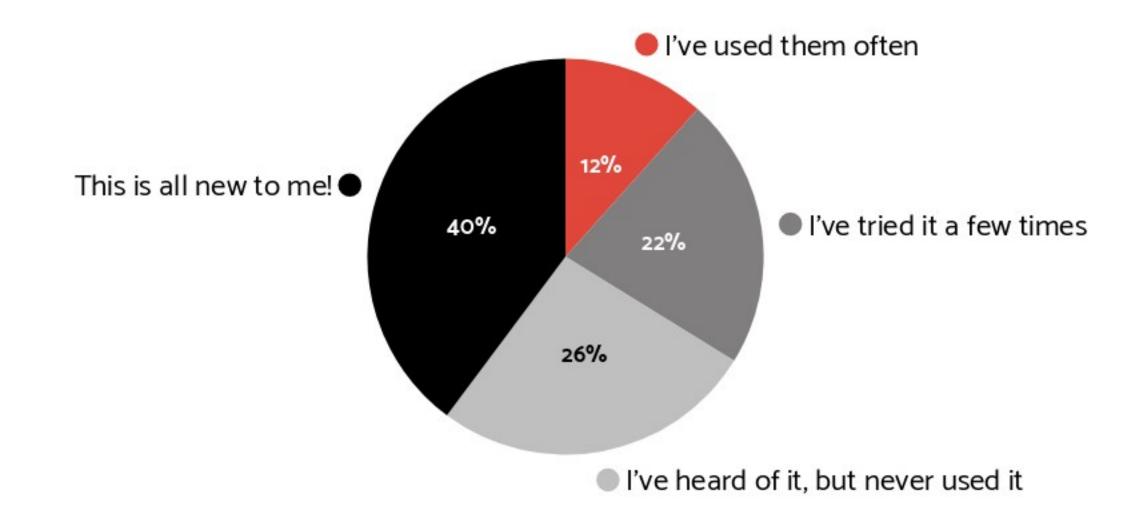
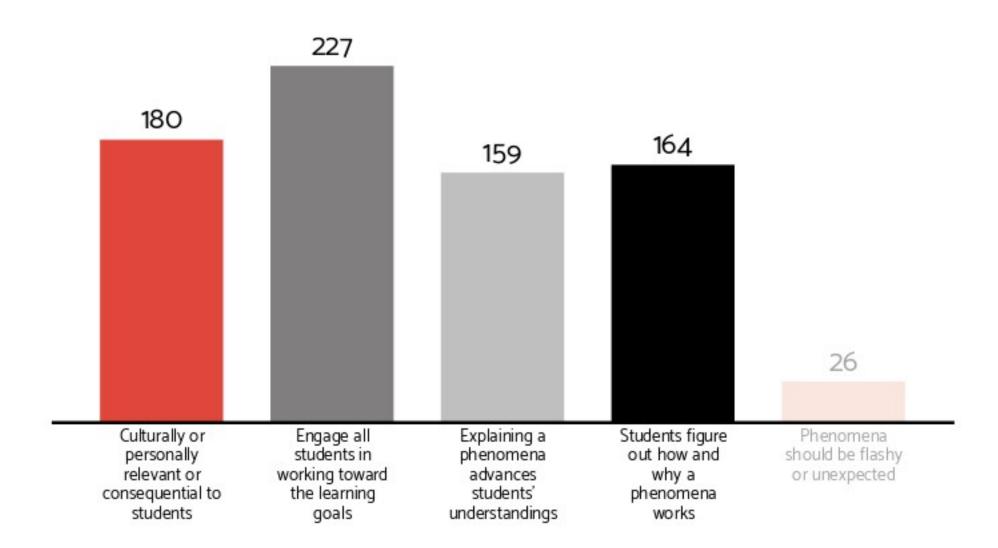
What is your familiarity with anchoring phenomena and how they are used in a unit of instruction?





What makes phenomena effective for use in instruction?







Wow- how many different breeds are there today? How expensive is the process for breeding?

I love the genetic information. Introducing the ultrasound also introduces a discussion about career options. I really enjoyed his presentation.

