Sports Cars vs. Farm Trucks:
Maintaining Cows Like the Top Performers They Are

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Vs.

Clem Nash, PhD

Executive Manager, Ruminant Tech Service and COWS

Novust International

clemence.nash@novusint.com

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Some Context: NOVUS C.O.W.S.™ Assessments

March 2010

2023

CA

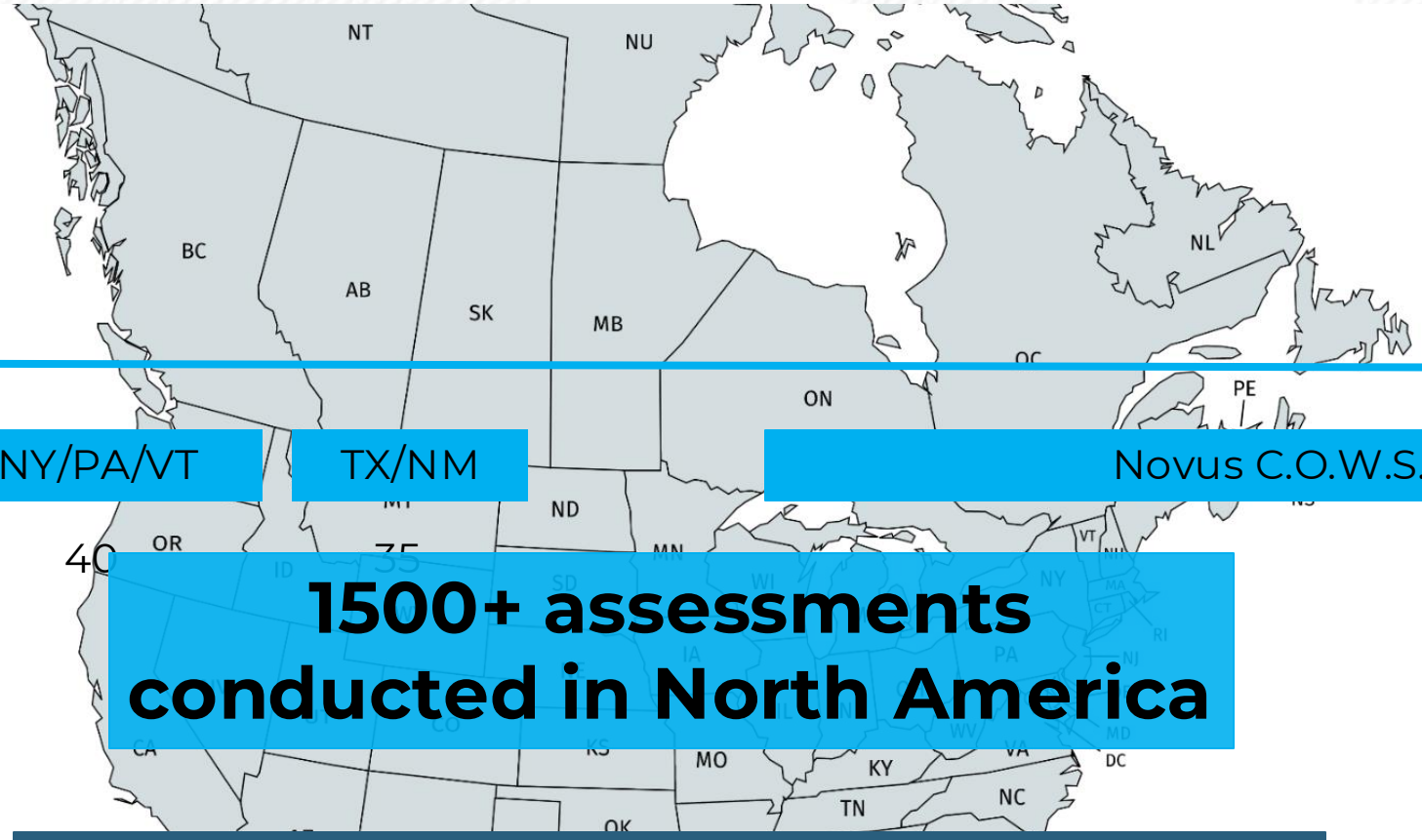
NY/PA/VT

TX/NM

Novus C.O.W.S.

43

40



1500+ assessments conducted in North America

200,000+ cows scored &
1.6 Million+ cows influenced
by the C.O.W.S.™ Program

C.O.W.S.™ ASSESSMENT PROCESS

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1. On-Farm Assessments

- **Management Metrics**

Feeding, hoof health, bedding, culling, etc

- **Cow Metrics**

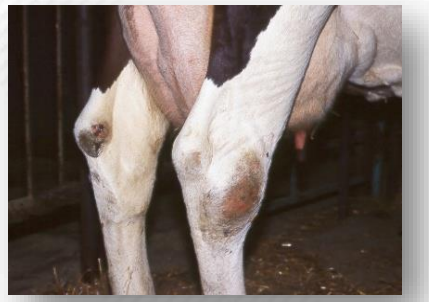
Lameness, lying time, injuries, etc

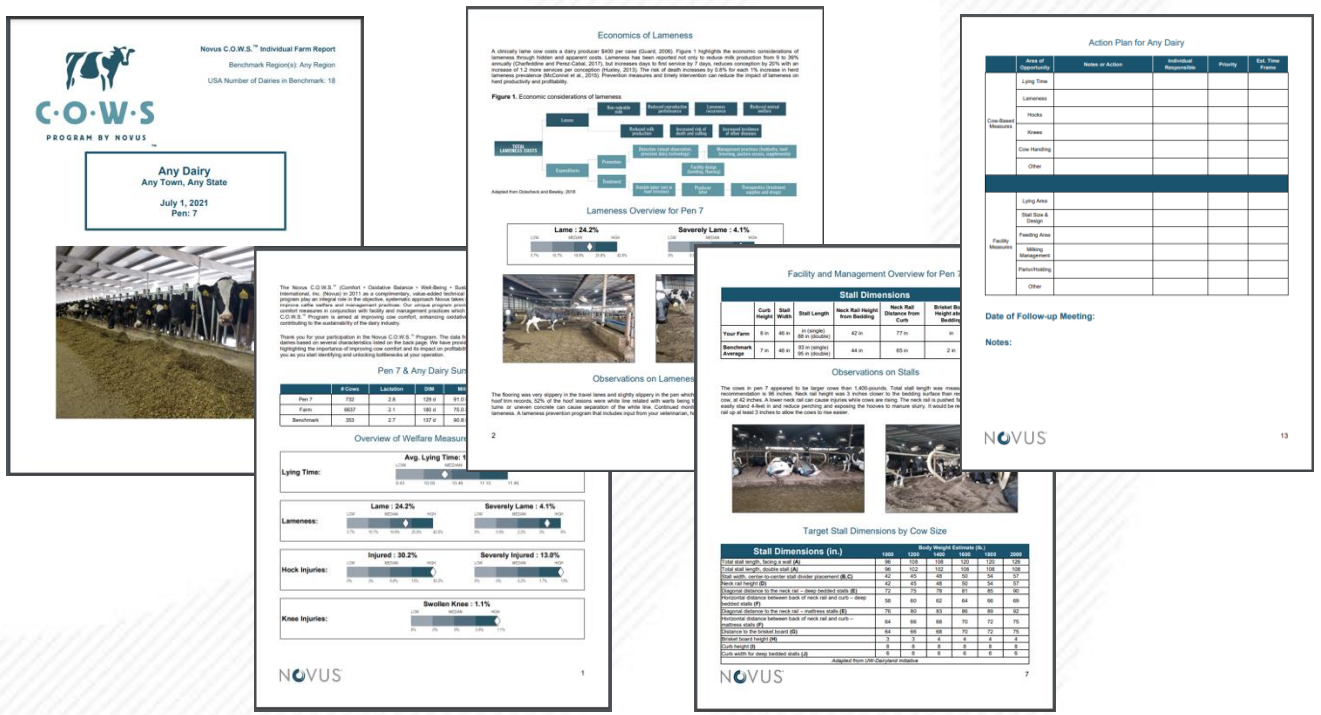
- **Facility Metrics**

Time away from pen, stalls, flooring, cooling, etc

2. Result Delivery

- **Benchmarked**
- **Detailed**
- **Facilities action**





40 years of change…

1981 Car of the Year
Plymouth Reliant

Performance:

Top speed: 99mph
Acceleration: 0-60 12.3s

1981 Supreme Champion
J-WS Monitor Racheal

Performance:

305 Milk: 6,560kg*
Milk fat: 3.4%*

2021 Car of the Year –
Mercedes-Benz E-Class

Performance:

Top speed: 186mph
Acceleration: 0-60 4.9s

2021 Supreme Champion
Erbacres Snapple Shakira-ET

Performance:

305 Milk: 14,236kg
Milk fat: 4.8%

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*Best estimates based on available data

What supported this change?

