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BEGIN TRANSCRIPTION

00;00;16;06 - 00;00;38;01

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Welcome to Pasture to Profit. My name is Scott Stinnett, CSU extension specialist here in Kit Carson County in the Golden Plains area. And with me today again is my colleague Travis Taylor from the Yuma County office in Wray, Colorado. And our special guest today is Doctor Jennifer Martin from CSU Animal Science Department. Welcome, Doctor Martin, how are you today?

00;00;38;04 - 00;01;02;13

Unknown

I'm doing great. Thanks for the opportunity to join the podcast. Yeah, you made a very interesting presentation back this spring when we did the Hoof to Plate conference there on campus, and it's something I'd really not thought about. I've thought about it in other aspects, but, so we went back through it. You shared your slideshow with us, and so we thought we'd share this with producers.

00;01;02;16 - 00;01;34;06

Unknown

I'm going to kind of kick it off. This is about development and developing the beef animal and where all that starts. And so it starts. Prenatal and postnatal we get is how we grow the beef animal to try to get the best beef that we can. So with that. Why don't you just kind of explain to us, you know, it's been a short you know, you had a nice hour long presentation, so we're going to try to shrink it, how skeletal muscle and fat development occurs both prenatal and postnatal.

00;01;34;09 - 00;02;00;26

Unknown

Yeah. It's such a good question. And I think often like, as a meat scientist, one of the questions that I kept getting and why I really sort of diving into this a bit more, is people would see a carcass and would want to know what went wrong, why wasn't it yielding, why didn't it grade and really didn't understand how the components of meat, muscle and fat were developing when they were developing and what contributed to their development?

00;02;00;26 - 00;02;25;07

Unknown

And I remember in graduate school and even as an undergrad student, taking classes on growth and development, really focusing on muscle development, skeletal and fat development, but never really tied that together and made the connection with, well, how the animal develops both pre and post. Natalie is connected to the ability of that animal to produce either a high yielding or a high quality grain carcass.

00;02;25;09 - 00;02;49;01

Unknown

And so we really started taking a step back when I was in acting with producers across the country, and especially post like in the pandemic, when folks were really getting getting interested into home raised beef, particularly other species, but really in the beef space and understanding why. Why, despite their best efforts, things weren't working out as they planned, right?

00;02;49;03 - 00;03;10;05

Unknown

Like we thought we did everything right, and then at the end it didn't work out as we thought. So that really was what led to this sort of, discussion series that we've been having with producers across the country is understanding the building blocks of meat, primarily muscle and fat. But the skeleton plays a role because when we talk about me, we're talking about skeletal muscle.

00;03;10;06 - 00;03;36;16

Unknown

So I like to say that the skeleton is the foundation of the house that we're building. And skeletal muscle development begins in the prenatal period. So while the animal is in utero, most of the cells that will form their skeleton are developed. And then after birth, as just like within humans, those skeletal cells start to mature and differentiate and bones start to get longer and start to get more dense, etc. muscle development is very similar.

00;03;36;18 - 00;03;57;21

Unknown

It occurs a little later in the prenatal period, but at the time of birth, in humans and in cattle, we have a fixed number of muscle cells, meaning that the number of muscle cells we will ever have is determined at the point of birth. Now there's some wiggle room with satellite cells and some of these things, but it's pretty, pretty small and on the margins.

00;03;57;23 - 00;04;22;27

Unknown

So what that means from a human development perspective is that I can't today take pills and get more muscle cells. All that I can do is grow in size, the existing muscle cells that I have. What that means from an animal production perspective, is that the ability of an animal to produce muscle depends on what happens to the mother or the calf in utero, and at the point of birth.

00;04;23;00 - 00;04;44;25

Unknown

All that changes is the ability of that muscle of that animal to grow the muscle cells that it already has. That is the one that's a little different. And that fat kind of transcends the prenatal and into the early postnatal period. And it reflects how the animal uses fat. So I like to tell people we talk about animals from a carcass perspective.

