Building the Foundation

Healthy Calf Conference 2022

Conference Proceedings

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Building the Foundation

Healthy Calf Conference 2022

Organized and hosted by:

VEAL Farmers of Ontario

Your calf care partners

Thank you for attending the tenth biennial Building the Foundation: Healthy Calf Conference. We are so grateful to both be able to gather again in-person and to connect with calf-raisers across the country virtually! As many of you are repeat attendees of this very exciting event, you know how important this is to our dairy, veal, and dairy-beef producers. This year we are proud to welcome a dynamic, all-Canadian line-up of speakers who are experts in their field.

Furthering knowledge and education in calf management is a top priority for Veal Farmers of Ontario (VFO). VFO strongly supports and invests in calf research to develop practical, on-farm protocols for producers. Recently protocols for navel, nesting, and fecal scoring were developed and laminated copies of these resources were mailed to all VFO producer members.

VFO is constantly making a concerted effort to develop calf care materials that improve the health and welfare of all calves in Ontario. One of these important resources is the second edition of *Building the Foundation for Healthy Calves* Manual. We are excited to provide each in-person attendee with a free copy at today's event.

VFO truly is your calf care partner! Over the past year, we have been excited to be re-connecting with producers and industry partners as in-person events and meeting have returned in full force.

We encourage you to provide feedback to VFO. Let us know if there are specific topics you would like more information on, whether you find our resources helpful, and if you would recommend any changes. If you are not receiving regular communications from VFO, contact the office to ensure we have up-to-date contact information and be sure to follow us on social media.

It is the support of our generous sponsors that allows us to continue to deliver this important event. We encourage each of you to take some time to visit our sponsors at their trade show booths and talk to them about their products and services. Be sure to thank them for sponsoring this important event.

On behalf of the VFO Board and staff, welcome to the 2022 *Healthy Calf Conference*. We know you will leave today's event with new ideas for many practical changes that can be made on your operation.

Sincerely,

Pascal Bouilly,

Chair

Agenda

9:30 a.m. Registration opens

10:00 a.m. Welcome and opening remarks

10:15 a.m. Proper ventilation – A key to raising healthy calves

Harold House M.Sc. P.Eng., DairyLogix

Proper ventilation isn't the only key to raising healthy calves, but it does play a major role. In this presentation, Harold will discuss the ventilation requirements for raising healthy calves, ventilation components for natural and fan ventilation systems, and positive pressure ventilation tube systems. He will also discuss other factors that contribute to success and failure of ventilation including drainage, drafts, and bedding.

Ventilation systems and their application for individual and group housing will be presented. Harold will also talk about troubleshooting ventilation issues in calf facilities.

11:00 a.m. New concepts in preweaning and weaning nutrition

Dr. Michael Steele, University of Guelph

This presentation will outline the newest concepts in preweaning and weaning feeding regimens and discuss how they may be related to future health and performance. The presentation will review not only feeding levels but also feed composition and how we can design feeding programs to improve gut health, growth, and development.

11:45 a.m. Fit to ship: Insights into transport practices that promote good calf health and welfare outcomes

Dr. Devon Wilson, University of Guelph

Calf transportation is a hot topic with increased oversight and concern for ensuring young calves successfully reach their final destination. New research has been trying to tackle questions about what age and under what conditions calves can be successfully transported. Dr. Wilson will bring some context to current calf transport practices across Canada and highlight new and ongoing research that aims to understand how farmers can ensure their calves are fit to ship.

12:30 p.m. Lunch

1:30 p.m. Discovering effective antimicrobial alternatives

Aaron Keunen, Mapleview Agri Ltd.

Through research and innovation, Truvital Animal Health is developing and validating safe and effective alternatives for use in promoting improved health and welfare for calves. Public health risks associated with antimicrobial resistance continue to increase. In this presentation, Aaron Keunen of Truvital will speak about Lactifen. Lactifen has shown to reduce the severity and duration of diarrhea in calves, and improve weight gain following a diarrhea challenge.

1:45 p.m. Managing *Salmonella* Dublin on veal farms

Dr. Frédéric Beaulac, Triple V Veterinary Services

Dr. Frédéric Beaulac shares his over 10 years of experience managing *Salmonella* Dublin (S. Dublin) challenges on veal farms. Dr. Beaulac will share the kinds of clinical symptoms he usually expects calves with S. Dublin to present, how he works with producers to control an outbreak, and the steps that can be taken to help prevent further spread of the disease.

2:30 p.m. *Salmonella* Dublin – An Ontario perspective

Dr. Cynthia Miltenburg, Ontario Ministry of Agriculture, Food and Rural Affairs

Salmonella Dublin, first reported in Ontario in 2012, has steadily been identified on new veal and dairy farms since. This disease is recognized as a threat to Ontario cattle farms due its high morbidity and mortality in calves, the pattern of multi-drug resistance associated with cases, and the risk to cattle caregivers and food safety. Dr. Miltenburg will share data on the prevalence of *Salmonella* Dublin in Ontario and why we need to continue to prioritize prevention and control.

2:45 p.m. There ain't no bodies like Antibodies – How to ensure you are getting the most from your colostrum management program

Dr. Kelly Barratt, Heartland Vet Services

During this presentation we will review colostrum guidelines, practical techniques, and equipment that you can implement on your farm to manage, monitor, and improve calf health and welfare.

3:30 p.m. Adjournment

Talks will be followed by a brief, moderated Q&A session.

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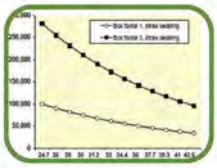
ACHIEVE MORE TOGETHER

Proper Ventilation – A Key to Raising Healthy Calves

Harold K. House, M.Sc., P. Eng.
harold@dairylogix.com

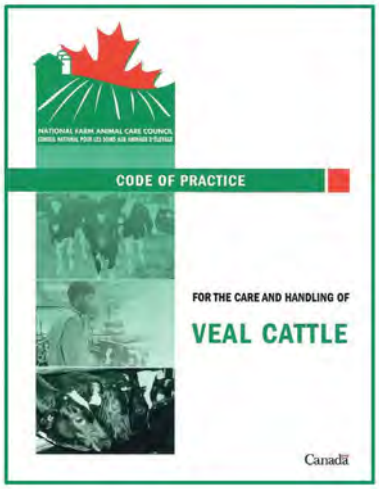
Key Factors to Raising Healthy Calves

- Ventilation
- Nutrition
- Health



Other Factors

- Space allowance
- Bedding
- Drainage
- Draft protection



Keys to Raising Healthy Calves

- Baby calves require a unique environment

Unique Environment

- Baby calves should be raised separate from weaned calves
- Weaned calves:
  - are grain fed producing different manure
  - can withstand colder temperatures
  - are larger requiring higher ventilation rates

Ventilation Basics

- Ventilation Goals:
  - fresh air without drafts
    - Winter: remove moisture
    - Summer: remove heat
  - remove odours and gases

Source: MSD Animal Health

Ventilation Rate – Animal No.

Type of Animal	Ventilation Rate CFM/Animal	
	Cold Weather	Warm Weather
Calves < 1 month	10	100
Calves 1 – 3 months	12	120
Heifers 3 – 12 months	15	150

Ventilation Rate – Air Changes

- Winter: remove moisture
  – 4 air changes per hour
- Spring & Fall: 20 to 40 air changes per hour
- Summer: remove heat
  – 40 to 60 air changes per hour

Air Speed at Calf Level

- Uniform distribution of fresh air
- Fresh air without drafts
  - Winter: <60 ft/min
  - Summer: 150 to 250 ft/min

Positive Pressure Ventilation Tube

- Minimum winter ventilation requirements
  – 4 ac/hr
- Distributes fresh air uniformly
- Reduces air speed < 60 fpm at calf level

Dr. Ken Nordlund

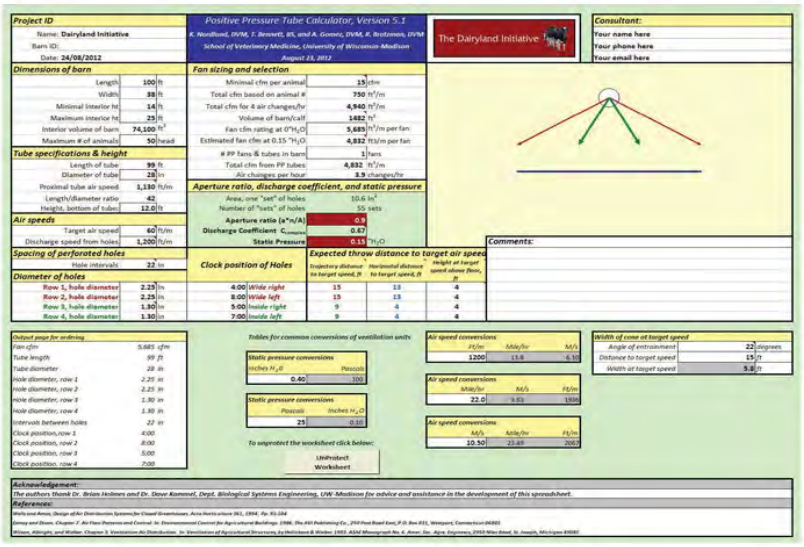
Key Factors for Respiratory Health

1. Low airborne bacterial counts
   P<0.003 – fresh air
2. Solid panels between calves
   P<0.003
3. Nesting in deep bedding
   P<0.002

Lago et al., J Dairy Sci 89:4014, 2006

Positive Pressure Ventilation Tube

- Fresh air directly from the outside
- Hole size and location to suit room or barn



Positive Pressure Tube Calculator, Version 5.1

K. Nordlund, DVM, T. Bennett, BS, and A. Gomez, DVM, R. Bratzman, DVM

School of Veterinary Medicine, University of Wisconsin-Madison

August 23, 2012

The Dairyland Initiative

Consultant:
Your name here
Your phone here
Your email here

Project ID
Name: Dairyland Initiative
Barn ID:
Date: 24/08/2012

Dimensions of barn
Length 100 ft
Width 38 ft
Minimal interior ht 14 ft
Maximum interior ht 25 ft
Interior volume of barn 74,100 ft³
Maximum # of animals 50 head

Tube specifications & height
Length of tube 99 ft
Diameter of tube 28 in
Proximal tube air speed 1,130 ft/m
Length/diameter ratio 42
Height, bottom of tube 12.0 ft

Air speeds
Target air speed 60 ft/m
Discharge speed from holes 1,200 ft/m

Spacing of perforated holes
Hole intervals 22 in

Diameter of holes
Row 1, hole diameter 2.25 in
Row 2, hole diameter 2.25 in
Row 3, hole diameter 1.30 in
Row 4, hole diameter 1.30 in

Fan sizing and selection
Minimal cfm per animal 15 cfm
Total cfm based on animal # 750 ft³/m
Total cfm for 4 air changes/hr 4,940 ft³/m
Volume of barn/calf 1482 ft³
Fan cfm rating at 0"H2O 5,685 ft³/m per fan
Estimated fan cfm at 0.15 "H2O 4,832 ft³/m per fan
PP fans & tubes in barn 1 fans
Total cfm from PP tubes 4,832 ft³/m
Air changes per hour 3.9 changes/hr

Aperture ratio, discharge coefficient, and static pressure
Area, one "set" of holes 10.6 in²
Number of "sets" of holes 55 sets
Aperture ratio (a*n/A) 0.9
Discharge Coefficient C 0.67
Static Pressure 0.15 "H2O

