

Finding the next 5 lb/day: Many ways to fill a tank!

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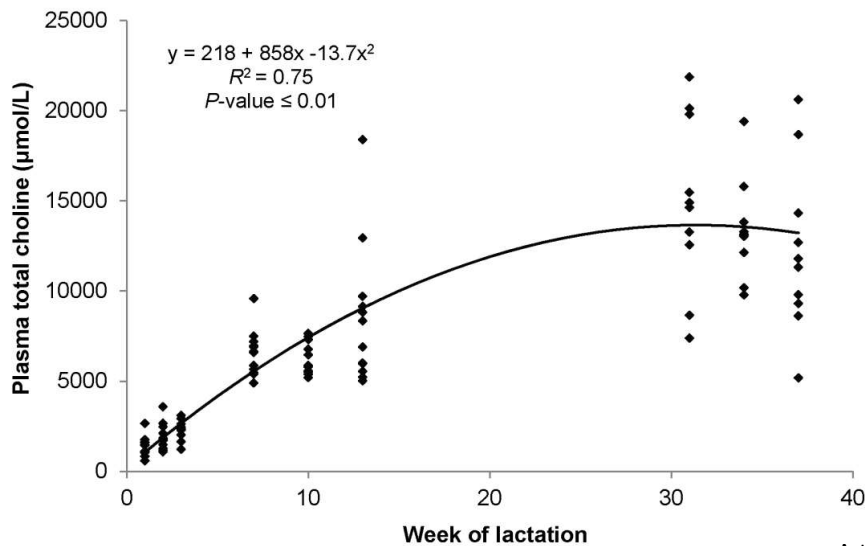
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How do we produce 5 lb more milk per cow?

1. Refine feeding & management strategies to better meet biological needs of cows and equip the mammary gland with the necessary nutrients for milk.
 - a. Have we supplied enough dry matter to support lactation?
 - b. Are the known essential nutrients supplied adequately?
 - c. What have we potentially overlooked?
 - d. Has the lack of data on long-term nutrient impacts led us to ignore crucial nutrients?

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Choline – a conditionally essential nutrient

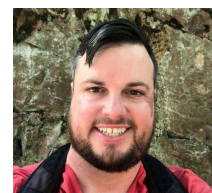


Artegoitia et al., 2014

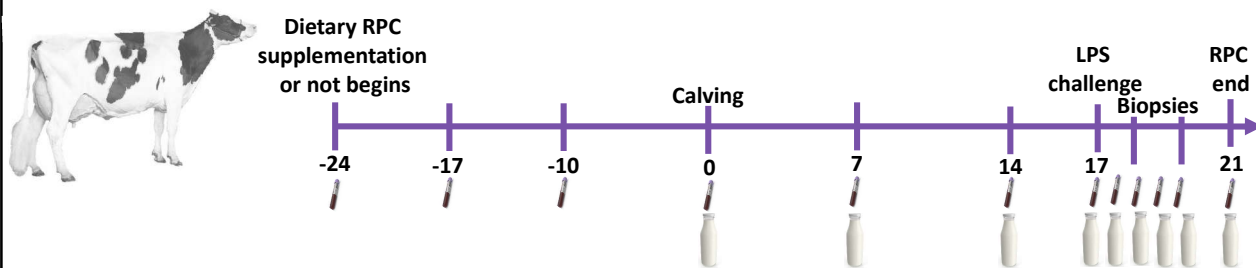
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Does choline make transition cows more resilient?

- Multiparous cows randomly assigned to receive one of three treatments: dietary supplementation of rumen-protected choline (RPC) at either 45 (**CHOL45**; 20.4 g/d choline), 30 (**CHOL30**; 13.6 g/d choline), or 0 (**CON**) g/d
- Intramammary LPS challenge at 17 DIM or left unchallenged



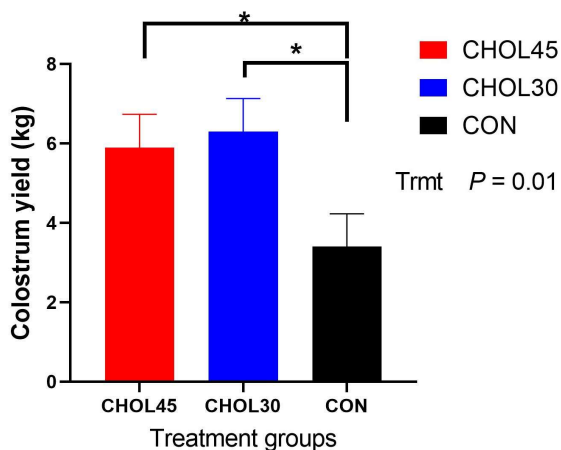
Transition cow study



Swartz et al., 2023

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Dietary choline (CHOL) supplementation increased colostrum yield



