Alltech®

ON-FARM SUPPORT

Helping your dairy save time and money.

Our team of Elite Dairy Advisors serve as a new tool for nutritionists, producers and laborers. Specializing in Herd Analytics, Forage Quality, Cow Comfort, and Talent Development we work with you to troubleshoot problems, set customized goals and help lay a foundation for your dairy to save time and money.

For more information about the Alltech On-Farm Support program, please contact DairyOnFarmSupport@Alltech.com or visit Alltech.com/on-farm-support

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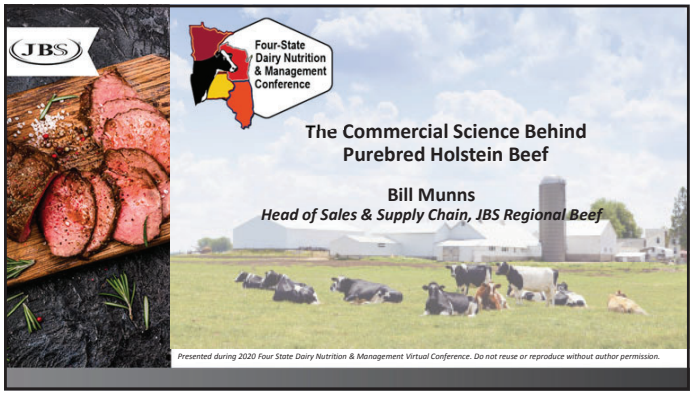
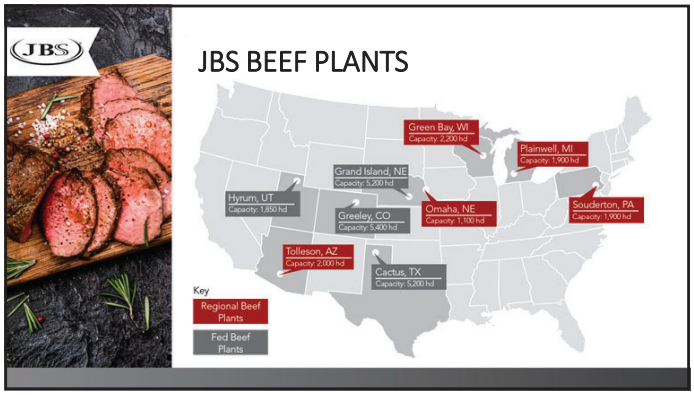
Four-State Dairy Nutrition & Management Conference

The Commercial Science Behind Purebred Holstein Beef

Bill Munns
Head of Sales & Supply Chain
JBS Regional Beef


Four-State Dairy Nutrition & Management Conference
The Commercial Science Behind Purebred Holstein Beef
Bill Munns
Head of Sales & Supply Chain, JBS Regional Beef
Presented during 2020 Four State Dairy Nutrition & Management Virtual Conference. Do not reuse or reproduce without author permission.

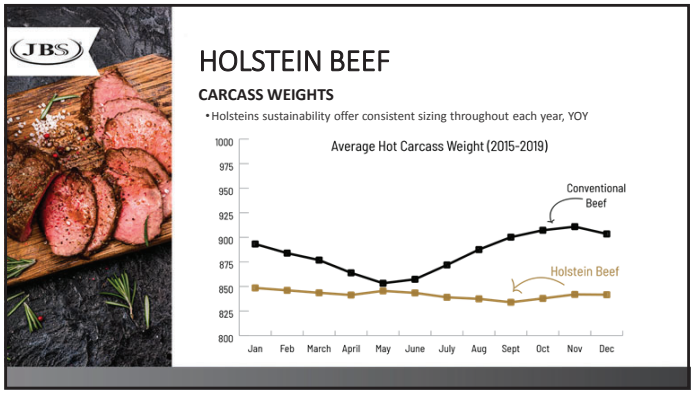
1


JBS BEEF PLANTS
Green Bay, WI
Capacity: 2,200 hd
Plainwell, MI
Capacity: 1,900 hd
Grand Island, NE
Capacity: 5,200 hd
Hyrum, UT
Capacity: 1,850 hd
Greeley, CO
Capacity: 5,400 hd
Omaha, NE
Capacity: 1,100 hd
Souderton, PA
Capacity: 1,900 hd
Tolleson, AZ
Capacity: 2,000 hd
Cactus, TX
Capacity: 5,200 hd
Key
Regional Beef Plants
Fed Beef Plants

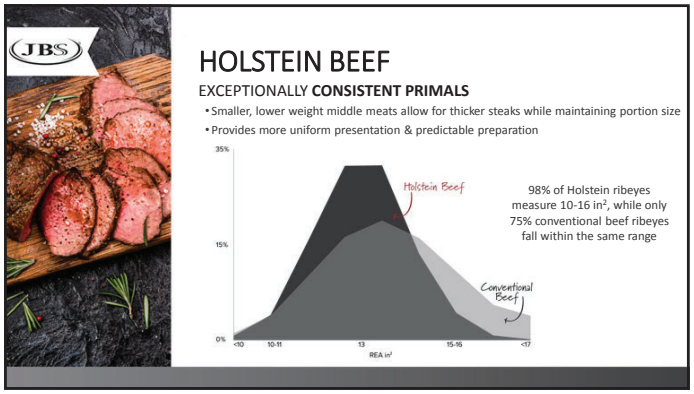
2


B2B MARKETING APPROACH
PUREBRED FED HOLSTEINS
• Holstein steers represent 20% of total US fed cattle harvested Approximately 100K head/week*
• 32% of industry USDA Prime is Holstein*
• Grain-fed from an early age
• Consistent genetic base delivers uniform carcass weights, primal confirmation, meat quality, tenderness & flavor
HOLSTEIN PERFORMANCE
• Above average USDA quality grade – 10-12% Prime, 72-75% Choice
• Delivers a more flavorful & tender eating experience consumers prefer
• Over 90% Yield Grade 1, 2 & 3
• Superior saleable yields deliver a retail gross margin advantage
PROVEN PROGRAMS
• Only young A Maturity cattle qualify into JBS Graded Holstein Brands
• No dark cutters allowed in JBS Programs
• Various programs available across USDA Prime, Choice & Select
Cedar River Farms Natural Beef
ELITE PRIME
5 Star
5 Star
SHOWCASE
PREMIUM USA BEEF
*National Beef Quality Audit, 2016.

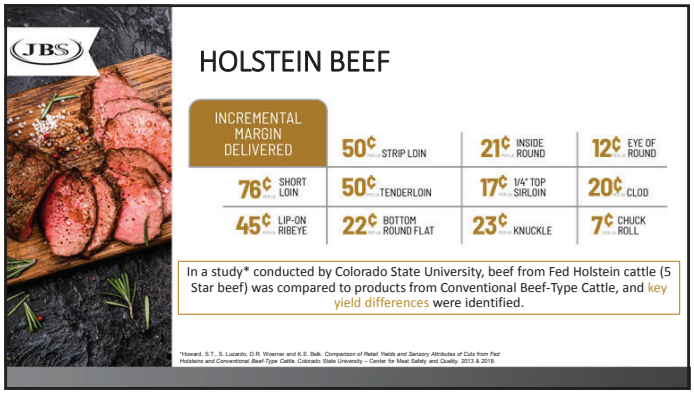
3


HOLSTEIN BEEF
CARCASS WEIGHTS
• Holsteins sustainability offer consistent sizing throughout each year, YOY
Average Hot Carcass Weight (2015-2019)
1000
975
950
925
900
875
850
825
800
Conventional Beef
Holstein Beef
Jan
Feb
March
April
May
June
July
Aug
Sept
Oct
Nov
Dec

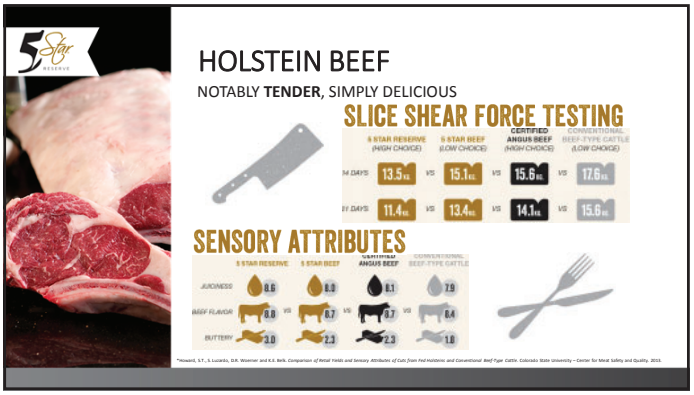
4


HOLSTEIN BEEF
EXCEPTIONALLY CONSISTENT PRIMALS
• Smaller, lower weight middle meats allow for thicker steaks while maintaining portion size
• Provides more uniform presentation & predictable preparation
35%
15%
0%
Holstein Beef
Conventional Beef
<10
10-11
13
15-16
>17
REA in²
98% of Holstein ribeyes measure 10-16 in², while only 75% conventional beef ribeyes fall within the same range

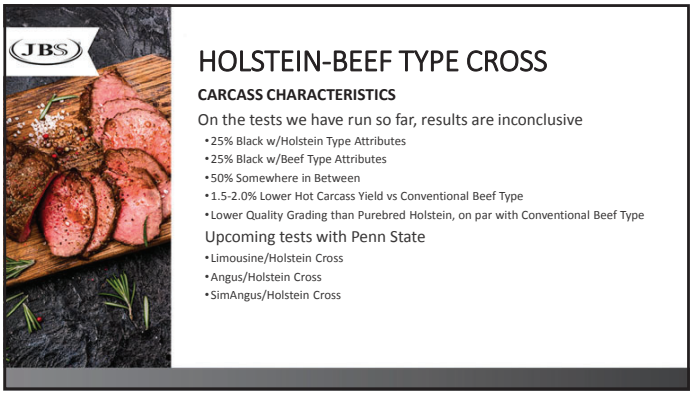
5


HOLSTEIN BEEF
INCREMENTAL MARGIN DELIVERED
50¢ STRIP LOIN
21¢ INSIDE ROUND
12¢ EYE OF ROUND
76¢ SHORT LOIN
50¢ TENDERLOIN
17¢ 1/4" TOP SIRLOIN
20¢ CLOD
45¢ LIP-ON RIBEYE
22¢ BOTTOM ROUND FLAT
23¢ KNUCKLE
7¢ CHUCK ROLL
In a study* conducted by Colorado State University, beef from Fed Holstein cattle (5 Star beef) was compared to products from Conventional Beef-Type Cattle, and key yield differences were identified.
*Howard, S.T., S. Luzardo, D.R. Woerner and K.E. Belk. Comparison of Retail Yields and Sensory Attributes of Cuts from Fed Holsteins and Conventional Beef-Type Cattle. Colorado State University – Center for Meat Safety and Quality. 2013 & 2018.

6


5 Star Reserve
HOLSTEIN BEEF
NOTABLY **TENDER**, SIMPLY DELICIOUS
SLICE SHEAR FORCE TESTING
5 STAR RESERVE (HIGH CHOICE)
5 STAR BEEF (LOW CHOICE)
CERTIFIED ANGUS BEEF (HIGH CHOICE)
CONVENTIONAL BEEF-TYPE CATTLE (LOW CHOICE)
14 DAYS
13.5 lbs
vs
15.1 lbs
vs
15.6 lbs
vs
17.6 lbs
21 DAYS
11.4 lbs
vs
13.4 lbs
vs
14.1 lbs
vs
15.6 lbs
SENSORY ATTRIBUTES
5 STAR RESERVE
5 STAR BEEF
CERTIFIED ANGUS BEEF
CONVENTIONAL BEEF-TYPE CATTLE
JUICINESS
8.6
8.0
8.1
7.9
BEEF FLAVOR
8.8
vs
8.7
vs
8.7
vs
8.4
BUTTERY
2.0
2.3
2.3
1.8
*Howard, S.T., S. Lucardo, D.R. Woerner and K.E. Belk. Comparison of Retail Yields and Sensory Attributes of Cuts from Fed Holstein and Conventional Beef-Type Cattle. Colorado State University – Center for Meat Safety and Quality. 2015.

