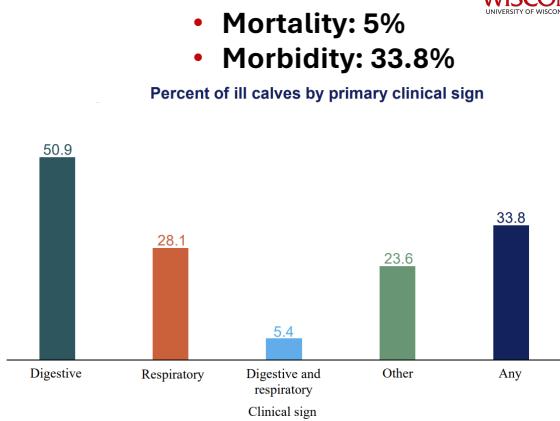
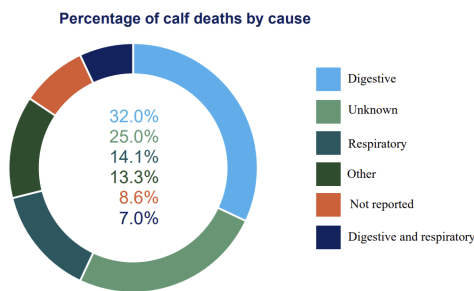


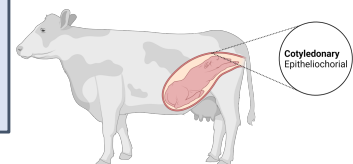
# Effects of processing colostrum on Calf Health

Lautaro Rostoll-Cangiano, PhD  
 Assistant Professor in Immunology, Animal & Dairy Sciences, UW Madison

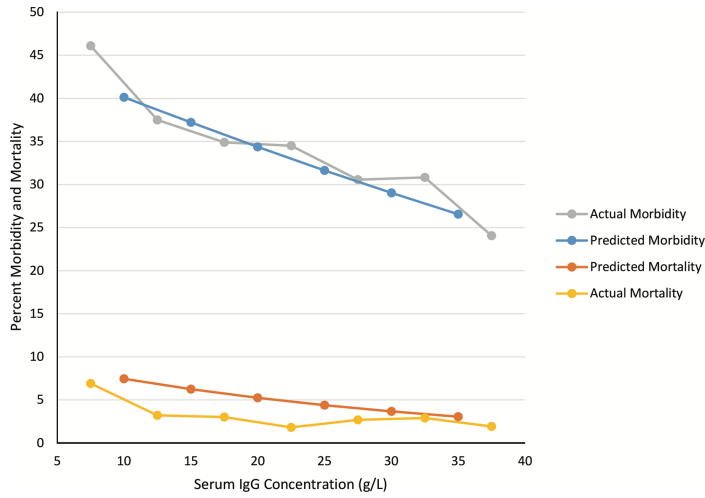
## Preweaning mortality and morbidity



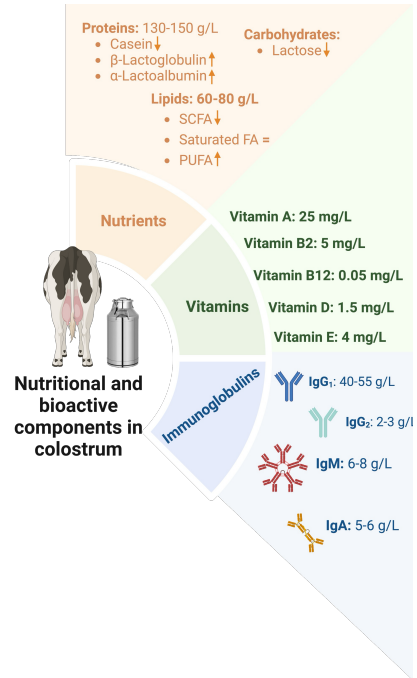
**Calves are born with NO antibodies of their own.** They rely 100% on colostrum for immune protection in the first weeks of life. How we manage colostrum determines whether each calf gets that protection and how well their immune system develops.