Comments:

Expected throw distance to target air speed

Clock position of Holes	Trajectory distance to target speed, ft	Horizontal distance to target speed, ft	Height at target speed above floor, ft
4:00 Wide right	15	13	4
8:00 Wide left	15	13	4
5:00 Inside right	9	4	4
7:00 Inside left	9	4	4

Output page for ordering

Fan cfm	5,685 cfm
Tube length	99 ft
Tube diameter	28 in
Hole diameter, row 1	2.25 in
Hole diameter, row 2	2.25 in
Hole diameter, row 3	1.30 in
Hole diameter, row 4	1.30 in
Intervals between holes	22 in
Clock position, row 1	4:00
Clock position, row 2	8:00
Clock position, row 3	5:00
Clock position, row 4	7:00

Tables for common conversions of ventilation units:

Static pressure conversions
Inches H2O 0.40 Pascals 100

Static pressure conversions
Pascals 25 Inches H2O 0.10

Air speed conversions
Ft/m 1200 Mile/hr 13.6 M/s 6.10

Air speed conversions
Mile/hr 22.0 M/s 9.83 Ft/m 1936

Air speed conversions
M/s 10.50 Mile/hr 23.49 Ft/m 2067

Width of cone at target speed
Angle of entrainment 22 degrees
Distance to target speed 15 ft
Width at target speed 5.8 ft

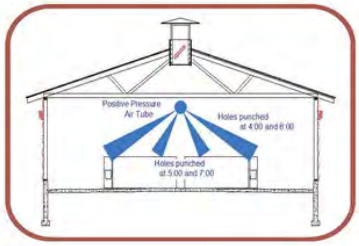
To unprotect the worksheet click below:
UnProtect Worksheet

Acknowledgement:
The authors thank Dr. Brian Holmes and Dr. Dave Kammel, Dept. Biological Systems Engineering, UW-Madison for advice and assistance in the development of this spreadsheet.

References:
Wells and Ames, Design of Air Distribution Systems for Closed Greenhouses, Acta Horticulture 361, 1994. Pp. 93-104
Barney and Dixon, Chapter 7. Air Flow Patterns and Control. In: Environmental Control for Agricultural Buildings. 1986. The AVI Publishing Co., 250 Post Road East, P.O. Box 831, Westport, Connecticut 06881
Nilsen, Albright, and Walker. Chapter 5. Ventilation Air Distribution. In: Ventilation of Agricultural Structures, by Bottcher & Hinkle 1993. ASAE Monograph No. 6, Amer. Soc. Agric. Engineers, 2950 Niles Road, St. Joseph, Michigan 49085

PPVT System

- Fan size – 4 ac/hr
- Tube size & material
- Hole size and location



Fan Control

- Minimum ventilation – 4 ac/hr
- Manually set variable speed control

Flip Duct – Two Ducts in One

Fan Ventilation

- Inlets
- Exhaust
- Controls

Fan Ventilation - Inlets

- Self adjusting
- Manual adjustment
- Automatic adjustment

Fan Ventilation - Exhaust

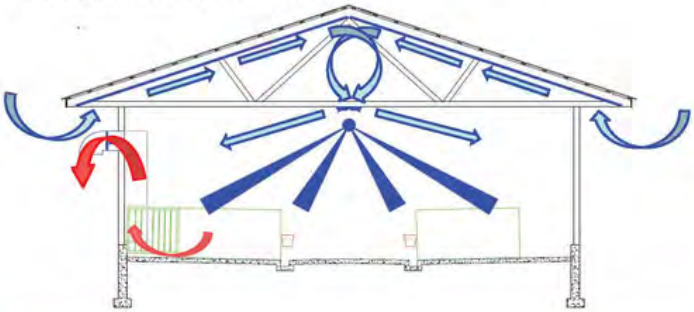
- Wall mounted fans
- Chimney fans
- Variable speed for smooth transition of ventilation rate

Fan Ventilation

- Inlets
- Exhaust
- Controls
- PPVT
  - uniformly distribute minimum ventilation

Fan Ventilation System

- Positive pressure ventilation tube system for winter
- Ceiling inlets with attic insulation for summer
- Exhaust fans to remove stale air

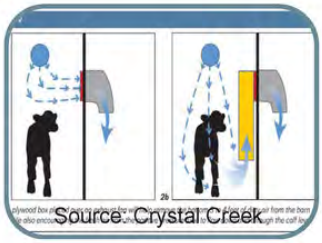


Fan Ventilation System

- PPVT system for winter, late spring, early fall
- Centre air ceiling inlets for remainder of year
- Air enters under soffit to insulated attic space
- Exhaust fans to remove stale air

Exhaust Fan Placement

- Don't short circuit PPVT system
- Draw stale air off at calf level



Source: Crystal Creek

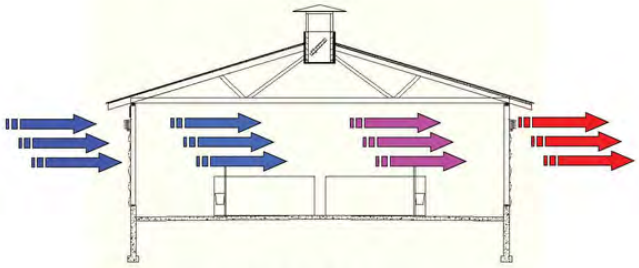
Exhaust Fan Placement

- Don't short circuit PPVT system through chimney fans
- Draw stale air off at calf level

Natural Vent

- Inlets
- Exhaust
- Controls

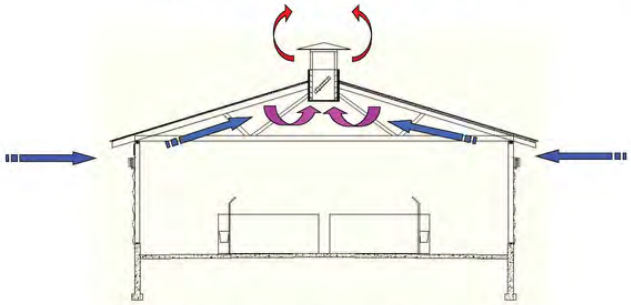
Hot Weather



Cross Flow

Locate barn perpendicular to prevailing winds.

Cold Weather



Warmed Air Rises

Calves do not produce enough body heat for system to work on thermal buoyancy alone!

Natural Ventilation - Inlets

- Adjustable curtain inlets
  - 12" of shade cloth for windbreak at the top of the opening

Natural Ventilation - Exhaust

- Chimneys
  - Damper to prevent down drafts




Natural Vent

- Inlets
- Exhaust
- Controls
- PPVT
  - Winter
  - Late Fall
  - Early Spring

Stocking Density

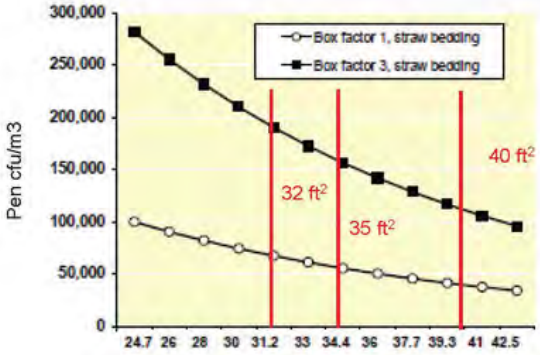
3.5 Ventilation, Temperature, and Relative Humidity

3.5.1 Ventilation

Ventilation brings in fresh air and removes metabolic end products produced by cattle, including heat, water, carbon dioxide, noxious gases from manure and urine (e.g. ammonia), and airborne microorganisms and dust. Stocking density (expressed as the air space per calf) is a major factor affecting the risk of respiratory disease. Maximizing the air space per calf is beneficial. A minimum air space of 10 m^2/100 kg (555 ft^2/220 lb) live weight has been recommended (19).

- 32 ft^2 x 10 ft = 320 ft^3
- 40 ft^2 x 10 ft = 400 ft^3

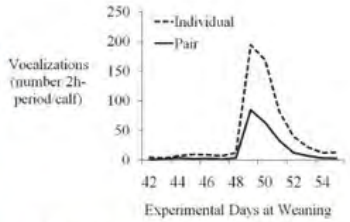
Page 18



Lago et al., J Dairy Sci 89:4014, 2006

Socialization

- Decreased vocalization at weaning
- Improved feed intake – learn from "buddy"
- Etc.



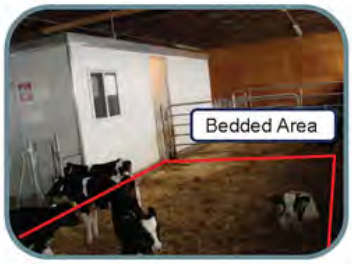
De Paula Vieira, Andrea. 2012. Effects of the Early Social Environment on the Response of Dairy Calves to Novel Events

Individual Pens

- 32 ft^2 of bedded area per calf
  - 4' x 8' = 32 ft^2
  - 8' x 8' = 64 ft^2
  - 5' x 8' = 40 ft^2
  - 10' x 8' = 80 ft^2


Group Pens

- 32 ft^2 of bedded area per calf
- 35 ft^2 to 40 ft^2 better



Bedding

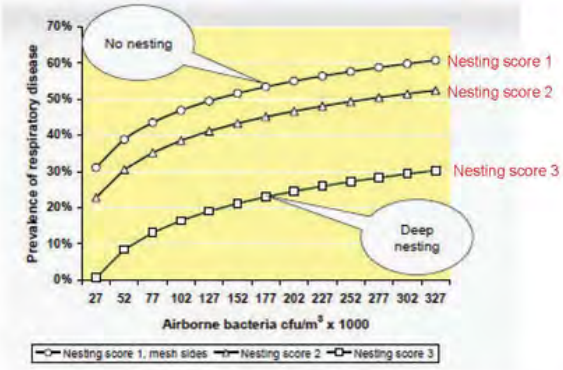
- Shavings to reduce flies in summer
- Long straw when cold in winter

Dr. Ken Nordlund

Key Factors for Respiratory Health

1. Low airborne bacterial counts
   P<0.003
2. Solid panels between calves
   P<0.003
3. Nesting in deep bedding
   P<0.002

Lago et al., J Dairy Sci 89:4014, 2006



Lago et al., J Dairy Sci 89:4014, 2006

Nesting Scores

- 1: Legs entirely visible
- 2: Legs partially covered
- 3: Legs completely covered

Bedding

- Enough straw to allow "nesting"
- Use calf coats as needed
  - Increase nesting score from 2 to 3

Drainage

- Keep bedding clean & dry
  - Individual pens
  - Sloped to drain

Drainage

- Drain for washing
- Weaner slats
- Raised platform

Dr. Ken Nordlund

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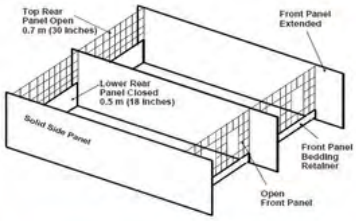

Individual Pens

- Back-to-back pens away from the outside walls
- Open front and back
- Separate rows of pens by 12" at the back
- 18" of solid panel in back to hold bedding

Group Pens

- Calves like a solid surface to lie along
- Solid panels protect from drafts
- Long straw still important for nesting

December 2018

Low Ambient Temperature

40 feet per minute 400 feet per minute

Table 3.1 – Temperatures at which cattle start to respond to cold (i.e. lower critical temperature) at different ages depending on air movement and bedding

	Exposed to 0.2 m/s air movement	Exposed to 2 m/s air movement	Provided with deep, dry straw bedding
Young calf on arrival	12°C (53.6°F)	20°C (68°F)	6°C (42°F) or lower
Calf at 5 weeks of age	2°C (35.6°F)	11°C (51.8°F)	2°C (35.6°F) or lower
Calf at 12 weeks of age	-11°C (12.2°F)	2°C (35.6°F)	-11°C (12.2°F) or lower

(Adapted from 28)

) m^3 per 100 kg (353 ft^3 ideal.

eks old are comfortable ratures between 15 to n temperatures fall be- rgy to keep warm (*Fig-* k or milk replacer and warm instead of grow- t disease. It's important alories to the calf's di- ets during cold weather to ensure calf health and growth. Calves not given enough feed in cold weather may even lose weight due to the negative energy balance.

