado State, but they really wanted to geneticist, but at the time I met Dr. Tom Brink and we hit it off very well. He started recruiting me to come do a postdoc there. My idea was after I finished my fifth year to go do a postdoc at Colorado State. I was planning on doing that. He wanted to take what they had learned in genetics and figure out how it was going to work in the real world putting together breeding systems. He was really interested in how some of the growth modeling we had done and how that would all follow through the system and carry on through time. The animal science meetings were in Spokane that summer. At the animal science meetings I ran into Dr. Bob Totusek from Oklahoma State. He had a position that was opening up that was in the genetics area, but really wanted a systems person. At the time people were starting to use personal computers and he was thinking maybe all this could go together. He looked at me like he thought I knew something about personal computers, how to make models, animal science, and how all that would work. He told me to come down and apply for the position, but I had seen it. I thought it was just a genetics job. I went and applied and they had me down to interview. Within two weeks after the interview I was back visiting my folks in Kansas. And the phone rang and he offered me the job. I had to call up and let Dr. Brink in Colorado know I wasn't coming. That was a good seven years. Oklahoma State was a very good school. Great for me there. I grew up where we had animals and feedlots in Texas and Kansas. We had bought cattle from other places, but I remember from Oklahoma and the sale barn there. I had been through there and always had a good respect for the people and particularly the wheat pasture cattle in Oklahoma. Yeah, that was a good place to go.

Was there a main reason you came back to California?

Let's just be honest here my wife is a Californian and it's hard to take the girl out of California. That was an underlying current for me to come back to California. Even while I was at Oklahoma, I continued to do research with the Lee Baldwin and others at Davis, some collaborative things with modeling. There was a very good ag economist farm management person in Michigan State. Dr. Roy Black. Two extension ag economists at Davis had done their PhD with Dr. Black. There was a connection there so he and I spent weeks in California with Lee Baldwin doing different projects. Then the position that I'm in was an extension animal management position that was almost perfect for me.

Were you in extension while you were in Oklahoma?

No. I was research and teaching. The job here is full extension, except that in 100% extension in the University of California system means that you are answering the problems or solving things whether it's doing talks or developing curriculum. I think my first job descriptions said 60% applied research. You're really doing the problem-solving research that addresses the questions that are going to help people out as opposed to doing basic research that's going to be published and then you forget about it. When I was at Oklahoma I always wanted to go see how what I was doing would work. Dr. Lusby and Dr. Gill were at Oklahoma State at the time and we collaborated a lot, but they basically were the ones that took it and did something with the things we were doing.

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We did ration programming at the time. We also did one of the first commercially available software for individual cow herd record keeping programs. We developed one there that was fairly popular. We developed one at Davis when I was out there called CowBoss.

Can you tell us about your current job and what you do on a daily basis?

At Oklahoma State that was the kind of rude research I did. We did animal trials too. I had some really good graduate students there. I developed a course on livestock systems. I taught a senior level course called interpretation of research all the animal scientists had to go through that. It was a half semester course on statistics. I called it cowboy statistics. It's enough statistics to understand statistics but not really be able do it. And then the other part of the course was that students had to give oral presentations on papers or on a topic. Some of them hated it, of course. It was a lot of work, and they weren't used to doing that. After doing that for 13 straight semesters where you had to be careful you just didn't go in there and turn on the lecture and turn it off at the end of the 50 minutes without thinking. I wanted to do something a little bit more and get out. Some of the best times I had was going with Keith Lusby and visiting ranches, farms, and other places in Oklahoma.

When you transitioned to a more extension job, you enjoyed it more?

Yes. I enjoy doing that, but I was still doing a lot of the basic computer simulation and some things with some pretty good mathematics in some of that you wouldn't think was a typical extension job.

Can you tell us more about your current job? What you do and what you most enjoy?