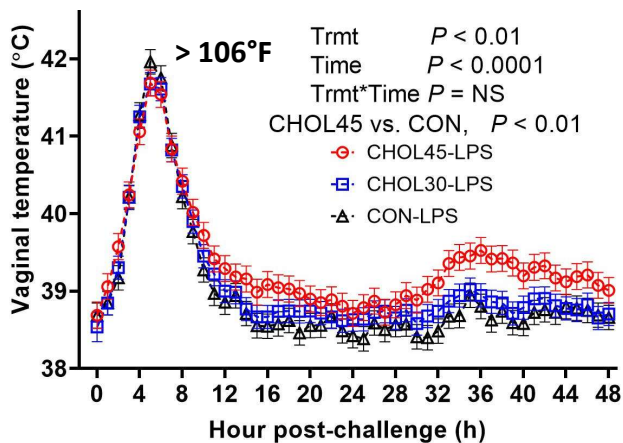
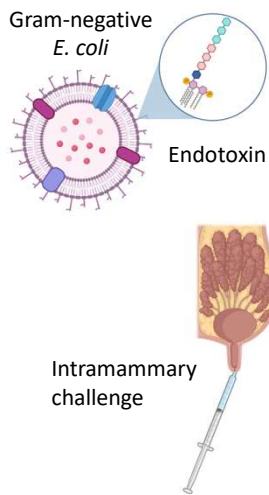
- CHOL45 and CHOL30 increased colostrum protein yield relative to CON.
- CHOL30 increased colostrum fat yield relative to CON.
- IgG content as assessed by Brix refractometry was not affected by treatment.

Swartz et al., 2022

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LPS – inflammatory response

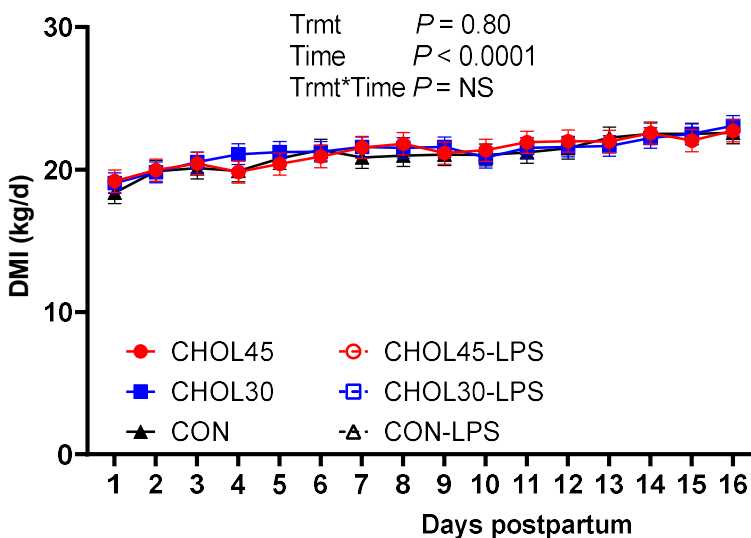
Fever



Swartz et al., 2023

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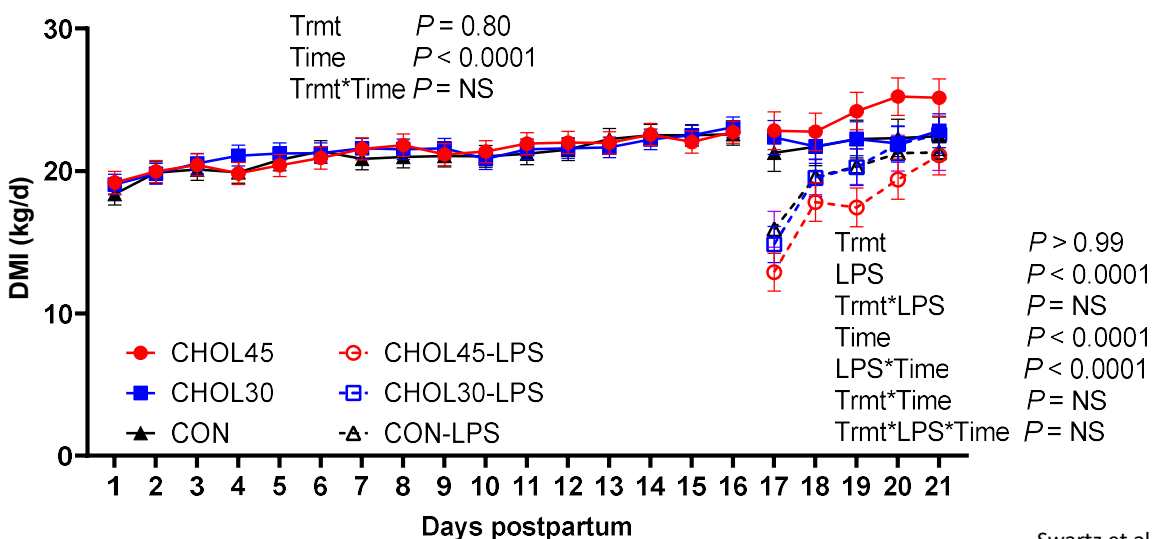
Dry matter intake through challenge