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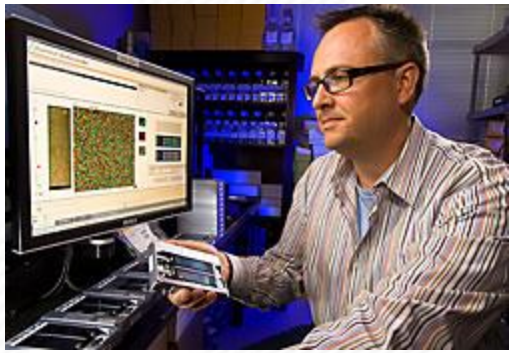
Engineering aka Genetics

Modern selective breeding practices have impacted as much as 30% of the Holstein genome. USDS-ARS and University of Minnesota



What supported this change?

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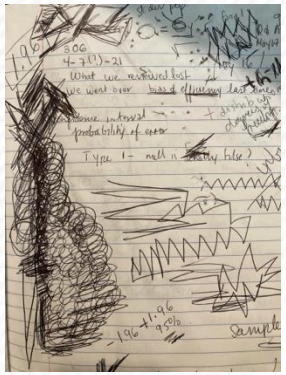
Fuel aka Nutrition

Basic Ingredient Feeding

TMR

PMR



Source: Nutraceuticals in Veterinary Medicine, 2019

40 years of change...

1981 Supreme Champion
J-WS Monitor Racheal

Performance:

305 Milk: 6,560kg*
Milk fat: 3.4%*

2021 Supreme Champion

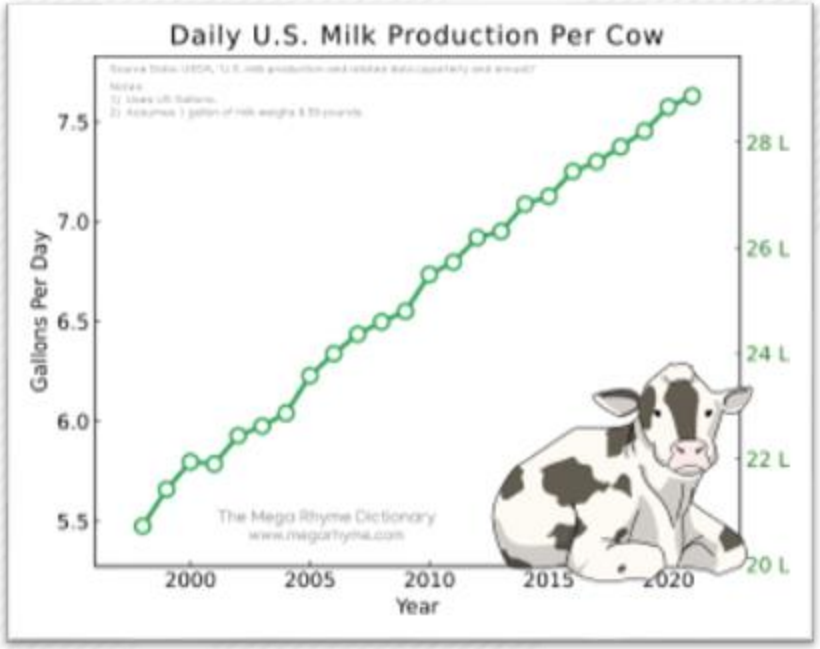
Erbacres Snapple Shakira-ET

Performance:

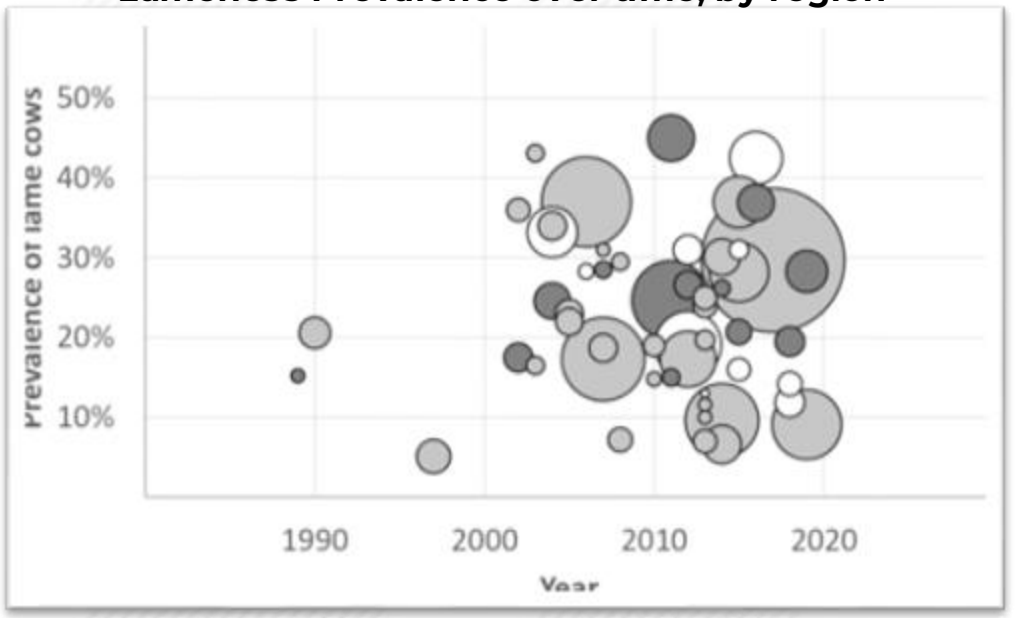
305 Milk: 14,236kg*
Milk fat: 4.8%*

Lower fertility
Higher Lameness
Lower longevity

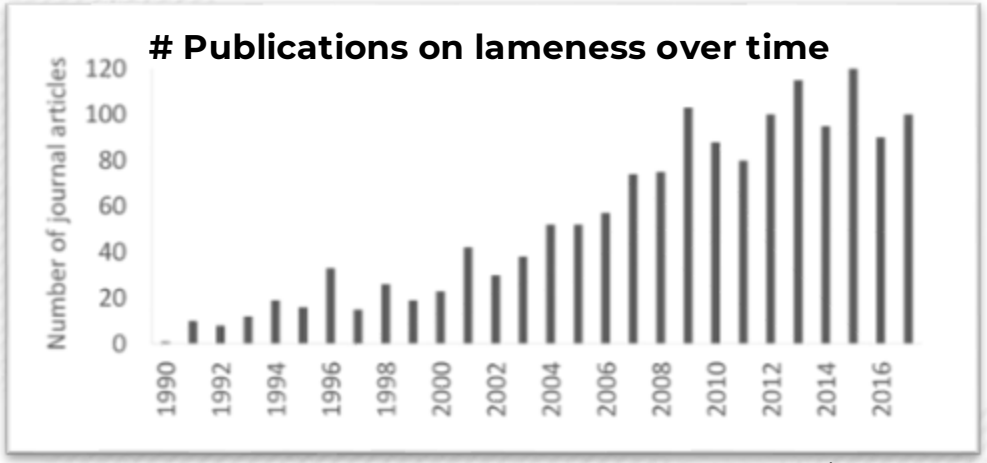
*Best estimates based on available data



Lameness Prevalence over time, by region



Houe et al., 2023



Ventura et al. 2015

What created these challenges?

Solid engineering, high quality fuel… What about the maintenance and environment?