Many traits can be affected by environmental factors

Is the "hump" connected to survival in hot climates?

Cattle traits are developed through predictions made by producers.

I wonder how often farmers try to manipulate traits to create new more favorable breeds There are so many more traits than I would have ever thought about when thinking about why a rancher choses a particular breed

Humans choose traits that will help them use the meat, or milk to breed them for human consumption.

Wonder the connection between desired specific traits and location on Earth





Theoretically, you can manipulate genes to serve human needs.

But, is it ethical?

Are their specific traits that are connected, if you try to bring out one trait but another tags along either for the good or bad for the animal

Are there any "heritage" breeds that are being brought back?

There are a variety of cattle traits to consider besides just the phenotypic traits we obviously notice first.

is there any thing being done to store heritage DNA to splece

Are Piedmontese the only breed with the double muscling trait?

Horns

There is a lot of diversity!

into curret production?

How long it took for traits to be exhibited



How similar yet versatile all traits are across the board.	Horns	I noticed that cattle traits are much more complex than I ever imagined!
There are a lot of traits that can be selected for when breeding cattle.	Which traits are the best?	How the heritability varies between traits.
What does the cattle hump taste like?	How can I get my students to look more into these individual traits???	Knowledge of cattle traits are definite essential for successful





Who the heck knew that we measure and quantify all that? That's amazing ... What are the pros and cons of using cattle for dual purpose vs separating them by purpose like the US does?

Which traits are the top 5 most commonly used for selection in beef cattle?

There are literally thousands of ways the cows in the card sort are different! Why do traits sometimes "skip" generations and show up when you least expect them?

Who is making the changes in the traits - individual farmers or specific breeders?

How many traits are controlled at a single loci?

I wonder how environmental influences affect traits?

Many traits that are passed on can be affected by the different environments that the cattle live in.



What is the best way to help teach students about EPDs and understanding them?

How can we continue to manipulate traits to feed the masses, especially as population grows?

There are a lot of details involved- from traits to environment type. I was unaware of this!

Lots of diversity in breeds

I wonder why we don't see farmers trying to make more new and interesting breeds to make cattle better The consideration of cattle traits have and will continue to be extremely important as our population continues to grow and we have to feed them.

Is utilizing EPD's the best method to alter traits in livestock or is phenotype as important in this decision process?

love the genetic information

Large variety of traits that can be influenced by a number of factors.



Over time, which traits will continue to be favorable or desired that will continue onto future generations? (Are there still some undiscovered traits or will there be newly developed ones?)

That you can crossbreed cattle to get more favorable traits in the offspring.

I wonder if you can produce cattle that release less methane into the atmosphere.

How would they have evolved without man's influence?

Are there characteristics that humans have "bred out" of the species?

Are protein content a trait also selected for genetic improvement?

Are cattle bred for their coats? Example- better leather?

How does this data and information translate in commerce?

What are the ethical implications of artificial selection?





There is a lot of traits that go into the selection of cattle for different industries.

How much doe imf play a part in choice for continuing genetic traits?

They are the specific traits

Think about origin use of cattle in certain geographic areas

There is a breed for just about everything. Calving ease, heat tolerance, dairy production, high marbling meat, etc...

Diversity!!!!

Despite their similarities there is an enormous range of difference in different cattle breeds.

How it was all figured out. How there is such variety based on need and environment. Cattle selection is largely based on statistics and numbers



How far does breeding go into visual traits? How much is controllable?

Humps disperse heat

I notice that some traits are very subtle and minor changes are made to make certain cattle more desirable.

What is the evolution of traits?

I wonder, with all the different breeds and their characteristics, how farmers decide what breed they will focus on raising.

Natural selection is awesome!

The charts about breeding characteristics, what is the most important information when it comes to farm management plans?

Is it better to have a single purpose animal of duel purpose animal?

I notice that cattle traits are connected to cattle function





As an industry we are getting closer and closer to being able to predict cattle traits and what we can expect our offspring to be like

I have always been fascinated about the differences between Bos taurus and Bos indicus.

Are there failed experiments while cattle breeders go through artificial selection?

