Building the Foundation

Healthy Calf Conference 2024

PROCEEDINGS

Wednesday, November 20, 2024

Celebrating 20 YEARS OF CalfCare

Organized and hosted by:

VEAL Farmers of Ontario

Your calf care partners

Title sponsors:

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DAIRY at GUELPH CANADA'S DAIRY UNIVERSITY

OABP Ontario Association of Bovine Practitioners

Welcome and thank you for attending the 2024 Healthy Calf Conference

For two decades, Veal Farmers of Ontario (VFO) has brought together dairy, veal and dairy-beef calf raisers to a single event dedicated to boosting calf health.

As your calf care partners, VFO strongly supports and invests in calf research to develop practical, on-farm protocols for producers and calf care materials that improve the health and welfare of all calves in Ontario. We also keep this goal in mind when we plan this conference.

We know producers are busy people, looking for practical information that will make a difference in the barn. And that's what the Healthy Calf Conference (HCC) has always delivered. Our focus is on actionable information grounded in science that anyone raising calves can take home and start implementing right away.

The insights shared by our speakers include both research and practical tips that will apply to calves destined for all markets. We believe this mix of knowledge will help bridge the gap between theory and practice, leading to healthier calves and more efficient farms.

We appreciate you taking the time to join us in-person or online, or by watching the presentation recordings after the event. Today's technology lets us offer these flexible options so everyone can benefit. We know not everyone can take time off the farm to attend live, yet still value these learning opportunities. To encourage as many people as possible to attend, we have kept our producer registration costs the same since 2016. Thank you for making this our third sold out HCC!

VFO is very fortunate to have the support of many of our sponsors for not only this event but throughout the year. We are also grateful for the businesses that have donated additional resources to this event, ensuring its success and providing valuable opportunities for all attendees.

On behalf of the VFO Board and staff, welcome to the 2024 Healthy Calf Conference. Once again thank you so much for joining us in-person or online and for accessing the recordings, as we celebrate 20 years of calf care! Your support has made this another one for the books.

Building the Foundation
Healthy Calf Conference 2024

Celebrating 20 YEARS OF CalfCare

VEAL Farmers of Ontario
Your calf care partners

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Agenda

10:00 a.m. Welcome

10:15 a.m. The skinny on fat

Christine Murray-Kerr, Ph.D., Grober Nutrition

Ever wonder where the fat in your milk replacer comes from? Get the skinny on each type of fat that can be used and the benefits and disadvantages of each for digestion, growth and health.

10:35 a.m. University of Guelph calf research spotlight

Colostrum feeding strategies and colostrum supplementation beyond day one

Hannah McCarthy, M.Sc., University of Guelph

Colostrum feeding strategies for Holstein and crossbreed calves to ensure successful transfer of passive immunity in calves, and colostrum supplementation beyond day one, and its impacts on calf health.

Impact of colostrum consumption at birth and marketing feeding strategies in the recovery of dairy-beef calves after transportation

Lucía Pisoni, DVM, Ph.D., University of Guelph

How insufficient colostrum consumption at birth and nutrient restriction during marketing and transportation influence the recovery of calves during the first week after arrival at rearing farms, and the effects they have on performance, energy status, and gut functionality.

When should we treat a diarrheic calf with antimicrobial drugs?

Luiza Stachewski Zakia, DVM, University of Guelph

Based on research identifying criteria and evaluating an evidence-based treatment algorithm, learn which calves with diarrhea should be treated and when.

11:10 a.m. Pain management for calves

Charlotte Winder, DVM, DVSc., University of Guelph

The science behind using pain management for various conditions and procedures in calves, including scours, respiratory disease, navel infections, extra teat removal, disbudding and castration.

11:50 a.m. Taking the challenge out of weaning

Kathleen Shore, M.Sc., Grand Valley Fortifiers

Connecting research demonstrating the link between gut health and calf health status to on-farm practices is important to maintain calf growth through weaning and ensure the animals remain profitable members of the herd.

12:30 p.m. Lunch

1:40 p.m. Impacts on calf health and performance

Aaron Keunen, Mapleview Agri Ltd.

Highlights of research conducted at Mapleview Agri Ltd., focusing on the economic impact of various factors associated with calf health and nutrition.

2:00 p.m. Ontario cattle health update and current biosecurity recommendations

Cynthia Miltenburg, DVM, DVSc., Ontario Ministry of Agriculture, Food and Agribusiness

Learn about the current calf health risks for Ontario calves from both existing and emerging diseases and what measures producers can take to protect their herds.

2:35 p.m. KEYNOTE PRESENTATION:

Preconditioning and early disease detection to rationalize antimicrobial use for respiratory disease

Bart Pardon, DVM, Associate Professor, Ghent University (Belgium)

High disease pressure and rapid spread of respiratory disease has made group antimicrobial treatments a cornerstone of calf health. How efficacious are those treatments actually? And how practical and effective could individual treatment be? What alternatives are there, such as vaccination or preconditioning, that can reduce the number of required dosages? Dr. Pardon will address these questions using the results of recent research, including lung ultrasound.

3:30 p.m. Wrap-up

Bonus talk

available exclusively online -

sponsored by: SCCL

Optimizing phase feeding in the postnatal period to prevent scours

Dr. Mike Nagorske, Saskatoon Colostrum Company Ltd.

The skinny on fat

Christine Murray-Kerr, Ph.D., Grober Nutrition

Ever wonder where the fat in your milk replacer comes from? Get the skinny on each type of fat that can be used and the benefits and disadvantages of each for digestion, growth and health.

Christine Murray-Kerr grew up on a veal and cash crop farm in Haldimand County. She graduated from the University of Guelph with a Bachelor of Science in Agriculture (Animal Science) in 2010 and completed a Ph.D. in epidemiology at the Ontario Veterinary College. During her Ph.D., she studied the effects of dystocia on newborn calf vitality and developed a VIGOR score assessment tool to assist producers in making decisions around pain management therapy and the implications on the future health and performance of the calf.

Following her Ph.D., she completed a post-doctoral fellowship at the University of Calgary, investigating how the VIGOR score could be applied to newborn beef calves. In 2014, she joined Trouw Nutrition Canada as a Ruminant Nutrition Research Scientist exploring different nutritional strategies to improve calf performance and increase profitability for producers. In 2023, she joined Grober Nutrition and is currently the Research & Development Lead.

1

2

Formulations

- 24/22
- 22/22/18
- 24/21/20

- % protein
- % protein from milk sources
- % fat

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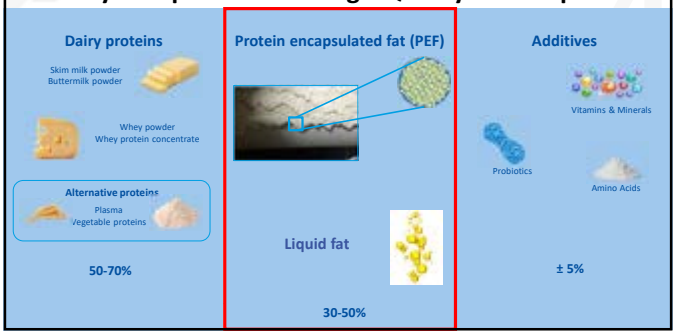
3

3 Key Components of a High Quality Milk Replacer



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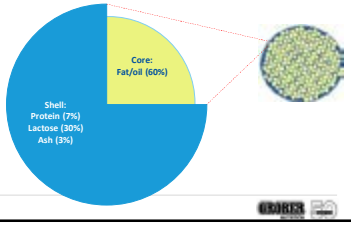
What is PEF?

- **PEF** = Protein Encapsulated Fat, also known as Dry-Fat
- **Problem**: Fat and oil don't mix with water (= hydrophobic), and is therefore not stable in solution
- **Solution**: PEF is a fat-droplet wearing a "jacket" of protein (= hydrophilic), and makes a stable solution

Microscopy photo of PEF



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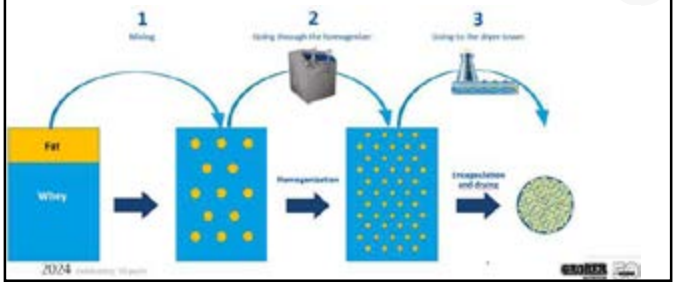
3 Important Production Steps



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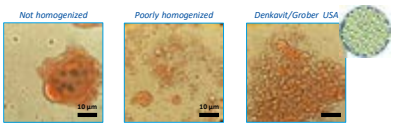
Why is homogenization so important?

- It results in extremely small (<2 µm) and uniform fat globules
- The result = easy to mix and stable solution
- Optimization of fat digestion



- ⇩ Handling quality
- ⇩ Shelf life
- ⇩ Digestibility

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7

DENKAVIT AND GROBER LONG-TERM COLLABORATION TO ENHANCE INNOVATION AND DRIVE GROWTH OF BOTH COMPANIES

*"Why we have such a strong collaboration? **Trust** and **mutual respect** – has to do with the fact that we started as family owned business with a mindset to offer **high quality products and services**"*

Arjan Gobius du Sart, R&D director Denkavit

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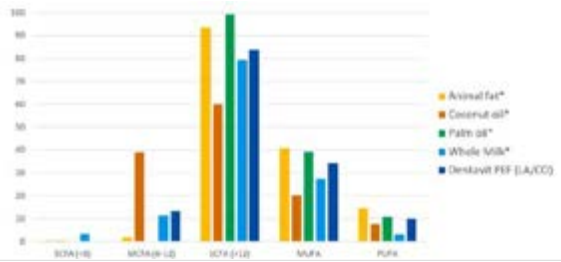
Fatty Acid Profile



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Fat Composition

Milk replacer is composed of long chain, medium chain and short chain fatty acids

Long Chain

- Lard, tallow, palm, canola
  - Major source of energy
  - Provides Ω3 and Ω6 essential fatty acids
  - Plays an important role in anti-inflammatory responses

Medium Chain

- Coconut oil
  - Sensitive to salivary and gastic enzymes that are intact right from birth
  - Antimicrobial & antiviral
  - Protective effect against gram+ bacteria (i.e. Clostridium perfringens)

Short Chain

- Butyrate
  - An energy source for epithelial cells in the GIT
  - Regulates gene expression
  - Anti-inflammatory
  - Anti-microbial

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Long Chain Fatty Acids

Lard/Tallow

Pros:
- Economic
- Excellent digestibility (90%)
- Food grade quality
- Natural source of omega 3 and 6 fatty acids
- Sustainable product (by-product from slaughterhouses)

Cons:
- Resistance of (some) clients to use fat of animal origin

11

Long Chain Fatty Acids

Palm

- Pros
  - Readily available
  - Digestibility of 89%
  - Price
  - Level of saturation similar to animal fat, originated from C16:0
- Cons
  - Lack of MCFA
  - Image

12

Long Chain Fatty Acids

Canola

- Pros:
  - Standard non-GMO
  - Canadian product
  - Natural source of omega 3 and 6 fatty acids
  - No negative associations in the market with this type of fat
- Cons:
  - Highly unsaturated, too "soft"

13

Medium Chain Fatty Acids

Coconut oil

Pros

- 66% C6 to C12
- Digestibility is very high in the young calf (94%)
- Can be absorbed directly from the small intestine to the liver, where it is converted into available energy
- Antimicrobial & antiviral properties

Cons

- Price

Minimum 20% coconut oil in all Grober formulas

14

Short Chain Fatty Acids

Butyrate

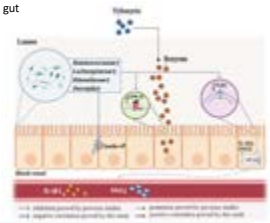
- An energy source of epithelial cells in the GIT.
- A regulator of gene expression stimulating cell proliferation in the gut
- An anti-inflammatory: reduction of pro-inflammatory cytokines
- Anti-microbial

Bedford, 2018

Supplying butyrate in MR for calves resulted in:

- Improved small intestine morphology
- Longer villi and thicker mucosa in the duodenum and jejunum
- More brush border enzymes activities
- Greater performance

Górka et al., 2018; Bedford & Gong, 2017; Niwinska et al., 2017



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15

Optimizing Fat Blends

Blend of food-grade fats and emulsifiers to provide energy, essential nutrients and health support

- ✓Optimized fatty acid profile
  - Balanced long chain and saturated vs. unsaturated fatty acids
  - Lard, Palm, coconut and canola oil
- ✓Match digestive capacity of calves
  - Optimized emulsifier concept
  - Easy to digest coconut oil
- ✓Support (gut) health
  - Antimicrobial effects of MCFA
  - Omega 3 and 6 balance
  - Butyrate

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16

Take Home

- 24/22
- 22/22/18
- 24/21/20

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17

Thank you

Questions?

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18

University of Guelph calf research spotlight

Colostrum feeding strategies and colostrum supplementation beyond day one

Hannah McCarthy, M.Sc., University of Guelph

Colostrum feeding strategies for Holstein and crossbreed calves to ensure successful transfer of passive immunity in calves, and colostrum supplementation beyond day one, and its impacts on calf health.

Hannah McCarthy is a Ph.D. student at the University of Guelph studying calf nutrition under Dr. Mike Steele and Dr. Dave Renaud. Her interest in the dairy industry started through her experiences working on a local dairy farm as a teenager. This sparked a passion for agriculture and led her to complete a B.Sc. at Dalhousie University and a M.Sc. specializing in calf nutrition at the University of Guelph. Currently her research focuses on colostrum nutrition and feeding strategies, with a goal to improve calf health and welfare through nutrition.

DAIRY at GUELPH
CANADA'S DAIRY UNIVERSITY

Colostrum feeding strategies and colostrum supplementation beyond day one of life

Hannah McCarthy

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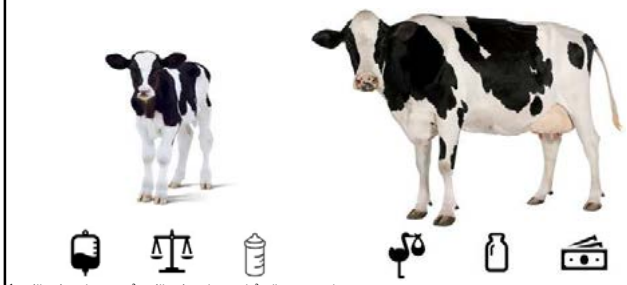
The Importance of the Preweaning Period



[1]Krpálková et al., 2014a [2]Krpálková et al., 2014b [3]Volkmann et al., 2019

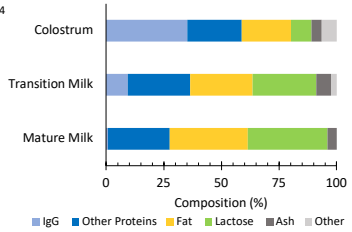
2

Colostrum

Calves are born immunologically naïve[4]

Transfer of passive immunity via colostrum

- Successful: > 10 g/L of IgG in serum[4]
- New recommendations[5]
  - Poor: < 10 g/L
  - Fair: 10 – 17.9 g/L
  - Good: 18 – 24.9 g/L
  - Excellent: ≥ 25 g/L



[4]Godden et al., 2019 [5]Lombard et al., 2020 [6]Fischer et al., 2019

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Colostrum – Beyond Day One

[7]Hare et al., 2020 [8]Pyo et al., 2020

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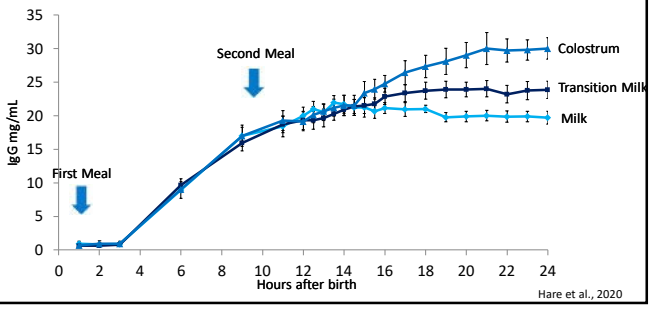
Colostrum – Beyond Day One



Hare et al., 2020

5

Colostrum – Beyond Day One

50% Colostrum 50% Milk Days 2-3	10% CR 90% MR Days 2-14
↑intestinal development	↑average daily gain
↑ IgG after 12h of life	↓ risk of diarrhea
↓ risk of mortality	↓ risk of mortality

Pyo et al., 2020; Hare et al., 2021; McCarthy et al., 2024

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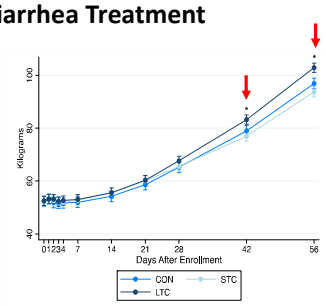
Colostrum – Diarrhea Treatment

50% Colostrum/50% Milk at onset of diarrhea for 4 days (LTC)

- ↑ diarrhea resolution
- ↑ preweaning ADG



Carter et al., 2022

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Acknowledgements

Steele and Renaud labs – University of Guelph

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Impact of colostrum consumption at birth and marketing feeding strategies in the recovery of dairy-beef calves after transportation

Lucía Pisoni, DVM, Ph.D., University of Guelph

How insufficient colostrum consumption at birth and nutrient restriction during marketing and transportation influence the recovery of calves during the first week after arrival at rearing farms, and the effects they have on performance, energy status, and gut functionality.