Mercedes-Benz E-Class

SOME RISK FACTORS FOR POOR PERFORMANCE

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COW COMFORT ISSUES ARE MULTI-FACTORIAL

Stall Stocking Density

Lying Time

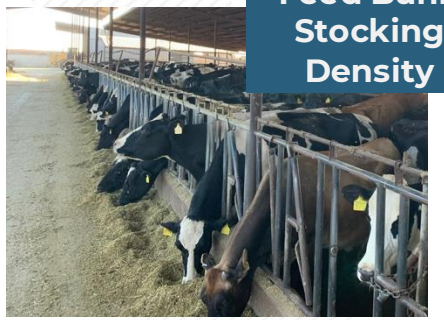
Lameness

Repro

Milk Fat

Production

Time Away From Pen for Milking



Feed Bunk Stocking Density

Feed and Feeding Behavior

40 years of change…

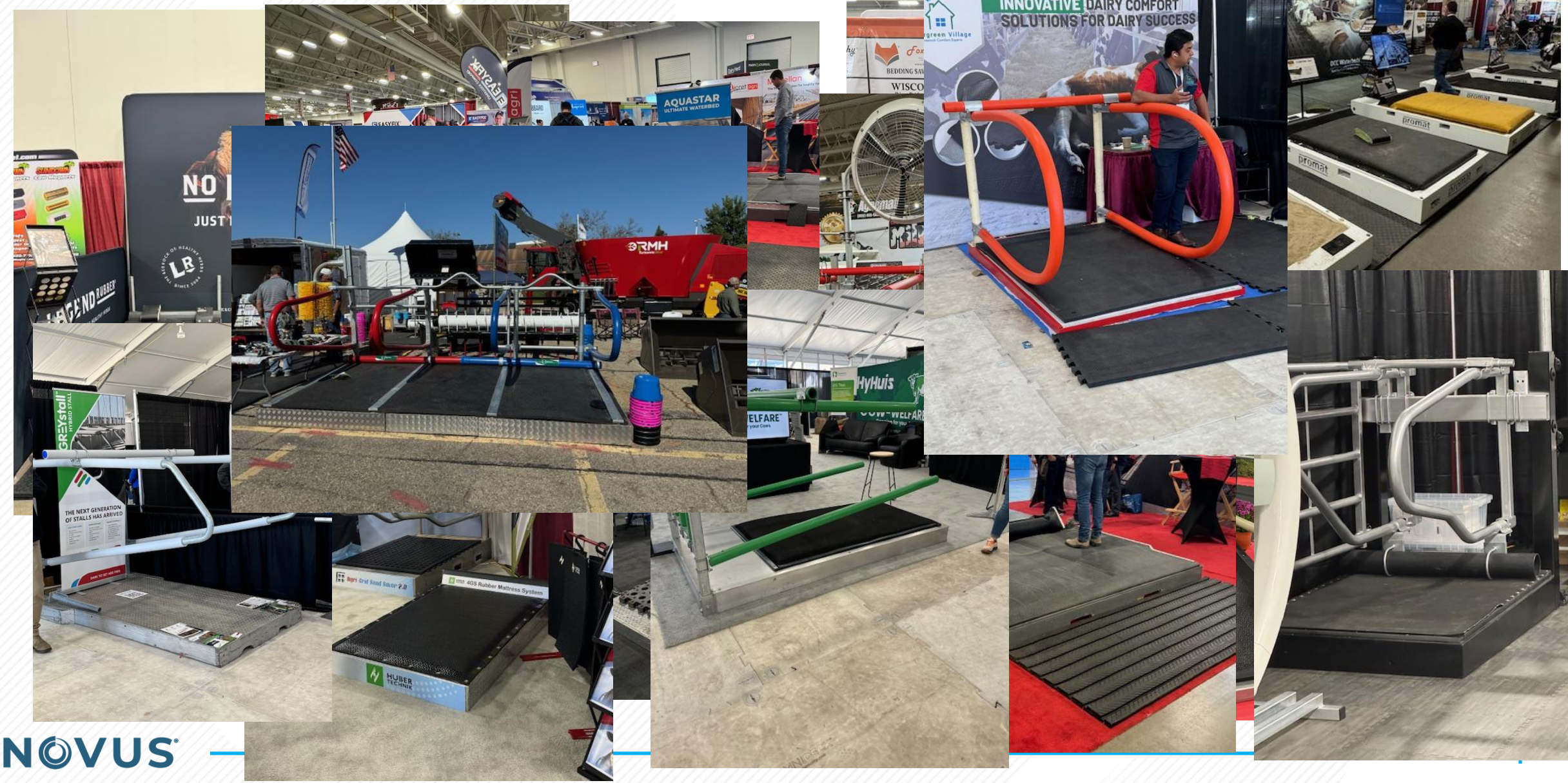
Source: Gayla Marty. Kodacolor. May 1986

Source: https://www.agristeelusa.com/dairy-buildings

Though tiestalls were more common, freestalls were invented as early as the 1950s by Major Bramley:

Major Bramley in 1962 said *"The size of the cubicle must be adequate to enable the animal to stand and lie down in comfort but at the same time its positioning must be reasonable accurate, and the permissible margin of movement restricted so that it cannot stand forward or move sideways sufficiently to enable it to dung and urinate on the bedding"* Eerdenburg and Ruud, 2021

The challenges...



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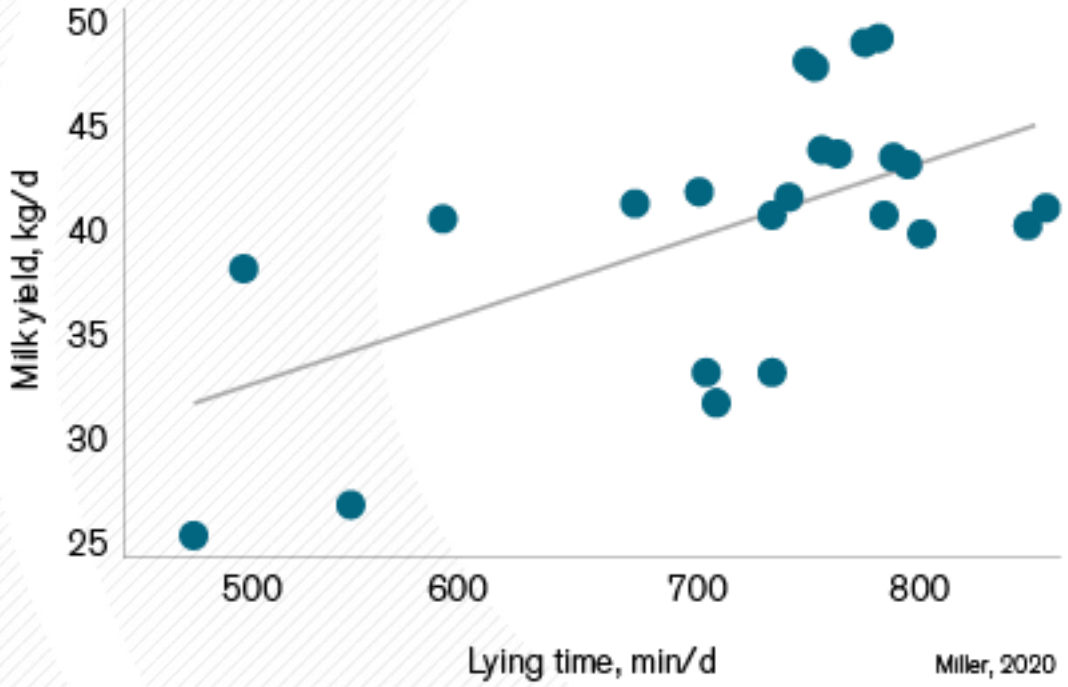
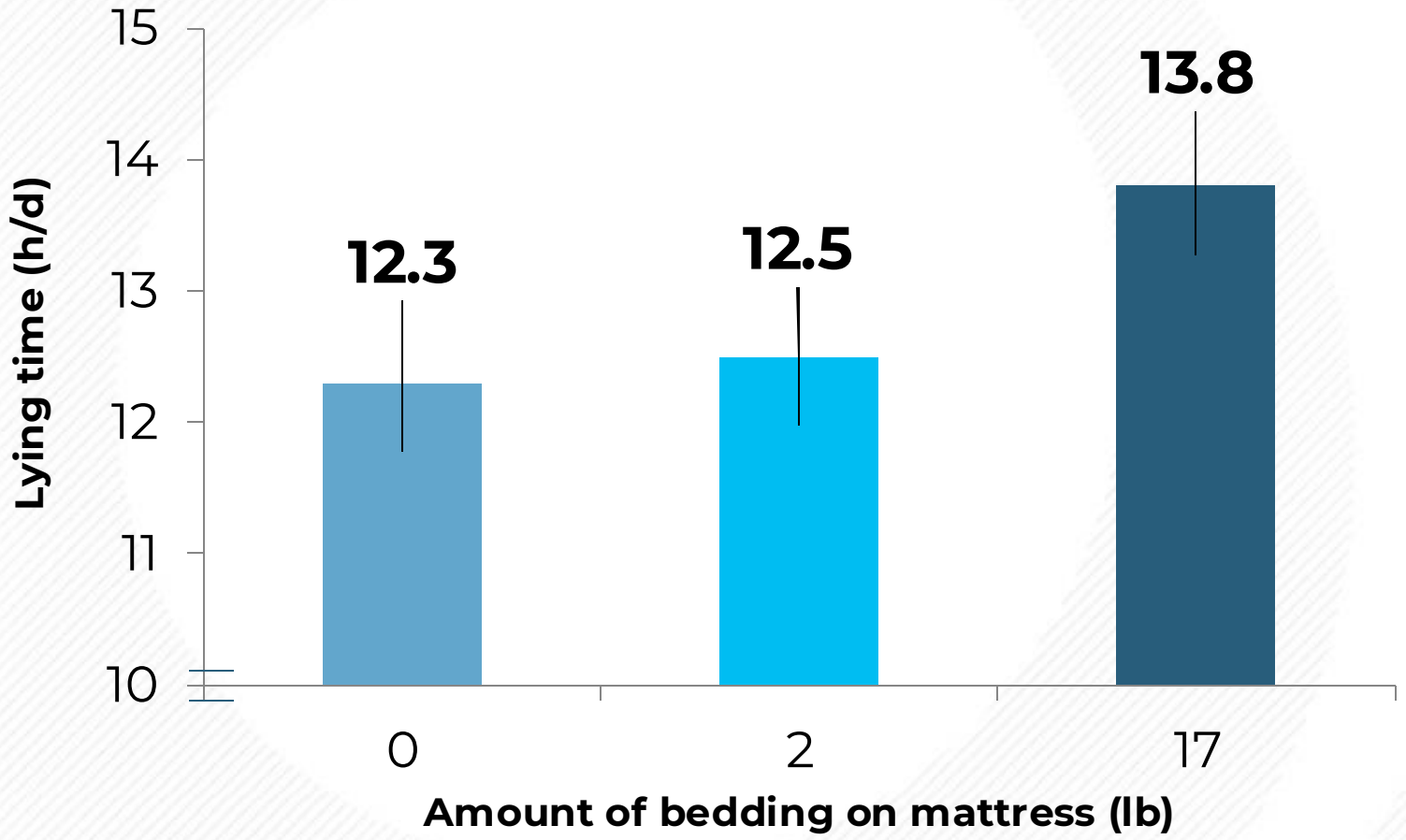
ECONOMICS OF LYING TIME
RELATIONSHIP BETWEEN MILK YIELD AND LYING TIME