When I came to California, I interviewed in 1989 and I didn't get here till May of 1990. Things were very good. We had five programmers in the Department of Animal Science and I was going to get to work with three of them. The economic downturn really hit about 1990 into 1991 so the department laid off three of the programmers. Suddenly I had nobody to help me. All of my plans of these three or four projects got pared down the one. One of my best friends when I was a PhD student at Davis was a guy named John Brawley and by that time he was back as executive director of the California Cattlemen's Association. That was the time Beef Quality Assurance was just getting started. He and I talked as well as the extension beef veterinarian Dr. Ben Norman. Colorado and Texas had already started putting a program together, but we wanted to be involved in working with the feeders on the Beef Quality Assurance program. The three of us put this together and implemented it in the Imperial Valley, as well as in the Central Valley. There are more feedlots then at that time. It took two locations, we developed a program, brought all the employees of the feedlots in, and it was a very successful program. That suddenly took a lot of time. For the next at least five years or so that was the main focus of my extension program. It went into the cow calf sector, too. In those five years we trained over 5000 people in California on Beef Quality Assurance. And either Ben Norman or I or both of us in many cases were at all of those programs. You start figuring an average of 20 to 50 people at those programs. We were on the road a lot.

Continued next page

CAREER CALL WITH JIM OLTJEN

We can see the program is still successful. The California Cattlemen Feeders just won a NCBA award in Beef Quality Assurance.

Joe Scoffield, who has now left the Beef Council, helped instigate that and I helped write some of the letters and got some of that going. We were very proud and happy to be at Nashville this August to see the award presented. I got to talk with Jessie Larios afterwards and congratulate him.

So you ended up spending a lot of time working on these trainings?

Yes, developing those trainings and working with students. The Beef Council is very supportive of the program and allowed us to hire some students. We did several videos for the program. Directing those students was just a very busy time. At the time we still develop Cow Boss, the record program. We updated a bunch of ration programs that we supported for 20-30 years. Taurus was the beef cattle one where we implemented my growth model that I developed during my PhD into that program. People could then project how cattle would do, not just formulate a ration.

Is that interaction with producers one of your favorite things about having an extension job?

Yes. You don't get to do as much of that as you might think, but the interaction with the agencies or the Cattlemen's associations. I've spent a lot of days, as well as a lot of other people, in Sacramento in the boardroom or the backroom of the California Cattlemen's Association.

What is something you wish you knew early in your career or that you didn't expect when you started this position?

The thing that came immediately to mind was simply how to work with organizations. I had been active in a fraternity, had been active as leadership. Leadership was something I could do, but you really had to get out there and listen to figure out the real problems that people were dealing with. When it came to Beef Quality Assurance, one of the real questions that I had that I didn't have an answer for (it took a long time to figure it out) was "Is this really going to help me or is this just window dressing to make the beef industry look good?" I think we could ask most everybody that does Beef Quality Assurance and they will say, "Yeah it actually has helped me." Whether it's that we treat the cattle better, we know how to use the vaccine so things work, and just the general attitude of pride in doing things well. Learning how to work with people and understand that they really were going to get something out of it was difficult at first, at least for me. You go on hoping that it's going to do some good. Let's say the staff at a California Cattlemen's Association have a specific bill or a regulation they need to go work with. Sometimes it may be difficult, or they may not quite know what they're supposed to do because we really don't know the outcome of what some of those are going to be.

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They have to keep their head up and keep working and tell the truth. I had to learn how what I was doing was actually going to make a difference and be able to tell people it was going to make a difference when I wasn't quite sure how. Learning how to work with programmers that really spoke a different language than I did. I had a very good one at Oklahoma State and I had an excellent programmer at Davis said. They ended up being really good at what they did and we did well together.

What is your job like on a daily basis?