Lucía Pisoni holds a degree in Veterinary Medicine from the National University of La Plata, Argentina. She completed her M.Sc. at Ohio State University, where she focused on nutrition and intestinal physiology in Holstein heifers. Driven by her interest in calf nutrition, she continued her studies with a Ph.D. in Ruminant Production at the Institute of Agrifood Research and Technology (IRTA) in Spain, where her research focused on the development of nutritional strategies to improve the recovery of dairy-beef calves after transport.

Currently, she is a postdoctoral researcher at the University of Guelph where she is exploring nutrition and physiology in calves. Her research focuses on the use of extended colostrum feeding strategies to effectively reduce the incidence of disease during the pre-weaning period.

1

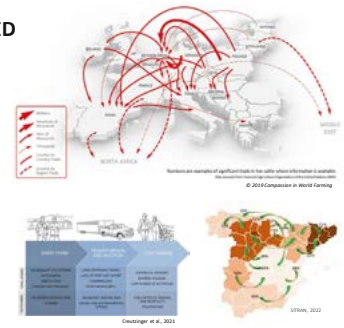
TRANSPORT OF UNWEANED CALVES WORLDWIDE

Canada → 8 d of age
12 h in transport
45 to 54 kg

USA → 28 h in transport

Europe → 14 d of age
18 h in transport + 1 h break
50-60 kg of BW

1.4 million surplus calves/year in Europe
42% > 8h transport



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HOW TO MANAGE TRANSPORT STRESS

1. ***Time in transit***
   - *6 vs. 12 vs. 16 h*[1]
   - *3 vs. 5 vs. 24 h*[2]
   - *6 vs. 18 h*[3]
2. ***Transport age***
   - *14 vs. 28 d*[4]
   - *3 vs. 5 vs. 10 d*[5]
3. ***Rest period***
   - *0 vs. 4 vs. 8 h*[6]
   - *5 vs. 10 vs. 15 h*[7]
   - *8 h*[8]
4. ***Fitness for transport***[9, 10, 11]
5. *Nutrition*

Goetz et al., 2023[1]; Marmendet al., 1982[2]; Marcato et al., 2020[3]; Marcato et al., 2022[4]; Jongman and Butler, 2014[5]; Melendez et al., 2020[6]; Marti et al., 2017[7]; Goetz et al., 2024[8]; Wilson et al., 2020[9]; Roadknight et al., 2022[10]; Rocano et al., 2022[11]

4

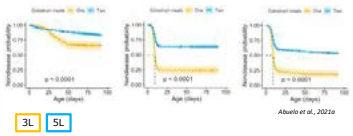
COLOSTRUM

QUALITY

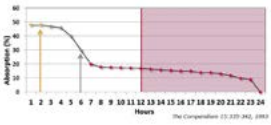
Category	Serum IgG (g/L)	Total Protein (g/dL)	% Brix	Target (% calves)
Excellent	≥ 25.0	≥ 6.2	≥ 9.4	~ 40
Good	18.0 to 24.9	5.8 to 6.1	8.9 to 9.3	~ 30
Fair	10.0 to 17.9	5.1 to 5.7	8.1 to 8.8	~ 20
Poor	< 10.0	< 5.1	< 8.1	< 10

Lombard et al. (2020)

QUANTITY



TIMING



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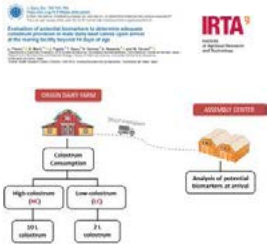
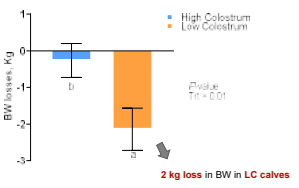




2 kg loss in BW in **LC calves**

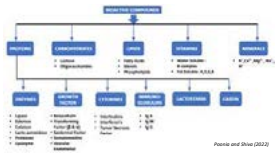
1. All calves fed **high-quality COL**
2. 1st feeding within **2 h after birth**
3. **No FTPI** in any treatment

Where is this difference in BW coming from??

6

COLOSTRUM IS NOT JUST IgG!

- Development of the **immune system** by the ingestion of **IgG**
- **IGF-1 and insulin:** stimulate the **growth of intestinal cells** increasing **nutrient absorption**
- **Lactoferrin: antioxidant, antimicrobial, and immunomodulatory.**
- **Lysozyme and lactoperoxidase: antimicrobial properties**



Poonia and Shivai (2022)

12 to 43 % of male calves entering the dairy-beef industry suffer from **FTPI** (Pardon et al., 2015; Wilson et al., 2020).

BW > 50 kg = lower risk of respiratory disease, diarrhea, morbidity, and mortality in the first 21 days after arrival (Renaud and Pardon, 2022)

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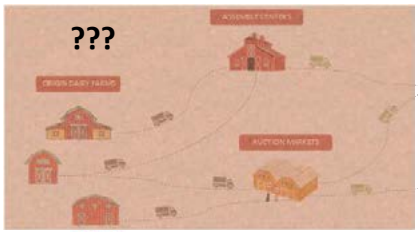
IMPACT OF FEED RESTRICTION / FASTING DURING TRANSPORT



DISCONNECTION BETWEEN DAIRY FARMS, COLLECTING CENTERS, AND REARING FACILITIES

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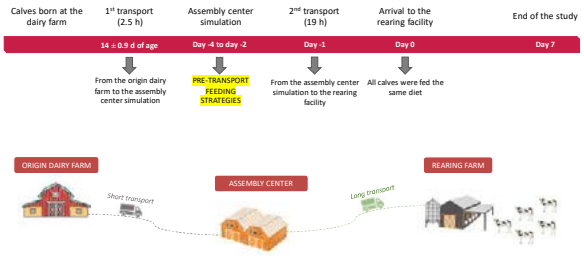

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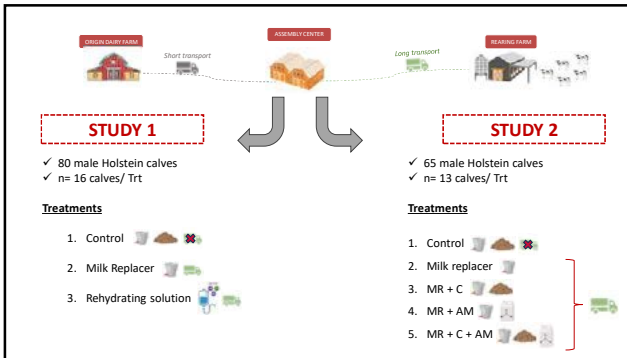

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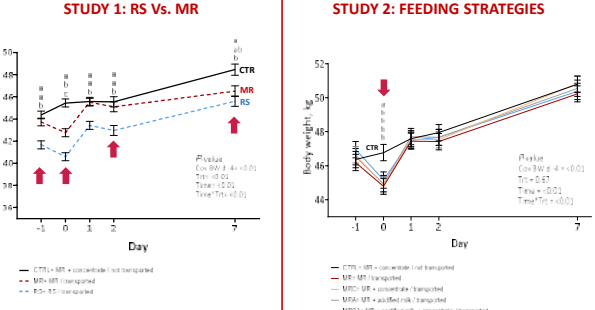

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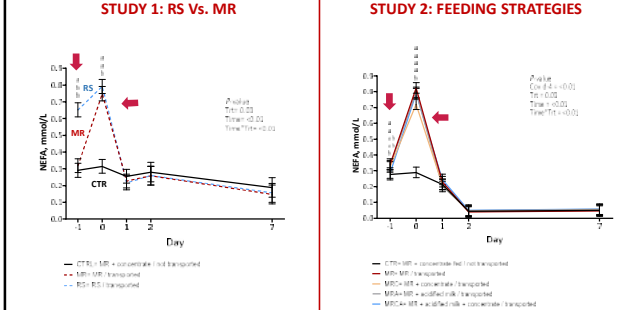

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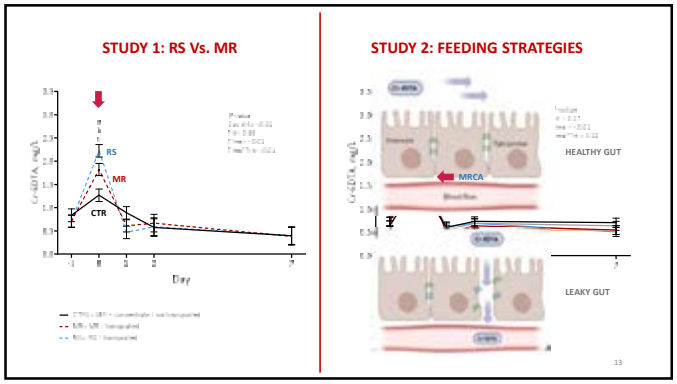
STUDY 1: RS Vs. MR
RS
MR
CTR
Day
STUDY 2: FEEDING STRATEGIES
HEALTHY GUT
MRCA
LEAKY GUT
13

13


TAKE HOME MESSAGES
1. Providing an adequate amount of colostrum at birth increased BW upon arrival at the rearing farms
2. Avoid the use of RS as a unique feed source at assembly centers
I. ↑ BW loss before transport, worsening shrinkage
II. Delayed recovery of BW the 1st week after arrival
III. ↑ fat mobilization before transport
IV. ↑ gut permeability after transport
3. Pre-transport feeding strategies
I. Prevented BW losses and fat mobilization before transport
II. Potential to reduce gut permeability after transportation
14

14


Thank you!
Questions?

15


ENDOVAC-Dairy
with Immune Plus
Not all Vaccines
are Created EQUAL
Why are
Veterinarians using
ENDOVAC in Calves?
• Battle Salmonella & E. coli
• Kickstart Immunity
• Protection Pasteurella & Mannheimia
• Combat stress with Immunostimulant
• Easy low 2 mL dose w/ no mixing
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Animal Health

University of Guelph calf research spotlight

When should we treat a diarrheic calf with antimicrobial drugs?

Luiza Stachewski Zakia, DVM, DVSc, DACVIM (LA), University of Guelph

Based on research identifying criteria and evaluating an evidence-based treatment algorithm, learn which calves with diarrhea should be treated and when.

Luiza Stachewski Zakia is a board-certified veterinarian in large animal internal medicine. She is currently pursuing a Ph.D. in epidemiology at the University of Guelph, where her research centres on neonatal calf diarrhea and the care of systemically ill calves. She aims to develop a treatment algorithm to reduce the unnecessary use of antimicrobial drugs in calves, and her focus extends to creating practical tools that can be applied in clinical settings, aiming to bridge the gap between clinical practice and research.

When should we treat a diarrheic calf with antimicrobial drugs?

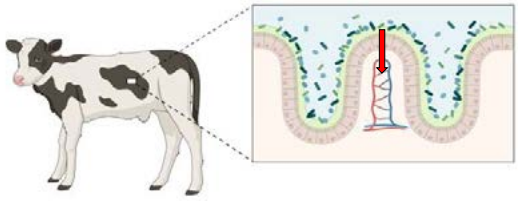
Luiza Stachewski Zakia

DVM, DVSc, DACVIM (LA)

PhD Candidate in Epidemiology

1

Introduction



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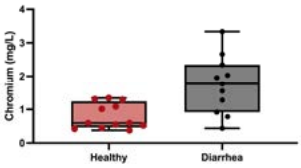
Gut permeability and diarrhea



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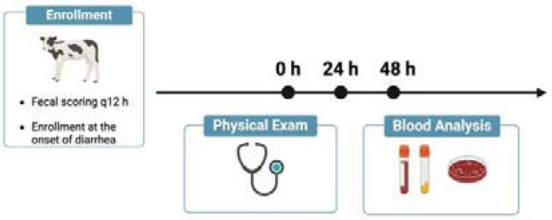
Bacteremia in diarrheic calves



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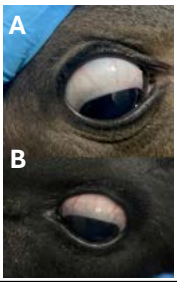
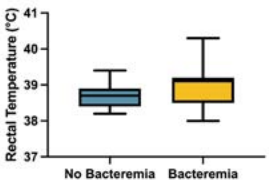
Bacteremia in diarrheic calves





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What is a calf that is systemically sick?

- Visible sunken eyes
- Presence of scleral injection
- Increased rectal temperature
- Inability to stand
- Absent suckle reflex

6

Treating diarrheic calves with AMD at the onset of diarrhea *vs.* when they show signs of systemic disease

- Calves that received AMD at the onset of diarrhea had:
  - Similar duration of diarrhea
  - Lower average daily gain
  - Higher mortality risk

7

Take home message

Systemically sick diarrheic calves need AMD, but not every calf with diarrhea needs AMD.

8

Thank you

9

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Pain management for calves

Charlotte Winder, DVM, DVSc., University of Guelph

The science behind using pain management for various conditions and procedures in calves, including scours, respiratory disease, navel infections, extra teat removal, disbudding and castration.

Charlotte Winder is an Associate Professor in Population Medicine at the University of Guelph and a clinician in the university's Ruminant Field Service. She is passionate about bridging the gap between research and industry, and her research focuses on helping farmers with practical solutions that improve the health and welfare of dairy cattle. She also teaches in the DVM program at the Ontario Veterinary College.

She received her DVM from the University of Guelph in 2007 and worked in private practice for six years. In 2017, she graduated from Guelph with her DVSc., and joined the faculty in 2018. She is also a board member with the Ontario Association of Bovine Practitioners.

Pain management for calves

Charlotte Winder, DVM, DVSc.
Dept. of Population Medicine, University of Guelph
winderc@uoguelph.ca

General principles of pain control

Pain can occur for many reasons, including tissue damage and inflammation, which can be a result of both injuries and disease processes. The intensity of pain and how long it may last can depend on the amount of damage, if pain control is used, as well as previous experiences with pain or stress and the calf's emotional state (Adcock & Tucker, 2018). Using pain control is most effective when given either before a painful procedure or as early as possible in the course of disease (Coetzee, 2017). In general, pain control options for calves are generally quite safe, with wide safety margins.

Disbudding

Disbudding, where either a hot iron or caustic paste is used to destroy the tissue which grows into the horn, is preferred over dehorning, which requires surgical amputation to remove the horn. Dehorning causes more tissue damage and causes longer lasting pain and decreased performance (Stock et al., 2013).