# Bovine colostrum: Not just a source of IgG

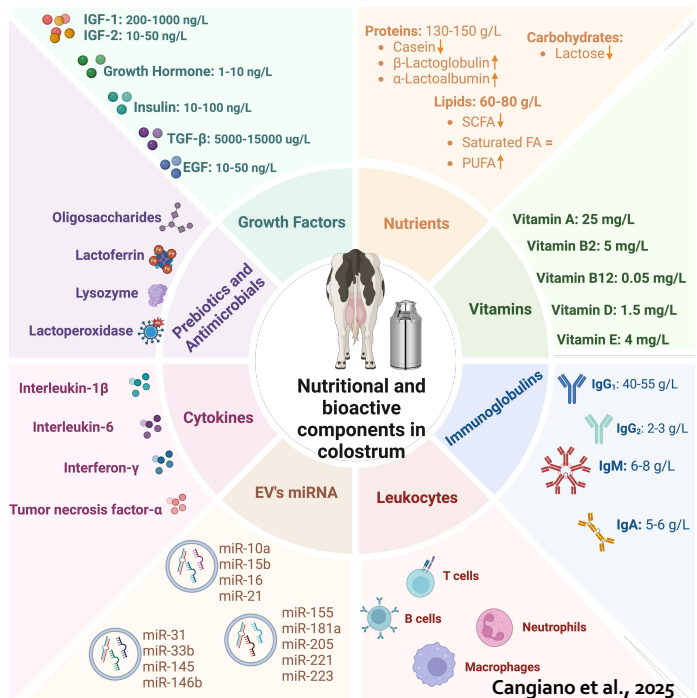


Lombard et al., 2020



# Bovine colostrum: Not just a source of IgG

- Well known for passive immune transfer
- Role in programming early immunity less understood
- Preserved by freezing/pasteurization to ensure supply
- IgG concentration maintained, but immune cells destroyed by freezing
- Freezing/pasteurization may reduce activity of other bioactives



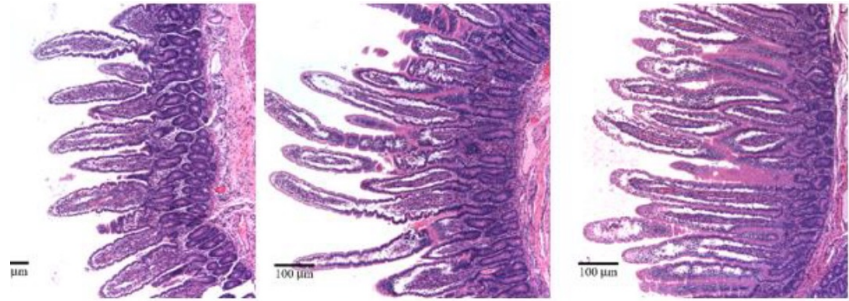
Cangiano et al., 2025

# Colostrum growth factors promote intestinal development



## → IGF-1 (Insulin-like Growth Factor):

stimulates epithelial cell growth and repair:  
More surface area for nutrient absorption



