

STØTTET AF

Mælkeafgiftsfonden

STØTTET AF

Kvægaftsfonden

Young heifers: the future of the dairy

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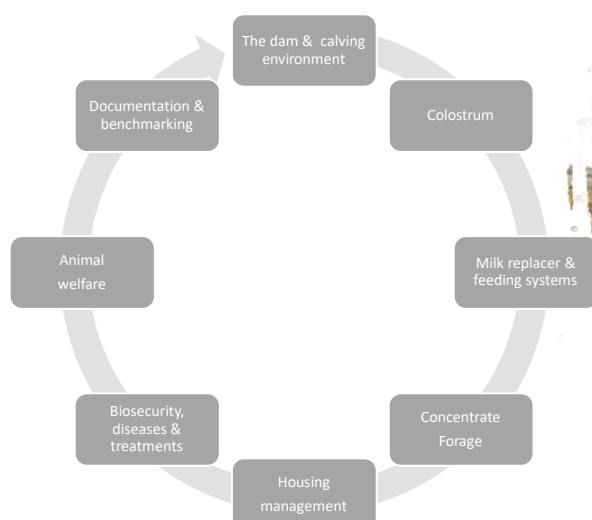
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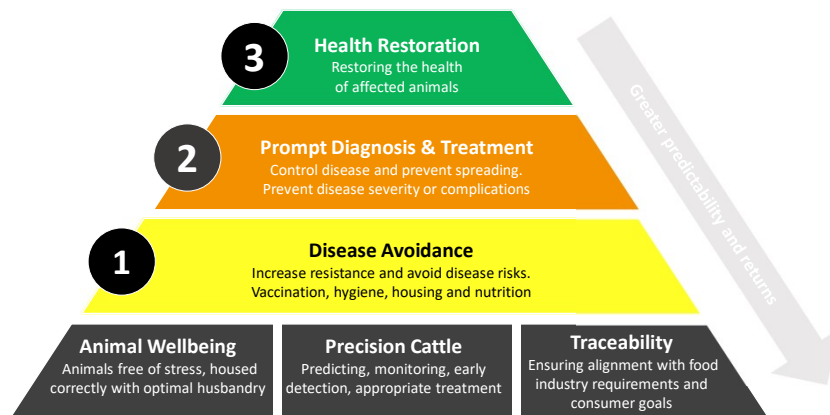
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A holistic calf programme



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The three levels of Disease Prevention



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Estimated losses due to diseases

- Diarrhoea - 50% of calf mortality
- Pneumonia - 30% of calf mortality
- Calf diseases - increase age at calving/inseminations
- Diarrhoea - reduce weight gain & future milk production
- Pneumonia - lower milk production, longevity in herd
- Increased early culling
- +++++ Calf disease impact calf workers and owners!



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Maternal nutrition – foetal impact

The cow will sacrifice her own body condition/milk production to ensure foetal calf growth.

However:

- **Deficiencies of micronutrients are common in dairy herds** (e.g., iodine, selenium, copper and zinc)
- have been associated with high stillbirth rates (Mee, Berry et al. 2011) , (Mee, Sanchez-Miguel et al. 2014)
- reduced calf health and performance (Enjalbert, Lebreton et al. 2006)



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Zinc, Copper or Selenium deficient herds have increased risks of calf disorders

Odds ratios for calf disorders associated with status of herds, estimated from cows plasma levels

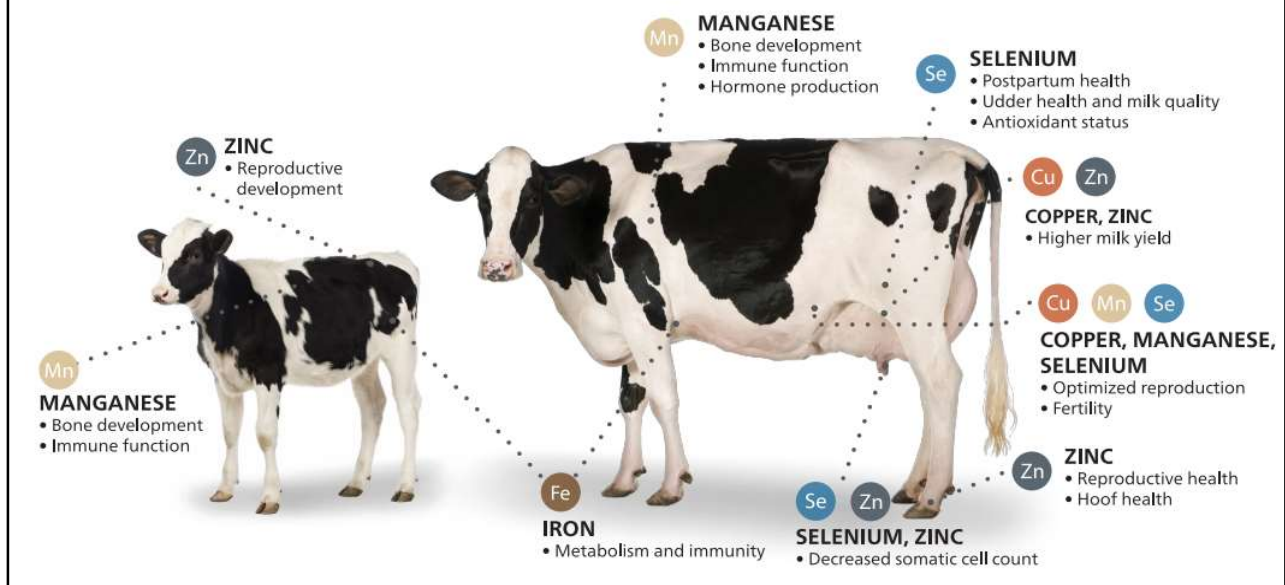
Herd challenges	Disorder	Number of herds	Odds of increased disorder		
			Copper Deficient	Zinc Deficient	Selenium Deficient
Production	Growth	96	10.9	6.1	5.3
Health	Perinatal	180	4.0	3.8	30.8
	Diarrhoea	427	3.6	3.0	13.5
	Vaccination	129	5.1		15.4
	Myopathy	60			77.5

Enjalbert et al, J. Anim. Physiol. and Anim. Nutr 90 (2006) 459-466



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Choose organic bound minerals for best results



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Selenium & Vitamin E



Vitamin E

- Anti-oxidants
- Enhance immunity
- α -tocopherol
- Vitamin E stressed calves 400 - 500 IU/calf/day,
- 200 mg/Kg Starter (or 80 IU/Kg dm)
- When cattle are not grazing green forage



Selenium

- Low selenium levels < 40 μ g/L serum
- 300 μ g/kg DM for dairy cows
- 100 μ g/kg DM for calves
- Organic selenium supplementation recommended in calves

(Mehdi and Dufrasne 2016)(Arshad, Ebeid et al. 2021)

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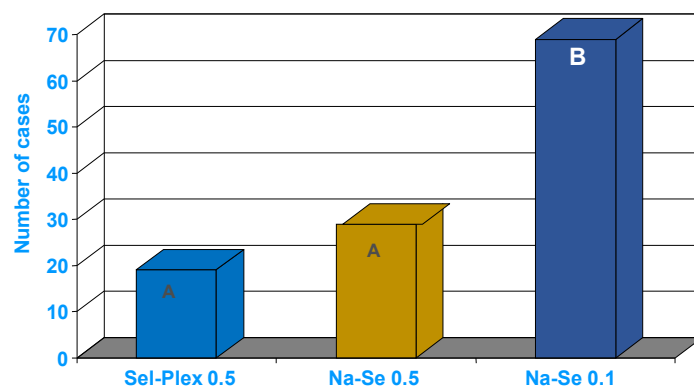
Organic selenium to dry cows improve calf health

- 3 treatments, 60-90 days pre-calving, 2 farms x 60cows
 - Control 0.1 ppm Na-Se (C)
 Na-Se 0.5 ppm (T1)
 - Sel-Plex 0.5 ppm (T2)
- Measurements:
 - Health and selenium status (blood, milk, colostrum) of both dams and calves.
 - Performance

(Guyot, Spring et al. 2007)

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Effect of selenium source in dams on disease incidence in calves



(Guyot, Spring et al. 2007)

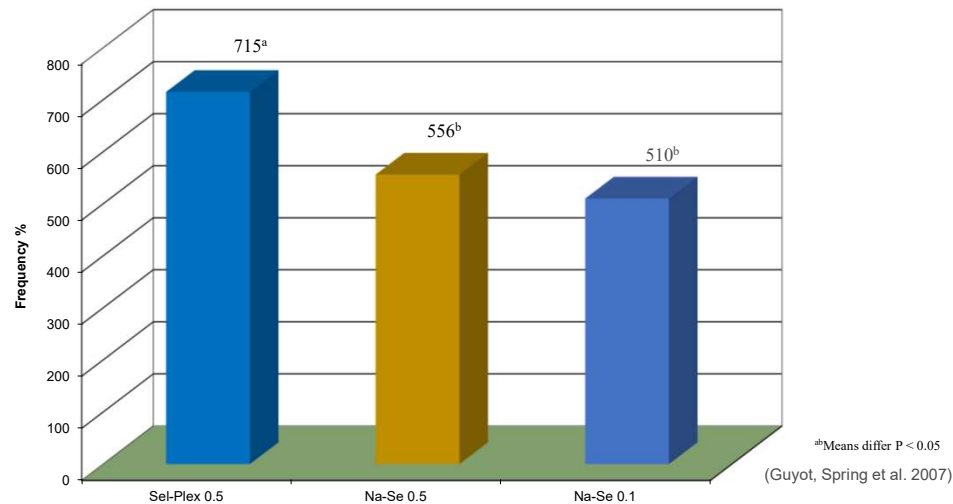
Selenium specific diseases : arthritis (primary or secondary to septicemia), neonatal diarrhoea and septicemia

A/B indicate a significant difference at $p < 0.05$



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Effect of Selenium source in dams on weight gain in calves



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Could a mineral deficiency impact calf health?

