I-29 MOO University

2025 Dairy Beef Short Course

In collaboration with

South Dakota State University Extension

Iowa State University Extension and Outreach

University of Minnesota Extension

Nebraska Extension

SDDP South Dakota Dairy Producers

ISDA Iowa State Dairy Association

Nebraska State Dairy Association

MDI Minnesota Dairy Initiative

Minnesota Milk Producers Association

WIDA Western Iowa Dairy Alliance

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Program Agenda

Time	Session
9:00 a.m.	**Registration** – Taylor Leach Hildebrandt, Assistant Editor with Dairy Herd Management will MC
9:30 a.m.	Zachary Smith, SDSU – **Update on Implants**
10:15 a.m.	Jennifer Spencer, Texas A&M – **Vaccination Management**
11:00 a.m.	Gail Carpenter, ISU – **Calf Management Research "Preparing 'em for the Feedlot"**
11:45 a.m.	**Q & A Session** – Taylor Leach Hildebrandt, moderating
12 noon	**Lunch**
12:45 p.m.	Garland Dalke, ISU – **What the Dairy Crossbreed Research is Telling Us About The Feedlot**
1:30 p.m.	Melanie Pimentel-Concepción, MSU – **Economics of BXD In The Feedlot**
2:15 p.m.	Sarah Erickson, TELUS Agriculture – **Hoof Related Lameness in Feedlot Cattle**
3:00 p.m.	**Q & A Session** – Taylor Leach Hildebrandt, moderating
3:15 p.m.	Adjourn

Planning Team

University of Minnesota

Melissa Runck, MAS

Regional Extension Educator | Beef Production Systems

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Melissa Runck is the University of Minnesota Beef Production Systems Extension Educator based in Worthington, MN. She leads the Extension Educator group tasked with disseminating Beef Quality Assurance certification to Minnesota beef producers through both in-person and online formats, and is part of the UMN Extension Beef Team. Melissa received her B.S. in Animal Science from South Dakota State University and her Master's of Applied Science in Beef Production Specialization through the University of Nebraska-Lincoln, with a minor in Ruminant Nutrition. Her programmatic areas of interest include optimizing reproductive efficiency, continual genetic improvement in the beef herd, and beef sire mating selections that optimize carcass characteristics and feedlot performance of beef x dairy offspring.

Jim Salfer

Extension Educator | Dairy

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Jim Salfer is a Regional Extension Educator – with University of Minnesota Extension. Jim has served in his present position for 22 years. Before that he managed a feed department, was a dairy nutritionist, a district sales manager for an AI company and managed a dairy farm. Jim has been involved on farm research projects studying robotic milking systems and automatic calf feeders. The focus of his education program has been to help farmers and other industry professionals understand the major factors driving dairy farm profitability and develop management strategies to improve profitability.

Iowa State University

Fred Hall

Northwest Iowa Extension Dairy Specialist

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Hall joined Iowa State University Extension in January 2017 as the dairy specialist for Northwest Iowa. He served as the Chickasaw County Extension Director for Iowa State University Extension from 2005 to July of 2009 where he served on the Iowa Extension Dairy Team. He coordinates the ISU webinar series and most recently publishes the Siouxland Latino Work/Life Celebration newsletter for Latino employees in the NW Iowa food industry. His industry focus is on milk marketing and labor issues. Hall is married to Sharon Lee and has two sons.

Beth Doran

Extension Beef Specialist

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Beth Doran is a beef specialist for Iowa State University serving 17 counties in northwest Iowa. She is based in Orange City, Iowa and is responsible for the development and delivery of educational programs to beef producers and allied industry professionals. Beth was raised on a beef farm in central Iowa that encompassed both seedstock production and cattle feeding. She obtained a B.S. in animal science at Iowa State University in 1983 and pursued an M.S. and Ph.D. in animal nutrition at Oklahoma State University in 1985 and 1988, respectively. Prior to joining Iowa State University, Beth served as an Extension Livestock Agent with Michigan State University. Her expertise includes beef nutrition, feedlot housing, value-based marketing, and Beef Quality Assurance. Beth's research has focused on the quantification of gaseous emissions from deep-bedded monoslope beef facilities, characterization of high moisture corn and earlage in feedlot diets, determination of factors affecting preconditioned calf price differentials, and identification of practices producers utilize in beef-on-dairy steer production.

Gail Carpenter

Extension Dairy Specialist

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Gail Carpenter is the state dairy extension specialist for Iowa State University, beginning in July 2022. Gail joined the faculty at ISU as a teaching professor and coach of the Dairy Challenge team in 2021. A Michigan native, Gail received a Bachelor's degree from Michigan State University in Animal Science. In graduate school, she completed her Master's at the University of Minnesota in ruminant nutrition and her PhD at Kansas State University in transition cow nutritional physiology. Gail was a faculty member at the University of Guelph, Ridgetown Campus from 2016-2019, where she held an appointment in teaching, service, and research, focusing on applied dairy nutrition management and alternative forages in dairy rations. From 2019-2021, Gail worked as a dairy nutritionist for CSA Animal Nutrition in Dayton, OH. Her current position is split between statewide extension, research, and teaching, and she is heavily involved with the Dairy Challenge organization as a national board member and member of the Midwest Regional Planning Committee in addition to serving as ISU's team coach. *Expertise*: nutrition, management, feed management, records analysis, beef on dairy.

South Dakota State University

Madison Kovarna

Beef Nutrition Field Specialist

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Madison is a Beef Nutrition Field Specialist with SDSU Extension based out of the Watertown Regional Extension Center in Watertown, SD. She grew up on a commercial cow-calf and feedlot operation that also farms row crops in Northwest Iowa. In August of 2023, she graduated with her Master of Science degree in Animal Science with emphasis on Ruminant Nutrition and started with Extension shortly after. Madison enjoys working with producers and beef cattle enthusiasts to improve their operations wherever possible. She works with other Extension colleagues to develop lessons and materials for youth to learn more about beef production across South Dakota. Madison also chats with industry professionals, producers, and others on SDSU Extension's Cattle HQ podcast that can be found on Spotify or at extension.sdstate.edu.

Dr. Warren Rusche

Assistant Professor and Extension Feedlot Specialist

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Warren Rusche currently serves as the Extension Feedlot Specialist for South Dakota State University, with prior Extension experience at the county level as well as a Cow/Calf Field Specialist. Along with his Extension responsibilities, he also has a 20% research appointment focusing on applied feedlot cattle management along with teaching the lab portion of an undergraduate feedlot management class. Prior to returning to SDSU in 2011, he co-managed his family's cow calf and backgrounding business. He holds a Ph.D. and B.S. degrees in Animal Science from South Dakota State University and a M.S. degree in Animal Science from Kansas State University.

Addie Womack

Livestock Production and Stewardship Field Specialist

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Growing up on a cow/calf operation in Southwest Arkansas, Addie had an interest in agriculture from a young age. She was involved in 4-H and FFA, all the programs that would lay the foundation for where she is now. After graduating from Arkansas Tech University, Addie pursued a master's degree in animal science from Oklahoma State University. She was able to assist with research in many segments of the cattle industry, from cow/calf to feedlots. Ultimately, Addie landed in South Dakota working for SDSU Extension focusing on Livestock Production & Stewardship, as well as handling the Beef Quality Assurance program for the state. Making the move north has been great, and it wasn't too hard to convince her husband and their two bird dogs to move to the "Pheasant Capitol of the World" either!

Speaker Biographies

Taylor Leach-Hildebrandt

Dairy Herd Management and MILK Business Quarterly Associate Editor

Taylor Leach-Hildebrandt currently serves as the associate editor for Dairy Herd Management and MILK Business Quarterly, where she blends her passion for storytelling with her deep-rooted connection to the dairy industry. She also leads the publication's beef-on-dairy coverage, providing in-depth insights into this evolving sector. Growing up immersed in dairy farming, Taylor understands both the rewards and challenges that come with life on the farm. This firsthand experience shapes her approach to journalism—one that is practical, relatable, and committed to elevating the voices of dairy producers. A fifth-generation dairy farmer from Hustisford, Wisconsin, Taylor remains actively involved in her family's dairy operation where she assists with milking, feeding calves and promoting the farm's small cheese business, Prairie Pure Cheese.

Zachary Kidd Foster Smith, PhD

South Dakota State University

Associate Professor

Zach Smith is an Associate Professor with Tenure in the Department of Animal Science and the Faculty Supervisor of the Ruminant Nutrition Center at South Dakota State University in Brookings, SD. Zach has served in this capacity since July of 2018.

His Bachelor of Science degree in Animal Production is from Texas Tech University. He received a Master of Science Degree under the direction of Dr. Robbi Pritchard at South Dakota State University in 2015 and a Doctor of Philosophy degree under the direction of Dr. Bradley Johnson in 2018 at Texas Tech University.

Zach has a 70% research and 30% academic appointment at South Dakota State University. Zach mentors graduate students and conducts applied research focused on nutrition and management interventions that enhance receiving, growing, and finishing beef cattle production in the Northern Plains. Since 2018, the Feedlot Research Group led by Zach has secured over 4.2 million dollars in extramural funding, published seventy-one peer-reviewed journal articles, two book chapters, and over one hundred refereed abstracts.

Zach and his Wife Shyan (both Texans) reside just north of Brookings along with their two children, Maddox Kru (8) and Renner Jack Toland (3), Bonnie the cat, plus, three dogs Max, Bella, and Henry.

Dr. Jennifer Spencer

Texas A&M AgriLife

Assistant Professor Extension and Research Dairy Specialist

Dr. Jennifer Spencer is an Assistant Professor and Extension and Research Dairy Specialist with Texas A&M AgriLife, specializing in dairy cattle reproduction, management, and calf and heifer health. With a strong background in applied research and producer education, Dr. Spencer is dedicated to improving herd productivity, sustainability, and animal welfare through science-based management practices. Dr. Spencer earned her B.S. in Animal Science, M.S., and Ph.D. in Dairy Cattle Reproduction from the University of Idaho. Her current research focuses on enhancing reproductive efficiency in dairy cattle, optimizing disease prevention protocols, and improving calf and heifer management strategies. She has also conducted welfare-focused research, including investigating non-invasive disbudding protocols and other methods to reduce stress and improve calf welfare. In addition to her research, Dr. Spencer plays a key role in extension programming, working closely with cattle producers to implement practical, science-based solutions that enhance animal health, performance, and profitability. She is also passionate about youth and community engagement, promoting awareness of the dairy industry's vital role in food production and agricultural sustainability.

Gail Carpenter

Iowa State University

Extension Dairy Specialist

Gail Carpenter is the state dairy extension specialist for Iowa State University, beginning in July 2022. Gail joined the faculty at ISU as a teaching professor and coach of the Dairy Challenge team in 2021. A Michigan native, Gail received a Bachelor's degree from Michigan State University in Animal Science. In graduate school, she completed her Master's at the University of Minnesota in ruminant nutrition and her PhD at Kansas State University in transition cow nutritional physiology. Gail was a faculty member at the University of Guelph, Ridgetown Campus from 2016-2019, where she held an appointment in teaching, service, and research, focusing on applied dairy nutrition management and alternative forages in dairy rations. From 2019-2021, Gail worked as a dairy nutritionist for CSA Animal Nutrition in Dayton, OH. Her current position is split between statewide extension, research, and teaching, and she is heavily involved with the Dairy Challenge organization as a national board member and member of the Midwest Regional Planning Committee in addition to serving as ISU's team coach. Expertise: nutrition, management, feed management, records analysis, beef on dairy.

Garland Dahlke

Iowa State University

Research Scientist III

Garland has been employed with the Iowa Beef Center of Iowa State University since 2003 and occupies his day with software support and development, ruminant nutrition and production consultation, troubleshooting nutrition issues with cattle, and small ruminants and research. Garland's education, apart from lessons learned in the school of hard knocks include a Bachelor's degree from the University of Wisconsin River Falls (Animal Science and Agronomy), a Master's degree in Animal Production from Iowa State University and a PhD in Ruminant Nutrition from Iowa State University. Prior to the ISU Beef Center tour, Garland had been (and is still) involved in his family's farm in central Wisconsin and worked in the feed industry in East-Central Wisconsin.

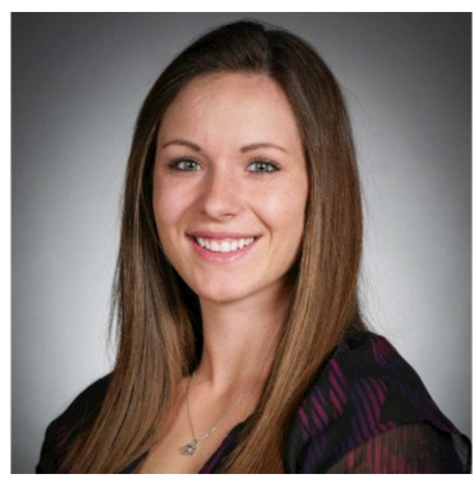
Melanie Pimentel-Concepción

Michigan State University

PhD Student

Melanie Pimentel-Concepción is a PhD student at Michigan State University, working with Dr. Dan Buskirk. She obtained her BS from the University of Puerto Rico in Animal Science and an MSc in Animal Science from Michigan State University, concentrating on beef cattle management. Her research evaluates feedlot performance, carcass traits, liver and gastrointestinal health, and the economics of beef x Holstein and Holstein cattle.

Sarah Erickson



TELUS Agriculture

Data Advisor - Animal Health Team

Sarah Erickson is currently pursuing her Doctor of Philosophy (Biomedical Sciences) through Texas A&M University, College Station, Texas. Sarah received her Master of Science (2023) from the University of Saskatchewan, Saskatoon, Saskatchewan, Canada and her Bachelor of Science (2018) from the University of Alberta, Edmonton, Alberta. The area of focus for Sarah's MSc thesis was the epidemiology of hoof-related lameness in western Canadian feedlot cattle. Sarah became part of the Feedlot Health Management Services team in 2018. In 2020, Sarah became part of the TELUS Agriculture team and currently works on the Animal Health Support Team as a data advisor.

Use of Steroidal Implant in Dairy Derived Beef Cattle: Impacts on Growth, Carcass Quality, and Cattle Behavior

Zachary Kidd Foster Smith, PhD

South Dakota State University, Associate Professor

Written with contributions from: Federico Podversich, PhD, South Dakota State University

Summary

For nearly 70 years, beef cattle producers have used steroidal implants to increase skeletal muscle growth rate, improve carcass leanness, increase average daily gain (ADG), and alter dry matter intake (DMI) compared to non-implanted cattle. Generally, using an implant increases ADG and moderately affects DMI relative to non-implanted cattle; subsequently, this enhances the rate of both live and carcass weight gain relative to the amount of feed needed for that gain accumulation, thus improving feed efficiency. Cattle that have improved feed efficiency require less input per unit of output. Implants allow cattle feeders to do more with less! When a producer chooses to use an implant, improvements typically range from 8% to 28% for ADG and 5% to 20% for feed efficiency. Implant effects on growth are typically well understood, while behavioral (i.e. riding) carcass-quality (i.e. marbling or reduction in dairy-type muscling) are more variable. A newer issue related to implant use is new industry guidance that only allows steroidal implants to be given once within each production period. Implants typically have an effective payout period of 60 to 120 days and only a maximum of two implants can be used in any production stage. Hence, dairy-derived beef steers require special attention to implant timing and use as they are typically fed for 280 to 360 days, depending upon placement BW. This talk will discuss the use of this technology with special emphasis placed on items that should be considered when developing an effective implant strategy for dairy-derived beef across all production phases.

New guidelines from the FDA

According to USDA-APHIS, more than 90% of all feedlot cattle in the United States receive some steroidal implant. From a sustainability perspective, implants: 1) Reduce feed required per unit of gain, reducing feeding costs; 2) Reduce the amount of land necessary to produce equivalent amounts of beef; 3) Limit the emissions of greenhouse gases by reducing the number of animals required to produce equivalent pounds of beef, and 4) Extends cost savings to consumers by providing a continuous, affordable beef supply at competitive prices. All reasons that should be considered for further regulation and scrutiny. Common compounds used in commercial implant formulations are shown in Table 1. Nearly all implants contain either estrogen alone or in combination with androgen (testosterone) or progestin. Implants are safe to use and have minimal risk for adverse environmental exposure to humans (based upon residue testing and blanket no withdrawal period) and other aquatic and terrestrial species (confirmed by a comprehensive environmental assessment conducted prior to approval) when used according to label instructions.

In December of 2021, the FDA issued an update announcing the target date of July 1, 2023 for the sponsors of beef cattle ear implants the labeling of their products regarding reimplantation within a production phase. In May of 2023, FDA provided additional information to clarify beef cattle target animal classes. Finally, in July of 2023, the FDA indicated that unless the labeling of a cattle ear implant clearly states that it is approved for reimplantation within a production phase, it is not approved for reimplantation.