One of the things that I do now that is different than most of my career is that I'm the chair of our Animal Biology graduate group. I was a graduate student at Davis, so that's near and dear to me when I see these students going through that. I get to meet the new crop of Master's and PhD students in the fall and tell them that life is different now. You're graduates. You're a professional. You're no longer a college student. Yes, you go to college, but you're no longer that. You're in a profession and that's exciting to get to do some of that. There may be days between doing anything with that program, and then when we have the applicants to look at and determine who to invite, that's an important job. You're affecting people's lives. It's a very important thing to do. I take that pretty seriously. That is one of the things I do. Nowadays, of course, directing some PhD students and other students has been a very important thing. I would consider that what I probably spend more time on because some students are out at the feedlot helping weigh or do something with cattle as well as helping them set up or being there for them when they want to meet. Over the years my highest priority has been when a livestock advisor or somebody from one of the agencies (Cattlemen or CDFA) call is to respond. To me that was always my highest priority because they weren't calling because they just wanted to chat always. They needed an answer. Working with California ARPAS and others that have done all the research (I was chair of the research committee), we've done a lot of work recently on just how to solve some of the problems we have now with feeding almond hulls because of the contamination of shells and how some of the regulations of categorizing based on crude fiber level when in reality it's just the level of contamination that really affects it. There's just those kind of things that need to be looked at and solved that are really the highest priority that needs some help. Sometimes you can be a lot of help and sometimes you just have to help them find somebody else or somewhere else.

What is your favorite food?

The answer is either a four letter or a five letter word. One is beef, the other is steak.

I know you also really like wine. Do you have a favorite wine?

Whatever one is in my glass.

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CAREER CALL WITH JIM OLTJEN

What do you like to do in your free time?

If I have free time that's more than a few days and it's winter I really like to go downhill skiing. During the summer, if we have time and horses I very much enjoy going with my wife to horseback ride. California has some beautiful mountains that we take the horses to and go riding. Other free time is spent around the home. My wife sometimes jokes and asks what are I will do when I retire. There's a lot of things to do. We have a few acres. We have some horses. There's just a lot of little things around there to keep up with. Whether it's taking care of weeds, doing something with the horses, the lawn, or the house. I enjoy actually doing those sort of things.

You've done several sabbaticals throughout your career and have had the opportunity to travel. What has been your favorite place to visit?

The East Coast of Sardinia. It's an island off the coast of Italy west of Rome several hundred miles. It has some of the most beautiful cliffs, beaches, and water in the world. My wife, son, and I were there when we were on sabbatical in Sardinia. We were actually on the other side of the island which had a beautiful beach but this one on the other side was just beautiful. The water there has such a high salt content that it's almost effortless to swim. The other place is a winter thing. We definitely go skiing in Tahoe quite a bit. There is a ski run that follows the upper ridge along the ski area that has an almost continuous view of lake Tahoe. You start at 10, 000 ft and it's a long run that has lots of views of Lake Tahoe. We have a picture of us, my wife and son, standing on that ridge. Somebody took a picture of us in the lake in the background. That's just another one of those beautiful places.

You've done sabbaticals in Italy, New Zealand, Australia, and Brazil. How were the sabbaticals important to your career?

The great thing about being an academic, at least in the UC system, after a certain amount they encourage you to take some time to further your career. In a way it's a little time off just to read and recharge. Every one of the sabbaticals I took had to do with somehow enhancing some sort of biological model we were working on at the time. Generally growth models. My specialty in this area of research is more in predicting how fast animals will grow, how compensatory growth will affect them and change their efficiency and composition, and just predicting the composition of gain. How much fat and how much lean, at what time, and dynamically. You could predict when the optimum time was to harvest. My first sabbatical was in Australia in 1999 and the model I developed during my PhD was still be used in some places and was very complex. We needed a simpler, more approachable, and usable model. I spent the time in Australia and New Zealand working with people in Ag Research putting together a new way of thinking about the net energy system. We basically decided instead of just having the animal as one big box, we divided the animal into the viscera (all of the organs) and everything else. All of those organs inside utilize energy must faster than all of the other places. So if we did that, then you could get the energetics more correct.

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CAREER CALL WITH JIM OLTJEN

What was it like working in the different cultures of those countries?