Copper:

Immunity
Bone development
Nervous system
Appetite
Skin & claw health
Coat hair
Oxygen transport

Zinc:

Immunity
Muscle development
Appetite
Skin & claw health
Coat hair

Manganese:

Immunity
Bone development
Skin & claw health

Iron:

Immunity
Oxygen
Transport



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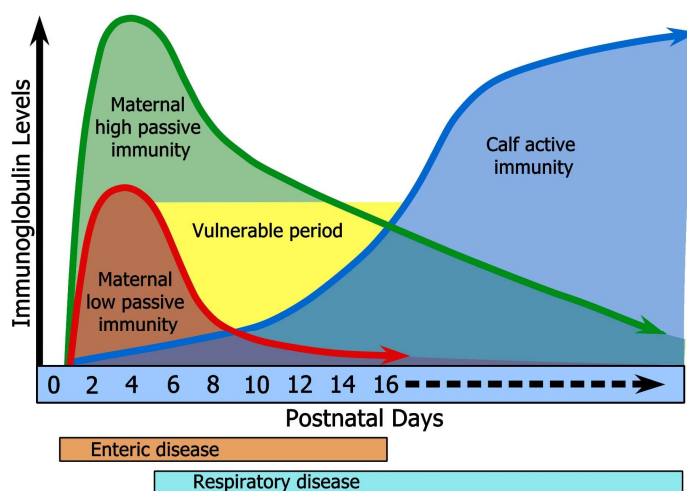
The first 24 hours will have huge impact on a heifer's lifetime performance.

- There is only one chance to do things right.
- Otherwise the heifer and the dairy suffer the consequences the rest of her life.



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Passive transfer of immunity through colostrum – the best protection against calf diseases



Half-life of colostral serum immunoglobulins 20-28 days (Murphy, Hagey et al. 2014)



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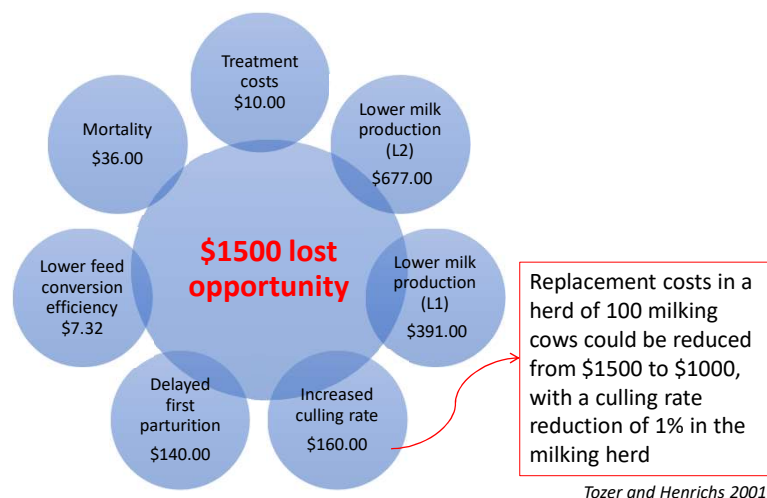


Colostrum Feeding

- Immediately, at least within 4 hours
- 4 liters (10% body weight)
- + 3-4 liters 8-10h later
- Super clean!
- High Immunoglobulin levels
- ++ a second feeding 6-10 h later

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What is the economic impact of insufficient colostrum consumption?



Estimated by Manuel Chamorro, SCCL

Faber SN, et al. *Prof. Animal Sci.* 2005; 21:420-25.
 Fowler, *Proceedings of the Professional Dairy Heifer meeting*, 1999, pp. 31-36.
 Tozer PR and Heinrichs AJ. *J. Dairy Sci.* 2001; 84:1836-1844

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J. Dairy Sci. 88:2166–2177

© American Dairy Science Association, 2005.

A Clinical Trial Evaluating Prophylactic and Therapeutic Antibiotic Use on Health and Performance of Prewaned Calves

A. C. B. Berge, P. Lindeque, D. A. Moore, and W. M. Sischo

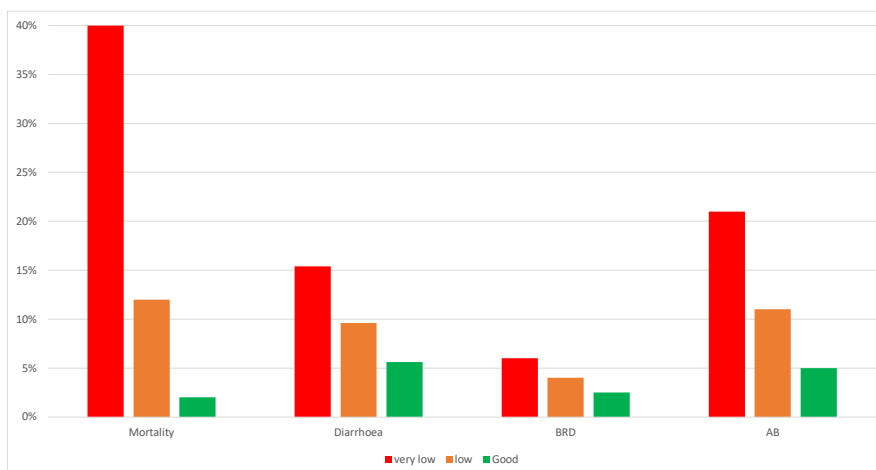
Veterinary Medicine Teaching and Research Center, University of California–Davis, Tulare 93274



- Day-old colostrum-deprived calves comingled on a calf ranch
- Prophylactic antibiotics in the milk was important the first 2 weeks
- Therapeutic antibiotics were necessary to treat disease

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Colostrum ≠ death, disease and treatments



(Berge, Lindeque et al. 2005)



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Colostrum volumes



Many cows produce low volumes. Risk factors include:

- Dry period length, calf sex, singleton or twin, age at freshening, month of calving and previous lactation length (*Gavins 2018*)
- Mastitis previous lactation (*Mansell 1998*)
- Dietary Cation-Anion Difference (DCAD). Severe metabolic acidosis (*Lopera 2018*)
- Colostrum volumes can be increased with MOS in dry cow feed (*Westland 2017*)
- *Non-published data indicates improvements with organic mineral supplementation in dry period*



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Dry cow period – how to improve colostrum quantity and quality