For both caustic paste and hot iron disbudding, using both a local anesthetic as well as a non-steroidal anti-inflammatory drug (NSAID) helps substantially reduce the pain of the procedure (Winder et al., 2018; Yakan et al., 2018; Reedman et al., 2020). The local anesthetic acts to stop the initial pain within the first few hours, while the NSAID helps control inflammatory pain for days following the procedure. Sedative such as xylazine may also be used to help with handling, however, it is clear that this drug alone does not sufficiently control the pain of the procedure (Stillwell et al., 2010), so must be combined with local anesthetic and NSAID. Results are mixed regarding impact of sedation on the calf (Vasseur et al., 2014; Reedman et al., 2021), therefore, xylazine use is best left up to the discretion of the individual farm and their herd veterinarian.

Castration

Castration may be done by rubber ring, surgical methods, or emasculatome. Performing this procedure earlier in life is preferred, as there is less tissue damage and less indicators of pain and inflammation (Tucker et al., 2015; Marti et al., 2017). For all methods and ages, use of local anesthesia (as an injection to the testes and under the skin in the scrotum) and NSAID analgesia show benefits in reducing indicators of pain (Meléndez et al., 2017; Newcomber, 2022). Preliminary research on the use of lidocaine impregnated bands shows evidence that they can deliver therapeutic concentrations in the tissue for long periods of time (Saville et al., 2020), and some field studies have shown benefit over no pain control (Roche et al., 2024; Ross et al., 2024), but more research is needed to compare to calves given injected lidocaine. While calves castrated with bands show more signs of pain in the weeks following castration compared to surgical methods (Nogues et al., 2021), it is important that the method used be appropriate for the environment and the operator – working with your veterinarian to determine an appropriate method for your farm is key.

Extra teat removal

Although not specifically studied, even small-scale subcutaneous procedures have produced post-operative pain (Frondelius et al., 2018). As a result, a combination of both an NSAID in combination with local anesthetics appears to show benefit in these cases (Frondelius et al., 2018).

Neonatal diarrhea

Regardless of the cause of the diarrhea, appropriate fluid therapy and continued feeding of milk are critical to recovery (Constable, 2009; Smith, 2009), as well as appropriate antibiotic use where needed (Meganck et al., 2014). Providing an NSAID to calves with diarrhea may help because of the pain control and anti-inflammatory actions, as well as their impact on fever (Constable, 2009). Calves with diarrhea treated with an NSAID can show improved appetite (Philipp et al., 2003; Todd et al., 2010), performance (Todd et al., 2010), activity (Welk et al., in press) and recovery (Barnett et al., 2003).

Respiratory disease

Although scientific studies on these specifically for respiratory disease in calves are limited (Francoz et al., 2012), use of NSAIDs can be beneficial when given as part of a treatment protocol. Respiratory disease causes sickness behaviours (Toaff-Rosenstein and Tucker, 2018) and is painful (Martin et al., 2022) and using NSAIDs can reduce fever and improve clinical signs (Apley, 2021), as well as alleviate indicators of pain (Martin et al., 2022).

Navel infections

Umbilical infections are not uncommon, yet may be underrecognized on farm (Renaud et al., 2018), can cause pain (Wieland et al., 2017), and can progress to septicemia leading to joint infections and even meningitis (Blowey & Weaver, 2011). While research specific on pain mitigation for navel infections is limited, adding an NSAID to antimicrobial treatments is likely to benefit calves by reducing inflammation and fever.

References available upon request.

Taking the challenge out of weaning

Kathleen Shore, M.Sc., Grand Valley Fortifiers

Connecting research demonstrating the link between gut health and calf health status to on-farm practices is important to maintain calf growth through weaning and ensure the animals remain profitable members of the herd.

Kathleen Shore has been a nutritionist in the Canadian feed industry for 18 years. She graduated from the University of Guelph with an M.Sc. in Ruminant Nutrition and has been playing with calves, heifers and cows ever since. For the past five years, she has been a nutritionist with Grand Valley Fortifiers balancing rations, visiting cows, heifers and calves and providing whatever nutrition service their customers need.

Taking the Challenge out of Weaning

HEALTHY CALF CONFERENCE - 2024

1

Is Weaning a stage or a process?

- This is a stage that helps set the calf up for the next group
  - It can also set a calf backwards very quickly creating immune challenges and gut development challenges
- It is a process because there should be a standard operating procedure driving this
  - Timing can be dependent on size and vitality of the calf
  - The approach should be slow and consistent

2

2

What is the ultimate goal of weaning?

- A smooth transition from a pre-ruminant to a ruminant
- What does the research say:
  - Smooth Transition decreases morbidity and mortality and increases gain (Khan et al, 2012)
  - Smooth Transition requires adequate size and function of the rumen (Baldwin, 2004)
  - Elevated plane of nutrition pre-weaning makes weaning more challenging (Khan et al, 2011)
    - How do we overcome the challenges of weaning and still feed enough milk to set these calves up for maximum lifetime productivity
    - 1 kg of preweaning ADG = 1,540 kg of milk in first lactation (Soberon et al, 2012)

3

3

Consistency is key to optimal calf management

Prevention of disease

Steady rate of gain

- ✓Heat and chill
- ✓Poor air circulation
- ✓Changing feed schedules
- ✓Switching feed – from whole milk to milk replacer or vice versa
- ✓Weaning strategy
- ✓Rough handling

4

4

Relationship between Nutrition and Disease

Prolonged gastric emptying can lead to disease

- the longer it takes the more carbohydrate/sugar is available to bacteria
  - Volume of ingested meal
  - Caloric content
  - Type of protein or fat
  - pH in the duodenum
- Larger meals fed less frequently
  - Abomasal inflammation and lesions
  - Milk overflow into rumen

Calves fed 28/20 MR had a faster recovery from diarrhea in a crypto challenge model when compared to 20/20

5

5

Gut microbiome

We have approximately 63 days to impact the gut microbiome for life

- In people about 2-3 years

With the development of the GI tract the gut microbiome of calves changes gradually – especially during weaning (Du et al, 2023)

- Why do we care
  - This is the key to strong nutritional and immune system development in calves
  - Disruption of the microbiome leads to digestive diseases in calves – scours without a cause

6

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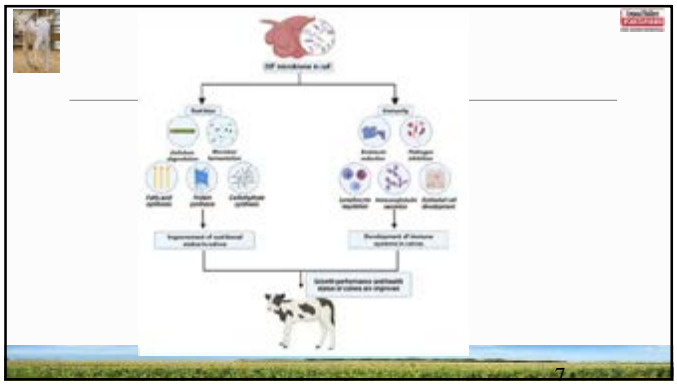

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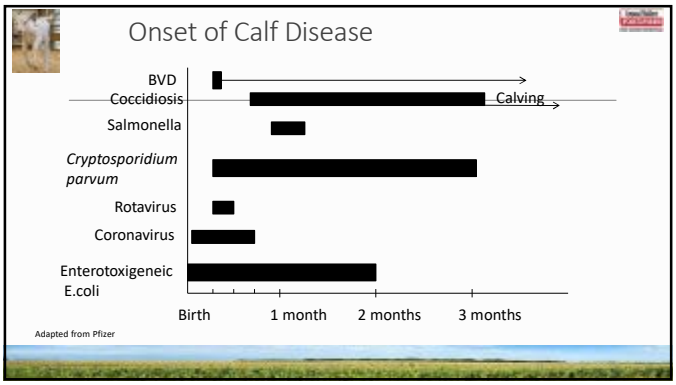

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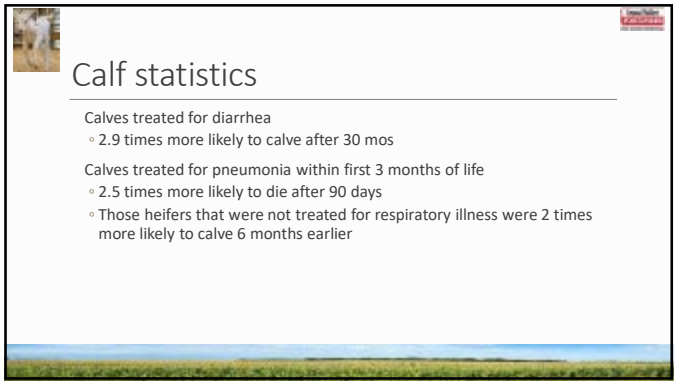

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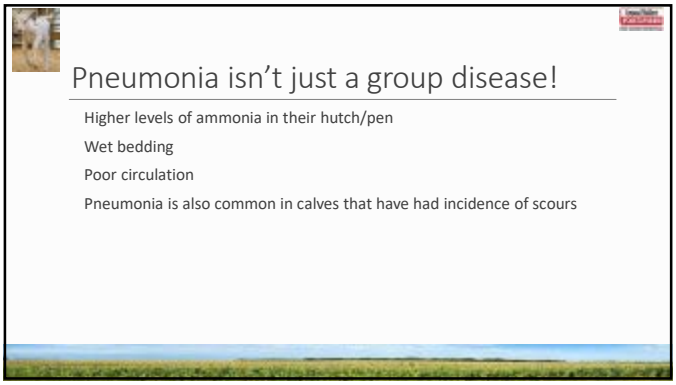

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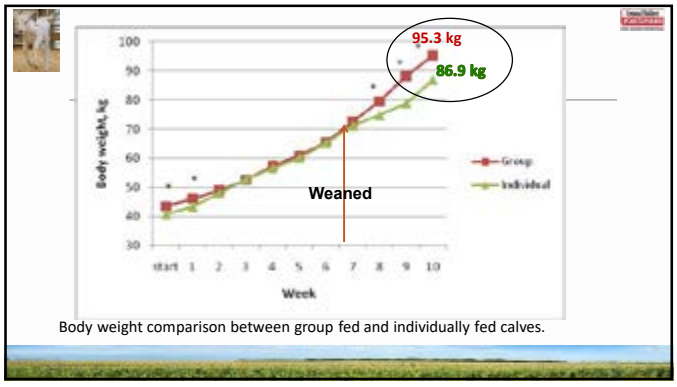
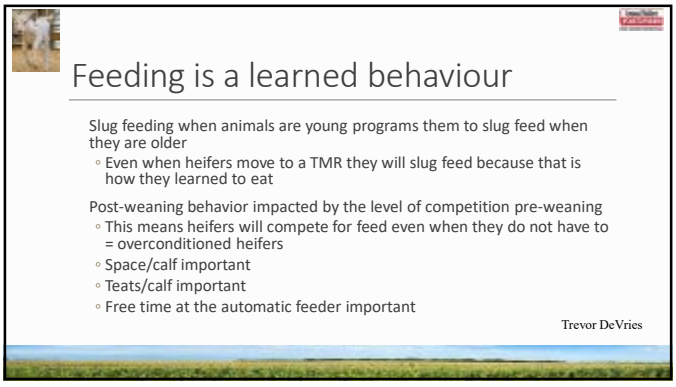


Body weight comparison between group fed and individually fed calves.

11



12

Step down process

Gradual weaning is best

Timing is important both for growth and health

Weaning is a stress
- Biologically when stressed immune status is impacted

Traditional Strategies
- Water down
- Reduce milk meals by taking a meal away per day
- Gradual reduction of total intake

13

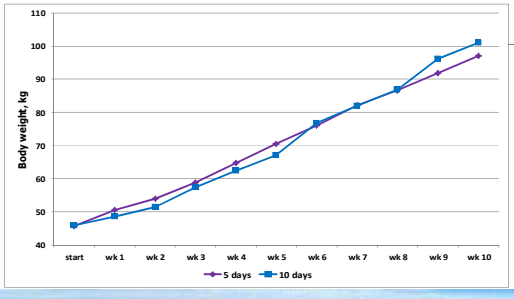
What is Step down

A gradual reduction can be

1. move milk level down, hold it for a few days, move it down again etc
   - Academically this has been reviewed where the process is done over several weeks
2. Reduce milk level a little bit each day over 10 days to 2 weeks driving calves to eat more grain over the same time
   - Adding hay separately in the pen 1x/day incredibly effective at giving calves something to do
   - Boredom is a real thing – creating irritating behaviours

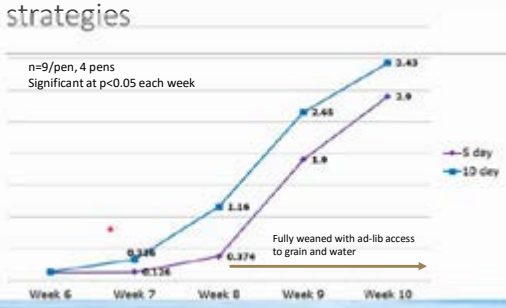
14

Time to wean



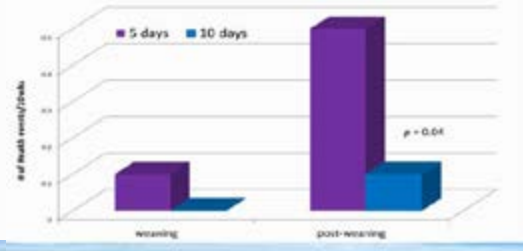
15

Grain intake – different weaning strategies



16

Weaning strategy and health



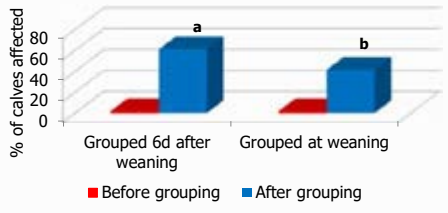
17

Results of animals grouped at different ages

Trmt	Body Weight Gain (kg)	Total Milk Replacer Intake (kg)	Total Starter Intake (kg)	Relative Cost of gain
GO	52.5	63.1	20.0	$1.02/kg
G3	53.9	64.9	13.9	$1.01/kg
G10	55.4	65.2	22.9	$1.01/kg
GW	61.3	66.9	34.7	$0.96/kg
I	58.7	67.5	30.4	$1.00/kg

18

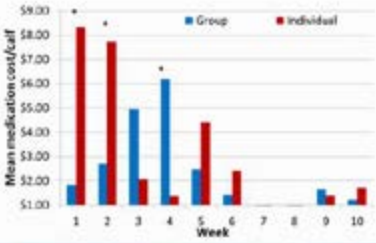
Incidence of respiratory problems



Bach et al, 2009

19

A look at medication costs



20

Calf Starter Feeding Goals

Stimulate rumen papillae growth
- VFA's from starch and sugars
- 3 to 6 weeks old

Maximize Starter Intake
- 1 to 4 weeks post-weaning feed 2.5 – 3.5 kg/day
- Energy limits growth – so maximize intake of starter/grower

21

Feeding a high quality starter

Feed Type	MR intake, kg of DM	Starter intake (g/d)	ADG (g/d)		Feed Efficiency (%)	
			Pre-wean	Post-wean	Pre-wean	Post-wean
Pelleted	21.30	863.9 ± 30.0	391	1743	50.87	69.02
Textured	21.73	944.8 ± 30.0	377	1791	52.11	63.19

(Bach et al, 2007)

22

What about hay in the diet

Item	No hay	With Alfalfa hay	With Oat hay
Initial wt, kg	44.7	43.2	44.1
Final wt, kg	89.8	92.3	98.6
ADG pre-wean, kg/d	0.53	0.62	0.66
ADG post-wean, kg/d	0.79	0.82	1.29

(Castells et al, 2013)

23

The value of straw

Little to no effect on growth when feeding pelleted feed
- Higher growth when compared to textured feed that includes whole grain

Impact on rumen pH – higher in calves receiving chopped straw
- For calves fed pelleted feeds
- No difference in calves fed textured feed with whole grains

Straw fed ad libitum
- 0.03-0.05 kg DM pre-weaning
- 0.11 – 0.15 kg DM post weaning

Terré et al, 2015

24

Water is a nutrient …

Calves need water

- Lubrication for the developing rumen
- Milk enters the abomasum so water in milk is NOT the same thing
- Promotes grain intake
- Promotes higher gains

25

The benefits of water … nothing new

	Free choice water	No water offered
# calves	20	21
Calf starter intake (kg) first 4 weeks	11.7	8.1
Weight gain (kg) first 4 weeks	8.5	5.3

(Kertz, 1984)

26

Mammary development

Improved early nutrition stimulates mammary tissue development (Brown et al, 2005)

Calves fed accelerated milk replacer:

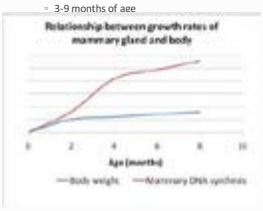
- 32% more parenchymal mass (cells that make up mammary tissue)
- 47% more parenchymal DNA than calves fed conventional milk replacer (Brown et al, 2005)

27

Mammary development

Too much energy can adversely affect mammary development

- 3-9 months of age



(Sejrsen et al, 2000)

28

Take home message

Weaning should be a protocol on farm

Calves should be well fed, strong and healthy before weaning

Weaning should be gradual and as consistent with the current milk program as possible

Don't be afraid to move calves BEFORE weaning but keep them where they are after weaning so they adjust to 1 change at a time

29

Questions?