Milk

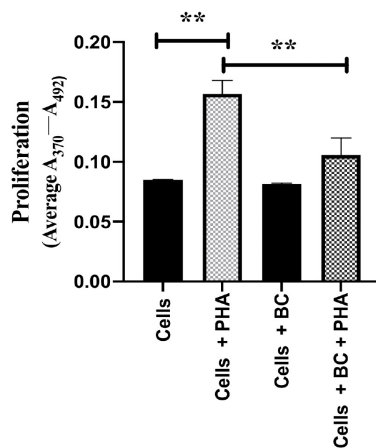
Transition Milk

Colostrum

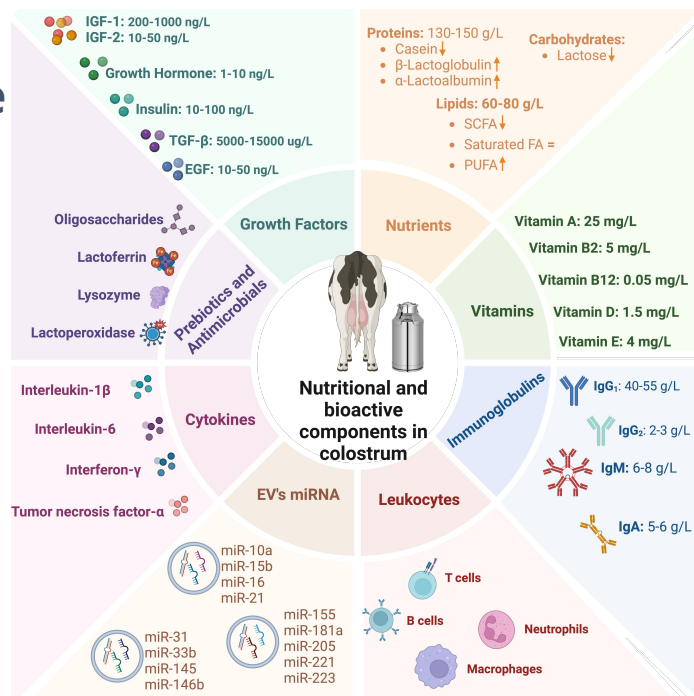
→ **Insulin:** increases intestinal villus height and mucus production: Thicker, more protective gut lining