Some traits overlap between the dairy and beef species.

Curious about double muscling

Do farmers perform all these calculations or is there a database reference?

Why do we not use cows as dual purpose here in the US? Wouldn't that mean we need less cattle overall if they can then be used for both purposes?

Does the "extra muscle" mutation produce more meat, or possibly leaner meat?

I didn't realize there were so many traits to consider when selectively breeding cattle.





Lots of info presented. I hope there are explanations under each slide, so we can remember what he was talking about?

I wonder if as summers are heating up, more producers will choose to cross their herds with Zibu cattle to bring in heat tolerance traits.

I notice the complexity of traits.

each breeder kind of has traits that he/or she favors. They aren't a one size fits all.

Heritage traits and how they are being used/reintroduced

One of my questions was regarding climate vs. breed and usability. There are many traits that allow for survivability which allows humans to use those animals in many ways due to being fit for their environment.

How amazing the diversity is. I do wonder about how it works into a Hardy Weinberg equilibrium.

Is there pictures of the first cow?

Having students understand similarities and differences among breeds and how they adapt to their environment or how the environment impacts the breed.



Who decides how/what cross breeding can occur?

What strategies are being used to ensure genetic diversity in case of disease or changes in human need or environment!?

Is the work for the "perfect" cattle hit and miss?

How to convey to students that traits are all about probability and dominance etc

The size related to the original Auroch and why it was bred away from in beef cattle. The differences between beef and dairy cattle, and the crossover of traits in the dual purpose cows.

What methods are being used to choose for traits other than just straight breeding?

Are their any sex linked traits?

Is breed connected to pasture size or feedlot requirements?

Are there some better than others? Is there a chance that any of these breeds could become extinct? What new breeds are we looking at? At what point does this become dangerous for the cattle?





I wonder about the influence of artificial genetic mutation of synthetic beef on the beef production to cut down on costs of farming.

How will genetic testing in beef breeds help improve acuuracy in genetic indexes?

Great presentation

What kind of food are they fed for the different cuts of meat?

I wonder what GMO marketing looks like and if requirements changes based on the specific genetics chosen

It appears we are breeding for fast growth, greater bone density and meat production. How much difference in size is there between say the cattle brought over on the Mayflower. I wonder on how much we rely on technology over the years to identify specific cattle traits.

In breeds where a solid coat is preferred (i.e., Black Angus), how is the amount of white hair determined? Why is this trait undesirable? Similar to sabino trait in horses, yet it is desirable in horses.

What about the need for maintaining genetic diversity within a species?





Costs in breeding

The complexity of genetics is often unnoticed in livestock, and there is so much to understand!

Are breeding selections/specifications always successful?

I have noticed that the environment with feed sources plays a crucial role in how the animal then converts that feed to either meat or milk.

I wonder what each trait is most useful for?

Cows and cattle are sometimes classified together. Cows give milk daily cattle don't. I am guess this is due to breeding and genetics?

Is heritidge DNA stored anywhere?

There is a lot of opportunities for producers to continue to utilize traits to maximize productivity

I did not realize there were so many quantifiable attributes looked at when artificially selecting cattle.





Please elaborate on how gaming helped scientists learn more about cattle genetics :-)

I never knew there were so many. different breeds.

Cattle traits can easily be analyzed just like any other species directly coordinating to other species like humans

Has there been a breed where we try to reverse a trait we've selected for because of adverse reactions?

Had no idea that we had artificially selected cattle traits since 10000 years ago. Fascinating

I find it fascinating the traits that can be bred for. As a cattle farmer and Aq teacher I love researching traits!

Traits are conducive to environment.

I would like to know more about the genetic value ratings!

I was most interested by the interdisciplinary nature of cattle industry problem solving (many students don't see connections).



So much more goes into cattle breeding and production than I knew. Also, it was interesting to see the ultrasound of the ribeye with the fat.

Other than traits that are "meeting human needs" what other traits could be beneficial to any other arena of life?

Cattle have a lot of variations based on the traits you are looking for.

What is the % heritability of specific traits (color, polled, etc)

More about how they became so diversified from one single animal.

