COW-FOCUSED MANAGEMENT, PERFORMANCE, AND MILK QUALITY CONSIDERATIONS

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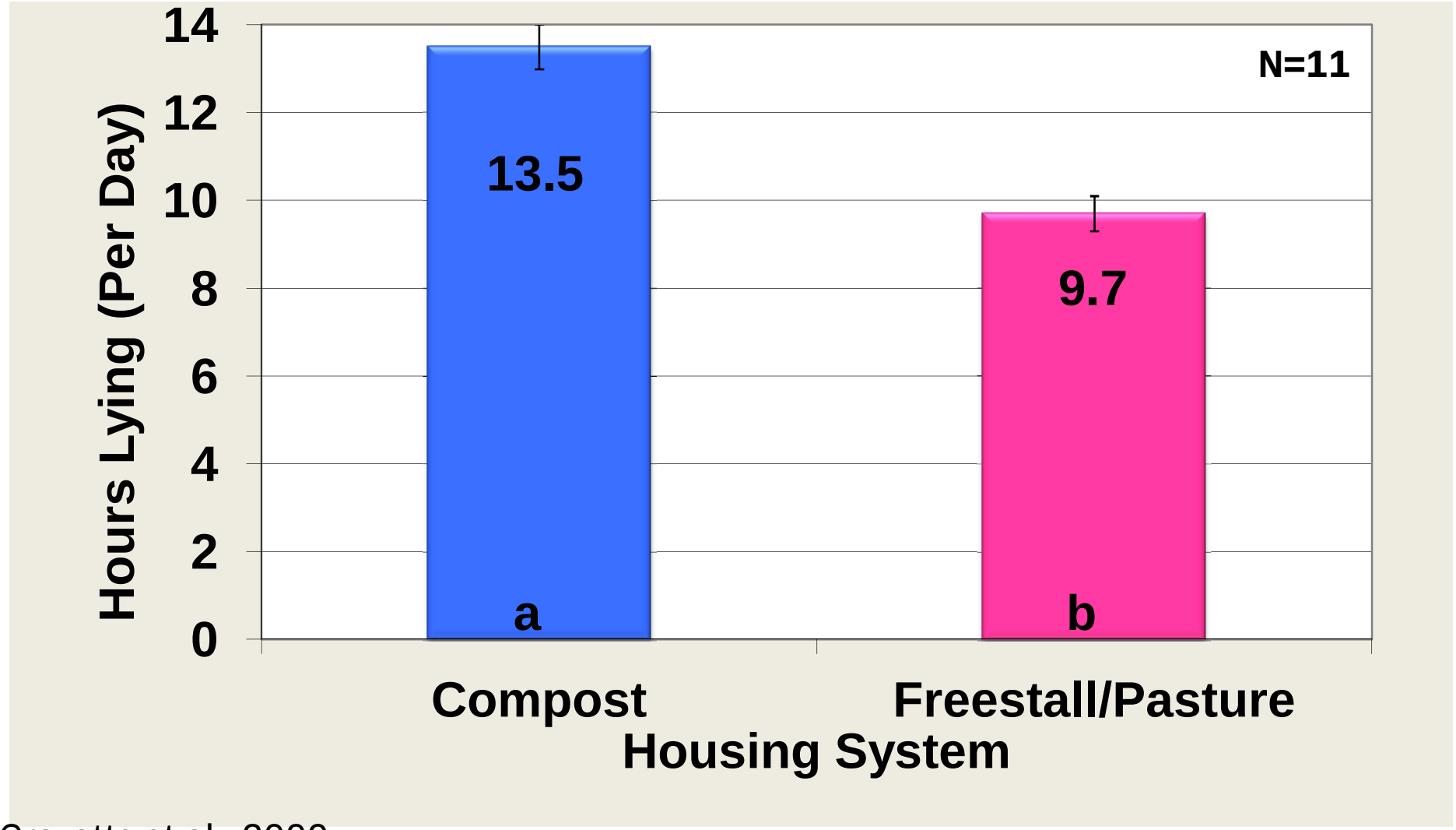
Compost Bedded Pack Barn Concept

- Loose-housing with large, open resting area
- Potentially improved cow comfort
- Not your grandfather's bedded pack barn!
- Intensively managed compost process
- Depends on aerobic digestion of sawdust, manure, and urine
- Compost temperature dries bedding