Each extra hour of lying time = **2.4 lbs/d** more milk *(Miller, 2020)*
Novus data – **2 to 4 lbs/d** more milk for each extra hour of lying
According to the USDA Mailbox Price Report, the Avg Mailbox Milk Price for the USA in 2020 was $16.96/cwt

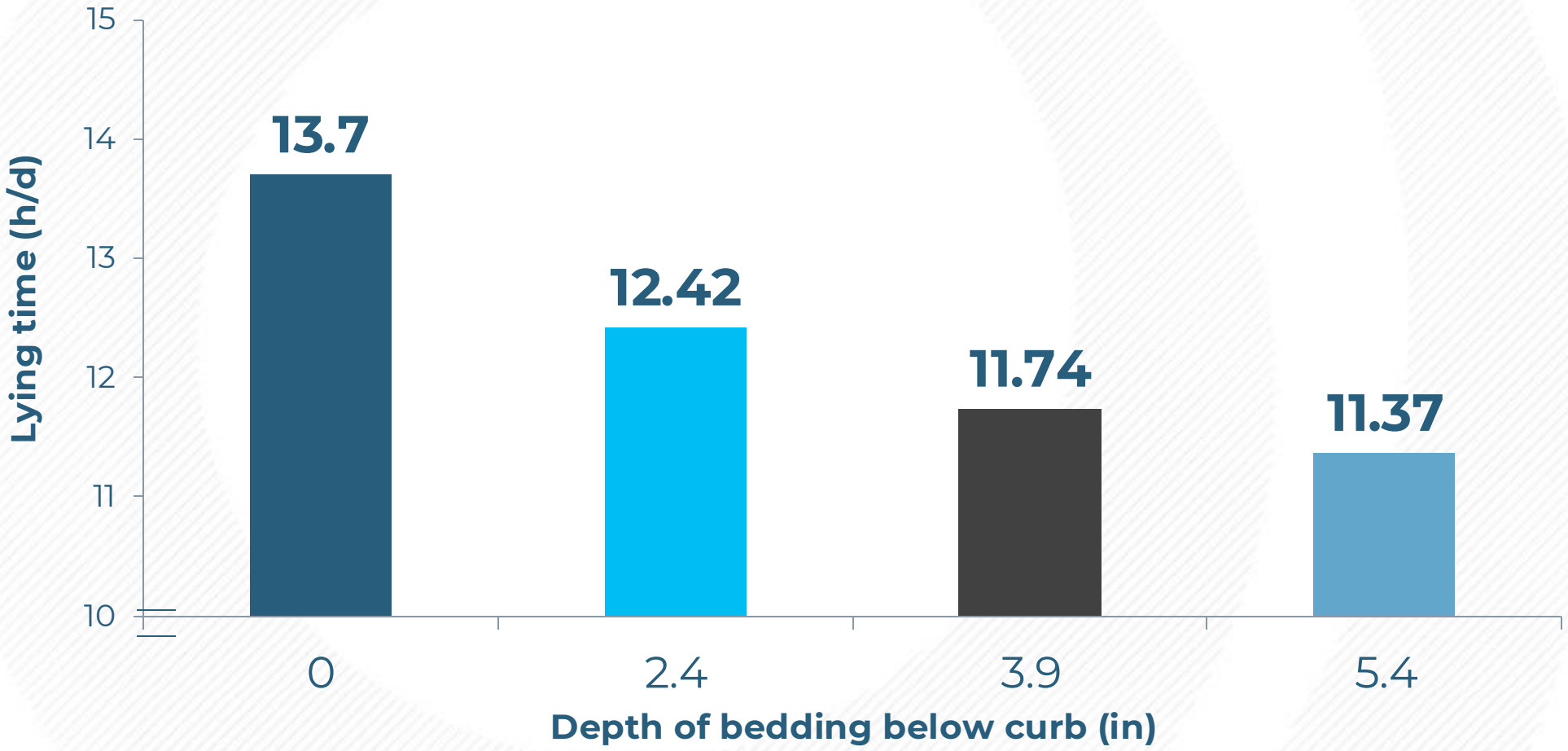
–$0.34 - $0.68 more income for each extra hour of lying time.
–For a pen with 150 cows that is $51 to $102 of additional income per DAY!

Lying Time on Mattresses Increases with More Bedding



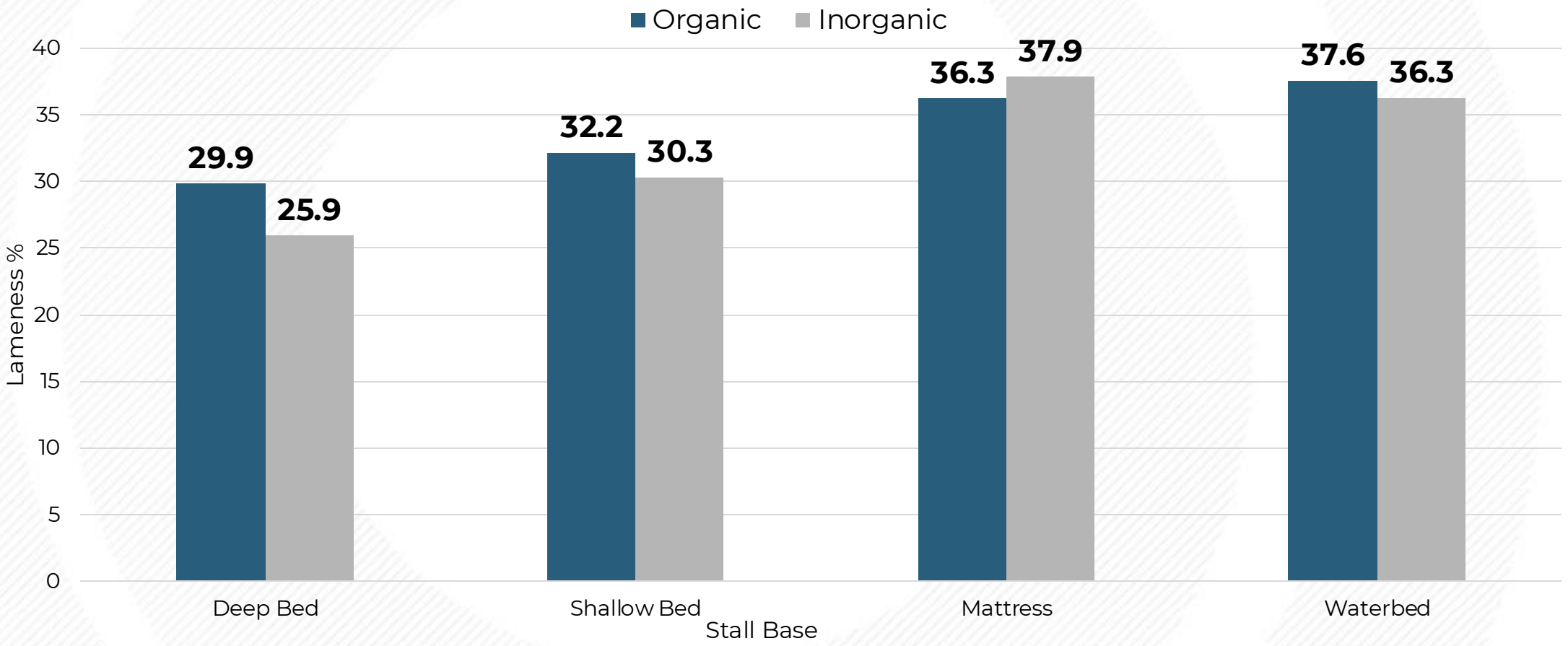
(Tucker and Weary, 2004)

Lying Time on Deep-Beds Decreases with Less Bedding



(Drissler et al., 2005)

Average Lameness by Stall Base – Organic vs. Inorganic Bedding



Novus Internal Data, 2021

What if mattresses are the only option?