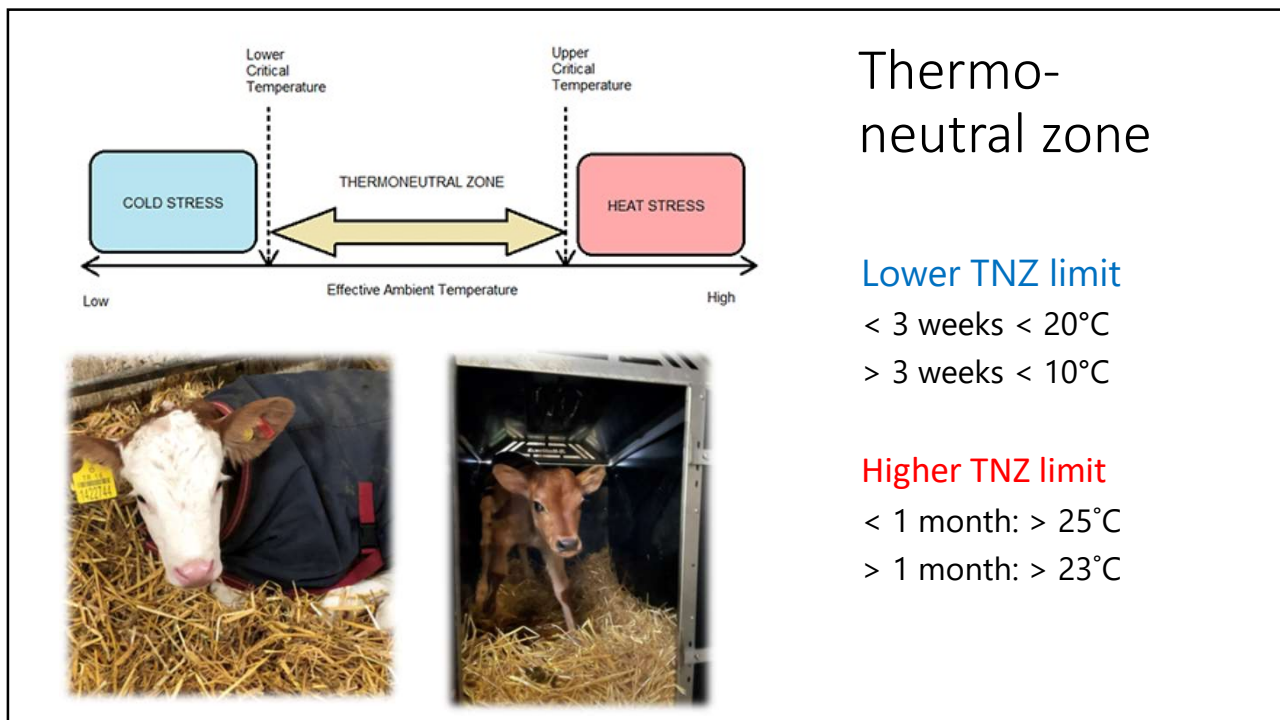
Challenges

- Metabolic acidosis
- Corn silage has less protein compared to hay silage
- protein supplementation is expensive
- Reduced protein concentrations in feed
- Anionic salts to reduce sub-clinical acidosis (bitter) – reduced feed intake
- Too long straw chop length (*Havekes, Duffield et al. 2020*)

Remedies

- Protein concentration 14.5-15.5%
- Chop length as in lactating diet (2 cm)- better feed efficiency
- Organic minerals (*Roshanzamir, Rezaei et al. 2020*)
- Mannan-oligosaccharides (Actigen) (*Westland, Martin et al. 2017*)(*Franklin, Newman et al. 2005*)
- Mycotoxin binders



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Transition Milk

- Best feed after colostrum.
- Encourage the use of transition milk for 3-5 days.
- Higher in protein and fat than milk replacer.
- Colostral antibodies.

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Colostrum supplementation to neonatal calves can decrease diarrhoea



3 trials on California calf ranches

4 Liters of CMR, twice daily:

Colostrum + calves (70 g powder)

Negative Control calves

Positive Control calves (70 nutritional equivalent of colostrum)

(Berge, Besser et al. 2009)

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Colostrum supplementation

- decreased diarrhoea days with 40% first month,
- increased weight gain
- increased grain intake

(Berge, Besser et al. 2009)



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Transition milk or colostrum-supplemented MR for 3 days improves weight gain throughout the preweaning period

- A trial in Michigan indicated that calves fed transition milk (TM) or milk replacer supplemented with colostrum (MR+Col) for 3 days increased growth rate throughout the preweaning period.
- In the trial calves fed TM or MR+Col weighed 3 kg more at weaning

(Van Soest, Cullens et al. 2020)



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Extended time colostrum supplementation of milk is important for calf health and growth

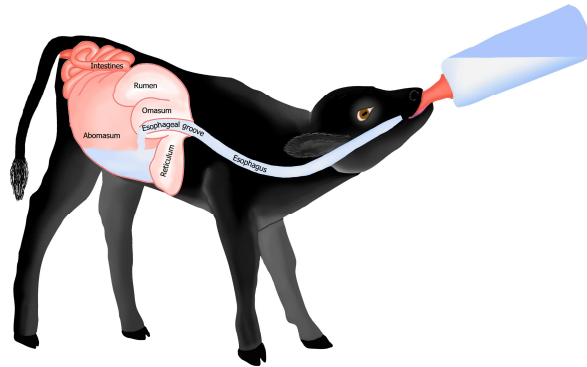
- A Swiss study -colostrum/transition milk the first 3 days improved ADG (Kuhne *et al.* 2000).
- California multi-farm study: Post-closure colostrum supplementation for 14 days reduced diarrheal disease days with 40% (Berge *et al.* 2009).
- A rotavirus challenge study, calves fed hyperimmunized colostrum supplement for 14 days, indicated protection against rotavirus diarrhoea, reduced virus shedding and improved mucosal immunity (Parreno *et al.* 2010).
- Iran dairy farm study: 14 days colostrum supplementation of whole milk reduced diarrhoea, improved feed efficiency and ADG (Kargar *et al.* 2020)
- Colostrum-supplemented milk positively affects serum biochemical parameters, humoral immunity indicators and ADG of calves (Zwierzchowski *et al.* 2020)

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The Milk Feed

- Quantity
- Type of milk feed – whole milk, waste milk, milk replacer
- Microbial quality
 - Pasteurization
- Feeding frequency
- Nipple versus bucket feeding



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Nutrient composition of milk feed influences growth potential in first month

	Whole milk	Milk replacer
Protein	26%	20-23%
Fat	30%	18-20%
Lactose	37%	55%
Ash	6%	5%
Energy	5,3 Mcal/kg	4,8 Mcal/kg



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Whole milk (or pasteurized waste milk) has numerous advantages

- Created by mother nature for the sole purpose of growing a calf
- Has been shown in numerous studies to create growth benefits compared to milk replacers (Moallem, Werner et al. 2010)(Godden, Fetrow et al. 2005)
- Pasteurized waste milk may reduce feed expenditures
- More diverse gut microbiome (Virgínio Júnior, Coelho et al. 2021)
- Long term effects- increased milk production and milk composition improvements (Moallem, Werner et al. 2010)
- Whole raw milk promotes a healthier gut microbiota and improved ADGcompare to UHT pasteurized milk (Bach, Aris et al. 2017)

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Milk protein sources in CMR should be milk-based

- Whey
- Whey protein concentrate
- Delactosed whey
- Skim milk
- Casein
- MR with high levels of whey protein can be equally or even better for calves compared to high skim milk replacers.
- (Terosky, Heinrichs et al. 1997)



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Two meta-analysis of preweaning ADG and first lactation milk production

- For every additional 100 grams ADG pre-weaning, the heifer can give 150-155kg more milk in first lactation.

(Soberon and Van Amburgh 2013)
(Gelsinger, Heinrichs et al. 2016)

Recent publications confirm (Ahmadi, Akbarian-Tefaghi et al. 2022)



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The impact of nutrition on udder development

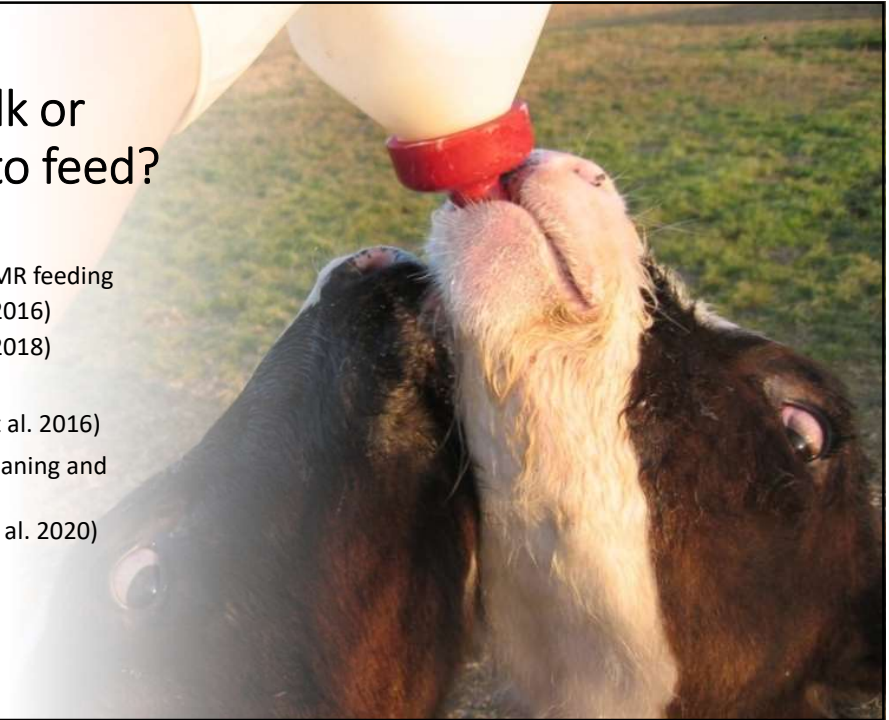
- Calves on enhanced nutrition had 6 times greater mammary parenchymal mass at weaning compared to restricted nutrition calves.
 - (Soberon and Van Amburgh 2017)
- **32-47%** increase in mammary DNA in heifers fed 900 grams versus 440 grams MR/d.
 - (Brown, VandeHaar et al. 2005)



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How much milk or milk replacer to feed?