My wife would go back to Australia in a minute to just spend time. We had a great time. Good people. We had good people every place we went. Excellent hospitality. We were in a relatively rural area. You were basically almost in the country if you drove two minutes anywhere. Friendly people. Good place to be as well as time to think and get away. There were times where I would just go into the office and look at my papers or computer and not talk to anybody except my wife when I came home at night for two or three days. You really get a lot done. That's the nice thing about a sabbatical. We would also just take a week and go do something. All the sabbaticals were similar to that and I did other things at other sabbaticals. When we went to New Zealand we had a very specific aim there to really improve the model I developed in Australia to a point that it was really useful. We had really excellent mathematician/statistician there that I work with who pushed me on the mathematics and statistics side to get it right.

What is your CattleCal top tip?

It depends on who your listeners are. If they're cattle producers, I'm going to say go and be involved, whether you go on the website or whatever, with the beef quality assurance program. That will only make you a better producer.

If it's a graduate student, it's to find the classical book in whatever area you're in and know it. If you're in the energetics side of things, it's the Max Kleiber book, Fire of Life, written 50 years ago. He talks about things people were talking about 120 years ago about the net energy system.

If you're talking to the general public, the book I go back and read every three or four years is Huckleberry Finn. It's entertaining, but there's several different levels in that book. Some of the are addressing some of the society issues we are seeing today. I'm not going to give it away.

RESEARCH CALL WITH JIM OLTJEN

This week we speak to Dr. Jim Oltjen again. This time we talk to him about the Davis growth model he developed.

Can you tell us about the Davis growth model and how you came up with the idea to develop the model?

As all PhD students do, the need to have something to write in their thesis. Something that's original and creative. My objective because of what I was interested in was basically growth of cattle and how you would hopefully make some money on them. To do that, you needed to know when they would be at a certain weight and composition in terms of fat and marbling to more optimally market them. What we then came up with working with my major professor, Lee Baldwin, was to figure out how to extend the biology that Dr. Baldwin as well as Dr. John Black from Australia had developed. They had gone through each of the organ systems in rats and pigs and a few other species to determine if you could use some basic concepts of cell number and cell size growth (hypertrophy and hyperplasia) to see how those organs would grow. It turned out that they actually made three pretty simplifying assumptions. All of those organs followed those assumptions. I thought that if those assumptions worked, then could we use those assumptions for the whole animal? We did that. I had some really good data on the growth of rats. Another group had taken a bunch of rats and published the data. Many rats at different times of their life and determined the composition of growth for those rats. We put those three assumptions together and it did a perfect job of modeling or simulating those rats growth. We thought cows aren't any more complicated than rats, right? Let's try it with steers. The idea then was to see if we can do it with cows and come up with a way of predicting, based on their feed intake, how much they would grow. That was the next two years of work. It wasn't trivial.

The idea of the Davis growth model is just like our energy systems that we use or feeding systems that we use to fit growth today. You have the amount of the feed that they give, in other words, the energy of the feed that they give, or the net energy. We know how much of it they ate. We have to input that. We're not predicting that at this point with that model. Then based on what type of animal it is, what its composition was when you start. We did this in California without having to adjust for bad weather. Those rats were originally grown with no problems. We wanted to make sure this model would work first in ideal conditions and then we would add more and try to adjust later. This model predicted growth better than the current NRC one. When we used the NRC model it would do a pretty good job of prediction, but we developed this new model for growth that was interrupted or restricted for a while. We put cattle on grass and then we put them in a feedlot at different periods of growth, so made growth this model to accommodate that. That was our objective. It did a much better job of that than the current feeding system would do.

Continued next page

RESEARCH CALL WITH JIM OLTJEN

We've tested it against the US Meat Animal Research Center (Clay Center, NE) data. We also tested against some basic literature data at the time. We were doing better. I'm going to tell you it's still never perfect and we learned to do better in the years since then. At least at that time we were making a step forward.

What are the major inputs you have in the model?

I'm going to go back and give you a little bit of what the three assumptions are.