FACILITY TRANSITION CASE STUDY



Gravatte et al., 2009

CLEAN COWS

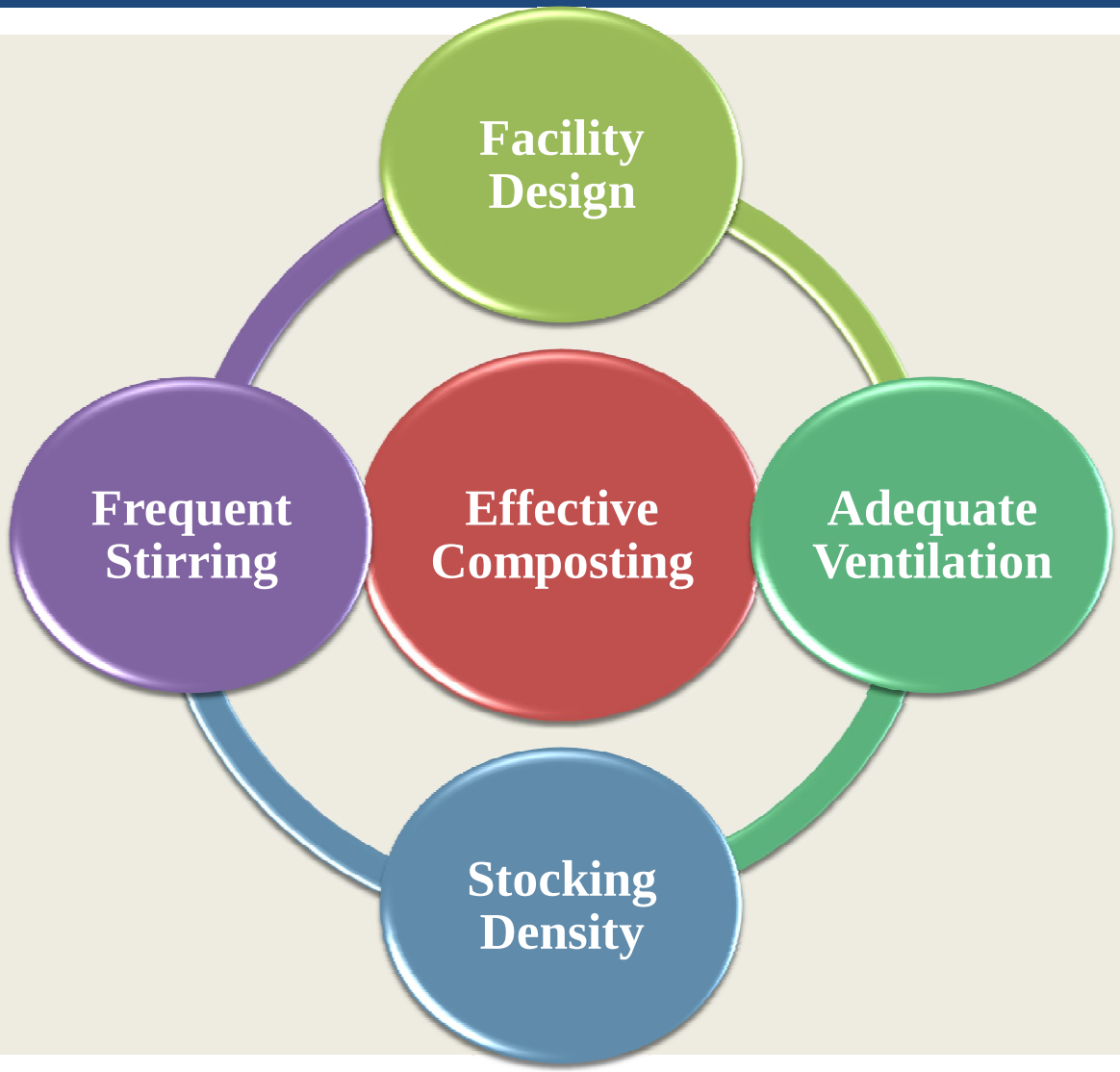
PACK MANAGEMENT

- 1.5 to 2 feet of bedding to start, may take 2-4 semi-loads of sawdust
- New bedding (4-8”) added when pack starts looking moist
- New bedding added every 1-8 weeks (more when humid or wet and in winter)
- Packs cleaned 1-2 times per year (fall & spring)
- Leave 6-12” (top layer)of old material to help start microbial activity

AERATION

- When cows are out of the barn during milking
- Start as soon as new sawdust is added
- Aerate at least 10-12”
- Stirring both lengthwise and crosswise may improve aeration
- Cultivator, tines, or roto-tiller
- Use caution with heavy equipment, may cause compaction

KEYS TO MANAGING A CBP BARN



WHY DON'T ALL PACKS WORK?

- Barn design flaws
- Stocking density (too many cows!)
- Material used (straw, cedar)
- Stirring frequency/depth
- Inadequate/ineffective stirring
- Compaction from tractors
- Starting pack in the winter
- No curtains in winter

MANAGEMENT CHECKS

- Temperature: 110 to 150° F or “just hot enough you don’t want to touch it”
- Moisture: 45 to 55% or can you form a ball without too much water
- Fluffiness: subjective (looking for give in bedding as you walk across it)
- Distribution of cows within barn
- Dirty cows (next to last resort)
- SCC or clinical mastitis (last resort)