- AD-LIB versus restricted MR feeding
 - (Schaff, Gruse et al. 2016)
 - (Schaff, Gruse et al. 2018)
- Large milk meals
 - (Ellingsen, Mejdell et al. 2016)
- Planes of nutrition preweaning and postweaning
 - (Rosadiuk, Bruinje et al. 2020)

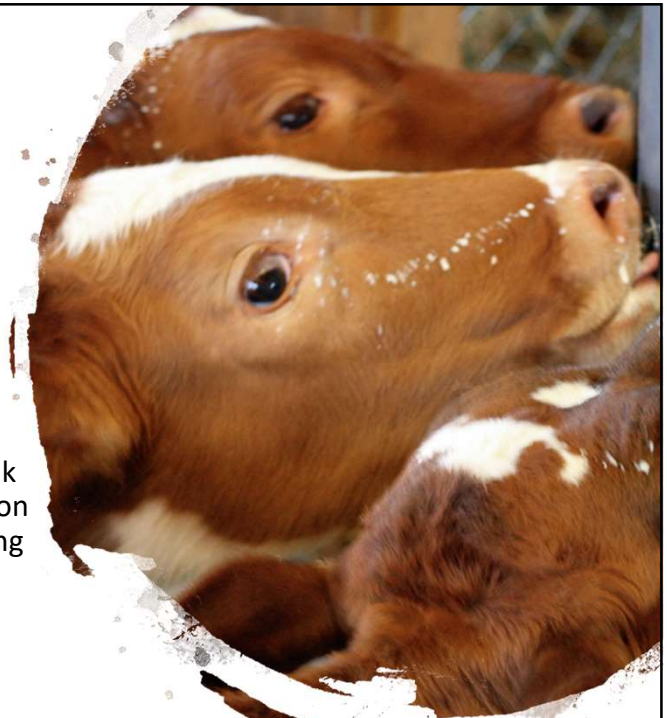


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Enhanced pre-weaning feeding and reproductive health

- more prepubertal follicle growth,
- better growth,
- not correlated with performance post-weaning.
- A 10-day reduction 10% reduction in milk feed prior to weaning enhanced transition and improved performance after weaning

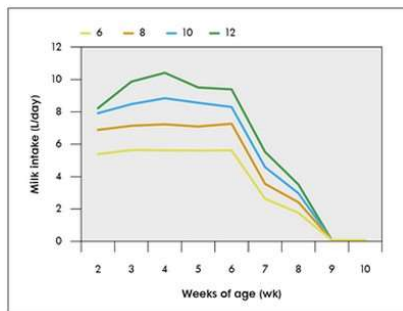
(Bruinje, Rosadiuk et al. 2019,
Bruinje, Rosadiuk et al. 2020,
Steele, Doelman et al. 2017))



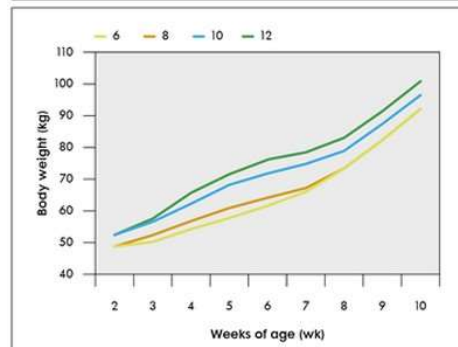
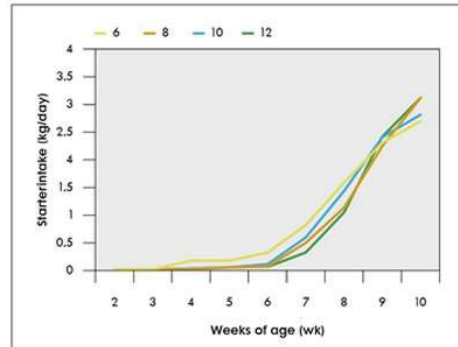
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How much milk does a calf want?

- 56 calves fed either 6, 8, 10 or 12 L/d of whole milk until d42. Weaned d55.
- Calves fed 6 L/d showed more signs of hunger than calves fed higher quantities



(Rosenberger, Costa et al. 2017)



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How much milk/MR does your calf need to grow 800 grams/day pre-weaning?

	MR	MR	Milk	Milk
Temp °C	< 3 weeks	> 3 weeks	< 3 weeks	> 3 weeks
20	8	6	7	5
10	9	6	7	5
0	10	7	8	6
-10	11	8	9	6
-20	12	9	10	7

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My recommended schedule of liters per day

Week	Liters/day
1	5-7
2-5	7-10
6	6-7
7	5-6
8-12	4-5
Weaning	2-3



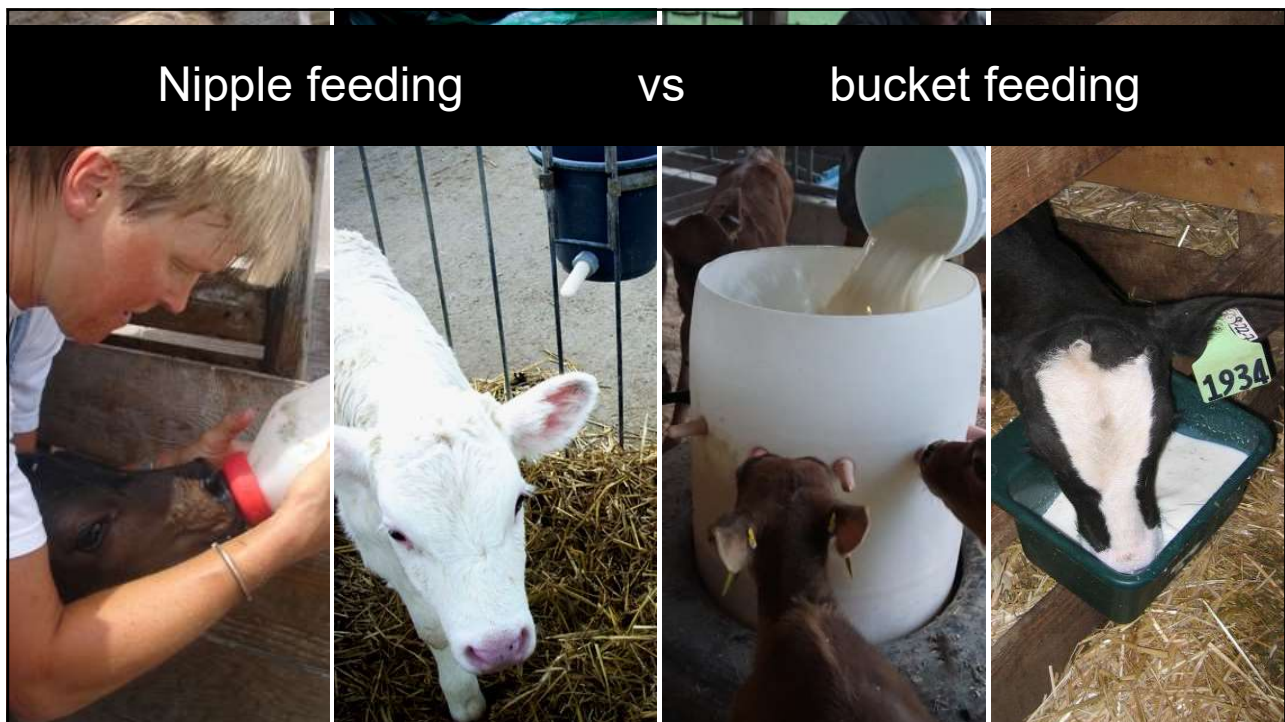
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Milk feeding frequency

- European Union Animal welfare regulation requires that animals are fed at least twice per day and inspected twice per day.
- Calf concentrate feed can not be considered a feed source for calves under 1 month of age
- NRC 2021 normal biological requirements = 20% of body weight
- More frequent feeding allows for higher milk intake, which results in less hunger and better growth and possibly better milk production later in life.
- Limit feeding of calves will result in sub-optimal growth, reduced future performance as well as calf welfare challenges.
- Recent publication confirms that twice daily generates better growth than once daily (Beiranvand et al, 2022)