1. The first assumption is that animals, unless you do some major manipulation, have a mature size. If your dad was tall and your mom was tall, there's probably a good chance you're going to be tall. We could kind of predict that. In our cattle industry we have genetic values (EPDs) to look at and start to use to input in those models, which gives us an idea of frame size and mature body weight. That's an input to the model and that really drives growth. We developed that with the rats. We took our original rat model and then had another set of data on some other rats that were much bigger than the previous rats. We made the adjustment just to frame size in the model and it worked perfectly. It's an easy on but it's very much a very important part of the model.
2. The second assumption is that for however many cells that you would have in your body, cells can only get so large. That would give us an upper limit on how much protein or how much fat they can end up being. In cattle you might think of muscling. Some animals are going to be more muscular than others. It may be related to frame size it may be related to some other things that may be inherit in the genetics of that animal. Some of it is the ratio of protein synthesis to protein degradation. If you make protein, the animal is also always degrading protein. Some of that relationship is how it is affected in the model.
3. The third assumption has to do with metabolically active tissue which we then used 15-18 years later when I went to Australia and developed another model that we looked at to improve this model.

How much have you advanced the model since you created it?

Two things come to mind. In a sabbatical I did in Australia, we decided to try to simplify some of the ideas in that model just to make it easy to use. We had some excellent sheep data to work with. We decided that the best way to improve the energetic part of the model, and make a big improvement, was to not to take the animal as one big box. Make it into two components. One of them was the viscera (the liver, the gut, the lungs, the heart, the spleen, the intestines). The second part was the rest of the animal. When we did that we could do a much better job of making the growth more accurate. Those organs are very responsive to the energy intake of the animal. Those organs use a lot of energy and therefor it increases what we call their maintenance requirements. What if you suddenly restrict those animals? Those animals still have big organs. They still use a lot of energy. The animals really lose weight fast. It's tough on the animal because their organs have to slow down. Fortunately, in animal agriculture we are the other way. We usually restrict first and when we put them in a better feeding situation, their organs use less energy. They're going to catch up, but they get what we call compensatory growth.

Continued next page

RESEARCH CALL WITH JIM OLTJEN

That's worth something. For example, several other animal industries, not just cattle, like turkeys use their feeding systems and levels to take advantage of that and make their whole system more efficient.

What do you see in the future?

Our feeding systems are continually evolving. We're improving those as we speak. Our beef nutrient requirements came out a few years ago with major improvements. Luis Tedeschi at Texas A&M added a lot of things that help us with the growth side. What I'm also working with now is some of the Australians who are taking some of the models we've developed and incorporating that into their future feeding systems to improve their predictions. The idea is now that we have these models they don't just have to be in somebody's computer somewhere. They can also be involved in the way that we predict and formulate rations and feeding strategies. The Australians are working on those. It's a small world. Once they develop some things, other countries will it use the good parts of all those that have proved their systems. Some of the aspects we've been talking about are going to be in that system.

What was the most difficult aspect of developing this model?

When I think back to the original research, the most difficult part was developing the trajectory growth of a normal steer. You may think that's so simple. Don't we already know that? I challenge you to go to the literature and find any paper that has really good data for the body weights and composition of animals every two weeks of their life. We had that with rats. We interpolated and I did a lot of work. I had data from California studies at different times and different ages. I developed what we call the reference Hereford steer. This was back in the 1980's so Angus were getting popular, but the Hereford was what we had all of the data on. I had a lot of data points but never with the same animal. Only two points with each animal. I developed that. I spent a month or two putting points on graph paper and trying to figure the best equation for the line that fit all of the points. That was really difficult. The other parts have been difficult, just coming up with the equation. We tried all kinds of equations. I had a lot of equations I could try, but I had to get it just right so it curved just right. In mathematics, they say if you get the limits right then the other parts are easy. In animal science we hardly ever have the limits. Tell me the actual mature weight if you kept an animal around for a long time. We kind of do it with cows, but with a growing steer we don't. We have had steers at been canulated that we keep around the university to get rumen fluid. We don't feed him very much, but if you fed them what they would eat, they would become huge. And you really don't know. So that was a challenge.