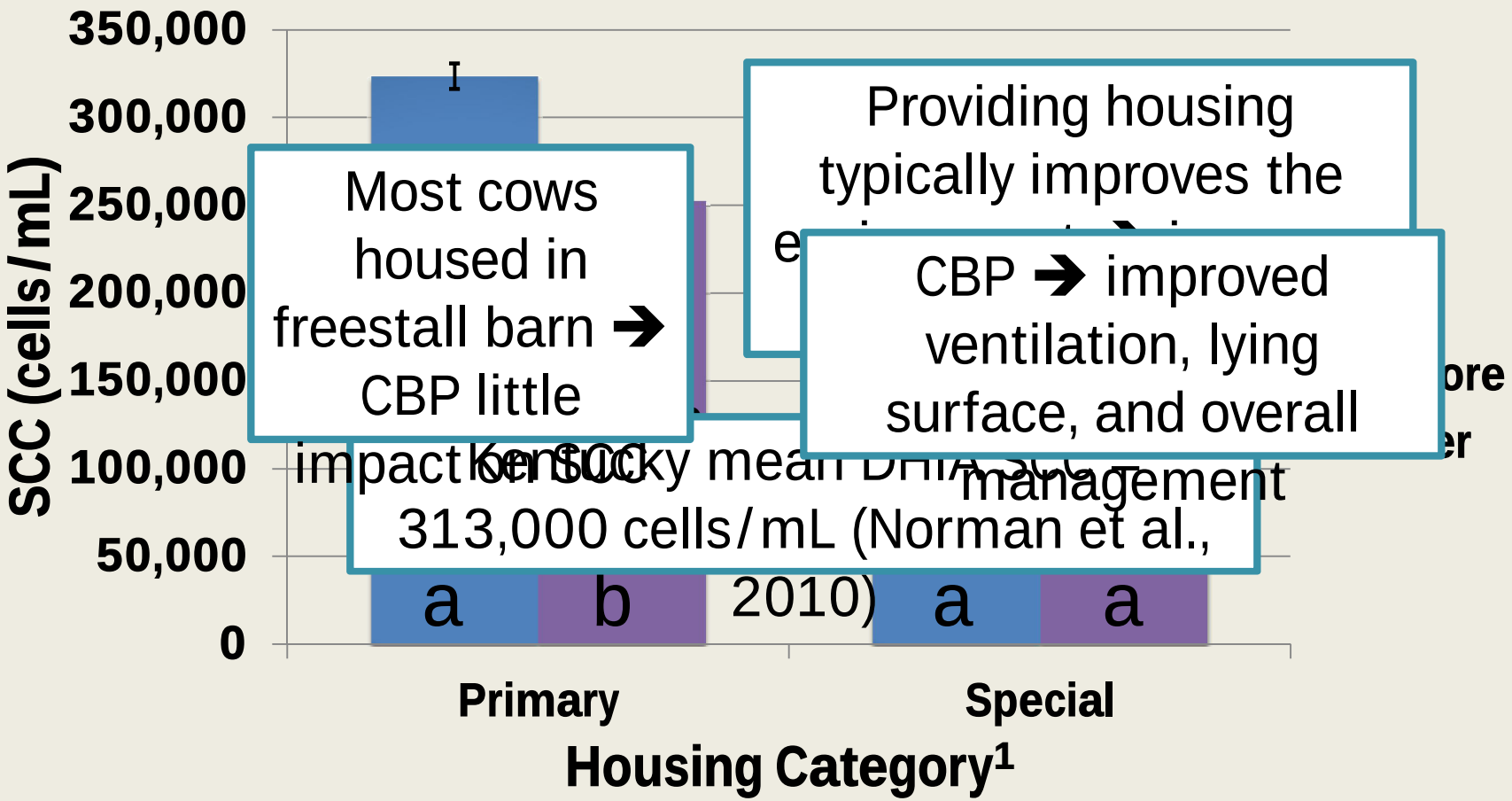
2011 COMPOST STUDY

- 43 Kentucky farms (51 barns)
- October 2010 to March 2011
- Compost samples collected from 9 equally distributed locations throughout each barn to produce a composite sample
- Producer questionnaire
- DHIA data

PRODUCER CITED BENEFITS OF CBP BARNS

- Improved cow comfort (n = 28)
- Improved cow cleanliness (n = 14)
- Low maintenance (n = 11)
- Good for heifers, lame, fresh, problem, and old cows (n = 10)
- Natural resting position (no stalls) (n = 9)
- Improved feet and legs (n = 8)
- Proximity to parlor (compared to pasture) (n = 8)
- Decreased SCC (n = 6)
- Increased heat detection (n = 6)
- Ease of manure handling (n = 3)
- Increased dry matter intake (compared to pasture) (n = 3)
- Increased production (n = 3)
- Increased longevity (n = 3)
- Fewer leg and teat injuries (n = 2)
- Minimizes time standing on concrete (n = 2)

RESULTS AND DISCUSSION
HISTORICAL SCC



[1]Primary housing = CBP acts as primary housing facility
Special housing = CBP houses portion of herd, typically lame, fresh, or sick cows

RESULTS AND DISCUSSION
DHIA DATA

Changes in productive parameters for primary housing farms before and after moving into a CBP

Parameter	Before[1]	Transition[2]	After[3]
Daily milk production, kg	29.3 ± 0.3[a]	30.1 ± 0.3[ab]	30.7 ± 0.3[b]
Rolling herd average, kg	8,937 ± 79[a]	9,194 ± 73[b]	9,403 ± 74[b]
SCC, cells/mL	411,230 ± 20,209[a]	305,410 ± 19,704[b]	275,510 ± 20,080[b]

[1]Before represents the 12 m before moving into the CBP
[2]Transition represents the 12 m after moving into the CBP
[3]After represents the 13 to 24 m after moving into the CBP
[4]Different subscripts within a row denote a significant difference ($P < 0.05$)

Transitionir
or lot to h
closer
accessible

Can achieve low SCC in CBP ➔ proper management and parlor procedures essential for maintain udder health