Temperatures at which calves start to respond to cold at different ages depend on air movement and bedding type and amount.

Cold stress should be managed by providing additional calories and deep straw bedding—not by enclosing the pen or shutting off ventilation.

Page 20

ratures at which calves respond to cold

Exposed to 0.2 metres per second air	Exposed to two metres per second air	Provided with deep, dry straw bedding

May 2022

Housing Applications

- Hutches
- Modified Hutch
- Individual Pens
- Group Pens

Troubleshooting

- Condition of air
- Condition of calves
- Condition of floors, walls, and ceiling

Condition of Air

- Fresh and clear?
- Stale and heavy (moist)?
- Sharp or pungent (odours and gases)?

"Smokin' a Barn"

- Insect fogger
- Light mineral oil or aviation smoke oil
- Air pattern
- Air speed
- Air exchange
  - Does smoke disappear in 15 min. – 4 ac/hr?

Conditions of Calves?

- Bright and frisky?
- Shiny hair coat?
- Dull and depressed?
- Sunken eyes?
- Stool condition?
- Vocalization?

Calf Health Scoring Criteria

	0	1	2	3
Rectal temperature	100-100.9	101-101.9	102-102.9	≥103
Cough	None	Induce single cough	Induced repeated coughs or occasional spontaneous cough	Repeated spontaneous coughs
Nasal discharge	Normal serous discharge	Small amount of unilateral cloudy discharge	Bilateral, cloudy or excessive mucus discharge	Copious bilateral mucopurulent discharge
Eye scores	Normal	Small amount of ocular discharge	Moderate amount of bilateral discharge	Heavy ocular discharge
Ear scores	Normal	Ear flick or head shake	Slight unilateral droop	Head tilt or bilateral droop
Fecal scores	Normal	Semi-formed, pasty	Loose, but stays on top of bedding	Watery, sifts through bedding

http://www.vetmed.wisc.edu/dms/fapm/fapmtools/8calf/calf_health_scoring_chart.pdf

Condition of Building

- Dry and clean?
- Damp and dirty?
- Dry bedding?

Questions?

DairyLogix

harold@dairylogix.com

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New Concepts in Preweaning and Weaning Nutrition

Healthy Calf Conference 2022

Michael A. Steele
Professor
Department of Animal Biosciences
UNIVERSITY of GUELPH

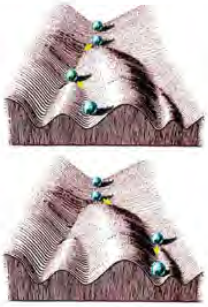
DAIRY at GUELPH

"Early Life Programming"

"…early adaptation to a stress or stimuli that permanently changes the physiology and metabolism of the organism and continues to be expressed even in the absence of the stimulus/stress that initiated them…"

Patel and Srinivansan, 2002

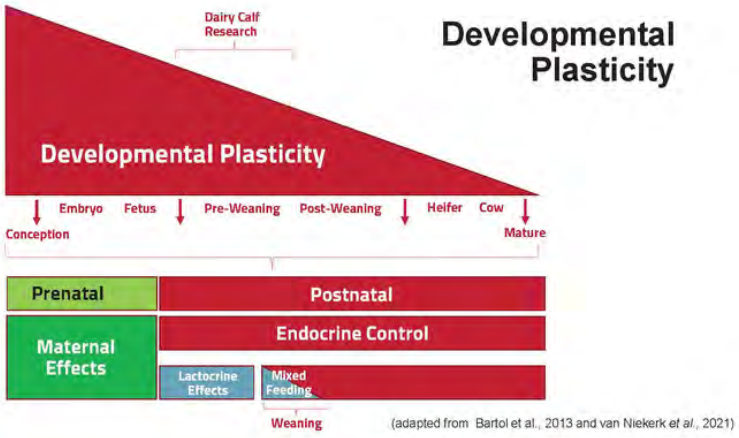
Adapted from Conrad's Waddington epigenetic landscape



Early Life Nutrition

- Dietary regimes in early life influence lifetime productivity
- 1kg of pre-weaning ADG = 1,540 kgs of milk in first lactation Soberon et al., 2012

Developmental Plasticity



(adapted from Bartol et al., 2013 and van Niekerk *et al.*, 2021)

Colostrum Basics

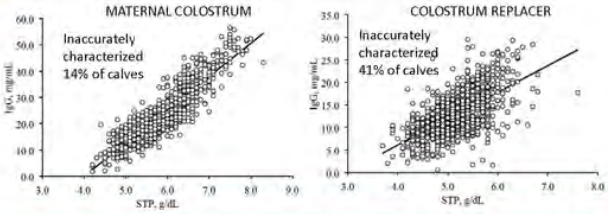
Fischer-Tlustos *et al.*, 2021

Colostrum Bioactives

Immunoglobulins	>100:1	passive immunity
Lactoferrin	>15:1	local immunity effect in gut
IGF-I	80:1	
IGF-II	20:1	
Epidermal growth factor	2:1	
Insulin	100:1	local gut effects
Oligosaccharides	25:1	Prebiotic, immune function
Relaxin	19:1	reproductive development
Omega-3 FA	2:1	
TGFα and TGFβ	100:1	
Leptin		hypothalamic pituitary axis
Leukocytes		immune function

Assessing passive transfer on farm

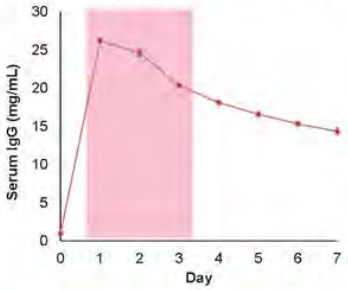
Serum total protein (STP): >5.2 g/dl = passive transfer



STP is not an accurate tool to predict passive transfer status in CR-fed calves

Lopez *et al.*, 2020

Assessing passive transfer on farm



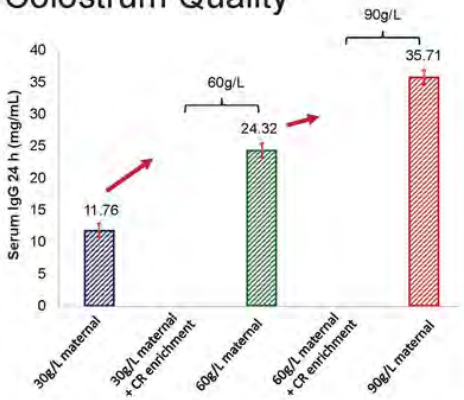
TPI category	Serum IgG category (g/L)	Equivalent TP (g/dL)	Equivalent Brix %
Excellent	≥25.0	≥6.2	≥9.4
Good	18.0–24.9	5.8–6.1	8.9–9.3
Fair	10.0–17.9	5.1–5.7	8.1–8.8
Poor	<10.0	<5.1	<8.1

Lombard et al., 2020

Sample calves for passive transfer on days 1-3 after birth – after day 4 is too late

Cantor *et al.*, 2022

Colostrum Quality

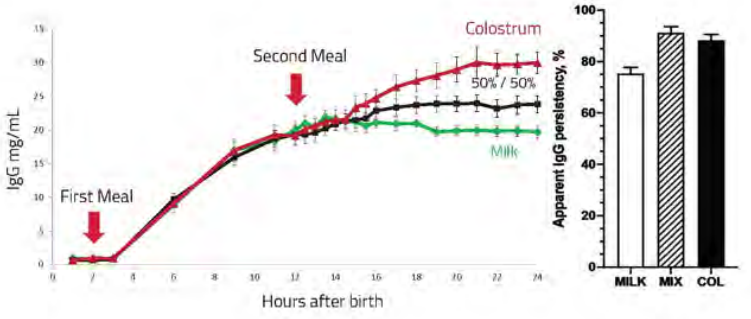


GOOD QUALITY COLOSTRUM
60 g of IgG/L
200 g of IgG total

Enriching low-quality colostrum with CR may be a feasible strategy to ensure passive transfer

Lopez *et al.*, 2022

Extended Colostrum Feeding



Hare *et al.*, 2020

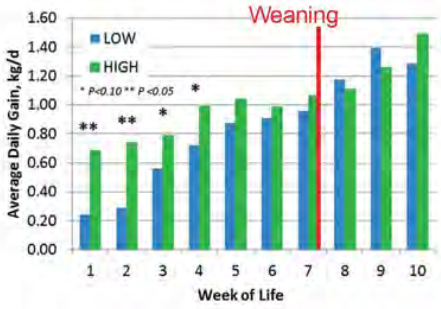
Extended Colostrum Feeding

50% Colostrum/50% Milk
Days 2-3

- ↑ intestinal development
- ↑ IgG after 12h of life
- ↓ risk of mortality

Pyo *et al.*, 2020; Hare *et al.*, 2021; McCarthy *et al.*, 2022

Low vs. High Milk Feeding



5 (Low) *vs.* 10L (High) WM

Very little solid feed intake during the first 3 wks of life

Are we missing an opportunity to increase growth?