30

Impacts on calf health and performance

Aaron Keunen, Mapleview Agri Ltd.

Highlights of research conducted at Mapleview Agri Ltd., focusing on the economic impact of various factors associated with calf health and nutrition.

Aaron Keunen is part of Mapleview Agri Ltd., a business based in Palmerston, Ontario specializing in the manufacturing of milk replacer, as well as Truvital Animal Health, an animal health business that has provided science-based solutions for calf health and performance since 2020. With a passion for agriculture and agribusiness, Aaron enjoys working with producers to help find solutions to improve the health and performance of their animals. As a farmer and partner in Keunen Cattle Ltd. he also has experience raising approximately 2,000 calves per year.

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ABOUT US

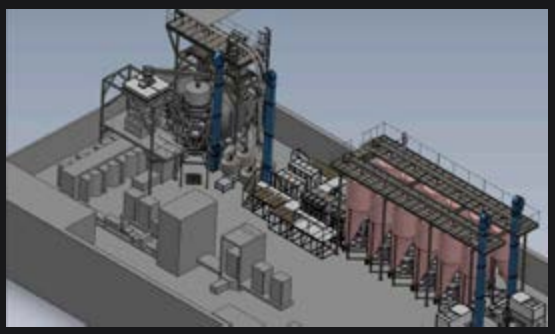
Timeline:

- **2012 –** Started manufacturing milk replacer
- **2013 –** Expanded warehouse and production capacity
- **2015 –** Built Research Facility housing 256 calves
- **2016 –** Started conducting internal & external research
- **2017 –** Purchased lab equipment to test incoming and outgoing product
- **2018 –** Expanded our milk replacer market outside of Ontario
- **2019 –** Automated manufacturing and added 50% more capacity
- **2020 –** Expanded market into every Canadian province
- **2022 –** Purchased land to build new warehouse/manufacturing area and fully automated bagging line in 2024 to maintain continual growth

MAPLEVIEW

Exterior render of new production facility.

MAPLEVIEW



Interior render of new production facility.

MAPLEVIEW

RESEARCH FACILITY

- Fecal and respiratory scoring twice daily
- Body weights
- Individual milk replacer and grain consumption
- Water consumption

MAPLEVIEW

MAPLEVIEW

RESEARCH AND COLLABORATION

Largest commercial research facility in Canada
Conduct trials internally for **academia and industry**
Validate products and **develop innovative technology**
Milk ingredients, feed additives, pharmaceuticals, nutraceuticals

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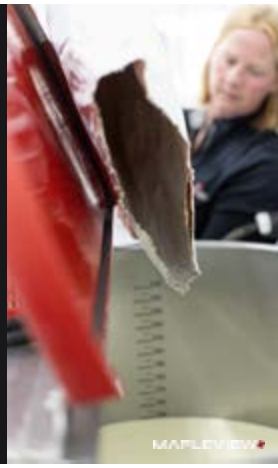
OVERVIEW

GENERAL RESEARCH FINDINGS
FEED EFFICIENCY
COST OF PRODUCTION



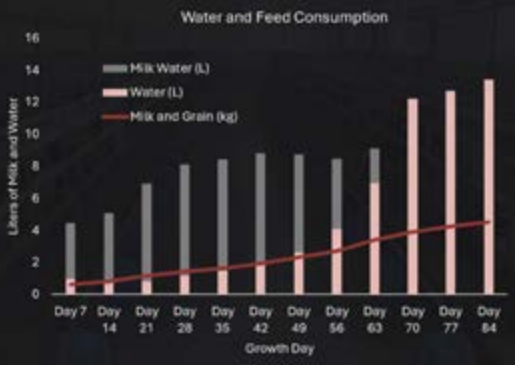
MAPLEVIEW

GENERAL RESEARCH

- Data taken from individual water, grain consumption, body weight
- Data from 768 calves
- November 2023 – October 2024
- Ad lib grain and fresh water available
- Weighed weekly
- Health scored daily
- Water meters read daily

MAPLEVIEW

GRAIN, MILK & WATER



MAPLEVIEW

WEIGHT GAIN LOSSES FROM DISEASE

WHAT DOES A CASE OF DIARRHEA RESULT IN LOST PERFORMANCE?

WHAT DOES A CASE OF RESPIRATORY DISEASE RESULT IN LOST PERFORMANCE?

MAPLEVIEW

DIARRHEA PROTOCOL

MAPLEVIEW

WEIGHT GAIN LOSS DIARRHEA

Diarrhea Losses Weight and Cost Associated								
	Start Weight	Finish Weight	ADG (lbs)	ADG (kg)	Daily Weight Lost (grams)	Days With Diarrhea	$/Lb of Gain	Additional Cost
No Diarrhea	107.7	317.9	2.50	1.136		0.00	$ 1.84	
0.5 to 1.5 Days	106.3	304.6	2.36	1.071	-65.0	1.08	$ 1.90	-$ 11.27
2 to 3 Days	106.4	302.6	2.34	1.059	-76.2	2.58	$ 2.00	-$ 30.98
3.5 -4.5 Days	106.8	300.9	2.31	1.048	-87.6	3.96	$ 2.01	-$ 33.00
5 days +	102.9	294.2	2.28	1.033	-102.4	6.56	$ 2.06	-$ 41.10

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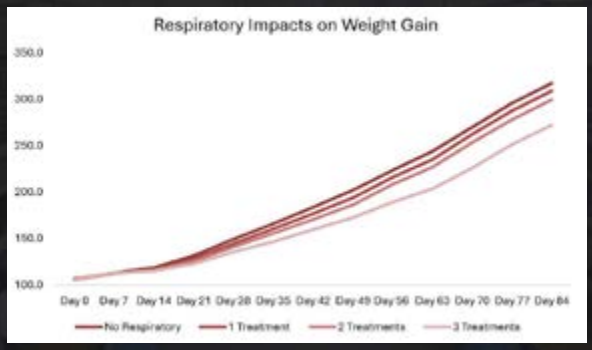
WEIGHT GAIN LOSS RESPIRATORY DISEASE



MAPLEVIEW

WEIGHT GAIN LOSS RESPIRATORY DISEASE

Respiratory Disease and Cost Associated							
	Start Weight	Finish Weight	ADG (lbs)	ADG (kg)	Daily Weight Lost (grams)	$/Lb of Gain	Additional Cost
No Respiratory	106.2	317.0	2.51	1.138		$ 1.84	
1 Treatment	107.0	309.0	2.40	1.091	-47.6	$ 1.92	-$ 17.27
2 Treatments	106.0	299.6	2.31	1.046	-92.8	$ 2.00	-$ 30.51
3 Treatments	106.2	272.0	1.97	0.895	-243.3	$ 2.35	-$ 85.35

MAPLEVIEW

COST OF PRODUCTION

INPUTS

- Considering impacts from milk replacer formulation on cost of production
- Feed efficiency will affect cost of production

MAPLEVIEW

EFFICIENCY OF FAT LEVELS

	FAT 17%	FAT 24%	FAT 31%
PERFORMANCE			
Start Weight	105.02	105.43	103.55
Finish Weight	353.98	325.07	323.59
INPUT COSTS			
Medications, Vaccines, Yardage, Labour	$121.32	$119.72	$118.62
Milk Replacer	$196.08	$196.20	$196.28
Grain	$110.58	$91.25	$93.59
ECONOMIC EVALUATION			
Total Gain	248.96	219.64	$220.04
Input Expenses	$427.98	$407.17	$408.49
Cost Per lb of Gain	$1.72	$1.85	$1.86
N= 128			

Future performance starts today.

MAPLEVIEW

MAPLEVIEW

EFFICIENCY OF PROTEIN SOURCES

	PROTEIN SOURCE #1	50% OF EACH PROTEIN	PROTEIN SOURCE #2
PERFORMANCE			
Start Weight	106.40	105.90	106.30
Finish Weight	284.7	267.30	257.60
INPUT COSTS			
Medications, Vaccines Yardage, Labour	$113.39	$185.00	$114.11
Milk Replacer	$162.01	$161.30	$161.54
Grain	$69.89	$62.43	$55.13
ECONOMIC EVALUATION			
Total Gain	178.30	161.40	151.30
Input Expenses	$345.29	$338.73	$330.77
Cost Per lb of Gain	$1.94	$2.10	$2.19

N= 160
Milk Replacer @ $4.00/kg
Grain @ $500/MT

Future performance starts today.

MAPLEVIEW

MAPLEVIEW

RATES OF MEDIUM CHAIN FATTY ACIDS

PERFORMANCE	LOWER MCFA	INCREASED MCFA
Start Weight	105.38	106.00
Finish Weight	293.78	312.74
INPUT COSTS		
Medications, Vaccines, yardage, Labour	$113.13	$114.52
Milk Replacer	$191.22	$990.63
Grain	$73.65	$82.49
ECONOMIC EVALUATION		
Total Gain	188.40	204.74
Input Expenses	$278.20	$387.64
Cost Per lb of Gain	$2.03	$2.01

N=128 calves

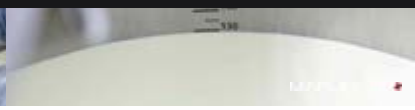
Future performance starts today.

MAPLEVIEW

MAPLEVIEW

INGREDIENTS MAKE A DIFFERENCE

- Some milk proteins are more efficient than others, ensure high quality milk protein
- MCFA fat formulations support growth while maintaining comparable input costs.
- Functional proteins reduce diarrhea and match high quality milk protein in growth efficiency.
- Functional proteins reduce diarrhea leading to less economic loss.
- Validated feed additives will improve feed efficiency.



THE MAPLEVIEW DIFFERENCE

Formulations prioritize science over cost.

Research enables us to incorporate economically viable ingredients and technologies.

Consistency in formulas - no least cost formulation.

MAPLEVIEW

THANK YOU

MAPLEVIEW

TRUVITAL ANIMAL HEALTH

Ontario cattle health update and current biosecurity recommendations

Cynthia Miltenburg, DVM, DVSc., Ontario Ministry of Agriculture, Food and Agribusiness

Learn about the current calf health risks for Ontario calves from both existing and emerging diseases and what measures producers can take to protect their herds.

Cynthia Miltenburg is a veterinarian and graduate of the Ontario Veterinary College where she earned her DVM and DVSc. degrees. After several years in large animal practice, her graduate research focused on strategies to improve transition cow health and immune function.

She is currently Lead Veterinarian Animal Health and Welfare with the Ontario Ministry of Agriculture, Food and Agribusiness, where she provides scientific expertise in veterinary science, epidemiology, and disease prevention and control related to animal, public, and environmental health with an emphasis on bovine health and welfare. She also co-leads the Bovine Ontario Animal Health Network, which works to coordinate preparedness, early detection, and response to animal disease.

Ontario cattle health update and biosecurity recommendations

Cynthia Miltenburg, DVM, DVSc

Ontario Ministry of Agriculture, Food and Agribusiness

Ontario

1

Reasons for antimicrobial use in heifer calves:

- respiratory disease (54%)
- diarrhea (20%)
- presence of a fever (3%)
- umbilical disease (2%).

Uyama et al. Associations of calf management practices with antimicrobial use in Canadian dairy calves. J Dairy Sci. 2022

2

Ontario

2

Current Disease Risks

Salmonella Dublin

- There are over 2500 serovars of Salmonella – many serovars have a narrow range of species it can infect
- *Salmonella* Dublin is a bacterial disease caused by *Salmonella enterica* subsp. enterica serovar Dublin
- A cattle host-adapted strain
  - The bacteria is shed in the feces, milk, colostrum, and calving fluids of infected cattle
  - Some cattle can be silent carriers – appear outwardly normal
- Can infect some other species but less common
- A risk to people

3

Ontario

3

Current Disease Risks

Salmonella Dublin

Fever

Depression

Off-feed

Pneumonia

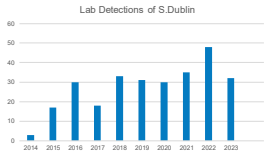
Respiratory distress (e.g., elevated respiratory rate, coughing, etc.)

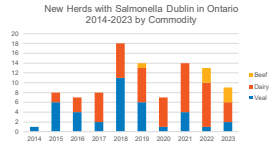
Dehydration

Septicemia

High group morbidity and mortality, primarily in young calves

Non-responsive to antibiotic treatment





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Ontario

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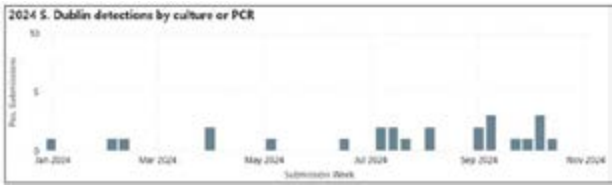
Current Disease Risks

Salmonella Dublin in 2024



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Ontario

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Current Disease Risks

Salmonella Dublin Individual Antibody Testing

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Ontario

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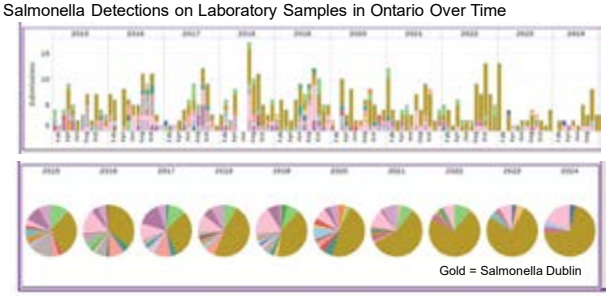
Current Disease Risks

Salmonella Detections on Laboratory Samples in Ontario Over Time



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Ontario

7

Current Disease Risks

Respiratory Pathogens

Viruses

Infectious bovine rhinotracheitis (IBR)	Bovine parainfluenza 3 (PI3)	Bovine respiratory syncytial virus (BRSV)	Bovine viral diarrhea (BVDV)	Possibly bovine coronavirus

Bacteria

Mannheimia haemolytica	*Pasteurella multocida*	*Histophilus somni*	*Mycoplasma bovis*

8

Ontario

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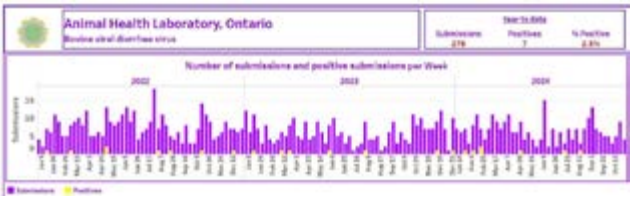
Current Disease Risks

Bovine Viral Diarrhea Virus (BVD)



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Ontario

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Current Disease Risks

Diarrhea Pathogens

- Bacteria – E.Coli, Salmonella
- Viruses – Rotavirus, Coronavirus
- Parasites – Cryptosporidium, Coccidia

10

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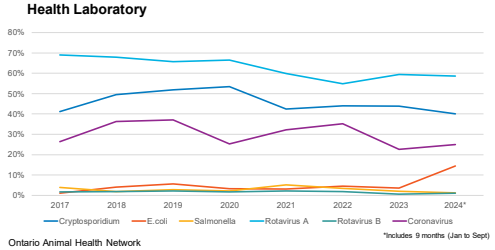
Neonatal Diarrhea

Percentage of Positive Neonatal Diarrhea Tests by Pathogen - Animal Health Laboratory



Ontario Animal Health Network

11

Ontario

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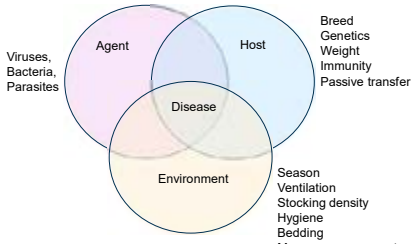
Disease Risk



12

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Practical Biosecurity

13

13

How are new disease pathogens introduced to a farm?