00;04;44;27 - 00;05;12;04

Unknown

We really focus on what they produced, but the animal doesn't care what it produced it. It has one job, and its job is to survive. And so the development of fat and the animal kind of reflects that survival nature. And then it first prioritizes the development of cells that will protect its internal organs from a fat perspective, so that subcutaneous fat, the fat, the internal fat, those cells develop really in the prenatal period.

00;05;12;04 - 00;05;35;12

Unknown

And then after birth that development stops, those cells are developed, the animal is going to start depositing energy to grow that fat, so that when, as you know, as the calf is growing, it's putting on fat around the tart, it's putting around fat around its kidneys to protect those internal organs. And then we see the subcutaneous, some of the interim fat development happening closer to the point of birth.

00;05;35;12 - 00;06;02;22

Unknown

But after birth, and really through the weaning period, that's where the fat cells that are associated with marbling, that's when they develop. And so oftentimes what we think about is if I have an animal at the end of the feeding period and I've thrown all sorts of groceries at it, trying to get it to grade or trying to get it to put on marbling, and it doesn't, we often think the problem is in the last 30 days, the last 60 days of the finishing period.

00;06;02;24 - 00;06;24;02

Unknown

But if those cells never developed in the weaning period or in that prenatal period, it doesn't matter what I feed it at the end of its life, because the cells are never there and I can't grow the cells that were never produced. And so that's really what we've tried to help producers understand is the art form of producing cattle or producing beef from raising cattle.

00;06;24;08 - 00;06;49;14

Unknown

There's an art to it, but that art is underpinned by science. There is a very well defined, well understood scientific process of how muscle develops fat and bone develop that you at least need to be familiar with the timeline and how those things, you know, interact with different production strategy, systems, times and production to help you do your art better.

00;06;49;17 - 00;07;13;12

Unknown

Because if you're operating blind or, you know, not aware of the biology of the animal itself, then you can really put yourself at a disadvantage. Well, I think when we were looking at your presentation, one of the things that really stuck out to me as a as a beef producer, we're usually dividing things into those trimesters during pregnancy.

00;07;13;13 - 00;07;40;10

Unknown

You know, that that first trimester, second trimester, third trimester, you were really showing that there are some muscle development things that come in in that second trimester, which is when we talk about coasting cows, or I like to tell everybody that's the green light, period. You need to put some body condition score on your cow. That's the time to do it in that second trimester, because the requirements are not quite as heavy.

00;07;40;16 - 00;08;11;22

Unknown

Well, you're also telling me that's the time to be prepping the muscle content of this next generation that's coming on? Yeah. So certainly from like a pregnancy like productivity of the pregnant mother. Right. That's the period where there is some stability, if you will, opportunity. But I also think that and assuming that everything goes well like her basic maintenance needs are met, then any excess energy is going to go into to producing excess muscle cells.

00;08;11;22 - 00;08;34;14

Unknown

But her she's going to do her job. She's going to devote an appropriate amount of energy to make sure that she has muscle cells going into that calf. What we really see is if there are any negative things, if there's an illness, if there is a deficiency in forage or grass quality, etc., if there are any nutritional deficiencies, that's where you're going to see the yield impacts.

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Unknown

And so if everything goes well, that mama cow is going to do her job and use whatever excess nutrients she has to devote towards putting letting that calf develop muscle cells, it's it's less so on. What can I do more? It's how can I make sure that nothing happens where there is a nutritional deficiency that would stop the formation of muscle cells or an illness, etc., that would make her where she couldn't, where that calf couldn't deposit muscle cells or couldn't start the development of those muscle cells.

00;09;06;01 - 00;09;28;02

Unknown

So I don't know that there's there's much research saying that if we really focus on that, that we can increase yield or increase muscling, etc.. I think really what the research shows it is, if there's a problem

in that, in that second trimester, then we're going to see some issues from a growth perspective or from especially at the carcass, like the ability of the animal to muscle or producer at meat.

00;09;28;05 - 00;09;48;21

Unknown

Well, I think with what you just said. So that kind of leads us to some common sense management deals. You know, here we are. We're in a drought year, and I've already got some producers telling me that they are out there going to have to feed. Hey, so they're already supplemental feeding. And normally here and as we are here in August and into September, forage quality starts going downhill.