"We can't do deep beds - what's the best option if we can only do mattresses?"

- Collected feedback from the industry on various brands to identify what the “best of the worst” might be
- The goal was to provide feedback on pros and cons from various mattress brands/models seen in the field without aligning with any specific brand

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General Feedback

Mattress Brand	Comfort	Warranty	Durability	Ease of installation	Longevity	Good top cover	Thickness of foam	Good bedding retention	Cost effect ive	Recommended by producers
[redacted]	✓	✓	✓	✓	✓				✓	✓
	✓		✓		✓	✓				✓
	✓		✓		✓		✓			✓
				✓				✓		
	✓		✓		✓					✓

Mattress Brand	Wear down	Top covers	Durability	Hock lesions	Abrasive Surface	Poor bedding retention	Bad warranty	Harden	Producers cautioned against them
[redacted]	X	X							
	X			X	X	X			
	X	X		X	X			X	
			X					X	
					X		X		X
		X							X

Key Takeaways on Mattresses

- Mattresses with foam and rubber top cover get the most positive feedback
- All mattresses tend to wear down after 7-10 years, no matter the brand
- Proper bedding management has a huge impact regardless of stall base

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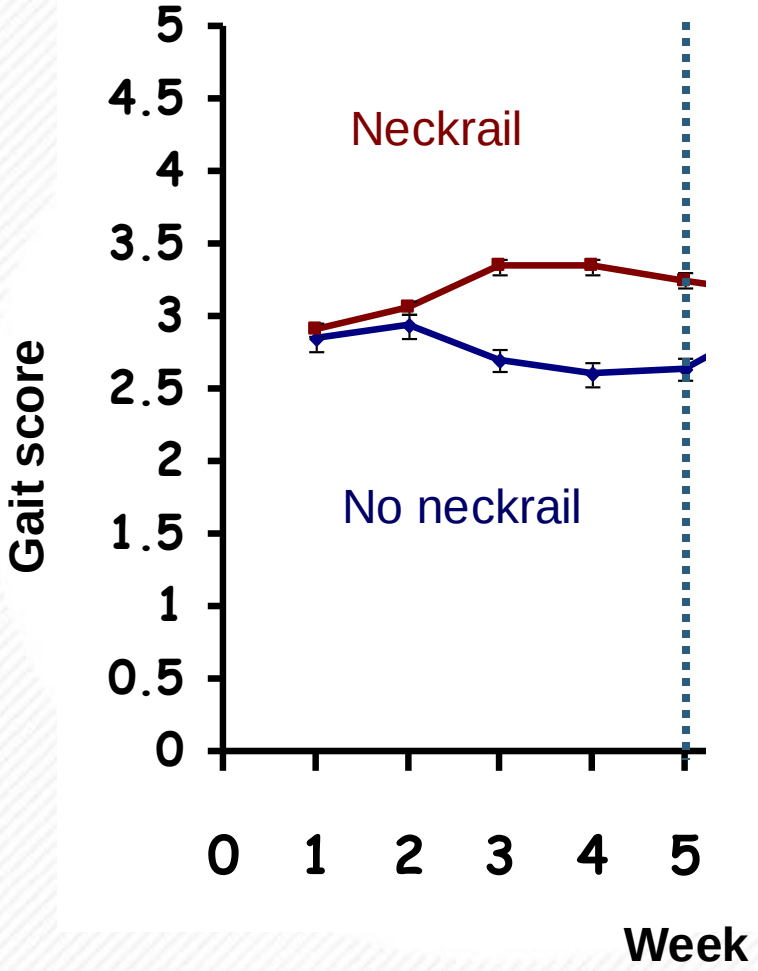
Neck Rail: Position Can Increase Lameness

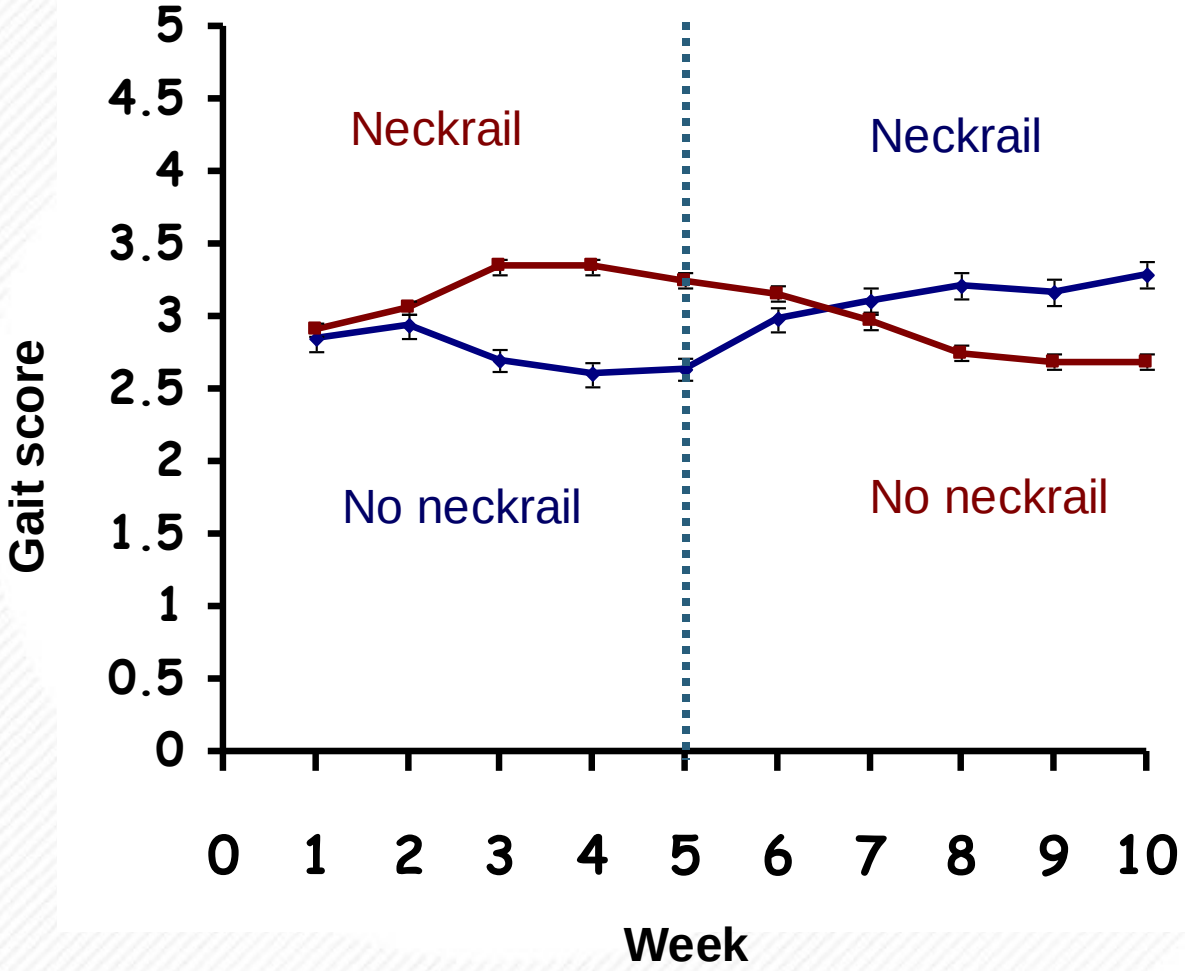
(Bernardi et al., 2009)

Neck Rail: Position Can Increase Lameness



(Bernardi et al., 2009)

Neck Rail: Position Can Increase Lameness



(Bernardi et al., 2009)