The different categories of production phases are described in Table 2. There is not a lot of margins of action on classes of cattle. Possibly, most-native beef cattle fed in SD, IA, MN, and NE could be subjected to the category considered “Growing Beef Steers and Heifers Fed in a Dry Lot”. For this initial growing phase, cattle could receive one implant (reimplantation not allowed at this phase) labeled explicitly for this phase, such as Ralgro, Synovex-Primer and Synovex-Choice. Next, after a change in location and increased dietary energy density, cattle can be considered to belong to the next category, “Growing Beef Steers and Heifers Fed in Confinement for Slaughter.” For this new category, cattle could receive a single implant or an approved reimplantation combination.

For the focus of this essay, we will assume that dairy-derived beef cattle only fit the category of “Growing Beef Steers and Heifers Fed in Confinement for Slaughter.” Hence, they will only be allowed to receive a single implant or an approved reimplant program. Herein lies the problem: the length of the feeding program required for this type of cattle can often exceed what can be covered with two implants.

Growth performance, carcass outcomes, and days on feed

Implants are one of the most studied technologies used in beef cattle production. Improvements in weight gain are greater in steers than in heifers, while ovariectomized heifers are intermediate. Additionally, the magnitude of the responses in weight gain is less when lower-potency implants are used in lighter-weight cattle. Implants effectively alter the frame size of cattle and delay fat deposition. Initially, this created issues related to marbling since implanted cattle were fed for the same time on feed as non-implanted cattle or cattle implanted with a less aggressive (i.e. less total dosage) implant program. Those issues were reduced Quality Grade and rib fat thickness. Such problems were solved by feeding these cattle for longer periods. This allows the cattle to achieve the same degree of fat deposition while reaching a heavier final weight (Figure 1). Again, since implants effectively increase the frame size and delay fat accumulation, implanted cattle should be fed to a greater body weight to ensure cattle are sold at a similar fat content endpoint.

Use of implants during the finishing phase should easily enhance daily gain by 20% (or more) and improve feed efficiency by 5 to 10%, compared to non-implanted cattle. For that reason, most people reading this article who are feeding dairy-derived beef cattle would probably never consider not using an implant in this class of cattle. Therefore, the disuse of this technology is not profitable, unless we are selling cattle in a special program or niche market that offers enough premium not to use steroidal implants. So, the rest of this discussion will be related to how to use implants.

Dairy-derived beef cattle require a different approach to implant use due to the extended days on feed required compared to their native-beef counterparts. Typically, implants have an active payout period of 60 to 120 d, or about 90 d on average. This is illustrated in Figure 1, where the active hormone from a steroidal implant was measured in circulation every 14 to 35 d. Figure 1 also illustrates how delayed-release and coated implant technologies effectively maintain blood hormone levels above those of non-implanted cattle for more than 200 days post-implantation.

To induce effective anabolic stimulation throughout the feeding period for dairy-derived beef, we now require counting backward from harvest and likely delaying the initial implant depending upon placement BW and anticipated DOF. For example, we could use a 200 d implant (i.e.. Revalor-XS or Synovex-One Feedlot) for up to a 250 to 300 d anticipated feeding duration by delaying implant until d 50 to 100 of the feeding period. As of March 2025, the only FDA approved re-implant combinations include the use of Synovex Choice initially, followed by another Synovex Choice, Synovex Plus, or Synovex One Feedlot at least 60 and no more than 120 d after initial implantation. The Choice-Choice (less-aggressive) and Choice-Plus (more-aggressive) are effectively 200 d implant strategies, that can both be extended into 250 to 300 d implant programs by delaying the initial implant 50 to 100 d. Using a Choice-One Feedlot allows for about 300 d of active hormone coverage, and could be made into a 350 to 400 d implant by delaying initial implant 50 to 100 d.

The thought of going without an implant initially may cause concern for some. In our research shop, we often joke that the only guaranteed recommendations in feeding cattle are unlimited access to water and the use of an implant. Unless a premium is awarded for disuse, implants must be used. However, we must remember this is a marathon, not a sprint. A recent analysis of Angus-Holstein crosses fed at the research feedlot in Brookings indicated gains of 3.0 lbs/d and feed conversions of under 5.0:1 during the initial 98 d on feed when cattle were not implanted. In this regard, starting the cattle on feed without an early implant might not be as detrimental as anticipated. Indeed, it has been demonstrated that increasing initial implant dosage increases re-implant BW, but cattle often can close the gap following terminal implant administration, reaching similar final body weight at harvest (Hilscher et al., 2016). Similarly, recent data from our research group would also indicate that cattle with implant delayed initially by up to 63 d have similar weight at harvest.

Applications

Implant effects on growth are typically well understood, while behavioral (e.g., riding) carcass quality (e.g., marbling or reduction in Dairy Type) is more variable. The latest industry guidance related to implant use only allows steroidal implants to be given once within each production period. Current implant technologies allow for a maximum of 200 d of effective hormonal stimulation, while current reimplant programs can extend these 100 days. The use of delayed implant strategies could effectively extend hormonal exposure 50 to 100 d after being placed feed.

References

Hilscher, F. H., Jr., M. N. Streeter, K. J. Vander Pol, B. D. Dicke, R. J. Cooper, D. J. Jordon, T. L. Scott, A. R. Vogstad, R. E. Peterson, B. E. Depenbusch, and G. E. Erickson. 2016. Effect of increasing initial implant dosage on feedlot performance and carcass characteristics of long-fed steer and heifer calves¹[,]². The Professional Animal Scientist 32(1):53-62. doi: 10.15232/pas.2015-01389

Table 1. Common steroidal hormones found in commercially available implants.		
Item	Natural	Synthetic
Estrogens	Estradiol-17 Beta	Estradiol benzoate and Zeranol: Estrogen - like
Androgens	Testosterone	Trenbolone acetate
Progestins	Progesterone	-

Table 2. Classes of Beef Cattle with Designated Implant Definitions.	
Category – Production phase	Definition
Beef calves 2 months of age and older	Beef calves considered ruminating and nursing their dams from 2 months of age to weaning. *Some implants labeled for beef calves at 45 d of age up to 400 lbs
Growing Beef Steers and Heifers on Pasture (stocker, feeder, and slaughter)	Weaned growing beef steers and heifers (beef and dairy breeds) intended only for slaughter (i.e., not for reproductive purposes) maintained on pasture and receiving the majority of their diet from grazing. Refers to cattle considered to be “stocker, feeder, and slaughter” cattle, and these words are always included in the parenthetical portion of the class name. “Stocker” refers to weaned growing cattle grazing pasture prior to finishing and slaughter; they are usually younger, weigh less, and are of lower condition (finish) than “feeder” cattle. “Feeder” refers to weaned growing cattle grazing pasture and of sufficient weight and maturity to be placed on high-energy rations for finishing; they are generally older, weigh more, and carry more condition (finish) than “stocker” cattle. “Slaughter” refers to weaned growing cattle grazing pasture and suitable for slaughter.
Growing Beef Steers and Heifers Fed in a Dry Lot	A subset population of growing beef steers fed in confinement for slaughter, these are weaned growing beef steers (beef and dairy breeds) confined in group pens and fed a moderate- to high-roughage diet ad libitum as their sole ration prior to the finishing stage. Grow yards may also be referred to as started yards in the industry.
Growing Beef Steers and Heifers Fed in Confinement for Slaughter	Weaned growing and finishing beef steers and heifers (beef and dairy breeds) intended only for slaughter (i.e, not for reproductive purposes) and confined in group pens and fed a progressively high-energy diet ad libitum as their sole ration until slaughter. May also be referred to as feed yard or feedlot cattle in the industry. Includes growing beef steers and heifers in a grow yard.

Figure 1. Implant effects on rib fat composition (yellow = non-implanted and blue = implanted).

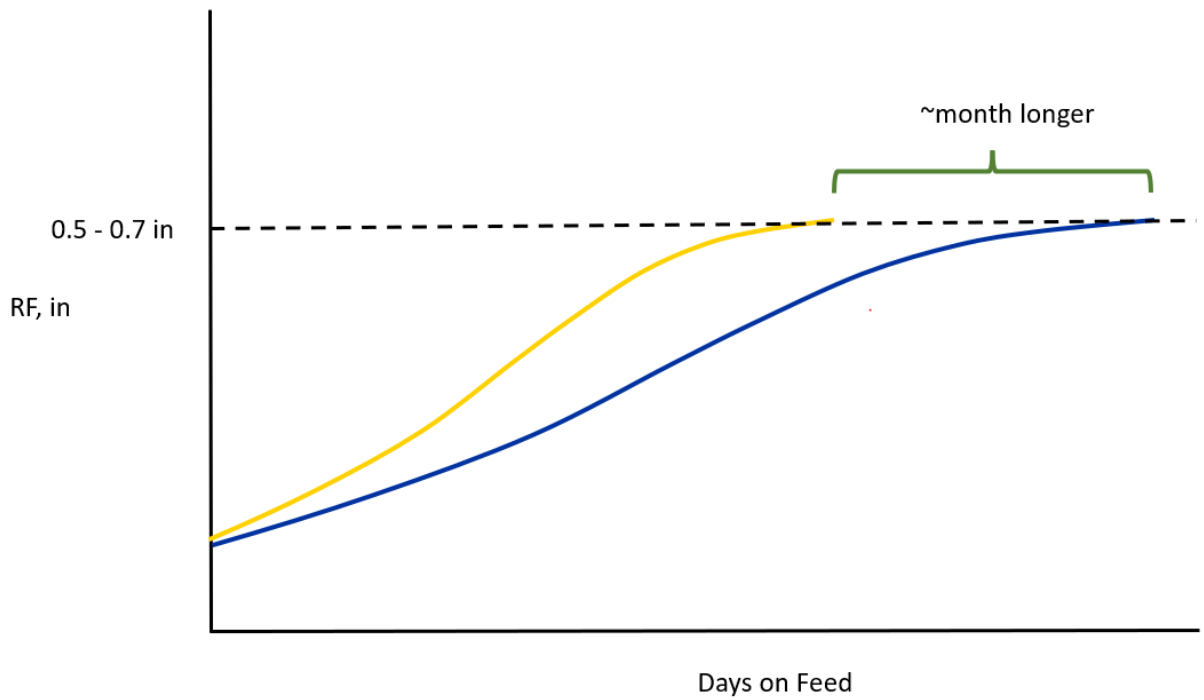
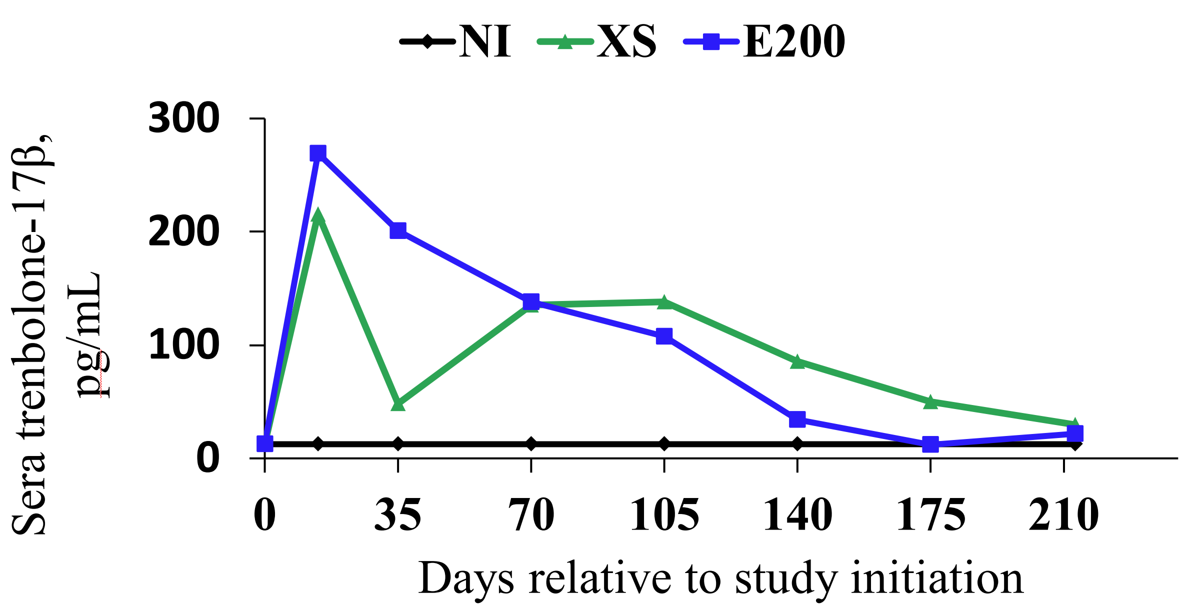


Figure 2. Implant effects on sera trenbolone-17 beta (NI = non-implanted, XS = Revalor-XS an initial and delayed release implant, and E200 Revalor-200 on d 1).



Optimizing Calf Vaccination Strategies for Dairy-Beef Success: Best Practices for Health & Performance

Dr. Jennifer Spencer

Texas A&M AgriLife, Assistant Professor and Extension and Research Dairy Specialist

Presentation Outline

1. Importance of Vaccinations in Calves
    a. Why vaccination matters for herd health and calf mortality
    b. Economic impact of disease prevention.
2. What are vaccines
    a. Passive immunity from colostrum vs. active immunity from vaccines.
    b. Types of vaccines (modified live, killed, etc.).
    c. Examples and purposes of vaccines in calves.
3. Determining the Right Number of Vaccinations
    a. No universal number—depends on risk factors, region, and operation type.
    b. Core vaccines and other vaccines.
    c. Booster doses and immunity reinforcement.
    d. Farm dependent and examples of resources and individuals to reach out to.
4. Timing of Vaccinations
    a. When should vaccines be given (immune system maturity).
    b. What vaccines should not be given during certain stages and why.
5. Vaccination Methods
    a. Proper vaccine handling, storage and administration.

Take Home Points

1. Importance of a vaccination protocol
2. Vaccination protocols should be customized to the individual herd needs
3. Understanding the importance of timing for optimal immunity.
4. Proper handling and administration ensure vaccine effectiveness

Optimizing Calf Vaccination Strategies for Dairy-Beef Success: Best Practices for Health & Performance

Presented by: Jennifer A. Spencer

Introduction
Vaccination is a critical component of calf health management, serving as a frontline defense against many economically significant diseases that affect dairy-beef systems. Vaccines are designed to stimulate the calf's immune system to recognize and respond to specific pathogens, reducing the risk of severe disease, minimizing production losses, and improving overall herd health. However, vaccines are not foolproof, and their effectiveness is heavily dependent on appropriate handling, administration, and an animal's overall health and nutritional status. This paper explores the principles behind vaccine use, proper management practices, and strategies to ensure optimal calf health and performance through effective vaccination protocols.

The Importance of Vaccination and Immunity Development
Vaccines are biological preparations that help stimulate an immune response against specific disease-causing pathogens, including bacteria, viruses, and parasites. While vaccines significantly reduce the risk of disease outbreaks, their success is influenced by several critical factors, including nutrition, stress, and environmental conditions. Vaccination failure can occur, and animals may respond differently depending on their health status.

Goals of Vaccination:
- Protect calves from economically significant diseases.
- Reduce mortality and morbidity.
- Minimize the need for antibiotics by preventing diseases.
- Support overall growth, performance, and productivity of calves in dairy-beef production systems.

Key Considerations for Developing a Vaccination Protocol
Creating a successful vaccination protocol requires careful consideration of operation-specific factors and close collaboration with veterinarians and county extension agents. Before administering vaccines, it is crucial to evaluate multiple elements that impact vaccine response and disease exposure risk.

Important Factors to Consider:
- Nutritional and health status of calves.
- Type of operation.
- Age and vaccination history.

- Upcoming stressors.
- Environmental challenges.
- Biosecurity and disease exposure risk.

Understanding Vaccine Types

Vaccines are categorized into two main types: killed (inactivated) and modified live (MLV). Both types stimulate immunity but have unique advantages and limitations.

Killed (Inactivated) Vaccines:
- Contain inactivated pathogens, unable to cause disease.
- ***Pros:*** Safer for pregnant cows and young calves, stable storage.
- ***Cons*:** Require two doses for immunity, shorter duration of immunity.

Modified Live (MLV) Vaccines:
- Contain weakened live pathogens that replicate to stimulate a strong immune response.
- ***Pros:*** Stronger and longer-lasting immunity, fewer doses needed.
- ***Cons*:** Should be used cautiously in pregnant animals unless specified.