Why don't all producers try to get polled offspring

So much knowledge of genetics is required in breeding animals for human needs!

What traits are considered for breeding purposes?

There is a great variety of breeds each with a variety of selected traits. A lot goes into the selective breeding.



There are so many variables that ultimately affect the outcome of cattle breeding.

How animals 'immigrated' or were brought from one location to another. Seems tricky. How are traits not selected for (mooing tone in Brahman) are linked to traits being selected for (Brahman phenotype)? I've noticed Brahman influenced cattle moo totally different than any other breed.

If we are selecting for only a couple of different uses for cattlemainly meat or milk, why are there still so many varying traits? Is it to account for the influence that environment plays? Enjoyed the epd explanation and it relevance to selection of traits.

By being able to choose the traits in cattle it has bettered the cattle industry.

Beef cattle genetics is a great way to teach HS geneticsstudents can relate. Very good on adaptations and environment. I a amazed by the varieties and how those traits are tracked on cattle during the distribution process

How much does environment affect cattle traits?



How different would cattle be if all selection had been natural? How often are breeds changed? I didn't realize breeds were a human based classification that can be changed by associations.

Mutations are not always bad, they can create some really great beef cattle.

Can the traits die off over time? *Meaning - can breeding for a specific trait can wear out over time (like in farming: pulling too many nutrients from the soil without replenishing it properly)?

How does a rancher or farmer determine which breed to raise? Do they have help in wading through all this information?

Will students raise ethical issues - e.g., Is it ethical to create animal breeds with the sole purpose of serving human needs?

How long does it take for genetic scientist to "develop" new breeds of cattle or any animal? Why not let nature run it's course? By breeding selective traits, doesn't it eventually decrease the health or longevity of the species?

Some traits have a greater probability of inheritance.

I teach 8th grade so more simplified introductory genetics.

Which cattle traits follow sumple mendelian genetics patterns?

Polled vs horned? Others?





How do you explain the term "heritage" breeds?

I

Are there particular breeds being used for the "Re-wilding" of Europe, or are there still wild auroch alive in Europe? Are there similar efforts in other parts of the world? Have there been any negative mutations or genetic traits that have occurred as a result of selecting for a single trait and how have producers handled that?

Are there ways to breed cattle to have a tolerance to different grasses so they'll have the ability to graze outside the typical seasons?

How cattle can be used for both beef/ dairy. Used for diary for few years and then sold for meat? Or breeding purposes?

How many generations does it take to change cattle traits for different environments?

Number of generations required to create new breeds

What is the procedure for breeding? How is progeny difference measured? Dna sequencing?





Do you have a way to teach students about what goes into the indices?

Are seedstcock producers still impacting trait changes in breeds?

I noticed the differences in sizes(such as height,muscle, and head size) il know these are important traits!!

How is the genetic variability retained so genetic defects are not common?

How many cattle traits are expressed in the wild auroch population?

How long did it take for those who designate breeds to use genetic findings and assign breeds to 'dairy' or 'beef'?

How were the tests done for showing grandparent relationships?

Cattle traits very connected to their environment and original survivability Looking at the traits heritability and sources of variation will be an aspect to help students understand complexity of concepts such as phenotype. Using surface area/skin related to climate is a good real life example.



How can this information be given to your "average farmer".

Why doesn't an organism have 25% of their DNA from their grandparent?

Is there interest in exploring older breeds for overlooked traits?

It would be interesting for students to look at different traits and where each animal evolved from since they all share a common ancestor.

Can absorption of nutrients from feed/grass be improved?

I noticed the cattle's are swelled.

I wonder if there are undesirable traits that are actually desirable elsewhere - another climate, another culture.

They are very interesting

which traits that we see today are driven by the environment vs ones that are guided/development by humans



Steroids	My answer erased about phenotype and coat color, the value of research for coat pigment	What traits are polygenic?
Oops - I put these in the Q&A. When were they first domesticated; What animals exist now that they are most closely related to.	Physical appearance	Increased production.
cherry picked	They perform well above the herd average for a given trait or traits	diversity



and resources resulting in a more viable food source?



feed conversion	Milk production Fat content	How these changes affect overall health of cattle
so many differences within a species	muscles	Abnormal caracters
How can cattle traits and human traits be compared/contrasted for a broader application of knowledge? Are there specific traits that would make for more efficient use of agricultural space	input and output	Superior genetics





How much can the environment influence the traits?