Risk Factors of Lameness –
Causes of Infectious vs. Non-Infectious

Infectious


Manure Slurry

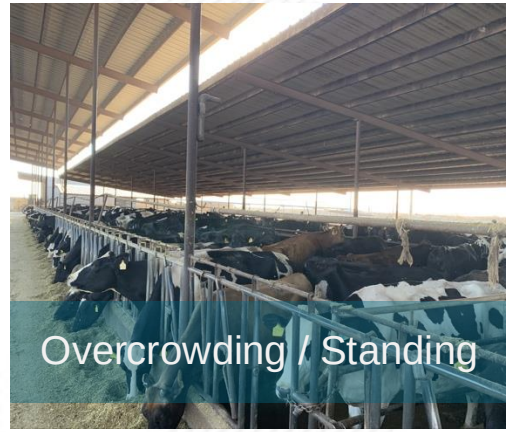

Excessive Flushing

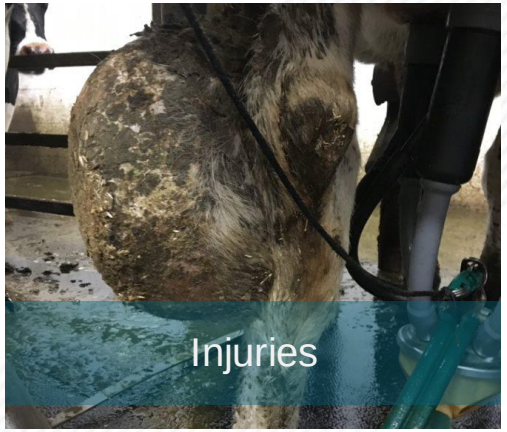

Poor Footbath Maintenance / Design

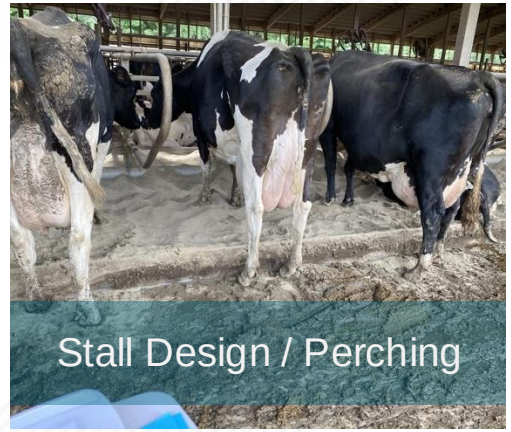

Hoof-Trimmer Wrap Removal

Non-Infectious


Sharp Corners, Uneven/Rough Surfaces


Overcrowding / Standing


Injuries


Stall Design / Perching

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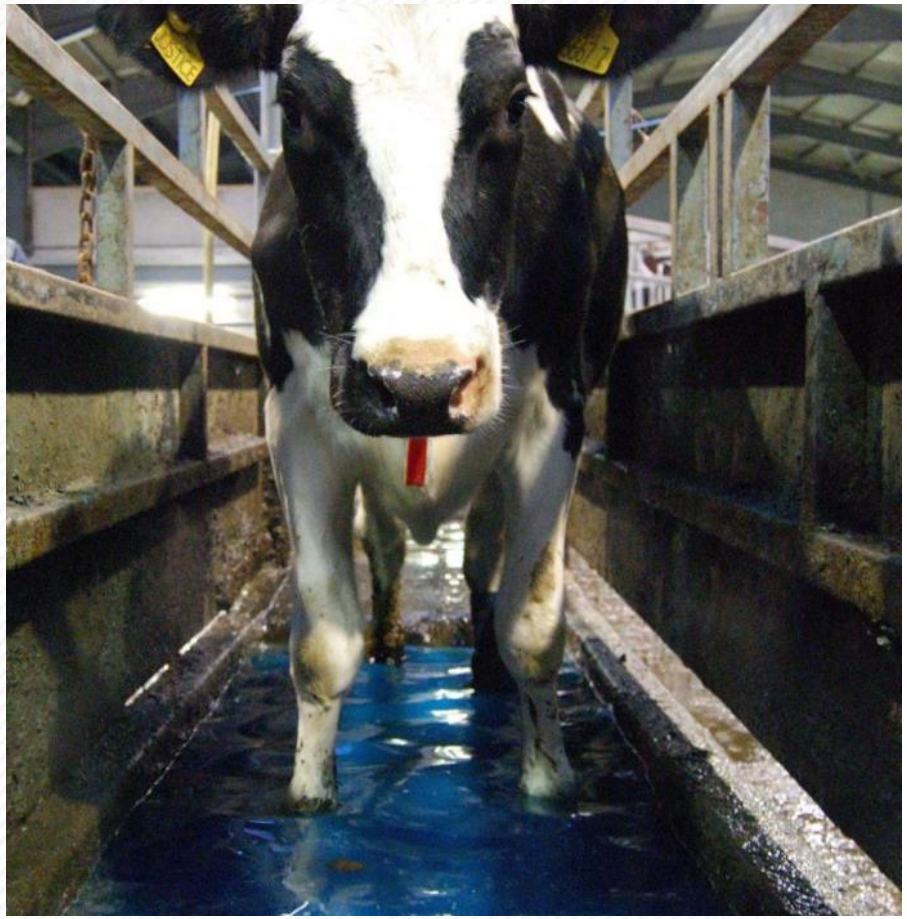
Footbath Management / Recommendations



Footbath Sizing and Use

- Minimum **10 ft** (**3 m**) long – each hoof **2** full steps in solution
- Minimum **4 in** (**10 cm**) solution depth – dewclaws submerged as pass through footbath
- Solution concentration – maintained according to manufacturer specifications
- Replacing/replenishing solution is dependent on:
  - Hoof & leg hygiene of cows
  - Product recommendations
  - Size of footbath
- Footbath pH should be maintained at **3.5 - 5.5**
  - Normal skin pH is **4 - 5.5**

(UW Extension – Dairy Team)

Alley Management / Recommendations

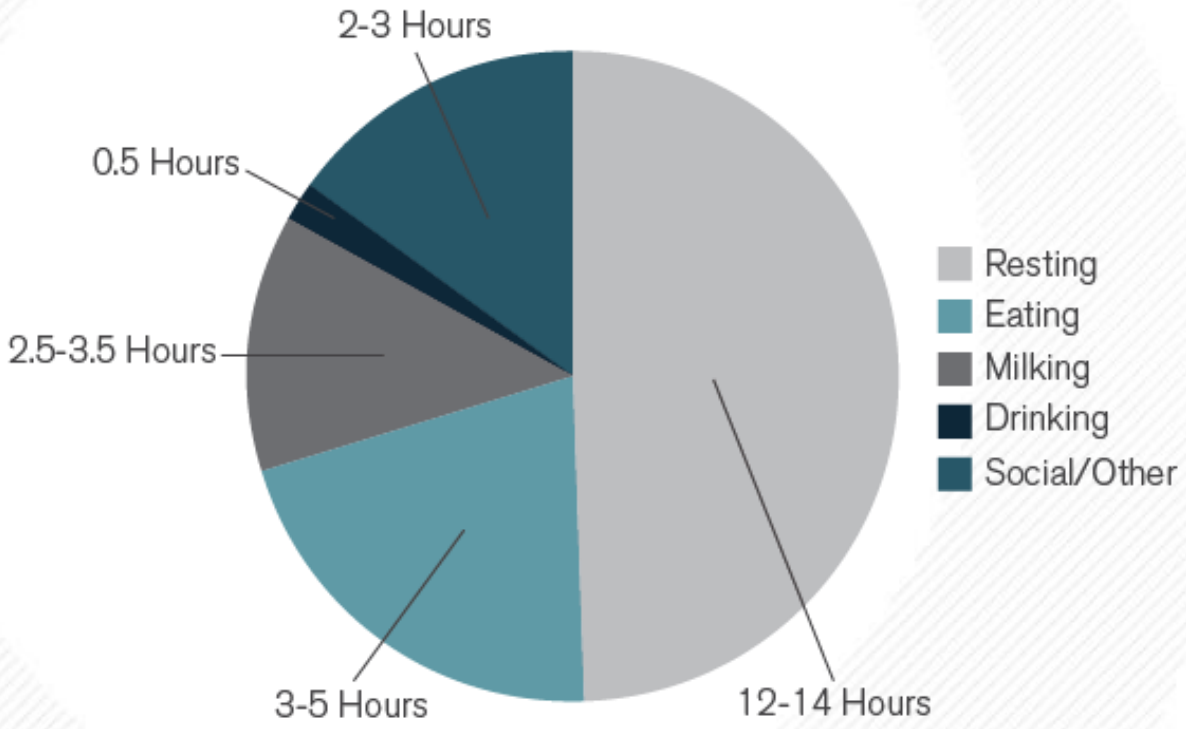
Source: Dan McFarland, Penn State

Surface Recommendations:

- Dependent on bedding type and concrete quality
- Grooves must be cut in a way that the hoof is fully supported
- Resurfacing must be done in a way that does not create too much ware on the sole and hoof walls
- **Grooving and resurfacing needs redone periodically**