Swartz et al., 2023

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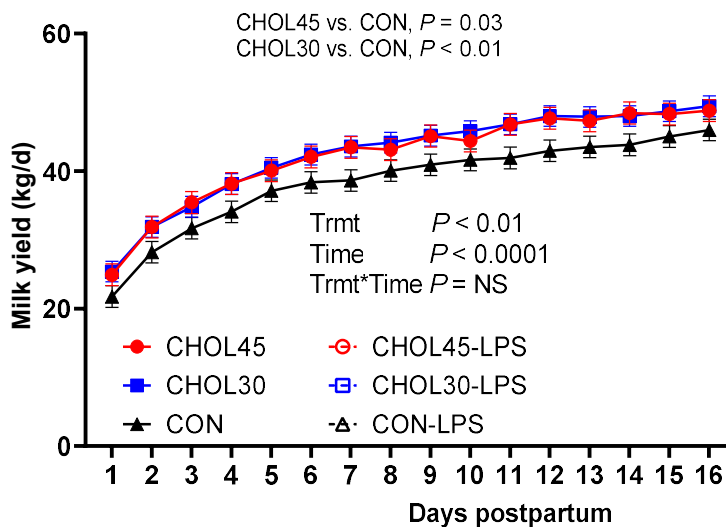
Dry matter intake through challenge



Swartz et al., 2023

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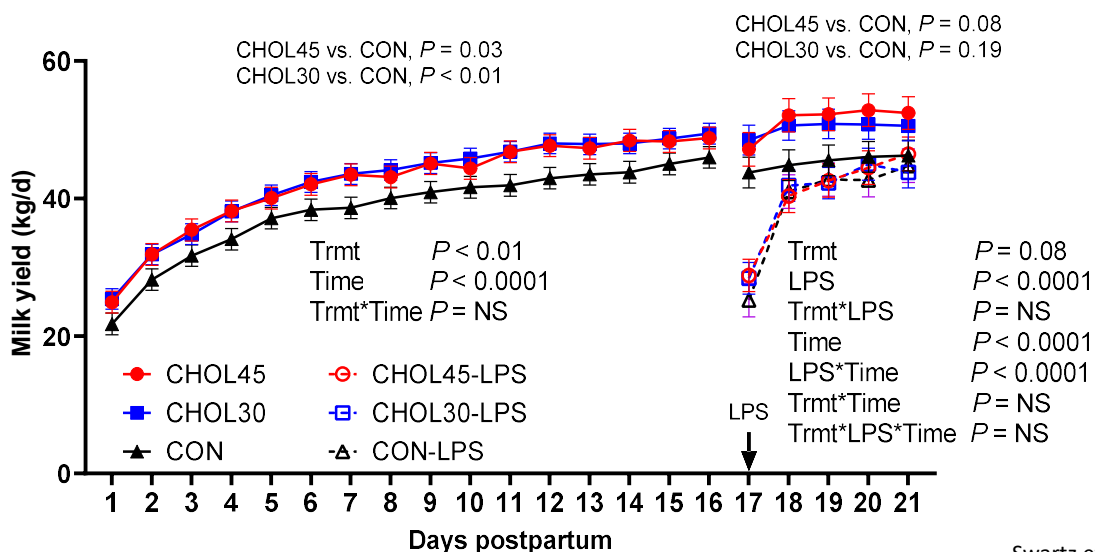
Milk yield response to challenge



Swartz et al., 2023

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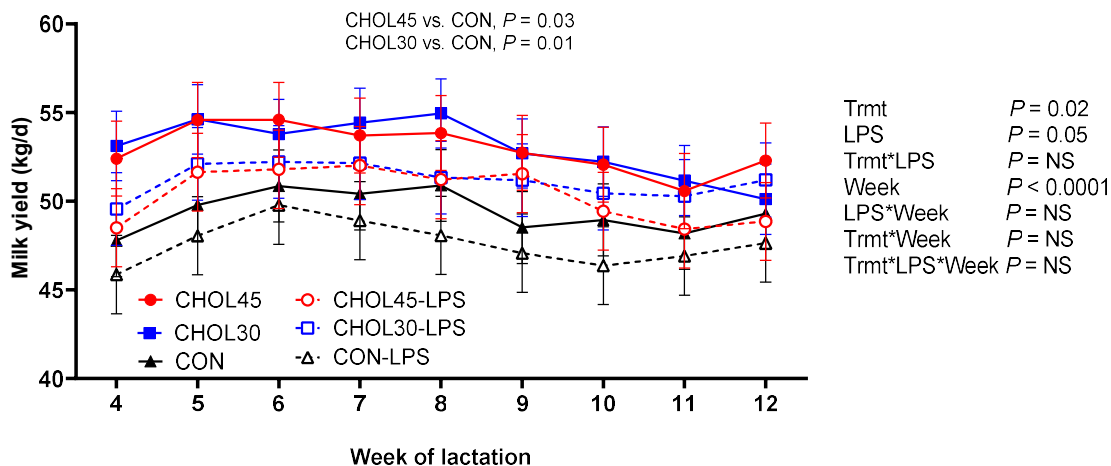
Milk yield response to challenge



Swartz et al., 2023

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Dietary CHOL supplementation increased milk yield in the carry-over period (22-84 DIM) by ~ 7 lb/day



Swartz et al., 2023

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Does feeding encapsulated niacin in the first 21 days benefit lactation?



