Understanding Diarrhea in Dairy Calves

Impact, mechanisms, prevention, and treatment strategies

Dave Renaud

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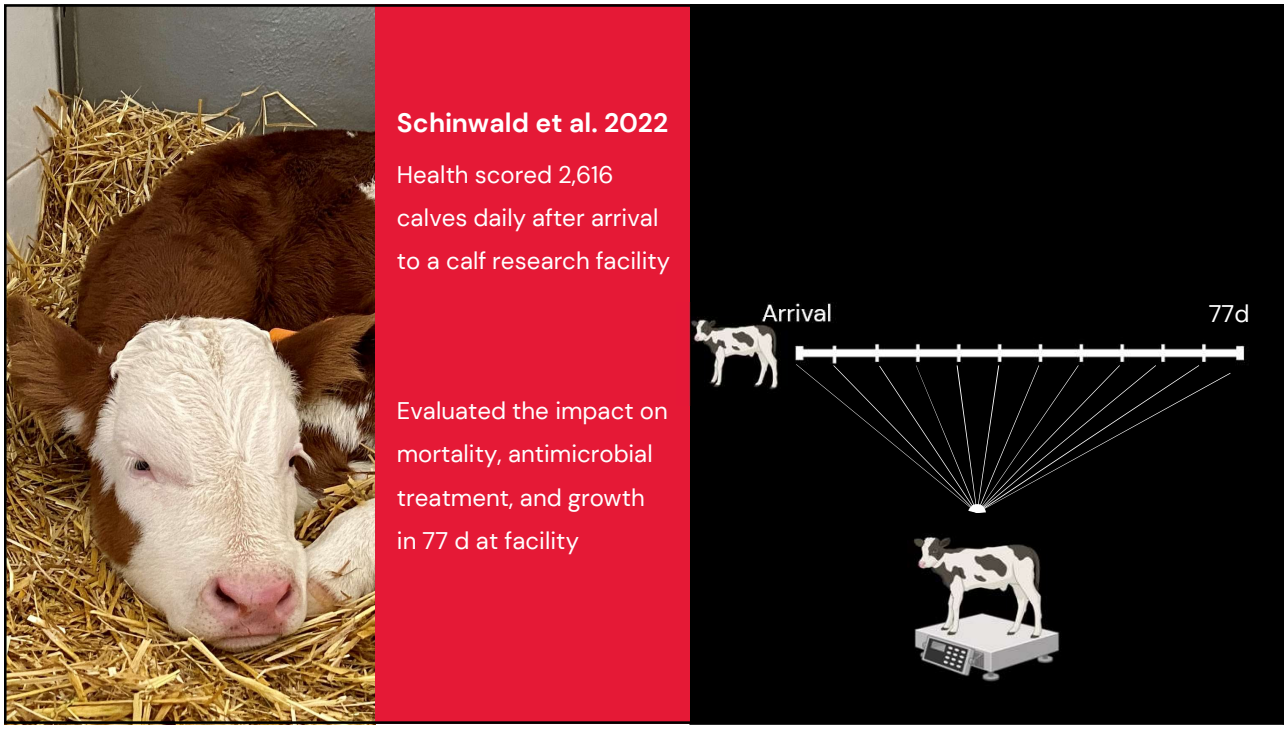
Schinwald et al. 2022
Health scored 2,616 calves daily after arrival to a calf research facility
Evaluated the impact on mortality, antimicrobial treatment, and growth in 77 d at facility
Bovine respiratory disease scoring system for pre-weaned dairy calves
Clinical sign
Score if normal
Score if abnormal (any severity)
Eye discharge
Nasal discharge
Ear droop or Head tilt
Cough
No cough
Spontaneous cough
Breathing
Normal
Rapid or difficult breathing
Temperature
< 102.5° F
≥ 102.5° F
Add scores for all clinical signs, if total score is ≥ 5, calf may be positive for bovine respiratory disease
Arrival
77d

3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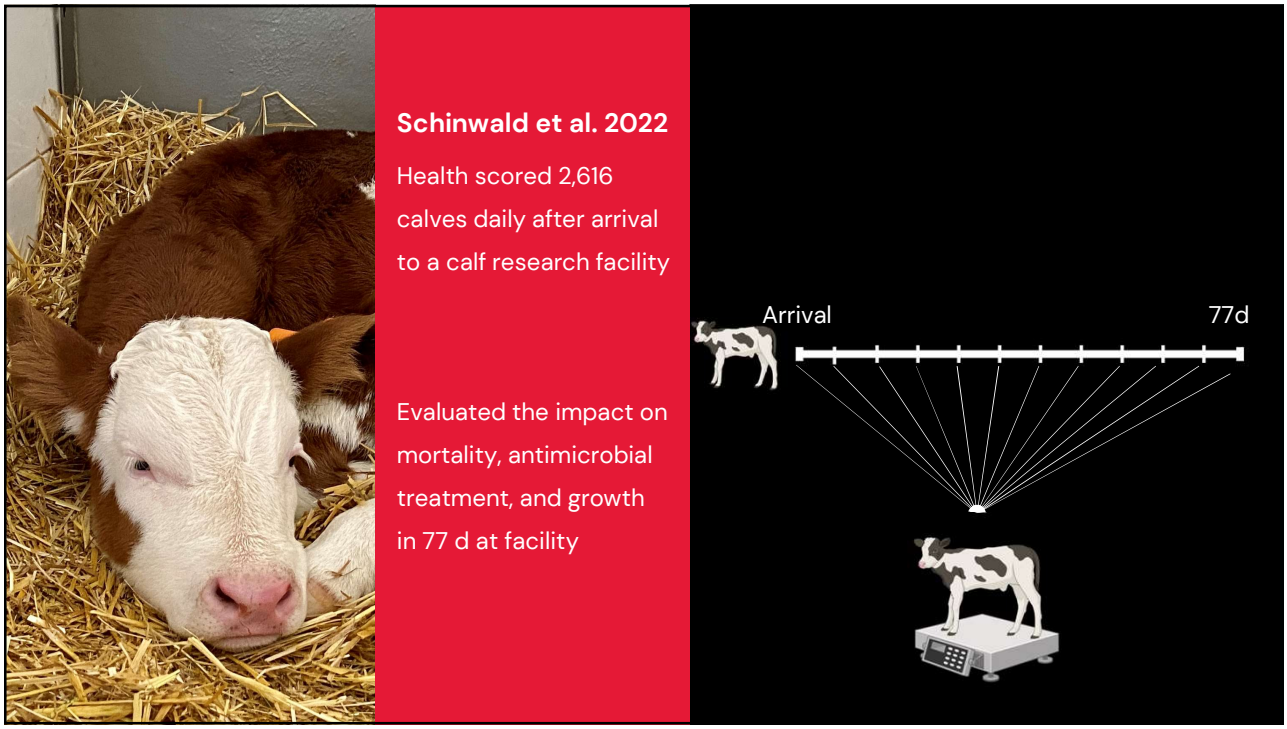
77d

4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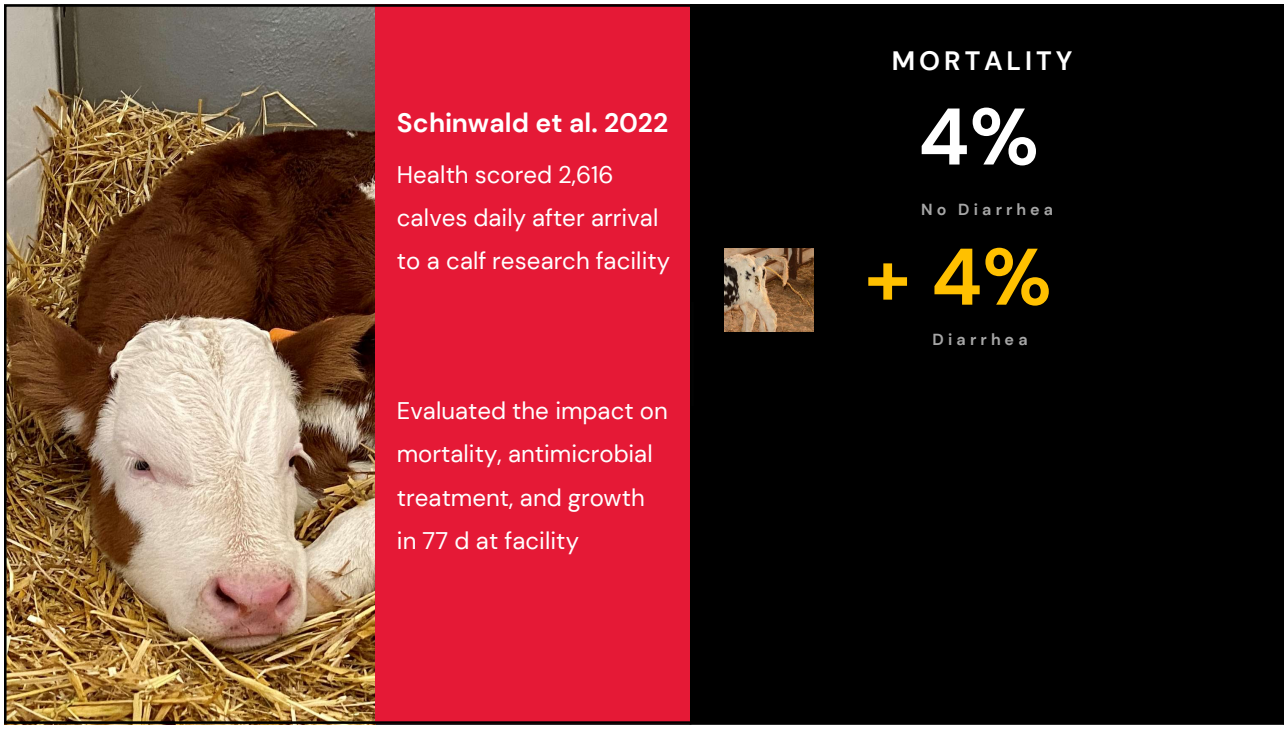
Schinwald et al. 2022
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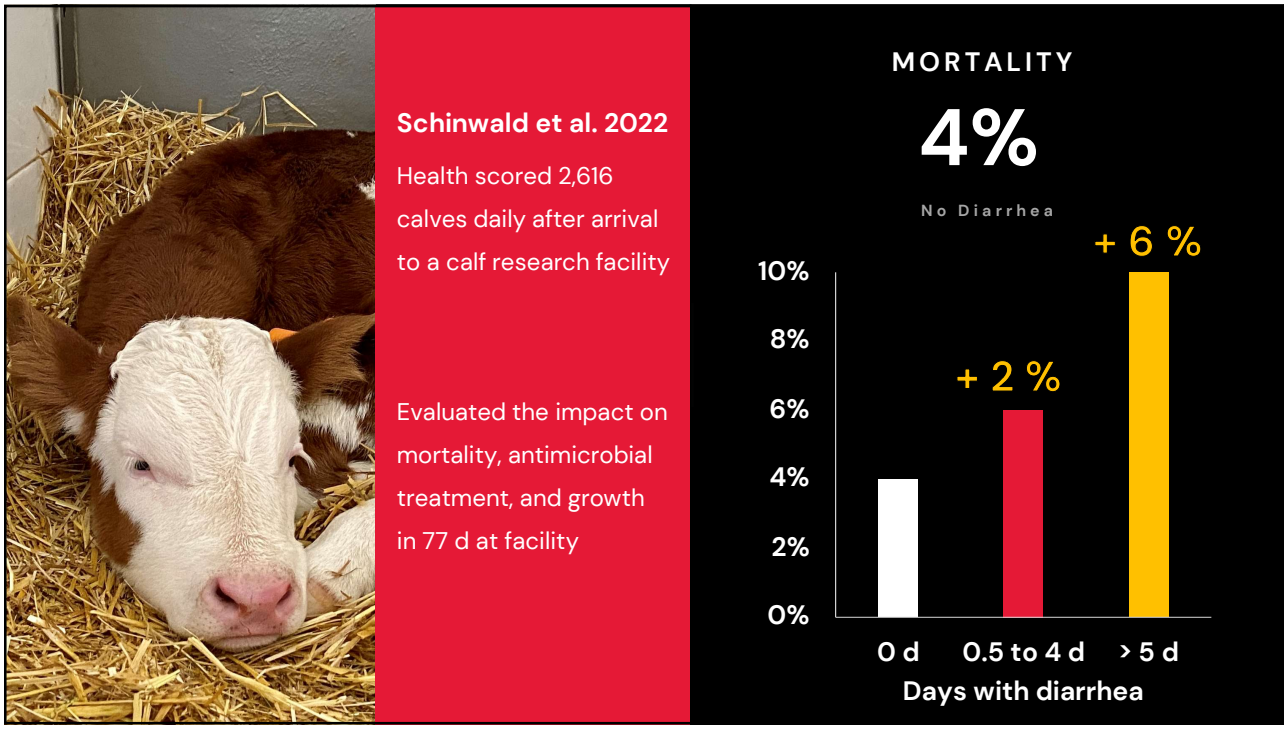
MORTALITY
4%
No Diarrhea
+ 4%
Diarrhea