Haisan *et al.*, 2018

Milk Supply & Organ Development

RESTRICTED: 0.6 kg/d MR

ENHANCED: 1.3 kg/d MR

	Restricted (n=6)	Enhanced (n=6)	P value
Birth weight, kg	39.2	39.7	0.90
Weight at 54d, kg	61.0	83.2	< 0.01
MJ above maintenance, MJ	3.7	15.7	< 0.01

(Soberon and Van Amburgh, 2011)

Milk Supply & Organ Development

RESTRICTED: 0.6 kg/d MR

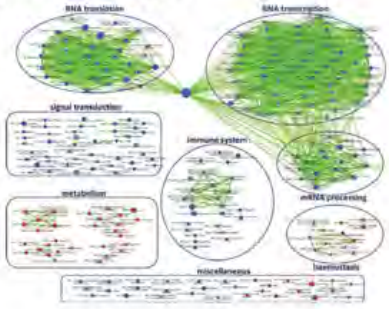
ENHANCED: 1.3 kg/d MR

	Restricted (n=6)	Enhanced (n=6)	P value
Pancreas, g	32.90	29.47	0.61
Pancreas, % of BW	0.06	0.04	0.11
Liver, kg	1.35	2.35	< 0.01
Liver, % of BW	2.23	2.84	< 0.01
Kidney, g	183.60	319.72	0.02
Kidney, % of BW	0.30	0.38	0.09
Mammary gland, g	75.48	337.58	< 0.01
Parenchyma, g	1.10	6.48	< 0.01
Parenchyma, % of BW	0.002	0.008	< 0.01

(Soberon and Van Amburgh, 2011)

Change in Gene Expression Profiles

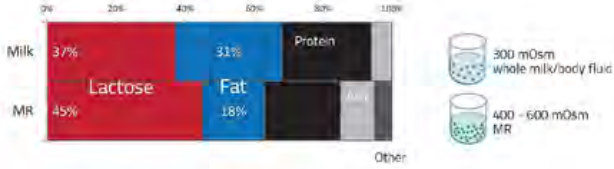
	Changed (P<0.01)
Mammary	654
Fat	1045
Liver	176
Bone marrow	435
Muscle	651
Pancreas	103



(Hare et al, 2010; Leal et al., 2019)

Whole Milk vs. Milk Replacer

Most MR are high in lactose and low in fat compared to whole milk

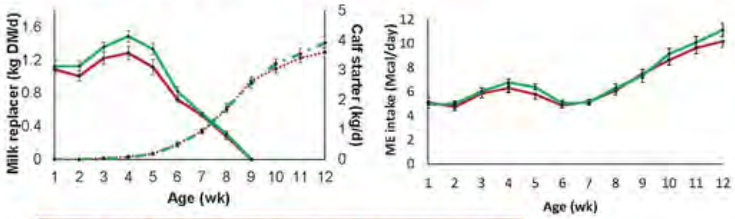


- Hypertonic MR increases gut permeability
- High lactose milk replacers decrease insulin sensitivity

Wims *et al.*, 2019; Welboren et al., 2021

High Fat vs. High Lactose: Ad libitum

High Fat vs. High Lactose

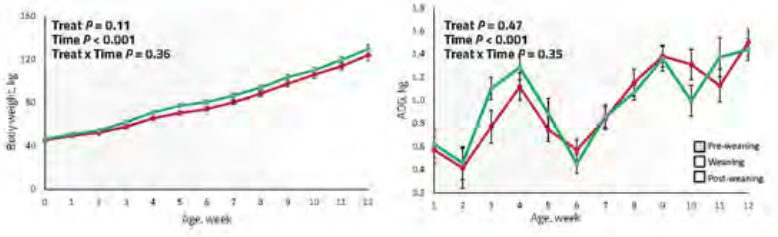


- Up to 3L/d difference with no evident negative effect on solid feed
- Calves consuming MR based on energy density of the diets

Echeverry-Munera *et al.*, 2021

High Fat vs. High Lactose: Ad libitum

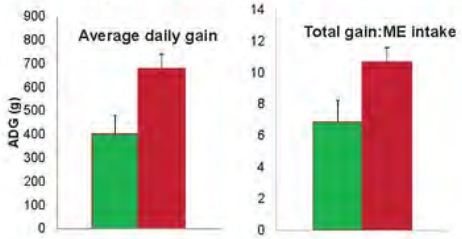
High Fat vs. High Lactose



Echeverry-Munera *et al.*, 2021

High Fat vs. High Lactose: First Week of Life

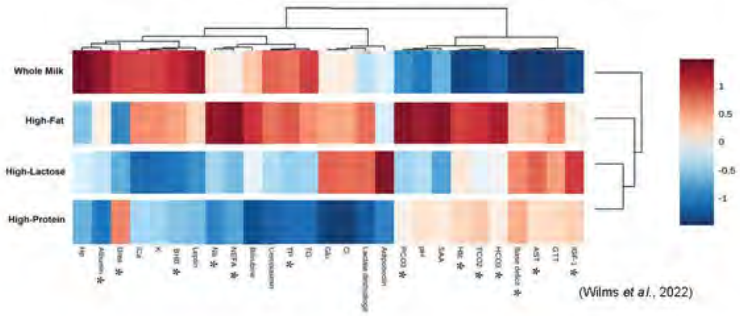
High Fat vs. High Lactose



- Calves fed the high fat MR gained more per unit of ME intake
- More energy was available to be retained

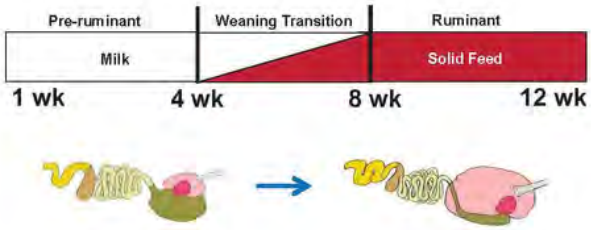
Welboren *et al.*, 2021

Minimal differences in growth but large differences in metabolic fingerprint

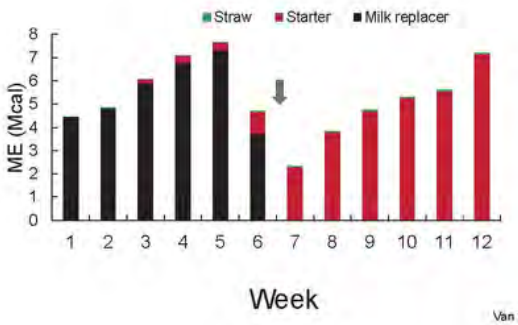


(Wilms *et al.*, 2022)

Pre and Post-Weaning

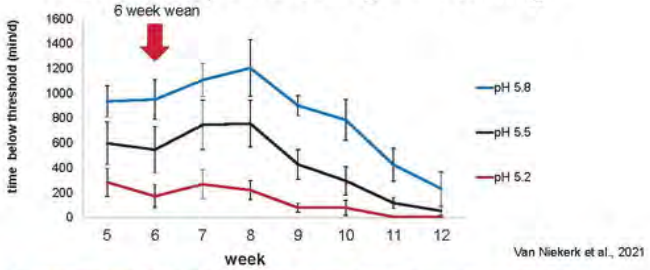


Total Metabolizable Energy



Van Niekerk et al., 2021

Ruminal pH During Weaning

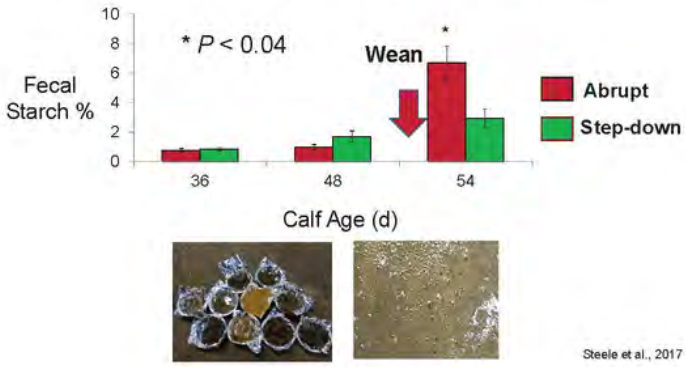


Van Niekerk et al., 2021

Keys to Successful Weaning

Van Niekerk et al., 2021

Abrupt Weaning – Fecal Starch



Steele et al., 2017

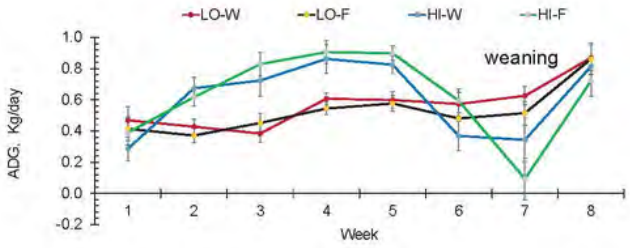
What about starter composition?

- Why do starters range from 10-50% starch?
- Induces ruminal acidosis an possibly hindgut acidosis
- Should starter composition be tailored for milk feeding program?

Hindgut acidosis?

Interaction Between Milk and Starter

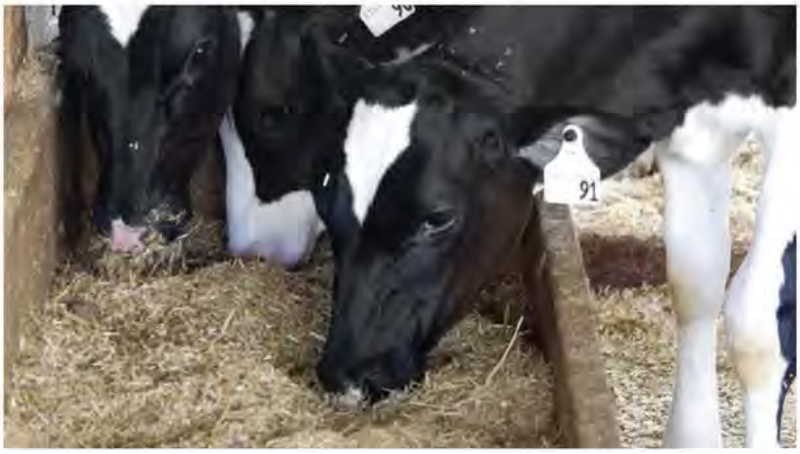
Factor 1 – High (HI) and Low (LO) Milk
Factor 2 – Whole (W) vs Flaked (F) Corn



Van Niekerk et al., 2020

Are we assuming that calves are consuming more forage than what they are?

Slide Courtesy of Jim Quigley

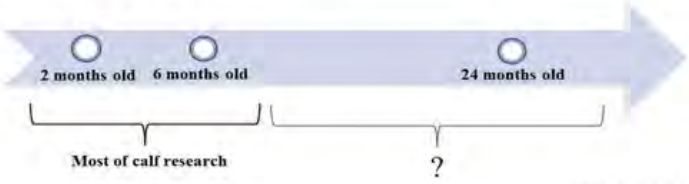


Post-Weaning Dry TMR Rations

Bruinjé et al., 2019; Bruinjé et al., 2021; Rodaduk et al., 2021

Weaning and Beyond

- Most calf research takes place in the first two months of life
- Need to integrate pre and post weaning planes of nutrition with lifetime performance



Van Niekerk et al., 2021

Funding provided by:

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Fit to Ship: Insights into transport practices that promote good calf health and welfare outcomes

Devon Wilson, DVM MSc
Healthy Calf Conference
November 30, 2022

Goals for today's presentation:

Introduction
- Calf transport challenges
- 4H's of a calf that is fit to ship
- Studying calf fitness

Ensuring calves are fit to ship
- Current situation
- Steps forward

Conclusions

Transport is challenging for calves

Wilson et al., 2020

Calves that are fit to ship are:

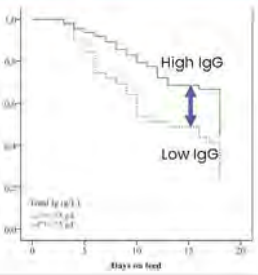
- Healthy
- Heavy
- Hydrated
- High immunity

Studying fitness for transport: Health Scoring

Scott et al., 2019

Studying fitness for transport: Performance at calf rearing facilities

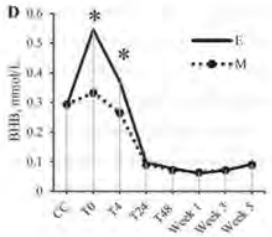
- Mortality
- Morbidity
- Antimicrobial use
- Growth
- Feed conversion



Pardon et al., 2015

Studying fitness for transport: Biomarkers

- Hormones: Cortisol
- Chemistry: Electrolytes
- Inflammation: white blood cells
- Hydration: blood concentration
- Metabolism: fat mobilization