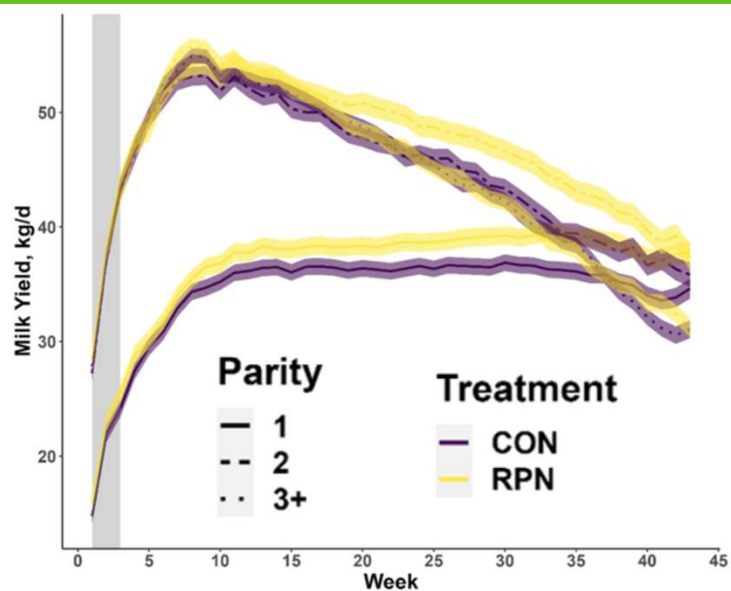
- Commercial farm with robotic milking system
- A bit over 1,000 cows enrolled in a randomized design over 11 months
- Hypothesis: niacin will reduce early lactation lipolysis, improve health, and improve reproduction

Krogstad et al., 2025

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Transition niacin improved young cow persistency

- No impact before peak lactation, no apparent health benefits
- Parity 1 & 2 cows: +1,489 lb 305-day milk
- Note: robotic management



Krogstad et al., 2025

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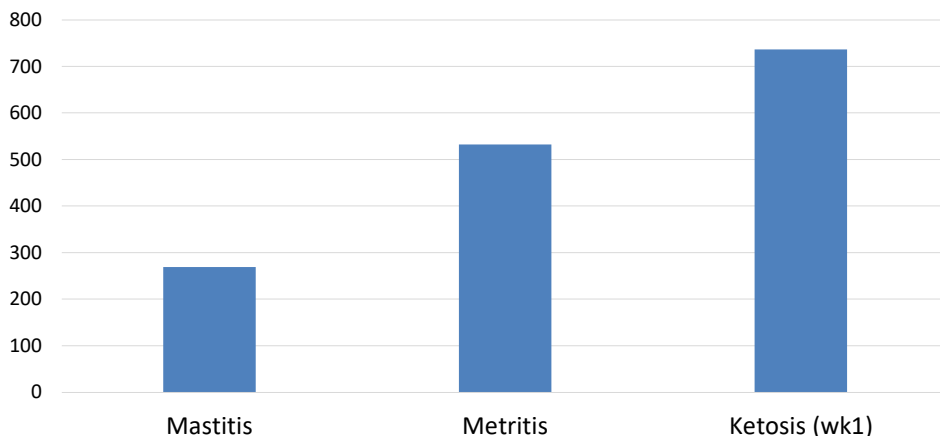
How do we produce 5 lb more milk per cow?

1. Refine feeding & management strategies to better meet biological needs of cows and equip the mammary gland with the necessary nutrients for milk.
2. Prevent the clinical + subclinical transition cow problems that impact productivity of 20-40% of our cows. (2-5 lb/d x 30%)

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Long-term consequences of transition problems