6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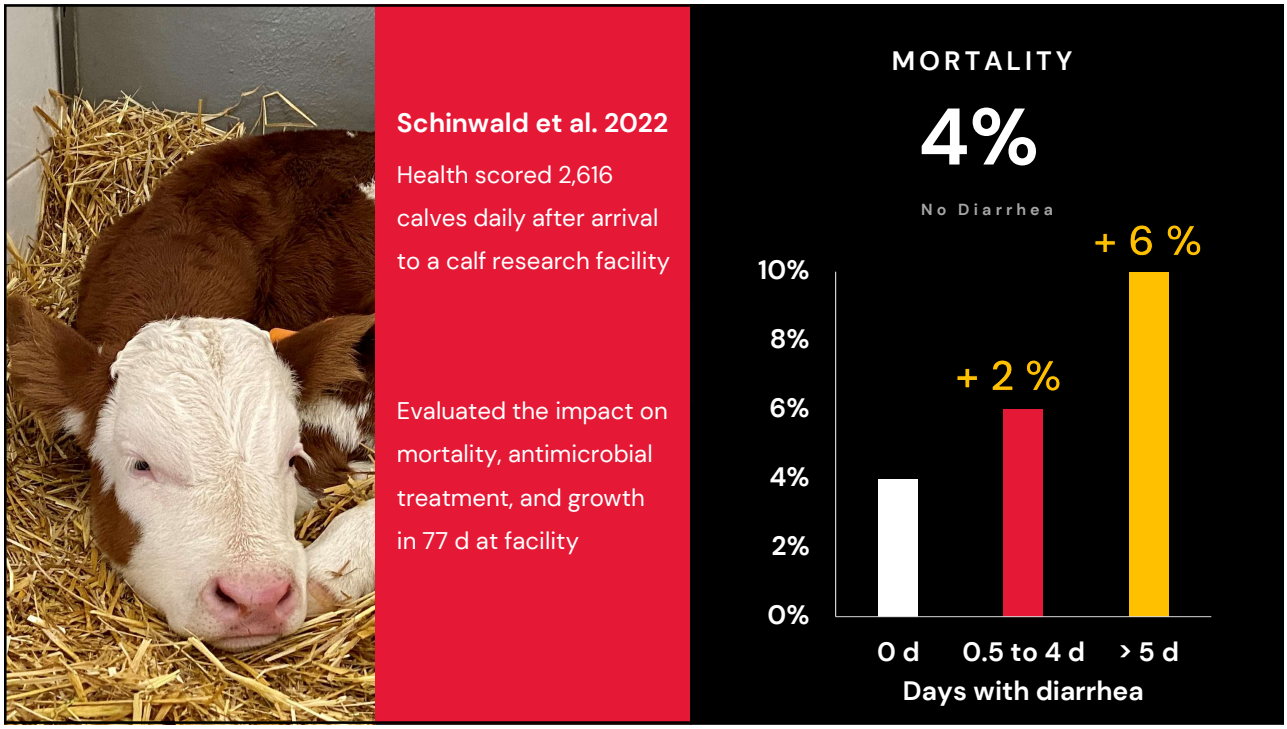
MORTALITY
4%
No Diarrhea
+ 6 %
+ 2 %
10%
8%
6%
4%
2%
0%
0 d
0.5 to 4 d
> 5 d
Days with diarrhea

7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0 d
0.5 to 4 d
> 5 d
Days with diarrhea

8

Schinwald et al. 2022

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RESPIRATORY

3 days

No Diarrhea

+ 2 days

Diarrhea

9

Schinwald et al. 2022

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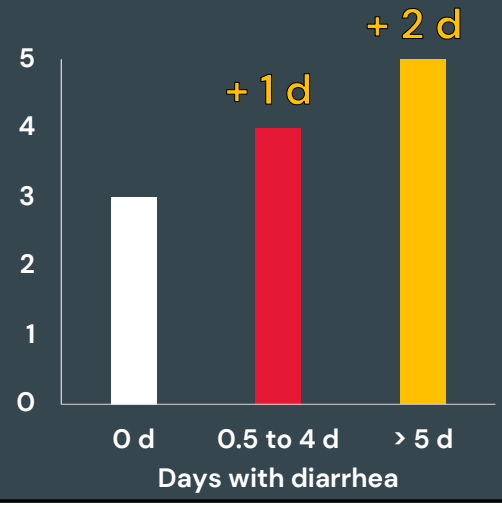
Evaluated the impact on mortality, antimicrobial treatment, and growth in 77 d at facility

RESPIRATORY

3 days

No Diarrhea



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Schinwald et al. 2022

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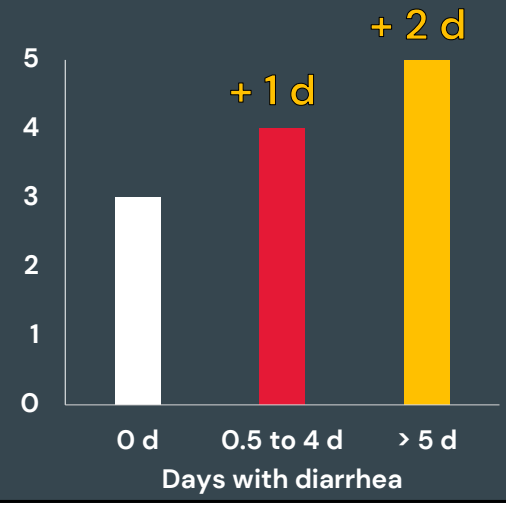
RESPIRATORY

3 days

No Diarrhea



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Schinwald et al. 2022

Health scored 2,616 calves daily after arrival to a calf research facility

Evaluated the impact on mortality, antimicrobial treatment, and growth in 77 d at facility

GROWTH

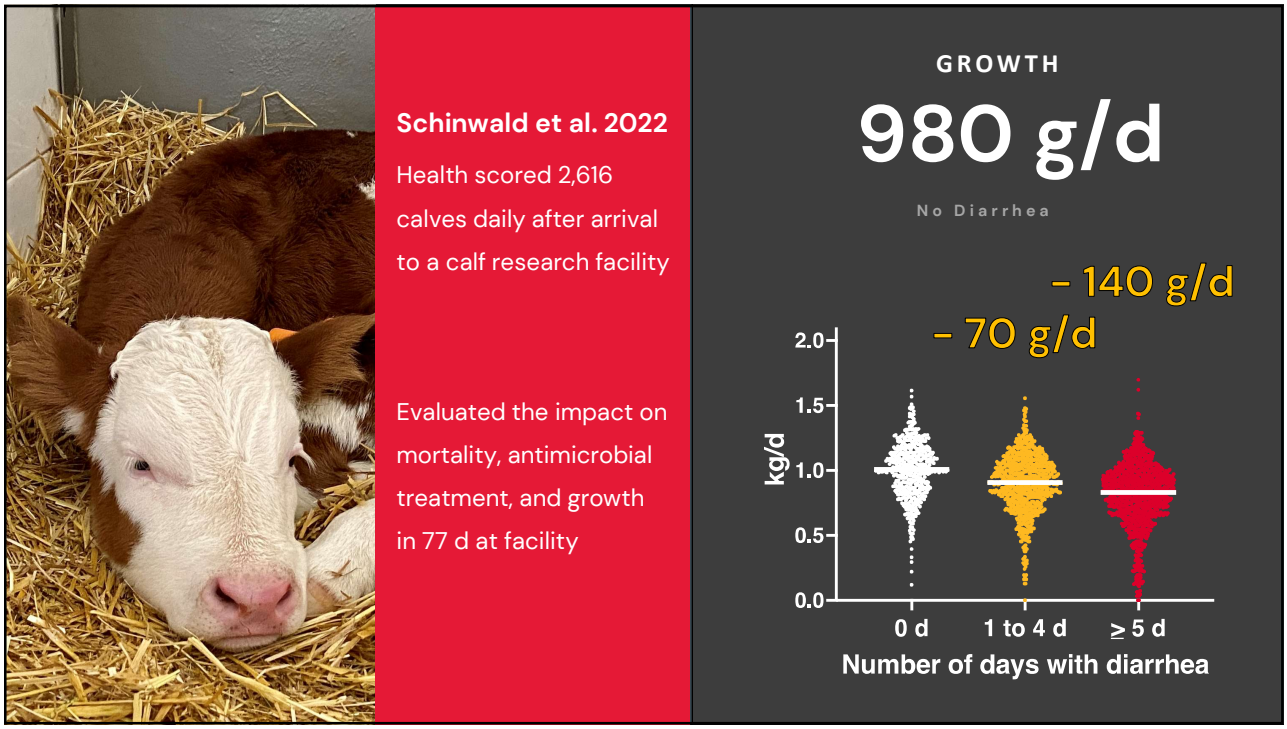
980 g/d

No Diarrhea

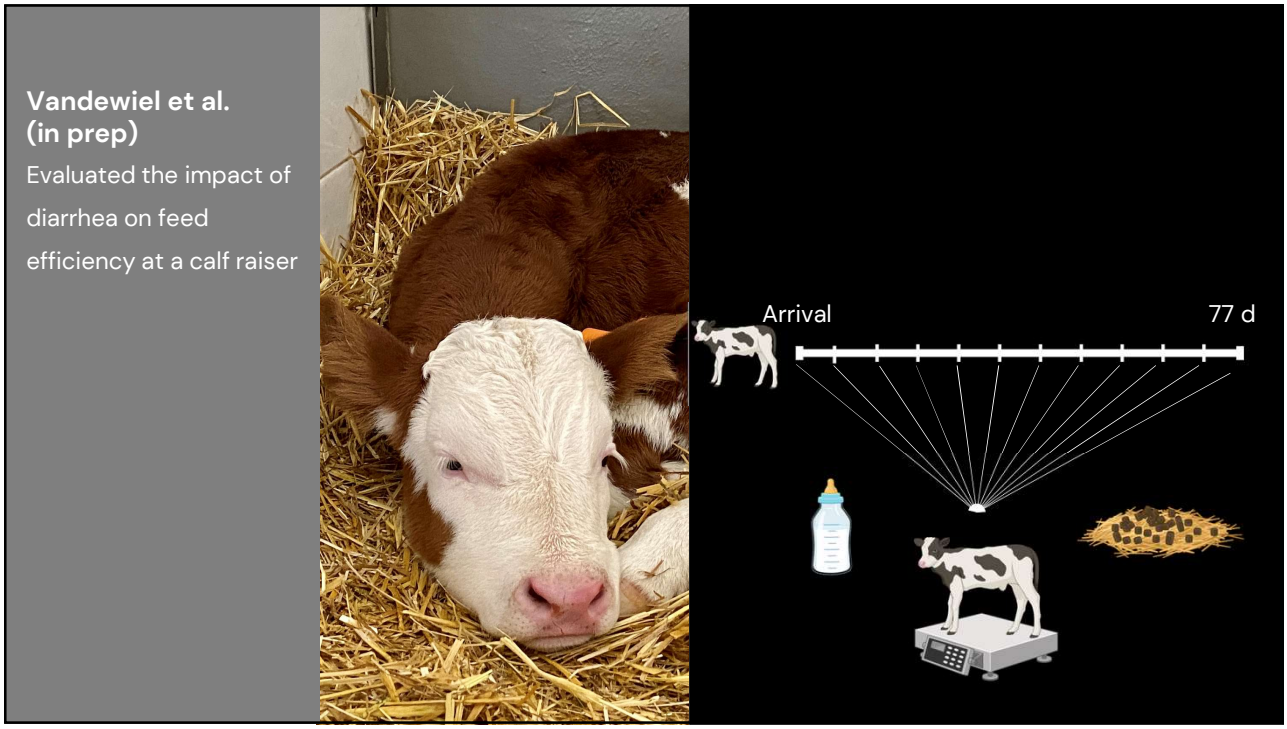
– 140 g/d

Diarrhea

12


Schinwald et al. 2022
Health scored 2,616 calves daily after arrival to a calf research facility
Evaluated the impact on mortality, antimicrobial treatment, and growth in 77 d at facility
GROWTH
980 g/d
No Diarrhea
– 140 g/d
– 70 g/d
kg/d
2.0
1.5
1.0
0.5
0.0
0 d
1 to 4 d
≥ 5 d
Number of days with diarrhea