7


JBS
HOLSTEIN-BEEF TYPE CROSS
CARCASS CHARACTERISTICS
On the tests we have run so far, results are inconclusive
• 25% Black w/Holstein Type Attributes
• 25% Black w/Beef Type Attributes
• 50% Somewhere in Between
• 1.5-2.0% Lower Hot Carcass Yield vs Conventional Beef Type
• Lower Quality Grading than Purebred Holstein, on par with Conventional Beef Type
Upcoming tests with Penn State
• Limousine/Holstein Cross
• Angus/Holstein Cross
• SimAngus/Holstein Cross

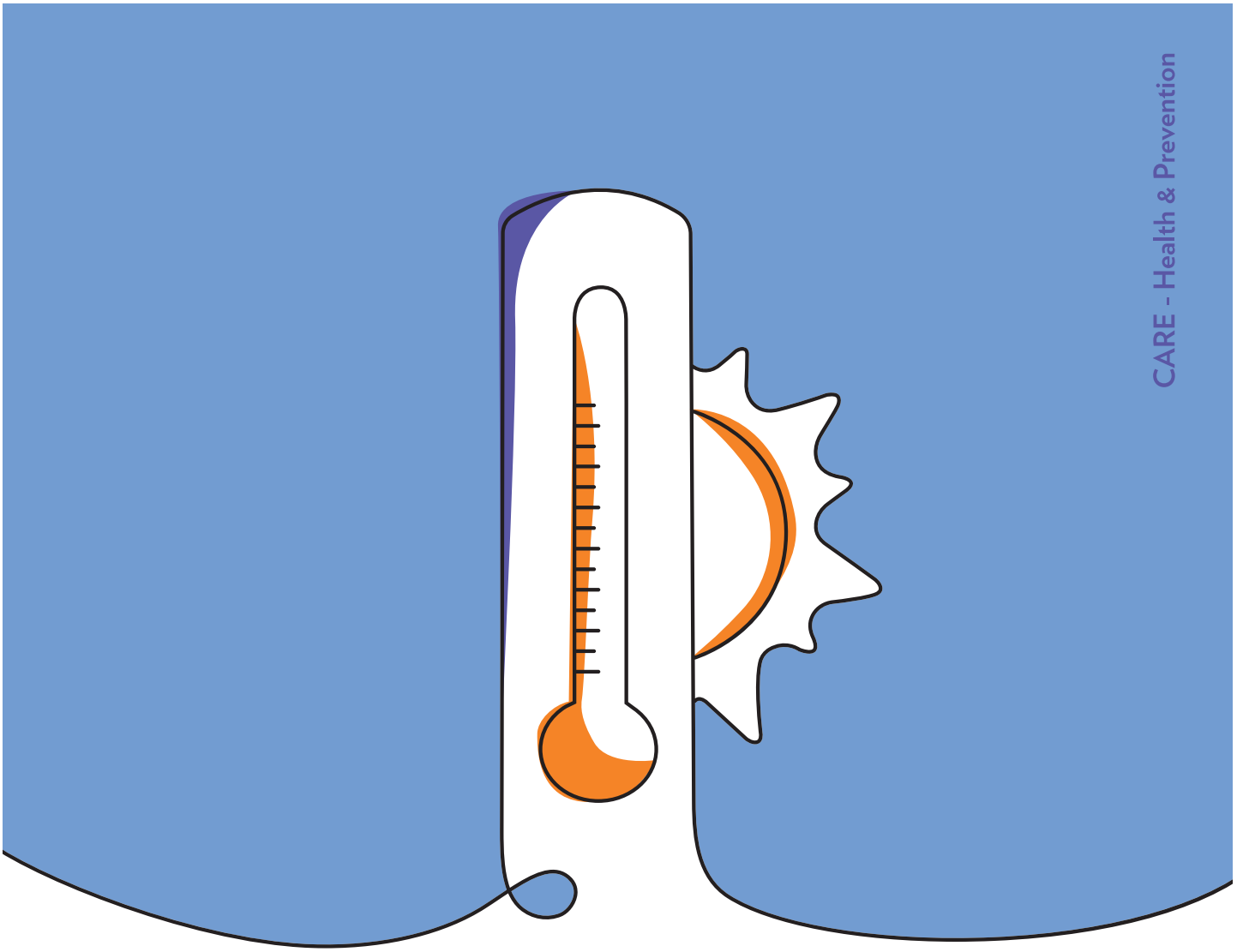
8


Clear River Farms
CLEAR RIVER FARMS
USDA INSPECTED **UNGRADED BEEF**
• Minimum marbling requirement SL^{00} – equivalent to USDA Select/Higher
• Lean & fat color specification to ensure premium visual appearance (6 or better on Japanese Color Chart)
• No dark cutters, no yellow fat allowed
• Minimum carcass weight & ribeye area size to ensure product sizing & consistency – 600 lbs & 1.2 in^2 per 100 lbs
• Comprehensive offering of Ungraded >30 products
• Carcasses not meeting these specifications are offered as Four Star
• Produced in all 5 JBS Regional plants
Branded Packaging
19024

9


FourStar BEEF
FOUR STAR BEEF
USDA INSPECTED **UTILITY PRODUCTS**
• High lean percentage carcasses primarily used in grinding operations
• Middle meat offerings include 190 & 190A tenderloins, ribeye rolls, 1x1 strips, 100% lean strips, top butts & coulottes
• End meat offerings include knuckles, insides, flats, eyes & 100% lean SPB
Branded Packaging
18024

10



Is heat stress affecting your herd?

Jefo's specific blends of protected B-Vitamins are designed to help dairy cows cope with stressful situations that affect production.

Move your business forward

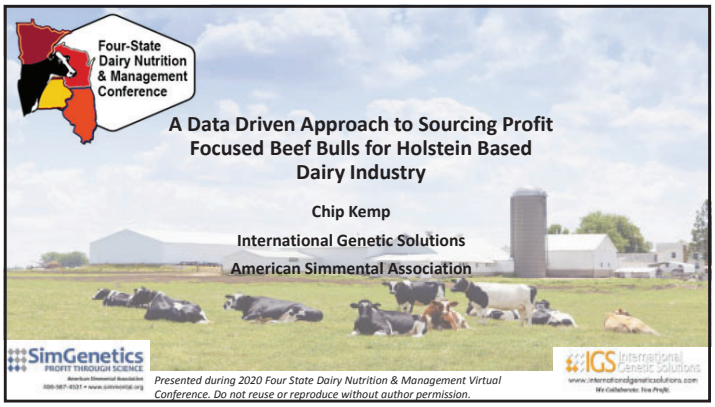
Jefo

Life, made easier.

jefo.com

CA Data Driven Approach to Sourcing Profit Focused Beef Bulls for Holstein Based Dairy Industry

Chip Kemp
International Genetic Solutions
American Simmental Association



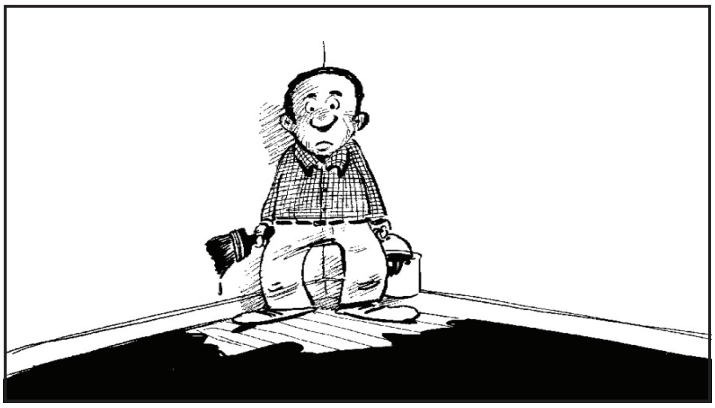
1

Transforming

FRUSTRATION

to *Leverage*!

2



3

What is IGS International Genetic Solutions?

- Collaboration of numerous associations and industry groups.
- Largest Beef Genetic Evaluation on the planet. (**~20,000,000 head**)
- Only Mega, Multi-Breed Evaluation in existence.
- Allows for direct comparison of cattle - regardless of breed type.
- No Breed bias.
- Most Importantly for this conversation…
  Allows for genetic awareness of largest population in the beef business…
  The Crossbred Terminal Beef Calf!

4

IGS is a tech company

- Data-driven tools to empower serious producers and the industry
- The key – take billions of data points, remove the noise, and make genetic tools to add value.
  - EPDs and Indexes on any breed of cattle
  - EPDs and Indexes on commercial, crossbred cattle
  - IGS Feeder Profit Calculator
- Significant growth in non-IGS seedstock types
- Tremendous growth in commercial clients

IGS International Genetic Solutions™
Feeder Profit CALCULATOR™

5

A little background…

6

A simple look at semen sales numbers…

Excluding import numbers which are small and export numbers that don't directly impact US beef market.

7

Combined Dairy Domestic Sales & Custom

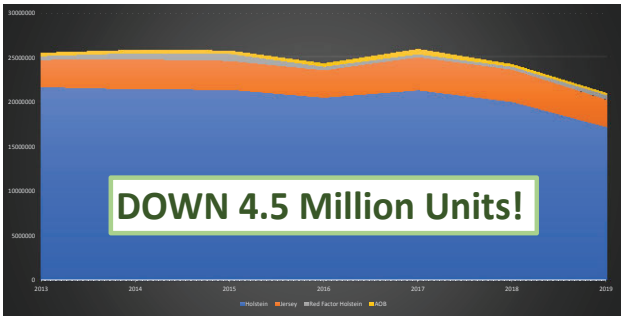
Total Dairy Semen (NAAB)

	2013	2014	2015	2016	2017	2018	2019	% Change
Holstein	21645443	21421445	21346838	20474167	21287608	19976218	17162554	-20.7105
Jersey	3048823	3333879	3243907	3072640	3703766	3630467	3074001	0.825827
Red Factor	416175	703441	782435	390038	343857	314176	500270	20.20664
AOB	401464	392582	391764	390462	609260	306804	262544	-34.6034
TOTAL	25511905	25851347	25764944	24327307	25944491	24227665	20999369	-17.688

NOTE: Dairy industry down 4,512,536 unit of semen.

8

Combined Dairy Domestic Sales & Custom



9

Combined Beef Domestic Sales & Custom

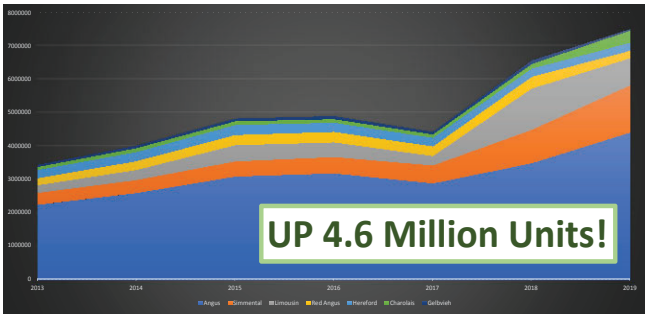
Total Beef Semen (Sales & Custom)

	2013	2014	2015	2016	2017	2018	2019	% Change
Angus	2241974	2595931	3090752	3180929	2881182	3489149	4411231	96.75656
Simmental	356369	386278	450136	493057	537386	996978	1412403	296.3316
Limousin	229878	299106	483099	434565	279856	1238743	807181	251.1345
Red Angus	207734	266282	308861	316277	291410	347441	228691	10.08838
Hereford	246881	271536	296837	274465	258375	249125	236462	-4.22025
Charolais	89880	119202	111198	103386	99619	136891	364647	305.7043
Gelbvieh	66091	78724	84933	98394	79792	110185	51484	-22.1013
AOB	932400	895105	889525	735164	810837	1142369	1438536	54.28314
TOTAL	4371207	4912164	5715341	5636237	5238457	7710881	8950635	104.7635

NOTE: Only three breeds beat the average % change.
NOTE: Beef semen units up 4,579,428.

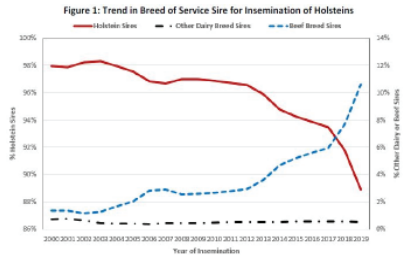
10

Combined Beef Domestic Sales & Custom



11

Beef on Dairy

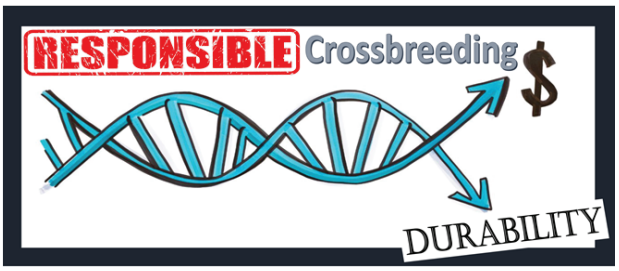


Canadian Dairy Network

YOUR SUCCESS Our Passion.

12

WHY?



13

All the while…

- Despite struggles dairy cow numbers are growing (albeit slightly).
- USDA numbers show steady year over year increase. 9 million.
- 50% or more of beef semen presently goes into dairies.
- No clear increase in beef semen usage in beef business.
- ~ 3 units of semen/dairy cow/pregnancy.

