Colostrum management – A cornerstone of the youngstock program

Sandra Godden DVM, DVSc
Department of Veterinary Population Medicine
University of Minnesota
email: godde002@umn.edu

How do we promote calf health & growth?

Maximize Immunity

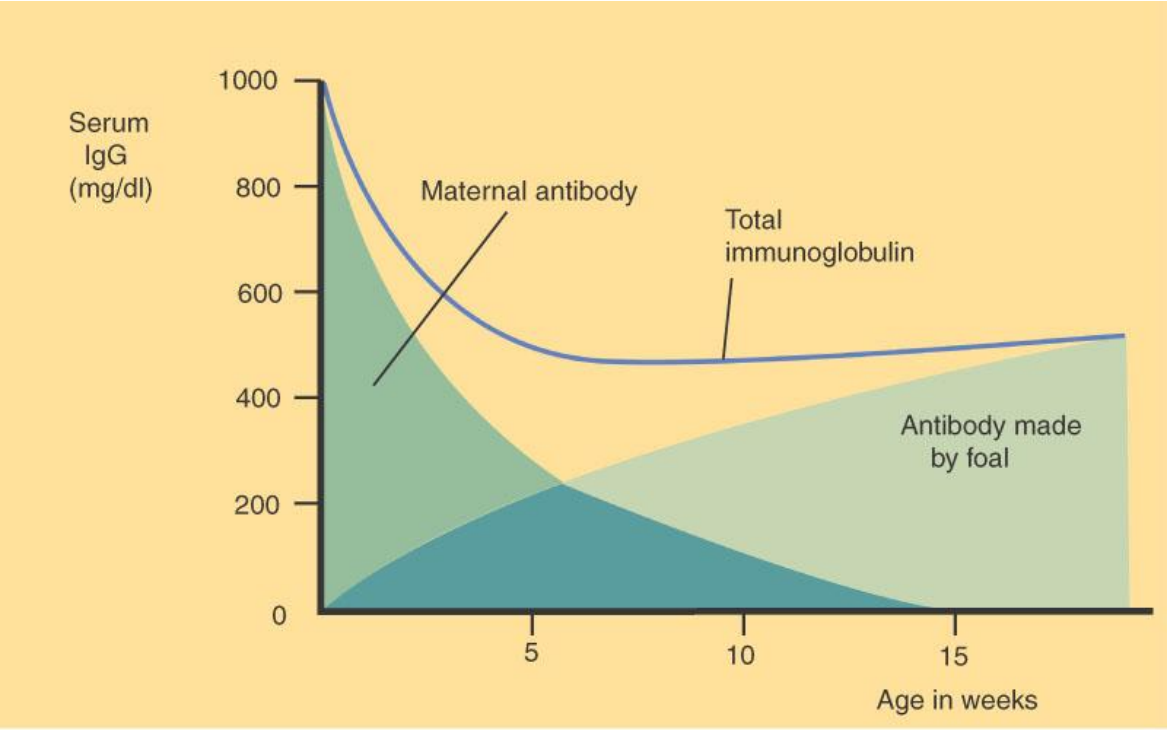
- **Colostrum**
- Nutrition
- Minimize stressors
- (Vaccination)