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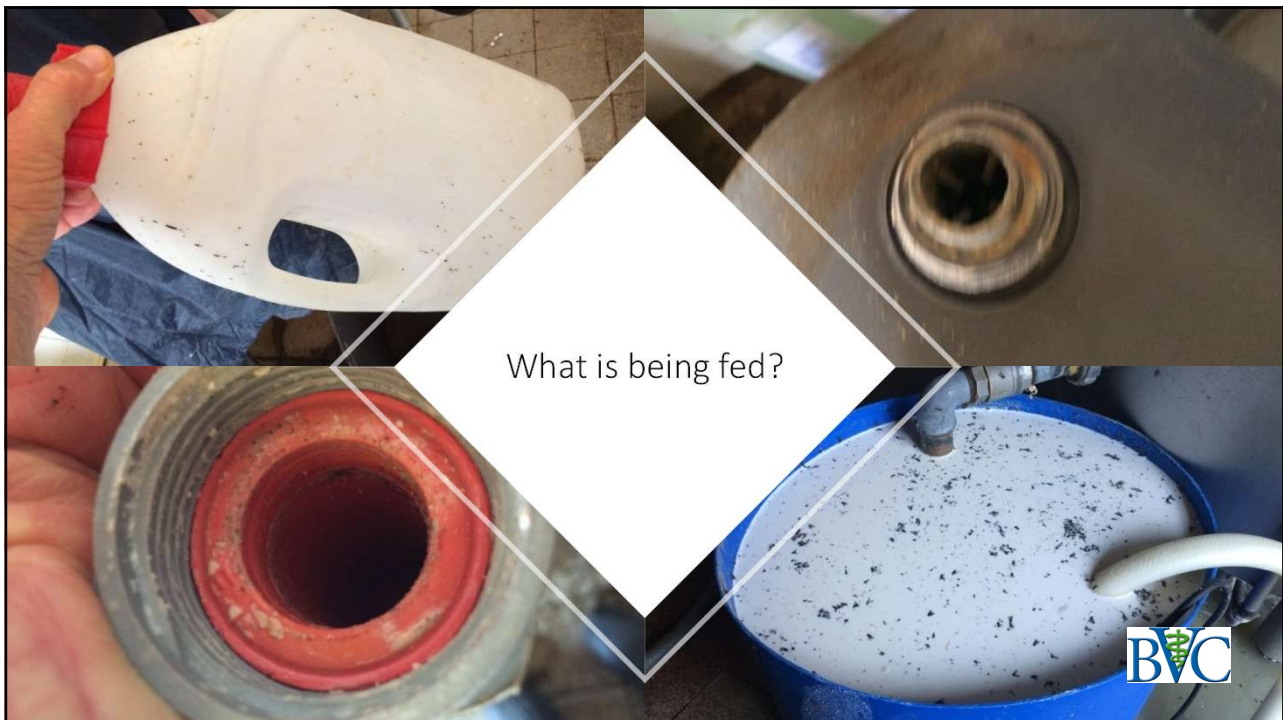
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Hygiene of feeding



BVC

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Not a good solution - acidified warm waste milk

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Pasteurization of milk

- Strongly recommended for all that use waste milk for calves
- Batch pasteurizer best for small farms.
- 30-60 min at 60°C.
- Temperatures > 80°C reduce calf health and performance.
- (Alex Bach, 2017)



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Pair housing is beneficial preweaning

Housing calves in pairs can improve:

- Grain intake
- Weaning weight
- Welfare
- Post-weaning performance
- Less cross-suckling with nipple bottles
- pen sizes ($\geq 1,5$ m² per calf)

(Jensen and Larsen 2014)
(Bolt, Boyland et al. 2017)



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Double milkbars for pair housed calvers



Milk distributed in firm nipples can reduce cross-suckling behaviour (Salter, Reuscher et al. 2021)

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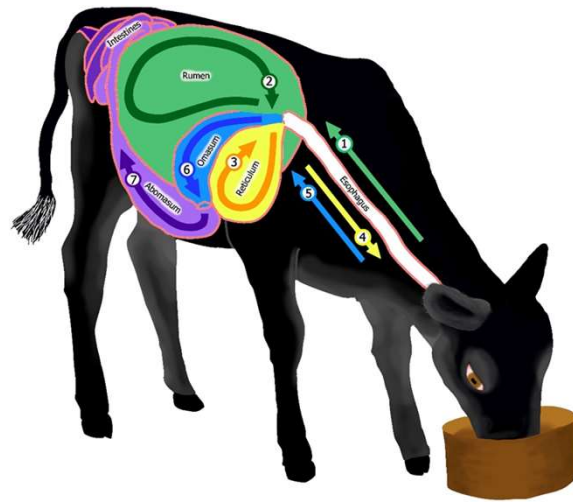
Group housing and automatic feeding increasing in popularity



(Jorgensen, ms-Progar et al. 2017)(Jorgensen, ms-Progar et al. 2017)

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Starter grains and roughage



BVC

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Calf starter

- ❖ Palatable- textured
- ❖ Little fines
- ❖ Whole grains & pellets
- ❖ 5 percent molasses
- ❖ Fresh
- ❖ Min. 18% protein (opt 19-20%)
- ❖ 3.1 MCal/kg DM

BVC

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Small changes can make a big difference

A day-old calf drinking water



A little bit of starter grain from day 1



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Rumen papillae develops through grain feed



Grain-based starters promote VFA, such as butyrate

Courtesy Jud Heinrichs, Penn State, USA

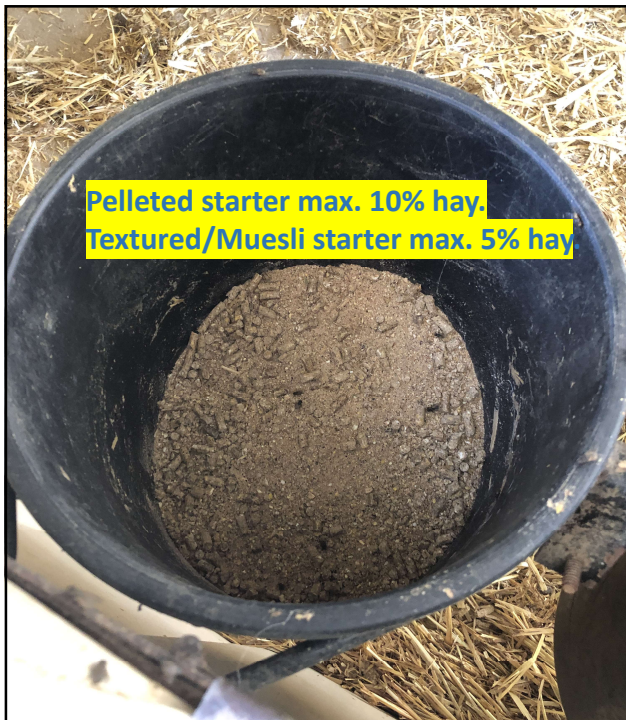
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Forage not really
needed
preweaning

- What about hay?
- They like hay!



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Pelleted starter max. 10% hay.
Textured/Muesli starter max. 5% hay

Hay or straw in grain or separate

- Pelleted starter grains are finely ground and rapidly fermentable.
- Not abrasive enough to prevent keratin build-up on the papillae.
- Causes ruminal acidosis and depressed feed intake.
- Intestinal morphology improved (Moeini, Mahdavi et al. 2017)
- Separate grain and roughage may be better than mixed (Engelking, Matsuba et al. 2020)



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What do you think of these?

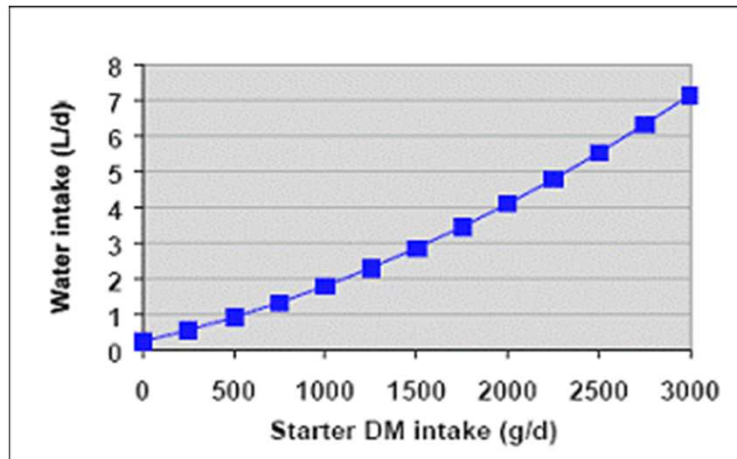
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This is not
good feed
post-
weaning!