14

Beef breeds used in the beef x dairy model

Angus

- Large Supply
- Marbling Genetics
- High Growth

- Less REA
- High BF
- Large Frame Size

15

Beef breeds used in the beef x dairy model

Charolais

- High REA
- High Growth
- High Retail Yield

- Less Marbling
- Large Frame Size
- Calf Color is Limiting

16

Beef breeds used in the beef x dairy model

Limousin & LimFlex

- High REA
- High Cutability
- Moderate Growth/Size

- Lower Marbling
- Lower Growth
- Particularly Popular for Jersey

17

Beef breeds used in the beef x dairy model

Simmental & SimAngus

- High REA & Cutability
- Moderate Size & Mod/High Growth
- More Marbling than LM or CH

- Have to avoid excessive white mark

18

Semen purchase
What are the producer's expectations

- Get them bred
- Fairly priced relative to the ROI
- Convenient, consistent, reliable quality and service
- Add more profit to the bottom line of the enterprise
- Outperform semen company competitors

19

Reality – we've set the bar way too low.

Most have grown to accept:

- Cheap
- Easy
- Fertility

We can do more!

Dollars, convenience, and fertility are crucial. BUT, shouldn't that be a given??

You are buying semen to breed a cow after all.

Where is the value add?

20

Adding a Profit Center to Dairy Business

- The BeefXDairy calf has become relatively commonplace.
- Too frequently, the beef sire has been a **byproduct** of other enterprises.
- This has resulted in some added value…
- However, also **wide variability in the true profit potential of BD calf**.
- Thus, buyers are still skeptical. This restrains their spend.
- **Data is needed** to provide decision support to ensure most profit focused BeefxDairy cross that is available.
- Need ongoing data feedback to refine and improve the model.

21

Precision Agriculture – *or lack there of*

- Beef on Dairy = "Vague on Vague"
- There is a distinct difference in the "beef" between Holstein & Jersey.
- First, we need to determine what is necessary to fit your cow base.
- Secondly, we have to be honest about what best complements.
- Excessive carcass length is a significant concern in Holsteins.
- Jerseys have greater marbling capacity than Holsteins.
- Calving ease, muscle conformation, dressing percent are problems in both.
- Two different approaches.
- The bulls appropriate in one may not be ideal for the other.

22

Without data-driven tools we aren't deciding

We are **Guessing!**

Let's study the **Beef X Holstein** model…

23

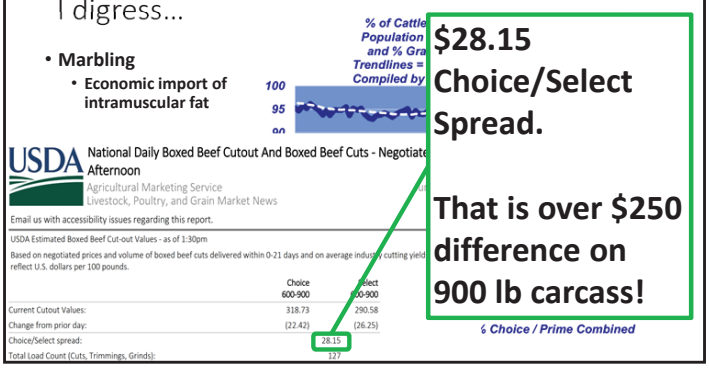
Step 1

- Late 2017/Early 2018
- IGS was asked to assist a group trying to solve the dilemma of identifying the appropriate Beef sire for Holstein operations.
- Group included:
  - Major packer (who provided carcass metrics)
  - Feedlots heavily vested in dairy cattle
  - Dairy Operators
  - Seedstock Producer
  - Various association group personnel
- Agreement that most important phenotypes were: MB, REA, Size/Growth, CE.

24

I digress…

- **Marbling**
  - **Economic import of intramuscular fat**



$28.15 Choice/Select Spread.

That is over $250 difference on 900 lb carcass!

25

I digress…

- Marbling
  - Economic import of intramuscular fat
  - **Jersey vs. Holstein**

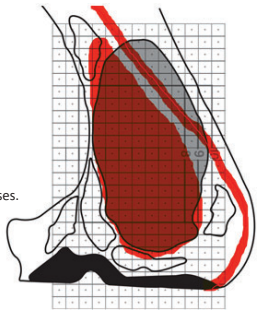
Jersey carcasses have an advantage of 20 degrees of marbling over Holstein carcasses.
Dr. Bob Weaber, KSU
NALF & IGS data

26

I digress…

- Marbling
  - Economic import of intramuscular fat
  - Jersey vs. Holstein
- **REA**
  - **Very Important**
  - **Not so much**

Holstein carcasses have 2/3 of inch advantage over Jersey carcasses.
Dr. Bob Weaber, KSU
NALF & IGS data



27

I digress…

- Marbling
  - Economic import of intramuscular fat
  - Jersey vs. Holstein
- REA
  - Very Important
  - Not so much
- **Size/Growth**
  - **AKA – carcass length. Not traditionally a concern in beef.**
  - **Jersey vs. Holstein. How does this impact or limit cattle feeder?**

The cattle feeder's success/failure and confidence in the product is the key to the success and viability of "Beef on Diary" efforts.

28

I digress…

- Marbling
  - Economic import of intramuscular fat
  - Jersey vs. Holstein
- REA
  - Very Important
  - Not so much
- Size/Growth
  - AKA – carcass length. Not traditionally a concern in beef.
  - Jersey vs. Holstein. How does this impact or limit cattle feeder?
- **CE**
  - **Dystocia**
  - **Production impact**

29

Step 1

- Late 2017/Early 2018
- IGS was asked to assist a group trying to solve the dilemma of identifying the appropriate Beef sire for Holstein operations.
- Group included:
  - Major packer (who provided carcass metrics)
  - Feedlots heavily vested in dairy cattle
  - Dairy Operators
  - Seedstock Producer
  - Various association group personnel
- Agreement that most important phenotypes were: MB, REA, Size/Growth, CE.
- Queried the entire IGS database to provide a view of what breed types fit.

30

And the answer was clear…

31

Step 2

- May 2018
- Massive change to the beef landscape.
- IGS Multi-Breed Genetic Evaluation *powered by BOLT*
- Allowed for better incorporation of genomic knowledge through single-step.
- Maintain (and enhanced) the multi-breed component of IGS.
- Revisited the Beef on Dairy question.
- Same Answer was delivered…

IGS Multi-breed Genetic Evaluation powered by BOLT

32

The Answer

- Searched IGS database (and the second largest beef database) for sires in:
  - Top 25% REA, MARB, CE, Mid level YW & CW
- Results:
- 3.125% were straight British
- 6.25% were straight Continental
- 90.6% were Composite bulls that were a mix of British & Continental

- Of the list of Composite Bulls – 89.7% were SimAngus.
- So roughly 80% of all bulls that populated were SimAngus.

33

Trait	Simmental Rank vs Major Continental Breeds	Angus/Red Angus Rank vs Major British Breeds
Marbling Score	First	Second
Carcass Weight	First	First
Lbs of Retail Product	Second	First
Weight Gain/Feed Efficiency	First	Second
Weaning Weight	Second	First
Post Weaning Gain	Second	Second
Shear Force	First	First

Across-breed EPD Table, GPE Report 22, MARC, USDA

34

So where is the BEEF – with Holstein?

- Clearly Continental based cattle are seen as the growth opportunity in the beef on Holstein sector.
- The data is clear that no singular breed type ideally fills this void.
- The data is also clear that composites are most appropriate.
- On the composite front, SimAngus are the largest group that genetically complement Holstein terminal genetics. But, definitely not the only group.

35

But…

Limitations exist to a threshold approach.
We need something more sophisticated.

36

Indexing is the way to go!

Beef on Holstein Index

Starting with largest population – SimAngus.

37

Starts with the…

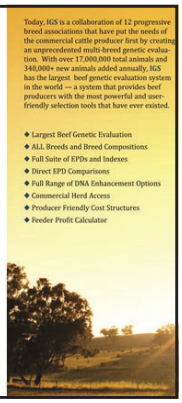
Feeder Profit CALCULATOR™

38

IGS Feeder Profit Calculator *-Highlights*

- Highlights known sires & management approach *(wean & vac)*
- Capitalize on cow herd genetic awareness
- Leverages power of largest database in industry
- USDA MARC & IGS data for breed differences
- Robust science team
- **No cost to producers!** ***HOW?***

IGS International Genetic Solutions



39

The How…

- The SimAngus x Holstein (SAxH) index uses the IGS Feeder Profit Calculator™, the industry leader in feeder cattle evaluation, as the foundation for this effort.
- The results from the FPC are then adjusted for the unique economic situations relevant to Holstein cattle, namely, the need for added calving ease, muscle conformation, grading ability and sensitivity to carcass length.

40

Using the FPC as foundation for the SAxH Index

- All homozygous polled & homozygous black 3/8 to 3/4 SimAngus bulls.
- FPC ran on a Holstein cow base with high health calves.
- Provided a profit prediction from all of those potential matings.
- Then added curvilinear adjustments to the FPC results for:
  - REA
  - Body Length
  - Calving Ease
- Utilized two separate curvilinear approaches.
- Sires had to be within top 1000 for both approaches to be considered.

41

HOLSim AMERICAN BEEF

HOLSim Objectives…

- To provide additional revenue to dairy producers through the production of value-added terminal calves.
- To offer new marketing avenues for progressive beef seedstock operations.
- To offer a consistent supply of high-quality calves better situated to capture market premiums.

AND MORE INDEXING WORK TO COME!

42

Interesting side note…

- Bulls that populate on the HOLSim index (e.g. look more appropriate in a Beef on Holstein model) tend to be high indexing bulls on a Whole Life Cycle index (All Purpose Index).
- Given the homogeneity of the traditional beef business, one could make a very sound argument that high API bulls are what is actually needed by overwhelming percent of beef operations. Along with strengths of responsible crossbreeding and heterosis.
- Semen companies could have the bulls that can "do both". Be a data appropriate match for Holstein genetics and add profit to their British based beef audience.

43

Opportunities associated with BeefXDairy Model

- Consistency of product
- Relatively known and consistent production costs
- Less impacted by land prices than traditional beef model
- Adoption of traceability and data tracking methodologies.
- Ability to choose strictly for terminally minded traits. No concern for maternal merit – clarity of genetic selection.
- R&D feedback loop and novel traits (fertility).

44

Key difference to the SimAngus X Holstein model

It takes advantage of the Premiums and Discounts presently built into the beef business.

Does not require building a complicated Rube Goldberg machine to add profit. It places these carcasses squarely at the center of the beef industry. Not on the periphery!

Simply build better cattle and then retain ownership.

45

Want a better understanding?
Want to maximize your return?

Become a cattle feeder!

46

Courage to consider the new

- The right kind of partners
- Profit-minded genetics
- The right kind of marketing
- The right kind of tools

47

48

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Our commitment to chromium promises to provide you with a high-quality, safe and efficacious product to help your animals reach their optimal performance while boosting your bottom line.

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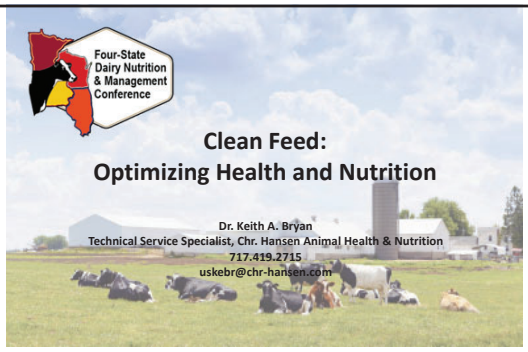
Clean Feed:
Optimizing Health and Nutrition

Dr. Keith A. Bryan
Technical Service Specialist, Chr. Hansen Animal Health & Nutrition
717.419.2715
uskebr@chr-hansen.com



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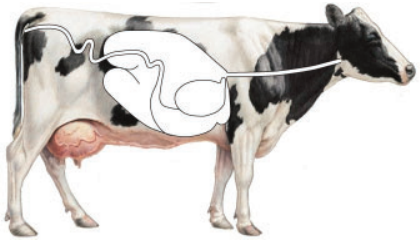
We don't feed the cow…we feed her microbiota!