Minimize Infectious Disease Challenge

- Housing
- Bedding management
- Ventilation
- Sanitation

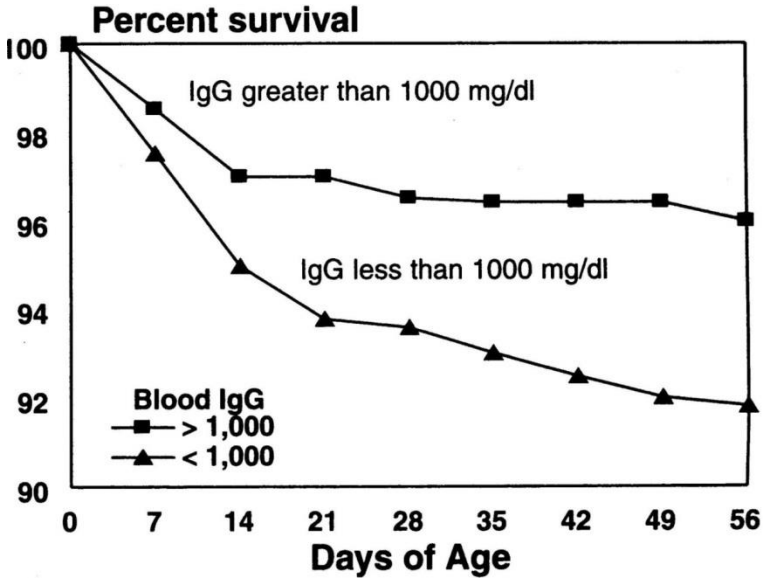
HEALTH ⟷ DISEASE

The role of colostrum in calf health



- Colostral (maternal) antibody protects neonate for first weeks/months until neonate's acquired immune system produces protective antibodies
- Also contains high levels of non-specific immune factors, growth factors, hormones, nutrients, etc.

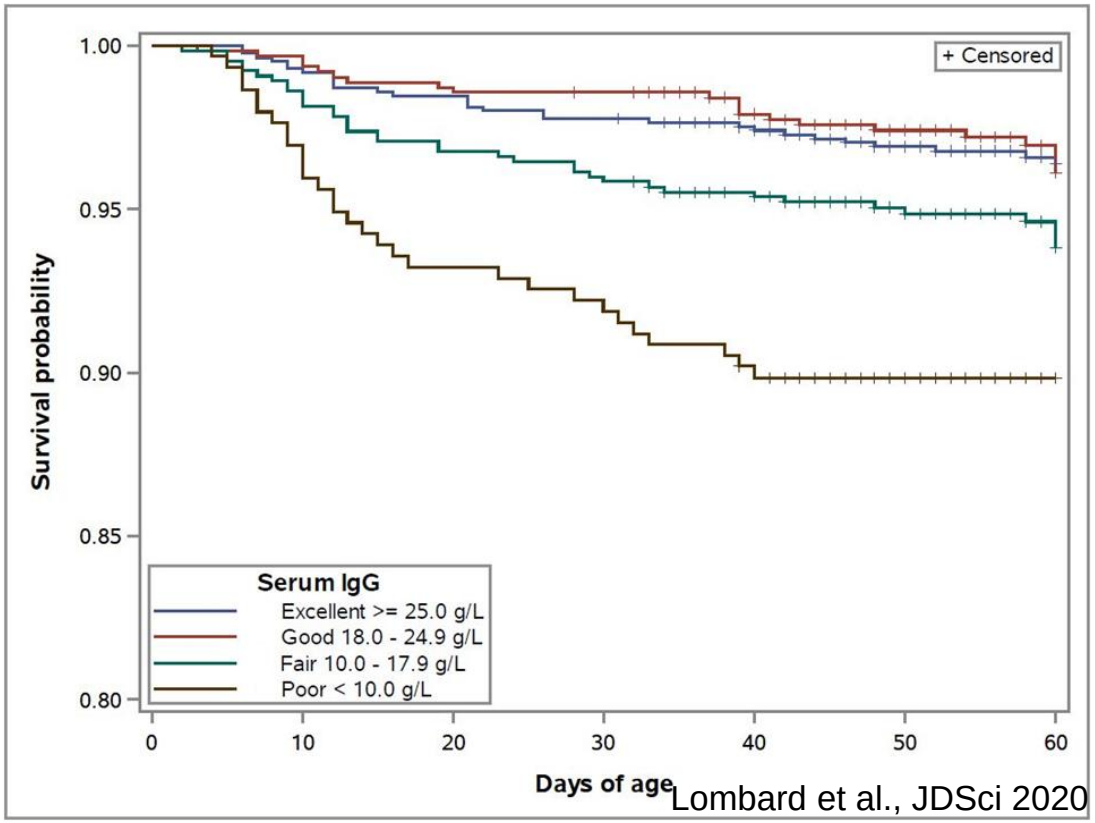
Benefits of Successful Transfer of Passive Immunity
(Serum IgG > 10 g/L)