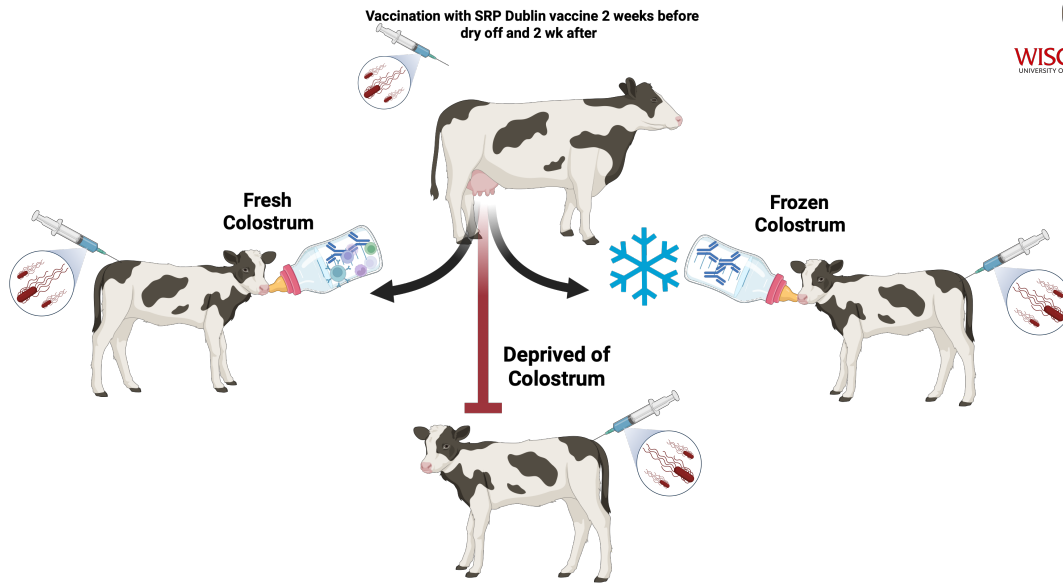
Adapted From Pyo et al., 2020

# Colostrum downregulate immune activation in vitro

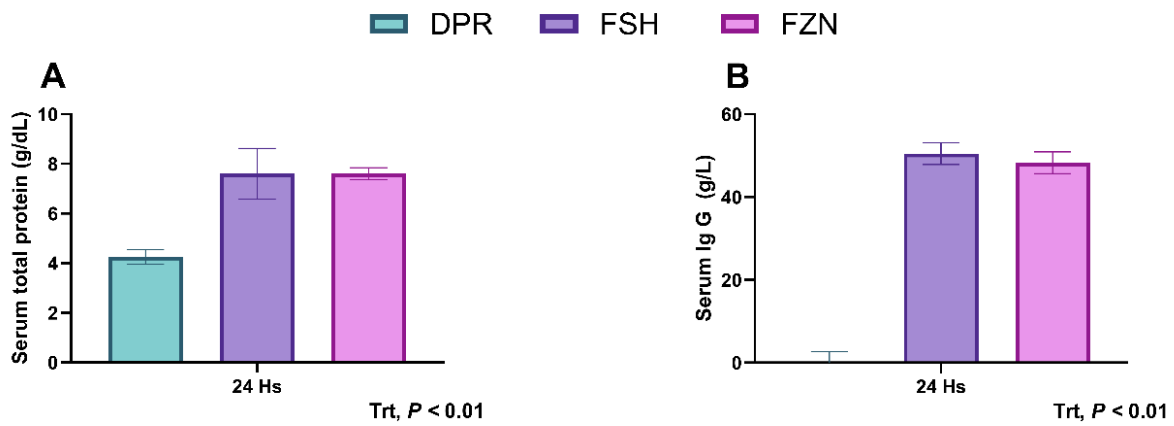


Duman et al., 2023

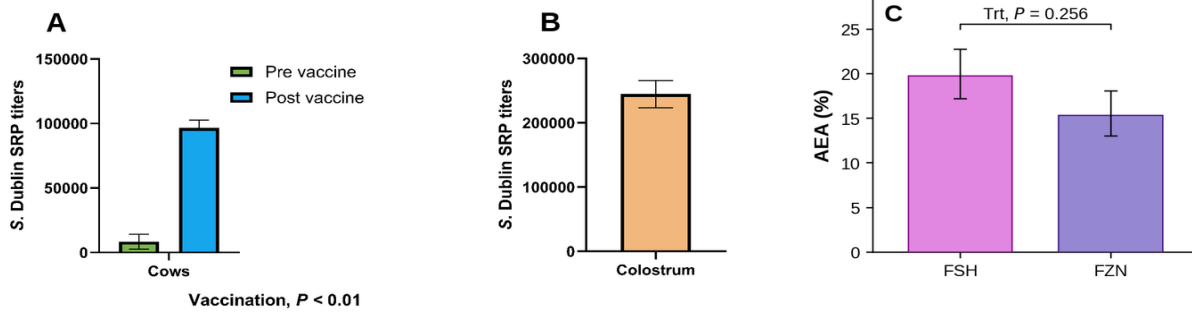




## Passive transfer of Immunity

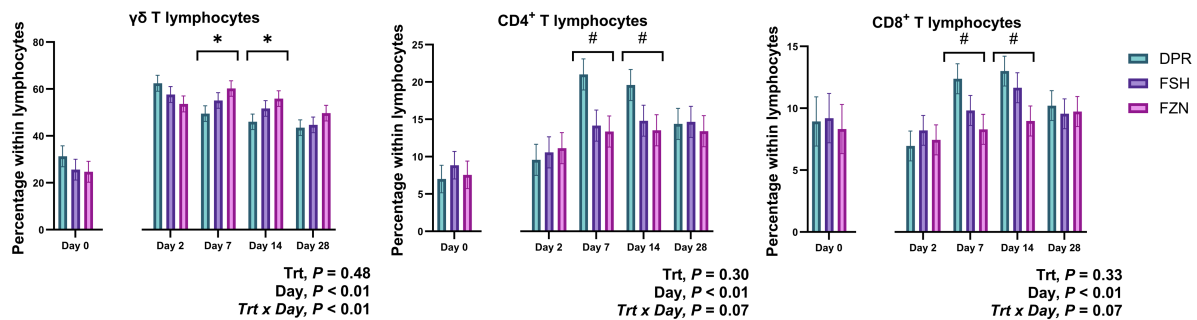


# Passive transfer of Immunity



Cid de la Paz et al. Submitted

# Colostrum role in programming T cell immunity

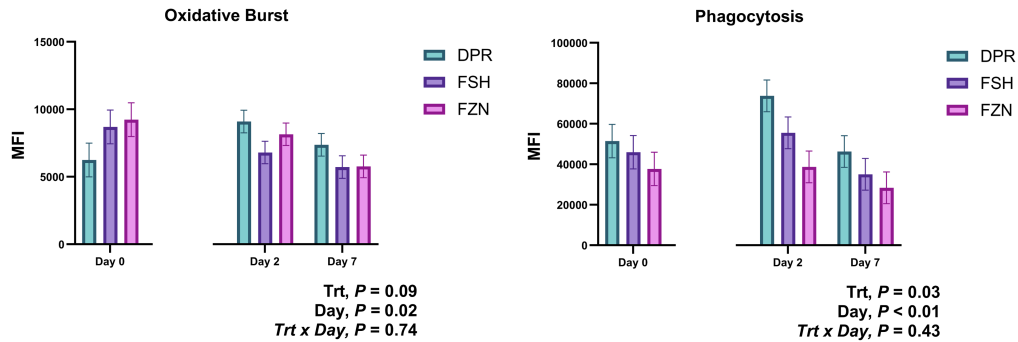


↑ **Higher CD8+ T cell activity** on day 2 of life: Defense cells were overactive  
It's not just about antibody levels, calves without sufficient colostrum might develop a fundamentally DIFFERENT immune system.

This dysregulation may persist and affect disease resistance for weeks.

Cid de la Paz et al., 2025

# Role of colostrum in downregulating systemic immune activation



**Think of it this way:** Without colostrum, the immune system is like an untrained army: Excessive Immune activity, and inflammatory signals. Colostrum provides the initial training.

Cid de la Paz et al., 2025



J. Dairy Sci. 108:13890–13904  
<https://doi.org/10.3168/jds.2025-27333>  