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Drinking water & grain intake go hand in hand



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Drinking water to newborn calves

- Study comparing day0 versus day17 introduction of water to ad lib milk fed calves
- Day0 calves – drank 0,75-1,25 L/day
- Day0 calves consumed more milk
- Day0 calves had higher preweaning weight gain, improved feed efficiency
- At 5 months Day0 calves were heavier

(Wickramasinghe, Kramer et al. 2019)



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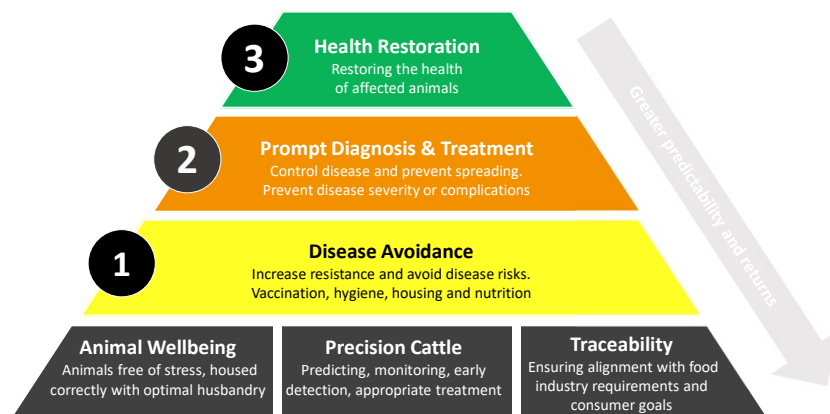
The diagnosis, treatment and prevention of dairy calf diarrhoea

Anna Catharina Berge
DVM, MPVM, PhD
Berge Veterinary Consulting



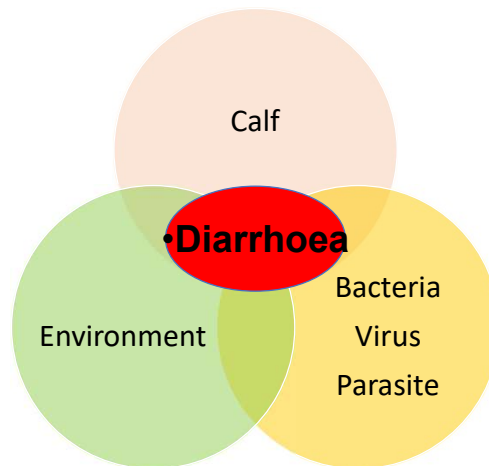
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The three levels of Disease Prevention



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The epidemiological triad infectious disease



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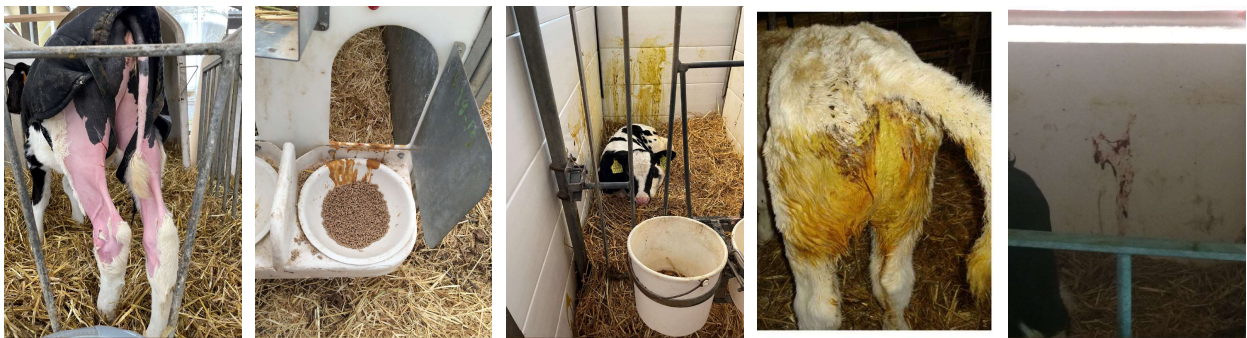
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Neonatal calf diarrhoea

- calf diarrhoea is not a disease but a symptom of a disease which can have many causes.
- **rapid dehydration**
- Mortality
 - due to loss of electrolytes, changes in body chemistry, dehydration,
 - change in acid-base balance



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Diarrhoea visual appearance alone can not tell you the cause

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Nutrition and management risk factors

- Colostrum feeding equipment
- Milk feeding equipment hygiene
- Rapid changes in milk feeding, especially in the high risk period
- Handling of whole milk or waste milk prior to feeding
- Cold milk
- Empty period between calves, cleaning routines
- Environmental conditions – drafts, cold, wet

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Bacteria, viruses and parasites work together to cause diarrhoea

- Bacteria often produce toxins
 - Enterotoxigenic *E. coli*
 - Malabsorption
- Viruses causes gut lesions
 - Rotavirus destroys intestinal cells at the top of the gut villi
 - Coronavirus also destroy intestinal cells in crypts of the villi in the large intestines.
 - The digestive and absorptive function is lost, resulting in reduced reabsorption of fluids.
- Parasites destroys gut cell villi
 - *Cryptosporidium parvum* destroy the microvilli of the gut cells, the resorption area decreases.



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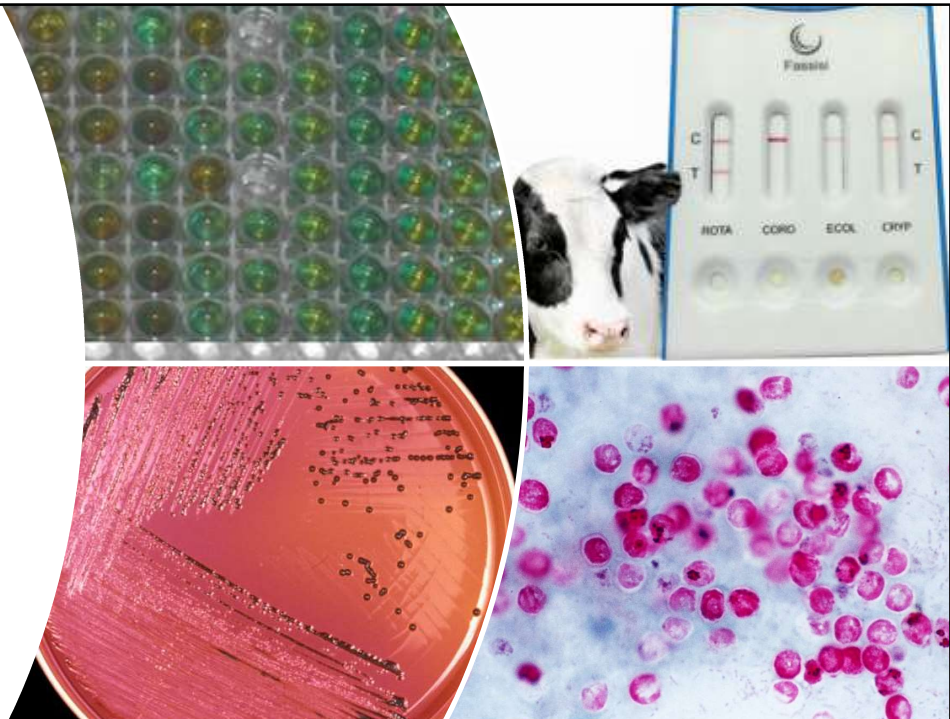
Common age periods for diarrhoea pathogens

Enteric disease pathogens	Age of calf in weeks								
	1	2	3	4	5	6	7	8	9+
bacteria <i>E. coli</i>	■								
virus Rota		■	■	■					
virus Corona		■	■	■					
bacteria <i>Salmonella</i>	■	■	■	■	■	■	■	■	■
bacteria <i>Clostridia</i>	■	■	■	■	■	■	■	■	■
parasite <i>Cryptosporidia</i>	■	■	■						
parasite <i>Coccidia</i>				■	■	■	■	■	■

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Diagnostics for calf diarrhoea

- Traditional – Bacterial culture on agar plates and faecal floatation with microscopy
- ELISA – Enzyme linked Immunosorbent Assay
- IF- Immunofluorescence
- PCR – Polymerase chain reaction
- **Farm-side kits**
- **BEWARE- enteric pathogens are found in healthy calves too!**



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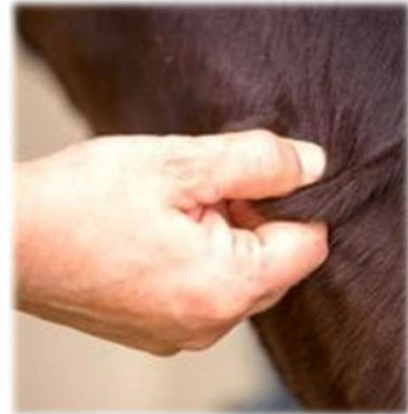
Treatments for diarrhoea

- Most important treatment: **sufficient electrolyte solutions/ Oral or IV**
- Anti-inflammatory medication (NSAID)
- Colostrum
- Antibiotics
- Bio-Mos/Actigen
- Fermented milk products (fil, kefir, yougurt)
- Keep calf warm
- Keep feeding the calf milk (do not force-feed)
- Ensure milk and electrolytes are at body temperature

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Skin pinch tests

- A well hydrated calf's skin will snap back flat after pinching it.
- it takes 1-3 seconds, then the is be ~6-8% dehydrated.
- If it 5 seconds, the calf is~8-10% dehydrated.