00;09;48;21 - 00;10;10;19

Unknown

There may be an abundance, but the quality goes down. Even if we get rain, we'll have an abundance, but it's low quality. So starting that supplementation, like Travis said, we're in the let's put the gas pedal down when it's the cheapest to get that body condition up. Yeah. So although we can't grow more carcass, we can prevent detriment to the carcass.

00;10;10;21 - 00;10;35;10

Unknown

Yep. Absolutely. Yeah. And I think that just that awareness. Right. Like I there are things I can do now that are going to save me in the long run. Like in the point of pregnancy. I'm not going to necessarily see some benefit to the calf, but I will see the payoff of that low cost to gain ratio right now, because then that calf is going to be able to put on pounds of muscle much more easily in the future.

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And that's what I kept seeing, you know, especially in spaces like where there is differences in forage quality or there may be, you know, drought years where we see nutritional deficiencies when people aren't supplementing and then they see two years later their calf crop doesn't produce as much red meat. And they're like, well, what happened? Well this happened.

00;10;54;28 - 00;11;31;23

Unknown

We were in a drought year in the second trimester. Some you didn't supplement and you paid the price for it two years from now in that calf crop was going to the yard. And that's really what we tried to say is, how can you have an understanding of the entire life cycle of the animal and the awareness that where we see the most opportunity for improvements, or at least I think insurance, if you will, if I can make sure that pregnant cow management is done well, that I am insuring myself from other things that I know are going to happen once the calf is born and all of the challenges that are coming there

00;11;31;23 - 00;12;03;00

Unknown

within. I'm not giving myself. I'm not stacking the deck against me before the animals even born. I guess I'd like to circle back to what you said, right? We're trying to optimize the genetic potential of those animals. Absolutely. We're not going to change the genetic potential of those animals because that's the part that's genetic. So, you know, overfeeding our beef cattle doesn't necessarily mean that we're going to get more yield on the back end of this two years down the road.

00;12;03;04 - 00;12;29;28

Unknown

So finding that optimum and, you know, Scott and I spent a lot of time on here talking about keeping these cattle in the right body condition score. Being active in terms of monitoring those things. And this just increases the need to be on top of what your cows are doing now. Yeah. In order to maintain, like you said, the whole beef cycle.

00;12;30;04 - 00;12;53;12

Unknown

Unfortunately, a lot of our producers, I believe, get focused on hey, this is the end point. I want just big weaning weights because that's what I sell. Yep. And they're missing out on some of the things. And I really appreciate how you're bringing in that. This is a a total beef cycle from yeah, early on in pregnancy all the way to the rail.

00;12;53;17 - 00;13;25;11

Unknown

Yep. Yeah. We like we frame it as from the cell to the rail. Right. Like we can't. What I see on the meat industry side is most folks focus on the finishing period and think that they can fix everything by throwing a ton of groceries or trying to to do all of the adjustments. And sometimes, like if the genetic potential is there and everything went well during pregnancy of the animal, then you can manipulate, yield and finish and graded, etc. but if you didn't take care of business in the front half of the beef cycle, it doesn't matter.

00;13;25;13 - 00;13;50;17

Unknown

And I've, I think there are so many producers who candidly waste a lot of time, energy and money throwing stuff at the end because they didn't take care of business at the front side. And I think understanding the biology of how the animal is built from the cell cellular level, then you can use that to your advantage. Like whenever I give this presentation, you don't have to be an animal scientist.

00;13;50;18 - 00;14;08;29

Unknown

You don't have to be a growth and development specialist. You just need to have a basic understanding of this phase of the life cycle. Here's what's going on. And I need to take care of these things. Or at this, I'm taking care of them because right now it may not seem like a big deal, but two years from now, it's going to be a really big deal.

00;14;09;02 - 00;14;29;08

Unknown

And so just that general understanding of the biology, I think is incredibly important. And what I've seen in my interaction with a lot of cattle producers is they understand the biology specific to they're part of the production cycle. But again, these animals don't care about they don't care that you're a stalker or a feed yard operator or you're a cow calf.