Marcato et al., 2020

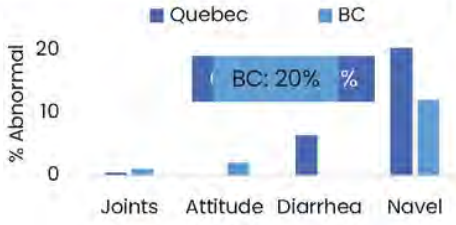
Ensuring calves are fit to ship

1. Healthy

Calf health in-transit

Auction markets

>4000 calves

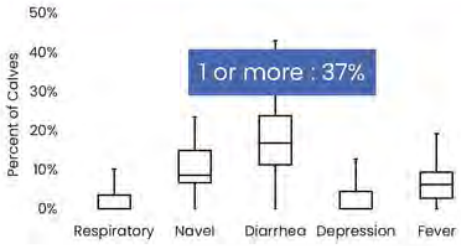


Marquou et al., 2019; Wilson et al., 2020a

Calf health pre-transport

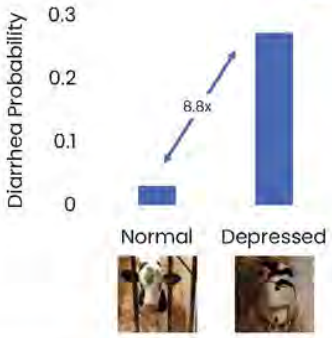
17 farms

~600 calves



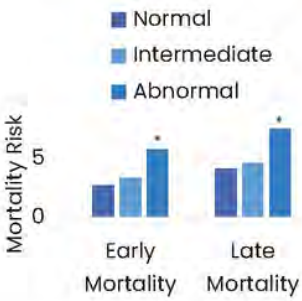
Wilson et al., 2020b

Calves with a depressed attitude had 8.8x greater odds of being treated for diarrhea



Wilson et al., 2020b

Navel infections increased the risk of early and late mortality

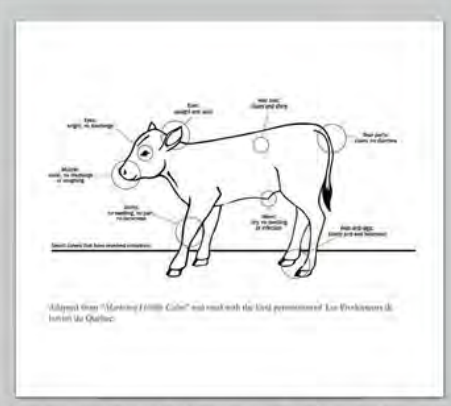


Renaud et al., 2018

Take Away Message:

Ship healthy calves

- Provide excellent neonatal calf care
- Examine all calves before transport

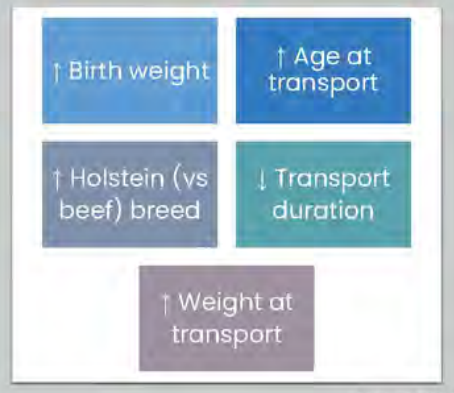


Code of Practice for the Care and Handing of Veal Cattle, 2017

Ensuring calves are fit to ship

2. Heavy

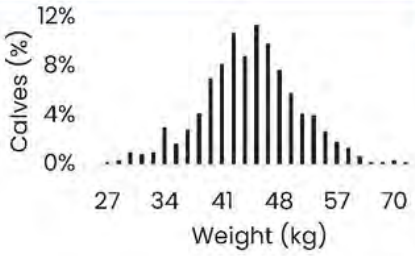
Factors that increase calf weight



Rot et al., 2022

Calf weight pre-transport

~600 calves



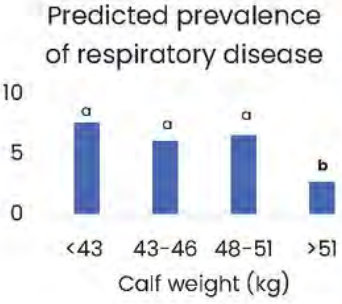
Wilson et al., 2019

Calf weight post-transport

~1000 calves

Scott et al., 2019

Weight is a very important predictor of calf performance



Brscic et al., 2012

Calf age at marketing

~300 producers

Wilson et al., in press

Similarly, younger calves are at increased risk of diarrhea

Study	Calf Age	Outcome
Goetz et al., 2022	2-6 days	
	15-19 days	74% IRR
Marcato et al., 2022	14 days	24%
	28 days	7%

Take Away Message:

Ship calves as heavy as possible

Consider shipping calves over:
- 50 kg/110 lbs*
- 14 days old*

Provide appropriate nutrition to support heavy calves
- Pregnant cows
- Neonatal calves

Review by: Renaud and Pardon, 2022

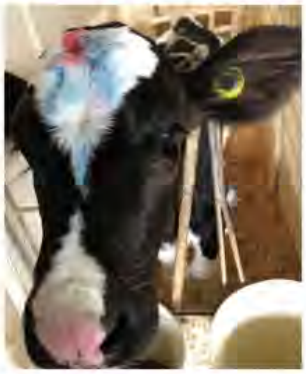
Ensuring calves are fit to ship

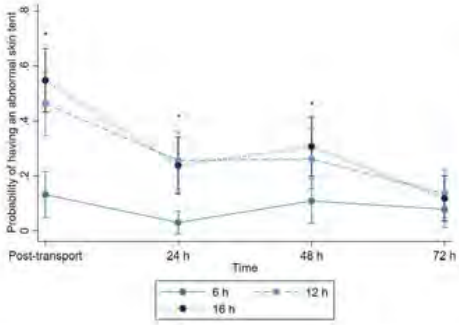
3. Hydrated

Many transported calves are dehydrated

On arrival
- 46% - Renaud et al., 2018
- 35% - Pempek et al., 2017

In transit
- 70% - Marcato et al., 2020

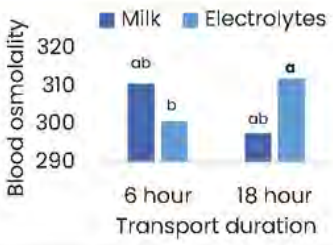


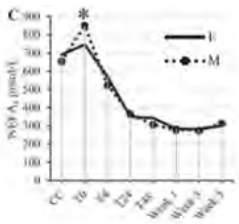


Hydration is influenced by transport duration

Goetz et al., 2022

Hydration is influenced by feeding practices





Marcato et al., 2020

Dehydrated calves are more likely to die

Renaud et al., 2018

Take Away Message:

Ensure calves are hydrated

Consider transport conditions:
- Duration
- Climatic factors

Providing milk before transport can help

Review by: Renaud and Pardon, 2022

Ensuring calves are fit to ship

4. High Immunity

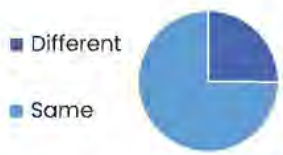
Passive Immunity in calves

Wilson et al., 2019
- pre-transport
- 5.2 STP cutoff
- **12%**

Pempek et al., 2017
- Post-transport
- 6.0 STP cutoff
- **23%**

Pardon et al., 2015
- Post-transport
- 10.0 IgG cutoff
- **41%**

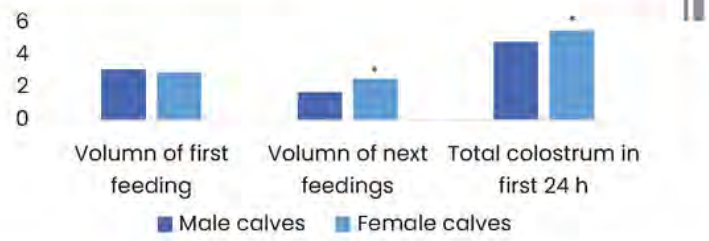
Colostrum management for female vs male calves



- 30% source of colostrum
- 13% poorer quality colostrum
- 13% lower quantity of colostrum
- 39% lower focus on colostrum
- 4% longer time from birth to feeding

Renaud et al., 2020

Colostrum management for female vs male calves



Shivley et al., 2019

Calves with failure of passive immune transfer had worse outcomes

1. Mortality (8 studies)
   - 2.5 x greater odds
2. Respiratory Disease (5 studies)
   - 2.3 x greater odds*
3. Diarrhea (7 studies)
   - 3 x greater odds

Abdallah et al., 2022

Vaccination?

Muddy waters

1. Dam vaccination + colostrum
2. IN or injectable calf vaccines

Intranasal vaccination for RSV and PI-3 may decrease risk of respiratory disease (8%) and mortality (6%) (abstract)

Vertenten et al., 2020

Take Away Messages:

Optimize calf immunity

Provide colostrum:
- Timing (ASAP, <6h)
- Quality (IgG, Clean)
- Volume (3-4 L)

Stay tuned on potential vaccination strategies

Review by: Renaud and Pardon, 2022

Transporting fit calves requires 4-Hs

The Canadian Food Inspection Agency (CFIA) regulates the humane treatment of all animals being transported into, within, and out of Canada by enforcing the *Health of Animals Regulations (Part XII) Transport of Animals*.

Conclusions:

- Prepare calves for the trip
- Evaluate calves before transport
- Consider how to minimize transport challenges

Thank you to the Funders

USDA National Institute of Food and Agriculture
U.S. DEPARTMENT OF AGRICULTURE

University of Guelph | Dairy at Guelph | NSERC CRSNG | The University of British Columbia Animal Welfare Program, Faculty of Land and Food Systems

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Questions?

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TRUVITAL

ANIMAL HEALTH

ANTIMICROBIAL ALTERNATIVES

WHO WE ARE

- Family owned business based since 2010
- Manufacture milk replacer for calves, lambs, kid goats
- Distribute products across Canada
- Recognized as top growing company in Canada – Globe & Mail

REPORT ON BUSINESS CANADA'S TOP GROWING COMPANIES

Mapleview Agri

TRUVITAL ANIMAL HEALTH

Healthy Calf Conference | 2022

MILK REPLACERS

- Canadian sourced milk proteins
- Extensive quality control – internal lab
- Products & ingredients are scientifically validated
- Extensive dealer network
- Dairy beef, veal, dairy heifer replacement products
- Locally manufactured

Mapleview Agri

Healthy Calf Conference | 2022

RESEARCH + COLLABORATION

Mapleview Agri

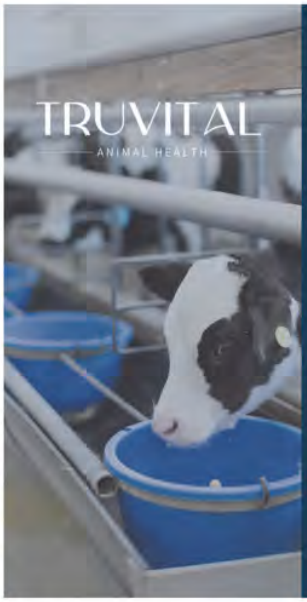
- One of the largest commercial calf research facilities in Canada
- Conduct trials internally, for academia, and industry worldwide
- Validate products and develop innovative technology
- Milk ingredients, feed additives, pharmaceuticals, nutraceuticals