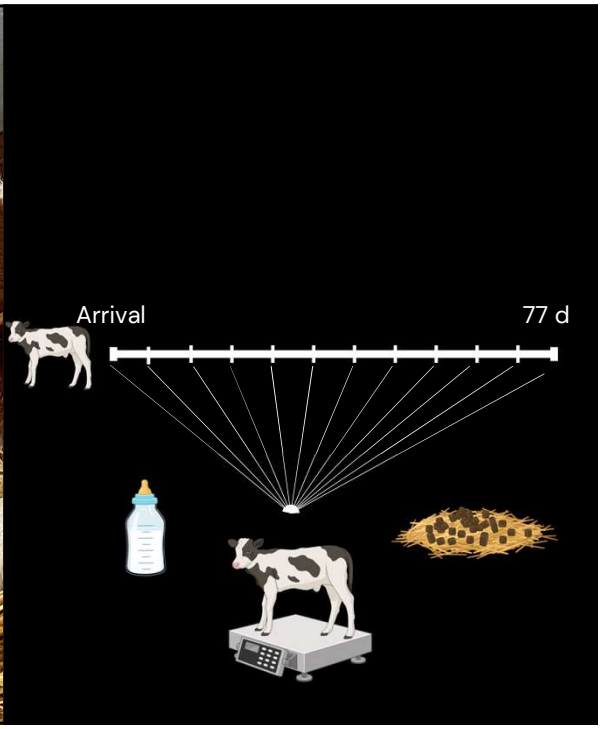
13


Vandewiel et al. (in prep)
Evaluated the impact of diarrhea on feed efficiency at a calf raiser
Arrival
77 d

14

Vandewiel et al. (in prep)

Evaluated the impact of diarrhea on feed efficiency at a calf raiser



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Vandewiel et al. (in prep)

Evaluated the impact of diarrhea on feed efficiency at a calf raiser

FEED EFFICIENCY

6.72 ME/kg gain

No Diarrhea

+ 0.10 ME/kg gain

Diarrhea

16

Vandewiel et al. (in prep)

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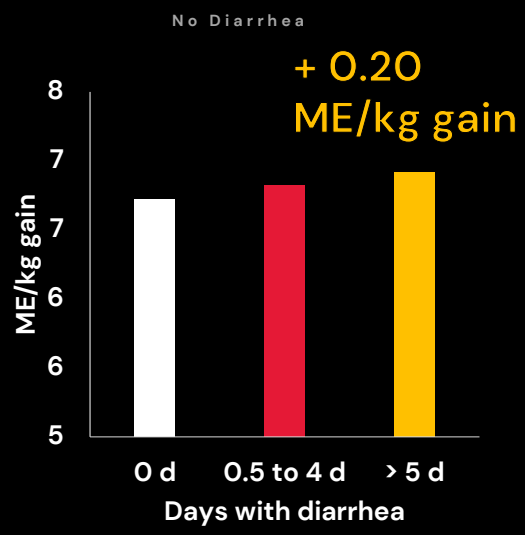
FEED EFFICIENCY

6.72 ME/kg gain



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Abuelo et al. 2021

Followed 2,200 calves through to the end of first lactation at a large Michigan dairy farm

Goh et al. 2024

Followed 9,833 calves through to the end of first lactation at a large Australian dairy farm

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Abuelo et al. 2021

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Followed 9,833 calves through to the end of first lactation at a large Australian dairy farm

PRE-CALVING

73% vs. 78%

CONCEPTION RATE

5% ↓ hazard

SURVIVAL TO FIRST LACTATION

+ 4 to 7 d

AGE AT FIRST CALVING

20

Abuelo et al. 2021

Followed 2,200 calves through to the end of first lactation at a large Michigan dairy farm

Goh et al. 2024

Followed 9,833 calves through to the end of first lactation at a large Australian dairy farm

−325 KG

305 MILKING EQUIVALENT

13% ↑ hazard

REMOVAL BY 300 DIM

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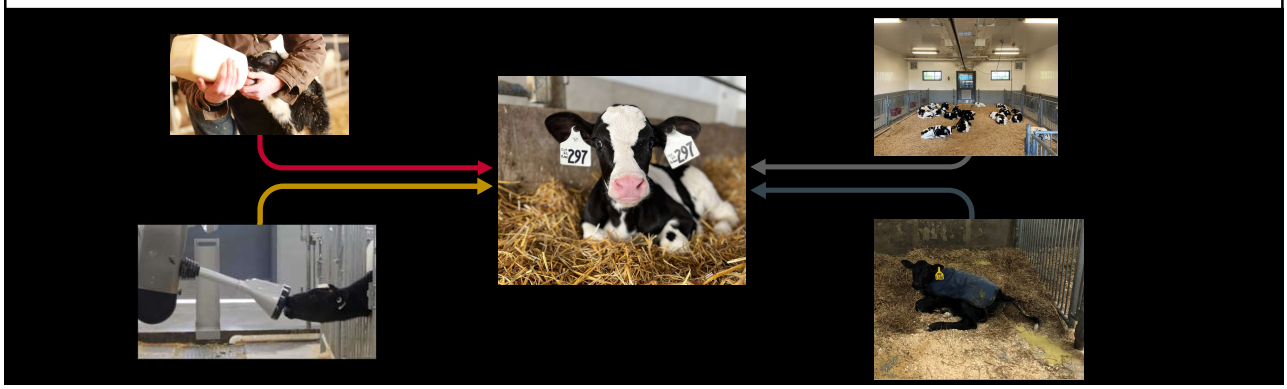
Managing Diarrhea

1. Colostrum management
2. Nutrition
3. Environment
4. Early and appropriate treatment



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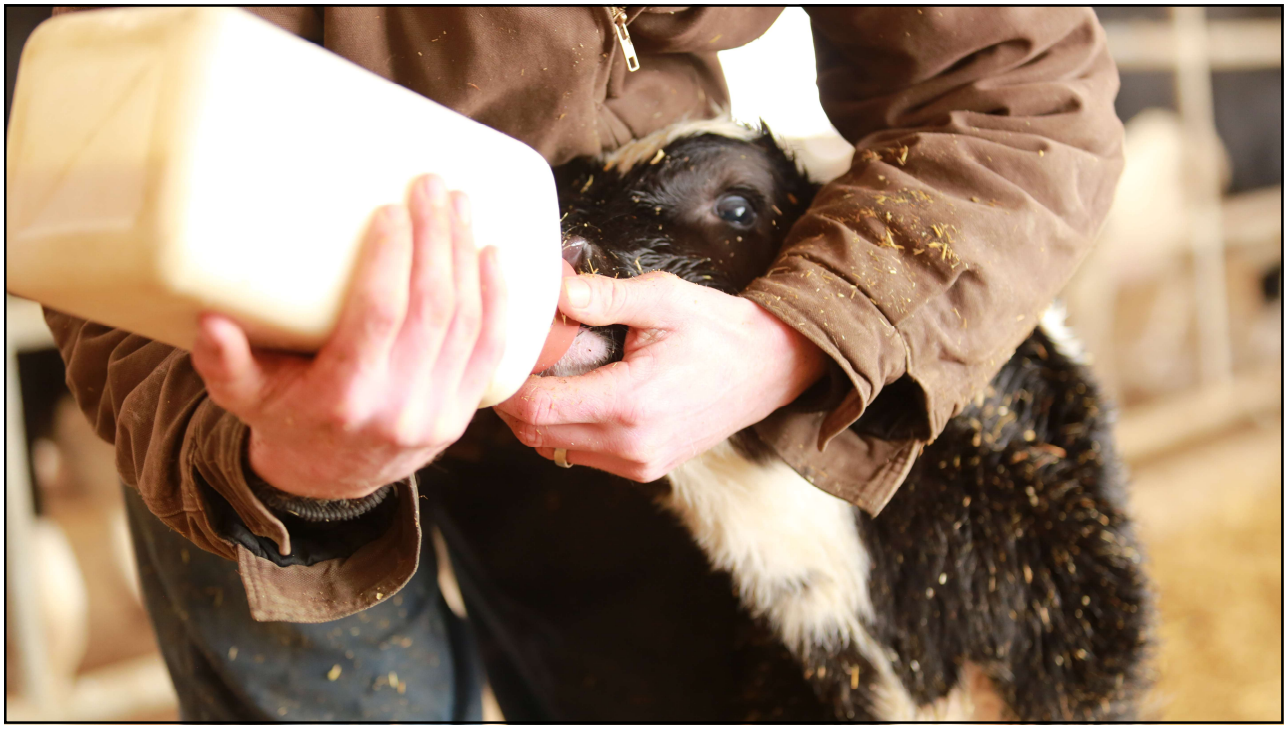

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Quantity | Quality | Quickness | Cleanliness

Achieving passive immunity.

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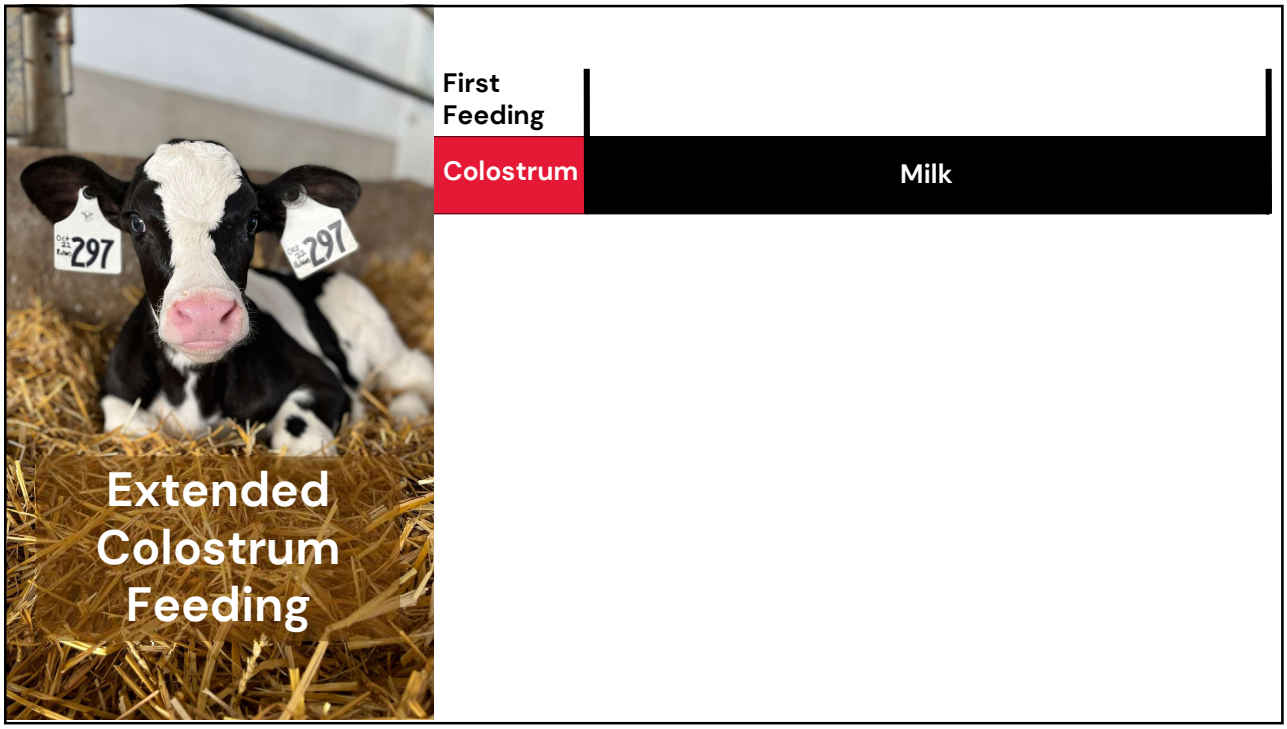
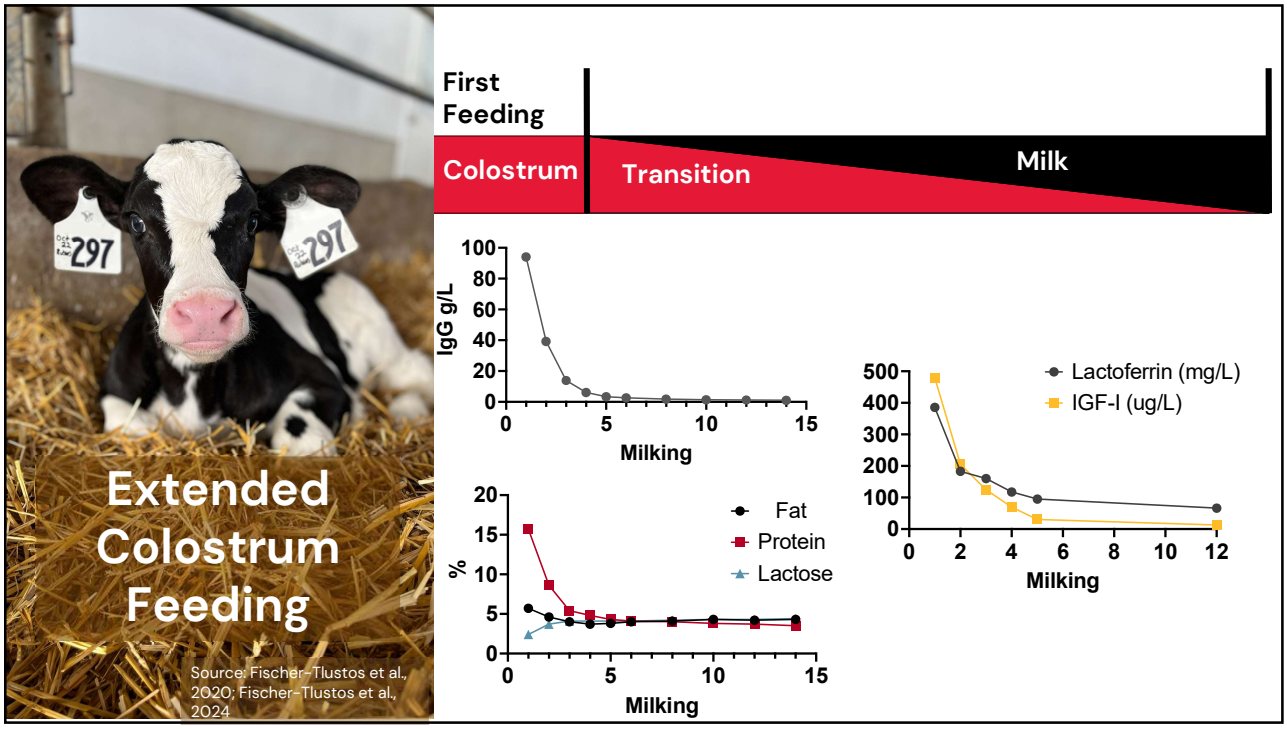