00;14;29;10 - 00;14;50;26

Unknown

They don't care about that. And that's why this whole understanding, I think, really gives an advantage to folks who are in the business of producing beef to kind of carry on with this whole idea of a little further down in your presentation, you get to the actual quality and flavor tenderness of the meat. And this all goes back to proper nutrition.

00;14;50;26 - 00;15;11;00

Unknown

And, you know, all three of us are parents, so we we understand trying to raise kids. You can't raise them on Twinkies and host, you know, as much as they would want to live on and soda pop the camp. Yeah. But same kind of deal. The nutrition can affect the flavor. I mean, we've got the big. We got the big.

00;15;11;02 - 00;15;31;22

Unknown

Well, I'll call it the the chasm between grass fed and grain finished grass fish, you know, and yes, there's definitely a flavor profile difference, but how does it really affect the flavor of the beef in the end in that nutrition and what they're fed. Yeah. Really great question. So I think there are two different conversations. One there's just general a general composition.

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Unknown

Right. So like what we eat if I, you know, the ratio of fat and protein and carbohydrates that I'm eating that's going to affect my body composition. Likewise for an animal it's going to affect their body composition, making sure that I have met my minimum nutritional requirements, that I can perform my basic body functions for animals and for humans.

00;15;53;21 - 00;16;26;14

Unknown

But we really see flavor differences, is understanding that what is actually happening. And when we're thinking about flavor, when we're thinking about beef as a product and how that relates to what we feed to an animal, we are what we eat. They are and we are, right. So if I'm eating a diet of Twinkies and all that sort of stuff compared to a whole balanced diet, or if I'm feeding an animal a diet that is very homogenous, like a corn finished diet, compared to maybe a grass fed diet that may be somewhat homogenous.

00;16;26;14 - 00;16;58;15

Unknown

But maybe I have some odd things growing in my pasture this year that's going to manifest in the composition of the animal, not just gross composition from a protein fat ratio, but also like the individual components that make up the fatty acids or the amino acid profile of the beef. And why that matters from a flavor perspective is when we take that raw beef flavor is what we experience on the cook side, and going from raw to cooked, it's a chemical reaction.

00;16;58;16 - 00;17;18;17

Unknown

I'm taking raw ingredients and I'm adding heat, and I am producing a different set of ingredients. And so I use the example often when I give this presentation, like the ingredients of a strawberry cake are not too different than the ingredients of a chocolate cake. But there are two big things that make them taste very different when they come out of the oven.

00;17;18;19 - 00;17;42;17

Unknown

And so even like when, when I'm when I'm going through this chemical reaction of taking raw beef, adding heat and producing different compounds, if my forage that was fed to that animal is different, it's possible that the consumer can tell the difference when they eat that product, because the fatty acid profile is different, the amino acid profile is different of that forage that was fed to that animal.

00;17;42;18 - 00;18;15;05

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And where we see most of that variation is in the grass fed side, because the the corn ration is so consistent, whether I'm feeding corn in Colorado or corn in Texas, Nebraska, Florida, you name it, it's pretty homogenous versus the forages or the pastures that we grades in Colorado. Look, I'm going to a conference in North Carolina in a couple of weeks and talking with their cattle producers about something very similar, totally different forage profile and the coastal areas of North Carolina, inland North Carolina.

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Unknown

So when they talk about forage composition, forage quality, it's a different conversation than what we talk about here. And it makes sense then to that the eating experience of grass fed beef from North Carolina is going to be different than grass fed beef in Colorado and so on, that what we feed the animals, especially when they're on grass, is going to influence the composition, gross composition, percentages of fat and muscle, but also the the micro composition, the fatty acid profile, the amino acid profile.

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Unknown

And those raw compounds, when heated, are going to produce different compounds when cooked. And the consumer can tell the difference. A couple of years ago, in my Lockard and I were having a conversation of the

number one question that she was getting is, why do I have like one year? You know, I'm producing cash, cattle on pasture.