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Eye inspection: sunken eyes

Wen you roll the bottom eye-lid down with your thumb, you notice a gap between the skin and the eye



Well-hydrated calf

Dehydrated calf

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Electrolytes

- Feed Oral Electrolytes

- When the calf is standing up and drinking- bottle or sond feeding



- Intravenous electrolytes

- When a calf is lying down and does not want to drink
- No suckle reflex or chewing



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A lots of
commercial
electrolytes
on the market

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Home-made functional Electrolyte Formula

Ingredient	Sick calf	Healthy calf
H ₂ O	4 liters	4 liters
NaHCO ₃	20 gr	5 gr
NaCl	20 gr	25 gr
Dextrose	200 gr	130 gr



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Anti-inflammatory treatments

- Non-steroidal anti-inflammatory Drug (NSAID)
 - Meloxicam
 - Flunixin meglumine
- At least one injection at the start of diarrhoea
- Speeds up diarrhoea recovery
- Increase milk intake
- Earlier starter grain intake
- Increase water intake
- Improve body weight gain

(Todd, Millman et al. 2010, Barnett, Sischo et al. 2003)

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Antibiotics create diarrhoea and reduce growth

- Calves that were treated routinely with antibiotics had 2 times more diarrhea than if calves were treated only when clinically sick
- Calves that recieved antibiotics in milk had 1.3 times more diarrhoea than calves that go no milk antibiotics
- Grain intake was higher in calves that were not treated with antibiotics (50 g/day more)
- Weight gain was higher in calves that were not treated with antibiotics

(Berge, Moore et al. 2009)

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Prevalence, prediction and risk factors of enteropathogens in normal and non-normal faeces of young Dutch dairy calves.

- 424 calves under 22 days of age from 108 Dutch dairy herds,
- 46% had diarrhoea,
- *In all calves: 31% rotavirus 1st week, 66% C. parvum 2nd week*
- *Clostridium perfringens* in 54% of diarrhoea calves
- *Cryptosporidium parvum* in 43% of diarrhoea calves
- *E. coli* and *Corona virus* were rarely found.
- **Routine antibiotic treatment for diarrhoea was a risk factor for cryptosporidiosis**

CJ Bartels, Prev Vet Med. 2010 93:162-9.

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When to use antibiotics?

- The calf does not want to stand up and drink milk
- **The calf is running a fever**
- The calf is not responding to other supportive treatment
- Use antibiotics effective against gram-negative bacteria, such as amoxicillin-clavulanic acid



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Keep feeding milk to calves with diarrhoea

- A young calf with diarrhoea needs the energy and nutrients in the milk to fight disease and the liquid to stay hydrated.
- Assist calf to drink
- Warm milk

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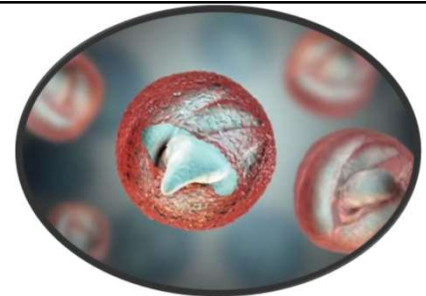
Cryptosporidiosis most common reported diarrhoea in calves in EU

- In ongoing study of 130 farms throughout Europe, Cryptosporidiosis is the most common reported enteric disease challenge in calves (Berge)
- Severe cryptosporidiosis in neonatal beef calves resulted in 34 Kg less weight at 6 months of age (Shaw, Innes et al. 2020)

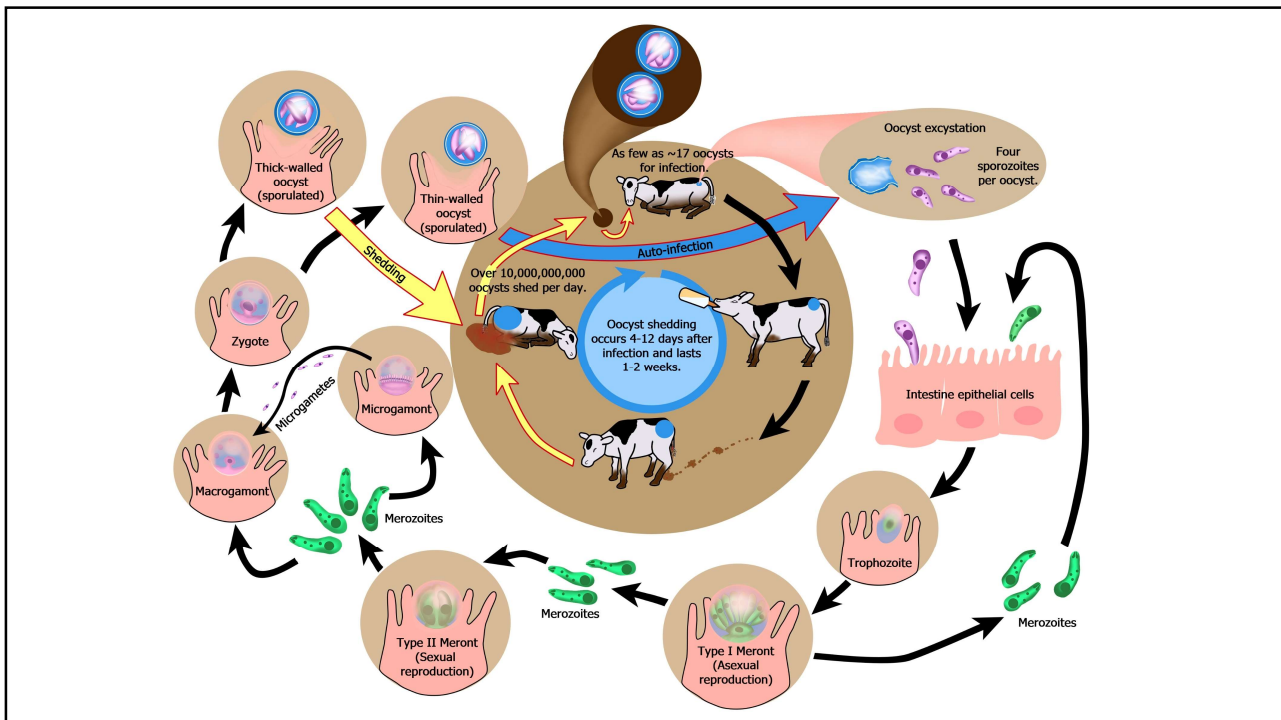
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Cryptosporidiosis

- *Cryptosporidium parvum* is a very hardy, highly infectious parasite
- It is very difficult to reduce the cryptosporidium load in the environment
- There are few effective treatments
- Prophylactic treatment with Halofuginone or Paramomycin
- Colostral immunity can reduce severity of disease
- Improving overall health and nutrition of calves is critical
- Breaking the infection cycle is important



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Better milk nutrition- less Cryptosporidiosis

- 20 calves inoculated with *C. parvum* at 3 days, followed for 3 weeks
- **HPN** - 0.30 Mcal/kg (MBW) using a 28% protein, 20% fat MR (8L MR @12.5% DM)
- **CN** - 0.13 Mcal/kg MBW using a 20% protein, 20% fat MR (4L MR @ 12.5% DM)

Performance	HPN	CN
Dehydration		++
Diarrhoea		++
ADG	433 g/d	-48 g/d
Feed efficiency (ADG/DM intake)	131.9 g/kg	-31.4 g/kg

Ollivett, T. L., et al. (2012). "Effect of nutritional plane on health and performance in dairy calves after experimental infection with *Cryptosporidium parvum*." *J Am Vet Med Assoc* **241**(11): 1514-1520.

80

Treatments

- **Prophylactic:**

- Halofuginone lactate
- Paramomycin

- **Treatment:**

- Rehydration
- Anti-inflammatory
- Gut protective supplements
- Probiotics?: *Lactobacillus reuteri*

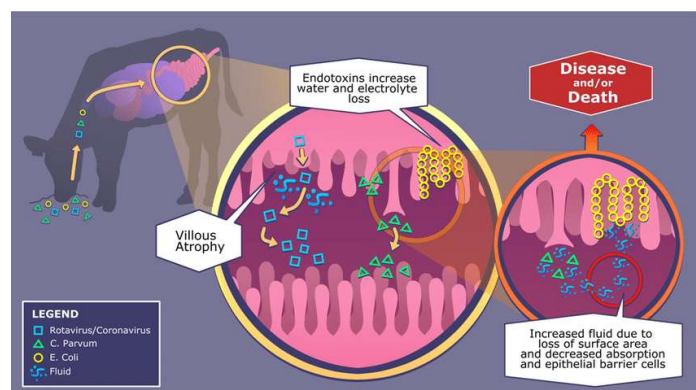


- **Other solutions?**

- Beta-cyclodextrin – non-digestible carbohydrate?
- Glucagon-like peptide 2 (GLP-2) – stimulated through feeding artificial sweetener?
- Numerous coccidiostats and antibiotics have been tested without efficacy

81

Carter, H. S. M., et al. (2021). "A Narrative Review on the Unexplored Potential of Colostrum as a Preventative Treatment and Therapy for Diarrhea in Neonatal Dairy Calves."