- Complex symbiotic microbial ecosystem
- Continuous replenishment and perturbation
- Pathogenic & Non-pathogenic organisms within the same *Genus*
- Silage: Inherent vs. Contamination
- Mitigation strategies

2

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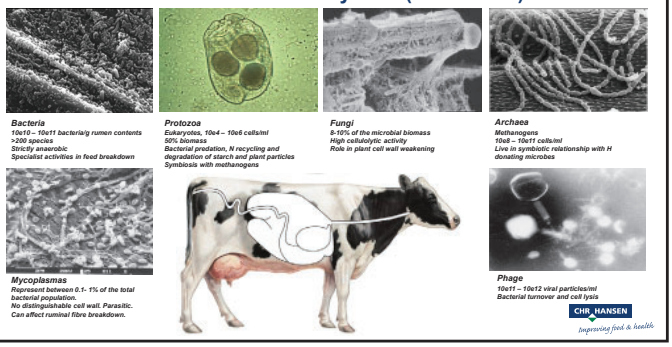
The rumen microbial ecosystem (microbiota)



Bacteria
10x10 – 10x11 bacteria/g rumen contents
>200 species
Strictly anaerobic
Specialist activities in feed breakdown

Protozoa
Eukaryotes, 10e4 – 10e6 cells/ml
50% biomass
Bacterial predation, N recycling and degradation of starch and plant particles
Symbiosis with methanogens

Fungi
8-10% of the microbial biomass
High cellulolytic activity
Role in plant cell wall weakening

Archaea
Methanogens
10e8 – 10e11 cells/ml
Live in symbiotic relationship with H donating microbes

Mycoplasmas
Represent between 0.1- 1% of the total bacterial population.
No distinguishable cell wall. Parasitic.
Can affect ruminal fibre breakdown.

Phage
10x11 – 10x12 viral particles/ml
Bacterial turnover and cell lysis

3

4

Typical Epiphytic Populations on Plants Prior to Ensiling

Group	Population (cfu/g)	Population (log cfu/g)
Total aerobic bacteria	> 10,000,000	> 7
Lactic acid bacteria	10 - 1,000,000	1 - 6
Enterobacteria	1,000 – 1,000,000	3 - 6
Yeast & yeast-like fungi	1,000 – 100,000	3 - 5
Molds	1,000 – 10,000	3 – 4
Clostridia (spores)	100 – 1,000	2 – 3
Bacilli (spores)	100 – 1,000	2 – 3
Acetic acid bacteria	100 – 1,000	2 – 3
Propionic acid bacteria	10 – 100	1 - 2

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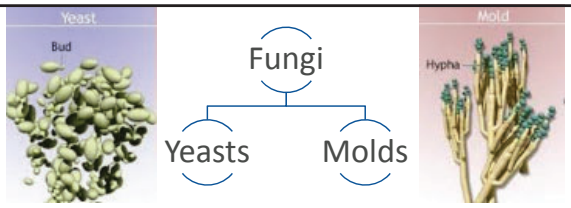

Single cell

Multicellular filaments (hyphae)

Desirable	Undesirable
Saccharomyces cerevisiae	*Candida albicans*
Pichia jadinii	*Candida tropicalis*

Desirable	Undesirable
Aspergillus oryzae	*Aspergillus flavus*
Aspergillus niger	*Aspergillus fumigatus*

6

6

Molds and mycotoxins of concern

Pre and post-harvest | Post-harvest



Fusarium
Deoxynivalenol (DON)
Nivalenol
T-2 toxin
HT-2
Fumonisin B1, B2, B3
Zearalenone (ZEA)

Aspergillus
Aflatoxin B1, B2, G1, G2
Ochratoxin A
Patulin

Penicillium
Ochratoxin A
Citrinin
Cyclopiazonic acid
Patulin
Roquefortine C
Mycophenolic acid

7

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Listeria monocytogenes

- Facultative anaerobe, Gram +
  - Soil
  - Silage
  - Surface water
  - Vegetation
  - Feces (human and animal)
- Severe systemic infections (Listeriosis)
- Prevalence:
  - Oxygen, high pH
    - Poor compaction
    - Air ingress
    - Relatively high pH
- Human health concern

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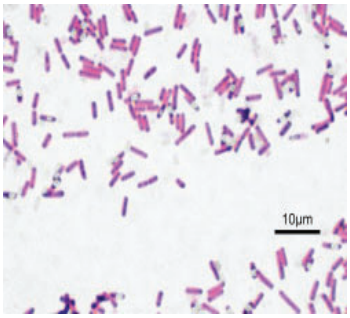
Bacillus spp.

- Aerobic (facultative anaerobe), spore-formers
  - Soil
  - Silage (soil contamination)
  - Other feeds
  - Bedding material
- Bacilli:
  - *B. subtilis, B. licheniformis, B. pumilus, B. coagulans, B. sphaericus, B. cereus*
- Prevalence:
  - Oxygen, high pH
    - Poor compaction
    - Air ingress
    - Relatively high pH (>4.6)
- Human health concern (food-borne pathogen)



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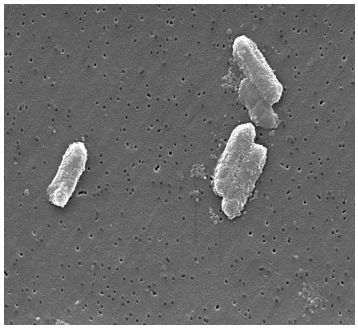
Enterobacteriaceae (*E. coli*)

- Facultative anaerobe, Gram -
  - Ubiquitous
- Silage
  - Epiphytic microflora of crops
- Varying degrees of pathogenicity
  - Commensal
  - STEC: *E. coli* O157:H7
    - Other serogroups: O26, O103, O111 & O145
- Prevalence:
  - Oxygen, high pH
    - Poor compaction
    - Air ingress
    - Relatively high pH (>5.0)
- Human health concern (food-borne pathogen)



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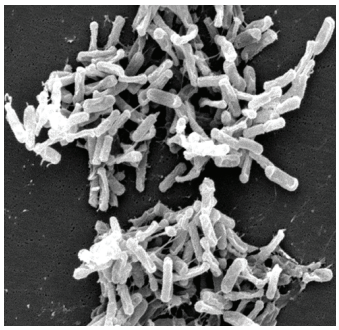
Clostridium

- Obligate anaerobe, Gram +, spore-formers
  - Ubiquitous
  - Soil
  - Silage
  - Feces (animal)
- Clostridium:
  - *C. butyricum, C. tyrobutyricum, C. beijerinckii, C. sporogenes, C. botulinum, C. tetani, C. difficile, C. perfringens*
- Prevalence:
  - Wet, high pH
    - High moisture (>65%)
    - High water activity (0.952-0.971)
    - Relatively high pH (>4.5)
- Human health concern (food-borne pathogen)



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Pathogen Load in Silage: Inherent vs. Contamination

- Human health concern (food-borne pathogens)
- Found in soil, silage, feces and bedding material
- Prevalence in silage: Oxygen & High pH
- Some spoilage microorganisms are pathogenic, some are not!
  - Contamination:
    - Soil
    - Fecal

- **"Hygiene" – silage, feed → TMR**


12

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Mitigation Strategies

- Proper silage making and feed-out practices:
- **Compaction**
  - Min. AF or bulk density: 48-50 lbs./ft^3
  - Min. DM density: 17 lbs./ft^3
  - Align packing tractor weight and forage delivery rate
- **Inoculant**
  - Science-based, research-proven inoculant
  - Drives pH below 4.5 within 3 days of ensiling
  - Maximizes aerobic stability at feed-out
- **Minimize air ingress at feed-out**
  - Leading edge of top-layer/face
  - Smooth face (rake or rotary de-facer)

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Compaction (Packing)

- Match delivery rate to packing tractor weight to exceed **'the rule of 800'.** (Packing tractor weight = 800 * tons of forage delivered/hour).
- Thin layers (**~4" thick**) spread and packed in a progressive wedge configuration will facilitate achievement of higher density bunkers and piles.
- For bunker silos, **alternate dumping**, push-up and packing from left side-to-right side and vice-versa for uniform layer thickness, optimal packing weight and time, and overall efficiency.
- Also, alternate dumping, push-up and packing will reduce the likelihood of 'crowned' or 'cupped' filling and the resulting variations in DM density across the face of the bunker. **The ideal packing tractor speed is 1.5-2.5 mph.** Do not turn around on the pile. Make sure one set of wheels comes off the pile when changing direction in order to minimize loss of traction.

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Compaction (Packing)

- In order to store more feed in the same area (volume) of storage, increase DM packing density! **Increasing DM packing density from 16 to 18 lbs. DM/cu. ft. increases storage capacity by 12.5%.** If you routinely store 6,000 tons of DM, you could now store 6,750 tons of DM in the same area, or an additional 2,140 tons as fed at 35% DM.
- **Packing is complete when every square foot of top layer has tire tracks; having been run-over twice, and is smooth!** There is no advantage to more than 30 minutes of packing after the final load has been spread.
- ***Bottom line: The most skilled tractor operator should be in the 'push' tractor. The people operating the 'push' and 'pack' tractors could be the most valuable (and often most overlooked) team members in the entire process! Oxygen is the enemy!***

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Density & Porosity

SILAGE COMPACTION: Seeing Is Believing

	Units	Actual	Example	Targets
Plunger depth	ml	60.0	30.0	
Corn silage, fresh weight	g	30.0	35.0	
Bulk Density	lbs. AF/cu ft.	31.2		> 47.5
Dry Matter	%	0.35	0.35	30 - 45
Dry Matter Density	lbs. DM/cu ft.		10.9	> 17
Maximum Achieveable Bulk Density	lbs. AF/cu ft.	73.3		
Bulk Density, % Max.	%		42.6%	> 65
Gas Filled Porosity	%	57.4		< 35
Solid, %		14.9%		
Liquid, %		27.7%		
Gas, %		57.4%		

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Density & Porosity

SILAGE COMPACTION: Seeing Is Believing

	Units	Actual	Example	Targets
Plunger depth	ml	30.0	30.0	
Corn silage, fresh weight	g	30.0	35.0	
Bulk Density	lbs. AF/cu ft.	62.4		> 47.5
Dry Matter	%	0.35	0.35	30 - 45
Dry Matter Density	lbs. DM/cu ft.		21.8	> 17
Maximum Achieveable Bulk Density	lbs. AF/cu ft.	73.3		
Bulk Density, % Max.	%		85.1%	> 65
Gas Filled Porosity	%	14.9		< 35
Solid, %		29.8%		
Liquid, %		55.3%		
Gas, %		14.9%		

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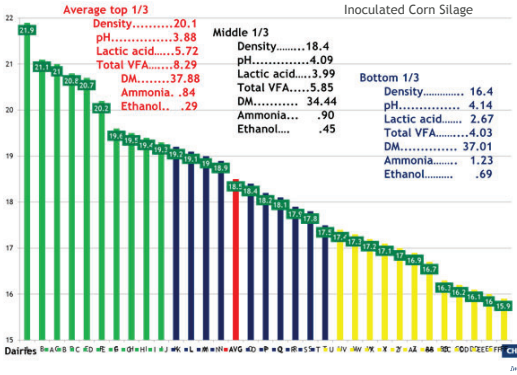

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Inoculant

- Patented inoculant strain to mitigate pathogenic organisms.
- Lactococcus lactis NCIMB 30117 (SR3.54) with patent number 511828 that was submitted on 26 September 1997 and approved on 6 December 1999.
- Swedish patent. The patent states that the identified Lactococcus lactis subsp. lactis strongly reduces development and growth of gram + bacteria, eg. *Listeria monocytogenes, Staphylococcus aureus, Clostridium tyrobutyricum, Bacillus cereus* and other lactic acid bacteria. Certain Gram - bacteria are weakly inhibited, eg. *Pseudomonas aeruginosa.*
- The following patent claim is made:
  - Lactococcus lactis NCIMB 30117 reduces development of yeast and clostridia and Gram + bacteria and certain Gram – bacteria.

19

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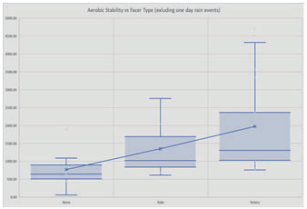
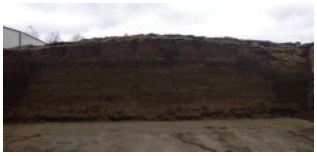
Minimize Air Ingress at Feed-out

- Leading edge of top-layer/face
- Smooth face (rake or rotary de-facer)





20

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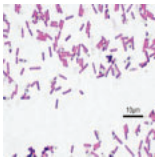
Listeria monocytogenes

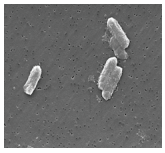
Bacillus spp.

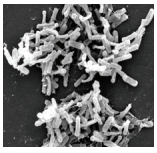
Enterobacteriaceae (*E. coli*)

Clostridium

- **Prevalence:**
  - **Oxygen, High pH**
  - **Human health concern**







21

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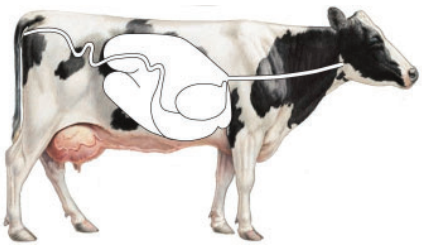
22

We don't feed the cow…we feed her microbiota!