How were miniature cattle developed? Was that a selective breeding?

Cattle traits are very important when realizing what they cattle are used for.

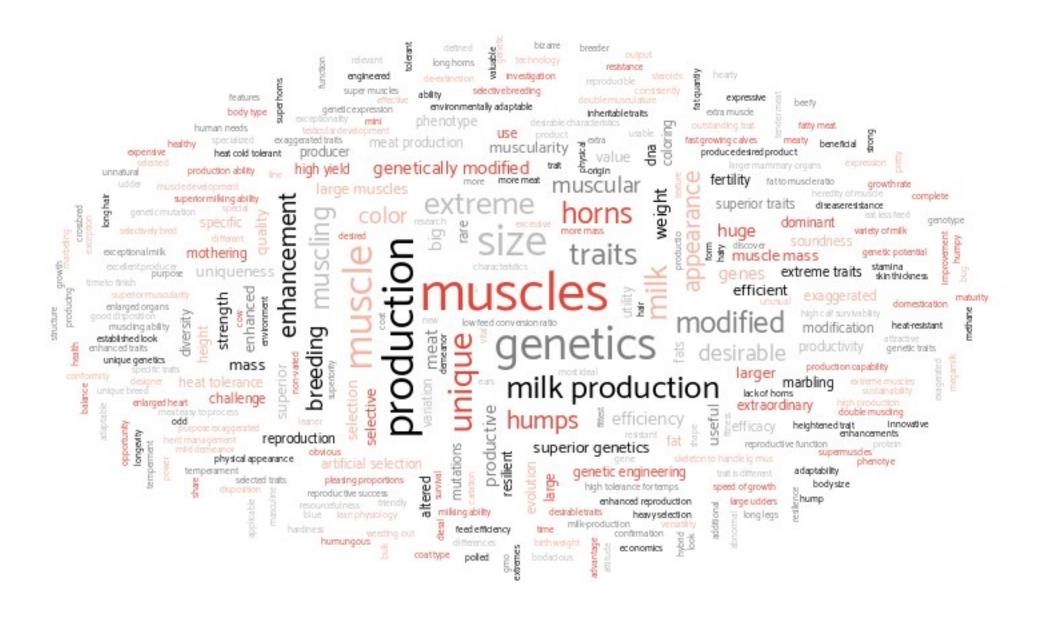
What is the next big gene or trait to be edited to make the modern cow?

If its that simple to isolate a desired trait; can we delete a trait just as easily?

The world's population will double by the year 2024. Without using gene modification, how will we feed the world?

In one word, what makes super cattle "super"? What unique traits do they have?







Is the TB in Cattle transmissible to humans

What is next?

So there are no genetic engineered cattle on the market or in existence?

How far can we go with genetics ethically?

Does she teach a class on genwtics with GMO's that Incan take online?

I have questions about the costs of all of this and who is funding it.

What happens to the "other 99" fetuses?

Why can't we allow for the use of this technology when it truly could do a lot of good in the end?

When does the ethical line get crossed? Where is the ethical line?



Why are animals more regulated by the FDA than plants?

Is CRISPR being used as a tool for modification?

Are there ethical conflicts for electronically editing genes like this?

How can all of agriculture use these technologies?

What will this lead to in the future that's best for everyone, inc

Will there someday be cattle on the market that are genetically modified?

How can we make people more accepting of these technologies? Which changes are best for the cattle's well-being? Which technologies have the most potential environmentally?

While great strides have been taken to increase production with fewer animals, is there a limit to what can be done?

Costs?



How does it feel to work on something that will not soon be used commercially? How do I motivate my students to continue this work?

What organizations are paying for further research to be preformed?

What do you think the next major advancement will be in genetics technology.

Do you see any of your research ever getting used in beef production in the future?