Intranasal Vaccines (IN):
- Delivered into nasal passages for localized immunity.
- Rapid onset of immunity but shorter duration. Ideal for respiratory diseases in young calves at high risk.

Core Vaccines for Dairy-Beef Calves

Recommended by American Association of Bovine Practitioners (**AABP**), core vaccines protect against diseases commonly encountered in the U.S. See Table 1 with vaccine examples.

Respiratory Vaccines:

- Infectious Bovine Rhinotracheitis (**IBR**)
- Bovine Viral Diarrhea Types 1 & 2 (**BVD**)
- Parainfluenza 3 (**PI3**)
- Bovine Respiratory Syncytial Virus (**BRSV**).

Clostridial Vaccines:

- 7-way or 8/9-way Clostridial vaccines.

Reproductive Vaccines:

- Leptospira spp.
- Campylobacter (Vibrio)
- Tritrichomonas foetus (Trich).

Miscellaneous:

- Pink eye
- Wart vaccines as needed

Clostridial Vaccines and Their Importance

Clostridial diseases are devastating when they occur. These bacteria are naturally present in the environment and become pathogenic under anaerobic conditions, such as wounds and bruising. A comprehensive clostridial vaccination program is essential to prevent sudden deaths caused by these diseases.

Key Clostridial Diseases Covered in a 7-Way Vaccine:
- Clostridium chauvoei (Blackleg)
- Clostridium septicum (Malignant edema)
- Clostridium novyi (Black disease)
- Clostridium sordellii (Malignant edema variant)
- Clostridium perfringens types C & D (Enterotoxemia)

Considerations for Clostridial Vaccines:
- Killed vaccines requiring initial and booster doses.
- Should be administered before stressful procedures.
- Annual boosters for cows and calves.
- Consider adding Clostridium haemolyticum and tetani if risks are present.

Proper Vaccine Handling and Administration

Proper storage, handling, and administration techniques must be used.

Vaccine Storage:
- Store between 35-45°F (2-7°C).
- Avoid freezing or overheating.
- Protect from light exposure.
- Use only within expiration dates.

Administration Guidelines:
- IM and SQ injections in neck (Fig. 1)
- IN vaccines applied to nasal passages.
- Use appropriate needle size (20-14 gauge).
- Use a new sterile needle when puncturing vials.
- Record vaccine details properly.

Figure 1. Subcutaneous injection. Image from Beef Quality Assurance National Manual.

Common Causes of Vaccine Failure

Factors Contributing to Poor Vaccine Response:
- Nutritional deficiencies.
- High stress.
- Poor water quality.
- Improper storage.
- Incorrect administration.
- Pathogen overload.

Endotoxins and Vaccination Safety

Some bacterial vaccines contain endotoxins, which can trigger adverse reactions.

To reduce risk:
- Avoid vaccinating during peak heat.

- Monitor animals post-vaccination.
- Avoid overloading with multiple bacterial components.

Building a Successful Vaccination Plan

A vaccination protocol should be part of a comprehensive herd health program. Developing a VCPR is critical.

Steps to Success:
- Partner with veterinarians and extension agents.
- Develop a biosecurity plan.
- Identify operation goals.
- Monitor and adjust protocols as needed.

Conclusion

Vaccination is a cornerstone of calf health, but it requires good nutrition, handling, and individualized planning. Be sure to work closely with your veterinarian to understand when to give vaccines and which vaccines to give. Clostridial vaccines are vital, while respiratory and reproductive vaccines protect herd performance. Best practices ensure healthy, productive dairy-beef calves.

Table 1. A list of core diseases and if they effect the respiratory (resp.) system or reproductive (repro.) system, the type of disease they are[1], what the effects are on cattle and the types of vaccines that are available[2].

Disease	Resp.	Repro	Type[1]	Causes & Effects	Vaccine[2]
Infectious Bovine Rhinotracheitis (**IBR**) or Bovine Herpes	✓	✓	V	• Contribute to BRD* • Abortion, killed vaccine protects against IBR abortion	K, MLV, IN
Bovine Viral Diarrhea (**BVD**) Type 1 & 2	✓	✓	V	• Contribute to BRD* • Abortion, fetal resorption, fetal malformations, birth of PI* calf	K, MLV
Parainfluenza Type 3 (**PI3**)	✓		V	• Upper respiratory tract infection • Indicator of secondary infection	K, MLV, IN
Bovine Respiratory Syncytical Virus (**BRSV**)	✓		V	• Contribute to BRD* complex in all ages	K, MLV, IN
Histophilus somni	✓	✓	B	• Associated with BRD* • Infertility and early embryonic loss	
Pasteurella haemolytica	✓		B	• Leukotoxoid	
Brucellosis		✓	B	• Zoonotic and causes abortions	
Camplobacter fetus (vibrio)		✓	B	• Decrease reproductive performance • Early embryonic loss and abortion	
Leptospirosis		✓	B	• Infertility and abortions • Poor milk yield	
Tritrichomonas fetus		✓	P	• Abortions	
Clostridium chauvoei			B	• Black leg, muscle lesions	K
Clostridium septicum			B	• Malignant edema, muscle lesions	K
Clostridium novyi			B	• Black disease, caused by liver trauma such as liver flukes	K
Clostridium sordelli			B	• Malignant edema, muscle lesions on neck and brisket areas	K
Clostridium perfringens (C and D)			B	• Enterotoxaemia, cross immunity with B	K
Clostridium haemolyticum			B	• Risk increases if have liver flukes & liver injury	K
Clostridium tetani			B	• Banding castration, anaerobic environment	K

[1] Type of disease either viral (**V**), bacterial (**B**), or protozoan (**P**).
[2] Types of vaccines that are available for each disease either killed (**K**), modified live vaccine (**MLV**), or intranasal (**IN**).
* **BRD** = bovine respiratory disease, **PI** = persistently infected

First Steps to Profit: Early-Life Nutrition and Care for Beef x Dairy Calves

Gail Carpenter

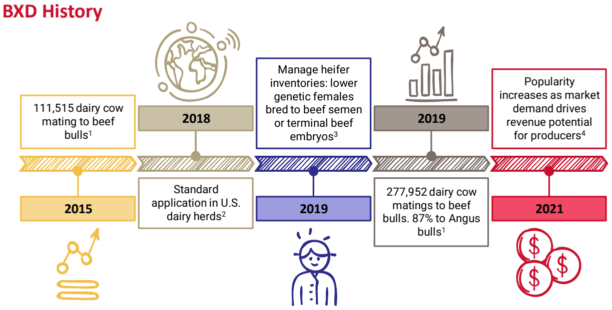
Iowa State University, Extension Dairy Specialist

First Steps to Profit: Early-Life Nutrition and Care for Beef × Dairy Calves

Gail Carpenter & Taylor Kauk (Klipp)
Department of Animal Science
Iowa State University

1

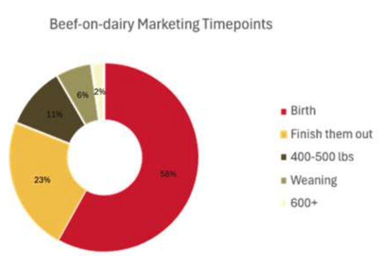
BXD History



[1]McWhorter et al. (2020), [2]Foraker et al. (2022), [3]Devant and Marti (2020), [4]Berry (2021)

2

When do you market your beef-on-dairy cross calves?

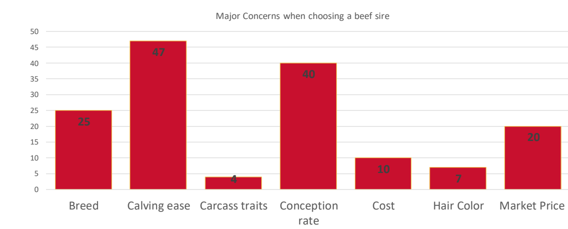


N=179

2024 Iowa Dairy Producer Survey

3

What is your major concern when choosing a beef sire?



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2024 Iowa Dairy Producer Survey

4

When worlds collide

5

The beef world: Let the cow do her job!

- **Adequate colostrum is critical**
  - **Calves are born without protection**
  - **Affects health all the way through the feedlot**
  - **Intake is affected by calf vigor and ability to nurse**
    - **Thin females, weak calves, dystocia, swelling of the tongue**
  - **Minimum of 2 quarts within 12 hours**
- **Risk factors for calf death loss: high % of heifers, calving season (timing & length), poor maintenance of calving area**

Health Considerations for Cow Herds (Dr. Grant Dewell, Beef Extension Veterinarian)
https://www.iowabeefcenter.org/

6

The beef world: Preventing beef calf losses

- Limit calf exposure to disease organisms
- Maximize general resistance of the calf
- Maximize specific immunity of the calf

Health Considerations for Cow Herds (Dr. Grant Dewell, Beef Extension Veterinarian)
https://www.iowabeefcenter.org/

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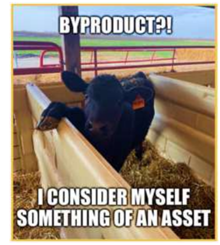
Calves intended for dairy beef production often receive poor colostrum management [4]

> PAST: *2002 collective farm study*
> > Male calves were more likely to be fed colostrum with high bacteria counts than their female counterparts [2]

> PRESENT: *2023 study, n = 34 BXD calves [1]*
> > 82% (28/34) Excellent 40%
> > 9% (3/34) Good 30%
> > 6% (2/34) Fair 20%
> > 3% (1/34) Poor 10%

*TPI category standards for replacement heifers [3]



[1]Cramer et al. (2023), [2]Fecteau et al. (2002), [3]Lombard et al. (2020), [4]Pisoni et al. (2023)

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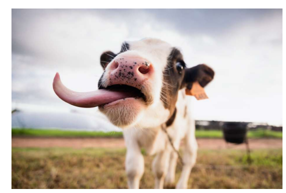
9

3 Q's? 5 Q's? 4 Q's + C?

- Quality: >50g/L IgG, recommended at least 150 grams of IgG at 1st feeding
- Quantity: 10-15% of bodyweight within first 18 hours of life
- Quickness: First feeding as soon as possible within 2 to 4 hours
- Quantify: Measure quality of colostrum using a colostrometer or Brix refractometer
- Clean: make sure all equipment for harvest, storage, and delivery are sanitized for each calf



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Monitoring levels of passive immunity

Category	IgG levels (g/L)	Serum total protein (g/dL)	Brix (%)	Calves in each category (%)
Excellent	≥25.0	≥6.2	≥9.4	>40
Good	18.0-24.9	5.8-6.1	8.9-9.3	≈30
Fair	10-17.9	5.1-5.7	8.1-8.8	≈20
Poor	<10.0	<5.1	<8.1	<10

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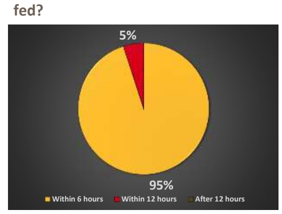
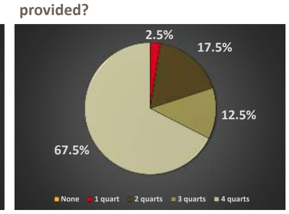
2023 Wisconsin Survey Results

How soon after birth is colostrum fed?



What amount of colostrum is provided?



n = 40 survey responses

Sterry, 2023. "Beef x Dairy Crossbreeding and Calf Management Practices on Wisconsin Dairy Farms"

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Cleanliness pays for the cow

- Clean bedded pack, freestalls, etc.
- "Knee drop" test
- Proper dry-off procedures
- Clean drinking water available
- Birds & other pests
- Calving assistance

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Cleanliness pays for the calf

- Maternity pen
- Calving assistance
- Housing
- Bedding
- Feeding
- Vaccination
- Animal handling

14

Effective cleaning

PHYSICAL

- ✓ Water temperature & contact time
- ✓ Scrubbing & rinsing
- ✓ Drying

Pro-tip: Monitor cleanliness with protein swabs or bioluminescence

CHEMICAL

- ✓ Detergents
  - Break up organic deposits such as fat & protein
- ✓ Disinfectants
  - Kill microorganisms
- ✓ Sanitizers
  - Not as effective as disinfectant
  - Can improve hygiene, but does not substitute for good practices

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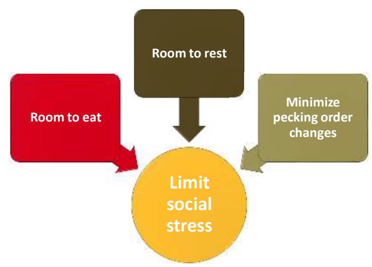
Minimizing pecking order changes & overcrowding (No Mean Girls!)



16

Benefits to the calf

- ✓ Easier to maintain cleanliness
- ✓ Reduced risk of difficult calving
- ✓ Reduced risk of injury
- ✓ Reduced risk of confusion

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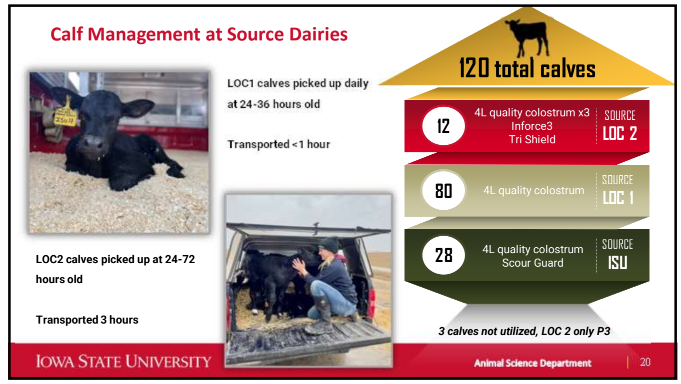
"How many of you have ever felt personally victimized by Regina George?"

- Target pen moves 21-30 days before calving (at least 10-14 days in close up)
  - Monitor average days carried calf
- Single dry cow ration?
- Just-in-time calving or long-stay maternity pen (>7 days)?

18

19



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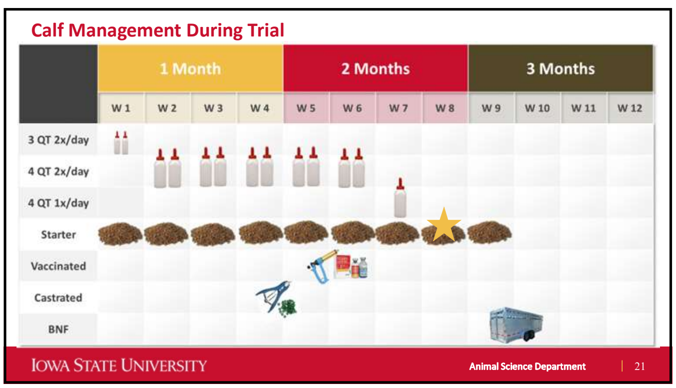

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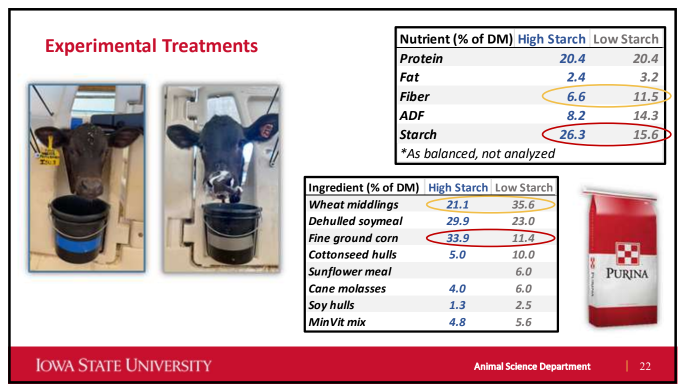

Nutrient (% of DM)	High Starch	Low Starch
Protein	*20.4*	*20.4*
Fat	*2.4*	*3.2*
Fiber	*6.6*	*11.5*
ADF	*8.2*	*14.3*
Starch	*26.3*	*15.6*

**As balanced, not analyzed*

Ingredient (% of DM)	High Starch	Low Starch
Wheat middlings	*21.1*	*35.6*
Dehulled soymeal	*29.9*	*23.0*
Fine ground corn	*33.9*	*11.4*
Cottonseed hulls	*5.0*	*10.0*
Sunflower meal		*6.0*
Cane molasses	*4.0*	*6.0*
Soy hulls	*1.3*	*2.5*
MinVit mix	*4.8*	*5.6*