- Reduced treatment and mortality rates (NAHMS, Wells, 1996)
- Improved growth rates and feed efficiency
  (Fowler, 1999; Faber et al., 2005; Nocek et al., 1984; Robison et al. 1988; Faber. 2005)
- Decreased age at first calving (Faber et al. 2005)
- Increase 1st & 2nd lactation milk: + 550 kg
  (DeNise, 1989; Faber, 2005)
- **Cost of FTPI: € 60 (€ 10-109)**
  or ~$70 USD ($ 12-127) (Meta-analysis by Raboisson et al., 2016)

Death loss for preweaned heifer calves by serum IgG concentration categories.

Data from 2014 NAHMS Dairy Study. Lombard et al. JDSci 2020
2,360 calves from 103 farms



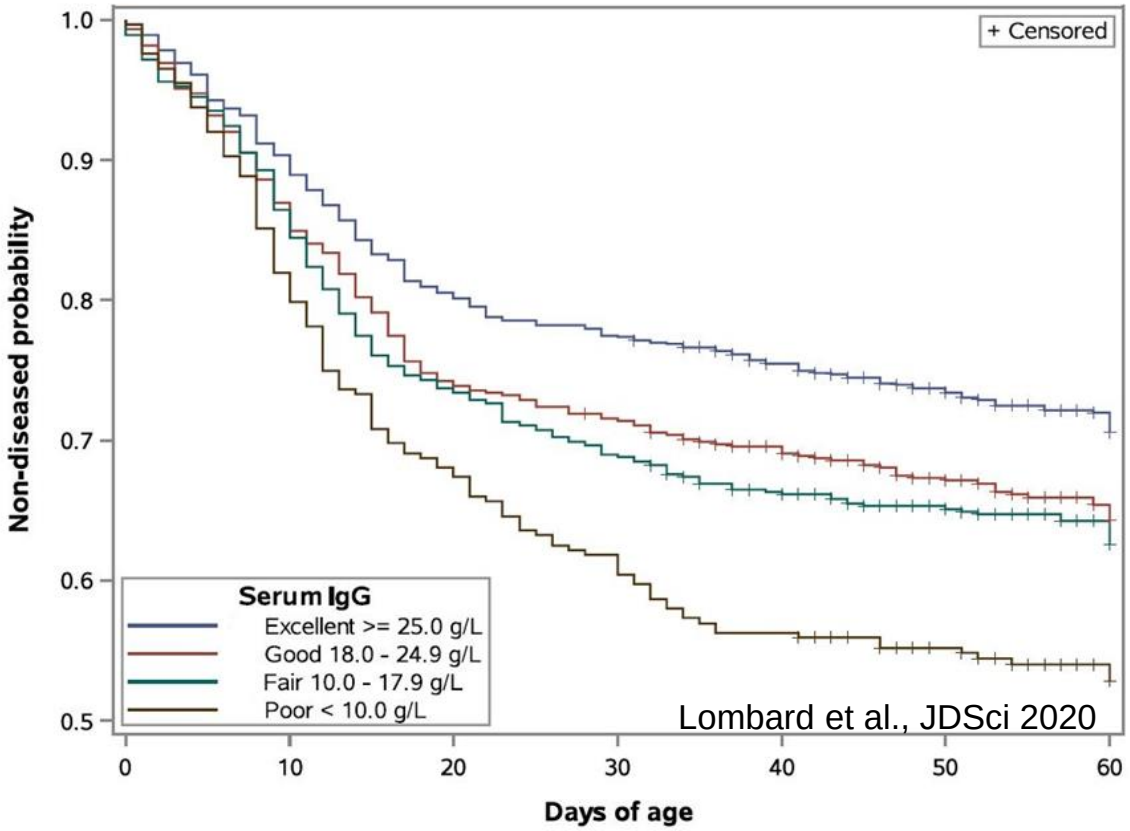
Lombard et al., JDSci 2020

Risk of death is highest if serum IgG < 10 g/L

Further reduction in death risk if serum IgG ≥ 18 g/L

Illness in preweaned heifer calves by serum IgG concentration categories

Data from 2014 NAHMS Dairy Study. Lombard et al. JDSci 2020 103
2,360 calves from 103 farms