ion to total
n ➔ better
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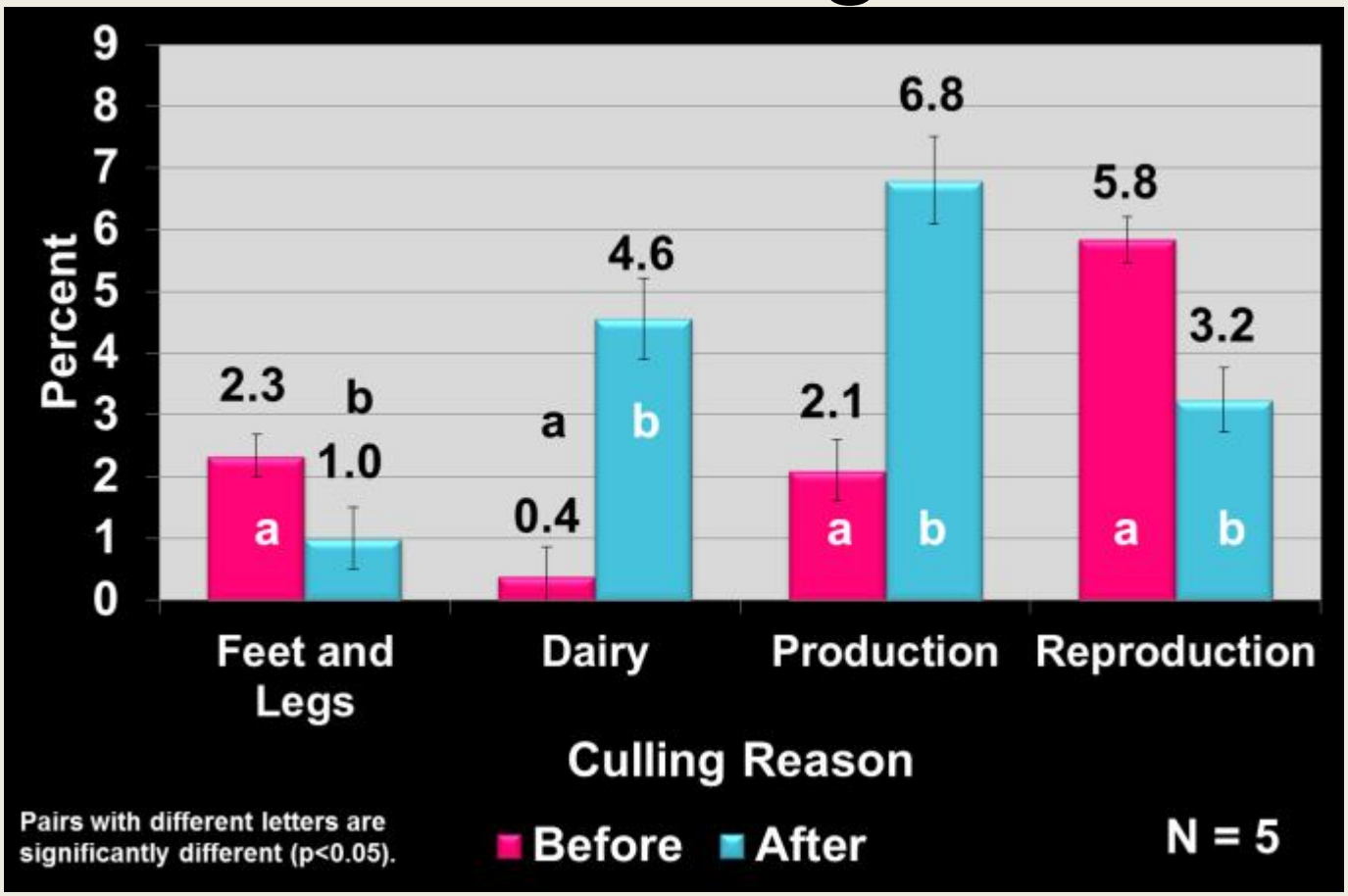
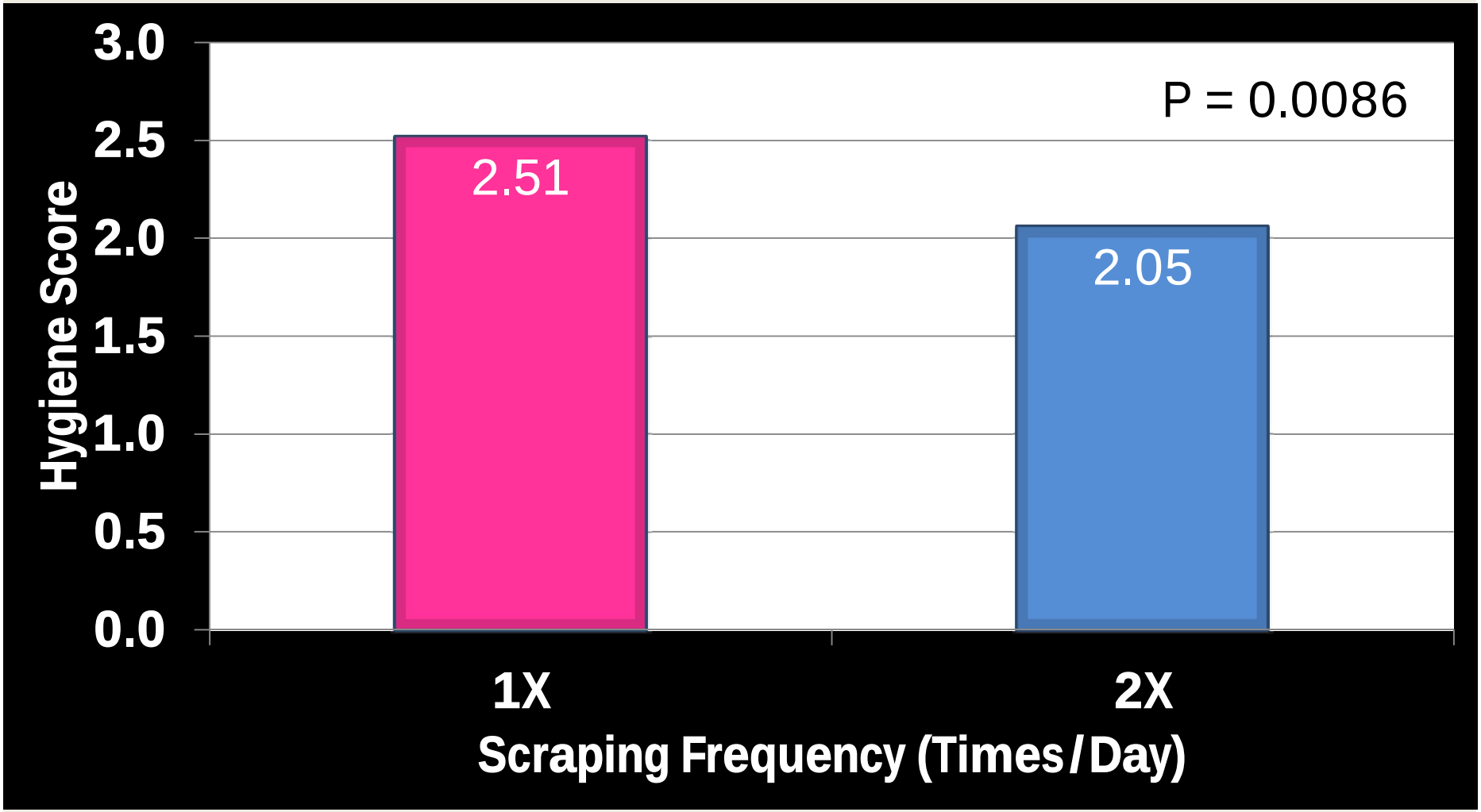
Culling rate before and after moving into a CBP barn used as primary housing