Extended Colostrum Feeding
First Feeding
Colostrum
Milk

27


Extended Colostrum Feeding
First Feeding
Colostrum
Transition
Milk
IgG g/L
Milking
%
Fat
Protein
Lactose
Milking
Lactoferrin (mg/L)
IGF-I (ug/L)
Milking
Source: Fischer-Tlustos et al., 2020; Fischer-Tlustos et al., 2024

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1. **Improved Gut Development**
2. **Improved Health**
3. **Improved Growth**

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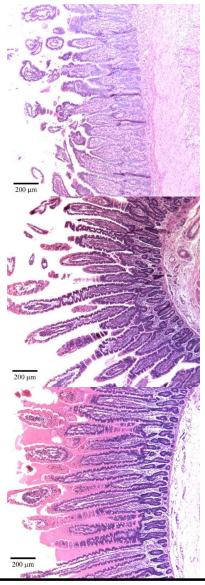
1. Improved Gut Development

All calves fed one meal of colostrum followed by:

- Milk
- 50% milk/50% colostrum
- Colostrum

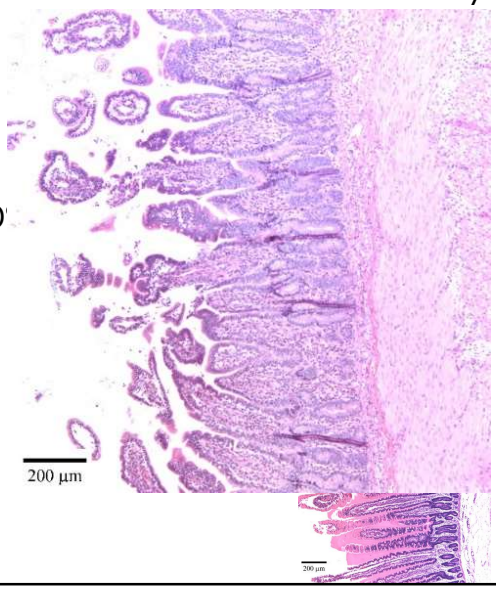


30

1. Improved Gut Development

All calves fed one meal of colostrum followed by:

- Milk
- 50% milk/50
- Colostrum



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1. Improved

All calves fed or

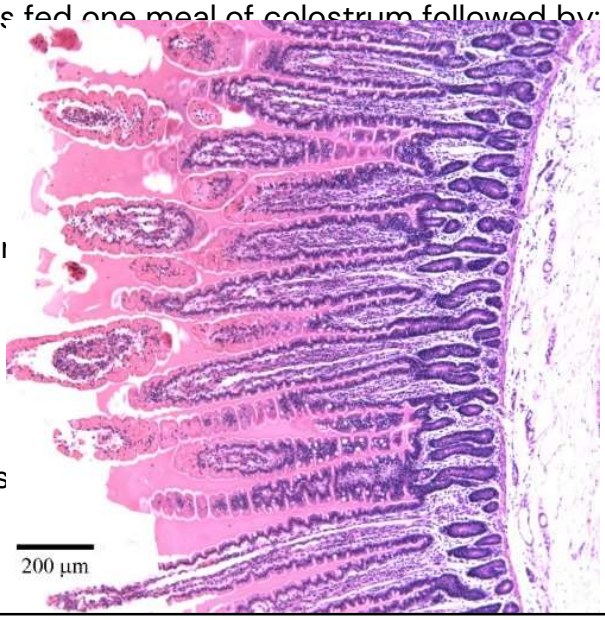
- Milk
- 50% milk/50
- Colostrum

32

1. Improved Gut Development

All calves fed one meal of colostrum followed by:

- Milk
- 50% r
- Colos



33

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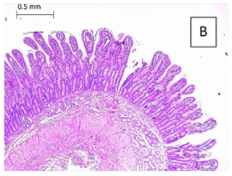
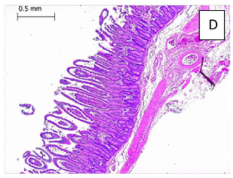
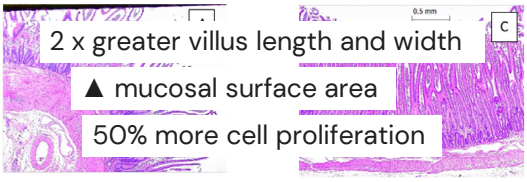
- Milk





- Transition milk



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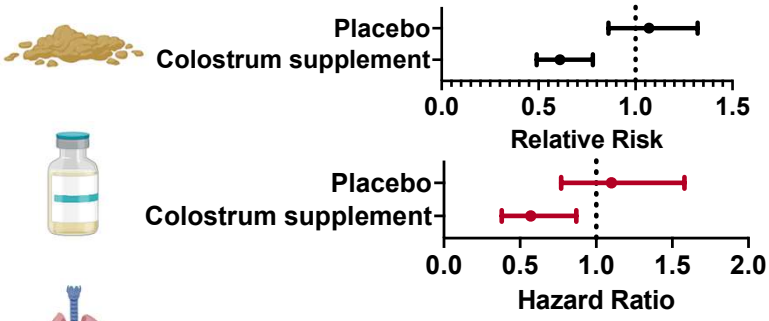
2. Improved Health

After arrival to calf ranch calves fed:

- Milk
- 70 g CR + MR twice daily for 14 d
- 70 g nutritionally matched supplement + MR without IgG twice daily for 14 d



No effect

35

2. Improved Health

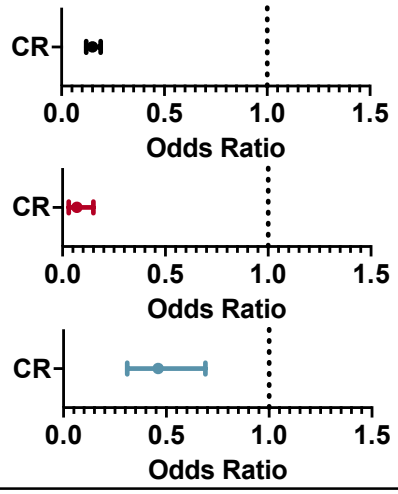
After arrival to calf ranch calves fed:

- Milk
- 150 g CR + MR twice daily for 14 d

▼ odds by 85%

▼ odds by 93%

▼ odds by 54%



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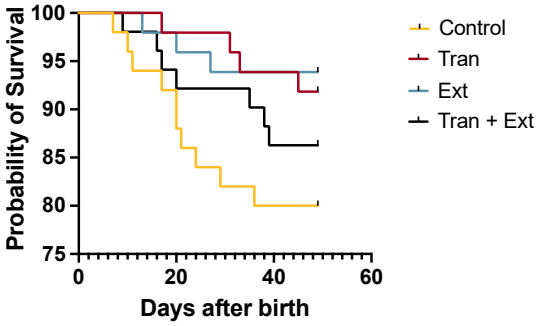
2. Improved Health

All calves fed two meals of colostrum followed by:

- Milk
- 50:50 MR:CR from d 2 to 3 (TRAN)
- 45 g CR twice daily + MR for 14 d (EXT)
- TRAN + EXT



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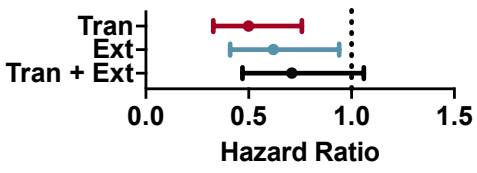
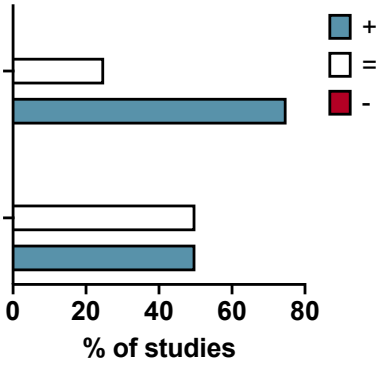


No effect

38

2. Improved Health



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3. Improved Growth

Van Soest et al. (2022)	+ 300 g/d Supplement transition milk for 4 d
Berge et al. (2009)	+ 40 g/d 75 g/d CR supplement 2x/d for 14 d
Kargar et al. (2020)	+ 40 to 100 g/d 0.350 kg/d colostrum for 14 days
Kargar et al. (2021)	+ 89 g/d 2 L transition milk for 21 days
McCarthy et al. (2024) Chamorro et al. (2017)	No effect

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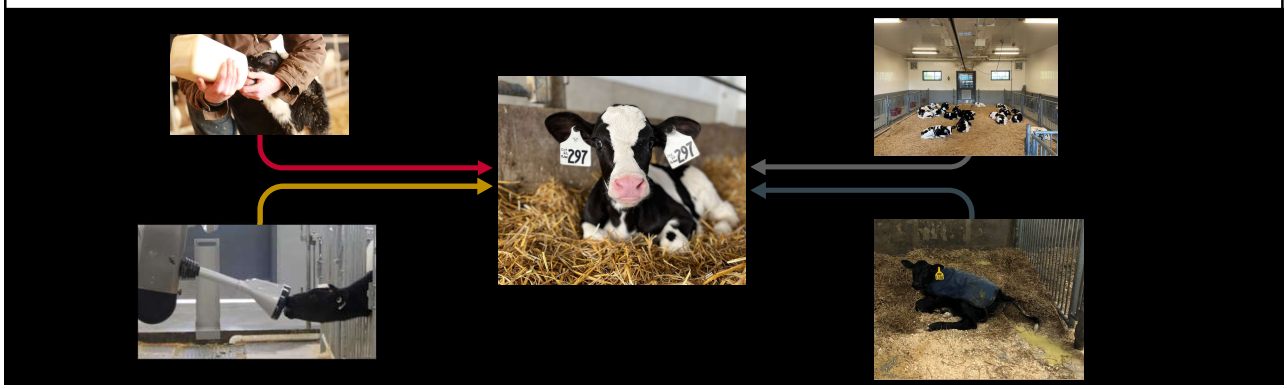
Managing Diarrhea

1. Colostrum management
2. Nutrition
3. Environment
4. Early and appropriate treatment



41

42

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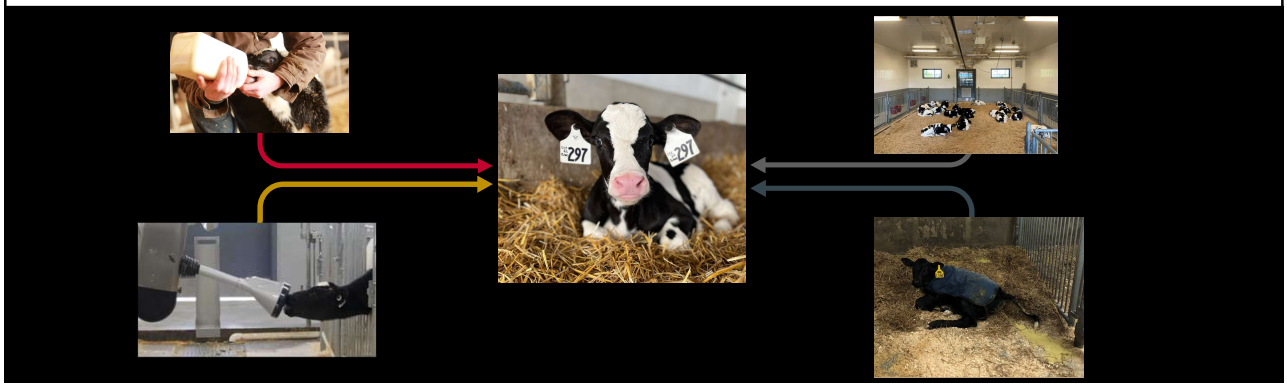