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 This is an open access article under the CC BY license (<https://creativecommons.org/licenses/by/4.0/>).

## Exploring the impacts of colostrum on systemic immune development in dairy calves

M. Cid de la Paz, F. Viquez-Umana, M. Mancheno, T. Fernandez-Wallace, H. C. Mantovani, and L. R. Cangiano\*  
 Department of Animal and Dairy Sciences, University of Wisconsin–Madison, Madison, WI 53706



### What Colostrum Does to the Immune System:

- ↓ **Reduces phagocytic overactivity** preventing the immune system from unnecessary activation and immune responses
- ✓ **Reorganizes T cell populations** into a coordinated, balanced defense system
- ✓ **Selective immunomodulation:** key protective functions (IFN- $\gamma$ , antibody responses) remain fully intact

### Why Does This Matter?

Excessive immune activation is COSTLY: it diverts energy away from growth.

A well-regulated immune system protects efficiently without wasting resources on unnecessary inflammation.

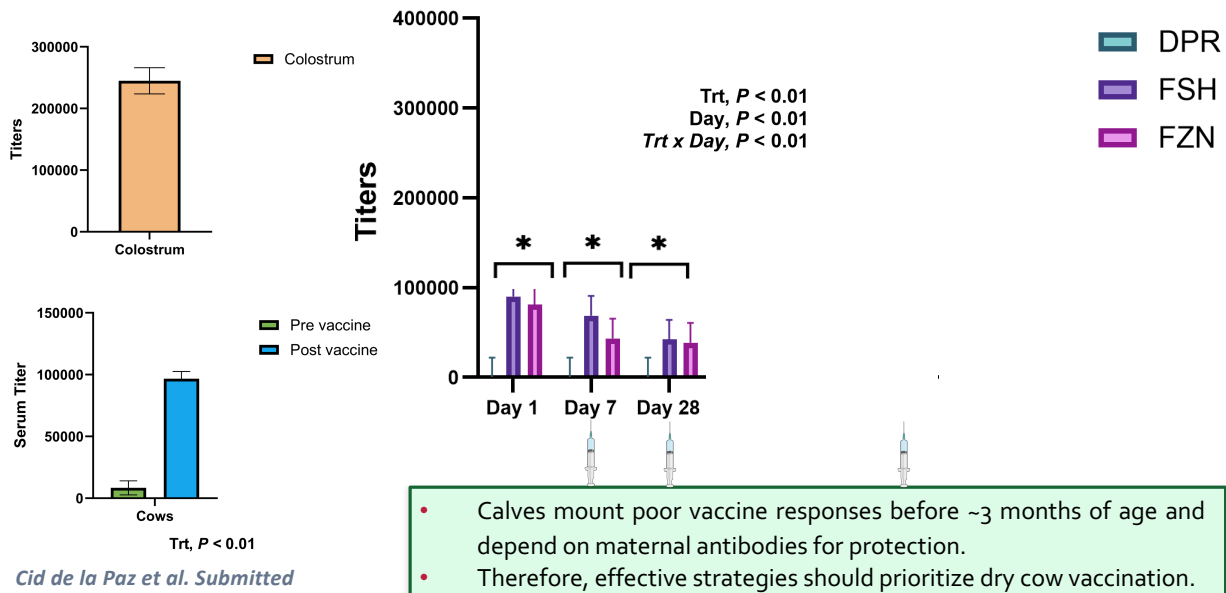
Colostrum sets this balance from day 1.