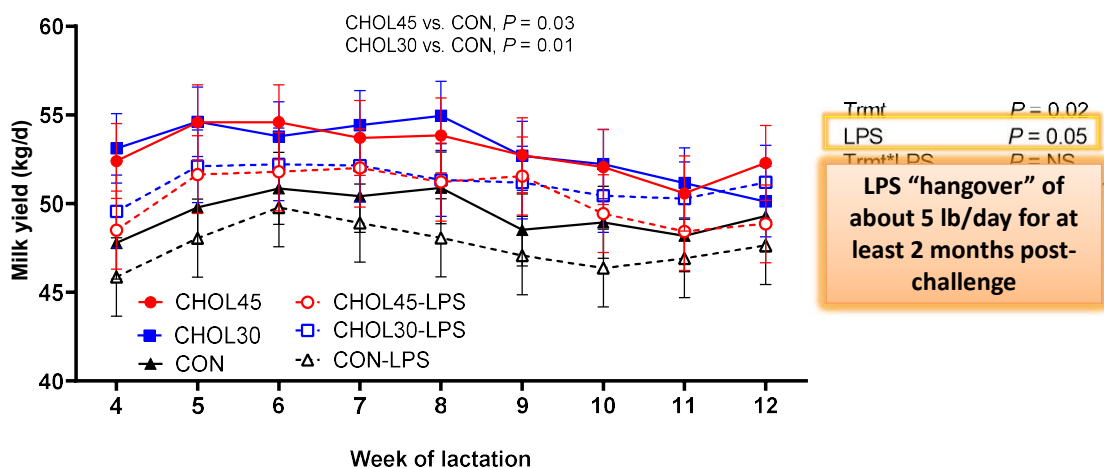
Whole-lactation production losses (lb)



Bar et al., 2008; Ojeda-Rojas et al., 2025; Duffield et al., 2009; Raboisson et al., 2014

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Dietary CHOL supplementation increased milk yield in the carry-over period (22-84 DIM) by ~ 7 lb/day

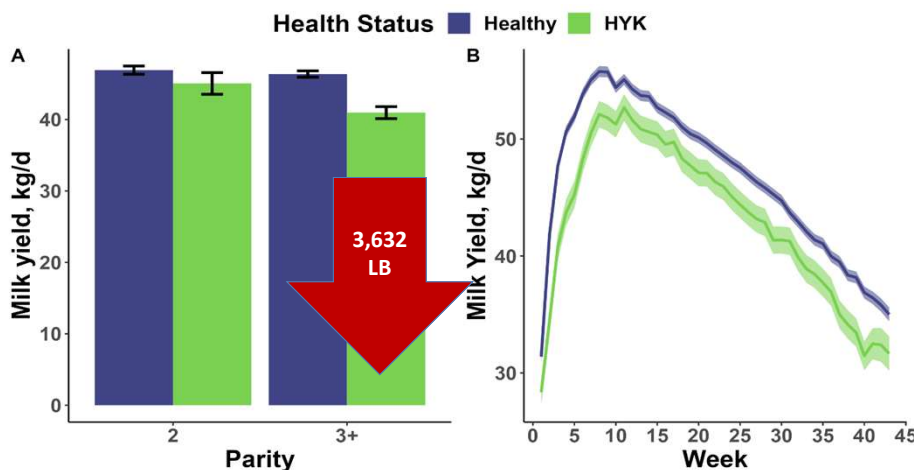


Swartz et al., 2023

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Older cows with hyperketonemia under-perform

- 23% of parity 3+ cows had blood BHB > 1.2 mM in week 1
- These cows produced 12% less 305-day milk vs. healthy parity 3+ cows



Krogstad and Bradford, 2025

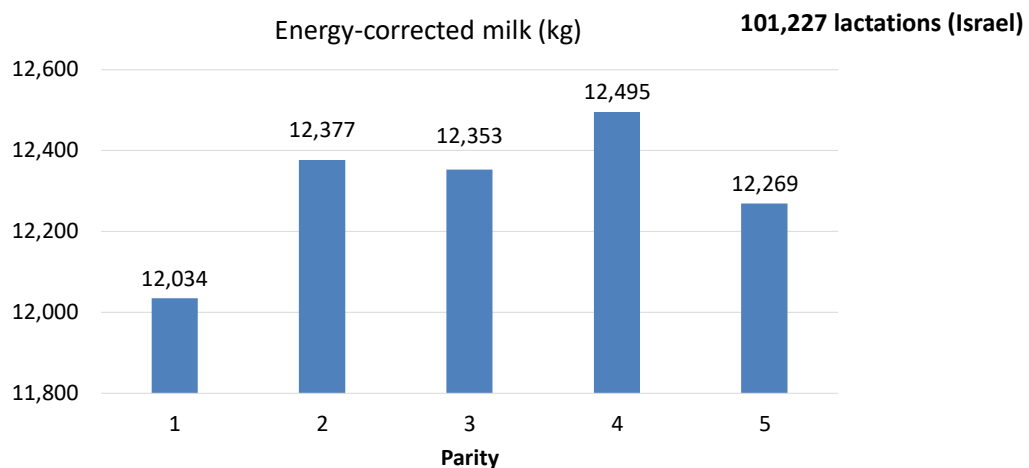
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How do we produce 5 lb more milk per cow?