1. Purchase of animals carrying the pathogen
2. Biosecurity breach – vehicles, equipment, boots

Biosecurity: practices designed to prevent, reduce or eliminate the introduction and spread of disease

14

14

Best Biosecurity Practices

Purchase of animals

DAIRY
- Herds purchasing animals have a greater risk of becoming positive for S. Dublin
- Attempt to purchase from a negative herd
  - Example for S. Dublin - neg bulk tank and neg blood test is best practice

VEAL
- Minimize sources of purchase wherever possible
- Attempt to source from negative farms – bulk tank screening can be employed

15

15

Best Biosecurity Practices

Isolate new additions

DAIRY
- Animals that leave the farm and return should be segregated for 3-4 weeks

VEAL
- Segregate newly received calves from general barn population upon arrival
- Maintain stable groups (all in/all out)
- Compromised calves should be separated and treated

16

16

Best Biosecurity Practices

Biosecurity for Visitors – Other producers and professionals

- Many diseases, including *Salmonella* Dublin are transmitted through the fecal-oral route
- Contamination on boots, clothing, trailers and vehicles is a risk for introduction

DAIRY and VEAL
- Don't enter the cattle housing unless necessary
- Ensure all visitors wear clean coveralls and boots to reduce risk of contaminated manure entering the property

17

17

Best Biosecurity Practices

Biosecurity for Visitors – Other producers and professionals

- Require professional visitors to change or disinfect their boots prior to entry

Photo courtesy of Sandy Terpstra and Dr. Lisa Sharko

18

18

Best Biosecurity Practices

Sharing Equipment

Low infective dose of some diseases means an increased risk of becoming infected if your neighbour has a positive disease status – movement of people and equipment

- Shared equipment must be cleaned and disinfected prior to use
- Clean and disinfect livestock trailers
- Bring cattle out to transporters

19

19

Best Biosecurity Practices

Biosecurity Between Groups

- Designate workers to calf area only
- Designate boots to calf area only
- Disinfect boots before entering calf area

20

20

Best Biosecurity Practices

Danish Entry

Graphic from the Information Manual for Enhanced Biosecurity for Pork Production: Animals Raised Indoors

Photo courtesy of Veal Farmers of Ontario

21

21

Best Biosecurity Practices

Disinfecting boots between cows and calves

Photos courtesy of Rachel Poppe and Hillmanor Farms, Frank and Heather Louwagie

22

22

Best Biosecurity Practices

Disinfecting boots between calf groups

Photos courtesy of Karen Raftis, Mapleview Agri

23

23

Summary

- Respiratory disease and diarrhea are the most common reasons for treatment of dairy calves
- *Salmonella* Dublin has emerged as a risk for Ontario calves; now the most common Salmonella species diagnosed from cattle
- New pathogens are introduced by:
  1. Purchase of animals carrying the pathogen
  2. Introduction on vehicles, equipment, boots
- Own your biosecurity – set standards for yourself and your visitors
- Evaluate your current biosecurity and opportunities for enhancement
  - https://inspection.canada.ca/en/animal-health/terrestrial-animals/biosecurity/tools/checklist

24

24

Acknowledgements

- Producers and veterinarians that shared photos
- Hannah Golightly, Lead Veterinarian Animal Health and Welfare, OMAFA
- Ontario Animal Health Network
- Animal Health Laboratory – Ontario Interactive Animal Pathogen Dashboards

ONTARIO ANIMAL HEALTH NETWORK

IAPD

25

Ontario

25

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SINCE 1974

50 YEARS OF EXCELLENCE IN CALF NUTRITION

Your trusted calf specialists. Fuel your calves with high quality milk replacer backed by 50 years of research, knowledge and dedication to calf nutrition

Contact us today to learn how we are **more than milk replacer**

KEYNOTE PRESENTATION:

Preconditioning and early disease detection to rationalize antimicrobial use for respiratory disease

Bart Pardon, DVM, Ph.D., Associate Professor, Ghent University (Belgium)

High disease pressure and rapid spread of respiratory disease has made group antimicrobial treatments a cornerstone of calf health. How efficacious are those treatments actually? And how practical and effective could individual treatment be? What alternatives are there, such as vaccination or preconditioning, that can reduce the number of required dosages? Dr. Pardon will address these questions using the results of recent research, including lung ultrasound.

Bart Pardon obtained his DVM from Ghent University in Belgium in 2007 and has been an associate professor large animal internal medicine at the university since 2020. He is a European Board of Veterinary Specialization-recognized specialist in bovine health management and achieved his certification from the European College of Bovine Health Management in 2016. In addition to his work in the clinic, he offers herd health consulting in the areas of calf health and infectious diseases. His Ph.D. work dealt with morbidity, mortality and drug use in veal calves with emphasis on respiratory disease, and his work served as a reboot of veal calf research as it coincided with the increased pressure to reduce antimicrobial use in food animals in the European Union.

His research group works on calf health, specifically respiratory disease with a focus on improved diagnostics and decision support tools to ultimately reduce antimicrobial use. He has authored over 130 peer-reviewed publications and is a frequently asked speaker at international conferences. In 2023 he co-founded qTUS, a UGhent spin-off company bringing his work on the control of respiratory disease to practice with emphasis on training in lung ultrasonography.

Department of Internal Medicine, Reproduction and Population Medicine

PRECONDITIONING AND EARLY DISEASE DETECTION

TO RATIONALIZE ANTIMICROBIAL USE FOR RESPIRATORY DISEASE

Bart Pardon

1

RATIONAL ANTIMICROBIAL USE

- "Only animals with a bacterial pneumonia, unlikely to self cure"
- No prophylactic antimicrobial treatments (law)
- No metaphylactic antimicrobial treatments
  - Exceptions possible? (*Mycoplasma bovis*?)
  - Obligatory sampling: proof of pathogen and susceptibility?

"Production systems that are unable to keep their animals healthy and productive without the systematic or intensive use of antimicrobials will need to be 'rethought' or abandoned"

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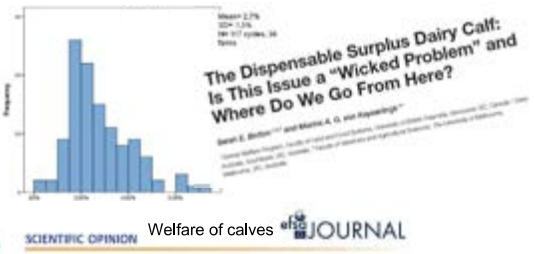
A CHANGING CONTEXT: ANIMAL WELFARE



SCIENTIFIC OPINION Welfare of calves EFSA JOURNAL

Bokma et al., JDS, 2019 4

SCIENTIFIC OPINION Welfare of calves EFSA JOURNAL

1. No individual housing (minimum in pairs)
2. Allowed minimally 24h with the cow to suckle
3. Good colostrum management → how to test/certify?
4. Housing in stabile groups, with maximum of 10 animals (?)
5. Access to rhougage of long fibre structure
6. Transport age: from 14 days → **28 days**

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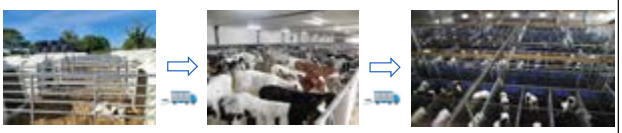
VEAL CALF SUPPLY/PRODUCTION CHAIN



Preconditioning

Stress alleviation

Disease detection
Adequate therapy
Prevention
- Barn climate
- Vaccination

6

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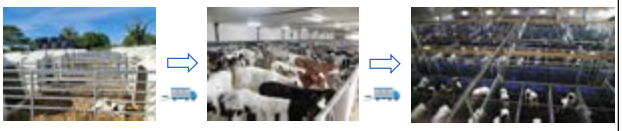
VEAL CALF SUPPLY/PRODUCTION CHAIN



Preconditioning

Stress alleviation

Disease detection
Adequate therapy
Prevention
- Barn climate
- Vaccination

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FIT FOR TRANSPORT!

1. Good body weight
2. Sufficient colostrum uptake
3. Vaccinated
4. Clinically healthy
5. No pneumonia on ultrasound
6. *M. bovis* negative farms

8

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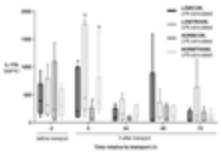
BODY WEIGHT AND PNEUMONIA





CHECKED

< 46 kg , , transported
increased WBC, TNF-α, IL-17a

- Body weight better linked then a body condition score
- > 51 kg for a 2-3 week old Holstein → 0.3 x lower odds for clinical BRD
- Body weight has an association, but is NOT a diagnostic test!

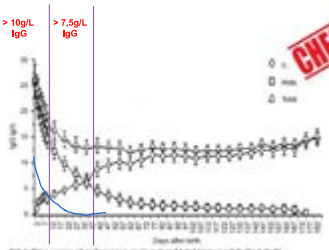
Bracic et al., JDS, 2012; Masmeijer et al., PVM, 2019; Renaud and Pardon, Vet Clin N Am Food Anim 2023 9

9

COLOSTRUM UPTAKE-

- Calf with FTP
  → 1.75 higher odds for BRD
  → 1.5 times higher odds for mortality

< 1 week: brix or protein refractometry, electrophoresis or antibody ELISA
1-3 weeks: only electrophoresis or antibody ELISA possible



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Hessig et al., Vet Rec, 2007; Pardon et al., 2015; Raboisson et al., Plos One, 2016 10

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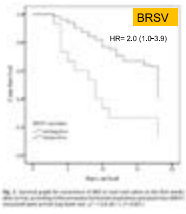
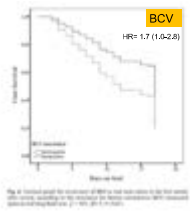
ANTIBODIES AGAINST RESPIRATORY PATHOGENS UPON ARRIVAL

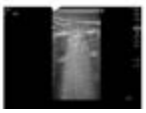




10% seronegative upon arrival

25% seronegative upon arrival

CHECKED



BRSV antibodies → OR= 0.58
BCV antibodies → OR= 0.37

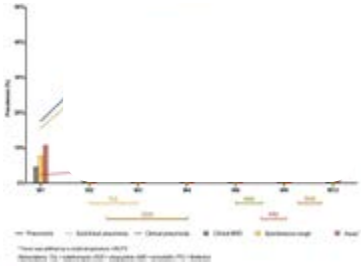
Stimulus for vaccination on the farms of origin!

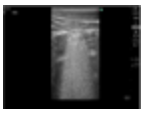
Pardon et al., PVM, 2015; Lowie et al., JDS 2024 11

11

UPON ARRIVAL

qTUS follow-up of 295 **veal** calves during ***Mycoplasmopsis bovis*** outbreak




Jourquin et al., 2022, JDS 12

12

NO PNEUMONIA ON (Q)TUS BEFORE TRANSP T

- Upon arrival
- 2-3 weeks old: 17-19% of calves already has lung consolidation > 1 cm upon arrival
- 88% was subclinical

- ADG 66 g
- OR to deve pneumonia= .-8.6)
- Chronic pneumonia → on average 10.3 kg carcass weight loss

CHECKED

TIJS CERTIFIED

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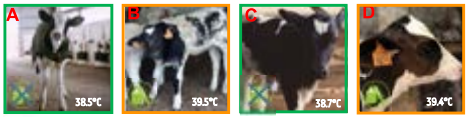
WHICH CALF NEEDS ANTIMICROBIALS?



Clinical signs

Diseased

"Healthy"

15

15

VEAL CALF SUPPLY/PRODUCTION CHAIN



Preconditioning

Stress alleviation

Disease detection
Adequate therapy
Prevention
- Barn climate
- Vaccination

14

14

GAMECHANGER: (QUICK)THORACIC ULTRASONOGRAPHY

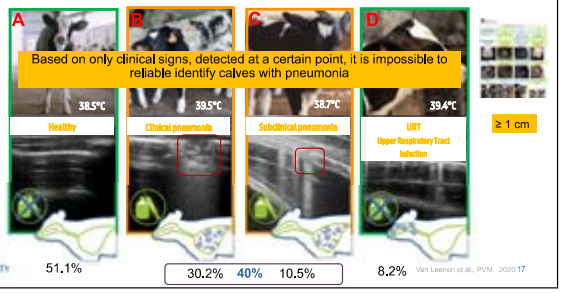
- Alcohol (no shaving)
- 2-3 min. / calf
- Devices already available (reproduction)

Most reliable tool to detect pneumonia:
Se = 79.4 – 90.9% (**85%**)
Sp = 93.9 – 97.6% (**95%**)

Buczinski et al., 2015; Ollivet et al., 2016; Pardon, 2019; Masset et al., 2022; Pravottoni et al., 2021 16

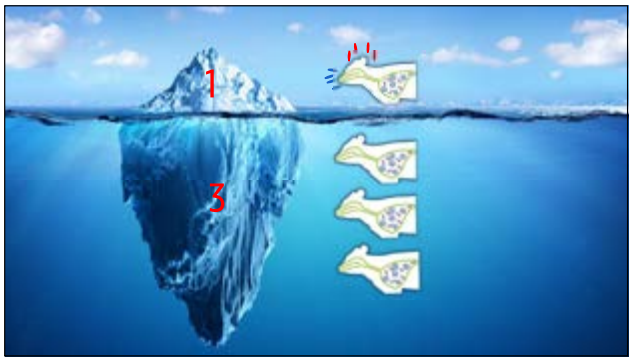
16

WHICH CALF HAS PNEUMONIA?



Van Leenen et al., PVM, 2020 17

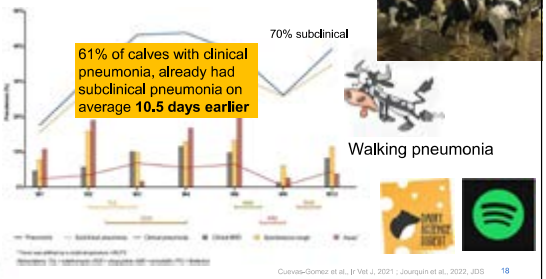
17



19

SUBCLINICAL PNEUMONIA

qTUS follow-up of 295 **veal** calves during ***Mycoplasmopsis bovis*** outbreak



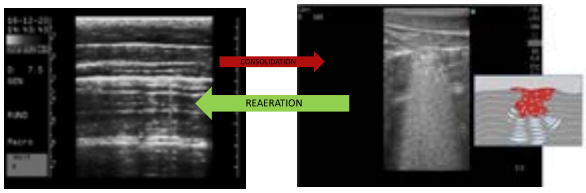
Walking pneumonia

Cuevas-Gomez et al., Ir Vet J, 2021 ; Jourquin et al., 2022, JDS 18

18

DEFINITION OF CURE

Lung reaeration as cure criterion



Healthy lung tissue

Lung consolidation ≥ 1cm in depth = Pneumonia

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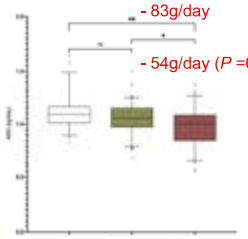
FULL CURE → NO WEIGHT LOSS



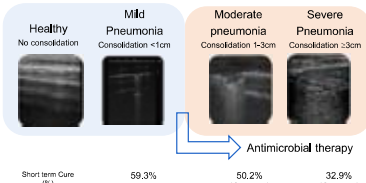
Chronic pneumonia= on average 10.3 kg lower carcass weight

Compensatory growth? More feed required?