KENT Nutrition Group · Natural MA Inc. · APC · vetoquinol · Dairymans Choice · zoetis · DAIRY at GUELPH · University of Kentucky · ANIMIX · LALLEMAND · PROVITA SUPPLEMENTS · ACER CONSULTING

RESEARCH FACILITY

- Fecal and respiratory scoring twice daily
- Body weights
- Milk replacer and grain consumption
- Treatment records
- Fecal sampling and analysis
- Calves individually housed until weaning and then co-mingled

Healthy Calf Conference | 2022



- Started in 2020
- Products developed and validated using our research facility
- Products encourage antimicrobial stewardship
- Collaborate with industry experts and producers to understand and find solutions for challenges

HOW WE GOT STARTED

ANTIMICROBIAL STEWARDSHIP

- Antimicrobials are necessary for health and welfare in animal agriculture
- Management practices are crucial for reducing the dependance on antimicrobials
- Truvital is conducting research to discover safe and effective alternatives
- Alternatives may improve efficacy when used in-conjunction with antimicrobials

TRUVITAL
ANIMAL HEALTH

- Electrolytes – Truvitalyte & Truvitalyte Max
- Multiple energy sources for quick & slow absorption
- Sodium Acetate Buffer – No bicarbonate
- Sweetener and highly desirable flavour
- Truvitalyte Max is only rehydration electrolyte to include:
  - B Vitamins
  - Vitamin C
  - Vitamin E
  - Mannan Oligosaccharide

PRODUCTS: ELECTROLYTES

TRUVITAL
ANIMAL HEALTH

Osmolarity
Sodium: 127 mmol/L
Dextrose/Maltodextrin: 125 mmol/L
Glycine: 40 mmol/L
Blood Buffers: 50 mmol/L
Potassium: 25 mmol/L
Chloride: 83 mmol/L
Total Osmolarity: 450 mmol/L

Free Choice Palatability Trial

- 80 calves offered either 2L of Water or Truvitalyte
- Consumption measured after 1hr
- 14 day old calves
- Repeated twice

Truvitalyte Consumption = 1.86L

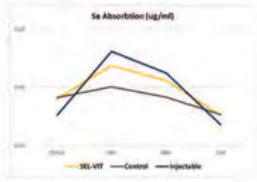
Water Consumption = 0.66L

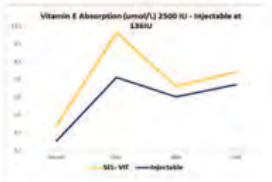
*Palatable electrolytes can be a great tool for increasing fluid intake compared to free choice water.

PRODUCTS: ELECTROLYTES

TRUVITAL
ANIMAL HEALTH

Osmolarity
Sodium: 127 mmol/L
Dextrose/Maltodextrin: 125 mmol/L
Glycine: 40 mmol/L
Blood Buffers: 50 mmol/L
Potassium: 25 mmol/L
Chloride: 83 mmol/L
Total Osmolarity: 450 mmol/L





- Safe alternative to synthetic injectables
- 100% Organic Selenium
- 2500 IU of Vitamin E compared to 136 IU in injectables
- Water soluble
- No withdrawal period - most injectables have a 21 to 35 day meat
- withdrawal

TRUVITAL

PRODUCTS: SEL-VIT

TRUVITAL
ANIMAL HEALTH

- Approved Veterinary Health Product by Health Canada
- Proprietary blend of Lactoferrin and carriers
- Antimicrobial peptides found in milk
- Supports immune function
- Anti-bacterial, anti-parasitic properties

LACTIFEN: PRODUCT INFO

- 156 Calves Enrolled
- 50 Control
- 52 Calves LFL (6g per day = label dose)
- 54 LHF (3g per day)
- Received treatment from d4 to d10
- Body weights at arrival, d4,d10 and weekly after treatment
- Fecal scored for 21 days

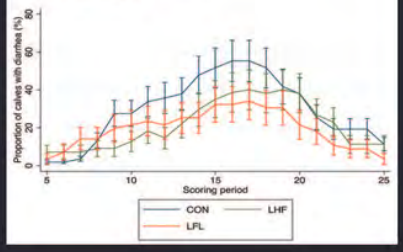
LACTIFEN: TRIAL DESIGN

- **Median days with diarrhea:**
- Control = 2.5 days
- ½ Dose (LHF) = 1.25 days
- Full Dose (LFL) = 0.25 days (P=0.055)

- **NSAID (Meloxicam) Treatment:**
- Control = 68.0%
- ½ Dose (LHF) = 49.1%
- Full Dose (LFL) = 46.3% *(P =0.048)

- **Antibiotic Treatment:**
- Control = 56%
- ½ Dose (LHF) = 40.4%
- Full Dose (LFL) = 37.0% (P =0.17)

Figure 3. Predicted probability of calves having diarrhea over the first 13 days after arrival by treatment group.



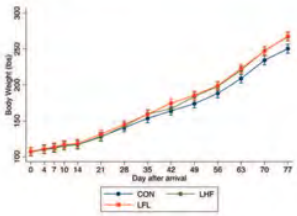
TRUVITAL
ANIMAL HEALTH

LACTIFEN: DIARRHEA PREVALENCE

Growth				
Day	Treatment	Weight	ADG (lbs)	*P* = Value
Arrival	Control	107.08		
	1/2 Dose (LHF)	106.80		0.95
	Label Dose (LFL)	107.54		0.91
Day 4	Control	110.62	1.18	
	1/2 Dose (LHF)	110.08	1.09	0.90
	Label Dose (LFL)	111.09	1.18	0.91
Day 7	Control	112.72	0.94	
	1/2 Dose (LHF)	111.95	0.86	0.85
	Label Dose (LFL)	113.54	1.12	0.84
Day 10	Control	115.76	0.96	
	1/2 Dose (LHF)	115.24	0.94	0.90
	Label Dose (LFL)	117.04	1.06	0.76
Day 28	Control	140.63	1.20	
	1/2 Dose (LHF)	142.71	1.28	0.62
	Label Dose (LFL)	144.84	1.33	0.32
Day 42	Control	163.88	1.35	
	1/2 Dose (LHF)	166.81	1.43	0.49
	Label Dose (LFL)	174.63	1.60	*0.01
Day 56	Control	188.16	1.45	
	1/2 Dose (LHF)	198.05	1.63	*0.02
	Label Dose (LFL)	199.04	1.63	*0.01
Day 77	Control	250.34	1.86	
	1/2 Dose (LHF)	267.17	2.08	*<0.001
	Label Dose (LFL)	267.77	2.08	*<0.001

LACTIFEN TRIAL: GROWTH

Figure 8. Predicted means of body weight as determined using a mixed repeated measures linear regression model.



TRUVITAL
ANIMAL HEALTH

TRUVITAL
ANIMAL HEALTH

- Reduction of diarrhea
- 22% less calves required NSAID
- 19% less calves required antimicrobial
- 11lbs heavier by 6 weeks
- ADG over first 11 weeks was 0.22lbs higher (16lbs total)

Healthy Calf Conference | 2022

LACTIFEN TRIAL: SUMMARY

WHY LACTIFEN?

- Safe and effective reduction of antibiotics
- Convenient
- Improved welfare
- Reduction in morbidity

- Improving pre-weaning ADG has shown to improve first lactation milk production
- ROI = 1kg increase of pre-wean ADG resulted in 1,113kg more milk in first lactation (Soberon, F. et al. 2012)

Lactifen = Approximately $15 per calf

ROI = Milk production 99L x $0.85 = $84.15 - $15.00 = $69.15

ROI = Calves marketed at $2/lb x 16.8 extra lbs = $33.60 - $15.00 = $18.60

Healthy Calf Conference | 2022

- We understand that antimicrobials are essential tools for animal welfare when used correctly

- Our goal is to continually develop and validate high quality animal nutrition and safe animal health alternatives that promote antimicrobial stewardship

SUMMARY

CONTACT DETAILS

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Soberon, F. et al., (2012) Preweaning milk replacer intake and effects on long-term productivity of dairy calves, Journal of Dairy Science, Elsevier. Available at: https://www.sciencedirect.com/science/article/pii/S0022030212000318#bib0005 (Accessed: November 7, 2022).

N Bruni, MT Capucchio, E Biasibetti et al (2016). Antimicrobial Activity of Lactoferrin-Related Peptides and Applications in Human and Veterinary Medicine. Molecules. 21(6):752.

Healthy Calf Conference 2022
November 30th
Stratford, Ontario

MANAGING SALMONELLA DUBLIN ON VEAL FARMS

Frederic Beaulac, veterinarian
Triple-V vet. services,
Acton Vale, QC

Services vétérinaires ambulatoires TRIPLE V inc.

Presentation overview

- Introduction
- Historic and present situation
- Clinical presentation
- Diagnostic
- Treatment
- Prevention

Services vétérinaires ambulatoires TRIPLE V inc.

INNOVATION. PRÉVENTION. VALORISATION.

Services vétérinaires ambulatoires TRIPLE V inc.

- **Specialty: Large population of meat producing animals**
- **14 vets – Two locations in QC**
- **Member of Canadian Livestock Veterinarians (9 clinics across Canada)**
- Swine
- Poultry
- Veal calves
- Beef
- Lamb
- Rabbit
- Fish

Canadian Livestock Veterinarians

INNOVATION. PRÉVENTION. VALORISATION.

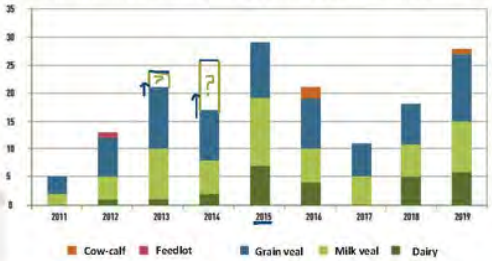
Introduction

- >20 years experience in veal and swine
- Overseeing >120 000 veal calves/year
- Working with independant producers and integrated network Preval Ag - DELIMAX / Serval / Montpack

INNOVATION. PRÉVENTION. VALORISATION.

S.Dublin - Historic and actual prevalence

Positives cases of S.Dublin in Quebec (by PCR or bacterial culture) 2011 - 2019



Quick math: I had to manage over 100 crisis of S.Dublin over the last decade... :-(

2015: mandatory declaration of positive cases

INNOVATION. PRÉVENTION. VALORISATION.

S.Dublin - Zoonotic disease

Zoonotic disease

Human cases roughly 3 times more severe than other salmonella infection (Ex: Typhymurium)

Farm caregivers in close contact = higher risk
- remember the route of transmission is ORAL

Recommandations :
-Never drink RAW milk and meat = very dangerous
-**Cook meat** at good temperatures (min: >145F ; ground meat min:>160F)
-Beware of cross-contamination with raw products

INNOVATION. PRÉVENTION. VALORISATION.

S.Dublin – clinical presentation

- Dublin is DIFFERENT than the ''usual'' salmonella (Typhimurium)
  - Septicemic vs enteric
- This characteristic explains the clinical presentation
  - I compare S.Dublin to a chameleon...
    - From bloostream to .... meninges, lungs, liver, guts and/or etc, etc,
    - Various clinics signs... vs linked to which organ(s) will be affected
    - Not always diarrhea
    - Often high fever/depression = in bloostream

S.Dublin – clinical presentation

- Various clinics signs and stages
  - Goes from asympomatic carrier to hyperacute sudden death, and through chronic cases
  - Typical age: 30-60days old
    - rare sporadic cases younger than 20 days old
      - Low prevalence + slow transmission (at the beginning)
    - Epidemias rarely seen passed 4 months old
      - more resistant, less stressed, better immune system ?