FEEDLOT RESEARCH BRIEF

Effect of implant strategy on performance of calf-fed Holstein steers fed in excess of 300 days

Introduction

- Since the introduction of coated, long-acting hormonal implants, there have been efforts to apply this technology to feedlot cattle.
- Longer payout periods have potential to reduce the need for multiple implantation events.
- Much of the research has been concentrated on beef breeds, while little information exists for calf-fed Holstein steers.
- Holsteins spend 300+ days in the feedlot, making extended released implants appealing.
- This study aimed to compare the effects of four implant strategies involving long-duration implants on growth performance of calf-fed Holstein steers.

Methods

- 192 calf-fed Holstein steers (~275 lbs) were blocked by weight and sorted into 32 pens (6 steers/pen) for a 335 day feeding trial.
- Treatments:
  1. S1S1 - Synovex One (200 mg TBA + 28 mg estradiol benzoate; payout period up to 200 days) on d 1; reimplanted with Synovex One on d 168.
  2. S1SP - Synovex One on d 1; reimplanted with Synovex Plus (200 mg TBA + 28 mg benzoate) on d 224.
  3. SCE - Synovex C (100 mg progesterone + 10 mg estradiol benzoate) on d 1; reimplanted with Encore (43.9 mg estradiol; 400 day payout period) on d112.
  4. SCS1 - Synovex C on d 1; reimplanted with Synovex One on d 112
- All steers fed the same diet
  - d 1-112 fed diet with 16% crude protein to meet metabolizable amino acid requirements
  - d 113-335 fed conventional finishing diet (14% crude protein)

Results

- Steers receiving an initial implant of Synovex One (long acting) had greater ADG, feed efficiency, and estimated NEg than those receiving an initial implant of Synovex C during the initial 112 days on feed.
- From d 112-224, SCS1 had greater ADG than SCE steers, though the differences were not appreciable during the final 111 day on feed.
- From d 112-224, S1S1 had greater ADG and DMI than cattle in the S1SP treatment, but had a decreased feed efficiency and estimated NEg during the final 111 d period.

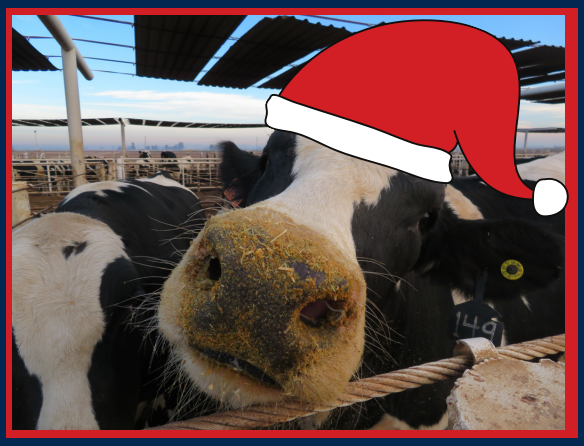
Table 1. Composition of basal diets

Item	Growing[1]	Finishing
Ingredient composition, % DM		
Sorghum sudangrass hay	8.00	8.00
Alfalfa hay	4.00	4.00
Yellow grease	2.50	2.50
Molasses, cane	4.00	4.00
Distillers grains plus solubles	7.00	10.00
Blood meal	3.00	0.00
Steam-flaked corn	68.09	68.06
Urea	1.15	1.15
Limestone	1.68	1.68
Dicalcium phosphate	0.10	0.10
Magnesium oxide	0.15	0.15
Monensin,[2] mg/kg	33	33
Trace mineral salt[3]	0.30	0.30
Nutrient composition,[4] % DM unless otherwise stated		
NE_m, Mcal/kg	2.19	2.21
NE_g, Mcal/kg	1.52	1.54
CP	16.2	14.3

Implications

Implant strategies using long acting implants to minimize implanting later in the growing-finishing period improved feed efficiency and ADG of calf-fed Holstein steers. Using a non-coated implant during the late finishing phase (224 days on feed) as the terminal implant increased overall NEg and efficiency.

We hope you have a happy and safe holiday season!



We look forward to a new year full of interesting guests, important feedlot research, and getting your questions answered!

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