Jourquin et al., 2022, JDS 21

21

QTUS SCORE

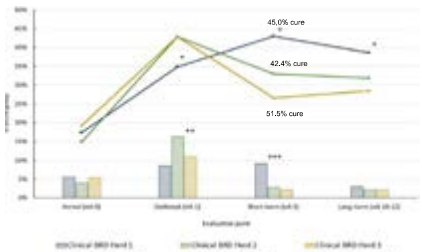


https://www.qtus-vet.com/for-farmers

Jourquin et al., JDS, in review 23

23

THERAPY FAILURE IN VEAL CALVES

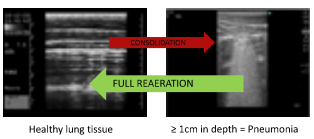


Jourquin, Ph.D, 2024 22

22

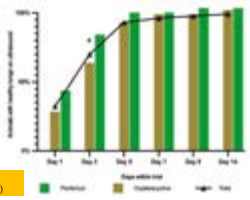
(Q)TUS IN OUTBREAK MANAGEMENT

qTUS follow-up of 130 Belgian blue **beef** calves during *M. bovis* outbreak
Metaphylaxis → individualised therapy length



Healthy lung tissue

≥ 1cm in depth = Pneumonia



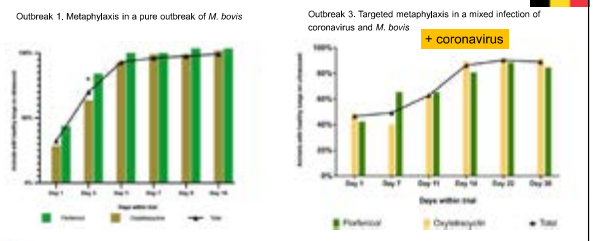
Average treatment length: FF: 2.5 days; OTC: 3.1 days
Reduction in ab use compared to a 7-day metaphylaxis: -64.5% (FF); 50% (OTC)

94.4% cure

Jourquin et al., JVIM, 2022 24

24

THERAPY FAILURE IS AN ISSUE



Cure day 7 = 94.4%
Cure day 14 = 98.2%
New cases: 0

Cure day 7 = 49.3%
Cure day 14 = 80%
New cases: 15

Jourquin et al., JVIM, 2022; Jourquin, Ph.D 2024

25

25

CONTEXT IS EVERYTHING

Diagnostics

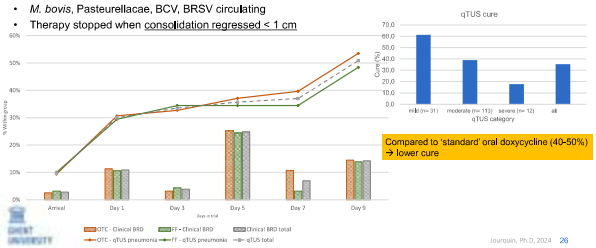
PCR Sequencing Culture

27

27

QTUS GUIDED AB TREATMENT IN VEAL CALVES

- 320 veal calves; 212 cases of pneumonia
- Randomised clinical trial
- Oxytetracycline vs. florfenicol
- *M. bovis*, Pasteurellacae, BCV, BRSV circulating
- Therapy stopped when consolidation regressed < 1 cm



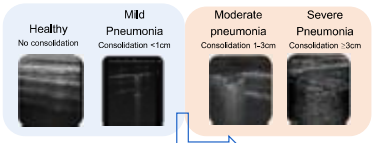
Compared to 'standard' oral doxycycline (40-50%) → lower cure

Jourquin, Ph.D, 2024

26

26

QTUS SCORE



Antimicrobial therapy

Short term Cure (%)	59.3%	50.2% (OR= 0.6)	32.9% (OR= 0.3)
Therapy length	4 days	6 days	8 days

Early detection, short therapy length, better cure!

https://www.qtus-vet.com/for-farmers

Jourquin et al., JDS, in review

28

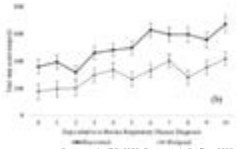
28

AND SENSOR TECHNOLOGY?

- Calves with pneumonia had
  - Lower milk intake
  - Lower starter intake
  - Longer lying time
  - More lying bouts
  - Less steps
  - Lower activity index
  - No effect on unrewarded or rewarded visits

Without Se? Sp? → no diagnostic test

Recovery? → Changes in drinking speed, starter intake and lying time

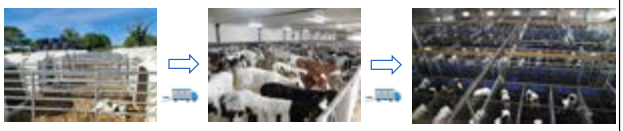


Cantor et al., JDS, 2022; Cantor et al., Sci Rep, 2022

29

29

VEAL CALF SUPPLY/PRODUCTION CHAIN



Preconditioning | Stress alleviation | Disease detection, Adequate therapy, Prevention
- Barn climate
- **Vaccination**

31

31

DIAGNOSTIC CHAIN TO TREATMENT

Screening test (high SE)

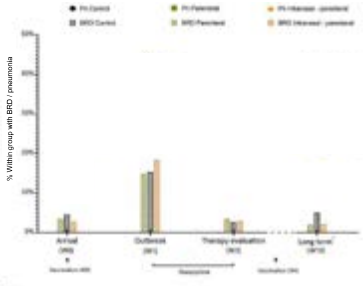
Confirmation test (high SP)

'One cough is enough'

30

30

AND VACCINATION UPON ARRIVAL?



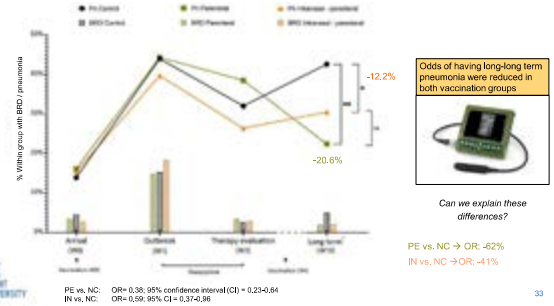
No effects on development of clinical signs of BRD

Jourquin et al., JDS, 2023

32

32

AND VACCINATION UPON ARRIVAL?



Odds of having long-long term pneumonia were reduced in both vaccination groups

Can we explain these differences?

PE vs. NC → OR: -62%
IN vs. NC → OR: -41%

PE vs. NC: OR= 0,38; 95% confidence interval (CI) = 0,23-0,64
IN vs. NC: OR= 0,59; 95% CI = 0,37-0,96

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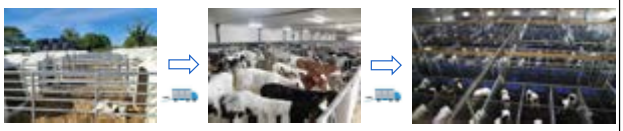
33

VEAL CALF SUPPLY/PRODUCTION CHAIN



Preconditioning

Stress alleviation

Disease detection
Adequate therapy
Prevention
- **Barn climate**
- Vaccination

35

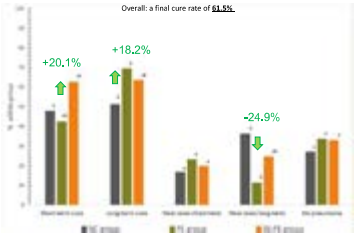
35

Mycoplasmopsis bovis
Pasteurella multocida

BRSV
Bovine coronavirus
(pooled sample – nanopore sequencing)

Better protected against secondary infections with Pasteurellaceae and/or *Mycoplasma bovis*?

Overall: a final cure rate of 61.5%



PE group vs NC group:
Long-term cure → (OR = 2.2; 95% CI = 1.1-4.1; *P = 0.02*)
Long-term new cases → (OR = 0.22; 95% CI = 0.09-0.57; P = *0.002*)

34

34

(Q)TUS FOR BARN CLIMATE EVALUATION

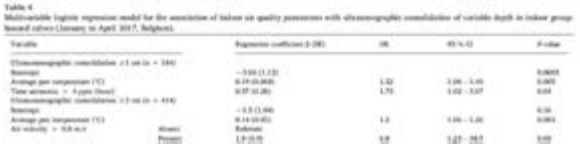
What should we measure?

36

36

ASSOCIATIONS WITH PNEUMONIA

- 428 calves from 60 dairy and beef herds
- Clinical score, TUS, BALf cytology and bacteriology



Ammonia→ 24h measurements (4 ppm)
Wind speed → single measurement (> 0.8 m/s)
Bacterial air load → no effect

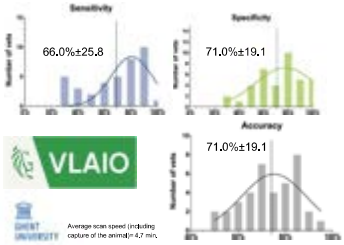
van Leenen et al., PVM, 2020 37

37

37

(Q)TUS REQUIRES TRAINING (AND CERTIFICATION)

43 practitioners



Interested in learning qTUS?

www.qTUS-vet.com

Average scan speed (including capture of the animal)= 4,7 min.

Jourquin et al., Vet Rec, 2024 39

39

FINE DUST IN CALF BARNS

- 24 dairy and 23 beef farms (339 calves)

Particulate matter diameter	Mean concentration (µg/m³)		Lung consolidation ≥ 1 cm	Lung consolidation ≥ 3 cm
PM_{10}	70.3 ± 54.5	(1.6-251.2)		
$PM_{2.5}$	25 ± 25.3	(0.50-144.9)		
⇨ $PM_{1.0}$ (> 49.1 µg/kg)	16.3 ± 17.1	(0.20-771)	OR= 3.3 (1.5- 7.1)	OR= 2.8 (1.2-7.1)
⇨ Endotoxin* (> 8.5 EU/µg)	4.2 ± 5.8	(0.03-30.3)	OR= 2.6 (3.4-58.8)	OR= 1.9 (1.7-27.0)

*of PM_{10} fraction
Human limits: PM_{10} < 50 µg/m³ ?

PM also associated with neutrophilia and isolation of *Pasteurella multocida*

Consistent association of very fine dust and endotoxin with pneumonia

van Leenen et al., JDS, 2021 38

38

38

CONCLUSIONS

Thoracic ultrasonography (q)TUS

- Clarified importance of subclinical pneumonia
- Offered a criterion for cure, hence therapy fail
- qTUS guided antimicrobial therapy
  → Precision medicine
  (context is
  →
- Refe
- Key-

TUS has the potential to make a calf health, sustainability and welfare label 'transparant'

use
better cure
evelopment
acy studies for antimicrobials, NSAIDs and v
ines,…

40

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FIT FOR TRANSPORT!

1. Good body weight
2. Sufficient colostrum uptake
3. Vaccinated
4. Clinically healthy
5. No pneumonia on ultrasound
6. *M. bovis* negative farms

41

41

Prof. Dr. Bart Pardon
Veterinarian, Ph.D, Dip. ECBHM

Calf Health Research Group
Clinic for Ruminants

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www.ECBHM.org

www.qTUS-vet.com

42

Optimizing phase feeding in the postnatal period to prevent scours

sponsored by: SCCL SCIENCE • NATURE • CARE We are colostrum

Dr. Mike Nagorske, Saskatoon Colostrum Company Ltd

Diarrhea in pre-weaned calves is a multifactorial disease that is contracted due to a combination of environmental, management, and pathogenic factors. This is one of the reasons why it is the primary cause of morbidity and mortality as well as one of the leading causes of antimicrobial therapy in dairy calves.

Alone, diarrhea can have short-term and long-term consequences related to health, welfare and productivity. Additionally, the use of antimicrobials can negatively affect the calf's gut microbial communities, leading to diminished immune function. This combination, paired with concerns related to antimicrobial resistance, justifies the need for alternate diarrhea therapies for calves.

Michael Nagorske grew up on a grain and cattle farm in southwestern Minnesota which continues to consist of corn, soybeans, and a registered Angus seed-stock business. He attended the University of Minnesota where he received his DVM and B.Sc. in Veterinary Science. During his veterinary studies, he completed the Dairy Production Medicine course at the University of Minnesota, which serves as the National Center of Excellence in Dairy Veterinary Medicine in the United States.

He has a strong passion for the continuous improvement of maximizing genetic potential in young calves through nutrition and disease mitigation, and he enjoys challenges related to calf health and nutrition in beef and dairy operations. As Director of Research for Saskatoon Colostrum Company Ltd., it is his standard to use evidence-based approaches for solutions, as well as challenge and influence research to provide the best answers for producers' problems.

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SCCL

SCIENCE ◆ NATURE ◆ CARE

We are colostrum

Optimizing Phase Feeding in the Postnatal Period to Prevent Scours

Dr. Mike Nagorske
Director of Research, SCCL


Nagorske Brothers

P3 Angus

Dr. Mike Nagorske
Director of Research, SCCL
Windom, MN


MY BIAS COMING OUT OF VET SCHOOL






RAISING CALVES W/OUT VACCINES




TRANS OVA genetics

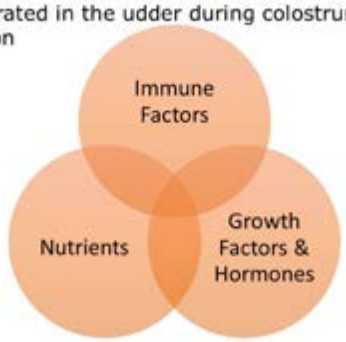
MY BIAS NOW: COLOSTRUM + NUTRITION

THE NON-OBVIOUS

The Most Unique Substance known…. BOVINE COLOSTRUM…..What's In it?…What's the Non-Obvious?

BEYOND IGG

Thousands of beneficial factors are also concentrated in the udder during colostrum formation

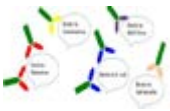


>170 now identified

Oligosaccarides (prebiotics):

Antimicrobials:

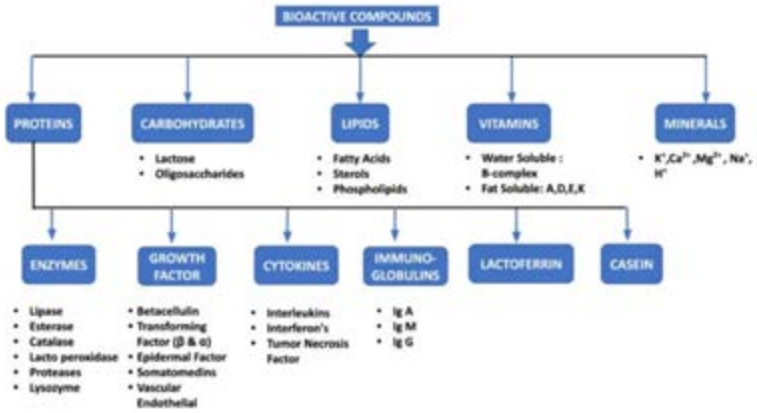
IgG:

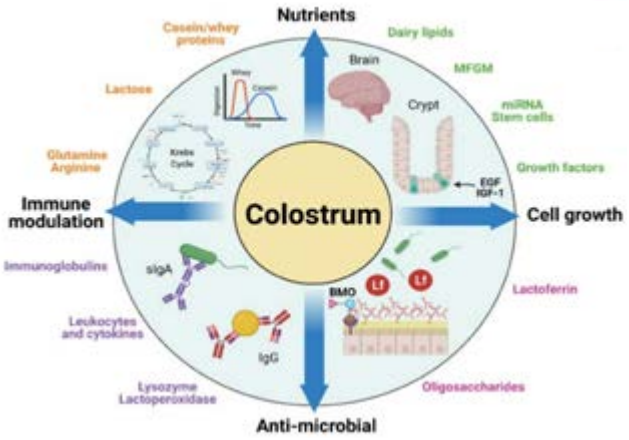


WHAT IS COLOSTRUM?