Calculated using 12 months before move in and 6 to 12 months after move in

SCRAPING FREQUENCY EFFECT ON HYGIENE



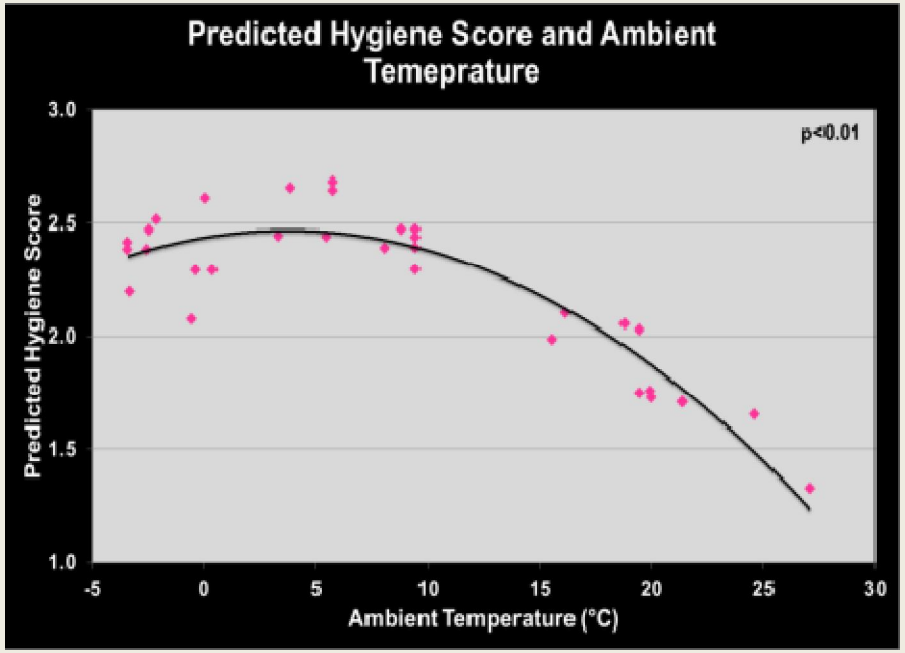
Hygiene depends on management!