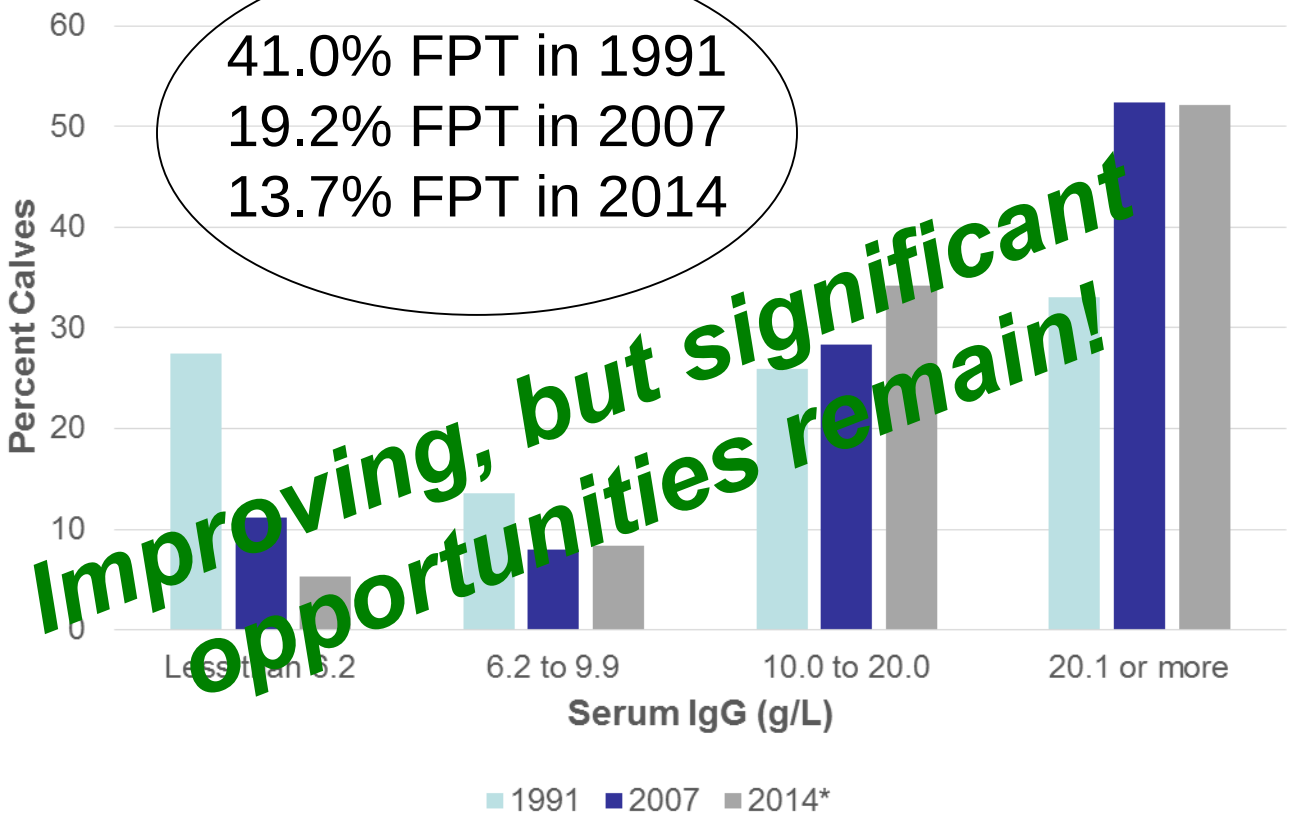


Risk of illness highest if serum IgG < 10 g/L

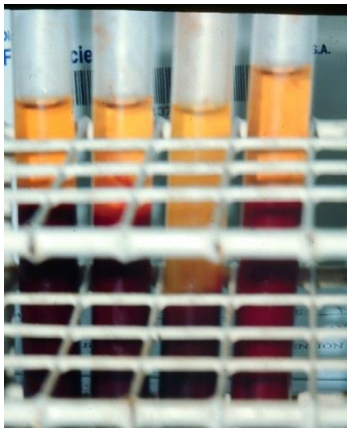
Further reduction in illness risk if serum IgG ≥ 25 g/L

- Incidence of Failure of passive transfer (FPT) (NAHMS): Serum IgG < 10 g/L (sample 1-7 days old)

41.0% FPT in 1991
19.2% FPT in 2007
13.7% FPT in 2014



Improving, but significant opportunities remain!