Immune Factors and Growth Hormones:

Fat:

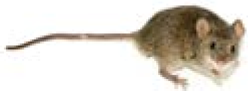


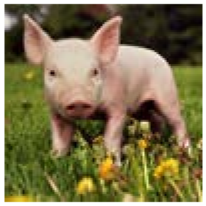


Examples of colostrum/trans milk biologically active factors (CBAF's)

Anti-microbials	Immuno-stimulants	Pro-metabolics	Anti-oxidants/ Anti-imflammatory
Lactoferrin	Cytokines	EGFs	Catalase
Lactoperoxidase	Interferons	Betaceluline	Lactoperoxidase
Lisozynme	Lactoalbumin	TGFs	Lactoferrin
Antibodies	Prolactin	IGFs	TGF α and β
	Cytokine antagonist	Prolactin, Relaxine	TNF receptor

IF COLOSTRUMS only Gift was IgG….
Then WHY is it so beneficial…





Filipescu IE, et al. Preventive effects of bovine colostrum supplementation in TNBS-induced colitis in mice PloS one. 2018;13:e0202929. doi: 10.1371/journal.pone.0202929. [PMC free article] [PubMed] [CrossRef] [Google Scholar]

"Mice administered with Bovine Colostrum **showed a reduction of intestinal damages and clinical signs of colitis** induced by 2,4,6 trinitrobenzene sulfonic acid. Accordingly, TLR4, IL-1β, IL-6 and IL-10 were downregulated."

Lo Verso L, Matte JJ, Lapointe J, Talbot G, Bissonnette N, Blais M, Guay F, Lessard M. Impact of birth weight and neonatal nutritional interventions with micronutrients and bovine colostrum on the development of piglet immune response during the peri-weaning period. Vet Immunol Immunopathol. 2020 Aug;226:110072. doi: 10.1016/j.vetimm.2020.110072. Epub 2020 Jun 13.

… CD3−CD8α+CD16+ leukocytes (which include Natural killer cells) and lower jejunal expression of IL18. Furthermore, supplementation with BC increased the blood percentage of CD3−CD16+ leukocytes and reduced jejunal IL5 and MLN IL15 expression whereas supplementation with ADCu + BC increased jejunal TNF superfamily 13B and MLN SPP1 expression. **Our results suggest that immune system development after birth differed between LBW and HBW piglets and that early dietary supplementation with BC and ADCu has the potential to modulate development of immune functions.**

Wong EB, Mallet JF, Duarte J, Matar C, Ritz BW. Bovine colostrum enhances natural killer cell activity and immune response in a mouse model of influenza infection and mediates intestinal immunity through toll-like receptors 2 and 4. Nutrition research (New York, N.Y.) 2014;34:318–325. doi: 10.1016/j.nutres.2014.02.007. [PubMed] [CrossRef] [Google Scholar]

"Colostrum supplementation **enhanced NK cell cytotoxicity and promoted immune response to primary influenza virus infection in mice**. Compared with milk supplement, colostrum supplement treated mice had an increase in IL-6 production, as well as IgA production derived from B cells in small intestine and lung."

Sun, J. et al. Human Milk Fortification with Bovine Colostrum Is Superior to Formula-Based Fortifiers to Prevent Gut Dysfunction, Necrotizing Enterocolitis, and Systemic Infection in Preterm Pigs. *JPEN. Journal of parenteral and enteral nutrition*, 10.1002/jpen.1422 (2018). [PubMed]

"Even in preterm pigs, BC formula was advantageous in the **prevention of gut dysfunction, necrotizing enterocolitis, and systemic infection**……. **There might be an interaction between Bovine Colostrum and immunity at the intestinal epithelium"**

Ji Li,1 Yi-Wen Xu,1 Jing-Jing Jiang,1 and Qing-Kun Song2,3. Bovine colostrum and product intervention associated with relief of childhood infectious diarrhea. Sci Rep. 2019; 9: 3093. Published online 2019 Feb 28. doi: 10.1038/s41598-019-39644-x

"Under a pooled analysis, **bovine colostrum consumption** correlated with a **significant reduction in stool frequency** of infectious diarrhea, **by 1.42 times per day** (95% CI, −2.70, −0.14). **Bovine colostrum intervention also reduced occurrence of diarrhea by 71%** (pooled OR = 0.29; 95%CI 0.16, 0.52).

Each year, more than 750 million children under five years are affected by acute diarrhea worldwide

Under the systematic search, five randomized control trials (RCTs) were included into this meta analysis. 320 children were analyzed to evaluate the effects of BC (products) on the outcomes of infectious diarrhea, in terms of stool frequency, occurrence of diarrhea and detection of pathogen in the stool. Compared with placebo, **BC products were effective to reduce frequency of stool, occurrence of diarrhea at the end of intervention and positive detection of rotavirus and E. coli in stool.**

Children received a four-week BC treatment and presented a **significant reduction in the episodes of respiratory tract infection, diarrhea and hospitalization** …… **Even in randomized control trials (RCTs), Bovine Colostrum showed a protective effect on upper respiratory tract infection?"……"**

Saad K, Abo-Elela MG, El-Baseer KA, Ahmed AE, Ahmad FA, Tawfeek MS, El-Houfey AA, AboulKhair MD, Abdel-Salam AM, Abo-Elgheit A, Qubaisy H, Ali AM, Abdel-Mawgoud E Effects of bovine colostrum on recurrent respiratory tract infections and diarrhea in children. Medicine (Baltimore). 2016 Sep;95(37):e4560. doi: 10.1097/MD.0000000000004560. PMID: 27631207; PMCID: PMC5402550

Background: **Bovine colostrum (BC) has direct antimicrobial and endotoxin neutralizing effects throughout the alimentary tract, as well as other bioactivities that suppress gut inflammation and promote mucosal integrity and tissue repair under various conditions related to tissue injury.** The precise role of BC in respiratory and gastrointestinal (GI) infections in children is not well defined. The aim of this study was to evaluate the efficacy and tolerability of BC administration in preventing recurrent upper respiratory tract infections (URTI) and diarrhea in children.

Results: From a total number of 160 children, 81 patients (50.63%) were males. The mean age (± SD) was 3.85 (± 2.03) years. The mean (± SD) total number of infections was significantly decreased after BC therapy from 8.6 ± 3.3 at baseline to 1.3 ± 0.2 after 2 months (P < 0.001) and to 1.7 ± 1.4 after 6 months (P < 0.001). The mean (± SD) total number of URTI (P < 0.0001), number of episodes of diarrhea (P < 0.001), and number of hospital admissions (P < 0.001) were significantly decreased after BC therapy.

Conclusion: **BC is effective in the prophylaxis of recurrent URTI and diarrhea as it reduces the number of episodes and the hospitalization due to these infections.** Results of this study suggest that BC could be provided as a therapeutic option for children with recurrent URTI and diarrhea.

Plettenberg A, Stoehr A, Stellbrink HJ, Albrecht H, Meigel W. A preparation from bovine colostrum in the treatment of HIV-positive patients with chronic diarrhea.

Jones AW, March DS, Curtis F, Bridle C. Bovine colostrum supplementation and upper respiratory symptoms during exercise training: a systematic review and meta-analysis of randomised controlled trials BMC Sports Sci Med Rehabil. 2016 Jul 26;8:21.

"Data on 11 week follow-up period, **bovine colostrum** supplementation when compared to placebo **significantly reduced the incidence rate of URS days** … **and URS episodes** … **44 and 38 % respectively**."

Shing CM, Jenkins DG, Stevenson L, et al. The influence of bovine colostrum supplementation on exercise performance in highly trained cyclists

Ungar BL, Ward DJ, Fayer R, Quinn CA. Cessation of Cryptosporidium-associated diarrhea in an acquired immunodeficiency syndrome patient after treatment with hyperimmune bovine colostrum.

Otto, Wlodzimierz et al. "Randomized control trials using a tablet formulation of hyperimmune bovine colostrum to prevent diarrhea caused by enterotoxigenic Escherichia coli in volunteers."

Halasa, Maciej et al. "Oral Supplementation with Bovine Colostrum Decreases Intestinal Permeability and Stool Concentrations of Zonulin in Athletes."

PREVENTION IS THE DAUGHTER OF INTELLIGENCE

Walter Raleigh

THE "Situation" is ALREADY HERE

Diarrhea and other digestive problems accounted for more than 56 percent of pre-weaned heifer deaths!

NAHMS, 1996, 2002, 2007, 2014

Respiratory DISEASE

- #2 cause of mortality in pre-weaned dairy calves – incidence has not decreased in the last 20 years
- BRD continues to be the leading cause of calf mortality in the beef industry

Lung consolidation and *first-lactation milk production*

- Heifer calves (n = 215) from 3 herds in Ontario, Canada
- Enrolled and assessed weekly during the first 8 weeks of life
- ≥ 3 cm consolidation
- Presence of lung consolidation at least once resulted in:
  - 525 kg (95% CI: -992.81 to -60.25) decrease in first-lactation milk production

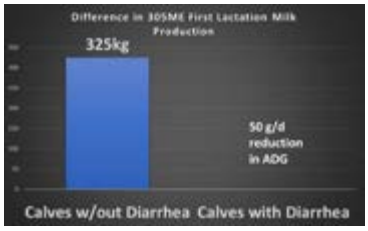
Dunn et al., 2018

1157 LBS

Preweaning Diarrhea… WHO CARES?

715 lbs

Dairy Comp 305 records from birth to first lactation on a 3500 Holstein herd in Michigan



.11 lbs

Abuelo, A., F. Cullens, L. Brester. 2021. Effect of preweaning disease on the reproductive performance and first-lactation milk production of heifers in a large dairy herd. J. Dairy Sci. 104 (In Press). https://doi.org/10.3168/jds.2020-19791

Preweaning Diarrhea… WHO CARES?

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Average Dairy Gain …. Does it affect Future Milk Production?

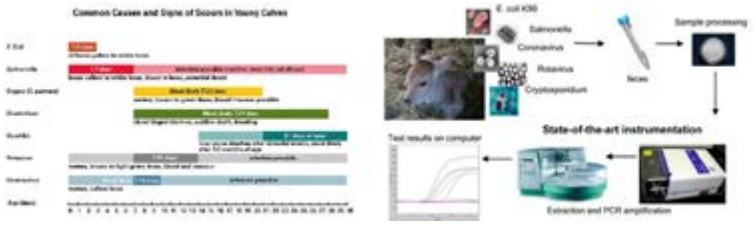
+100 g preweaning ADG = +155 kg milk produced in first lactation

+0.2 lb increase in Preweaning ADG = 340 lbs milk produced in first lactation

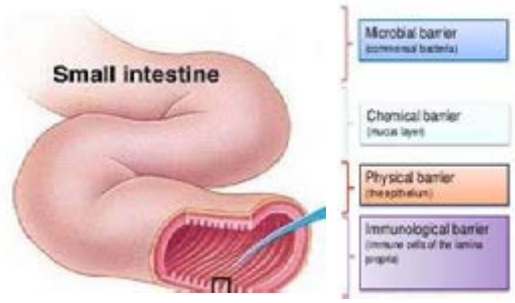
……. Numerous Studies say……..

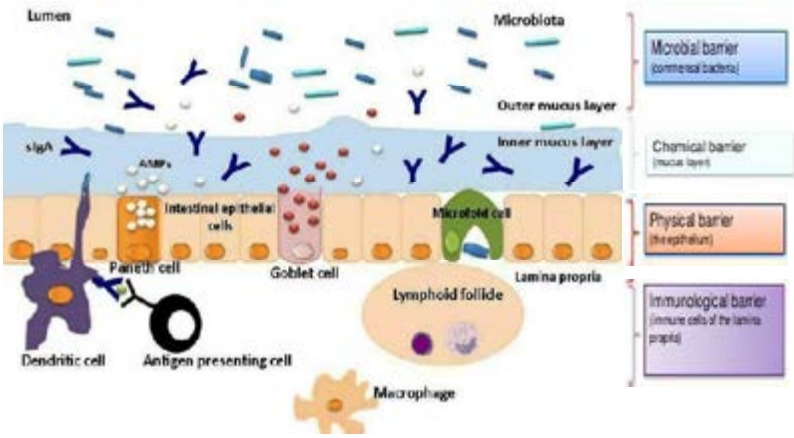
Study	Milk yield, kg
Foldager and Krohn, 1991	1,405[s]
Bar-Peled et al., 1998	453[l]
Foldager et al., 1997	519[l]
Ballard et al., 2005 (@ 200 DIM)	700[s]
Shamay et al., 2005 (post-weaning protein)	981[s]
Davis-Rincker et al., 2011	416[ns]
Drackley et al., 2007	835[s]
Raith-Knight et al., 2009	718[ns]
Terre et al., 2009	624[ns]
Morrison et al., 2009 (no diff. calf growth)	0[ns]
Moallem et al., 2010 (post-weaning protein)	732[s]
Soberon et al., 2012	552[s]

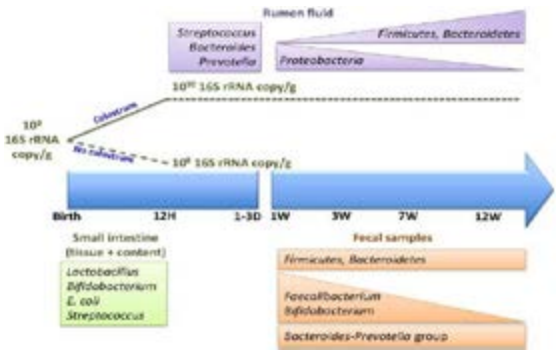
Is The Key to Calf Scours Pathogen related?



The Non-Obvious….Gut Development!







(Malmuthuge et al., 2015)

ANTIBIOTICS ON DIARRHEA

• NO EFFECT ON DECREASING CALF DIARRHEA

- Diarrhea rates actually increased in some studies
  - Calves fed medicated milk replacer had 31% more days with diarrhea than normal MR fed calves (Berge et al 2009)
- No difference in average daily gain, feed efficiency or proportion of calves treated for diarrhea
  - (Higginbotham et al 2010; Donovan et al 2002)

75% of calves with diarrhea are treated with antimicrobial

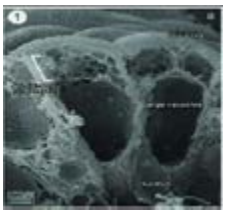
87% of the calves in the study were infected with pathogens not susceptible to antibiotics

Carter, H.S.M.; Renaud, D.L.; Steele, M.A.; Fischer-Tlustos, A.J.; Costa, J.H.C. A Narrative Review on the Unexplored Potential of Colostrum as a Preventative Treatment and Therapy for Diarrhea in Neonatal Dairy Calves. *Animals* **2021**, *11*, 2221.

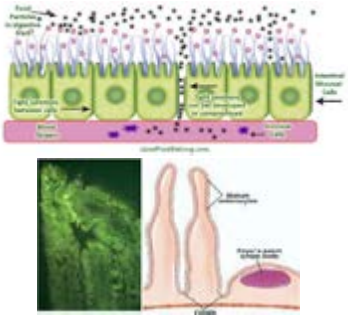
ANTIBIOTICS ON DIARRHEA

What About Hospital Milk?...Dysbiosis… Gut Permeability?

MATURATION OF GI TRACT- PHYSICAL BARRIER



Gut closure at 24 hrs and then maturation from fetal to adult-like enterocytes over longer period of time

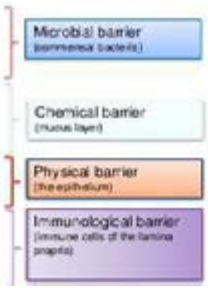


Guilloteau, P., R. Zabielski, J.W. Blum. 2009. Gastrointestinal tract digestion in the young ruminant: ontogenesis, adaptations, consequences and manipulations. J. Physiol. Pharmacol. 60:37-46.