Will it ever be used in the industry?

What are some other specific cattle genes that are being researched right now?

Since there are no edited animals on the market, what do they do with these animals once they are born?

what are we doing to put this tech out to the common farmer

How long does the actual process of editing a gene take? Hours, days, weeks, months?



How long does it take for the cost of genetic testing to come down so small farmers can afford it?

Can you tell us more about the genetic engineering regulated by FDA How are these successes in trait transfer being used in other animal species?

So many possibilities!!!

Any recent technology application aside from the polled that they are currently working on?

Does the average, small time farmer know this information?

What precautions need to be addressed before these animals can enter the food system?

I wonder how long it will take until animal genetics and technologies will be accepted.

Is there something that students can due to simulate this technology other than a virtual lab?



Can they be generically modified to produce less methane??

Where do we, as an industry, draw the line as far as how far we'll go. Have those regulations been put in place as an industry?

What impact will there be when these cattle are allowed in the market

The CRISPR gene and "Princess"

What can we do to help people understand the benefits?

Does gene editing and selective breeding reduce the gene pool?

What happens to the embryos that do not have the strong traits? Can they be purchased? Figure that would be a question some of the cattle students would want to know.

How many farms in the US or world wide are able to use this type of technology?

How long does it take to identify needs for genetic alterations and to actually see them through? (before the industry is impacted)



There are so many modifications that you make. How do you choose which ones to address first?

Can the edits create a lean piece of meat without losing the marbling for flavor.?

More information about impact of gmo on sustainable agriculture. Lower carbon footprint.

When do you estimate that this technology might be approved in the future?

Ethical issues_who determines the ethical issues?

Does she see a day in the future when gene edited farm animals will be in the market or are the regulatory rules too expensive and prohibitive?

Why is there so much funding even with the restriction on usage?

I'm inspired by her teachings. I wanted to join the research lab what r the requirements?

How long does it take to determine what effect these genetic changes have on the meat and dairy these cattle are producing?



Is there a line where the manipulation causes more problems than it solves?

What kinds of disease preventing genes have been experimented with?

I never thought about the sustainability aspect of gene editing. This will be a great discussion for my students. Socratic Seminar!

Interesting that there are so many more restrictions on use of modified animals than modified plants. We have lots of crops grown with herbicide resistance and insecticidal properties (Bt) around here.

Can't some of this be questionable as far a ethics are involved?

Where else could this technology be used?

Dr. Van Eenennaam's presentation was absolutely fascinating. I think it represented why everyone here is involved in scientific fields. The more she spoke, the more curious I became - about her presentation and the infinite possibilities.

The financial possibilities & ethical issues

Does the general public understand the importance, benefits and common practice of genetic modification in cattle both dairy and beef?



What materials are available to teachers to introduce these new technologies?

Do local farmers actually consult with scientists to improve their cattle? If so, doesn't that go against their stance in the Republican party?

Do these GE cattle producing more meat or milk require more substance or land? It was mentioned that they are more sustainable, I would like more information on that

Why all the non GMO labels on food packaging if no GMO technique has been approved for FDA food grade purposes?

Why does the FDA classify gene editing as a "drug?"

Wouldn't it be much more humane to breed cattle with the genetic alteration for polling rather than do the procedure shown?

How can genetics be manipulated? How can we relate this to plants? What primary benefits does genetic engineering provide?

Are genetic engineering technologies economically feasible for those who raise cattle?

How expense is it to do some of these modifications?



Cattle genetics, I teach in an area where there are 11,000 cows, a dairy farm. Now I am curious about inviting one of their workers and talk to our students about their cattle breed and if they also do genetic editing. way too cool, and interesting!

Just wondering how we can get people to to realize, yes there may be problems. But editing out horns, solves problems. Without similar technology we would not have many of the medicines we now have.

Thank you

Im curious how long it will take for these GMO cows to be put in the mai stream of cows???

What do you think will be the first modified trait to be approved and how long do you think it will take?

How affordable or accessible is this technology at the rancher.