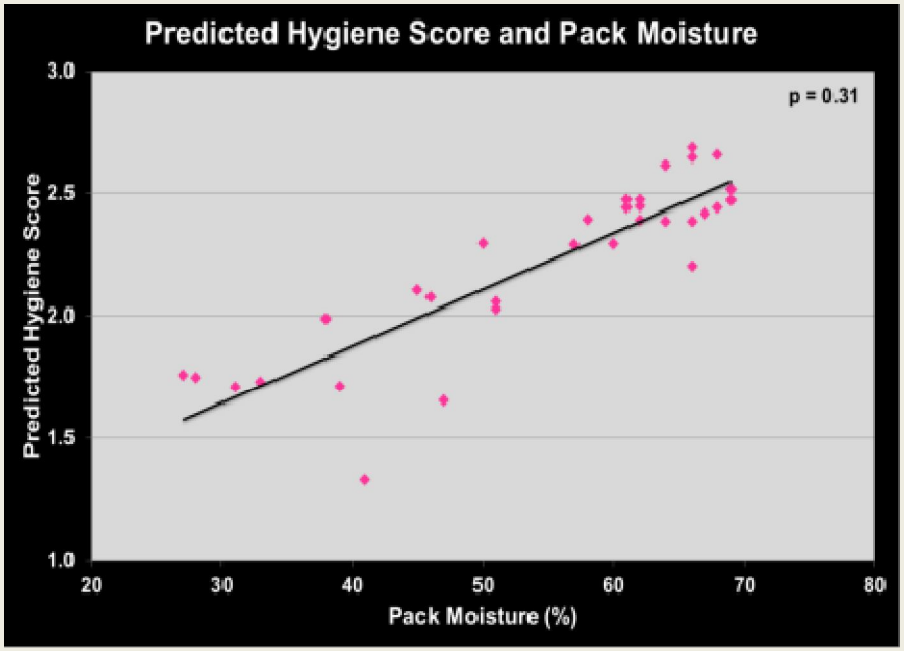
HYGIENE SCORING

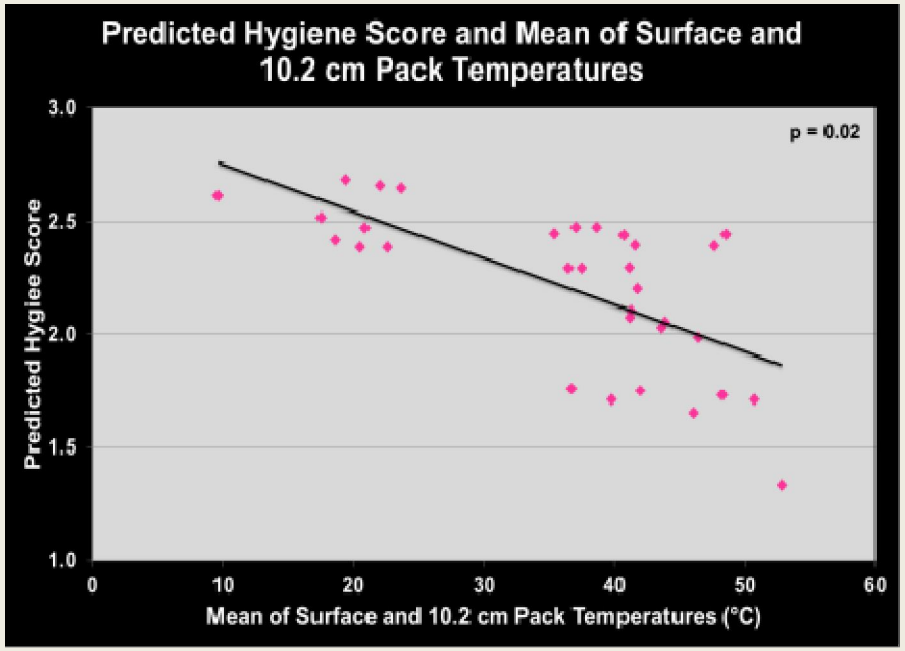
- Four hygiene categories (Cook, 2007)
  - 1: clean, little or no evidence of manure
  - 2: clean, only slight manure splashing
  - 3: dirty, distinct pieces of manure
  - 4: filthy, confluent pieces of manure
- At least 50 cows per barn
  - If fewer than 50 cows, every cow was scored
- Cows randomly selected based on tag number (i.e. multiples of 3, even tag number)

http://www.infodairy.com/infodairy_upload_files/Cows_heifers_calves/Milk%20Quality/0111hygiene%20scoring%20card.pdf

Hygiene Score Graphs





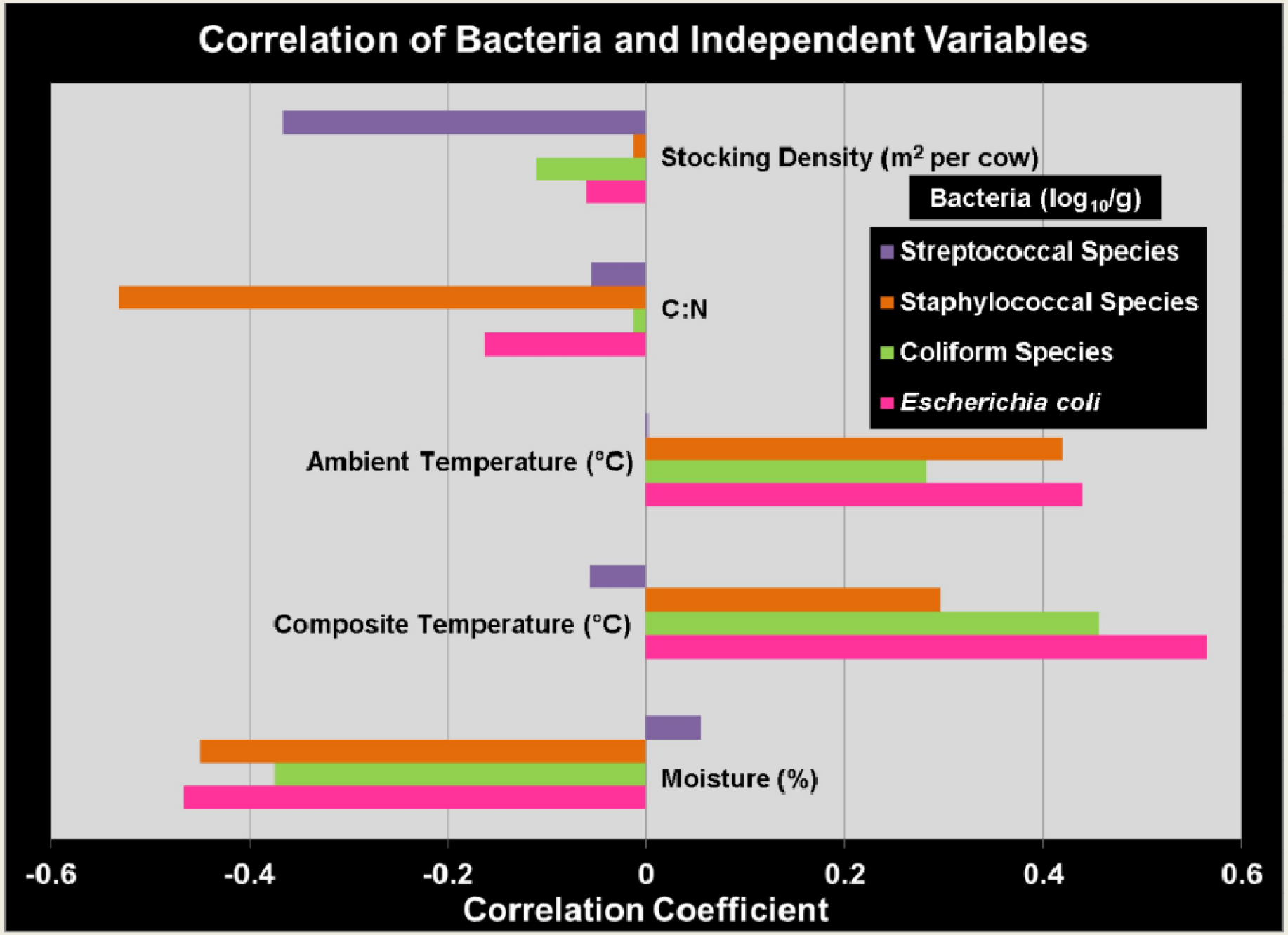


HYGIENE

- Heat generated by composting process dries bedding material creating a drier lying surface
- Drier packs decrease hygiene score which may reduce exposure to mastitis pathogens
- Effective composting more critical to cow hygiene during winter