HOW TO MITIGATE DISEASE AND PROMOTE GASTROINTESTINAL HEALTH

A suggested solution:

- **Probiotics**
- **Prebiotics**
- **Antibiotics**
- **Antibody Products**
- **Egg antibodies**
- **Vitamin/Mineral packs**



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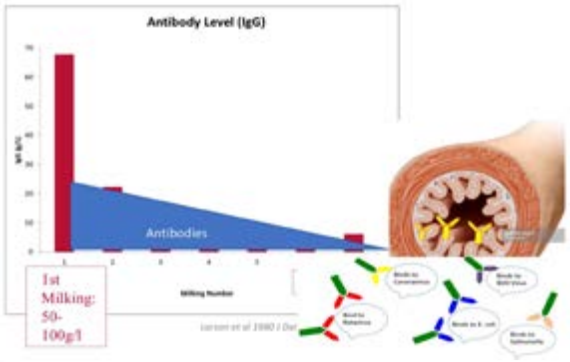
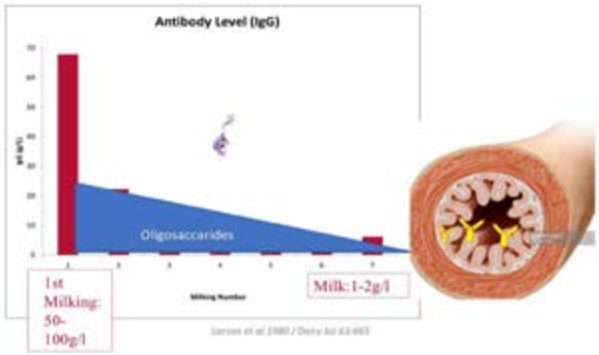
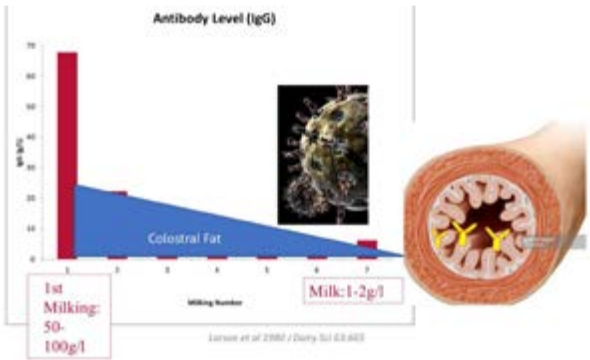
WHAT IS TRANSITION MILK?



WHAT IS TRANSITION MILK?



WHAT IS TRANSITION MILK?



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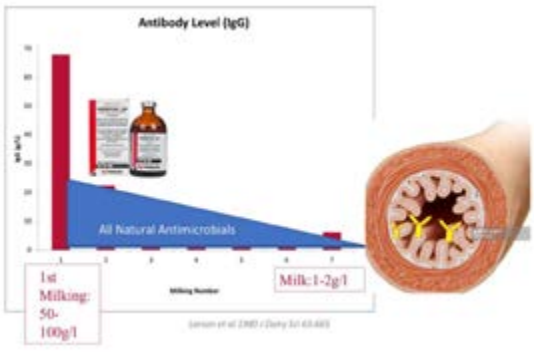
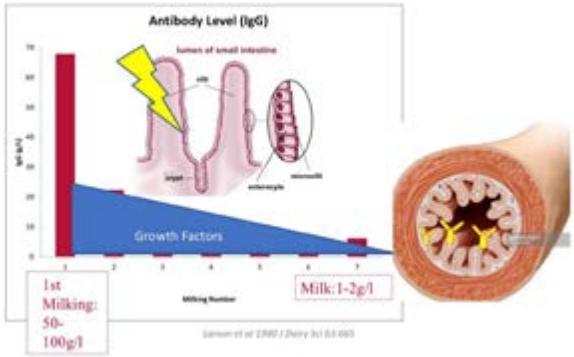


WHAT IS TRANSITION MILK?



WHAT IS TRANSITION MILK?

HOW TO MITIGATE DISEASE AND PROMOTE GASTROINTESTINAL HEALTH

Colostrum/Transition Milk Components support all layers

Immunoglobulins:
– IgG, IgA, IgM

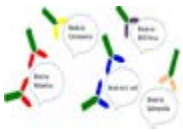
Oligosaccarides:
– Serve as pre-biotics for Good microbes…

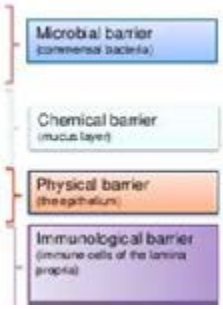
Fat:
-Colostral fat and Sialic acid

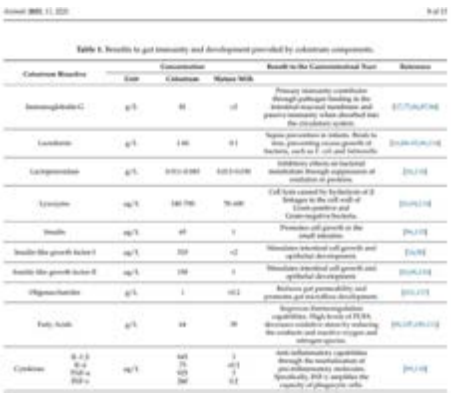
Antimicrobial agents:
– lactoferrin, lysozyme, lactoalbumin--- fight pathogens

Growth Factors and Immune stimulants:

HUMANS???







NEW APPLICATIONS

PREVENTION

TREATMENT

Post day One Colostrum, Is there Evidence this idea really works?

SCCL
SCIENCE • NATURE • CARE

"Post day one" milk replacer supplemented with colostrum replacer

- On farm field trial
- Excellent passive transfer
- 150 g of colostrum replacer delivered twice per day
- 14 days of feeding

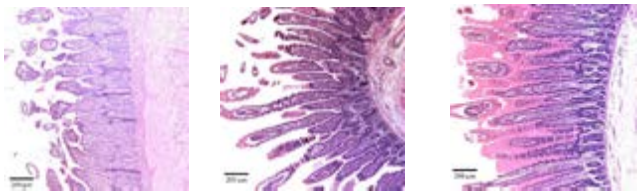
Group	Abnormal manure	Respiratory disease	Depression	Abnormal navel
Milk replacer	87%	54%	78%	73%
Supplemented with colostrum*	13%	46%	22%	27%
Risk reduction when adding colostrum	85%	64%	79%	72%

Antibiotic use in supplemented calves was 57.7% Lower

Chamorro et. al J Dairy Sci. 2017 Vol 100 (2) .....

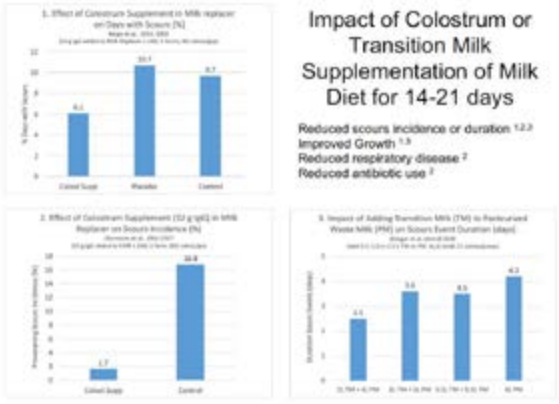
FROM COLOSTRUM TO MILK- PD1 USE

- All calves fed one meal of colostrum followed by:
  - Milk
  - 50% milk/ 50% colostrum (Transition)
  - Colostrum



Milk **50% /50%** **Colostrum**

(Pyo et al., 2020)



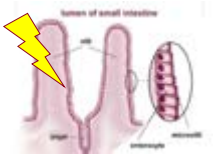
Impact of Colostrum or Transition Milk Supplementation of Milk Diet for 14-21 days

Reduced scours incidence or duration [1,2,3]
Improved Growth [1,3]
Reduced respiratory disease [2]
Reduced antibiotic use [2]

Influence of Colostrum Bioactives on morphology and maturation of intestinal epithelium

Parmeter	Without colostrum extract	With colostrum extract	P value
Villus circunference (µm) x 10	105 + 3	120 ± 5	<0.05
Villus hight (µm) x 10	43 + 2	50 + 3	<0.05
Crypt depth (µm) x 10	13 + 1	15 + 1	NS
Submucosal thiknes (µm) x 10	46 + 10	44 +10	NS

IGF-1



*villus circumferences, heights in small intestine, and epithelial cell proliferation rate were higher in calves fed the colostrum extract than in controls

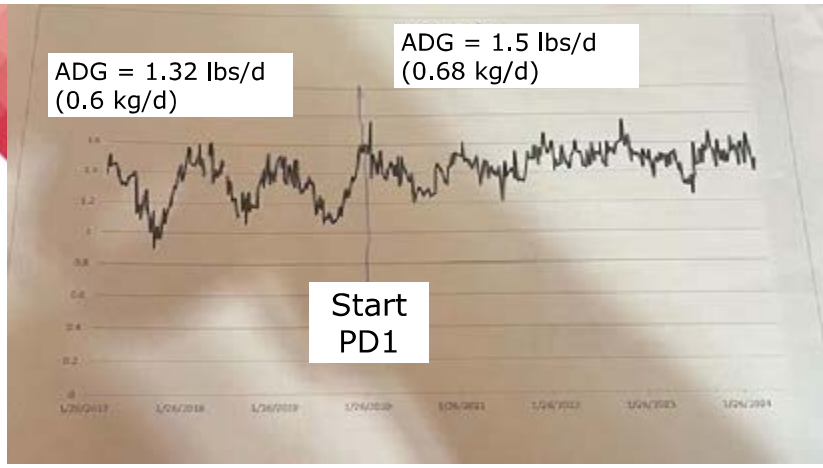
Roffer B. et al. 2003 J. Dairy Sci. 86:1797-1806

Preventing Calf Scours Through Advancements in Phase Feeding Strategies... Implementing PD1

Setting Expectations: Example 4,000 cow Dairy AZ

Setting Expectations: Example 4,000 cow Dairy AZ

	Dry Basis	As Received	
Moisture, Karl Fischer		88.60	%
Dry Matter		11.40	%
Protein, Crude	30.79	3.51	%
Fiber, Crude		Less than 8.2	%
NEL: Net Energy-Lactation	0.95	0.11	Mcal/lb
NEG: Net Energy-Gain	0.73	0.08	Mcal/lb
NEM: Net Energy-Maintenance	1.06	0.12	Mcal/lb
TDN: Total Digestible Nutrients	90.17	10.28	%
Fat By Acid-Hydrolysis	15.18	1.73	%
Ash	5.96	0.68	%
NFE-Nitrogen Free Extract	47.98	5.47	%
Lactose	38.6	4.4	%



How do you implement a PD1 Protocol?

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Transition

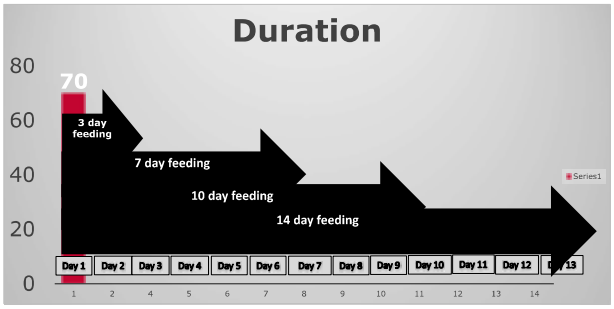
- Adding colostrum powder to the calf's whole milk or milk replacer diet for the first two weeks
- Maintains gut health
- Improves overall health and performance

Health Challenge Level	Feeding Recommendation	Duration
LOW CHALLENGE <5% Mortality	70g powder/ day	10 days
MODERATE CHALLENGE 5-8% Mortality	95g powder/ day	12 days
HIGH CHALLENGE >8% Mortality	120g powder/ day	14 days

Transition

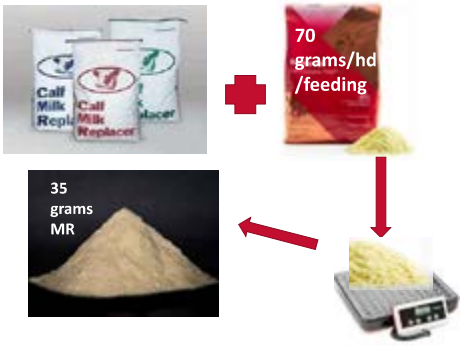
Days 2-14

Health Challenge Level	Feeding Recommendation	Duration
LOW CHALLENGE *<5% Mortality*	**70 g powder/day**	10-14 days
MODERATE CHALLENGE *5-8% Mortality*	**90 g powder/day**	7-14 days
HIGH CHALLENGE *>8% Mortality*	**120 g powder/day**	7-14 days



1. Dose X Duration: The shorter the duration, the heavier the dose…
2. Dose X Duration: Length of feeding usually always wins (12 days is ideal)
3. There is an advantage to feeding calves with high rates of FPT

Substituting colostrum powder for MR powder….



Mixing with Milk Replacer or Balancer

1. Bring Temp of water to **110-115 degrees F**
2. Deliver Weighed colostrum powder into water
3. Deliver Weighed amount of MR (with substituted weight taken out)…ex- If you add 70 grams of colostrum powder per hd, take out 70 grams of milk replacer powder per head

Do's and Don'ts…. But OVERALL Phase Feeding works

Dos'

- Feed Pasteurized Whole milk or Skim based/high quality MR for 10-14 days
- Test milk feeding program and maternal colostrum
- Perform milk replacer mixing audit
- Feed colostrum powder 90 grams/hd d (100-120 for stress times)

Don'ts

- Feed hospital milk (until 3wks old)
- Feed poor quality MR
  - Soy is not digestible
  - Whey protein concentrate should not be a primary ingredient
- Expect things to turn around fast
- Chase calf diseases with vaccines, products and additives against specific Pathogens unless proven research

Do's and Don'ts…. But OVERALL Phase Feeding works

Dos'

- Push Solid levels as high as possible without causing GI issues
- Consider offering water via Bottle feeding after MR
- If having Scours, try feeding Pasteurized whole milk to diagnose MR ingredient issues

Don'ts

- Bucket Feed 2-3 week old calves
- Expect to fix GI issues with Probiotics and Prebiotics
- Use equipment not fit for proper mixing
- Mixing milk ingredients for under 5 min at improper temp
- Think only pasteurized whole milk or MR are only options..Both can work!

All the Technology in the World Doesn't Help When Milk IS NOT RIGHT

Milk Nutrition Analysis

	Dry Basis	As Received	
Moisture, Karl-Fischer		88.60	%
Dry Matter		11.40	%
Protein, Crude	30.79	3.51	%
Fiber, Crude		Less than 0.2	%
NEL: Net Energy-Lactation	0.95	0.11	Mcal/lb
NEG: Net Energy-Gain	0.73	0.08	Mcal/lb
NEM: Net Energy-Maintenance	1.06	0.12	Mcal/lb
TDN: Total Digestible Nutrients	98.17	10.28	%
Fat By Acid-Hydrolysis	15.18	1.73	%
Ash	5.96	0.68	%
NFE-Nitrogen Free Extract	47.98	5.47	%
Lactose	36.8	4.4	%

Mixing vat too big for PD1

Inappropriate mixing examples

Client tried mixing from above with paint mixer on electric drill

	Dry Basis	As Received	
Moisture, Karl-Fischer		83.60	%
Dry Matter		16.40	%
Protein, Crude	20.24	3.32	%
Fiber, Crude		Less than 0.2	%
NEL: Net Energy-Lactation	0.90	0.15	Mcal/lb
NEG: Net Energy-Gain	0.68	0.11	Mcal/lb
NEM: Net Energy-Maintenance	1.00	0.16	Mcal/lb
TDN: Total Digestible Nutrients	86.19	14.14	%
Fat By Acid-Hydrolysis	10.79	1.77	%
Ash	7.50	1.23	%
NFE-Nitrogen Free Extract	61.40	10.07	%
Lactose	47.0	7.7	%

608 bottle cart

Thank you!

DR. MIKE NAGORSKE
Director of Research, SCCL

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