Average Time Budget of a Freestall-Housed Dairy Cow

Figure 2. Average time budget of a freestall-housed dairy cow



Adapted by Grant and Albright 2000

Effects of Time Away from Pen

Higher lameness prevalence

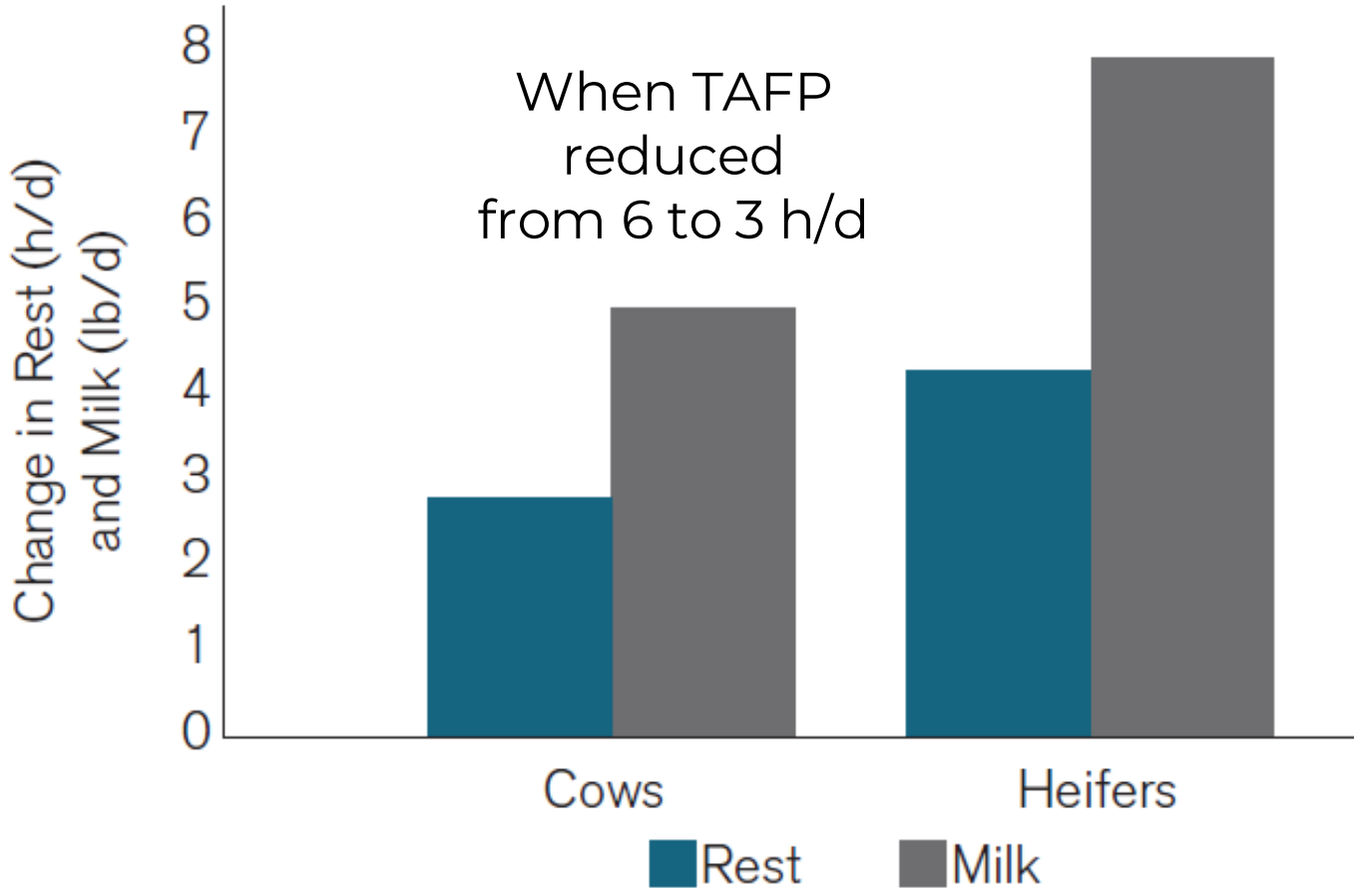
(Espejo and Endres, 2007)

Reduced lying time

(Matzke, 2003)

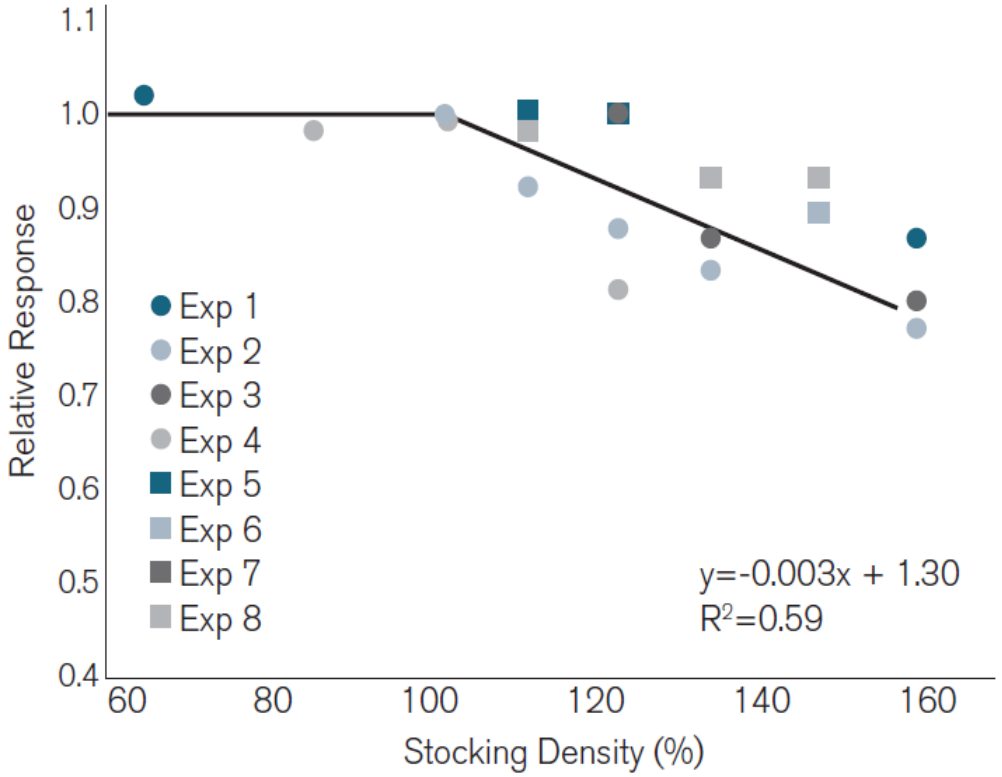
Reduced production

(Matzke, 2003)



Courtesy of Dr. Rick Grant

Lying Time Decreases with Stall Overstocking



Summary of 8 studies:

- Lying time decreases as stall stocking density increases
- As low as 109%, and especially beyond 120%

(Wierenga and Hopster, 1990; Matzke and Grant, 2002; Winkler et al., 2003; Fregonesi et al., 2007; Hill et al., 2009; Krawzcel, 2008; 2009; 2010)

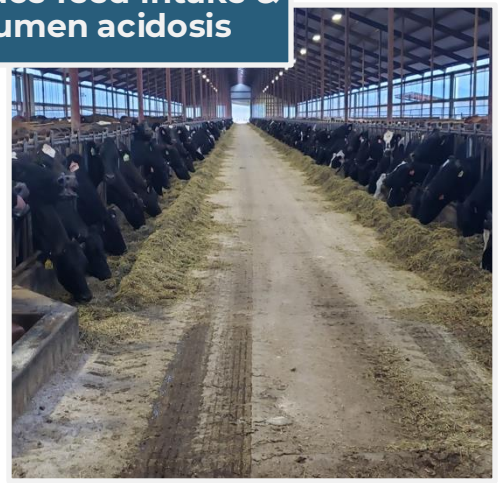
Effects of Heat Stress

Milk production

↓ milk production in the following lactation ≈ 5kg (11lbs)

(Tao and Dahl, 2013; Ferreira, 2016)

Reduce feed intake & Rumen acidosis



↓ rumination activity, ↓ DM digestibility of concentrate and diet *(Maia et al., 2020)*