1. Refine feeding & management strategies to better meet biological needs of cows and equip the mammary gland with the necessary nutrients for milk.
2. Prevent the clinical + subclinical transition cow problems that impact productivity of 20-40% of our cows. (3-5 lb/d x 30%)
3. Reduce culling to increase average productive life and decrease the fraction of first-lactation cows in our herds

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Productivity & profitability increase until lactation 4-5



Courtesy of Zachut, Ezra, and Lavon; 2021 data

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What is the milk drag from young herds?

- Recent 305-day milk correction factors with 2 million Holstein records/year are about:

- Parity 1: **1.3**
- Parity 2: **1.1**
- Parity 3 – 5: **1.0**

40% lact1, 30% lact2, 30% lact3+



30% lact1, 27% lact2, 43% lact3+

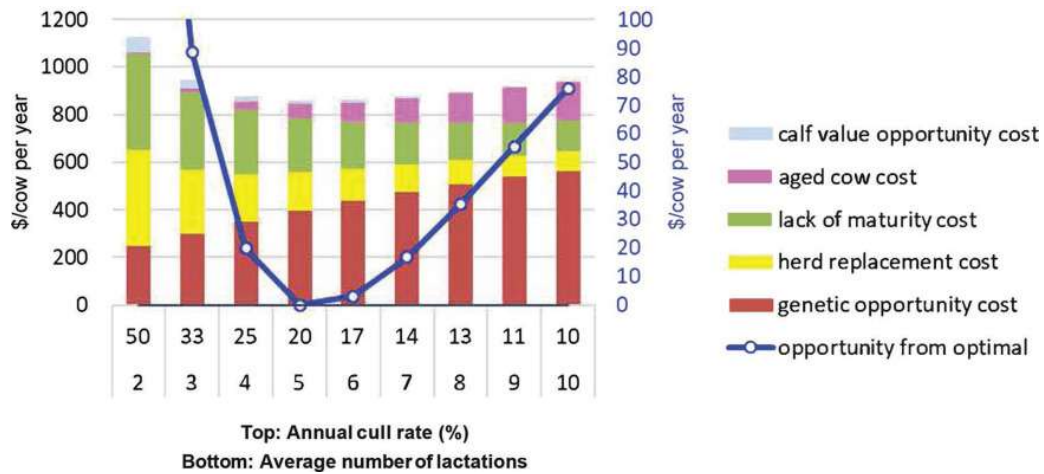


25% lact1, 22% lact2, 53% lact3+

(Miles et al., 2023)

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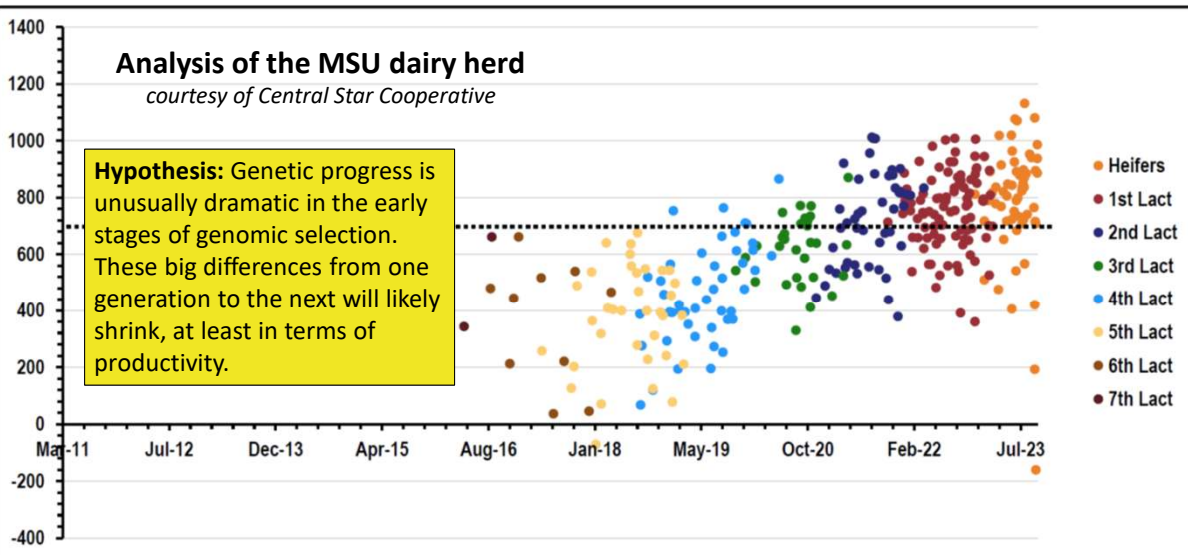
Productivity & profitability increase until lactation 4-5



De Vries, 2020

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Net Merit\$ by Lactation Group & Birth Date