As a beef producer, I am super frustrated with the refusal of populace to listen to experts in that GMOs are not the enemy. Gene editing is also being researched for human use in some kinds of cancer. We need to embrace this technology!

Is there research being done on unintended effects of genetic modification?

Will the producer of these cattle have push back commercially from consumers. Is this going to be cost effective for small scale producers.





It seems that there is a long wait to see the final ideal animal has there been a case where the one selected doesn't end up being ideal/high merit?

What kind of cattle genetic engineering has been stopped if any and why? Genome editing as we know is costly, has the funding increased over the years to make any genome projects successful?

If it isn't economical to get the animals FDA approved, why keep doing the research? How many animals have the new trait; how big do you let the herd get? If it is so expensive and takes so long, why is the research continuing? Will it eventually become more widespread in it's use?

I am curious in regards to genetic modifications how that might affect the digestibility and or nutrient absorption of cattle products in human consumption? For instance, there is a lot of discussion about GMO soybeans and protien availability.

Are there any negatives for gene editing in animals to improve health or production? Seems that it is a healthier alternative to having diseased animals that require medication Presently, the cattle industry has animals limited to extremely confined spaces. Is it likely that the GM animals will be allowed to experience their natural environment in commercial farms?

How can we foster dialogue so the public understands genetic technologies better? What are some points to emphasize?



What are some ways for high school students to become involved with this in the form of an internship or work based learning?

So many career opportunities for the future...

What about the ethics surrounding genetic engineering?

Unless a particular application is being used as a disease therapy, why are the genetic technologies regulated as drugs by the FDA?

Gene changes to reduce the need for procedures-what else other than disbudding?

How we have been doing some of this for many years but not in a lab.

What is next?!

What other diseases are being addressed through genetic editing?

Is artificial selection causing genetic uniformity? If so how do we protect our agricultural populations?





Why aren't we having more open discussions and debates on ethical/moral dilemmas of genetic engineering and technologies?

There are so many things that we can do to improve our lives and the lives of our animals using genetics and technologies; we just need more people to embrace these ideas!

Are there standard procedures to check for unintended negative traits that may not be easily observed? Or is it trial and error?

How long / how many repetitions of a gene editing procedure before these organisms and procedure is approved? Will genitally modified animals be fully accepted by the FDA for human consumption?

Thank you, Dr. Van Eenennaam! You rock!

How do you see CRISPR technologies impacting/changing the cattle industry, and even other industries?

What quality of life do the cows have when they are forced to reproduce at such a young age or carry such a heavy udder or give birth to extremely large offspring?

What are some advances in goats, or sheep? Are those species actively pursued as cattle or swine? Sexed semen is available to producers currently in cattle. Do other species have the same opportunity?



Will we ever see genetically engineered animals in the market?

What are some resources teachers can use in classrooms to help our students become more informed in these matters?

How do we as cattleman and scientists educate the public on the advantages of this kind of research? There seems to be so much bias against it from uneducated sources.

Checkoff is doing a better job than ever before but we have a long way to go. The lack of knowledge blows my mind. People have no idea about where food comes from.

Are these technologies available to producers at an economical price point?

What diseases are being edited

What is the cost involved? How will farmers be able to afford genetically superior animals?

What do people fear are the intended consequences of this technology? We have more people to feed so we need to explore ways to be able to accomplish this. Natural and artifical selection alone will take too long without some additional support.

What impact do you predict these technologies will have in livestock shows?



What concrete steps can normal people take to remove some of the misconceptions and help integrate some of the experimental tools into the industry? Why does the general population condemn GMOs when all that is being done is a simple gene insertion or deletion? We have been breeding from specific traits for decades. Ethics of genetic engineering and how people feel about it

This is exciting!

What are the major benefits to this research - consumer and producer, if the methods are not approved by the FDA?

Are there any patents pending?

What is the best way to explain the importance of genetically modifying animals (and plants) to students? So many have negative ideas about GMOs from parents/consumers...

How often do such genetic programming cause detrimental side effects/results?

Has it been difficult to convince your partners to use the science?



What impact do mutations have on research?



Navigation Routine: After hearing all of the speakers, what topics or questions would you like to investigate more?