### ★ Farm Implication

Colostrum management is not just about preventing scours in week 1  
 It shapes how efficiently calves grow and protects against disease both with passive and active mechanisms

# Specific antibody titers against *S. Dublin*

## Antibodies against *Salmonella Dublin*



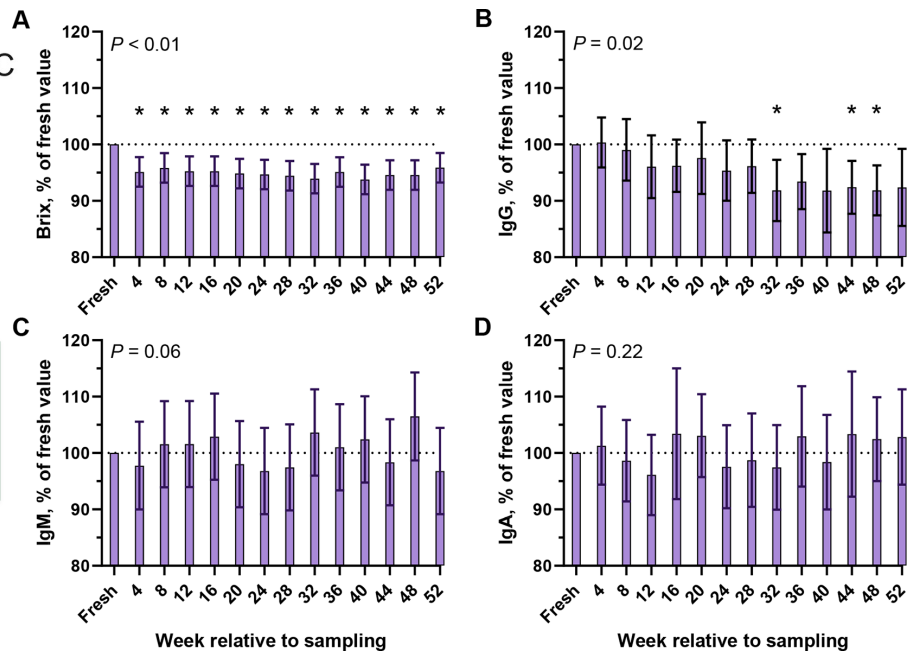
# Effect of freezing -20°C bovine

Colostrum samples (n = 10) collected on a commercial dairy farm at -20°C for 1 yr

**RECOMMENDED STORAGE LIMIT**  
**≤ 32 Weeks (8 Months)**

★ **Farm Action**  
 Label every bag with the DATE of collection. Rotate stock: Oldest colostrum first.