- Complex symbiotic microbial ecosystem
- Continuous replenishment and perturbation
- Pathogenic & Non-pathogenic organisms within the same *Genus*
- Silage: Inherent vs. Contamination
- Mitigation strategies

HYGIENE MATTERS! Feed her microbiota CLEAN FEED!

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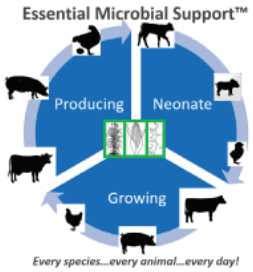
Healthy rumen…healthy lower gut…healthy cow…more productive!

- ***Dysbiosis*** is the abnormal prevalence of specific microorganisms in the GI tract leading to sub-optimal health and productivity of individuals within a herd or flock
- ***Dysbiosis*** can result from:
  - Nutritional imbalances
  - Pathogen ingestion
  - Sub-optimal fermentation of stored forage
  - Diet changes
  - Stress (environmental, social, etc.)
- Science-based, research-proven silage inoculants and probiotics when fed daily and provide **Essential Microbial Support** to stabilize normal GI, digestive and immunological function; re-establishing and maintaining normal health, consistency and optimal productivity



24

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Feed hygiene is a threat to optimal cow health and sustainable performance

25

25

RRL TMR Nutrient Analysis

TMR Nutrient Analysis	Your TMR, % of DM	Avg TMR,
Crude Protein (CP)	17.1%	16.1%
aNDF	32.3%	32.6%
Fat (EE)	5.6%	3.8%
Starch	20.6%	24.8%
Organic Matter (OM)	92.1%	92.0%
uNDF120	14.3%	
Non-Starch NFC	16.6%	14.8%

26

26

RRL TMR-D *in vivo* Analysis

TMR-D in vivo results	Your TMR % Digested	Benchmarks (Prior 4 Year Data) Avg	Goal - 85th Percentile	15th Percentile
OM-D	62.1%	60.3%	71.8%	48.9%
NDF-D (% NDF)	51.7%	37.2%	52.0%	22.3%
NDF-D (% pdNDF)	92.8%	66.2%	87.9%	45.0%
Starch-D	92.7%	95.3%	99.0%	89.7%
CP-D	58.5%	57.2%	71.1%	43.4%
Fat (EE)-D	75.0%	62.0%	79.2%	44.7%
Lb Dig OM	32.2lb	31.3lb	37.2lb	25.4lb

27

27

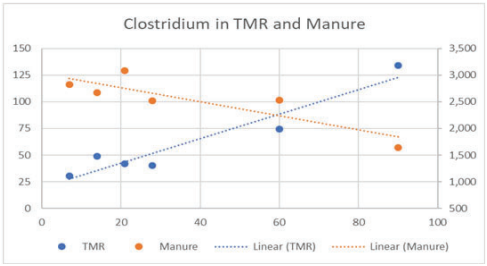
RRL TMR Anti-Nutrients Analysis (Hygiene)

Anti-Nutrients	
Mold	200,000
Yeast	13,600,000
Vomitoxin, ppm	2.46
Aflatoxin, ppb	
Zearalenone, ppb	
Fumonisin, ppm	
T-2, ppb	
Ochratoxin-A, ppb	
Clostridium perfringens	590
Enterobacteria	180,000

28

28

Composite Hygiene: *C. perfringens*



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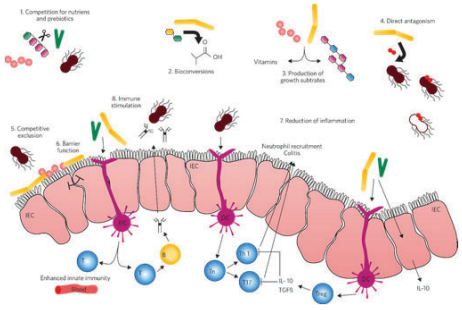
29

Known Modes of Action of Probiotics



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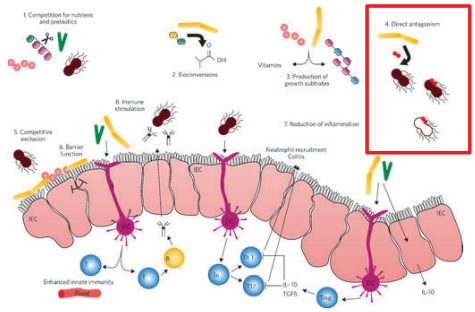
Known Modes of Action of Probiotics



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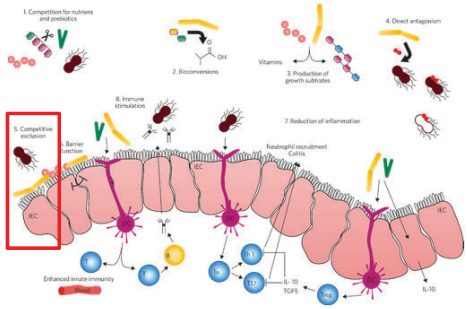
Known Modes of Action of Probiotics



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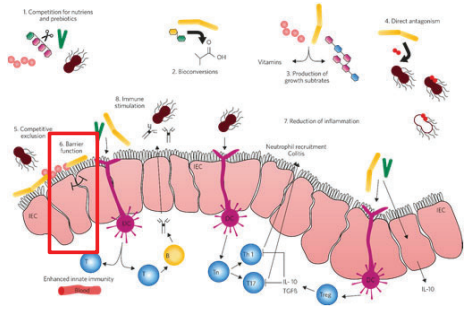
Known Modes of Action of Probiotics



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Water sample report

SAMPLE DESCRIPTION:

Source: **Pen #22 Stock Tank**

RESULTS: *(< 1.1 = minimum detection limit)*

Total Coliform:	**>23.0**	per 100 mL
Fecal Coliform	**>23.0**	per 100 mL
Non Coliform:	**>23.0**	per 100 mL

BACTERIA ISOLATED: *(< 1.1 = minimum detection limit)*

E. coli:	**>23.0**	per 100 mL
Klebsiella spp.:	**<1.1**	per 100 mL
Serratia spp.:	**<1.1**	per 100 mL
Pseudomonas aeruginosa:	**>23.0**	per 100 mL
Pseudomonas spp:	**<1.1**	per 100 mL
Bacillus spp:	**<1.1**	per 100 mL

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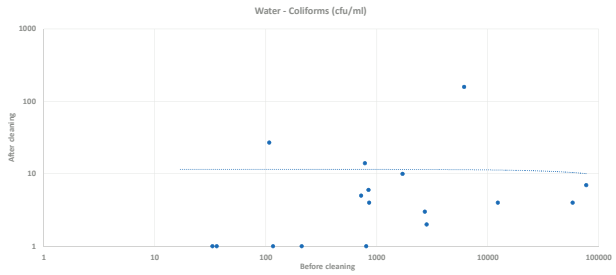
Water (hygiene) – The forgotten nutrient



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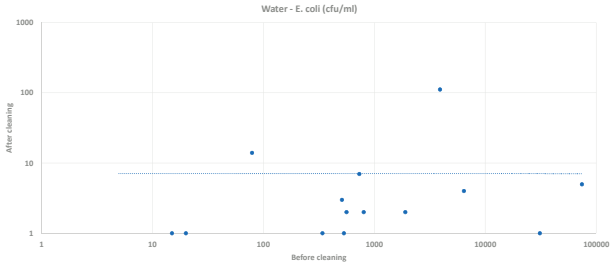
Water (hygiene) – The forgotten nutrient



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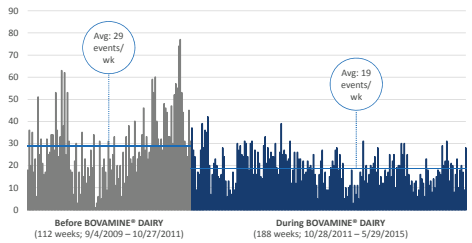
Number of weekly health events* at a 1,400 cow dairy

Field data collected over 6 years from a large dairy



* Includes deaths, metritis, pneumonia, and other miscellaneous non-metabolic illnesses

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Cow # 6987	Cow # 8433
300 d 52,340 M	305 d 50,630 M
3.32% F 1,737 F	3.72% F 1,884 F
2.81% P 1,471 P	3.11% P 1,575 P
174 lbs./day	166 lbs./day
5.79 lbs. F/day	6.18 lbs. F/day
4.90 lbs. P/day	5.16 lbs. P/day
174/10.6 lbs. daily	166/11.34 lbs. daily

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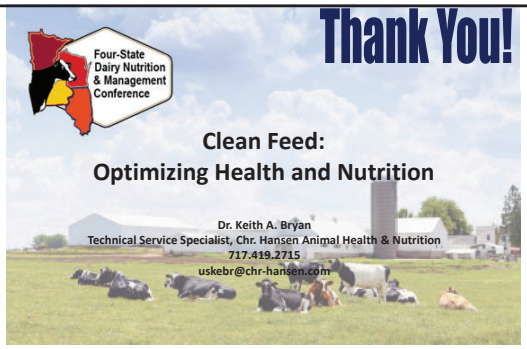

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39

Four-State Dairy Nutrition & Management Conference

Lessons Learned from 2019 Growing Season

Dr. Mike Hutjens, University of Illinois

Dr. Steve Woodford, Nutrition Professionals, Inc.

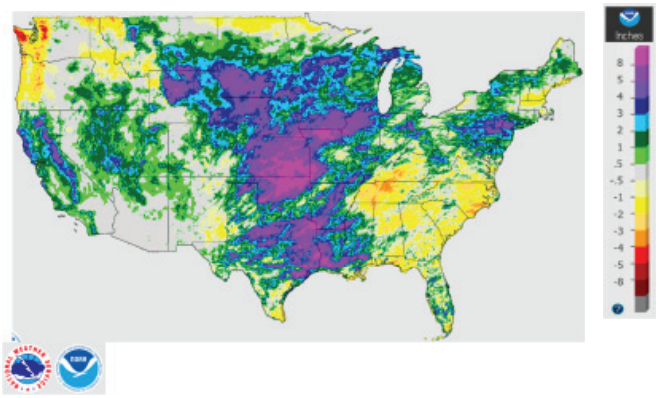
1

A Look At The 2019 Growing Year

- Cold winter killing alfalfa and wheat in some areas
- Wet spring delaying harvesting 1st cutting and planting corn
- Flooded areas
- Large increase in Prevented Plant Acreage (PPA)
- Harvest of (PPA) after Sept 1st including high seeding rate of corn for corn silage
- Variable quality and quantity year
- Early killing frost and snow cover

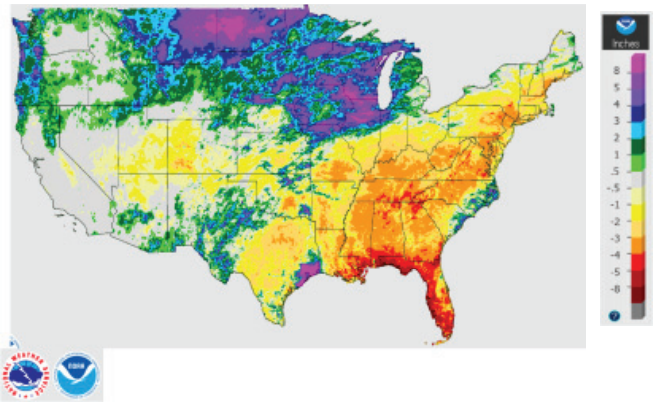
2

Monthly Departure Precipitation: May 1, 2019



3

Monthly Departure Precipitation: September 1, 2019



4

Prevented Plant—19 million acres

- Outlook for 2020 is wet winter and spring
- Limited field work in 2019
- 38.8 million acres of winter wheat (2nd lower acreage)
- Deep ruts and field damage from 2019 harvest
- Flooded acreage may take years to recover

5

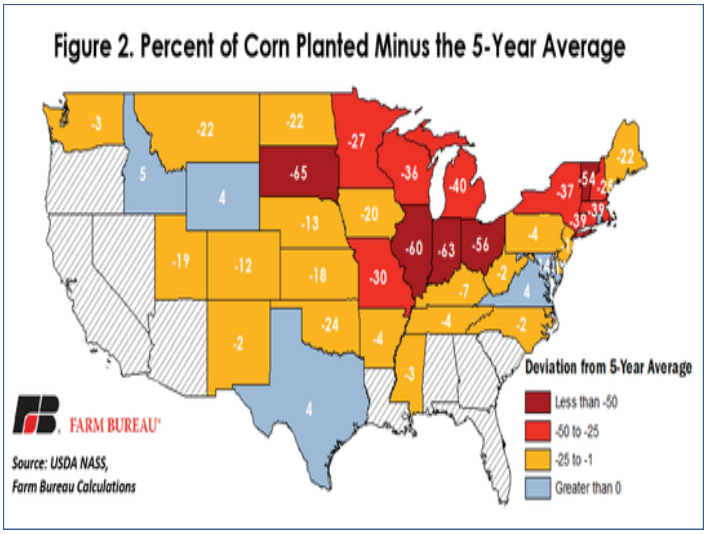
What Happened On Dairy Farms in NE Wisconsin?