Change in rumen microbial composition resulting in acidosis

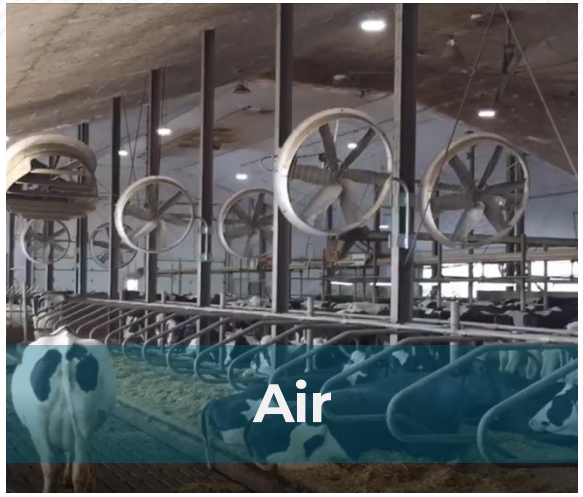
(Russell et al., 2011)

Lameness & Laminitis

↑ in claw horn lesion development in late summer, associated with ↑ in total standing time per day

(Cook et al., 2003)

Mitigating Heat Stress



Mitigating Heat Stress – Air *Ventilation*

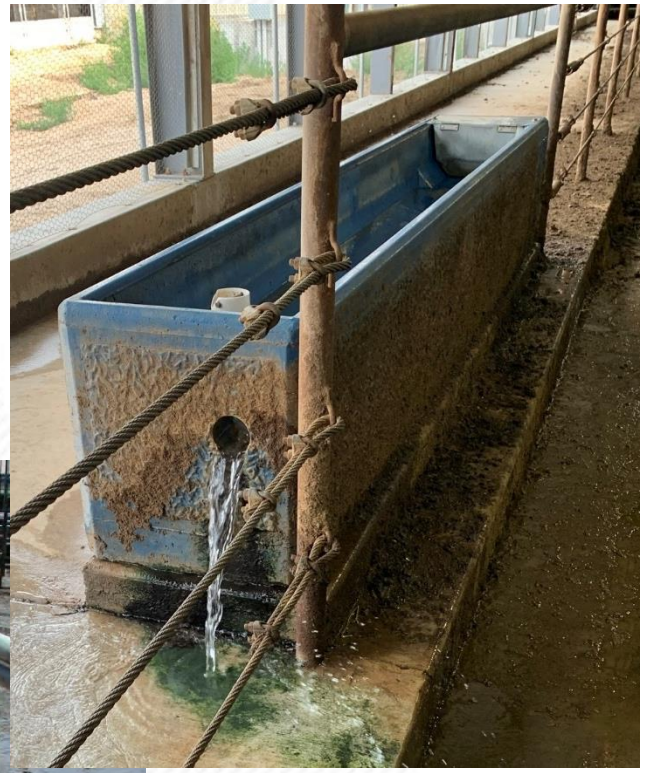
Air Speed	
Avg. Air Speed	•Across the barn 3-5mph (5-8kmh) •At resting height = 5 mph (8kmh)
Start of heat load differs between standing and lying cows (THI = 70 vs. 65), *Pinto et al., 2020.*	

Fans (optimize natural ventilation first)	
ON	•Turn fans ON when Temp > 68° F
Spacing	•10x diameter •2x for HVLS
Angle	•20°

Maintenance	
Clean	•Blades | Louvers | Cages •Inlets •Can reduce speed by 50% if dirty
Check	•Motors | Bearings | Belts •Curtains | Inlets open and operational

Mitigating Heat Stress – Water *Availability*

IN THE PEN & Return Alleys – Soakers	
Water	•Consumption will increase during hot season, make sure to provide enough water to all cows •Space > 3.5 in/cow •Depth ≈ 7 in maintained when cows drinking •Flow Rate > 4 gal/min for individual waterers
Check	•Cleanliness •Leaks •Cow behavior at the drinker - with increasing THI, cows drank more water, spent more time at the drinker, made more visits to the drinker, and engaged in more competitive events at the drinker *(McDonald et al., 2020)*



Handling

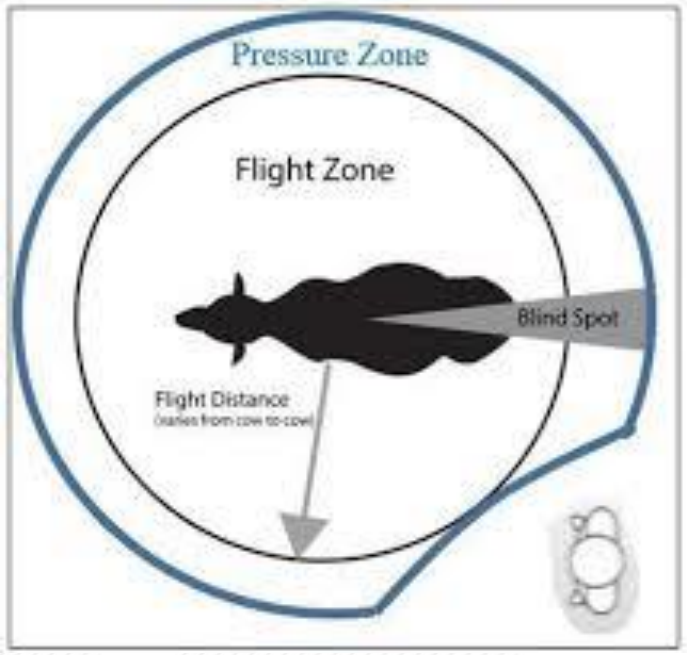
Fear of humans has been correlated with lower production parameters: milk volume and components. (Breuer et al, 2000, Hemsworth et al, 2000)

Poor handling has also been associated with greater probability of injury to both cow and human. (https://dairy.extension.wisc.edu)

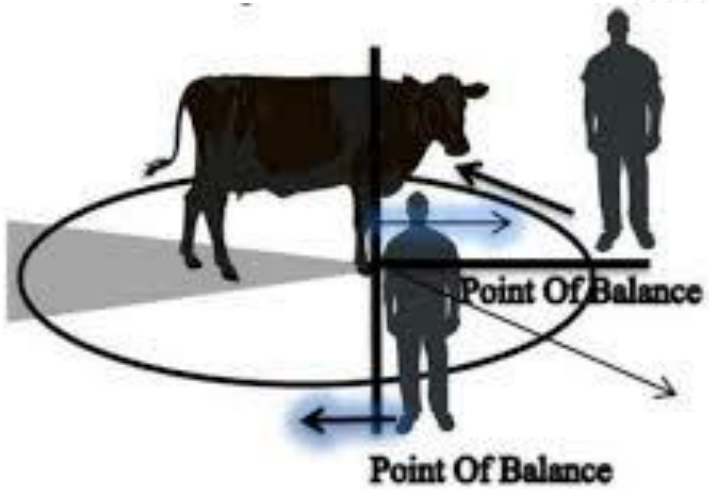
Proper handling of these top performers allow them to perform their best.

Source: https://dairy.extension.wisc.edu/

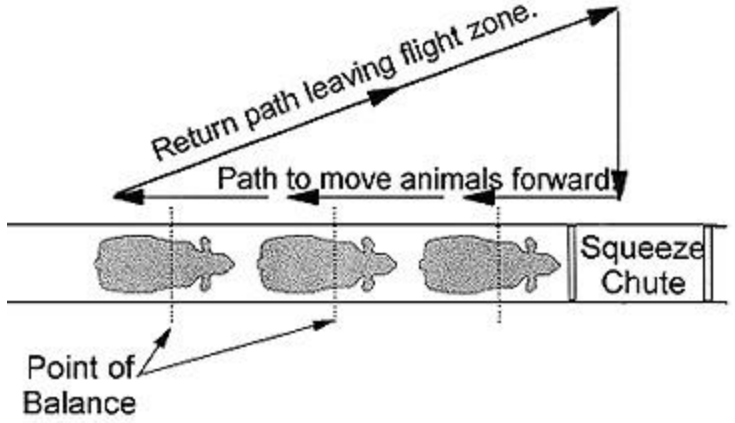
Stress-Free Handling



Source: SDS University



Source: Virginia State University



Source: Dr Temple Grandin

Cattle handlers properly trained and supervised, facilities designed for natural cattle movement, accountability and reporting system for poor handling.

Take Aways

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PROGRAM BY NOVUS.

Keep and manage cows like the high performers they are!

- **Genetics and Nutrition have shown exponential improvements**
- **Housing and Management have not kept up…**

What do we need to do? Use critical Cows-First thinking!

- ✓ **Comfortable housing – bedding, no pressure points or moisture**
- ✓ **Ideal time budgets – no excessive lock up, stocking dendities or holding pen times**
- ✓ **Optimized hoof care – optimally timed high-quality trims, footbath strategy, high traction non-abrasive walkways**
- ✓ **Climate controlled – good ventilation and air exchange, heat mitigation adapted to environment**
- ✓ **Gentle, effective handling and handling systems – no rushing, aggression, yelling**

Utilize the services available to you!

NOVUS®

Made of More™