00;19;09;29 - 00;19;32;24

Unknown

I have direct to consumer beef and everything tastes great. Year one same genetics. Everything's the same change pastures. Year two I have a consumer that doesn't like it. What happened? Well, what you fed them changed. And when what you feed them changes, the composition of their meat changes. And then sometimes a consumer can tell the difference. Not all the time, but sometimes it's such a compositional change.

00;19;32;25 - 00;20;14;00

Unknown

They can tell the difference. And that's because it's a chemical reaction when we cook beef or cook any food. So I guess that leads me to maybe conversation, maybe a totally different pastor to prophet topic when we get there. When we talk about the composition. So we've had a big change chase in this deal for having genetics and looking at the tenderness gene versus what we have done in the past, where we're looking at intra muscular fat and marbling and how the two of those relate to get there.

00;20;14;02 - 00;20;39;22

Unknown

You know, in terms of the things that we're able to do now in the last ten years in the beef industry that have just, caused us to maybe look at our grading system and quality system a little bit different from just being reliant on the fat that is intramuscular or intramuscular in the beef animal. Yeah.

00;20;39;23 - 00;20;58;09

Unknown

I think there's a you know, when I think back to I was in grad school when we were working with Zetas and other companies to try to identify a tender gene and identify a genetic marker, like how I remember collecting a ton of loin samples and at the time not having a clue what they were working on.

00;20;58;09 - 00;21;21;27

Unknown

But I was really tired of going and taking slices of loin and to think about how far we've come and not only having a gene, but having a predictable pattern of if the gene is present, then we can have tender beef. I think the other part that we see now, like the National Beef Tenderness Survey that's done with National Cattlemen's Beef Association every five or so years, says that the majority of beef in the US is tender or very tender.

00;21;22;03 - 00;21;44;10

Unknown

So the last time that survey was performed, 90 plus percentage of beef stakes were tender or very tender. And we've seen a transition from really focusing on tenderness to focusing on flavor. But how they connect together, right. Like what role does marbling play in tenderness and how

does that how does that relate to consumer acceptance, consumer preference, etc.?

00;21;44;13 - 00;22;06;18

Unknown

What we know is that if if beef is tender enough, then flavor is the predominant deciding factor if a consumer likes the product or not. But we also know that we have a very small threshold of acceptance for toughness because we have a history with it, right? So it doesn't have to be super tough. If it's a little bit tough, then flavor kind of goes out the window.

00;22;06;21 - 00;22;31;07

Unknown

And so I think we've kind of seen the pendulum shift a little bit back of we can't forget about tenderness because we can't go back to where we were. And consumers aren't willing to take even a small step back. And so how can we prioritize flavor? Because that's the where that's where we get the most value, if you will like the most from a profitability, from a marketability perspective, that's what everyone wants to pay more money for.

00;22;31;08 - 00;23;00;10

Unknown

Is does it does it taste like beef? Does it taste good? How can we capitalize the desire to move towards a better flavor profile for beef and use the advantages that we've gotten on the tenderness side to get there, and what sort of interplay is there? So and there's a lot of potential. What I've seen more recently is understanding that it's it's not just the gross amount of intramuscular fat, it's how it's actually situated within the animal.

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Unknown

There's a lot of work coming right now, like, especially with the Wagyu trend that we saw a couple of years ago and how we really stretched the quality grading system. We really stretched the percentage of intramuscular fat in animals almost to the point where people didn't like it. It was we were getting two fat within the rib and within the loin.

00;23;22;00 - 00;23;57;05

Unknown

There's, I think, a whole different set of balancing those two dynamics and making sure that we can continue to see tenderness improvements, while we're also continuing to see improvements in flavor and intramuscular fat. Well, I, I think as we look at this and we talk about going forward, really the bottom line for our listeners today is you can affect the genetics and the ability of an animal to express those genetics in utero.

00;23;57;07 - 00;24;40;25

Unknown

Yeah. And any time that nutritional level is highly volatile in some fashion for any of that animal through its entire from cell to the rail,

point being taken there. So I think it is behoove of our listeners today, the bottom line is, is those little bitty ups and downs that we deal with and drought or flood or fire or whatever can have a huge dramatic impact on our product and what it says to our consumer at the end, even if we're not that person, that takes it the last three steps to the consumer.