6

What Happened On Dairy Farms In NE Wisconsin?

- Above average alfalfa winter kill over 17-18 and 18-19 winters.
- Consequently forage inventories tight.
- An extremely wet spring with alfalfa replanting and corn planting severely delayed.
- By mid June many farms turned to alternative forages like sudan and sorghum and eventually seed was unavailable.
- Very little winter wheat planted fall of 2018.

7



8

- Majority of alfalfa made late, around mid June resulting in lower quality.
- Sorghum-sudan a favored option on prevent plant acres, ended up not yielding well due to cool, wetter year.
- Due to wet fall corn silage was immature, so lower starch, but also made drier than ideal, some was frozen when chopped.
- Very little 4th crop made due to rain, significantly hurting haylage inventories.

9

What Recommendations Were Made And Suggested?

10

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- As we approached fall it was clear forage inventories would be down
- Suggested looking to contract best value forage-fiber replacements.
- Cottonseed, corn gluten feed, soy hulls, and beet pulp.
- Dry hay generally the higher priced option.

11

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12

What Did Clients Do To Feed Herds In 2019/2020?

13

What Did Clients Do To Feed Herds In 2019-2020?

- First priority was to make sure enough forage-fiber was available.
- Somewhat unprecedented to have low energy fiber such as straw and grass hay more expensive that high energy fiber.
- Oat hulls, rice hulls, cotton gin trash, and sawdust were considered.

14

- It was clear corn silage would be lower starch and lower energy.
- We tried alternative starch sources such as ground wheat, corn starch, and molasses.

15

What Is The Situation Going Into The 2020/2021 Production Year?

16

What Is The Situation Going Into 2020 Production Year?

- In Eastern WI most crops planted by mid-May which is much earlier than average.
- Forage supplies still very tight
- Significant alfalfa winter kill again.
- Many looking at other options on that alfalfa ground including small grains and forage cocktails.
- Opportunity to lock in cheap corn long term.

17

What Long Term Lessons Were Learned?

18

What Long Term Lessons Were Learned?

- Many looking at alfalfa economics given the winter kill we are continually seeing.
- Producers are seeing cows perform fine with a high percentage of by-product fiber, even with shorter ration particle size.
- If current price trends continue, it is more profitable to grow your lower quality forage and buy higher energy fiber.

19

- Really important for good communications between nutritionist and agronomist.
- Cost to buy options versus cost to grow.
- The last 12 months demonstrated the need to source and contract supplies early.
- Covid-19 situation exposed weakness in supply chain.

20

21

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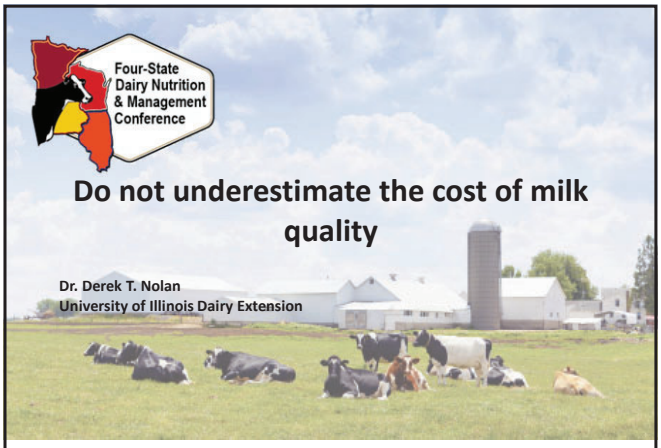
Four-State Dairy Nutrition & Management Conference

Do Not Underestimate the Cost of Milk Quality

Dr. Derek T. Nolan

University of Illinois Dairy Extension



Do not underestimate the cost of milk quality

Dr. Derek T. Nolan
University of Illinois Dairy Extension

1

The cost of mastitis

- Well known that mastitis is most costly disease in the dairy industry
- Often see estimates of mastitis costs of $150 to $400 per case

$2 Billion to US dairy industry

2

Underestimated

- $2 Billion only considers the cost of mastitis cases
- Incidence rate of mastitis * the estimate of cost of case of mastitis

> $2 Billion to US dairy industry

3

Total mastitis cost

- Cost associated with disease can be explained with simple equation

$$C = L + E$$

  - C = Total cost
  - L = Losses – benefits taken away (milk production, premiums)
  - E = Expenses – resources used to manage a disease (management, labor)

McInerney et al. (1992)

4

Total mastitis cost

- Losses – Failure costs
  - Direct costs:
    - Cost of treatment
    - Discarded milk
    - Cost of culling the cow
  - Hidden costs:
    - Lost milk production
    - Lost reproductive efficiency

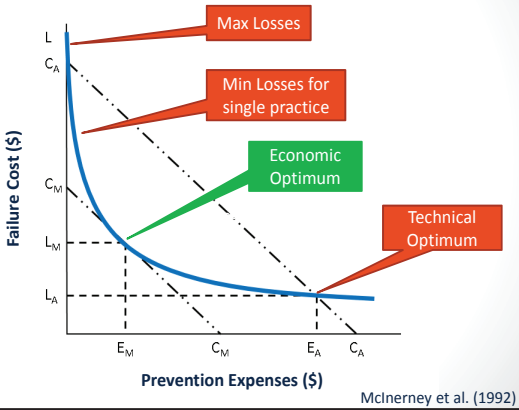
5

Total mastitis cost

- Expenses – Preventative Costs
  - Management practices
    - Proper milking procedures
    - Gloves
    - Milking equipment function
    - Cow environment management
    - Vaccination
  - Labor

6

Loss-Expenditure Frontier



McInerney et al. (1992)

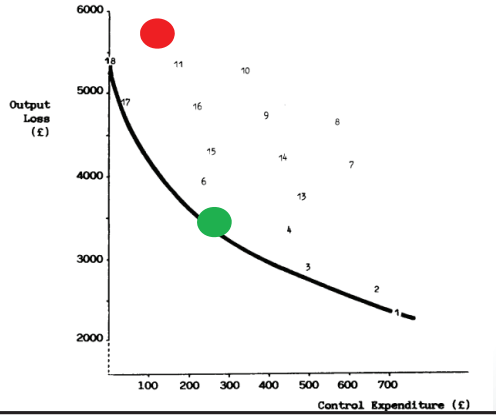
7

McInerney et al. (1992)

- Three different scenarios for subclinical mastitis
  - Teat disinfect – all year long
  - Dry cow treat – every cow at dry off
  - Milk equipment tests – annually

8

McInerney et al. (1992)



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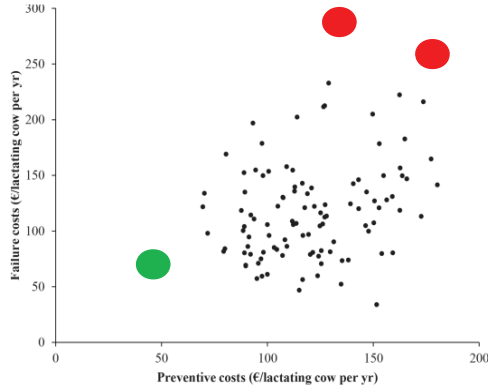
van Soest et al. (2016)



10

Use of loss-expenditure frontier

- Educate on disease and management practice costs
- Determine if management practices pay off
- Help dairy farmers make more informed decisions

11

Cost of SCC Management

- Base Model:
  - Dairy Herd
  - Data collected from Dairy Records Management Systems
  - Cost of SCC and benefits from management practices
- Stochastic Simulation
  - 1,000 iterations
  - Look at different scenarios
  - Account for variation

12

Base Model

Variable	Input
Herd Size	205
Rolling herd average (lbs)	22,740
Somatic cell count (# cells/mL)	251,000
Percent of herd in 1st lactation	36.1%
Percent of herd in 2nd lactation	26.0%
Percent of herd in 3rd lactation	17.7%
Percent of herd in 4th lactation	11.0%
Percent of herd in 5th lactation	5.8%
Percent of herd in 6th (or greater) lactation	3.4%

13

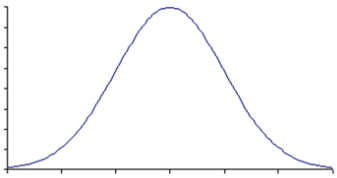
Base Model

- Determine costs of SCC management for herds with differing SCC
  - Farm A – 109,000 cells/mL
  - Farm B – 251,000 cells/mL
  - Farm C – 393,000 cells/mL
    - Based on one standard deviation from average

14

Stochastic Simulation

- Static variables : use single value in model – herd size
- Stochastic variable: want to account for variation



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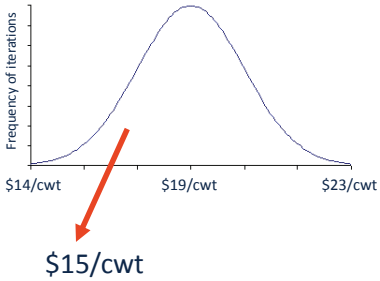
Milk price



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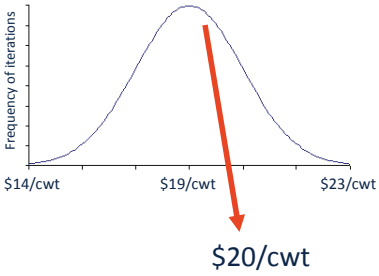
Milk price



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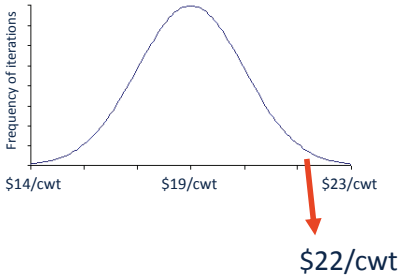
Milk price



18

Cost of SCC

- For each herd the current cost of SCC was calculated
  - Milk loss
  - Lost of premiums

19

Milk Loss

SCC Threshold (SCC*1,000 cells/mL)		Milk loss (lbs/yr) by lactation		
Lower SCC	Upper SCC	1	2	3+
100	200	363	765	838
200	300	431	818	930
300	400	556	976	1,106

20

Premiums

Premium Level SCC (cells/mL)	
< 100,000	
100,000 to 200,000	Farm A
200,000 to 300,000	Farm B
300,000 to 400,000	Farm C

All farms lost $0.25/cwt due to SCC

21

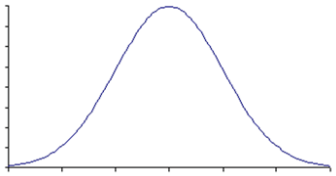
Cost of SCC

- Expenses
  - Management practices : $0.37 to $58.40/cow/yr
  - Teat dips to vaccinations or feed additives

22

Stochastic Variables

- Milk price
- Change in herd SCC
- Cost of management practice



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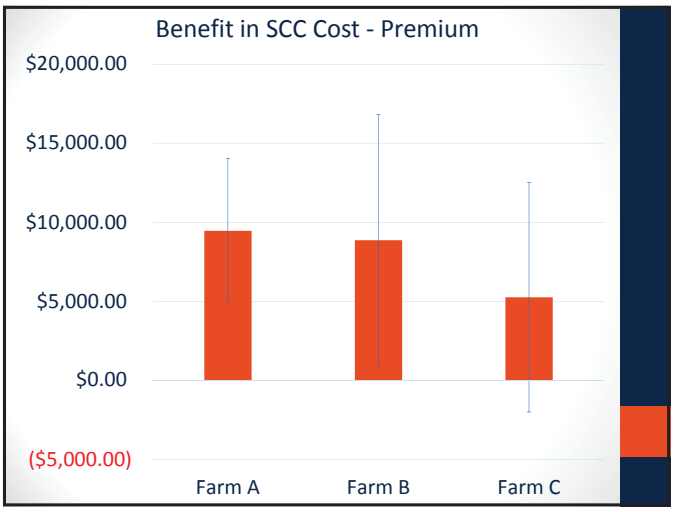
Data Analyzed

- Total cost of original SCC (losses)
- Benefits – costs of management practice adoption
- Total cost of new SCC
- Change in cost of SCC after adoption of management practices