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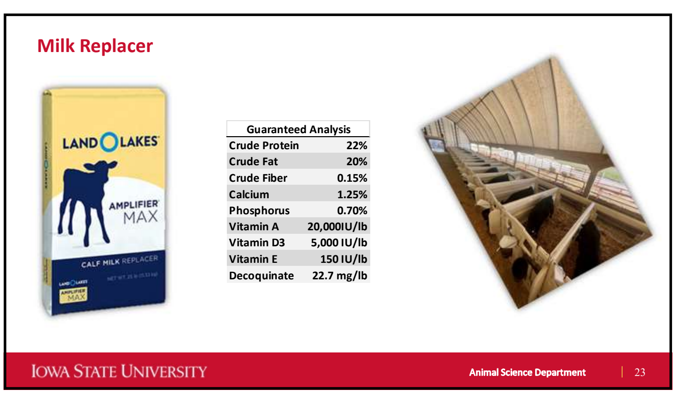
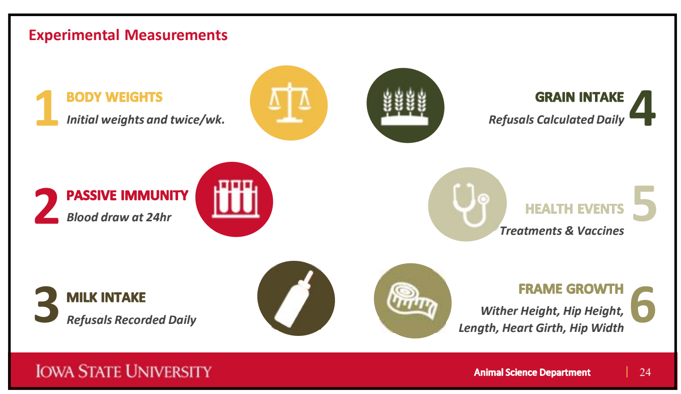


Guaranteed Analysis	
Crude Protein	22%
Crude Fat	20%
Crude Fiber	0.15%
Calcium	1.25%
Phosphorus	0.70%
Vitamin A	20,000IU/lb
Vitamin D3	5,000 IU/lb
Vitamin E	150 IU/lb
Decoquinate	22.7 mg/lb

23



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Results

	Treatment			P-Value					
	HIGH	**LOW**	SE	**Trt**	**Period**	**Wt1**	**TPI**	**Age (d)**	**Trt*Age**
Body weight (kg)	63.06	60.36	0.61	0.19	0.01	<0.01	<0.01	<0.01	0.06
Grain intake (Kg)	0.45	0.43	0.03	0.04	<0.01	0.67	<0.01	<0.01	<0.01
Average daily gain (kg)	0.41	0.39	0.02	0.34	<0.01	<0.01	0.79	-	-
Frame (cm)									
Length	97.57	83.92	10.75	0.37	0.01	0.88	0.67	0.67	-
Heartgirth	109.44	107.80	0.62	0.06	0.01	<0.01	0.46	0.46	-
Withers height	90.95	90.44	0.51	0.48	<0.01	<0.01	0.84	0.84	-
Hip Height	94.64	94.01	0.40	0.26	<0.01	<0.01	0.10	0.10	-
Hip width	22.80	22.82	0.25	0.86	0.86	0.97	<0.01	<0.01	-

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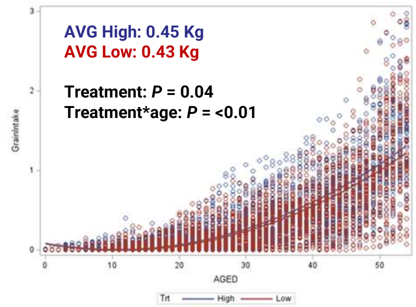

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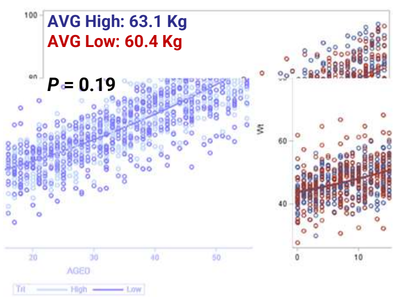

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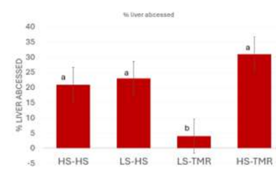
Feedlot results

- Lower starch diets pre-weaning may impact long-term outcomes
- Biggest impact was from health
  - 2+ respiratory events → ↓ 29-lb carcass weight & ↓ $91 return



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Conclusions

- Colostrum is still key!
- Manage for good health
- Feed for good pre-weaning growth
- Lower starch diets pre-weaning may impact long-term outcomes

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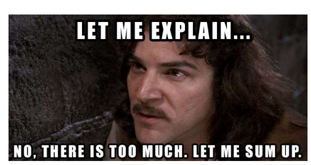
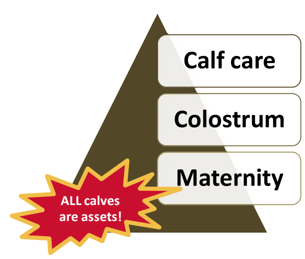


Early-life management starts with good maternity & colostrum management in the first 24 hours…

No matter who the calf's sire is!



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Thank you!
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Beef x Dairy: Effects of Early Nutrition on Finished Beef Health, Performance, and Carcass

Garland Dahlke

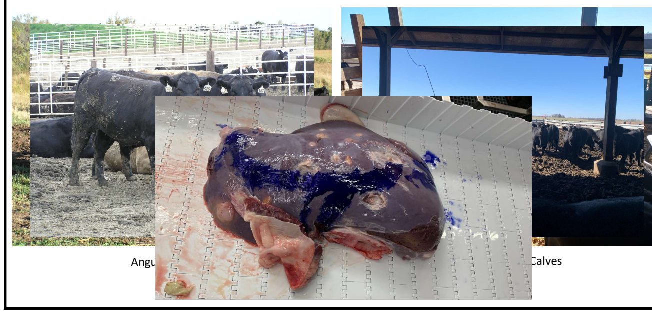
Iowa State University, Research Scientist III

Summary

Calf starter and early grower formulation has a long-lasting impact and what makes a good early calf nutrition program needs to look beyond weight gain in the first five months of life. This presentation addresses the impact of calf nutrition from weaning through the early grower phase of life and what the results are in Angus X Holstein crossed steers as they move through the feedyard and into finished beef. Subsequent growth and carcass quality are addressed, but health in terms of tissue damage may be the real issue.

1

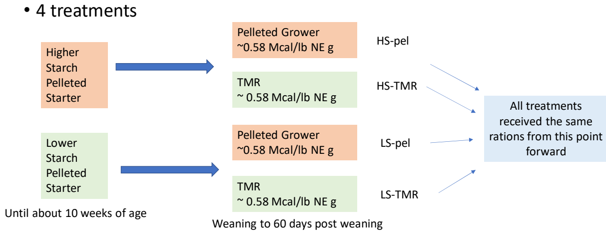
Motivation for the Trial



2

Experimental Treatments

- Calves obtained from 3 sources within 24 hours of birth
- 3 time reps of the experiment, 40 head per rep
- 4 treatments



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Timelines

- Group 1
  - ISU Dairy Farm — Late Nov. 2022 – Jan. 2023 — (~85 to 235 lbs, ~ 70 days)
  - ISU Beef Nutr. Farm — Feb. 2023 – Aug 2023 — (to ~800 lbs, ~ 200 days)
  - ISU Armstrong Farm — Sept. 2023 – mid March 2024 — (to ~1450 lbs, ~190 days)
- Group 2
  - ISU Dairy Farm — Feb. 2023 – May 2023
  - ISU Beef Nutr. Farm — May 2023 – Nov 2023
  - ISU Armstrong Farm — Nov 2023 – May 2024
- Group 3
  - ISU Dairy Farm — Aug. 2023 – Oct. 2023
  - ISU Beef Nutr. Farm — Oct. 2023 – Apr. 2024
  - ISU Armstrong Farm — Apr. 2024 – Oct. 2024

4

Time Line Continued

Treatment Group	Weeks 0 - 10	Weeks 11 - 18	Weeks 19 - 24	Weeks 25 - 38	Weeks 39 - 67	
A	Milk replacer + HS pellet	HS pellet	TMR 1	TMR 2	Finishing Ration	
B	Milk replacer + LS pellet	HS pellet	TMR 1	TMR 2	Finishing Ration	
C	Milk replacer + LS pellet	TMR 1	TMR 1	TMR 2	Finishing Ration	
D	Milk replacer + HS pellet	TMR 1	TMR 1	TMR 2	Finishing Ration	
NOTES	Pellets were provided with milk	Moved to group housing at BF Farm, vaccinated ~ 235 lbs	All calves moved on same ration ~ 350 lbs	All calves revaccinated and implanted ~ 525 lbs	Moved to Armstrong Farm, terminal implant, ~ 800 lbs	All calves sold and processed at Upper Iowa Beef ~ 1450 lbs

5

Diet Specifications

AS-fed Basis	TMR 1	TMR Grower 2	Finisher
Corn Silage	30.6%	37.5%	
Mineral	3.6%	2.6%	2%
Ryelage	32.0%	22.4%	
Corn	12.1%	26.3%	60%
Dry Distillers	28.7%	11.3%	
Hay			11.5%
Mod. Distillers			26.5%

6

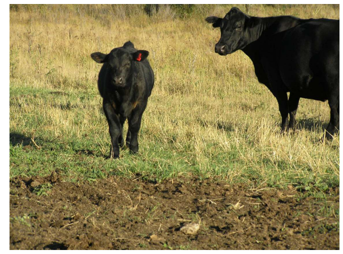
Nutrient Specs

DM Basis	HS pellet	LS pellet	HS-2pellet	TMR 1	TMR 2	Finisher
CP%	25.5	25.5	19	18.9	14.1	12.3
NFC %	39	26	42	40.6	53.1	57.8
NSC %	30	17	27.5	24.4	40.8	47.1
peNDF	1	1	1	9.2	8.2	5.0
Fat %	3.1	4.5	4.6	5.2	4.8	4.5
NE g Mcal/lb	.58	.51	.58	.58	.62	0.61

DM Basis	Penn State Calf Starter Recomendations
CP%	25.5
NFC %	44.5
NSC %	36.5
peNDF	0-5
Fat %	4.0
NE g Mcal/lb	.60

7

Traditional Beef Calf at this Age consuming Milk and Grass



DM Basis	Milk	Grass
CP%	21	15 - 25
NFC %	36	25
NSC %	36	9
peNDF	0	100
Fat %	26	2.0
NE g Mcal/lb	~ 1.0	~.70 - .45

Note that the milk normally by-passes the rumen and does not undergo fermentation

8

Feedlot Performance

9

Starting with the final closeout

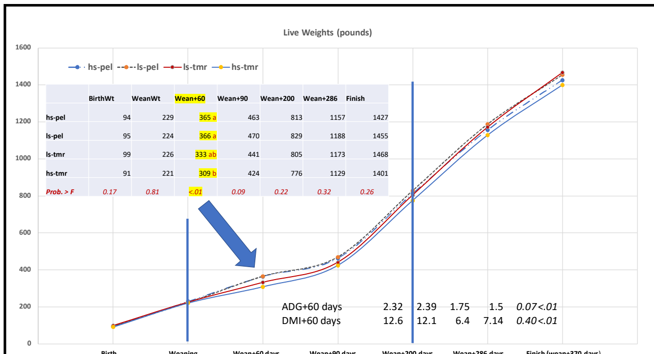
Combined Closeout Summary

```
DESCRIPTION                    FEED          TOTAL $    TOTAL lbs   % DM   DM/HD    $/UNIT
==========================     =====================================================================
Head Started: 108  (805 lb)    hay           9859.0      98590      84     766.8   200.00
Head Sold:    107  (1443 lb)   corn_whole   46073.0     460730      85    3626.1   200.00
Mortality:   0.9 %             mod dist      6228.2     124565      49     565.2   100.00
                               mineral       4221.3      16885      98     153.2   500.00

PURCHASE LOT/ SOURCE
             / beef nut
             / beef nut
             / beef nut

Lots:
1234a
1234c
1234b
```

10

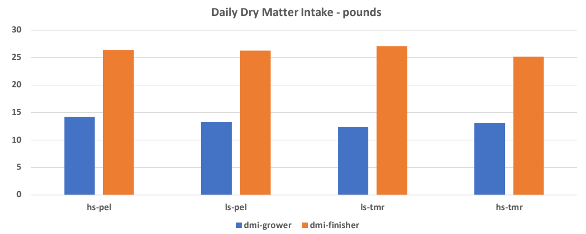
```
ANIMAL PERFORMANCE                COST SUMMARY            $/UNIT          $/HD SOLD   TOTAL $
==========================        ================================================================
Total Beef In:     86957 lb       feed                  240.50 $/tn DM    620.39      66,381.50
Total Beef Out:    154367 lb      interest cattle/inputs  8.00%/0.00%      45.55       4,873.59
Avg.Carcass Wt.:   863.8 lb       yardage                 0.65 $/hd/d     125.16      13,392.60
Actual Dress:      59.9 %         trucking                0.68 $/hd/d     130.96      14,013.00
Yield Grade 4+5:   0.0 %          bedding                 0.03 $/hd/d       6.26         670.00
Choice:            91.4 %         processing              0.07 $/hd/d      12.84       1,373.80
T.Head Days:        20604         cattle                  1.34 $/lb      1087.49     116,361.91
Avg Days in Yard:  192.6          ----------------------------------------------------------------
ADG:               3.27 lb        TOTAL COST                             2028.66     217,066.41
Feed/Gain:         8.19
DMI (avg):         26.79 lb       INCOME SUMMARY
AFI (avg):         34.01 lb       ================================================================
Avg NEg:           61 Mcal        cattle                  1.89 $/lb      2722.34     291,290.20
      peNDF:       3 %            ----------------------------------------------------------------
      NFC:         60 %           TOTAL INCOME                           2722.34     291,290.20
                                  NET INCOME              0.48 $/lb       693.68      74,223.78
           Intake     Pulls
1st Qrt:    1.06       0
2nd Qrt:    1.18       0          TOTAL POUNDS FED (AF): 700770   (DM): 552020    78.8 %DM
3rd Qrt:    1.26       0
4th Qrt:    1.20       0          $ Loss on Dead/Missing Cattle:  Head:  1   $1824.53

$ PERFORMANCE
           Feed       Total
$/Day:      3.22       4.89
$/lb Gain: 0.98        1.49
Breakeven $/cwt:     140.62
less interest:       137.46
```

11



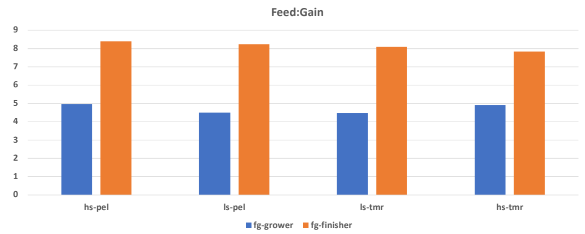
	BirthWt	WeanWt	Wean+60	Wean+90	Wean+200	Wean+286	Finish
hs-pel	94	229	365 a	463	813	1157	1427
ls-pel	95	224	366 a	470	829	1188	1455
ls-tmr	99	226	333 ab	441	805	1173	1468
hs-tmr	91	221	309 b	424	776	1129	1401
Prob. > F	0.17	0.81	<.01	0.09	0.22	0.32	0.26

12



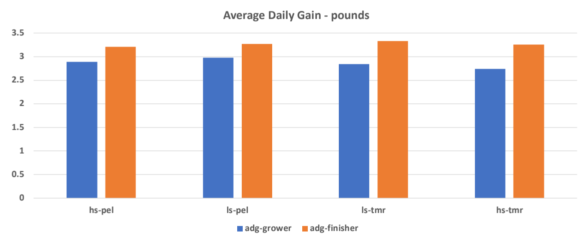
Prob > F: 0.66 0.52

13



Prob > F: 0.43 0.81

14



Prob > F: 0.18 0.92

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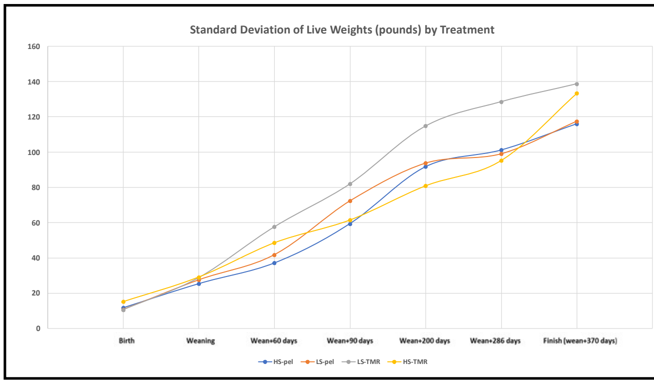