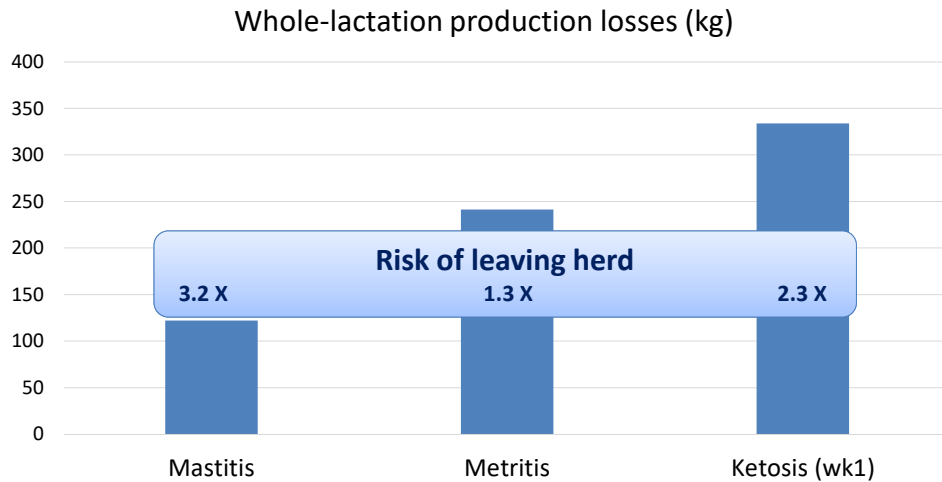


The herd is currently averaging 733 NMS.

Group	Heifers	1st Lact	2nd Lact	3rd+ Lact
NMS	840	753	725	467

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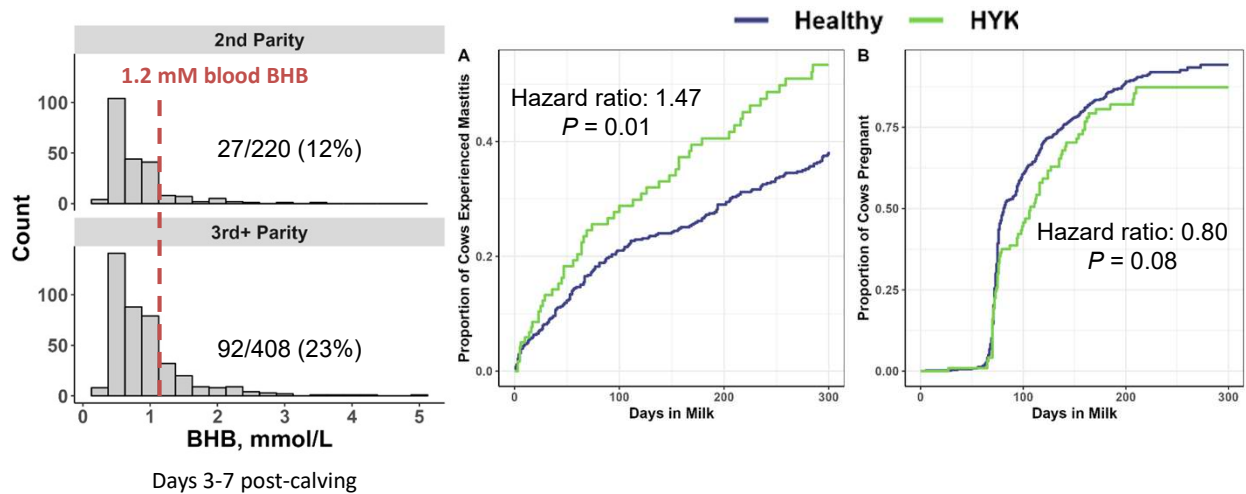
Long-term consequences of transition problems



Bar et al., 2008; Ojeda-Rojas et al., 2025; Duffield et al., 2009; Raboisson et al., 2014

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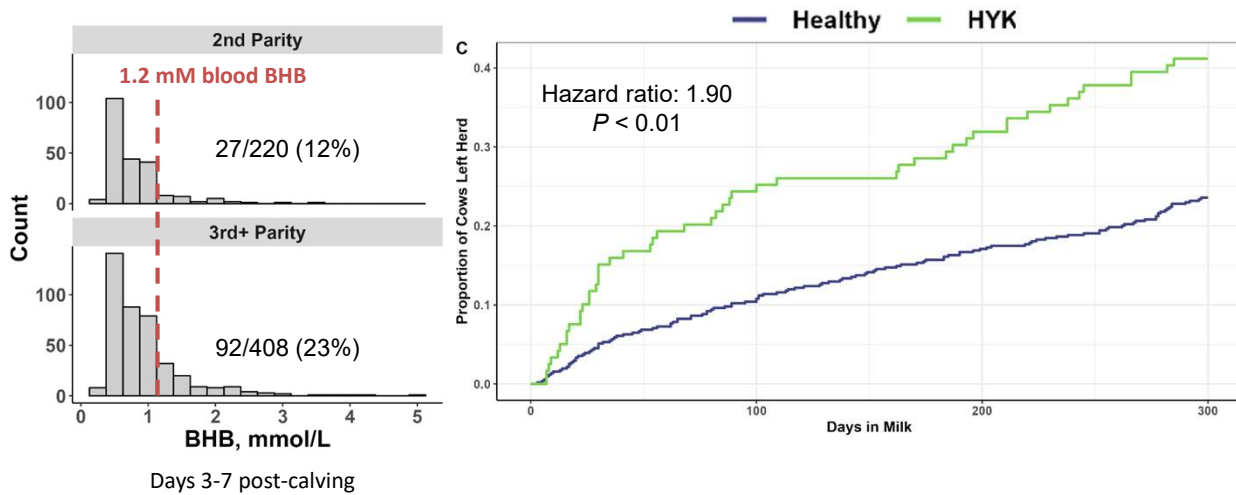
Disease + infertility → culling