24



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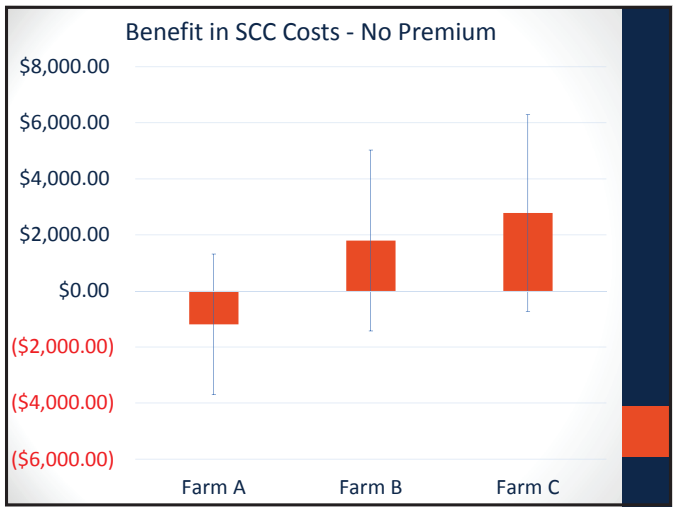

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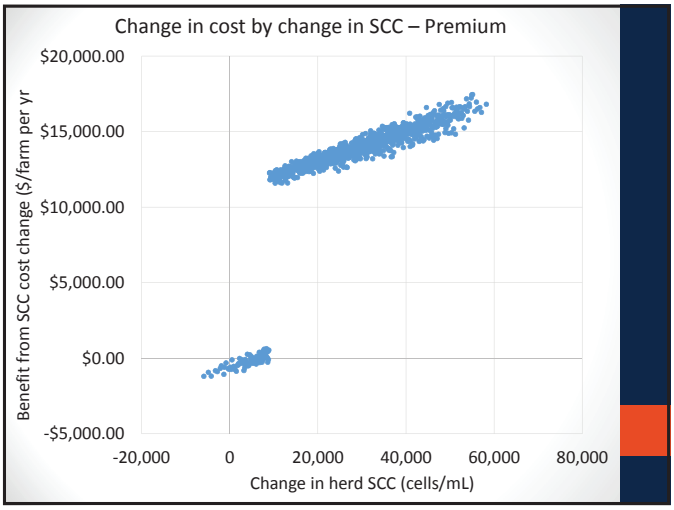

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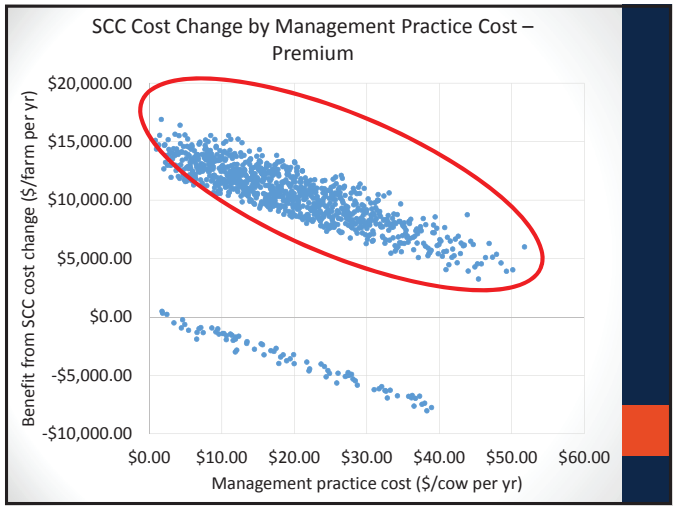

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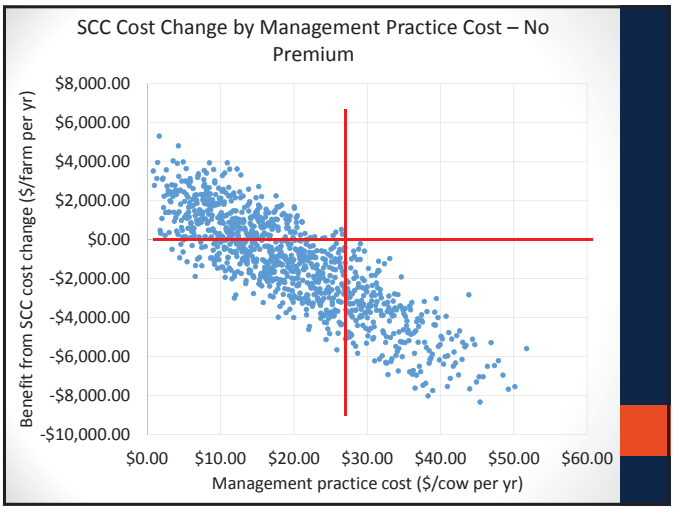

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Discussion

- Low cost management decisions are the least risky for all producers
- High cost management practices may not be recommended for low SCC herds
- All results highly dependent on original SCC and premium structure
- Current results only account for milk value – do not consider reproductive benefits

30

Take Home Messages

~~$2 Billion to US dairy industry~~

31

Take Home Messages

- Loss-expenditure frontier useful tool to help make decisions
- Help understand failure and preventative costs to aid decision making
- Just because one goes up does not mean the other will go down (van Soest et al., 2016)
- Use premium as investment for milk quality
- Keep up to date with records

32

Thank you

Dairy Extension

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Dairy Focus Lab

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University of Illinois
Department of Animal Sciences
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33

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Four-State Dairy Nutrition & Management Conference

Effect of Timing of Induction of Ovulation Relative to Timed AI Using Sexed Semen on Pregnancy Outcomes in Primiparous Holstein Cows

Megan R. Lauber and Paul M. Fricke
Department of Dairy Science
University of Wisconsin – Madison

Four-State Dairy Nutrition & Management Conference

Effect of timing of induction of ovulation relative to Timed AI using sexed semen on pregnancy outcomes in primiparous Holstein cows

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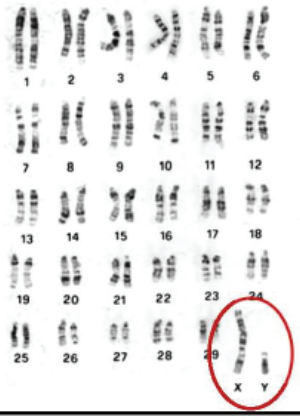
1

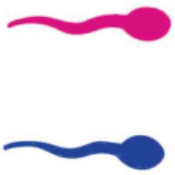
Outline

- Introduction to sexed semen
- Timing of insemination relative to increased activity associated with estrus
- Timing of induction of ovulation relative to synchronization of ovulation
- Questions

2

Sperm Differences



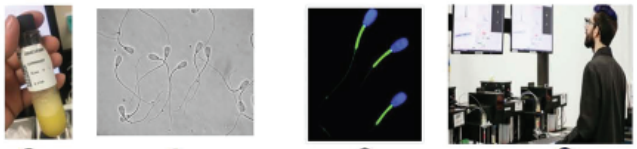


X- bearing bovine sperm have 4% more DNA content than Y-bearing bovine sperm

Garner et al., 1983; Garner et al., 2006; Seidel et al., 2014

3

Sexed Semen Processing



Ejaculates collected and examined

Quality Control
1. Motility
2. Concentration
3. Morphology

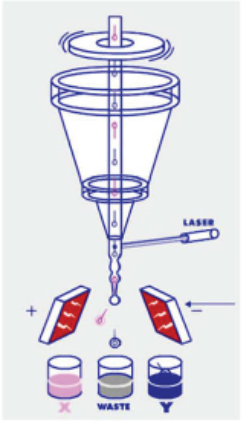
Pool ejaculates and stain with fluorochrome Hoechst 33342 that binds to minor groove of DNA

Stained ejaculates aliquoted and begin sexing process

4

Sex Sorting

ST Genetics



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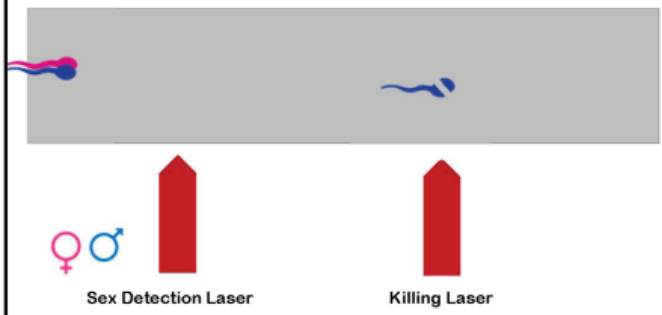
Selective Killing

Sexcel Sexed Genetics



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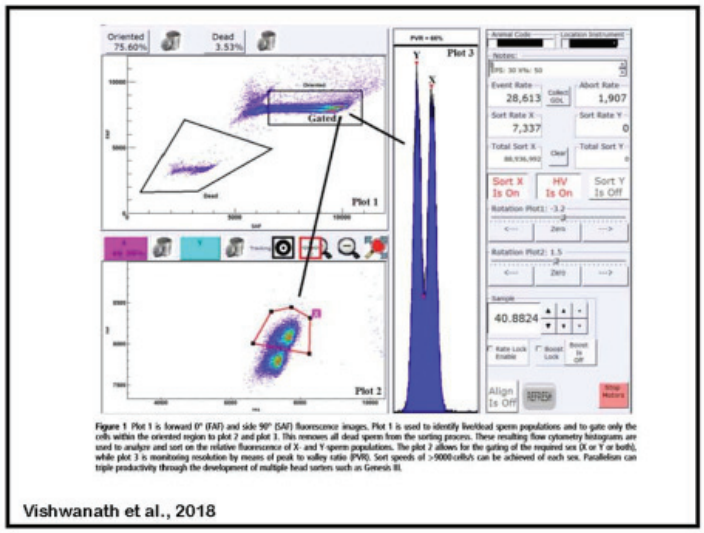
Vishwanath et al., 2018

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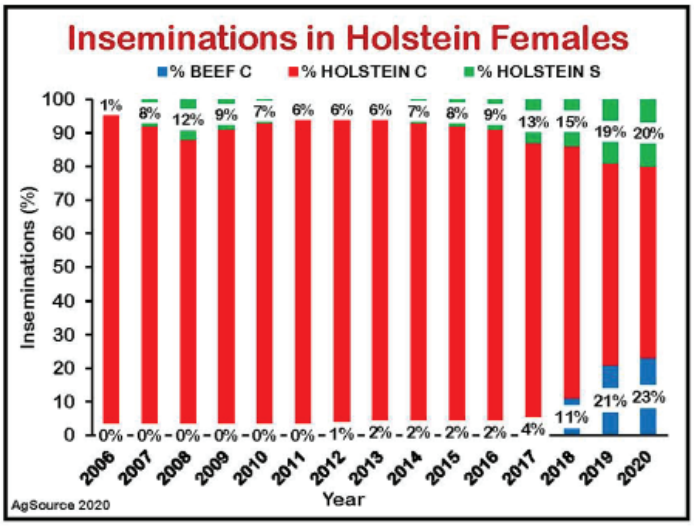
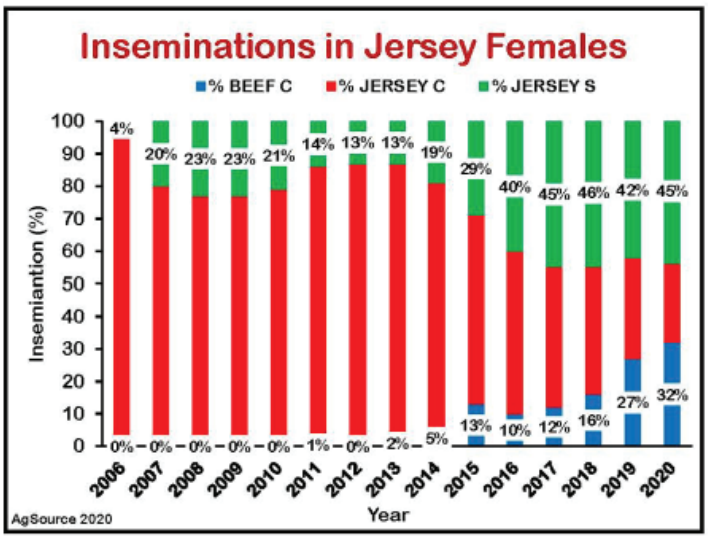
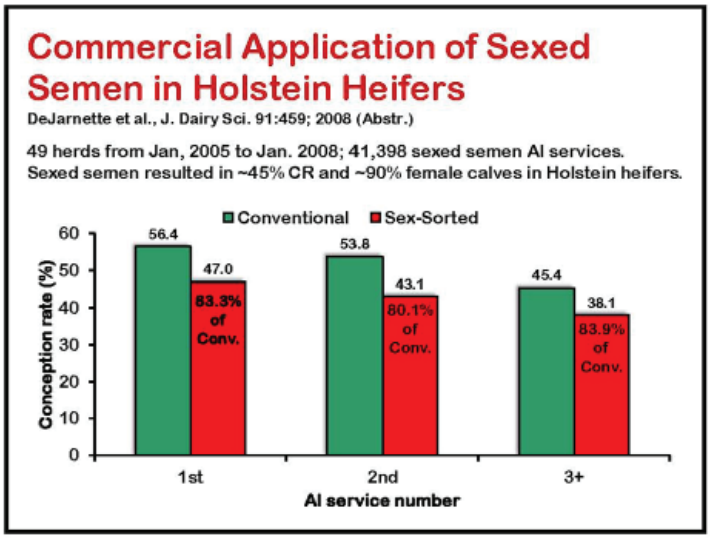