00;24;40;27 - 00;25;09;07

Unknown

Yeah, absolutely. I think, you know, all of the work that the industry has done to improve genetic, I think futures, right. Like so many improvements and whether it's birth weights or weaning weights or marbling or tenderness gene like we've made so many genetic improvements and, and opened up opportunities for in a relatively short generational interval to really see genetic progress.

00;25;09;14 - 00;25;34;23

Unknown

And it can all go to waste if we don't take care of business here. And so the ability of a producer to maximize their genetic potential, to maximize all of the work they've done to improve their genetic base of their herd or of their population of animals, whether it's cows or bulls or whatnot, really depends on understanding how that layers with the biological processes of the animal.

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Unknown

So you've laid the foundations with genetics. Now you're going to have to let biology kind of play its course and understanding when when you need to be dialed in and pay attention and when you can let Mother Nature kind of do her job. And it's usually what I've seen. The the worst thing that we can do is ignore biology and focus on what we can do from a human perspective, when we're controlling what's being fed, when we're controlling, when we finish, and what slaughter weights are, you can do that, but you're missing probably the point of their life cycle where you can have the most consistent impact.

00;26;13;02 - 00;26;39;15

Unknown

And that's by making sure that when you have a calf in utero and shortly after birth that you are you are insulating that animal from anything that might harm its genetic potential. And that's why supplementing when you need to, making sure that you're, you know, keeping animal health and low stress practices top of mind and managing environmental conditions to the best that you can, it doesn't mean that you have to do a lot.

00;26;39;16 - 00;27;01;27

Unknown

Sometimes it's just good animal husbandry and you, Mother Nature, kind of take over. But if you forget that part, then you're left only with hoping that you can recon and recover from what you didn't do then. And biology just doesn't work that way. Like I tell the story often of, I remember growing up, I was the tallest person in my family.

00;27;01;29 - 00;27;20;09

Unknown

Among my three siblings. I was a tallest one of my siblings, and it was a very sad day in our household when we went to the doctor for like our junior high physical, and the doctor comes in and says, well, your brother's taller than you. And to this day I wish that I could. You know where shoes with heels and be taller than my brother.

00;27;20;09 - 00;27;51;22

Unknown

But that ship has sailed. I can no longer compensate and become taller than him. I can't undo what didn't happen then, right? Like I cattle producers can't undo at the end what they didn't do at the beginning. And so I think it's just a really important opportunity to be mindful of, of the biology that you can maximize and allow genetic potentials to reach their full potential by understanding what's going on within the animal.

00;27;51;24 - 00;28;11;21

Unknown

Yeah, it goes back to very basic things that I told me a long time ago, which is you can work with nature, but you can't control it. Yep. Understanding how this works, being able to provide proper nutrition all the way through from sail to rail, is is going to be the takeaway. I'm going to try to leave with producers today.

00;28;11;27 - 00;28;40;14

Unknown

So thank you, Doctor Martin, for being with us today. Travis and I, we enjoy having our guest. And if you have questions for our topic today, you can get ahold of myself or Travis Taylor. You can get ahold of me. Scott at Scott.Stinnett. That's STINNETT at colostate.edu. Or you can call me here at the office at (719)346-5571.

00;28;40;14 - 00;29;03;26

Unknown

And Travis, how do they get ahold of you? Well, if you want to catch up with me, you can catch me at the Yuma County office in Wray, Colorado at (970)522-4151 or at Travis.Taylor@colostate.edu is my email. And again, thank you, Doctor Martin, for being with us today and going over this subject.

00;29;03;28 - 00;29;33;01

Unknown

And for those of you out there listening that may be in the eastern Colorado area on September the 17th, we'll be having a cheatgrass workshop in Joe's, Colorado, sponsored by the Eastern Colorado Grasslands Coalition. And if you'd like to participate, you can contact Travis or I or be on the lookout for advertisement of how to register for that event through the CSU extension office and other social media, or some just some handbills around town.

00;29;33;03 - 00;29;37;02

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So thanks again for listening to Pasture to Profit. We hope you'll tune in next time.

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