The 5 Q's of Colostrum Management

- **Q**uantifying passive transfer (monitoring)
- **Q**uality
- **Q**uantity
- **Q**uickness
- S**Q**ueeky clean (bacterial contamination)

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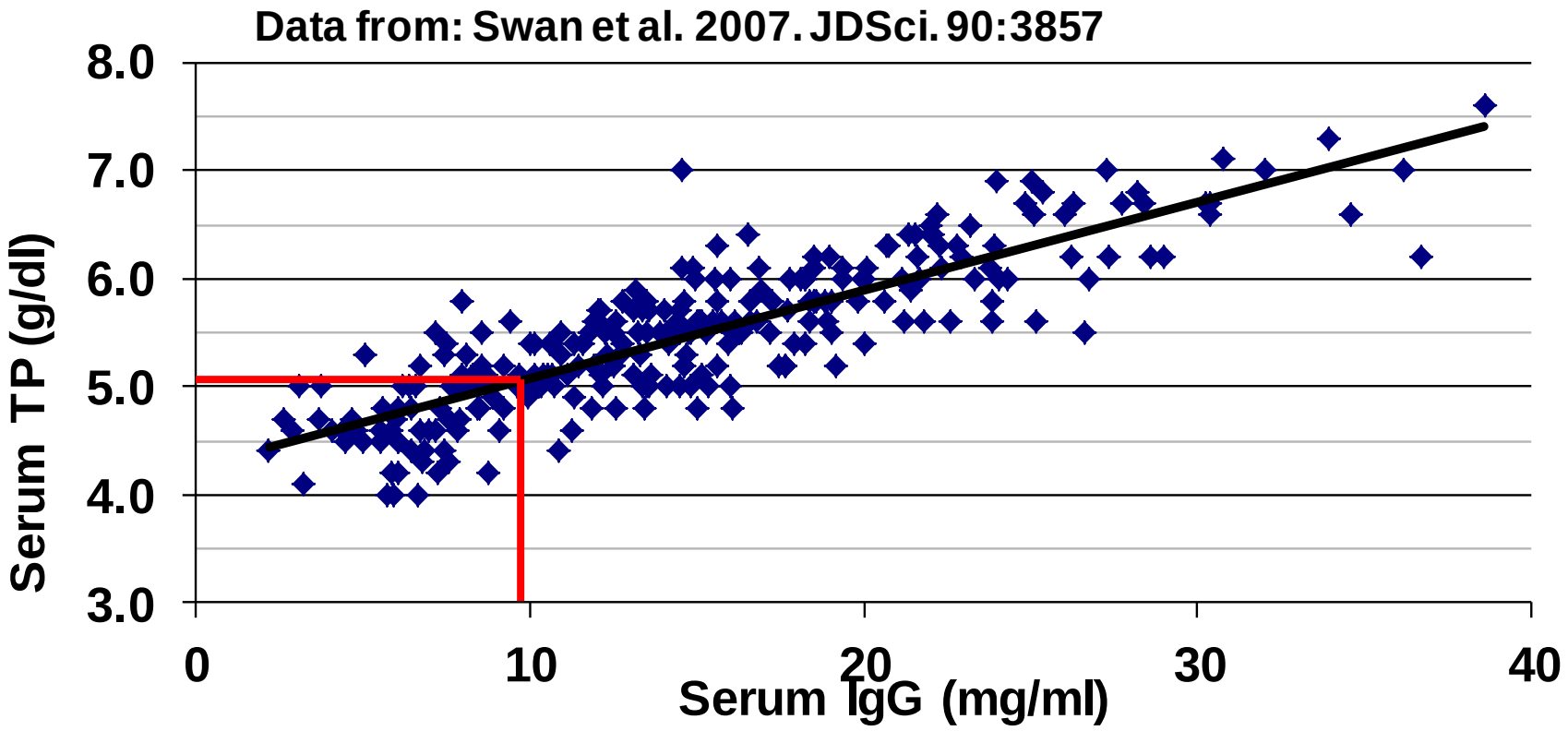
On-farm monitoring of serum total protein to evaluate the colostrum program