Inseminations in Holstein Females
% BEEF C
% HOLSTEIN C
% HOLSTEIN S
Inseminations (%)
Year
AgSource 2020

8


Inseminations in Jersey Females
% BEEF C
% JERSEY C
% JERSEY S
Insemiantion (%)
Year
AgSource 2020

9


Commercial Application of Sexed Semen in Holstein Heifers
DeJarnette et al., J. Dairy Sci. 91:459; 2008 (Abstr.)
49 herds from Jan, 2005 to Jan. 2008; 41,398 sexed semen AI services.
Sexed semen resulted in ~45% CR and ~90% female calves in Holstein heifers.
Conventional
Sex-Sorted
Conception rate (%)
83.3% of Conv.
80.1% of Conv.
83.9% of Conv.
1st
2nd
3+
AI service number

10


Theriogenology
journal homepage: www.theriojournal.com
Time of insemination relative to reaching activity threshold is associated with pregnancy risk when using sex-sorted semen for lactating Jersey cows
Gabriel D. Bombardelli, Henrique F. Soares, Ricardo C. Chebel
Journal of Dairy & Veterinary Sciences
Research Article
Time of Insemination Relative to onset of Activity Threshold of Cow Manager ® is Associated with Pregnancy Risk When Using Gender Selected ™ Semen for Jersey Cattle
Ray Nebel*
Inseminating later relative to the onset of activity yielded increased fertility with sexed semen

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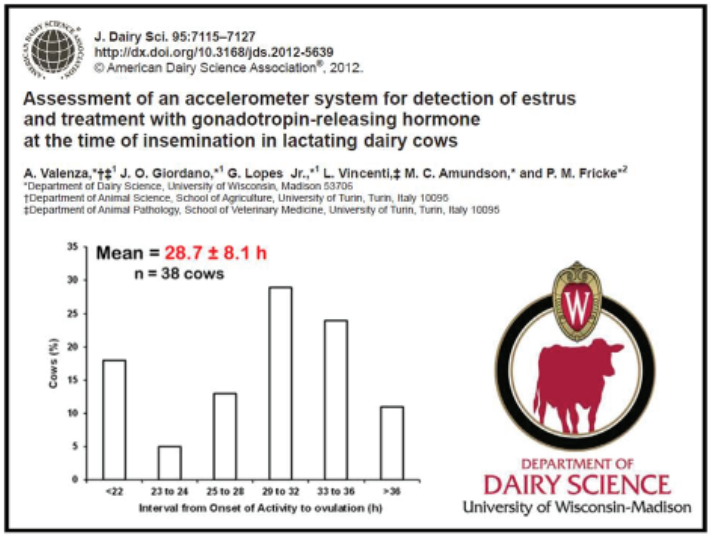

J. Dairy Sci. 95:7115–7127
http://dx.doi.org/10.3168/jds.2012-5639
© American Dairy Science Association®, 2012.
Assessment of an accelerometer system for detection of estrus and treatment with gonadotropin-releasing hormone at the time of insemination in lactating dairy cows
A. Valenza,*†‡ J. O. Giordano,*¹ G. Lopes Jr.,*¹ L. Vincenti,‡ M. C. Amundson,* and P. M. Fricke*²
Mean = 28.7 ± 8.1 h
n = 38 cows
Cows (%)
Interval from Onset of Activity to ovulation (h)
DEPARTMENT OF DAIRY SCIENCE
University of Wisconsin-Madison

12

New Idea

Inseminating later relative to the onset of activity or estrus will lead to increased fertility with sexed semen

- May be the case when inseminating cows based on estrus or increased activity
- This idea has not been tested in a synchronized breeding protocol in which timing of ovulation is precisely controlled

13

Effect of timing of induction of ovulation relative to timed artificial insemination using sexed semen on pregnancy outcomes in primiparous Holstein cows

Sexcel

Megan Lauber

Graduate Research Assistant
Fricke Lab

DEPARTMENT OF
DAIRY SCIENCE
University of Wisconsin-Madison

14

Hypothesis

Induction of ovulation (G2) earlier relative to TAI in a Double-Ovsynch protocol will result in more P/AI

15

Standard Double-Ovsynch Protocol

G2 to TAI = 16 h

Sun	Mon	Tue	Wed	Thu	Fri	Sat
					GnRH a.m.	
					$PGF_{2\alpha}$ a.m.	
	GnRH a.m.					
	GnRH a.m.		G2-16			
	$PGF_{2\alpha}$ a.m.	$PGF_{2\alpha}$ a.m.	G2 p.m.	TAI a.m.		

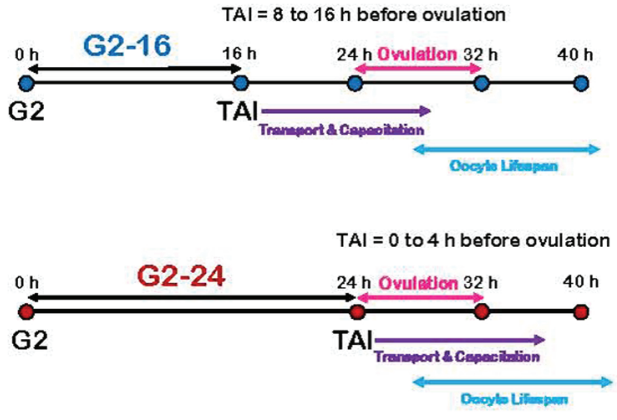
16

Modified Double-Ovsynch Protocol

G2 to TAI = 24 h

Sun	Mon	Tue	Wed	Thu	Fri	Sat
					GnRH a.m.	
					$PGF_{2\alpha}$ a.m.	
	GnRH a.m.					
	GnRH a.m.		G2-24			
	$PGF_{2\alpha}$ a.m.	$PGF_{2\alpha}$ a.m.	G2 a.m.	TAI a.m.		

17



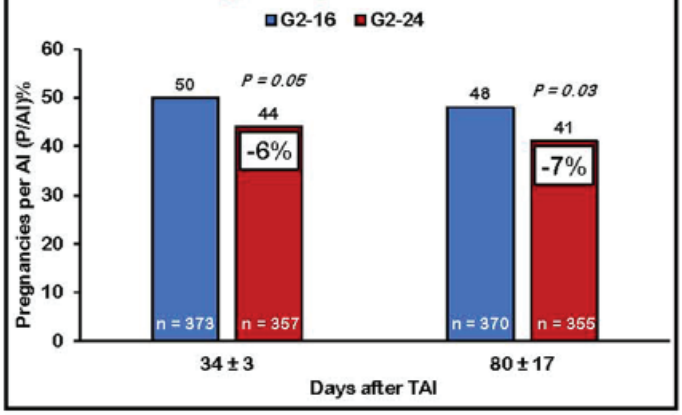
18

Collaborating Farms

- Three locations:
  - Nebraska, Ohio, Wisconsin
- Primiparous cows (n = 730)
- All farms submitted cows for first Timed AI using a Double-Ovsynch protocol
  - Farm A: 6,650 cows; ME305 = 24,900 lb.
  - Farm B: 1,800 cows; ME305 = 28,500 lb.
  - Farm C: 2,260 cows; ME305 = 31,000 lb.

19

Effect of Treatment on Pregnancy Outcomes



20

Effect of Time of Artificial Insemination on Pregnancy Rates, Calving Rates, Pregnancy Loss, and Gender Ratio After Synchronization of Ovulation in Lactating Dairy Cows

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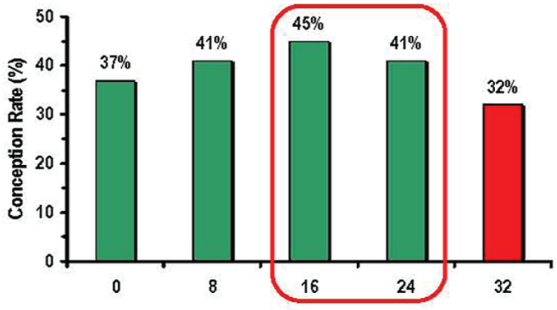

21

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Optimization of timing of insemination of dairy heifers inseminated with sex-sorted semen

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		Sexed	
Item	Conventional	Early	Late
n	300	415	402
P/AI at 30 d (%)	67[a]	45[b]	47[b]
P/AI at 62 d (%)	63[a]	43[b]	45[b]
Female (%)	43[a]	89[b]	91[b]

P/AI of sexed semen = 69% of conventional semen

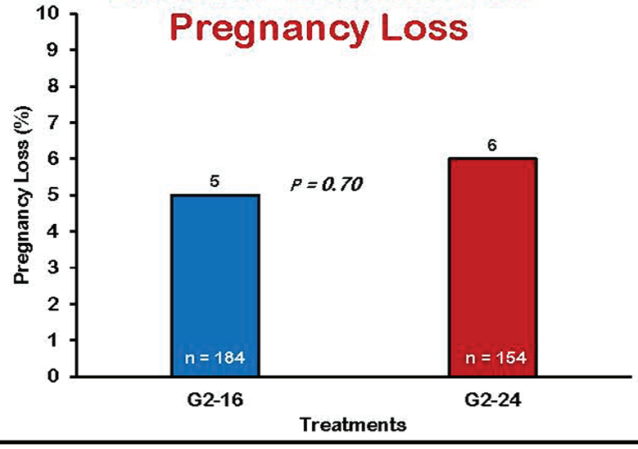
22

Factors affecting fertility

- Time for sperm transport and capacitation
  - G2-16 cows: 8 to 16 h ; G2-24 cows: 0 to 8 h
  - Sustained transport requires 8 to 12 h
- Time for luteolysis
  - G2-24 cows had 8 fewer hours than G2-16 cows
    - Altered estradiol and progesterone concentrations
- Ovulatory follicle size
  - G2-24 cows likely ovulated smaller follicles because they had 8 fewer hours to develop during the synchronized follicular wave than G2-16 cows.

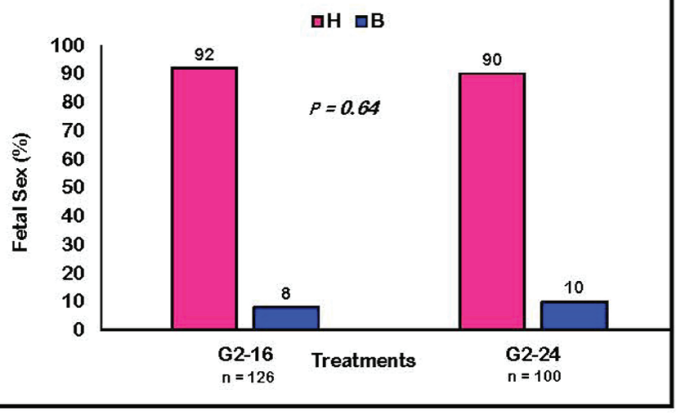
23

Effect of Treatment on Pregnancy Loss



24

Effect of Treatment on Fetal Sex



25

Hypothesis

Induction of ovulation (G2) earlier relative to TAI in a Double-Ovsynch protocol will result in more P/AI

Reject

6% and 7% decrease in P/AI 34 ± 3 d and 80 ± 17 d at 24 h interval

No difference in pregnancy loss at 24 h interval

No difference in fetal sex ratio

26

Thank you and Questions?

27

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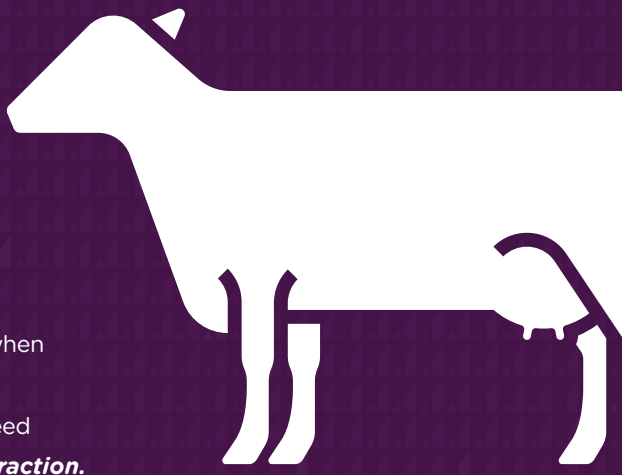

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