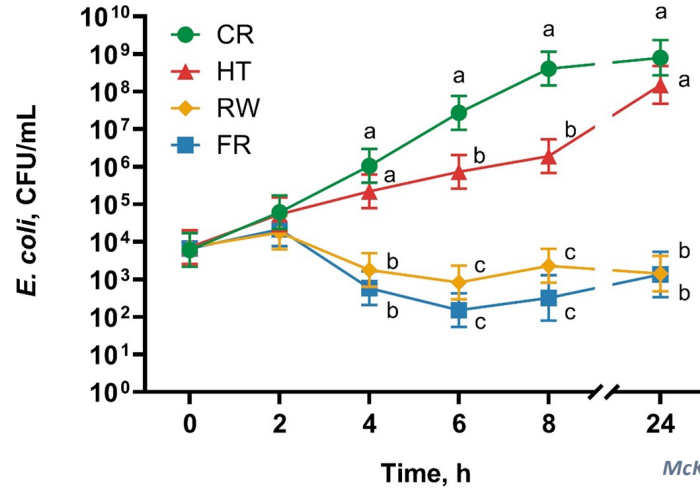
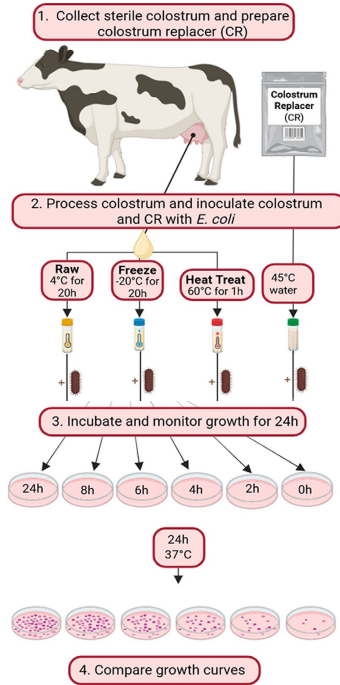
*Westhoff and Mann, 2025*





## Evaluating bacterial growth in raw, frozen, and heat-treated colostrum inoculated with fecal *Escherichia coli*

A. M. McKane, T. A. Westhoff, S. Klaesig, C. Altier, K. E. Bell, P. D. Pavinski Bitar, and S. Mann\*



## SCC at dry off affects colostrum quality and passive transfer in calves

### Category of SCC:

- L-cow: <200,000 cells/mL
- H-cow: >200,000 cells/mL

### Calf Category:

- L-calf: Born from a L-cow
- H-calf: Born from a H-cow

### Colostrum Category:

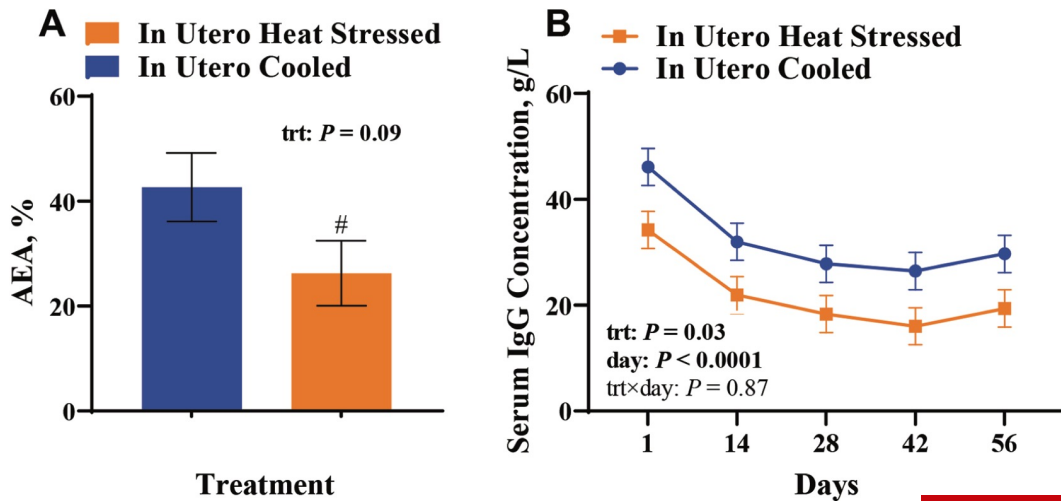
- L-col: Colostrum from L-cow
- H-col: Colostrum from H-cow

All calves were tubed 4 L colostrum within 3 h of birth

Item	Treatment <sup>1</sup>			P-value <sup>2</sup>
	H-cow	L-cow	SEM	
Colostrum yield (kg)	5.11	5.32	0.53	0.77
Fat				
%	5.14	5.70	0.39	0.33
kg	0.27	0.31	0.04	0.55
Protein				
%	14.17	17.87	0.54	<0.01
kg	0.72	0.93	0.09	0.08
Lactose				
%	2.82	2.91	0.10	0.56
kg	0.14	0.16	0.02	0.58
TS				
%	22.13	26.48	0.59	<0.01
kg	1.13	1.41	0.14	0.19
IgG <sup>3</sup> (g/L)	74.7	92.8	4.42	0.01
Brix (%)	22.7	25.9	0.79	0.01
SCC (Log <sub>10</sub> )	6.2	5.8	0.12	0.02