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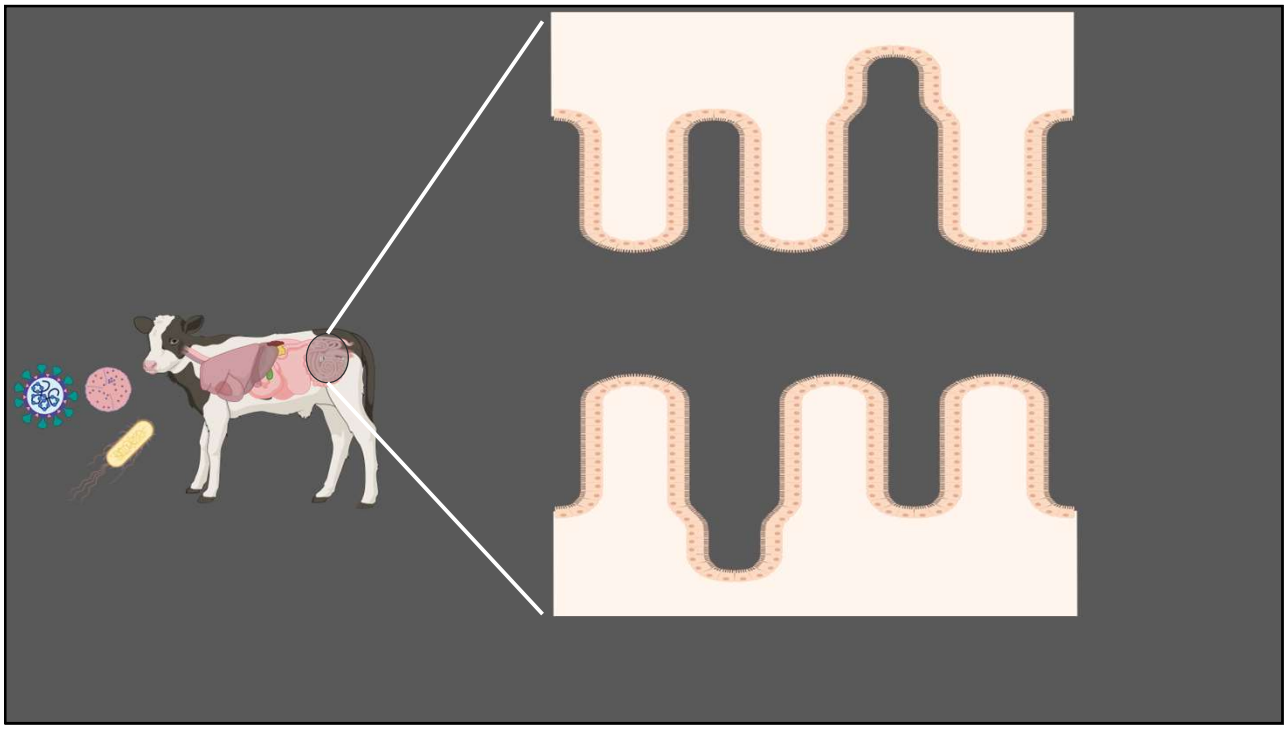

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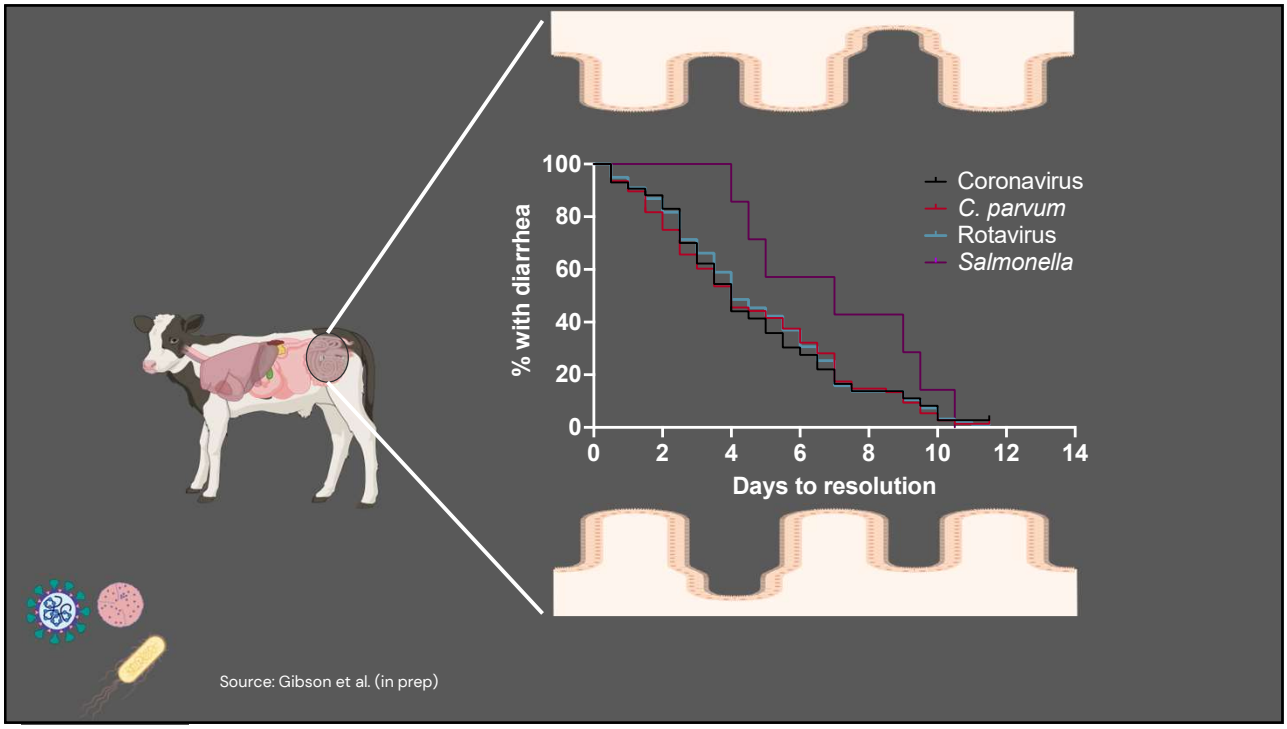
100
80
60
40
20
0
% with diarrhea
0
2
4
6
8
10
12
14
Days to resolution
Coronavirus
C. parvum
Rotavirus
Salmonella
Source: Gibson et al. (in prep)

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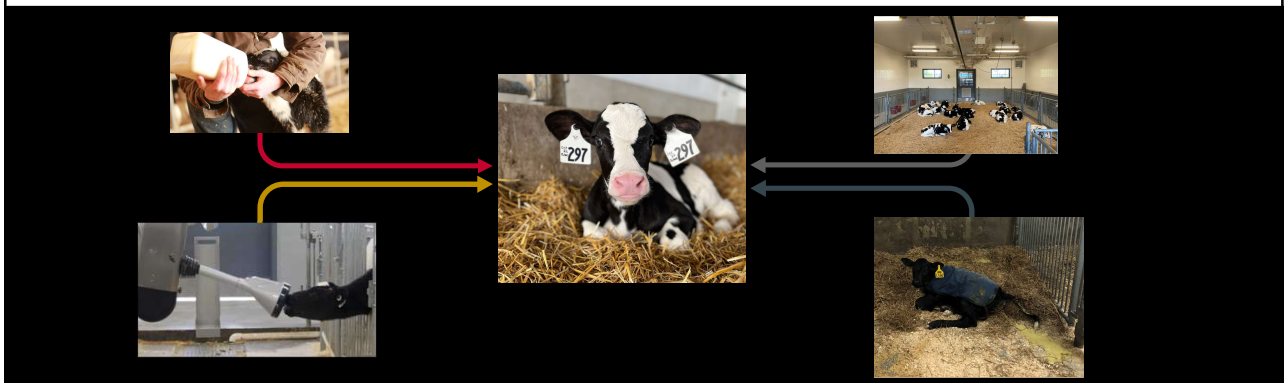
Managing Diarrhea

1. Colostrum management
2. Nutrition
3. Environment
4. Early and appropriate treatment



47

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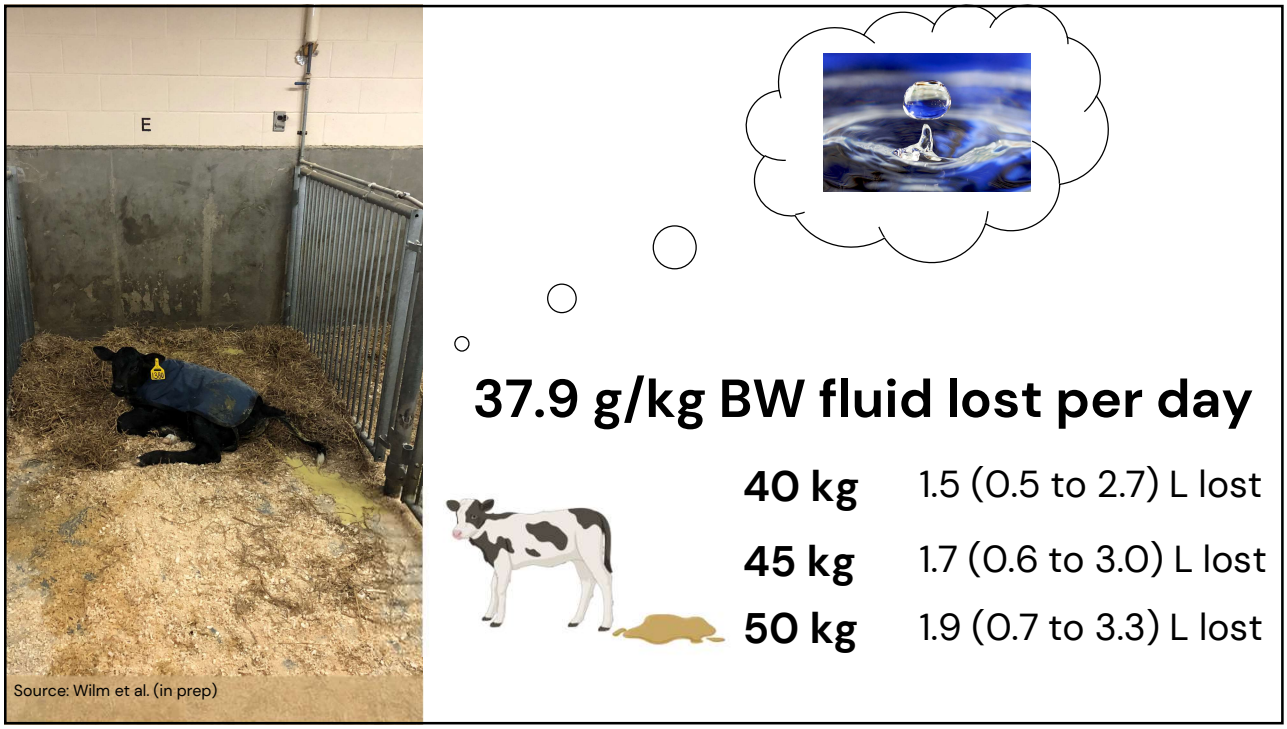
E
Source: Wilm et al. (in prep)
37.9 g/kg BW fluid lost per day
40 kg 1.5 (0.5 to 2.7) L lost
45 kg 1.7 (0.6 to 3.0) L lost
50 kg 1.9 (0.7 to 3.3) L lost