S.Dublin – clinical presentation

Video of acute case with pain and increased resp. rate - 3.5months old .

Same case (45days) – one calf with diarrhea

Most survivors = CHRONIC EVOLUTION

- lost of body condition (skin and bones)
- no more growth
- milder cases still affected by **chronic arthritis**

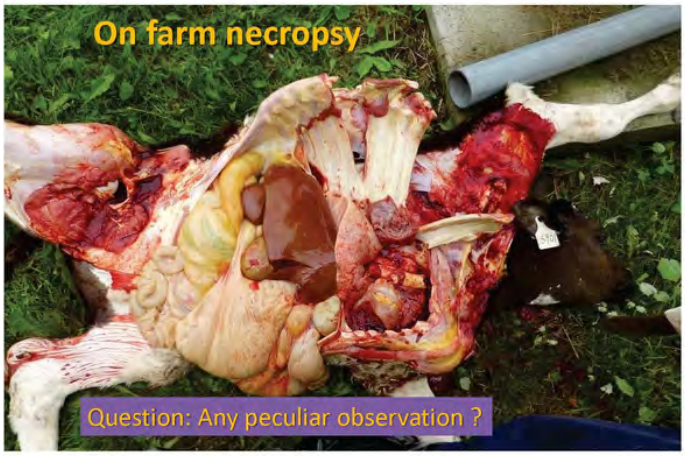
S.DUBLIN - DIAGNOSTIC

Best way = ?

Necropsy the deads + liver in bacteriology

– **Typical findings can be observed with on farm necropsy**
- Allows to get a piece of liver
- PS: Feces NOT good to find S.Dublin

– Liver to bacteriology lab
- allows access to **antimicrobial resistance pattern** of the strain = **essential !**
- S.Dublin are "always" highly multiresistant



S.DUBLIN - DIAGNOSTIC

Typical findings with on farm necropsy

– **Jaundice**

S.DUBLIN - DIAGNOSTIC

Typical findings with on farm necropsy

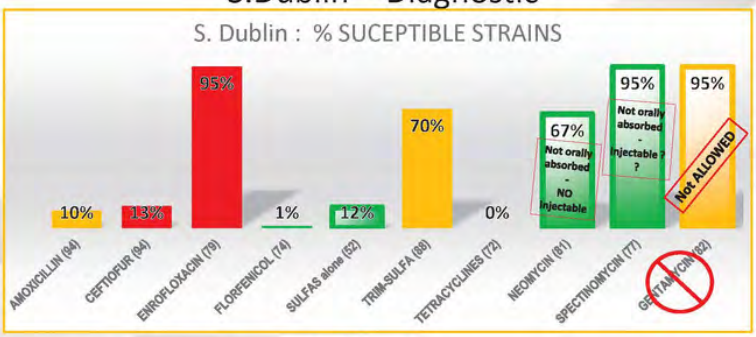
– **Jaundice**
– Petechias in lung

S.DUBLIN - DIAGNOSTIC

Typical findings with on farm necropsy

– **Jaundice**
– Petechias in lung
– Petechias on the gut or stomach serosa and liver bladder
– Enlarged spleen

S.Dublin - Diagnostic



S.Dublin – Treatment

RUN or RUNT !

S.Dublin – Treatment

- **At individual level: Run or Runt**
  - Treat rapidly, **long enough** and with the right product (ATB sensitivity)
  - Supportive care (NSAID, hydrate, etc..)
- **At herd level:**
  - Antibiotic group treatment if an option (vs ATM resistance pattern)
    - Often not very effective on sick animal but can slow the transmission
  - Consider vaccination against Salmonella (1st dose or booster)
  - Isolate the sicks
  - Rapidly identify the futur "runts" and **euthanize** them
  - Supportive care

S.Dublin – Prevention

- **How not to get it ?**
  - **For Veal calves ranchs ?**

    IMPOSSIBLE
    - **Impossible not to be exposed to a carrier at this point**
  - **For Cow farms ?**

    CLOSED HERD + STRICT BIOSECURITY
    - **Silent carriers are biggest risk : Close your herd / buy animals only from "negative" herds**
    - **Apply strict biosecurity protocols for the rest (strong survival of salmonella in environnement(years)**

S.Dublin : Prevention of OUTBREAK in veal calves

- S.Dublin = **Opportunistic pathogen**
  - Avoid stress, Avoid bad management
    - Feeding
    - Building confort

    Don't underestimate this !
    and Don't overestimate you !
  - Control other diseases
    - Especially BVD : **BVD = immunosuppression**
    - Frequent co-infecter
    - **Vaccinate against BVD** with live vaccines

S.Dublin : Prevention of OUTBREAK in veal calves

Remember: Route #1 of transmission is ORAL

- OBJECTIVE:

  Apply internal biosecurity to lower the chances of oral transmisson

S.Dublin : Prevention of OUTBREAK in veal calves

- Avoid Rotation - Promote AI/AO
  - Rotation vs AI/AO = 3x + positifs calves
  - AI/AO per site is best
  - AI/AO par room is NOT AI/AO
- If ROTATION:
  Minimize contact between groups / between pens /between animals
  - Direct contact
  and
  - Indirect contact

S.Dublin : Prevention of OUTBREAK in veal calves

- Indirect contact:
  - Tube feeders, boluses guns, rubber nipples, buckets
    - Buy more, use a good cleaning protocol
  - Yourself: Boots, clothes and HANDS
  - Logic order in chores
  - High general hygiene:
    - Clean hallways, avoid stagnant water, pulverize Stalosan F to dry, desinfect and lower microbism
    - Keep the water bowls clean
  - Add desinfectant to drinking water
    - Hydrogen peroxyde, Chlorine, etc.
  - Always change inj. needles between sick calves
    - Blood to blood transmission pathway

S.Dublin : Prevention of OUTBREAK in veal calves

- Cleaning protocole: **valid, well done and verified**
  - Key points:
    - Use SOAP (detergent) with foamer or brush
    - Choose a good desinfectant: H2O2, gluts
      - Validated the concentration and application rate
    - DRY well
    - Don't forget the dock and the small stuff
      - (brooms, trays, shovel, hoses, boots, office, etc..)
    - ATP luminometers audit

S.Dublin : Prevention of OUTBREAK in veal calves

VACCINATION

- Available vaccines in Canada :
  - **Salmonella Vetovax SRP** – labelled for cattle
    - *Injectable*, S.Newport **killed** vaccine, crossprotection for Dublin
  - **Enterisol Salmonella T/C** – labelled for swine
    - *Oral*, S.Typhimurium + S.Cholerasuis **LIVE** VACCINE
    - EXTRA-LABEL in veal – crossprotection for S.Dublin

S.Dublin : Prevention of OUTBREAK in veal calves

VACCINATION

- **Salmonella Vetovax SRP – injectable**
  - Expensive in the veal calves context (6,75$/full dose)
  - Little experience with the product in veal
  - Trials made in 10 barns at very low dose (quarter dose x2) for economical reasons but was not able to prevent outbreak in at least 2 cases.
  - Safer alternative in COWS.
  - Good data for protection at normal dose

S.Dublin : Prevention of OUTBREAK in veal calves

- **Enterisol Salmonella T/C** – labelled for swine - **oral**
  - Used on a regular basis in most of the veal barns in Qc
  - Proven it's value many times from my experience
    - Clinical example
    - But we need to manage the expectations: not a miraculous product – i.e. not 100% effective – I still have a few outbreaks /year
  - Never used it **in cows – I cannot recommand it** - it's a live vaccine and comes with risk

S.Dublin : Prevention of OUTBREAK in veal calves

- **Enterisol Salmonella T/C** – labelled for swine - **oral**
  - Easy to give (oral) - Cheap (< 1 to 2$/head)
  - Adverses reactions on animals can be rough (but it's a necessary evil in my mind)
    - Some precautions must be taken (age at vaccination, dosage, medication, etc..)
  - It's a LIVE vaccine = very fragile vaccine = failed vaccination is easy if not cautious
    - Residual desinfectant and some antibiotics will kill and inactivate the vaccine
    - Excessive heat will harm the vaccine

INNO ATION. PRÉ ENTION. ALORISATION.

S.Dublin – Prevention

- **Biocontainement**

If you know your herd is S.Dublin unstable...
please act accordingly :
- Avoid and warn visitors
- Do not sell your animals to others or to auctions
- Stabilise or eradicate the disease

INNO ATION. PRÉ ENTION. ALORISATION.

Merci !

Thank you !

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Services vétérinaires ambulatoires
TRIPLE V inc.
Canadian Livestock Veterinarians

INNO ATION. PRÉ ENTION. ALORISATION.

Our Building the Foundation for Healthy Calves II manual is also for sale. We're also holding the special discounted rate of $15 including shipping until December 13. Tell your friends and neighbours or pick up a copy for your calf management team members – it makes a great gift! The manual can be ordered on the conference page here.

Salmonella Dublin: An Ontario Perspective

Dr. Cynthia Miltenburg
Lead Veterinarian Animal Health and Welfare

Ontario

Salmonella Dublin: An Ontario Perspective

Overview

1. Cases and detections in Ontario
2. Clinical presentation of Ontario cases
3. Ongoing Ontario research
4. Preventing introduction to new premises

Ontario

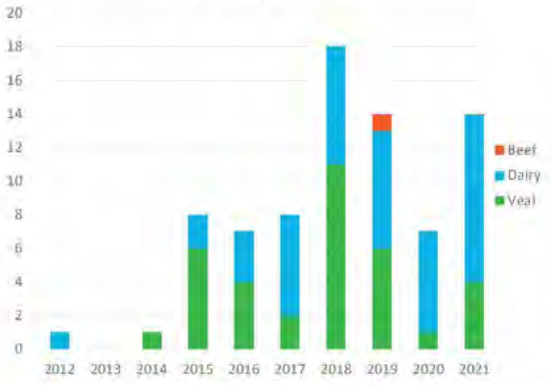
An emerging disease in Canada

Salmonella enterica subsp. *enterica* serotype Dublin

- 1980s and 1990s – detected in the Western US
- 2000s - Prominent serotype of *Salmonella* isolated from cattle in Midwest USA
- Mid – 2000s - Emerged in Northeastern USA
- Entered Quebec and Ontario
  - Detected at the diagnostic lab in Ontario first in 2012, again in 2014 and with increasing frequency since then
  - Similar pattern of emergence in Quebec (2011)

Ontario

New Premises with *Salmonella* Dublin in Ontario 2012-2021 by Commodity



There have been an estimated 78 premises with *Salmonella* Dublin confirmed on lab samples

Data: Ontario Animal Health Network Q4 Report 2021

ONTARIO ANIMAL HEALTH NETWORK

Ontario

Ontario

Salmonella Dublin in Ontario – 2012-2020

S. Dublin in Ontario

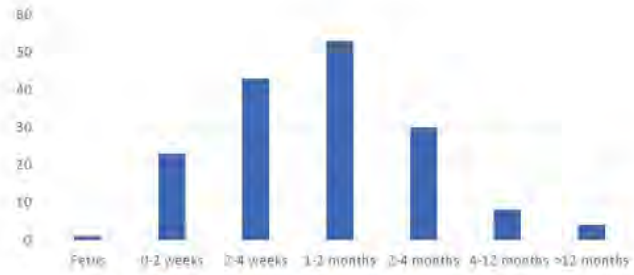
Reported by Ontario veterinarians and lab findings