refractometer

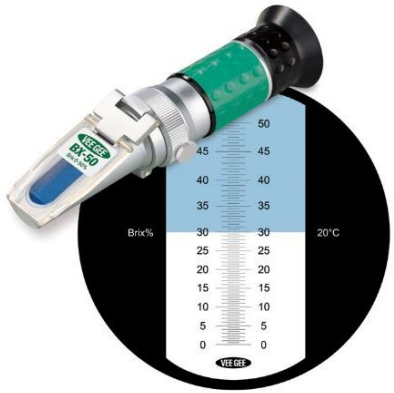


- 5.0 or 5.2 g/dL STP value to predict serum IgG of 10 g/L:

(Calloway, et al., 2002)

Monitoring transfer of passive Immunity

- Herd/group level testing:
  - Bleed 12+ clinically normal 1-9 d old calves & separate serum



- STP Refractometer reading (g/dL)

or

- Brix Refractometer (%):

Consensus recommendations for monitoring levels of passive immunity in dairy calves in the United States

Lombard et al. JDSci 2020 103

Proposed Categories	Proposed IgG Levels	Proposed % Calves in each Category	Equivalent Serum Total Protein Levels (g/dL)	Equivalent Serum Brix Levels (%)
Excellent	≥ 25.0 g/L	> 40%	≥ 6.2 g/dL	≥ 9.4%
Good	18.0 – 24.9 g/L	~ 30%	5.8 – 6.1 g/dL	8.9 – 9.3%
Fair	10.0 – 17.9 g/L	~ 20%	5.1 – 5.7 g/dL	8.1 – 8.8%
Poor	< 10.0 g/L	< 10%	< 5.1 g/dL	< 8.1%

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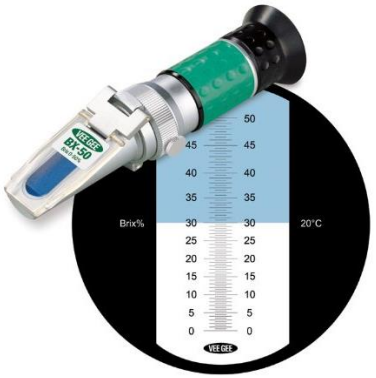
Colostrum Quality

(Colostrum IgG > 50 g/L)

- Monitoring tools:
  - Colostrometer
  - Brix refractometer: 19-22% = 50 g/L IgG

- Goal: ≥ 90% of samples tested ≥ 22% on brix
- Practical approaches:
  - Dry cow vaccination program – esp. scours vaccines
  - Feed balanced dry cow ration
  - Avoid dry cow stressors (heat, crowding)
  - Avoid short (<21 day) dry periods (Goal > 45 days)
  - Milk cows within 1-2 hrs (≥ 90% max 6 hrs)



Colostrum Quantity

What volume should we provide at first feeding?

- Goal: Feed ≥ 300 g of IgG to average calf
- Recc: Feed 10% BWt at first feeding (3-4 L)
- Practical approaches to delivery:
  - Bottle or esophageal tube:
    - Both work equally well if feeding a sufficient volume
    - If bottle, may have to offer 2nd feeding
    - Training and equipment cleaning/condition important
    - Don't tube calves multiple times
  - Benefits to multiple feedings if practical to implement

Quickness (time to first feeding)

- Gut Closure:
  - Progressive loss of ability to absorb Ig over 24 hrs
- Goal: Feed within 1-2 hrs (≥ 90% in 6 hrs max)
- Practical approaches:
  - Milk and feed dam's colostrum
  - Warm & feed stored colostrum (refrigerated or frozen)
  - Feed colostrum replacement