Item	H-calf		L-calf		SEM	P-value	
	H-col	L-col	H-col	L-col		T-calf <sup>3</sup>	T-col <sup>4</sup>
Intake of IgG							
Total, g	281.0	332.2	262.5	301.7	22.51	0.31	0.05
g/kg of BW	8.6	9.9	7.9	9.4	0.63	0.39	0.03
TPI							
IgG, g/L	22.7	22.9	27.4	30.0	2.10	0.01	0.55
Brix, %	8.9	8.9	9.8	9.6	0.35	0.03	0.85
STP, g/dL	6.2	6.0	6.6	6.9	0.30	0.03	0.81
AEA, %	25.1	23.8	29.4	30.7	1.95	0.01	0.99

## In Utero heat stress reduces IgG absorption in calves



Davidson et al., 2021

## Does colostrum quality reflects the cow's metabolic trajectory?



### What drives IgG concentration in first-milking colostrum?

- Elevated prepartum NEFA is associated with lower colostrum Brix and IgG concentration
- Elevated BHBA and NEFA prepartum correlated with increased colostrum yield within parity groups (Whestoff et al., 2023)
- Heat stress, mastitis, and periparturient inflammation further reduce colostrum IgG
- Several interventions aim at improving metabolic status at calving (Cr, RPC) appears to also influence Brix, yield or both (Swartz et al., 2022; Dr Heather White preliminary data)

Whestoff et al., 2023; Hoffmann et al., 2024

# Colostrum Brix at first milking as a predictor of peripartum disease risk



## 2,770 Holstein cows in a grazing Dairy Farm- Argentina:

Each 1-unit increase in colostrum Brix was associated with:

- 21% lower odds of composite parturition disorders (OR = 0.79)
- 7% lower odds of endometritis (OR = 0.93)
- 7% lower odds of any disease event (OR = 0.93)

→ **Cows with higher-quality colostrum were healthier before, during, and after calving**

**Can Colostrum data can serve as a real-time transition cow health surveillance tool?**

Effect	<sup>1</sup> OR	<sup>2</sup> 95% CI	<i>p</i>
<sup>3</sup> Colostrum quality (Brix scores)	1.22	<sup>4</sup> Risk of retention of fetal membranes 0.87–1.75	0.25
	0.86	<sup>5</sup> Risk of dystocia 0.77–0.97	0.02
	0.64	<sup>6</sup> Risk of stillbirth 0.56–0.73	<0.01
	0.79	<sup>7</sup> Risk of parturition diseases 0.72–0.87	<0.01
	0.99	<sup>8</sup> Risk of metritis 0.92–1.06	0.76
	0.93	<sup>9</sup> Risk of clinical endometritis 0.87–0.99	0.02
	0.93	<sup>10</sup> Risk of diseases 0.88–0.98	0.01

*Jaureguiberry et al. (2025)*

## KEY TAKE-HOME MESSAGES FOR YOUR FARM

**1**

**Colostrum does far more than deliver antibodies:** It actively programs your calf's immune system, builds gut health, and shapes disease resistance for weeks. Every management decision around colostrum has lasting consequences for health and development.

**2**

**Heat treatment trades bioactive richness for pathogen control:** HT reduces antibacterial activity. After heat treating, your hygiene protocol must be flawless.

**3**

**Don't store frozen colostrum beyond 32 weeks (8 months):** IgG and insulin both decline with extended storage. Label every bag with the date collected and rotate your stock.

**4**

**Your dry cow is the foundation of your colostrum program:** Nutrition (starch, DCAD, NDF), vaccination, and metabolic health before calving directly determine colostrum quality. Fix problems there, not just at the calf end.



# Questions?

Let's keep the conversation going:

[rostollcangi@wisc.edu](mailto:rostollcangi@wisc.edu)

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Sciences Department



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- **Martina Mancheno**
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