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

Ontario

S. Dublin in Ontario

Age of Cattle From Diagnostic Submissions where S. Dublin Detected



Data: Ontario Animal Health Network Q4 Report 2021

ONTARIO ANIMAL HEALTH NETWORK

Ontario

Salmonella Dublin

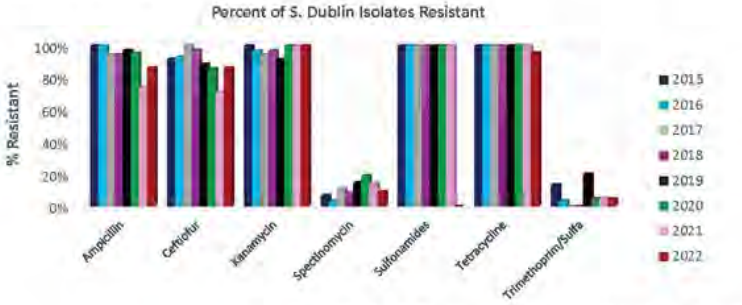
Multi-drug Resistance

- *Salmonella* Dublin strains isolated from cattle in Ontario, Quebec, and northeastern US show a consistent pattern of multi-drug antibiotic resistance
- Veterinarians and producers report poor response to most traditional drugs used to treat pneumonia

Ontario

Salmonella Dublin in Ontario

Ontario S. Dublin isolates show a consistent pattern of antibiotic resistance, with almost 100% of isolates between 2015-2022 tested as resistant to 5 different families

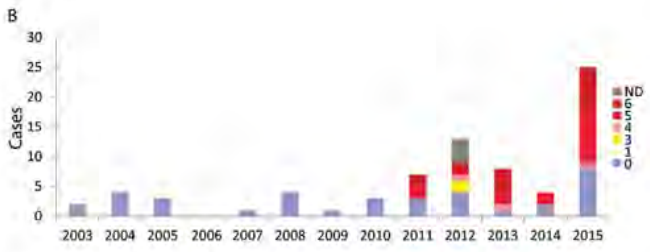


Care of Dr. Durda Slavic and Dr. Tanya Rossi, Animal Health Lab for the Ontario Animal Health Network

Ontario

Human Health Risk

- Strains isolated from animals and people in Canada are closely related and multi-drug resistant
- Can cause a bloodstream infection which frequently requires antibiotic treatment and is associated with a higher risk for hospitalization and mortality



Antimicrobial resistance of *S.* Dublin human infections between 2003 and 2015. CIPARS results are presented by number of antimicrobial drug classes to which isolates were resistant. Mangat et al. 2019. Antimicrobial Agents & Chemotherapy, 63(6): e00108-19

Ontario

Human Health Risk

- Calf caregivers and farm workers are at risk of contracting the disease when handling ill cattle
  - Concern for farm visitors, children, those who are immunocompromised
- *Salmonella* Dublin can cause food-borne illness either through contaminated ground meat, or consumption of unpasteurized milk or milk products

Ontario

Research Projects Examining *Salmonella* Dublin in Ontario

- Dr. David Renaud and graduate student Kate Perry, U of G
  - Visited 100 dairy farms across Ontario to look for risk factors for becoming *S.* Dublin positive
  - Tested 20 individual heifers and 2 bulk tank samples from each farm for *S.* Dublin
  - 24% of farms had at least one positive animal
- Dr. David Kelton and postdoc Dr. Diego Nobrega, U of G
  - Every dairy farm in the province received a *S.* Dublin bulk tank screening test result as part of a disease surveillance project
  - Herd results are private – encourage producers to discuss results with their veterinarian to develop next steps

Ontario

Keeping Dairy Farms Negative

1. Purchase of a carrier animal is a major risk for entry
   - Herds purchasing animals have a greater risk of becoming positive for S. Dublin
   - Attempt to purchase from a negative herd – neg bulk tank and neg blood test is best practice
2. Cattle movement off farm is a risk
   - Quarantine returning animals and blood test
3. Increased risk if neighboring farms are positive – transmitted by people, boots, coveralls, equipment
   - Practice biosecurity

Keeping Dairy Farms Negative

1. Visitors – other producers and professional visitors
   - Poor biosecurity in visitors associated with herds having an outbreak of disease
   - Boots still contaminated after 48h when only rinsed with water
   - Bring cattle out to transporters
5. Practice cleaning and disinfection of calf feeding equipment and calf housing

Keeping Veal or Beef Farms Negative

1. Minimize sources of purchase wherever possible
2. Attempt to source from negative farms – bulk tank screening can be employed
3. Biosecurity for visitors including professionals
4. Manage all in/all out
5. Cleaning and disinfection of calf feeding equipment daily and calf housing between groups

Salmonella Dublin Summary

- *Salmonella* Dublin is often characterized by high levels of morbidity and mortality in calves
- Strains detected in Ontario are multi-drug resistant
- There is a risk of zoonoses for people
  - Need to take efforts to protect family and workers
- Projects are underway to evolve our understanding of this disease and help producers make good decisions
- Good biosecurity is paramount to keeping negative farms from becoming infected

"Ain't no bodies like antibodies":

Getting the most from your colostrum management program

Dr. Kelly Barratt DVM

November 2022

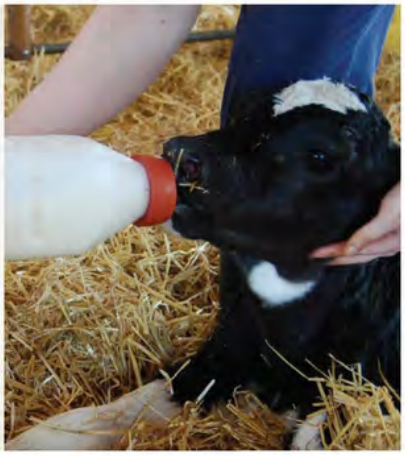
"Colostrum management is single most important management factor in determining calf health and survival"

–Dr. Sandra Godden

Basic Concept ~ Precise Implementation

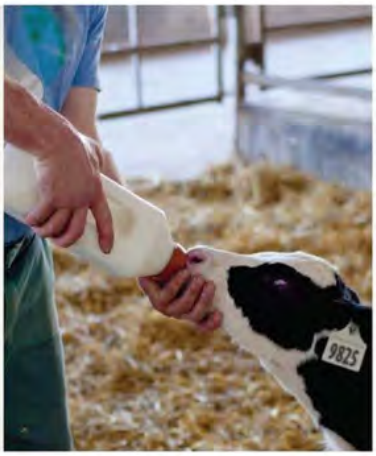
What is colostrum?

- "First milk"
- Antibodies (Immunoglogulins: **IgG**, IgA, IgM, IgE)
- High fat
- High protein
- High vitamins and minerals
- Non-nutritive factors (hormones, growth factor…)



Why is colostrum important?

- Cow placenta separates maternal and fetal blood
- Calf is born agammaglobulinemic
- Calf initially depends entirely on maternal antibody, immunoglobulins (Ig), from colostrum for immunity
  - "Passive Transfer"
- High nutrient value
- Non-nutritive factors



Why do we care?

- Est. 15% of calves have failure of passive transfer (FPT)
- Decreased pre-weaning morbidity and mortality
- Decreased post-weaning mortality
- Increased rate of gain
- Decreased age at 1st calving
- Increased milk in 1st and 2nd lactations
- Decreased risk of culling in 1st lactation

The process:

- Cow has to make it
- We need to harvest it
- We need to feed it
- Calf needs to absorb it

Set Yourself Up For Success

- Vaccination program
- Proper dry period length
- Good nutrition and feeding methods
- Heat abatement
- Reduce risk of other factors like calf hypothermia and metabolic issues resulting from dystocia

Timing of Harvest and Feeding

- ASAP!
  - Collect and feed within 1-2 hours (<6 hours)
    - Ig decreases 3-4% every hour post calving
  - Feed calf or chill** leftovers within 30 minutes of collection
  - Feed colostrum again at second feeding, then transition milk for first 3 days minimum

Cleanliness

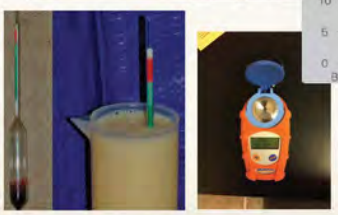
- Bacteria blocks Ig absorption
- Bacteria can cause disease
  - Collection technique
  - Storage technique
  - Feeding tools and equipment
  - Heat treat** (NOT pasteurized)
    - 60 degrees for 60 minutes

Quantity

- Calf should receive 10-12% of body weight
  - 88lb calf: 10% = 4L
- Colostrum replacer - check the label!
  - Ideally deliver 300g of Ig
- Tube vs nipple?
- Fresh vs Frozen vs Heat Treated vs Replacer?

Quality (Level of Ig)

- Cannot tell by appearance!
- IgG level of colostrum (>50g/L)
  - Brix Refractometer: ≥22
  - Colostrometer



How do I know if it's working?

"You can't manage what you don't measure"

–W. Edwards Deming

What can I measure?

- Determine if calves are receiving adequate amount of Ig (passive transfer) or not (failure of passive transfer (FPT))
- **Serum Total Protein (STP)**
  - Collect a single red top vacuum tube of blood from calves 24hrs - 9 days of age
  - Let sample sit upright for a few hours until blood clot separates from serum (can use a centrifuge)
  - Use a refractometer to evaluate the serum (Brix or TP)
  - Individual calf considered to have FPT if STP <5.3g/dL

Serum Total Protein ~ Herd Level

Recommendations for monitoring transfer of passive immunity in dairy calves

Proposed categories	Proposed Serum IgG (g/L)	Proposed calves in each category (%)	Equivalent Serum TP (g/dL)	Equivalent Serum Brix (%)
Excellent	>25g/L	>40%	≥6.2g/dL	>9.4%
Good	18-24.9g/L	~30%	5.8-6.1g/dL	8.9-9.3%
Fair	10-17.9g/L	~20%	5.1-5.7g/dL	8.1-8.8%
Poor	<10g/L	<10%	<5.1g/dL	<8.1%

AABP proceedings Vol 54, No 2, October 2021, S. Godden and W. Knauer, adapted from Lombard et al. 2020

What can I measure?

- **Colostrum** test results (assess level of Ig prior to feeding)
  - Brix Refractometer reading >22%
- **Luminometer** results (assess level of bacteria and cleaning procedures)
  - <100 RLU
- Calf treatment records/proAction biosecurity disease events records
- Calf lung ultrasound records
- Growth and production records

How do I know if it's working?

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WRITE IT DOWN!

TAKE HOME:

- Assess colostrum harvest and feeding equipment cleanliness
- Assess colostrum harvest, storage and feeding procedures
- Review records (and your memory!)
- Get a Brix refractometer
- Get a notebook or make a spreadsheet
- Consider opportunity for investment?
- Things to discuss with your herd veterinarian/vet tech/advisors:
  - Protocol review
  - Calf treatment records
  - Health and performance data
  - Luminometer?
  - Serum protein testing?
  - Bacteria counts?
  - Lung ultrasound?

The story doesn't end here

- Research is ongoing!
- Use of colostrum for treating sick calves
- Extended feeding of colostrum
- Finding out more about what is in colostrum and what the benefits are
  - Non-nutritive factors

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