Perfect Udder ® Bag
in Matilda unit (DairyTech)

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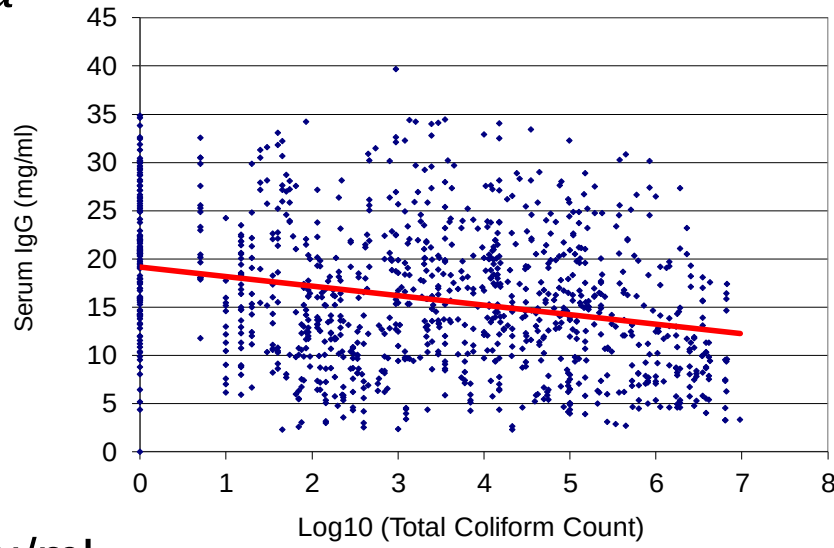
Consequences of microbial contamination of colostrum?

- Pathogens may cause disease
  (e.g. *E. coli*, *Salmonella* spp., *Mycoplasma* spp., *M. avium* subsp. *paratuberculosis*)

- Bacteria counts are associated with ↓ serum IgG levels
  (James et al., JDSci 1981;
  Godden et al., JDSci 2012)



- Goals:
  - Raw: Total bacteria count < 100,000 cfu/mL
  - Heat-treated: TBC < 20,000 cfu/mL

Practical Control Points to Reduce Contamination


- Cow
  - Identify infected cows (MAP)
  - Don't let calf suckle dam
  - Udder prep
  - Don't pool raw colostrum



- Equipment
  - Sanitation of milking, storage & feeding equipment


- Proliferation
  - Feed ASAP (< 1-2 hrs)
  - Refrigerate (< 48 hrs)
  - Freeze
  - Preservatives

- Replacers, Heat-treating

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  - Preservatives (eg. K-sorbate)

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Heat-treating Colostrum

Another management tool to reduce pathogen exposure to calves

Fresh colostrum

Heat-treat
(60 °C or 140 °F
x 60 min)