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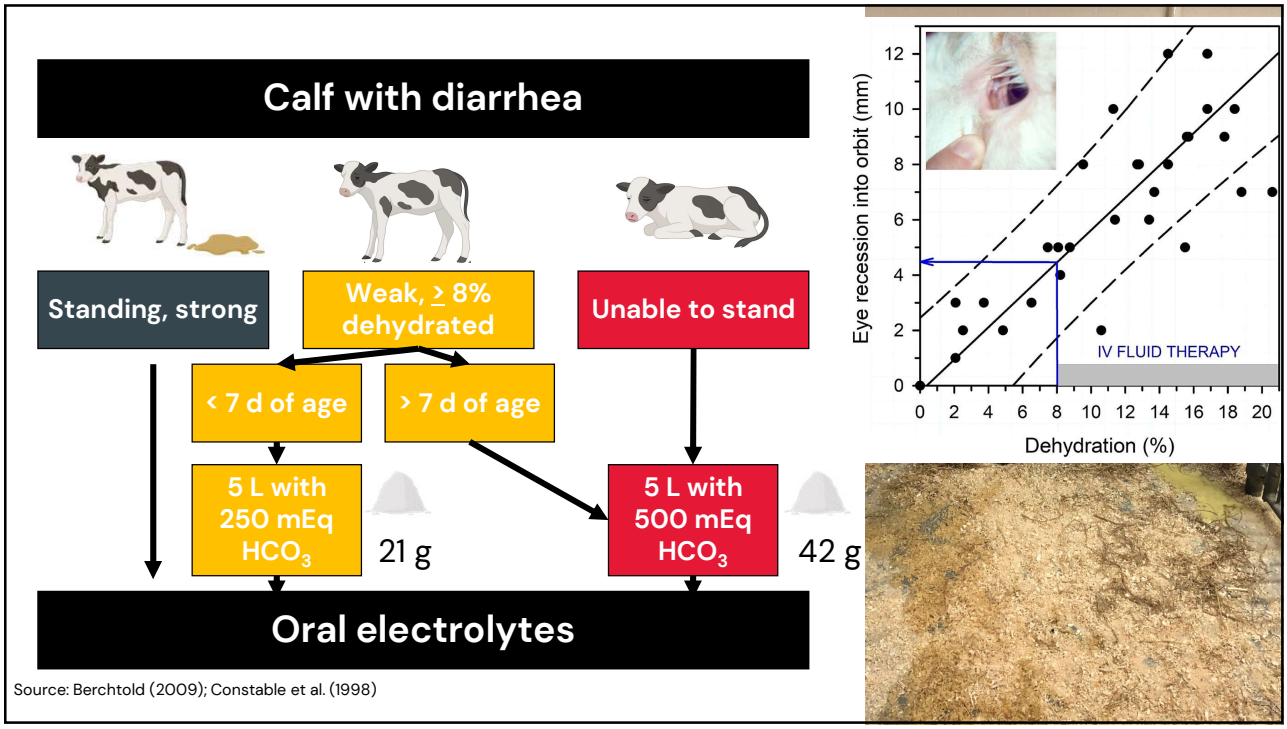
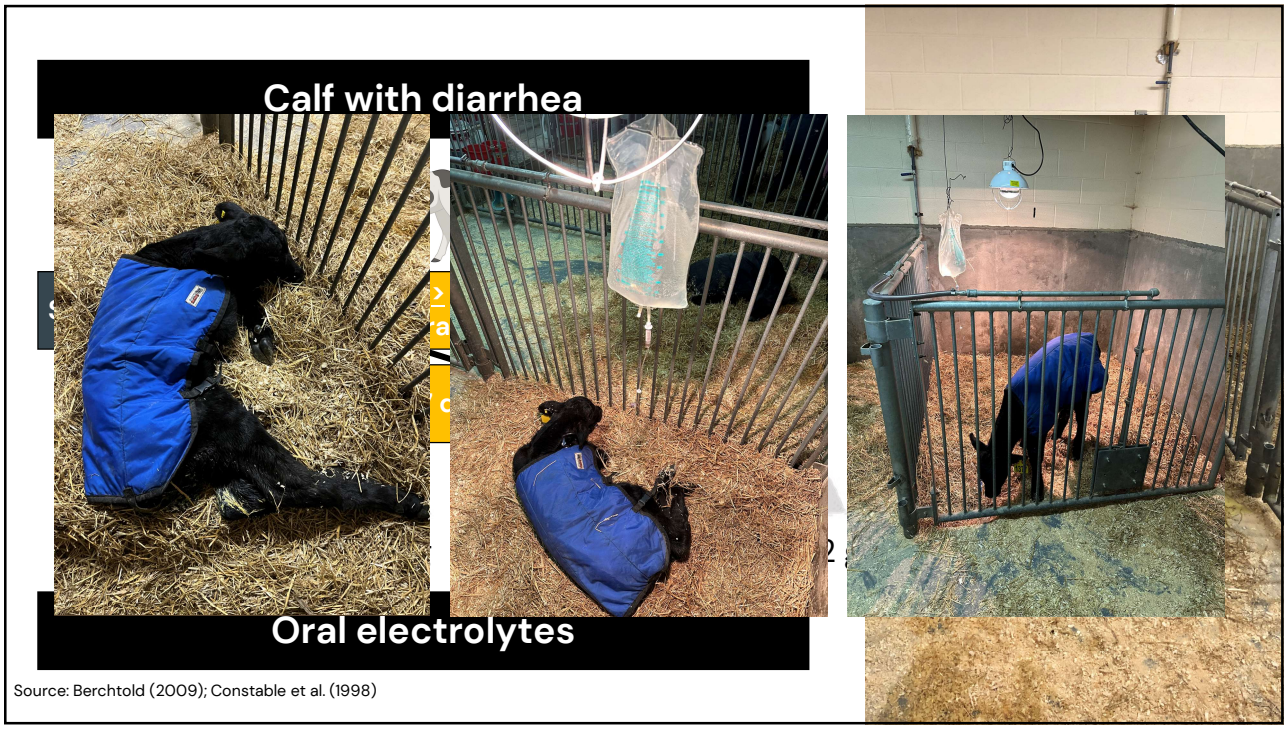
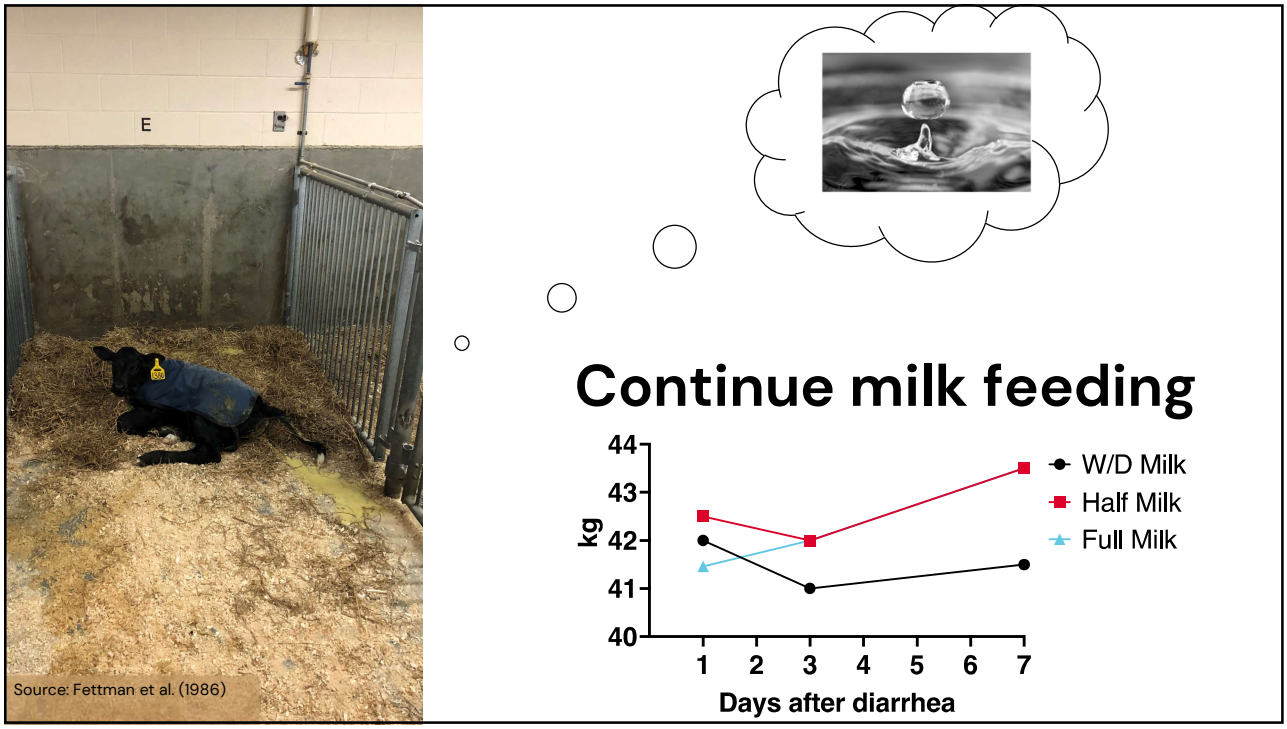

Calf with diarrhea
Standing, strong
Weak, ≥ 8% dehydrated
Unable to stand
< 7 d of age
> 7 d of age
5 L with 250 mEq HCO3
21 g
5 L with 500 mEq HCO3
42 g
Oral electrolytes
Source: Berchtold (2009); Constable et al. (1998)
Eye recession into orbit (mm)
Dehydration (%)
IV FLUID THERAPY

50



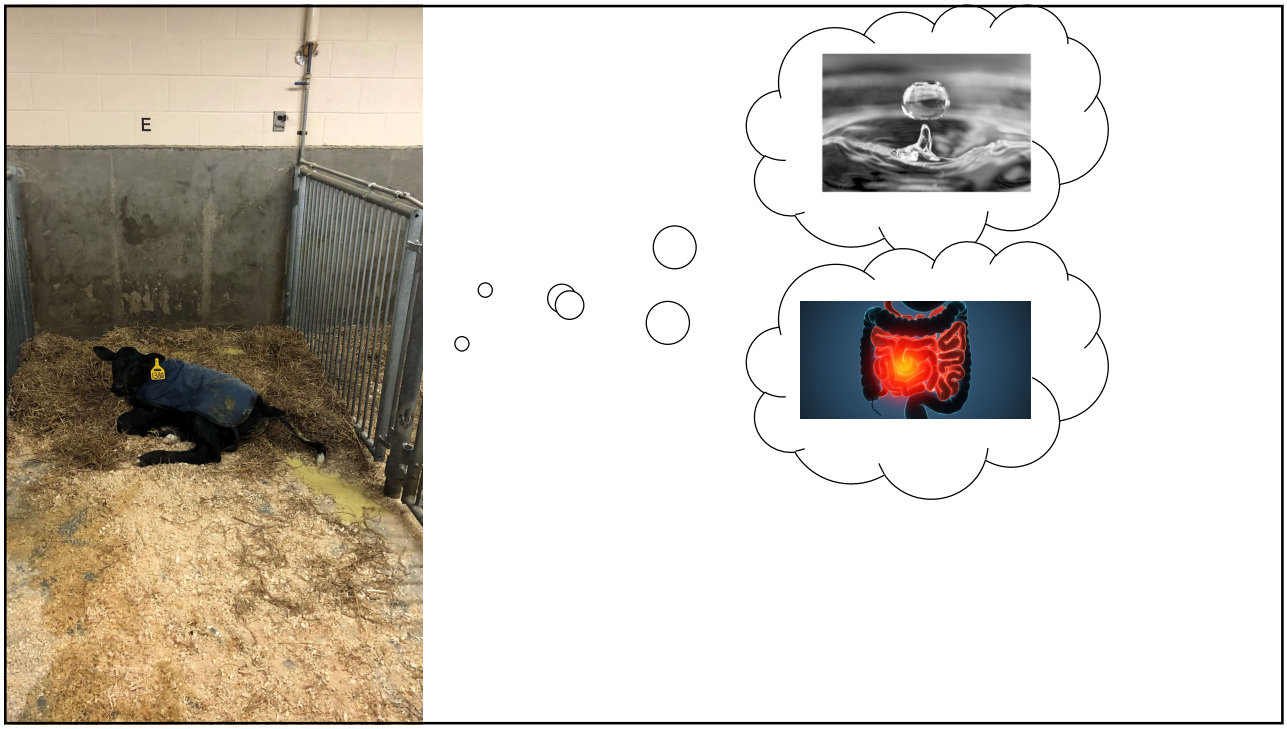
Source: Berchtold (2009); Constable et al. (1998)

51



Source: Fettman et al. (1986)