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Carcass Results

UPPER Iowa Beef

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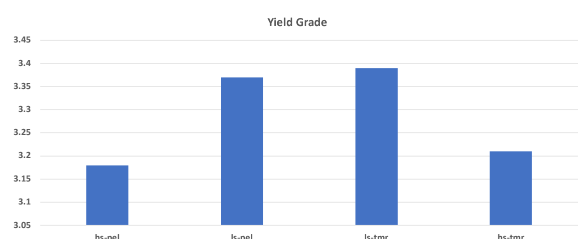
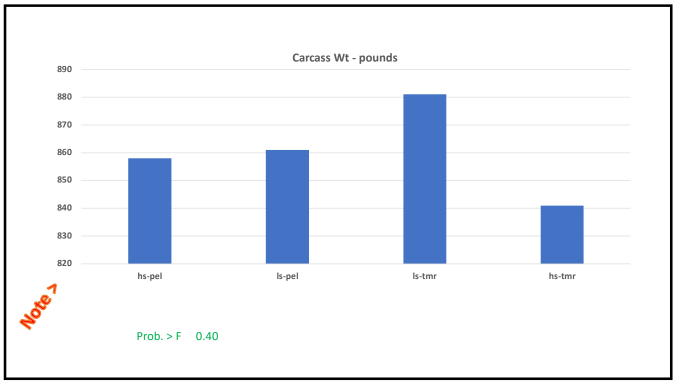


Note >

Prob. > F 0.42

18



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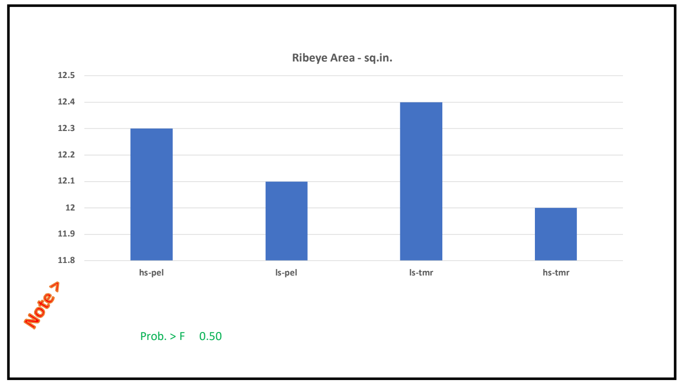

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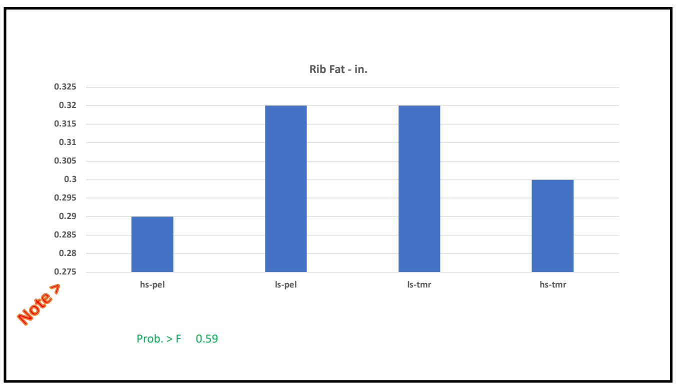

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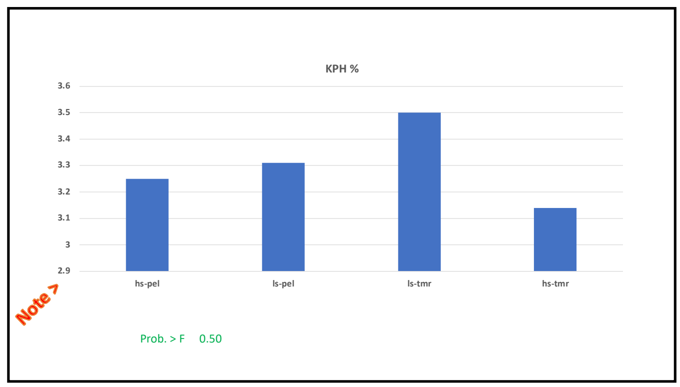

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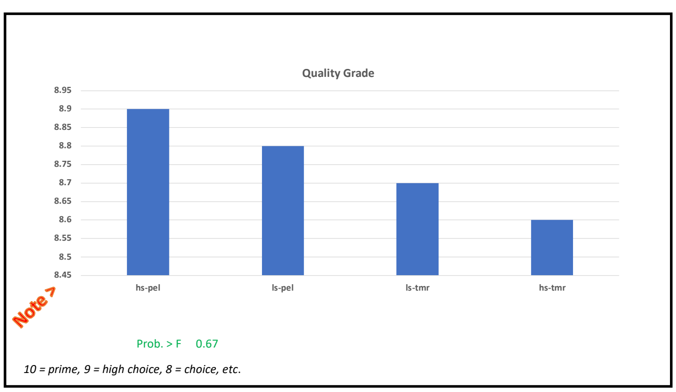

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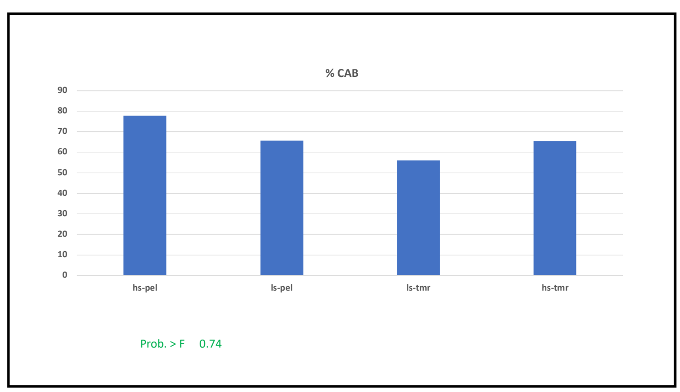

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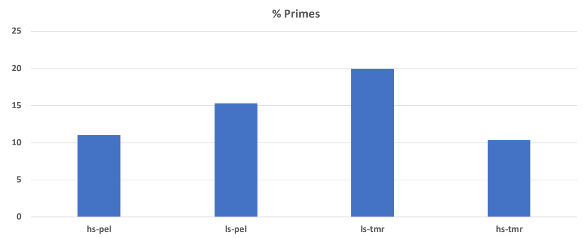
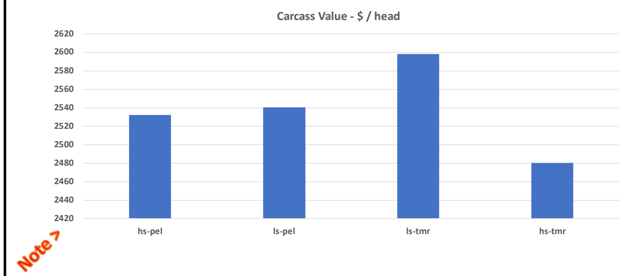


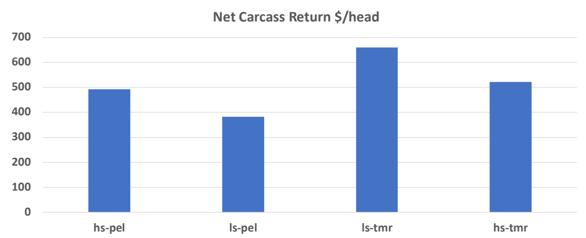
Prob. > F 0.43

25



Prob. > F 0.38

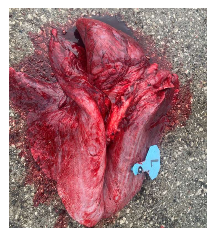
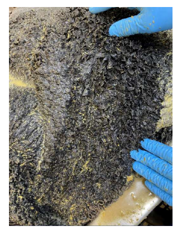
26



Prob. > F 0.14

27

Health Data

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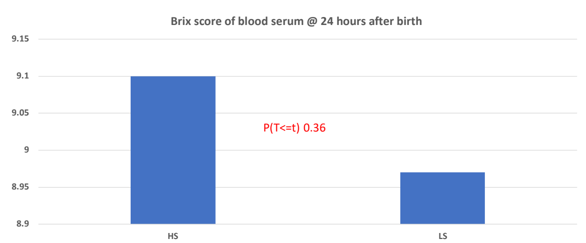
Colostrum Quality Estimate



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Serum BRIX and Later Health Issues

	Preweaning	Grower Phase	Multi treated	Treatment or condemned tissue
BRIX	9.04	8.96	9.01	9.07
BRIX of those with issues	9.04	9.16	9.20	9.07
Pr(>F)	0.97	0.12	0.24	0.95

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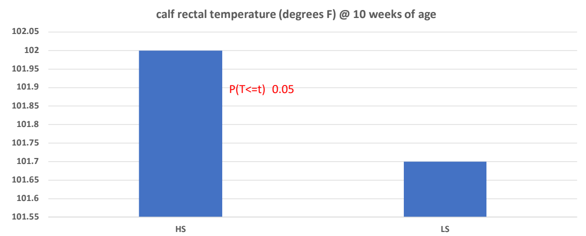
Calf Body Temperature @ 10 Weeks



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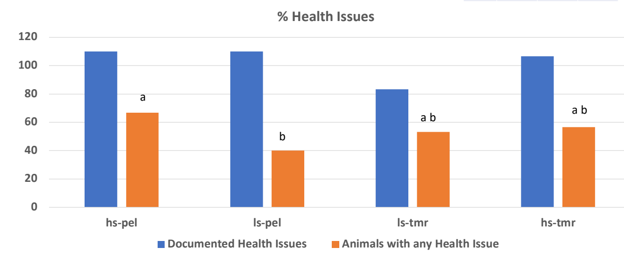
Health Issues

		Documented Health Issues	Animals with any Health Issue
hs-pel	ls-pel	0.5	0.02
hs-pel	ls-tmr	0.12	0.15
hs-pel	hs-tmr	0.45	0.22
ls-pel	ls-tmr	0.19	0.15
ls-pel	hs-tmr	0.46	0.1
ls-tmr	hs-tmr	0.17	0.4



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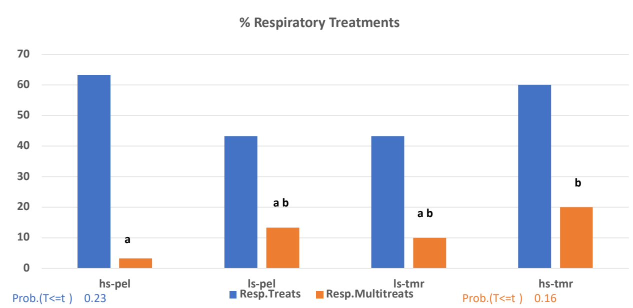
Treatments



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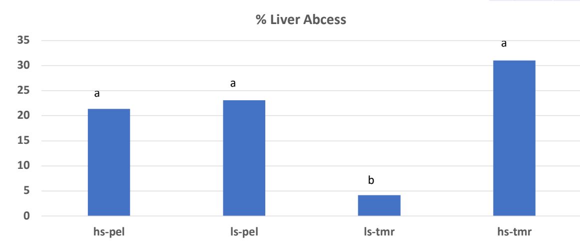
Liver Abscesses

	P(T<=t) one-tail
HS-HS /LS-HS	0.44
HS-HS /LS-TMR	0.04
HS-HS /HS-TMR	0.21
LS-HS /LS-TMR	0.03
LS-HS /HS-TMR	0.26
LS-TMR /HS-TMR	<.01



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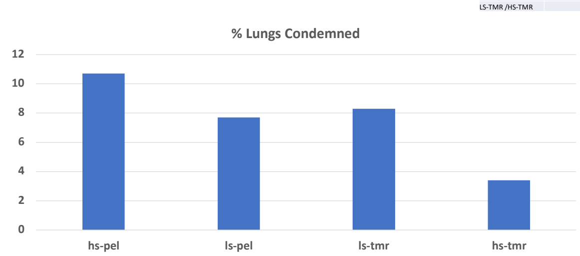
Condemned Lungs

	P(T<=t) one-tail
HS-HS /LS-HS	0.35
HS-HS /LS-TMR	0.39
HS-HS /HS-TMR	0.15
LS-HS /LS-TMR	0.47
LS-HS /HS-TMR	0.25
LS-TMR /HS-TMR	0.23



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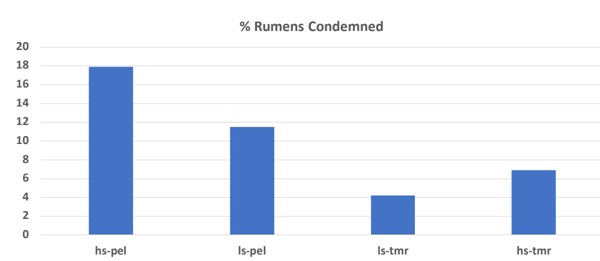
Condemned Rumens

	P(T<=t) one tail
HS-HS /LS-HS	0.26
HS-HS /LS-TMR	0.06
HS-HS /HS-TMR	0.11
LS-HS /LS-TMR	0.17
LS-HS /HS-TMR	0.28
LS-TMR /HS-TMR	0.34



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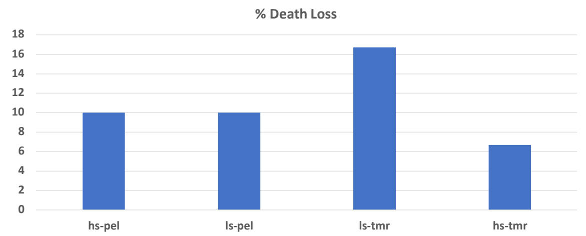
Death Loss

	P(T<=t) one-tail
HS-HS /LS-HS	0.5
HS-HS /LS-TMR	0.23
HS-HS /HS-TMR	0.32
LS-HS /LS-TMR	0.23
LS-HS /HS-TMR	0.32
LS-TMR /HS-TMR	0.18



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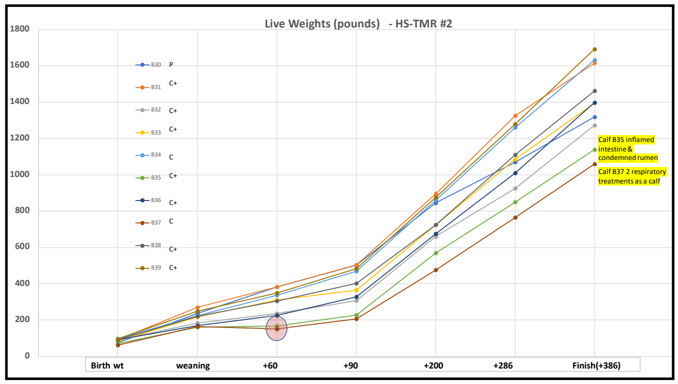

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Documented Health Issues & Resulting Beef

	Average Change from Mean	*Pr(>F)*
Finished Carcass Weight	-69	<.01
Yield Grade	-.09	0.08
Quality Grade	-.15	0.06

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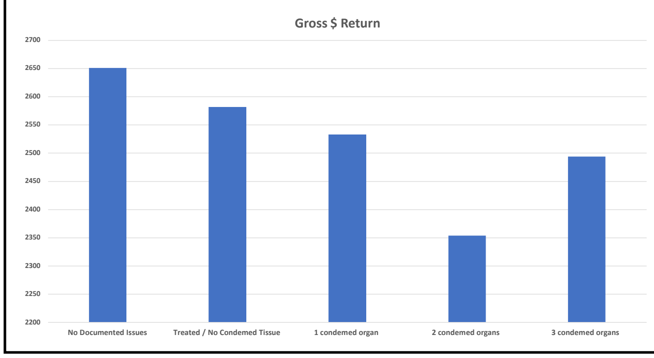

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A few more points of interest:

- 45% of animals with condemned body parts were also treated for a respiratory condition during the grow/finishing phase
- Animals with 1 respiratory treatment were $49 below the others in net return
- Animals with multiple respiratory treatments were $91 below the others in net return
- Animals with any documented health issue /condemned organ were $75 below the others in net return

Note that individual feed intakes are part of this net return equation

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Summary

Early calf nutrition in terms of higher nonstructural carbohydrate (NSC) levels as often promoted by short term research and industry when compared with moderate nonfiber carbohydrate levels in the first 19 weeks of life appears to:

* increase liver abscess and rumen ulcer incidence

*positively affects post weaning gain in the first month post if left on a similar diet

*appears to reduce weight variation over the time on feed

*does not seem to enhance long term, feedlot, carcass performance or net return on finished beef x dairy cattle

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As a side Note :

When everything goes well

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When Things go right…..Finishing Phase

Holstein x Angus Heifers
Received at 173 lbs
Grower Phase - ADG 2.42

Closeout Summary

Feeding Lot: dyx hf fin

Date Fed: 12/15/2020 - 04/13/2021

DESCRIPTION

Management: Conventional
Facility:
calf -females-beef
Head Started: 8 (925 lb)
Head Sold: 8 (1417 lb)