Refrigerate
< 48 hr
or
Freeze

Warm and feed

Colostrum can be heat-treated in individual bags or larger pooled batches

Pooled colostrum
in batch pasteurizer

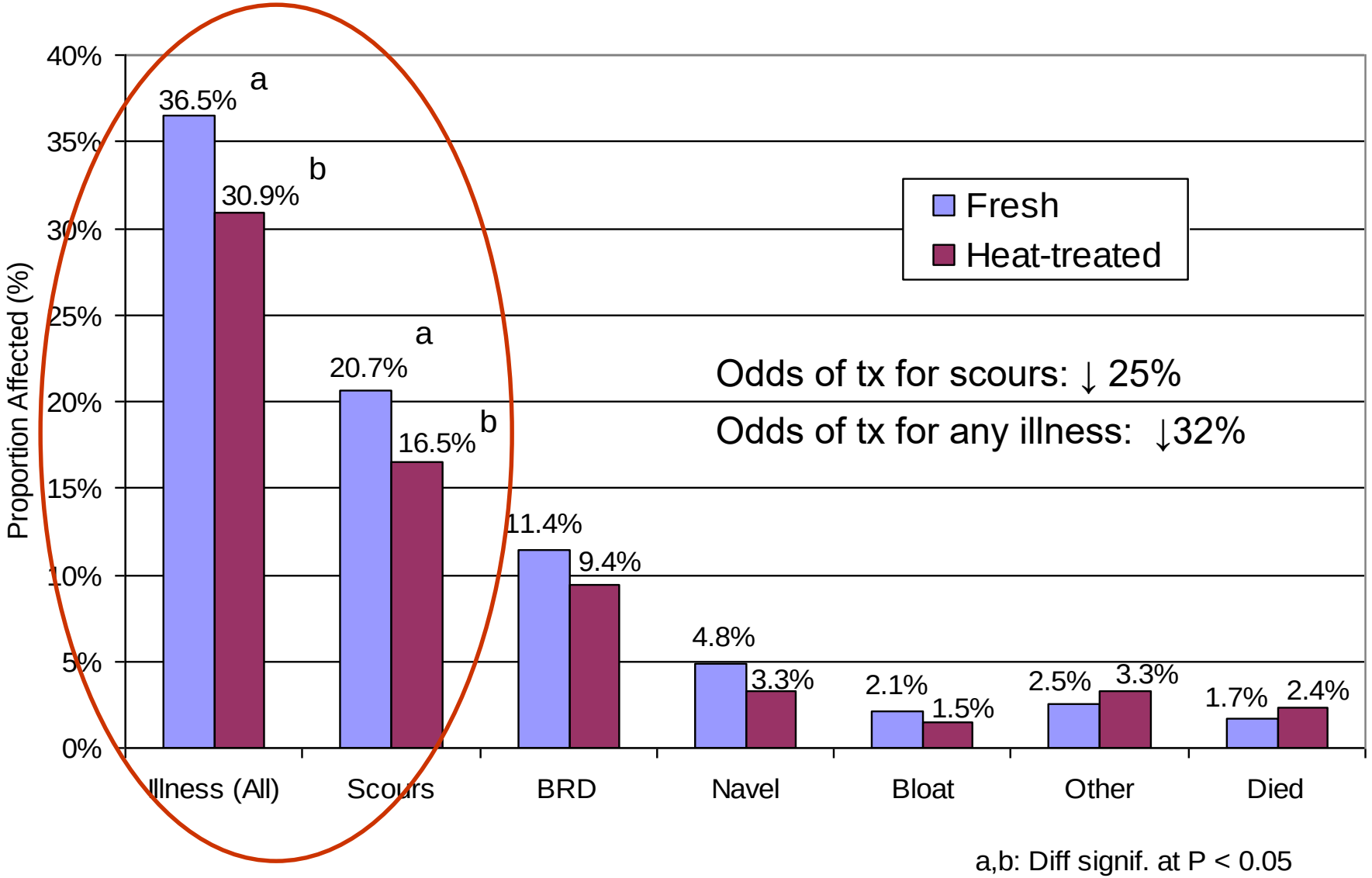
Perfect Udder ® Bag
in Matilda unit (DairyTech)

Heat-treating colostrum in individual Perfect Udder ® bags (DairyTech) performed equally well to a batch pasteurizer

(Kryzer et al., J. Dairy Sci. 2015)

Calves fed HT colostrum have improved health

Decreased risk for treatment (all causes) or treatment for scours.
(Godden et al., JDSci. 2012)



a,b: Diff signif. at P < 0.05

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- Replacers, Heat-treating

Summary

- Colostrum management:
  - Dairy industry has made great advances
  - Still an opportunity to improve: ↑ calf health, performance & economics

- 5 Q's of colostrum management:
  - **Q**uantifying passive transfer (monitoring): new goals
  - **Q**uality: ≥ 22% on Brix for ≥ 90% of samples
  - **Q**uantity: 10% of Birth Weight at 1st feeding
  - **Q**uickness: 1-2 hrs (≥ 90% fed within 6 hrs)
  - S**Q**ueaky clean: TBC < 100,000 cfu/ml

College of Veterinary Medicine
University of Minnesota

Thank you!

Questions?

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  - USDA – CSREES
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- Student and laboratory technicians