52



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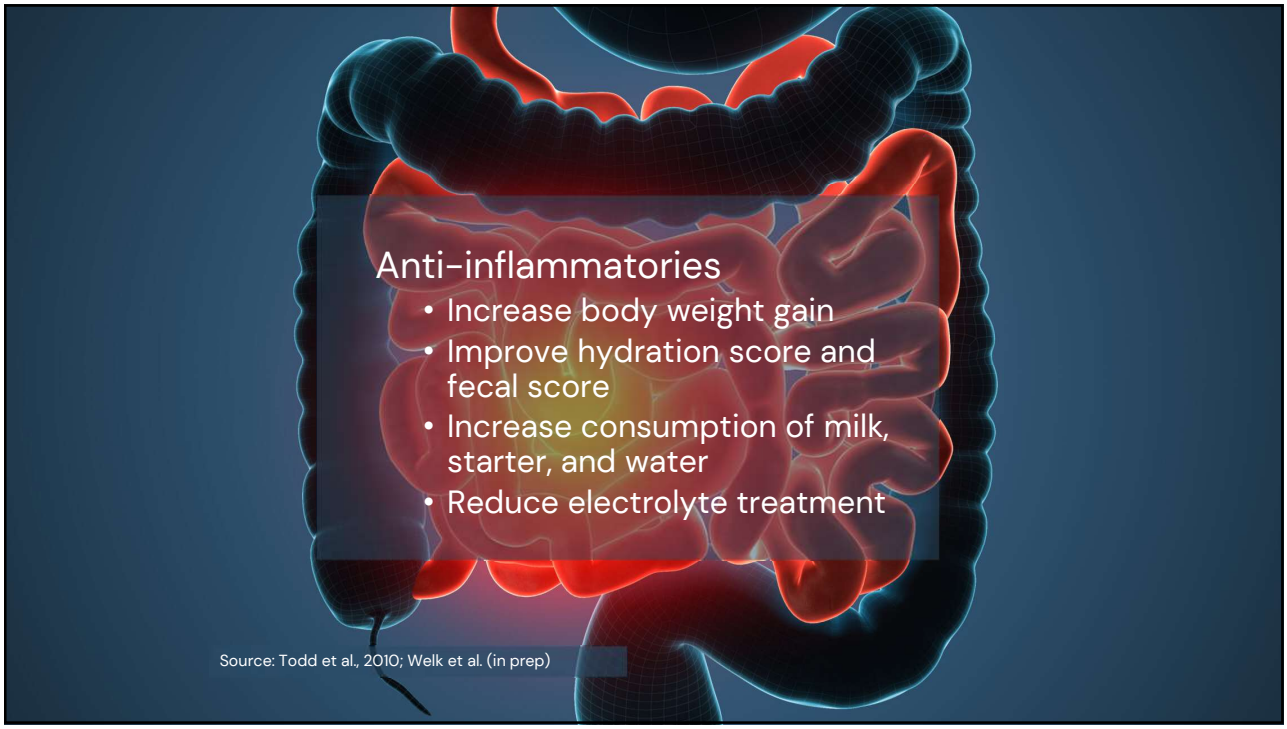
Anti-inflammatories
• Increase body weight gain
• Improve hydration score and fecal score
• Increase consumption of milk, starter, and water
• Reduce electrolyte treatment
Source: Todd et al., 2010; Welk et al. (in prep)

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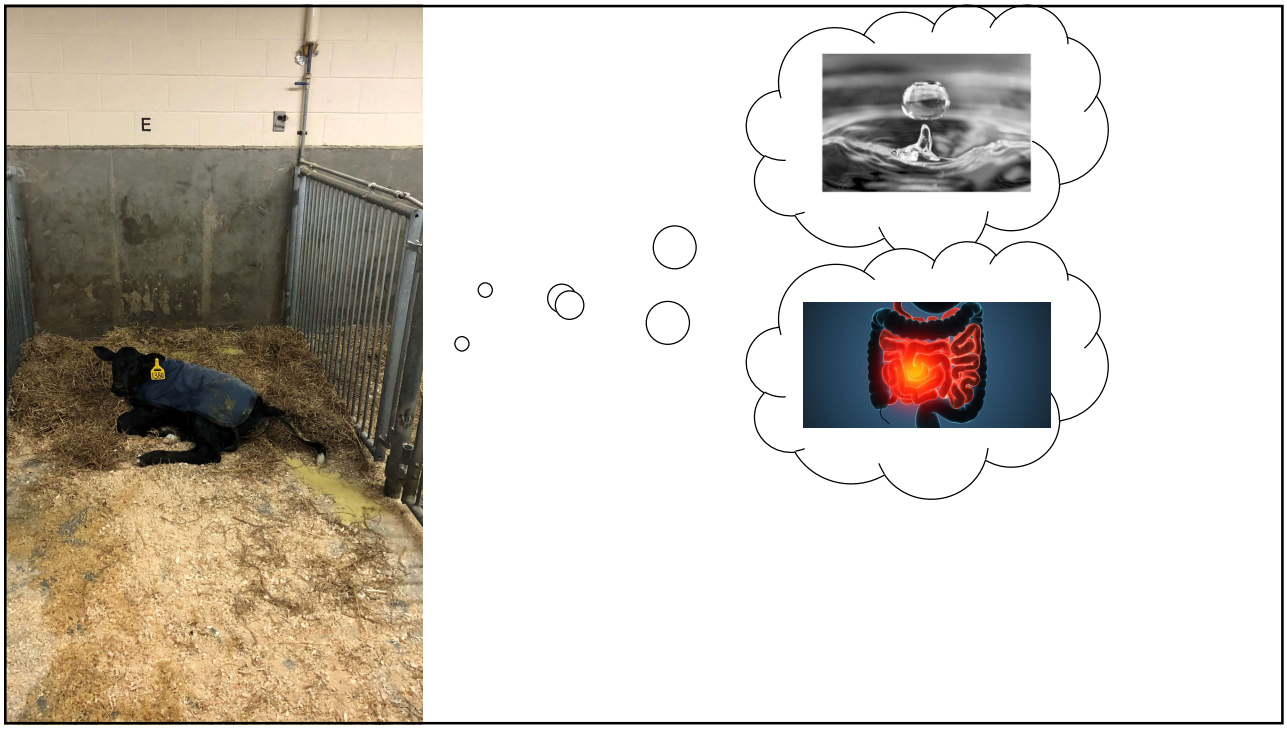

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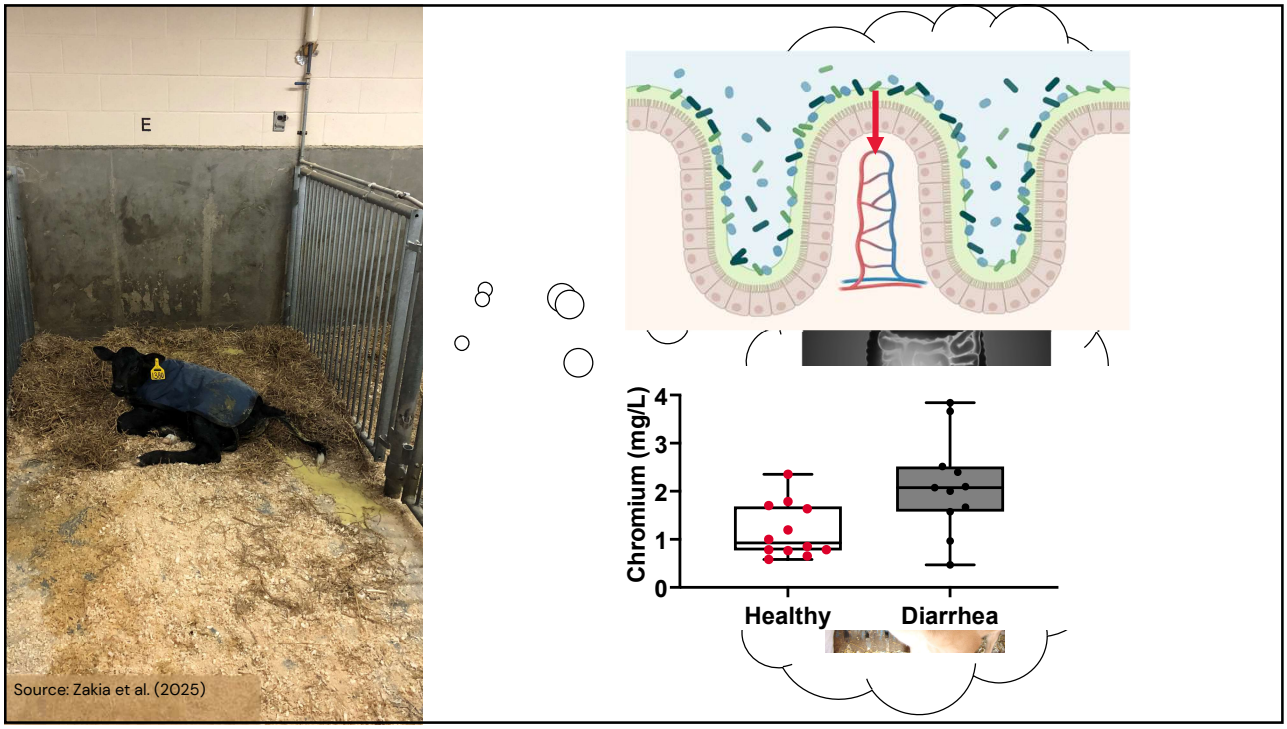
Chromium (mg/L)
0
1
2
3
4
Healthy
Diarrhea
Source: Zakia et al. (2025)

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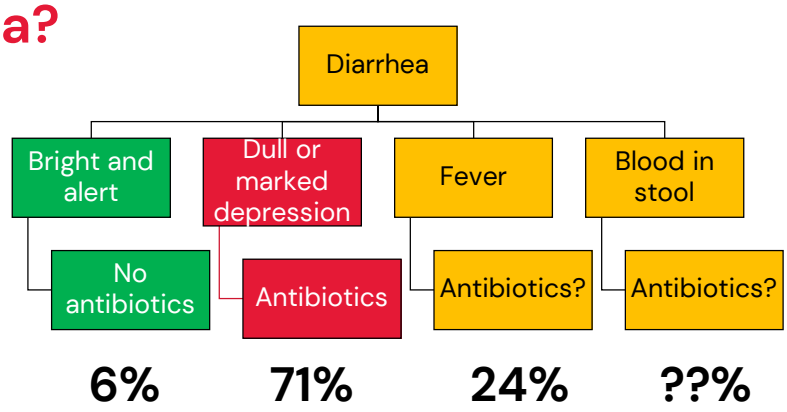
How should we treat diarrhea?

Only 30% of calves with bacteremia



Source: Garcia et al., 2021; Fecteau et al., 1997; Gomez et al., 2017.

57

Zakia et al. (in prep)

Evaluated selective therapy of diarrhea with antibiotics at a commercial calf rearing facility

2 or more signs:

- Scleral injection
- Fever
- Unable to stand
- Sunken eyes
- Absent suckle reflex

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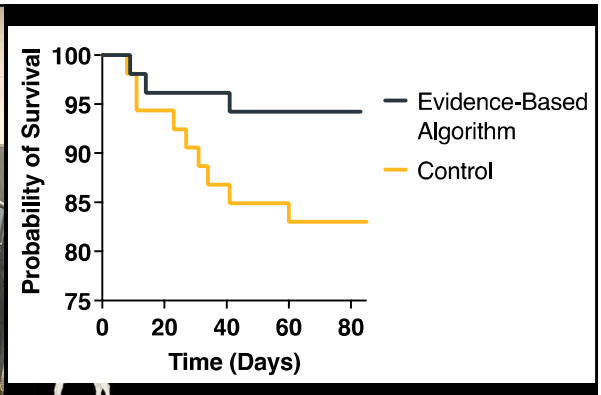
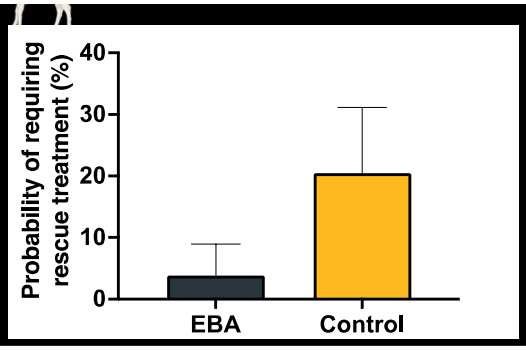
Zakia et al. (in prep)

Evaluated selective therapy of diarrhea with antibiotics at a commercial calf rearing facility





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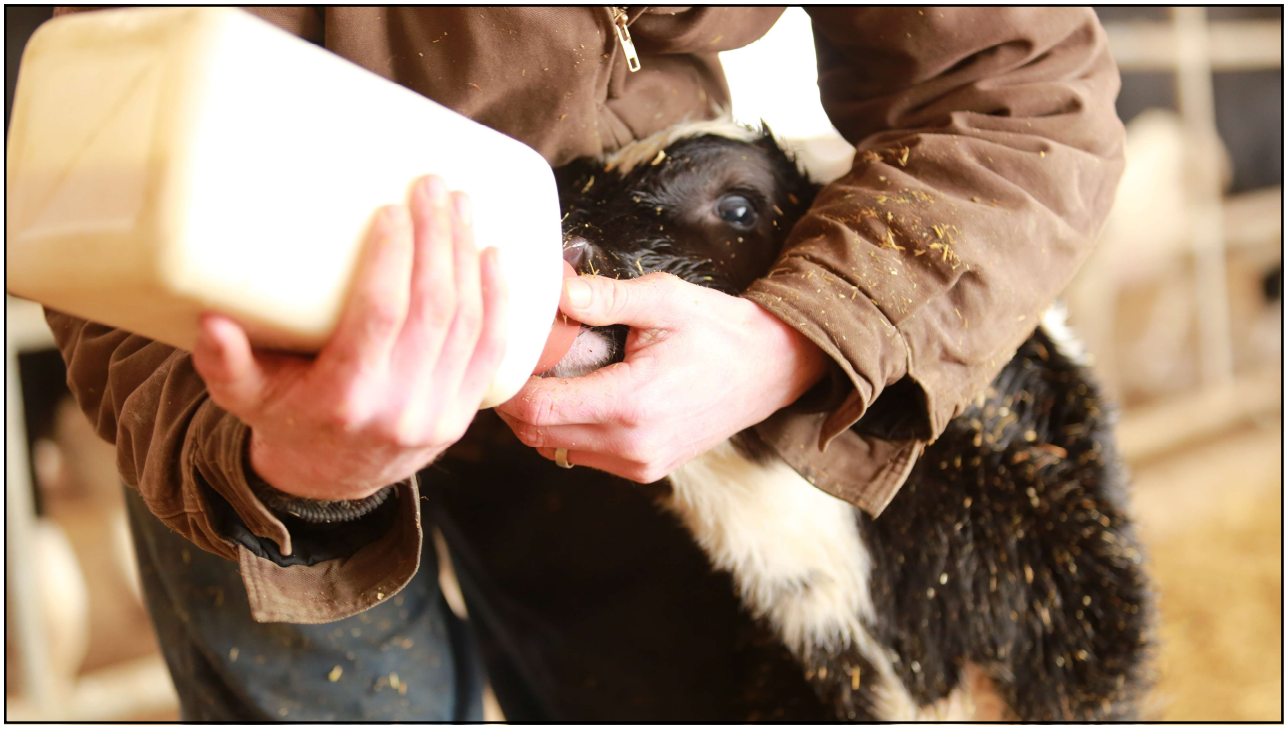