BACTERIA LEVELS

Bacteria	N	Mean	Standard Deviation
Escherichia coli	43	13.31 $\log_{10}$cfu/g	1.44
Coliform	43	14.07 $\log_{10}$cfu/g	1.30
Streptococcal species	43	16.04 $\log_{10}$cfu/g	1.63
Staphylococcal species	43	17.54 $\log_{10}$cfu/g	1.09


Correlation of Bacteria and Independent Variables
Stocking Density (m2 per cow)
C:N
Ambient Temperature (°C)
Composite Temperature (°C)
Moisture (%)
Bacteria (log10/g)
Streptococcal Species
Staphylococcal Species
Coliform Species
Escherichia coli
-0.6
-0.4
-0.2
0
0.2
0.4
0.6
Correlation Coefficient

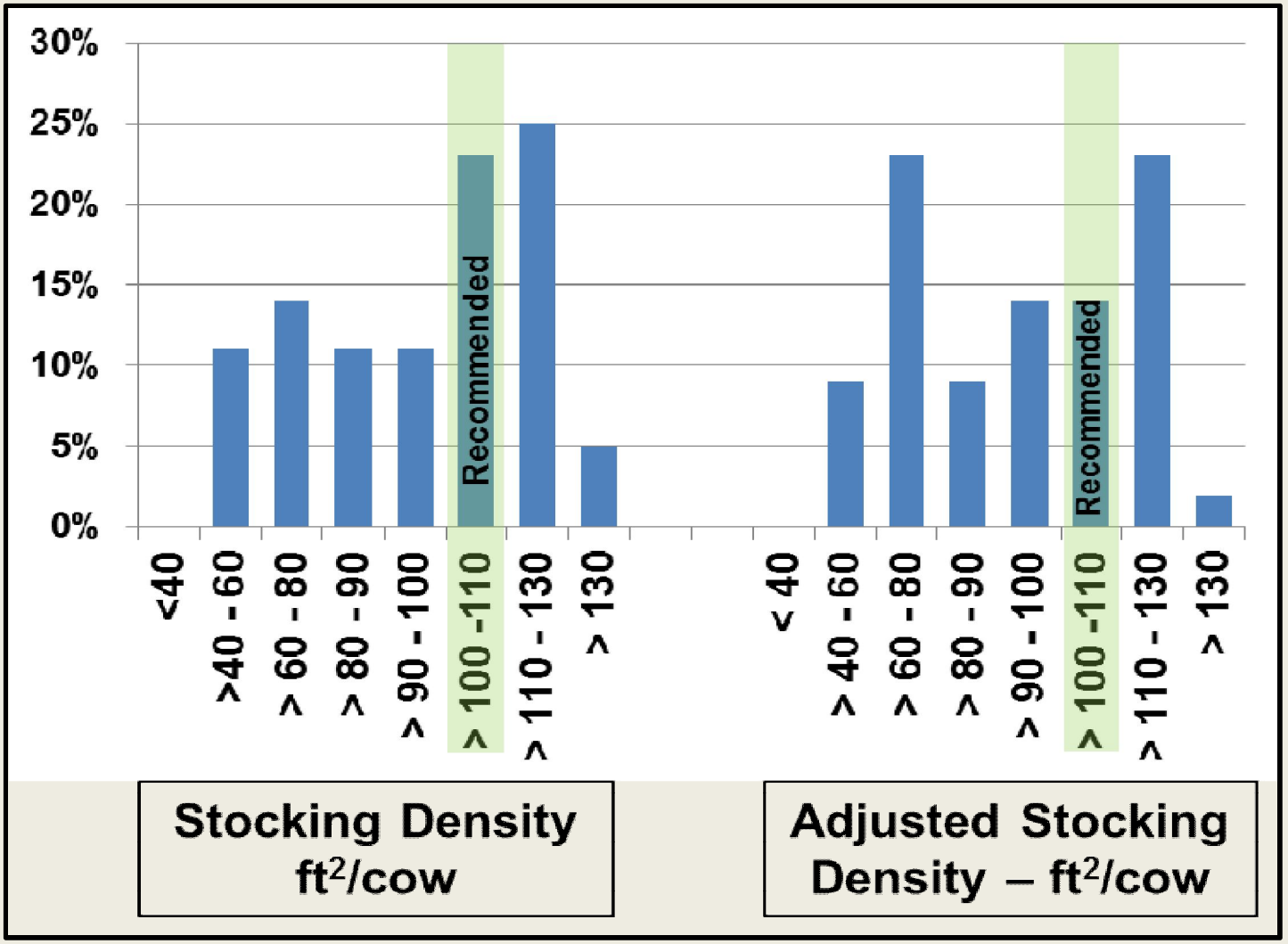
BACTERIA

- Bacteria load high in all compost bedded packs
- Coliform and Staphylococcal species seem to thrive in optimal composting conditions
- Streptococcal species may be more susceptible to composting heat
- Addition of bedding material may reduce competition for carbon sources of bacteria and composting microbes
- Bacteria likely flourish in warmer ambient conditions