Krogstad and Bradford, 2025

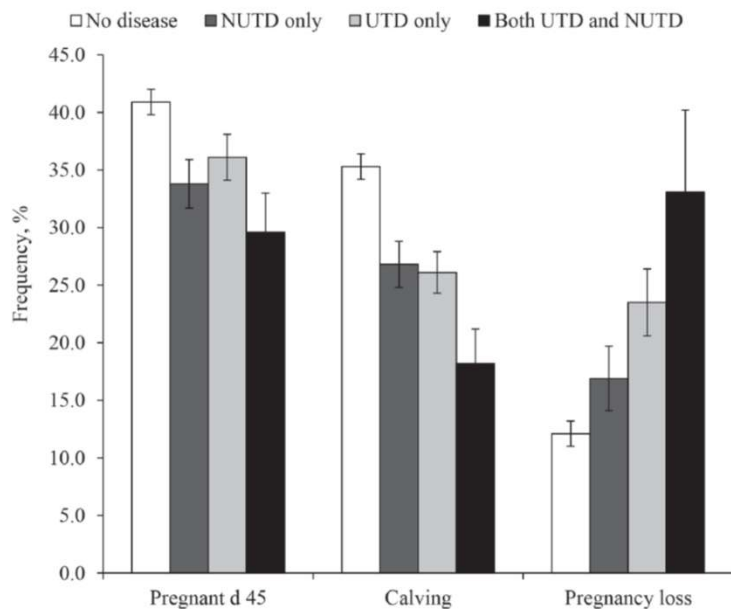
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Disease + infertility → culling



Krogstad and Bradford, 2025

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Disease is disastrous for dairy cow reproduction

- Analysis of 5,085 cows calving on one dairy in a year (pregnancy / breeding)
- Additive negative impacts of both **uterine (UTD)** and **non-uterine (NUTD)** diseases
- Impact far worse after accounting for pregnancy loss!

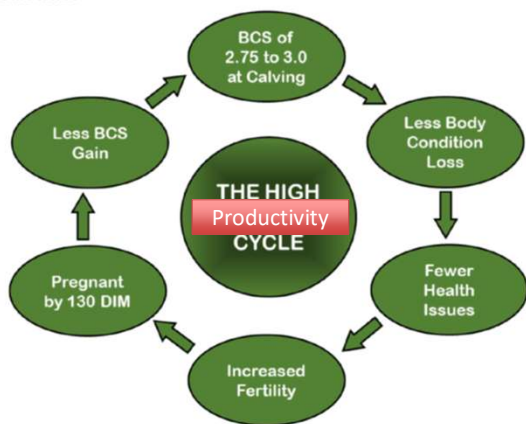
Ribeiro et al., 2016

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The high fertility cycle

P. M. Fricke,^{1*} M. C. Wiltbank,¹ and J. R. Pursley²

Graphical Abstract



- Controlling body condition contributes to lesser inflammation, improved metabolic function, less disease, and greater fertility
- This, in turn, promotes rapid pregnancy and avoids extended lactations that lead to fat cows
- Feed for this virtuous cycle!

Fricke et al., 2023

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Highlights from recent findings

- Some nutrient requirements are still not fully defined
 - e.g. flavonoids, choline, niacin
- Lots of transition feeding studies have shown carryover benefits, making ROI calculations complex for transition investments
 - Should be evaluated on a cost per cow/year basis
- Our recent study is the first randomized study to show that early lactation mastitis substantially reduces peak milk yield (~5 lb/d)
- Health, reproduction, and productivity (of individual cows and herds) are intimately linked
 - Late lactation management is a critical piece of the puzzle

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How do we get the next 5 pounds of milk?

1. Refine feeding & management strategies to better meet biological needs of cows and equip the mammary gland with the necessary nutrients for milk.
Potential impact: 2-5 lb/d (or more)
2. Prevent the clinical + subclinical transition cow problems that impact productivity of 20-40% of our cows. (2-5 lb/d x 30%)
Potential impact: 1-2 lb/day
3. Reduce culling to increase average productive life and decrease the fraction of first-lactation cows in our herds
Potential impact: 2-5 lb/day

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THANK YOU!
Questions? Comments?
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