82

Colostrum supplement as diarrhoea treatment

- Michael Steele, University of Guelph
- Evaluating 2 days or 4 days colostrum supplementation for diarrhoea treatment
- Colostrum supplementation shortened duration of diarrhoea
- Calves treated with 4 days colostrum supplementation grew 100 gram more per day in the preweaning period

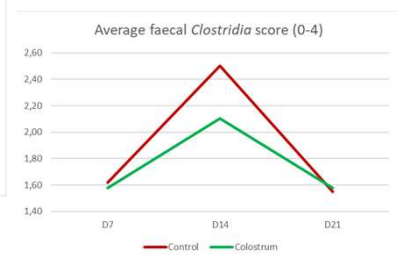
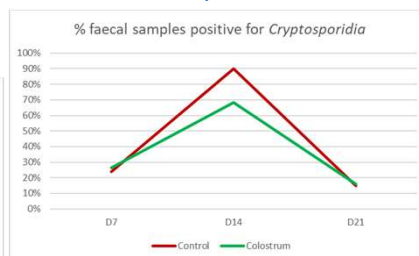
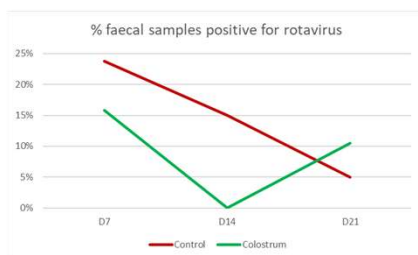
(Carter, Steele et al. 2022)

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Post-closure colostrum supplementation farm trial in the UK



- Calves supplemented with colostrum for 5 days.
- post-closure colostrum supplementation has a positive effect on gut health with reduced detection of rotavirus, *Cryptosporidia*, and *Clostridia* in faecal samples.



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Dry cow vaccinations are increasingly used to protect neonatal calves

- Early neonatal calf vaccinations are many times necessary, but vaccination response is variable and sub-optimal in the face of maternal antibodies (IFOMA). (Chamorro, Woolums et al. 2016)
- Dry cow vaccinations are increasingly used to boost colostral antibodies for various calf diseases
- enteric pathogens such as rotavirus, coronavirus and *Escherichia coli* F5,
- Transition milk and post-closure colostrum supplementation increasingly important
- Bio-Mos to cows during the dry period can increase colostral immunity and transfer to immunity to calves (Franklin, Newman et al. 2005)



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How can we help farmers make the most and best use of colostrum?

- Colostrum in refridgerator
- Freeze small quantities colostrum
- Make Kefir of transition milk?

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Kefir- prophylaxis, treatment and performance

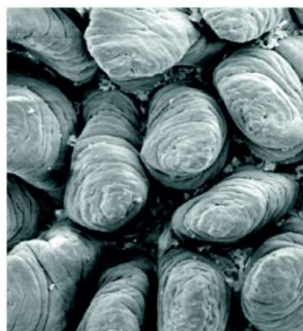
- Kefir has been shown to reduce diarrhoea and improve weight gain in preweaning calves
- (Satik 2017), (Fouladgar, Shahraki et al. 2016)

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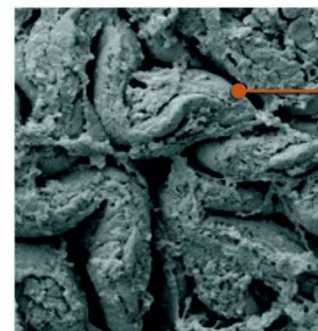
Mannan-oligosaccharides boost gut immunity

Mannan-oligosaccharides and mannan-derivatives

- Increases mucus-layer in intestines
- **Improves gut immunity**
- Binds pathogenic bacteria
- Improves gut digestive function
- **Decreases diarrhoea**
- **Improves daily gain**
- Improves feed conversion



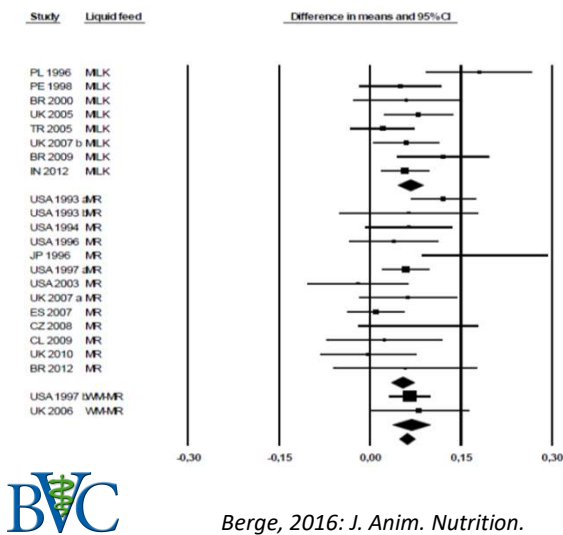
with Actigen



without Actigen

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Meta-analysis of ADG: Bio-Mos® in calf milk/milk replacer

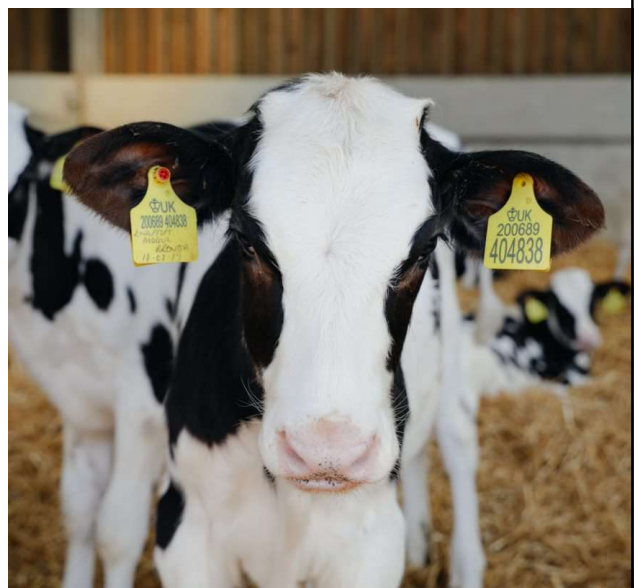


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Meta-analysis proof: Bio-Mos® to pre-weaned calves

- ❖ 65 gram increase in daily weight gain.
- ❖ 14,2% increase in daily weight gain.
- ❖ 3,64 Kg higher weaning weight (weaning at 56 days) in calves that have been fed Bio-Mos.

Berge, 2016: J. Anim. Nutrition.



90

Supportive treatment for common neonatal diarrhoea

Recommend

- Electrolytes
- Anti-inflammatory
- Actigen in milk/MR/electrolytes
- Bio-Mos in milk/MR/electrolytes
- Colostrum supplement
- Fermented milk products
- Egg immunoglobulins

(Carter, Renaud et al. 2021)(Carter, Steele et al. 2022)(Heinrichs, Heinrichs et al. 2013)(van Kuijk, Kinkead et al. 2021)

No not recommend

- Agents that slow down gut peristalsis (movement) (they do not assist the healing of the gut)
- Kaopectate® or Pepto-Bismol® (maybe for clostridiosis)
- Activated Charcoal (lacking scientific evidence)
- Probiotics (lacking consistent evidence)

(Afema 2018)

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Prevention/prophylaxis of neonatal diarrhoea

Recommend

- Transition milk feeding
- Whole milk/pasteurized waste milk
- Actigen/Bio-Mos in milk/MR
- Fermented milk products
- Egg immunoglobulins
- Halofuginone (crypto)

(Carter, Renaud et al. 2021)(Carter, Steele et al. 2022)(Heinrichs, Heinrichs et al. 2013) (van Kuijk, Kinkead et al. 2021)

Do not recommend

- Antibiotics
- Acidification of milk or milk replacer
- Restriction of milk quantities

(Afema 2018)

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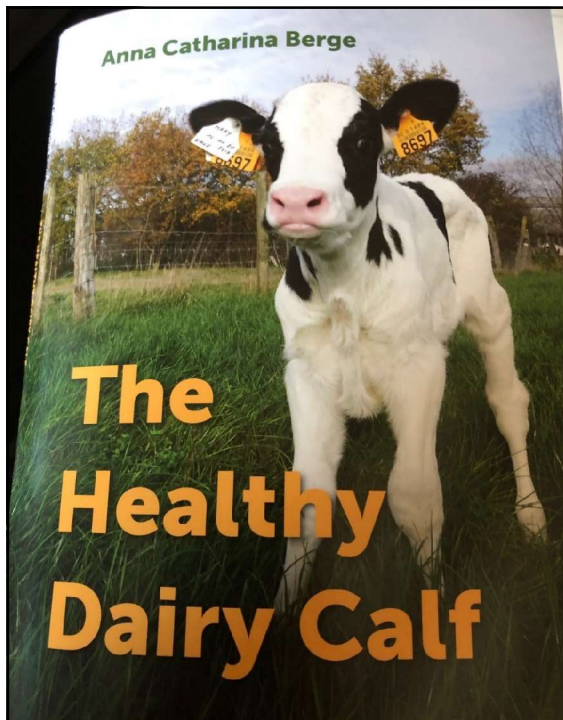


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In summary

- Carefully evaluate dry cow and transition cow period
- Colostrum - the best insurance policy
- Give calves sufficient milk or milk replacer to live and grow as much as possible
- Good quality milk or milk replacer
- Good quality starter grain, hay and water keep feeding through 4 months
- Monitor calves daily at feeding
- Be very careful with antibiotic treatment

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Questions?

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