FEED	TOTAL $	TOTAL lbs	% DM	DM/HD	$/UNIT
sweet bran	236.8	5506	57	391.1	86.00
corn silage	207.6	8685	44	477.7	47.81
min vit	235.2	1568	91	178.8	300.00
corn-rolled	117				

Starter/Early Grower
CP = 25% NEg =0.64
NFC = 38 %
NSC = 17%
NDF = 27% @ 42% NDFd
Fat = 6%

Finisher
CP = 11.4% NEg =0.63
NFC = 61 %
NSC = 50%
NDF = 16% @ 21% NDFd
Fat = 4%

One implant given when starting the finishing phase (Elanco TE 200)

MGA was given

Optaflexx was used for the last 4 weeks

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ANIMAL PERFORMANCE

Total Beef In:	7400 lb
Total Beef Out:	11333 lb
Avg.Carcass Wt.:	892.5 lb
Actual Dress:	63.0 %
Yield Grade 4+5:	0.0 %
Choice:	100.0 %
T.Head Days:	960
Feeding Days:	120
Avg Days in Yard:	120.0
ADG:	4.10 lb
Feed/Gain:	5.43
DMI (avg):	22.26 lb
AFI (avg):	32.15 lb
Avg NEg:	63 Mcal
peNDF:	2 %
NFC:	62 %

	Intake	Pulls
1st Qrt:	1.00	0
2nd Qrt:	1.20	0
3rd Qrt:	1.29	0
4th Qrt:	1.29	0

$ PERFORMANCE

	Feed	Feed+ydg	Total
$/Day:	1.93	2.48	2.64
$/lb Gn:	0.47	0.61	0.64

Breakeven $/cwt: 71.67
less interest: 70.73
Iowa Beef Center - Feedlot Monitor

COST SUMMARY	$/UNIT	$/HD SOLD	TOTAL $
feed	173.72 $/tn DM	232.06	1,856.52
interest cattle/inputs	6 %/ 0 %	13.39	107.12
yardage	0.55 $/hd/d	66.00	528.00
processing	0.05 $/hd/d	5.63	45.00
cattle	0.75 $/lb	698.26	5,586.10
TOTAL COST		1015.34	8,122.74

INCOME SUMMARY
cattle
TOTAL INCOME
NET to DATE

TOTAL POUNDS FED (A
$ Loss on Dead/Miss
Marketed Cattle: H

37.5 % graded prime

12.5 % YG 1

50 % YG 2

37.5 % YG 3

All qualified for a CAB market

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Economics of Beef x Holstein and Holstein Feedlot Steers

Melanie Pimentel-Concepción

Michigan State University PhD Student

Summary

Since 2017, dairy producers have increasingly adopted the practice of breeding their low genetic merit dairy dams to beef sires in hopes of enhancing the value of the resulting offspring. Their goal is to produce cattle that can achieve added premiums from branded programs requiring a black-hided phenotype, such as Certified Angus Beef. Limited research indicates that, when compared to their Holstein counterparts, beef x Holstein steers exhibit faster growth rates, greater feed efficiency, and carcasses with increased muscling and yield. However, in the current marketplace, the performance and conformation (whether they are beef or dairy type) of these beef x Holstein offspring can vary, affecting their relative value. There is limited research on the economics of these crossbreds; therefore, we conducted studies to examine the feedlot performance, carcass traits, and economics of beef x Holstein and Holstein steers. The results from these studies indicate that breeding dairy dams to beef sires can result in steers capable of having a lower cost of gain, a greater carcass value, and a greater breakeven feeder calf cost when compared to Holstein steers.

MICHIGAN STATE UNIVERSITY

Economics of Holstein and beef × Holstein steers

Melanie Pimentel-Concepción
Michigan State University
Department of Animal Science

I-29 Moo University Dairy Beef Short Course
March 25, 2025

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MICHIGAN STATE UNIVERSITY

Outline

- Relevance
- Project 1
  - *Growth performance, carcass traits, and feeder calf value of beef ×Holstein and Holstein feedlot steers*
- Project 2
  - *Effects of corn silage inclusion rate in the finishing diet on performance, carcass characteristics, and liver abscess incidence of Holstein and beef × Holstein steers*
- Future
- Summary

2

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Relevance | Project 1 | Project 2 | Summary | Future

Dairy vs. Beef

- Intensive selection for milk production
- Less muscle, more angular

- Intensive selection for beef production
- Greater muscle expression

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Relevance | Project 1 | Project 2 | Summary | Future

Why Beef × Holstein?

- Dairy producers are breeding their lower milk production cows to beef sires to increase calf revenue.

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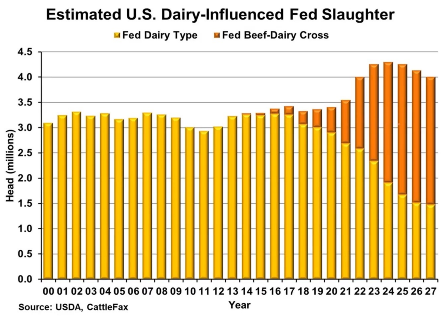
Relevance | Project 1 | Project 2 | Summary | Future



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Relevance | Project 1 | Project 2 | Summary | Future

Relevance

- Dairy and beef × dairy comprise 15-20% of U.S. beef production
- There is a substantial market value disconnect within the supply-chain for beef × Holstein crossbred cattle
  - Premiums for crossbred calves are high

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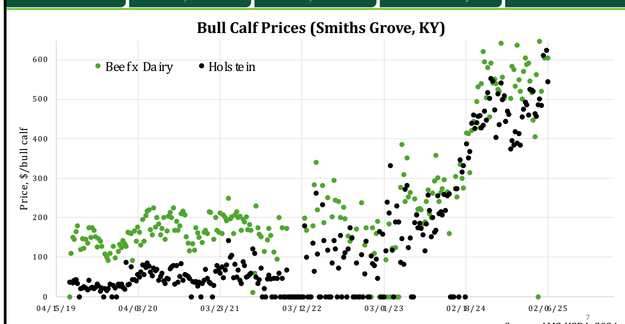
Relevance | Project 1 | Project 2 | Summary | Future



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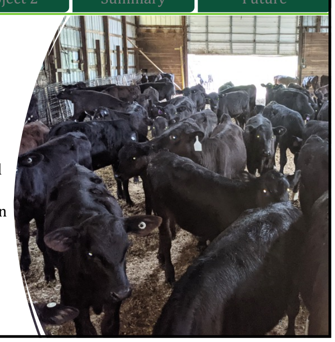
Relevance | Project 1 | Project 2 | Summary | Future

Objectives and Hypothesis

- Evaluate and compare finishing performance, carcass traits, and economics of beef × Holstein and Holstein steers.
- H_{alt}: Health, growth, feed intake, feed efficiency, carcass traits, cost of gain, and carcass value will be improved in beef × Holstein steers when compared with their Holstein contemporaries within the current supply chain



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Relevance | Project 1 | Project 2 | Summary | Future

Materials

- Steers:
  - 75 Holstein
  - 75 Beef × Holstein (35% Angus; 39% Limousin; 25% Simmental)
- Sourced from a Michigan calf raiser (multiple dairies)
- Age: ~ 4 months old
- Arrival weight: 379.0 ± 39.9 lb
- After a 21–d adjustment period:
  - 120 steers blocked by BW
  - 10 pens/breed-type (Covered, solid floor; 14 × 38 ft)
  - 6 steers/pen

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Relevance | Project 1 | Project 2 | Summary | Future

Composition of starter and finishing diets

	Diets	
Ingredient	Starter	Finisher
	--Percentage of diet DM--	
Dry shelled corn	66.0	-
Oats	15.3	-
Pelleted supplement (with monensin)	18.3	-
Molasses	0.42	-
Chopped hay	29.1	-
High moisture corn	-	43.6
Corn silage	-	25.0
Dry corn distillers grains with solubles	-	25.3
Pelleted supplement (with monensin)	-	5.0
Limestone	-	1.1
Item		
	--Percentage of diet DM--	
Crude protein	13.4	14.8
aNDF	27.2	22.0
Ca	0.50	0.90
P	0.39	0.46
	--Mcal/lb--	
NE_m	0.81	0.92
NE_g	0.53	0.62

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Relevance | Project 1 | Project 2 | Summary | Future

Feedlot Performance

Item	Breed-type: Holstein	Breed-type: Beef × Holstein	SEM	*P*-value
Number of steers	59	56	-	-
Days on feed	266	245	-	-
Initial weight, lb	434	433	3.7	0.89
ADG, lb/d	3.63	3.75	0.06	0.07
Dry matter intake, lb/d	23.53	23.37	0.55	0.85
Feed conversion, lb DM/lb gain	6.02	5.81	0.012	0.01
Final weight, lb	1,398	1,368	13.8	0.06
Final hip height, in	58.5	54.8	0.2	< 0.01
Final frame score[1]	9.4	7.5	0.1	< 0.01

[1] Calculated using established equation for bulls (BIF, 2023) with age at purchase estimated as the same for all steers.

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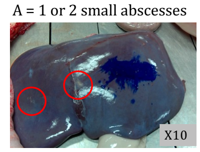
Relevance | Project 1 | Project 2 | Summary | Future

Liver abscess incidence

0 = Healthy

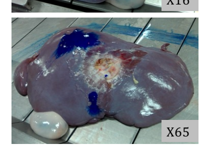
61%

A = 1 or 2 small abscesses



23%

A+ = Multiple small, 1 or more large abscesses



16%

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Carcass Characteristics

Item	Breed-type: Holstein	Beef × Holstein	SEM[1]	*P*-value
Number of carcasses	59	55	-	-
Hot carcass weight, lb	806	804	8.6	0.78
Dressing percentage, %	57.9	59.1	1.0	0.31
Kidney, pelvic, and heart fat, %	2.6	2.6	0.1	0.71
Ribeye area, in^2	11.3	13.6	0.23	< 0.01
Calculated Yield Grade[2]	3.2	2.9	0.1	0.02
Fat thickness, in	0.31	0.47	0.03	< 0.01
Marbling score[3]	437	427	20.8	0.62
Carcass empty body fat, %[4]	27.6	28.4	0.4	0.11
USDA Quality Grade	4.4	4.3	0.21	0.70

[1]Standard error of the mean.
[2]Yield grade = 2.5 + (2.5 × (FT/2.54)) + (0.2 × KPH) + (0.0038 × (HCW/0.453592)) - (0.32 × (LMA/6.4516))
[3]Marbling scores are based on a numeric scale: 300-399 = slight, 400-499 = small, and 500-599 = modest.
[4]cEBF, % = 17.76207 + (4.68142 × FT) + (0.01945 × HCW) + (0.81855 × QG) - (0.06754 × REA)

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Economic Analysis

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Total Input Costs

Item	Breed-type: Holstein	Beef × Holstein	SEM[1]	*P*-value
Number of steers	60	60	-	-
Days on feed[2]	287	266	-	-
Purchase cost, $/feeder calf[3]	$540.33	$849.56	10.90	< 0.01
Interest on cattle, $/steers[4]	$21.24	$30.96	0.38	< 0.01
Feed costs, $/steer				
Pre-trial feed cost	$35.29	$38.49	-	-
Starter feed cost	$60.61	$58.87	0.92	< 0.01
Finisher feed cost	$822.53	$730.37	15.30	< 0.01
Interest on feed	$18.05	$15.05	0.29	< 0.01
Subtotal	$936.48	$841.07	15.59	< 0.01

[1]Standard error of the mean.
[2] Includes pre-trial period.
[3] Includes transportation from the calf raiser to the feedlot
[4] Interest rate on the cattle was 4.53%.

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Total Input Costs

Item	Breed-type: Holstein	Beef × Holstein	SEM[1]	*P*-value
Non-feed operating costs, $/steer				
Preventative health[2]	$21.44	$21.44	-	-
Medication	$2.21	$2.43	1.62	0.89
Death loss[3]	$10.42	$17.42	20.22	0.73
Implants	$6.90	$6.90	-	-
Yardage[4]	$287.00	$266.00	-	-
Transportation	$21.83	$21.83	-	-
Beef Checkoff	$1.00	$1.00	-	-
Subtotal	$361.62	$337.02	1.69	0.53
Cost of gain, $/lb[5]	$1.29	$1.22	0.05	0.03

[1] Standard error of the mean.
[2] Includes vaccination, metaphylaxis, and deworming.
[3] Sum of purchase cost and preventative health divided over all steers.
[4] Yardage was included as $1.00/steer/day.
[5] Cost of gain was the total feed and non-feed operating costs divided by the total gain.

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Pricing Scenarios

Pricing Scenario	Carcass priced as ($/cwt)	Base carcass price
❶	Holstein	$224.00
❷	Beef × Holstein	$228.50
❸	Beef	$233.00
❹	Beef or Beef × Holstein	Variable

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Premiums and discounts, $/cwt HCW

- Premiums
  - YG 1: $4.00
  - YG 2: $2.00
  - Prime: $20.00
  - Certified Angus Beef: $4.29
- Discounts
  - YG 4: −$27.00
  - YG 5: −$15.00
  - Select: −$20.00
  - HCW < 600 or > 900 lb: −$29.29 to -$16.07

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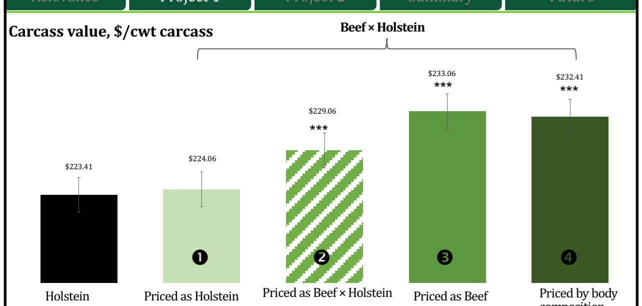
Carcass value, $/cwt carcass



P < 0.0001***

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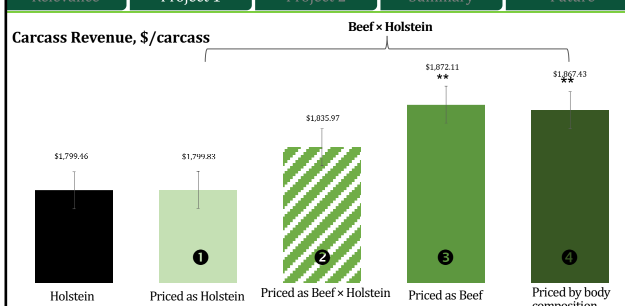
20

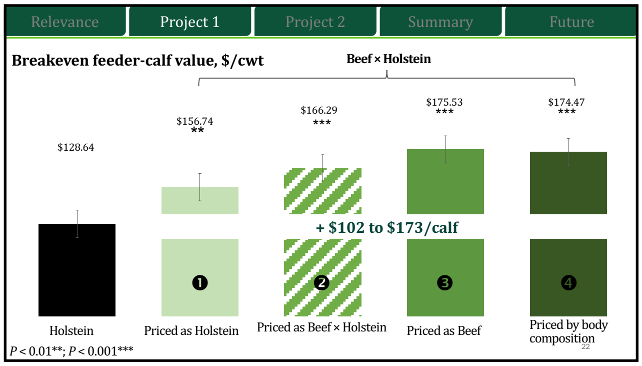
Carcass Revenue, $/carcass



P < 0.01**

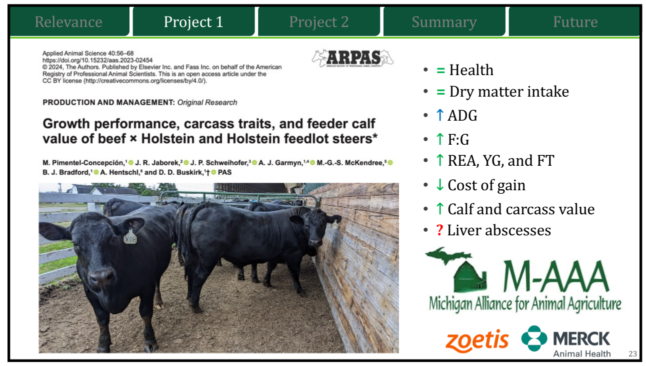
21

21



Relevance
Project 1
Project 2
Summary
Future
Breakeven feeder-calf value, $/cwt
Beef × Holstein
$128.64
$156.74 **
$166.29 ***
$175.53 ***
$174.47 ***
+ $102 to $173/calf
Holstein
Priced as Holstein
Priced as Beef × Holstein
Priced as Beef
Priced by body composition
P < 0.01**; P < 0.001***