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Carter et al. 2022

Enrolled 108 calves at a calf rearing facility at the onset of diarrhea

327 g MR + 2.5 L water

CON: 8 feedings

STC: 4 feedings

163.5 g CR + 163.5 g MR + 2.5 L water

LTC: 8 feedings

63

Carter et al. 2022

Enrolled 108 calves at a calf rearing facility at the onset of diarrhea

Followed for 56 d with daily fecal and respiratory scoring as well as weekly body weights

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64

Carter et al. 2022

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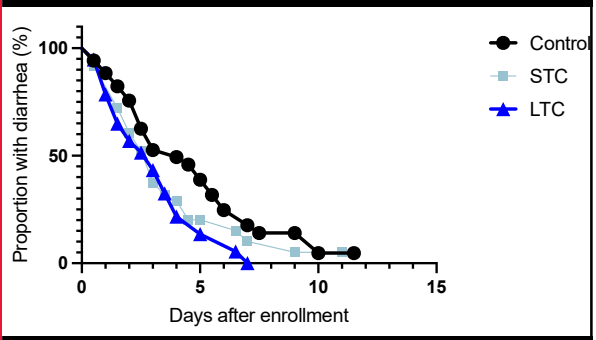
DIARRHEA RESOLUTION

1.6 d faster in LTC



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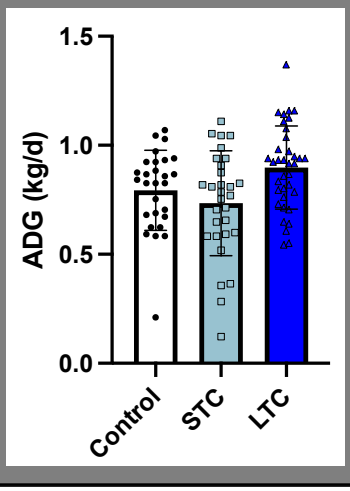
Carter et al. 2022

Enrolled 108 calves at a calf rearing facility at the onset of diarrhea

Followed for 56 d with daily fecal and respiratory scoring as well as weekly body weights

GROWTH

+ 98 g/d in LTC



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Carter et al. 2022

Enrolled 108 calves at a calf rearing facility at the onset of diarrhea

Followed for 56 d with daily fecal and respiratory scoring as well as weekly body weights

AMU AND MORTALITY

No differences in AMU

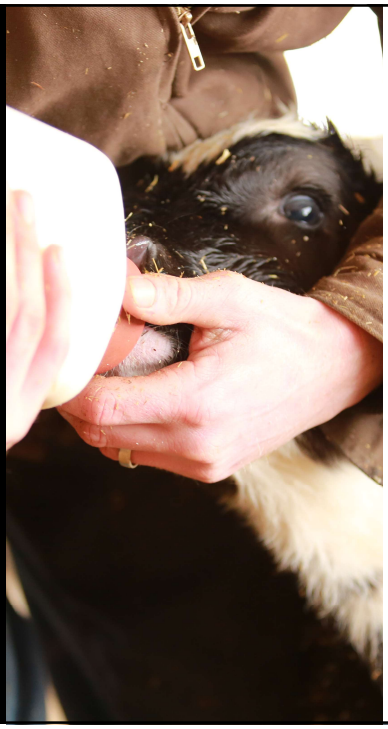
No differences in mortality (14% CON and 0% LTC)

67

Welk et al. (in prep)

Enrolled 88 calves at Ontario Dairy Research and Innovation Centre at an alert from automated milk feeder

Calves triggered the alert at (mean ± SD) 10 ± 3 d of age



≤ 60% rolling dividends in milk intake or drinking speed over 2 d

Colostrum Replacer (1 L at 130 g/L for 4 d)

Milk Replacer (1 L at 150 g/L for 4 d)

68

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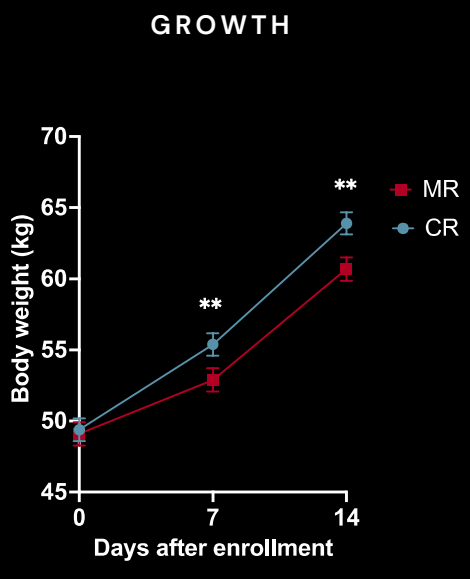

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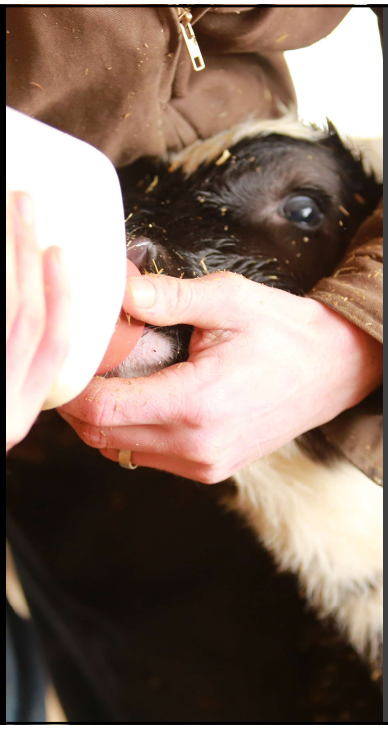

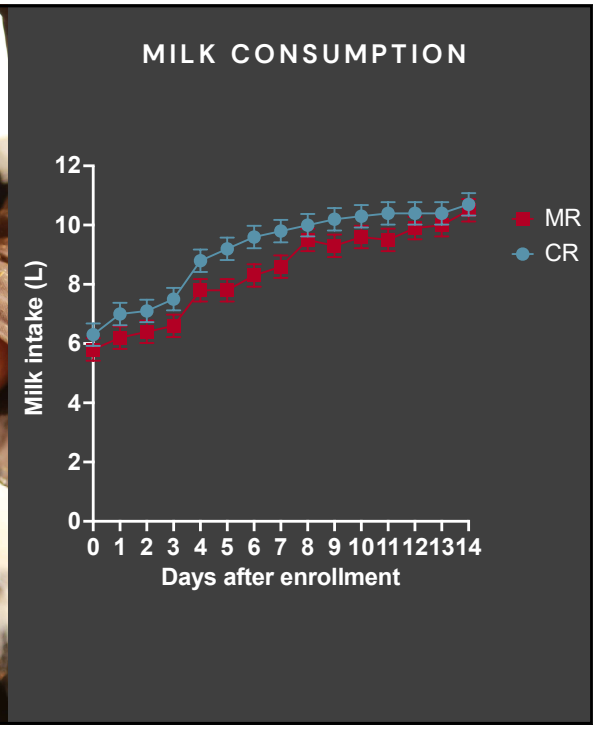

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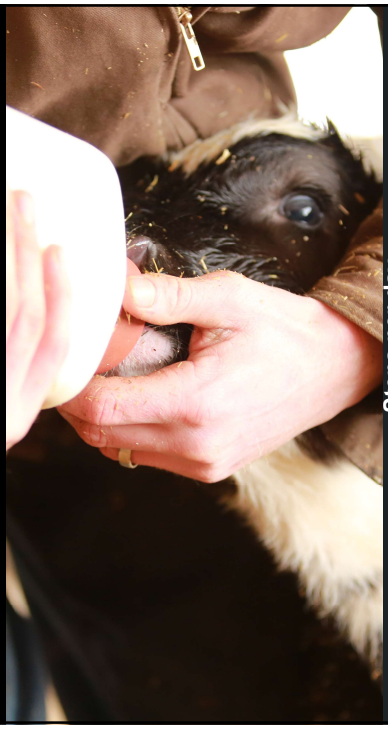

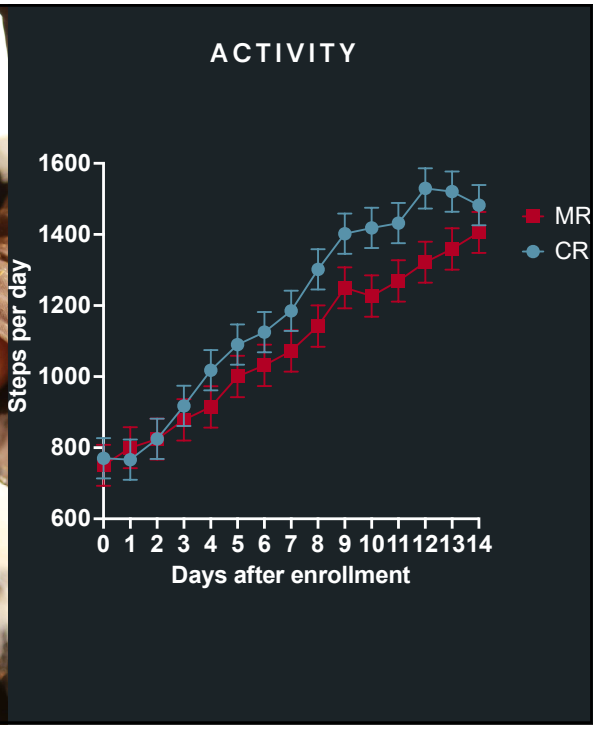

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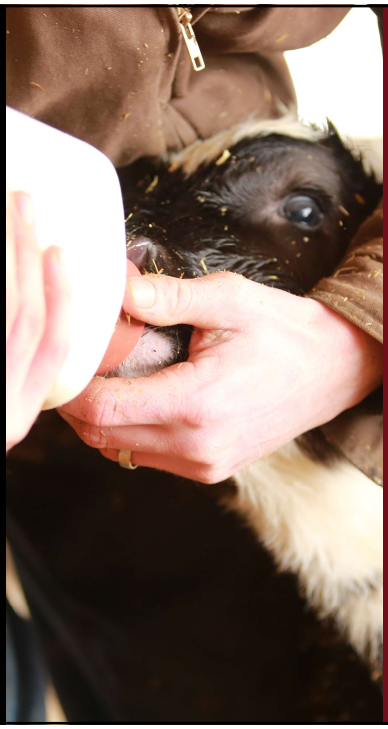

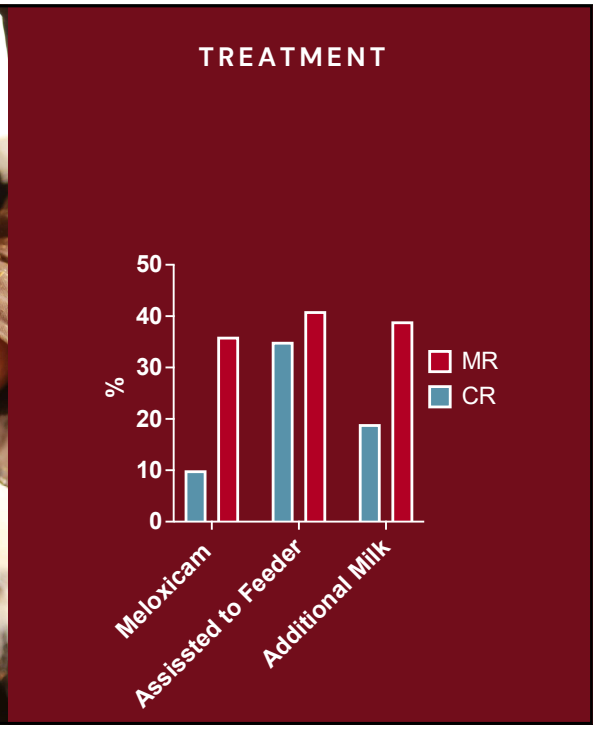

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