22



Relevance
Project 1
Project 2
Summary
Future
Applied Animal Science 40:56–68
https://doi.org/10.15232/aas.2023-02454
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ARPAS
PRODUCTION AND MANAGEMENT: Original Research
Growth performance, carcass traits, and feeder calf value of beef × Holstein and Holstein feedlot steers*
M. Pimentel-Concepción, J. R. Jaborek, J. P. Schweihofer, A. J. Garmyn, M.-G.-S. McKendree, B. J. Bradford, A. Hentschl, and D. D. Buskirk, PAS
= Health
= Dry matter intake
↑ ADG
↑ F:G
↑ REA, YG, and FT
↓ Cost of gain
↑ Calf and carcass value
? Liver abscesses
M-AAA
Michigan Alliance for Animal Agriculture
zoetis
MERCK Animal Health
23

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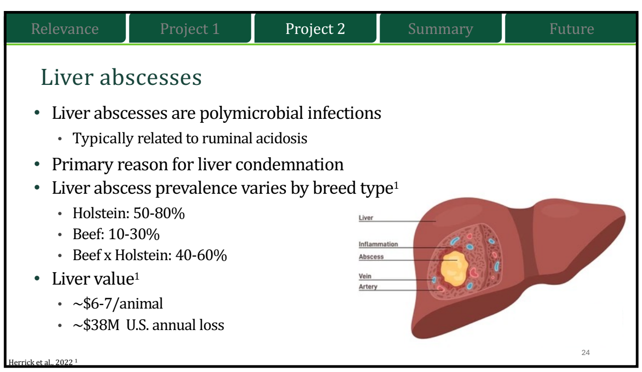

Relevance
Project 1
Project 2
Summary
Future
Liver abscesses
Liver abscesses are polymicrobial infections
Typically related to ruminal acidosis
Primary reason for liver condemnation
Liver abscess prevalence varies by breed type[1]
Holstein: 50-80%
Beef: 10-30%
Beef x Holstein: 40-60%
Liver value[1]
~$6-7/animal
~$38M U.S. annual loss
Liver
Inflammation
Abscess
Vein
Artery
24
Herrick et al., 2022 [1]

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Relevance
Project 1
Project 2
Summary
Future
Effects of corn silage inclusion rate in the finishing diet on performance, carcass traits, and liver abscess incidence of beef × Holstein and Holstein steers
M. Pimentel-Concepción, D. D. Buskirk, A. J. Garmyn, J. Kim, and J. R. Jaborek
M-AAA
Michigan Alliance for Animal Agriculture
zoetis
MERCK Animal Health

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Relevance | Project 1 | **Project 2** | Summary | Future

Objectives and Hypothesis

- Compare feedlot growth, feed efficiency, cost of gain, carcass traits, carcass value, and liver abscess rate of B×HO and HO steers fed finishing diets with two different corn silage concentrations.
- H_{alt}: Increasing the inclusion of corn silage in the diet of B×HO and HO steers will reduce the incidence of liver abscesses.

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Relevance | Project 1 | **Project 2** | Summary | Future

Materials

- Steers
  - 65 Holstein
  - 65 Beef × Holstein steers (77% Angus; 2% Limousin; 19% SimAngus)
- Sourced from two Michigan calf raisers
- Age: ~ 5-6 months of age
- After a 14–d adjustment period, 120 steers randomly allotted to pen
- Two dietary treatments by two breed types
  - 20% Corn silage – Beef × Holstein (5 pens)
  - 40% Corn silage – Beef × Holstein (5 pens)
  - 20% Corn silage – Holstein (5 pens)
  - 40% Corn silage – Holstein (5 pens)

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Relevance | Project 1 | **Project 2** | Summary | Future

Composition of finishing diets

Ingredient	Diets CS20	CS40
	--Percentage of diet DM--	
Corn silage	20	40
High moisture shelled corn	50	30
Dry corn distillers grains with solubles	25	25
Supplement [1]	5	5
Analyzed Composition		
	--Percentage of diet DM--	
Crude protein	15.2	15.3
Neutral Detergent Fiber (NDF)	21.9	28.8
physically effective NDF	16.4	24.1
Ca	0.74	0.77
P	0.48	0.48
	--Mcal/lb--	
NE_m	0.93	0.93
NE_g	0.63	0.58

[1] Calculated analysis on a DM basis provided by the manufacturer: monensin (250 mg/lb), crude protein (13.3%), Ca (17.2%), K (0.5%), P (0.1%), vitamins, and minerals.

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Relevance | Project 1 | **Project 2** | Summary | Future

Feedlot Performance

	Breed		Diet			*P*-value		
Item	Holstein	Beef × Holstein	CS20	CS40	SEM[1]	Breed	Diet	Breed × Diet
Pens, no.	10	10	10	10				
Days on feed	332	290	307	314				
Morbidity, %	1.7	0	1.7	0	0.0351	1.0	1.0	0.98
BW, lb								
Initial[2]	613	558	563	608	8.13	< 0.01	< 0.01	0.52
Final	1586	1685	1625	1647	13.0	< 0.01	0.19	0.69
ADG, lb/d	2.99	3.70	3.33	3.35	0.107	< 0.01	0.87	0.74
DMI, lb/d	25.05	27.34	25.48	25.62	0.543	0.01	0.07	0.49
F:G, lb/lb	8.38	7.39	7.68	7.65	1.76	< 0.01	0.23	0.98
Frame Score[3]	8.5	7.1	7.7	7.9	0.162	< 0.01	0.56	0.18

[1] Standard error of the mean. Reported as the greatest SEM among treatments (n = 5 pens per LSM).
[2] Used as covariate for analysis.
[3] Calculated using the equation for bulls (BIF, 2023) assuming all steers were born on the same day.

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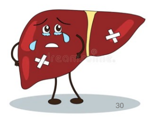
Relevance | Project 1 | Project 2 | Summary | Future

Liver abscess incidence

Item	Breed: Holstein	Breed: Beef × Holstein	Diet: CS20	Diet: CS40	SEM[1]	P-value: Breed	P-value: Diet	P-value: Breed x Diet
Pens, no.	10	10	10	10				
Liver scores								
0, %	50.8	78.3	48.3	81.4	0.54	< 0.01	< 0.01	0.21
A, %	33.9	15.0	38.3	10.1	0.31	0.02	< 0.01	0.49
A+, %	15.3	6.7	13.4	8.5	0.54	0.98	0.97	0.98
Scar, %	22.0	35.0	31.7	25.4	0.46	0.16	0.55	0.65



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Relevance | Project 1 | Project 2 | Summary | Future

Carcass characteristics

Item	Holstein CS20	Holstein CS40	Beef × Holstein CS20	Beef × Holstein CS40	SEM[1]	P-value: Breed	P-value: Diet	P-value: Breed × Diet
Pens, no.	5	5	5	5				
Hot carcass weight, lb	910	934	972	965	15.9	0.01	0.58	0.13
Dressing percentage, %	60.4	58.9	62.3	59.8	0.472	0.07	0.01	0.29
Ribeye area, in^2	10.7	11.2	14.7	14.3	1.76	< 0.01	0.91	0.07
Fat thickness, in	0.43	0.24	0.57	0.56	0.0451	< 0.01	0.02	< 0.01
Kidney, pelvic, and heart fat, %	2.94	2.83	1.75	1.73	0.195	< 0.01	0.83	0.80
Calculated Yield Grade [2]	4.21	3.57	3.30	3.33	0.140	0.01	0.18	< 0.01
Carcass empty body fat, % [3]	30.8	29.2	30.0	30.9	0.381	0.38	0.50	0.01
Marbling score [4]	533	504	550	512	24.4	0.76	0.38	0.86
USDA Quality Grade	5.3	5.1	5.4	5.1	0.239	0.81	0.27	0.87

[1] Standard error of the mean.
[2] USDA Yield grade = 2.5 + [2.5 × (FT/2.54)] + (0.2 × KPH, %) + [0.0038 × (HCW× 2.205)] – [0.32 × (LMA/6.4516)]
[3] cEBF, % = 17.76207 + (4.68142 × FT) + (0.01945 × HCW) + (0.81855 × QG) - (0.06754 × LMA)
[4] Marbling scores are based on a numeric scale: 500-599 = modest

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Relevance | Project 1 | Project 2 | Summary | Future

Economic analysis

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Relevance | Project 1 | Project 2 | Summary | Future

Total Input Costs

Item	Breed-type: Holstein	Breed-type: Beef × Holstein	Diet: CS20	Diet: CS40	SEM[1]	P-value: Breed	P-value: Diet	P-value: Breed x Diet
Pens, no.	10	10	10	10	-	-		
Days on feed[2]	332	290	307	314	-	-		
Purchase BW, lb	563	553	555	561	-	-	-	-
Purchase cost, $/feeder calf[3]	$1,230.29	$1,593.62	$1,402.98	$1,420.93	10.882	< 0.01	0.38	0.07
Interest on cattle, $/steers	$58.25	$66.27	$61.24	$63.28	0.464	< 0.01	0.03	0.13
Feed costs, $/steer								
Pre-trial feed cost	$45.01	$45.40	$45.21	$45.21	-	-	-	-
Finisher feed cost[4]	$1,119.09	$995.65	$1,016.63	$1,098.11	3.734	< 0.01	< 0.01	0.86
Interest on feed	$26.38	$20.55	$22.34	$24.60	0.121	< 0.01	< 0.01	0.46
Subtotal	$1,190.48	$1,061.60	$1,083.18	$1,167.92	6.319	< 0.01	< 0.01	0.91

[1] Standard error of the mean.
[2] Includes pretrial period.
[3] Includes transportation from the calf raiser to the feedlot.
[4] Ration costs were $0.133/ton for CS20 and $0.124/ton for CS40.

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Relevance | Project 1 | Project 2 | Summary | Future

Total Input Costs

	Breed-type		Diet			*P*-value		
Item	Holstein	Beef × Holstein	CS20	CS40	SEM[1]	Breed	Diet	Breed x Diet
Nonfeed operating costs, $/steer					-	-		
Preventative health	$8.56	$8.56	$8.56	$8.56	-	-	-	-
Medication	$0.29	$0	$0	$0.29	1.975	1.00	1.00	1.00
Implants	$12.44	$12.44	$12.44	$12.44	-	-	-	-
Yardage[4]	$332.00	$290.00	$307.00	$314.00	-	-	-	-
Transportation to harvest	$24.82	$24.82	$24.82	$24.82	-	-	-	-
Beef checkoff	$2.00	$2.00	$2.00	$2.00	-	-	-	-
Subtotal	$380.11	$337.82	$354.82	$362.11	1.950	< 0.01	0.04	0.71
Cost of gain[5], $/lb	$1.49	$1.35	$1.44	$1.40	0.201	0.68	0.90	0.90

[4] Includes management, taxes, insurance, interest on facilities, machinery, facility repairs, fuel, oil, utilities, depreciation, and bedding and was included as $1.00/steer/d.

[5] Calculated by dividing total operating costs by total BW gained from delivery to slaughter.

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Relevance | Project 1 | Project 2 | Summary | Future

Carcass pricing

Carcass priced as ($/cwt)	Base carcass price[1]
Holstein	$268.93
Beef	$283.93

[1] Base carcass price for both breed types was the average reported by USDA on the weeks of harvest (September and October, 2024).

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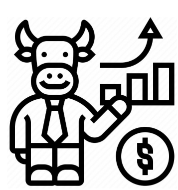
Relevance | Project 1 | Project 2 | Summary | Future

Premiums and discounts, $/cwt HCW

- Premiums
  - YG 1: $4.00
  - YG 2: $2.00
  - Prime: $17.00
- Discounts
  - YG 4: –$12.50
  - YG 5: –$17.50
  - Select: –$16.50
  - HCW < 600 or > 900 lb: –$30.00 to –$15.00



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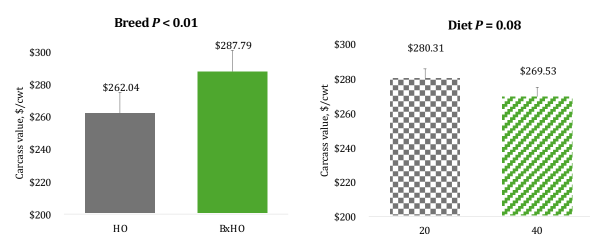
Relevance | Project 1 | Project 2 | Summary | Future

Carcass value[1], $/cwt carcass



[1] Carcass price after applying premiums and discounts.

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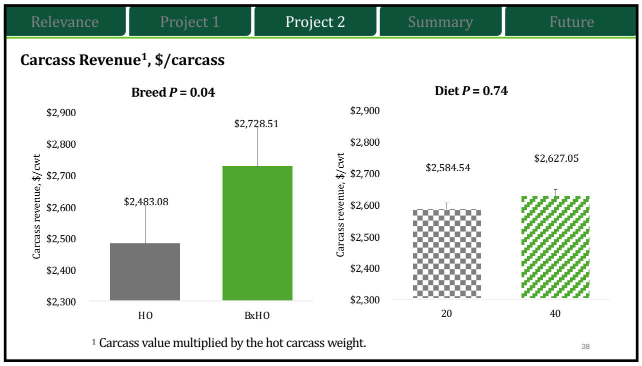
Relevance
Project 1
Project 2
Summary
Future
Carcass Revenue[1], $/carcass
Breed P = 0.04
Diet P = 0.74
Carcass revenue, $/cwt
$2,900
$2,800
$2,700
$2,600
$2,500
$2,400
$2,300
$2,483.08
$2,728.51
HO
BxHO
$2,584.54
$2,627.05
20
40
1 Carcass value multiplied by the hot carcass weight.
38

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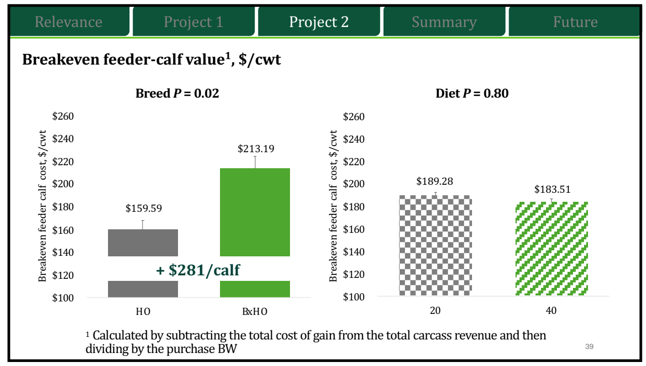
Relevance
Project 1
Project 2
Summary
Future
Breakeven feeder-calf value[1], $/cwt
Breed P = 0.02
Diet P = 0.80
Breakeven feeder calf cost, $/cwt
$260
$240
$220
$200
$180
$160
$140
$120
$100
$159.59
$213.19
+ $281/calf
HO
BxHO
$189.28
$183.51
20
40
1 Calculated by subtracting the total cost of gain from the total carcass revenue and then dividing by the purchase BW
39

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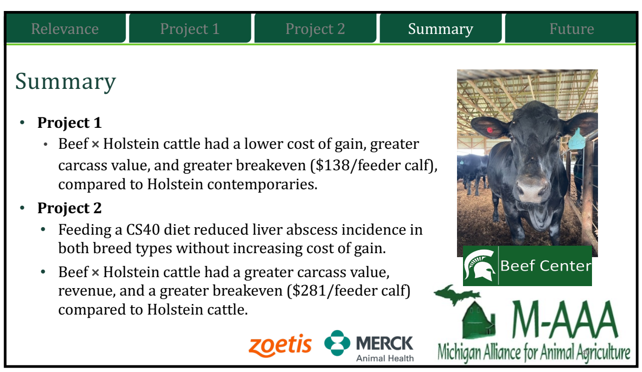
Relevance
Project 1
Project 2
Summary
Future
Summary
Project 1
Beef × Holstein cattle had a lower cost of gain, greater carcass value, and greater breakeven ($138/feeder calf), compared to Holstein contemporaries.
Project 2
Feeding a CS40 diet reduced liver abscess incidence in both breed types without increasing cost of gain.
Beef × Holstein cattle had a greater carcass value, revenue, and a greater breakeven ($281/feeder calf) compared to Holstein cattle.
Beef Center
M-AAA
Michigan Alliance for Animal Agriculture
zoetis
MERCK
Animal Health

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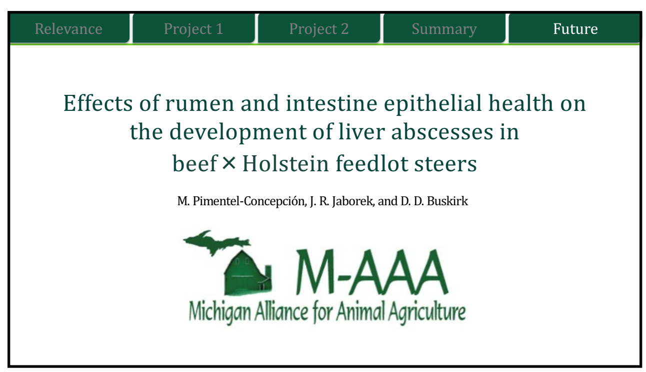
Relevance
Project 1
Project 2
Summary
Future
Effects of rumen and intestine epithelial health on the development of liver abscesses in beef × Holstein feedlot steers
M. Pimentel-Concepción, J. R. Jaborek, and D. D. Buskirk
M-AAA
Michigan Alliance for Animal Agriculture

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Relevance | Project 1 | Project 2 | Summary | Future

Feedlot performance, carcass traits, and sensory characteristics of SimAngus × Holstein steers and heifers, Holstein steers, and beef steers

M. Pimentel-Concepción, J. R. Jaborek, J. P. Schweihofer, A. J. Garmyn, and D. D. Buskirk

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Questions?

piment11@msu.edu

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Hoof-related Lameness in Feedlot Cattle

Sarah Erickson

TELUS Agriculture, Data Advisor- Animal Health Team **Presentation**

Outline

1. Review of the clinical signs
2. Epidemiology
3. Treatment and prevention strategies
    1. Digital dermatitis
    2. Toe tip necrosis syndrome
    3. Foot rot

Foot-Related Lameness in Feedlot Cattle

Date: March 25, 2025
Presented by: Sarah Erickson

1

Lameness in the Feedlot Industry

TELUS Agriculture

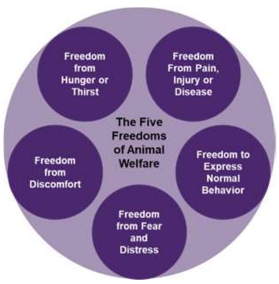
- 30 to 40% of all feedlot treatments.
- Over 70% foot-related
- Foot rot accounts for 40 to 90% of cases.
- Digital dermatitis accounts for 8% to 26% of cases.
- Toe tip necrosis syndrome accounts for 2 to 4% of cases.

Griffin et al., 1993; Hendrick and Abeysekara, 2014; Terrell et al., 2017; Davis-Unger et al., 2019; Marti et al., 2021; Erickson et al., 2023; Erickson et al., 2024

2

The Impact of Foot-Related Lameness

TELUS Agriculture



Five Freedoms of Animal Welfare (Brambell, 1965)

Economic Impact (USD):

- Cost to reach finishing (635 Kg (1400 lb)).
  - Healthy: $521/animal.
  - FRL/Chronic: **$632 - $1,532**/animal (Davis-Unger et al., 2017).

3

4

TTNS – Etiology and Pathogenesis

TELUS Agriculture

- Other names: Apical white line disease, P3 necrosis, foot lesions.
- Non-infectious (Paetsch et al., 2017).
- Associated with the ‘Abrasion Theory’ (Greenough 2007).
- Bacteria degrade the white line and penetrate the hoof capsule and pedal bone (P3) (Greenough 2007; Paetsch et al., 2017; Penny et al., 2017).
- *Escherichia coli* and *Trueperella pyogenes* abundantly isolated (Paetsch et al., 2017).

Photos courtesy of TELUS Agriculture

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TTNS – Clinical Findings

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- Separation of the apical white line of the hoof (Sick et al., 1982; Miskimins 1994).
- Dark pus and/or necrosis of the corium (Jelinski et al., 2018; Gyan et al., 2015).
- May progress causing necrosis of the P3 bone (Jelinski et al., 2018; Gyan et al., 2015).
- Commonly lateral claws on hind feet (walk cow-hocked)

Photos courtesy of TELUS Agriculture

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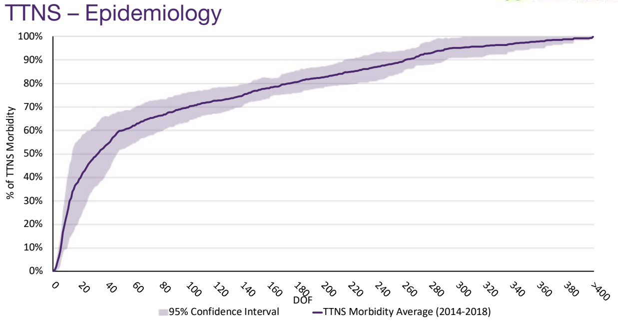
TTNS – Epidemiology



(Erickson et al. 2023)

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TTNS – Management

- Develops within days after arrival/processing (Paetsch et al., 2017).
- Animal temperament and handling can play a role (Paetsch et al., 2017; Erickson et al., 2024).
- Debridement (trimming) of the hoof plus systemic long-acting antimicrobials (Griffin et al., 1993).
- Treatment with antimicrobials alone is **not** sufficient (Griffin et al., 1993).
- Provide a soft surface layer (sand, manure, etc.) at chute exit
- Provide recovery area: small pen (easy access to resources); soft, dry surface

Photos courtesy of TELUS Agriculture

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Laminitis

9

Laminitis – Etiology and Pathogenesis

Histamine from trauma, concussion, or infectious disease → Vasoactive substances ← Histamine, Endotoxins ← Ruminal acidosis

↓

Blood flow in microvasculature of corium is disrupted

↓

Arteriovenous shunts open

↓

Blood destined for corium is short-circuited

↓

Hypoxic damage ± Inflammation of Corium

↓

Deterioration of the horn capsule-corium interface

Hoblet and Weiss, 2001; Ossent and Lischer, 1998

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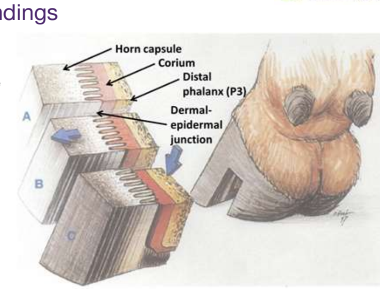
Laminitis – Clinical Findings

- Degeneration, necrosis, and inflammation of the dermal and epidermal laminae in the hoof wall.
- Elongated hooves ("slipper feet") are a sign of chronicity.
- Three severity categories: Mild (1), Moderate (2), or Severe (3)



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Laminitis – Clinical Findings

Mild:
- No other lameness
- Shortened stride
- Level back when standing
- Level back when walking
- Able to keep up with the herd

Moderate (always):
- No other lameness
- Shortened stride
- Able to keep up with the herd

Moderate (often):
- Level back when standing
- Arched back when walking
- Reluctant to rise
- Shift weight from foot to foot

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Laminitis – Clinical Findings

Severe (always):
- No other lameness
- Deliberate stride
- Arched back when standing and walking
- Unable to keep up with the herd

Severe (often):
- Reluctant to rise
- Shift weight from foot to foot
- Loss of body condition

Photos courtesy of TELUS Agriculture

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Laminitis – Management

- Late DOF onset
- More commonly observed in heifers
- Ship cattle prior to becoming severely laminitic
- Railing options are an important consideration
- Mild and Moderate cattle: move cattle up one market group after sorting
- Cost per affected animal is significant; Can be greater than 0.5 lb decreased ADG (unpublished data).
- Overall economic impact depends on % of lot affected.

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Foot Rot (FR)

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Foot Rot – Etiology and Pathogenesis

- Other names: interdigital necrobacillosis, infectious bovine pododermatitis, and foot abscess.
- *Fusobacterium necrophorum* considered the primary pathogen involved (Morck et al., 1998; Stokka et al., 2001).
- Secondary pathogens: *Porphyromonas levii* and *Prevotella intermedia* (Morck et al., 1998; Stokka et al., 2001).
- Injury to the interdigital cleft allows for entry of these pathogenic bacteria (Stokka et al., 2001).
- Highly infectious/contagious

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Foot Rot – Clinical Findings

- Symmetrical swelling at coronary band, at the heel, and between the claws (Berg and Loan 1975; Van Metre 2017).
- Lesions size: <1 cm to length of the interdigital cleft (Berg and Loan 1975).
- Necrosis and sloughing of subcutaneous tissues and foul odor (Berg and Loan 1975).
- Often single foot affected; most commonly a hind foot (McLennan 1988).
- Chronic FR: Abscess development which leads to deep digital sepsis or septic arthritis (McLennan 1988; Baxter et al., 1991; Stokka et al., 2001; Terrell et al., 2017) .

Photos courtesy of TELUS Agriculture

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Foot Rot – Risk Factors

- Seasonal disease: weather fluctuations/moisture increases (Griffin et al., 1993; Stokka et al., 2001; Tibbetts et al., 2006).
- Poor pen hygiene (dried mud, rocks, frozen uneven ground, and ice) identified as a main risk factor (Griffin et al., 1993; Stokka et al., 2001; Tibbetts et al., 2006).
- Injury to the interdigital cleft allows for entry of these pathogenic bacteria (Stokka et al., 2001).
- Conflicting research on risk being higher in calves vs. yearlings or visa versa (Davis-Unger et al., 2019; Marti et al., 2021; Erickson et al., 2023).

Photos courtesy of TELUS Agriculture

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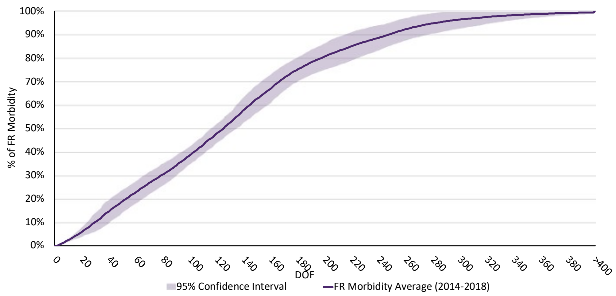
Foot Rot – Epidemiology



(Erickson et al. 2023)

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Foot Rot – Management

- F. necrophorum vaccine: Fusogard licensed for the prevention of FR (Novartis Animal Health Canada, Mississauga, Ontario).
- Treatment success depends on early detection and rapid intervention with antimicrobials (Berg and Loan 1975).
- Mounding soil promotes drainage and provides a bedding surface (Stokka et al., 2001).
- Railing or euthanasia of chronic cases (Baxter et al., 1991; Stokka et al., 2001).

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Digital Dermatitis (DD)

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Digital Dermatitis – Etiology and Pathogenesis

- Other names: papillomatous digital dermatitis, hairy-heel wart or strawberry foot rot.
- Contagious, multifactorial and polybacterial (Gomez et al., 2014, Krull et al., 2014).
- Endemic in the dairy industry (Read and Walker 1998; Krull et al., 2014; Klitgaard et al., 2017).
- Growing concern in North American feedlots (Hendrick and Abeysekara 2014; Krull et al., 2016).
- *Treponema* species are thought to play an important role (Evans et al., 2009; Gomez et al., 2014; Krull et al., 2014; Wong et al., 2024).

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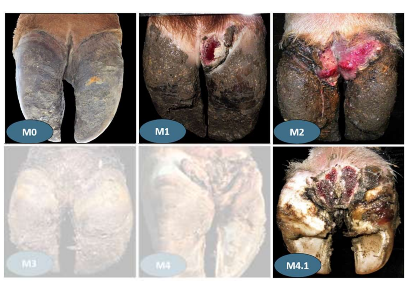
Digital Dermatitis – Clinical Findings

- Stage M0: Healthy.
- Stage M1: Circumscribed area, mottled red-gray, 0.5-2 cm diameter.
- Stage M2: classical red ulcers >2 cm diameter.
- Stage M4.1: New M1 lesion identified within M4 lesion.

(Döpfer at al., 1997; Berry et al., 2012; Döpfer et al., 2012; Wilson-Welder et al., 2015)



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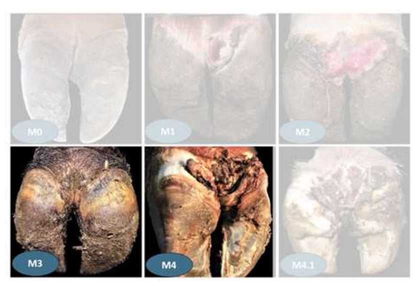
Digital Dermatitis – Clinical Findings

- Stage M4: Hyperkeratotic, chronic lesion with proliferative hair-like growths on lesion surface.
- Stage M3: Healing with scab over lesion.
- Often no pain/lameness observed.

(Döpfer at al., 1997; Berry et al., 2012; Döpfer et al., 2012; Wilson-Welder et al., 2015)



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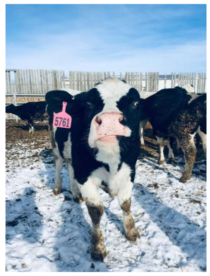
Digital Dermatitis – Risk Factors

- Pen hygiene (moisture, mud, manure) is a known risk factor (Rodriguez-Lainz et al., 1996; Wells et al., 1999; Relun et al., 2012).
- Speculation that dairy cattle introduce DD in feedlots, may not be accurate (Brown et al., 2000; Hendrick and Abeysekara 2014; Erickson et al., 2024).
- Higher risk of DD diagnosis determined in heifers than steers and bulls (Erickson et al., 2024).
- Highest risk in grass cattle and those backgrounded in confined pens (Erickson et al., 2024).



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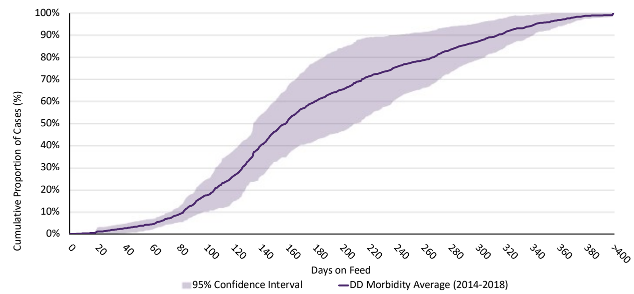
Digital Dermatitis – Epidemiology



(Erickson et al. 2024)

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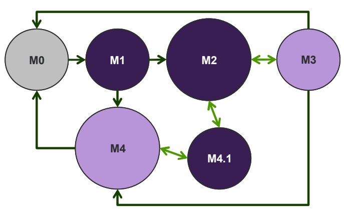
Digital Dermatitis – Management

- Feeding increased organic trace minerals may be preventative (Kulow et al., 2017; Anklam et al., 2022).
- **Wash the foot** and apply topical tetracyclines and copper compounds are common treatment options: +/- Systemic antimicrobials (Moore et al., 2001; Berry et al., 2012).
- Chronic/unresolved lesions are common; treated animals may act as a reservoir (Apley 2015; Shearer 2015).
- Mounding soil promotes drainage and provides a bedding surface (Stokka et al., 2001).
- Scrape pens and leave empty for ~ 1-2 weeks (Stokka et al., 2001).



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Digital Dermatitis – Management: Footbaths

- Copper-sulphate or formalin footbaths are the most common prevention method (Cook et al., 2012; Döpfer et al., 2012; Shearer 2015; Jacobs et al., 2019).
- Closest thing to a mass treatment for DD
- Feedlot considerations: location, size/depth, use frequency, maintenance, weather

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Take Aways: Risk Factors

- **Laminitis, FR, DD** and **TTNS** are common forms of lameness in feedlot cattle.
- **TTNS:** Abrasive surfaces are a risk factor. Soft surface layers mitigate this.
- **Laminitis:** Metabolic disease associated with high-grain diets.
- **Laminitis** and **DD: C**ommonly observed at late DOF.
- **FR** and **DD:** Poor pen conditions are associated with development.
- **DD:** Sex and acquisition source are significant risk factors.

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Take Aways: Differential Diagnosis

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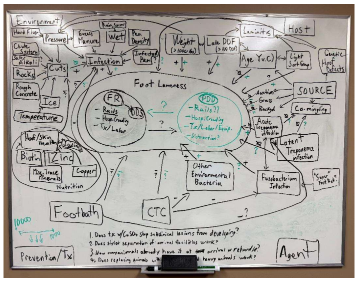
- **FR** and **DD** are infectious and may spread rapidly.
- **TTNS:** early DOF, in all cattle types.
- **FR:** all DOF, in all cattle types.
- **Laminitis** and **DD:** late DOF and/or fat cattle, particularly heifers.
- **The differential diagnosis of TTNS, laminitis, DD and FR is a critical part of managing these diseases.**



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Take Aways: Management/Treatment

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- **TTNS:** treat by debriding the hoof and administering systemic antimicrobials.
- **Laminitis:** manage by shipping or railing afflicted cattle.
- **FR:** treat with systemic antibiotics. Aggressively/mass treat pens with increasing cases.
- **DD:** treat with topical tetracyclines or copper compounds. Add systemic antimicrobials, if FR also present.
- **DD:** footbaths for treatment/management; Considerations for feasibility in feedlot settings.
- **FR** and **DD**: Mound soil and/or scrape pens to improve hygiene.

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