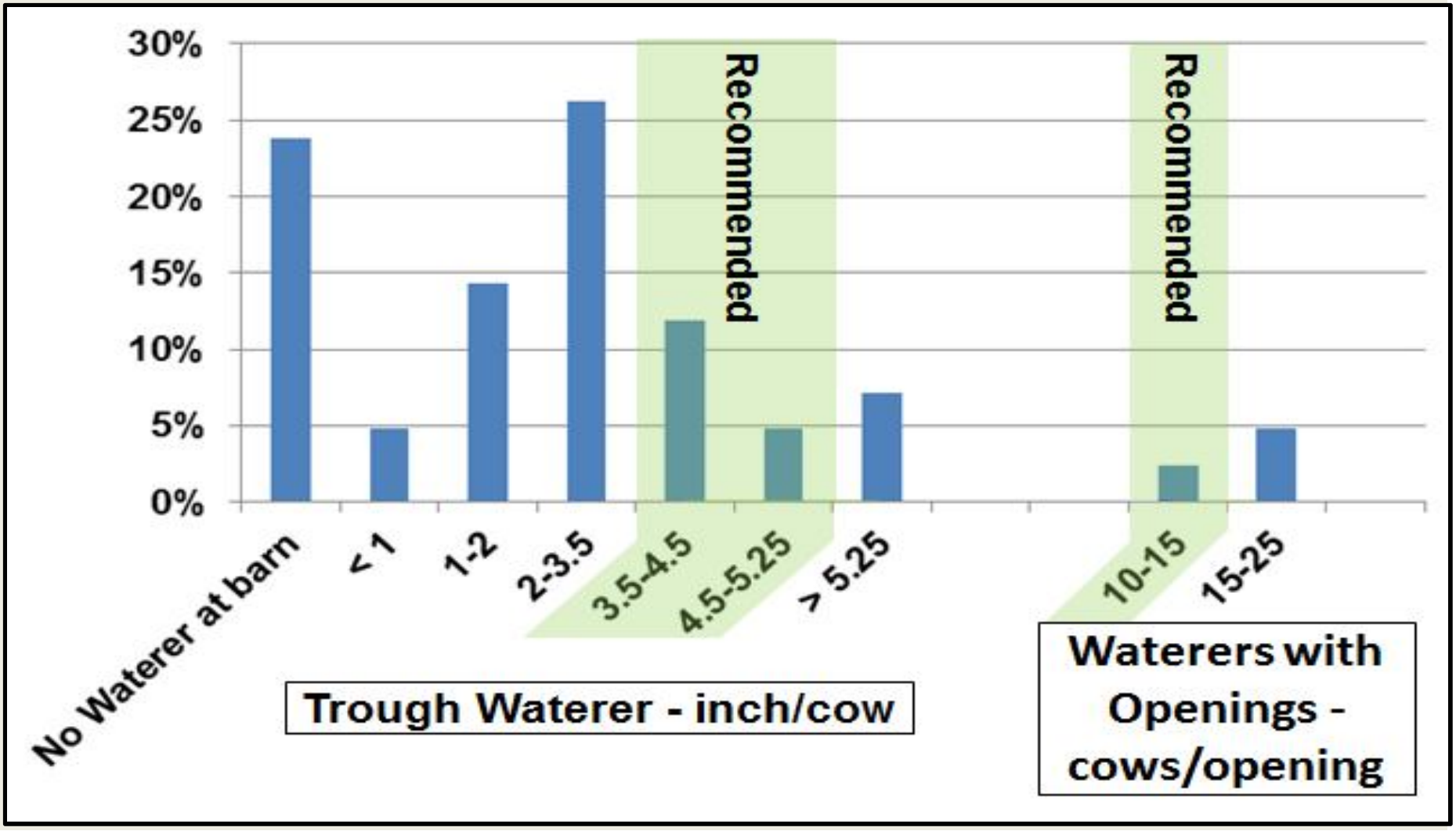
CONCLUSIONS

- Managing the CBP moisture and temperature can improve cow hygiene, which may help in the prevention of mastitis
- Each bacteria acts differently in the composting environment (Streptococcal species most affected)
- Mechanism for reduced SCC in CBP cannot be explained by bacteria content:
  - Dry resting surface
  - Immune function???
  - Clinical mastitis incidence and milk culture study needed
- Future studies may examine fewer farms over a longer period of time to reduce farm to farm variation and account for ambient differences

STOCKING DENSITY



WATER SPACE


30%
25%
20%
15%
10%
5%
0%
Recommended
Recommended
No Waterer at barn
< 1
1-2
2-3.5
3.5-4.5
4.5-5.25
> 5.25
10-15
15-25
Trough Waterer - inch/cow
Waterers with Openings - cows/opening

RECOMMENDED FACILITY CHANGES

Increase size or capacity of the barn (n = 15)

Larger ridge vent (n = 5)

Higher sidewalls and improved ventilation (n = 12)

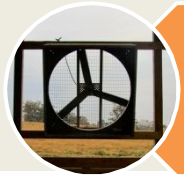
No posts in pack (n = 4)

Add a retaining wall (n = 6)

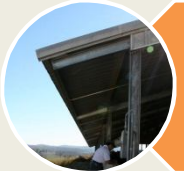
Change number or location of waterers (n = 4)

Add Curtains (n = 5)

Change location or size of feed bunk (n = 4)



More fans (n = 5)



Length of overhang or eaves (n = 3)

BUILDING DESIGN: NEW RECOMMENDATIONS

- Curtains in winter
- East-West orientation
- Ridge with cap
- Build for number of cows milking in winter
- Consider milk production and cow size
- Multiple entrances beneficial
- Start thinking about feed and water space early
- Be careful with fan sizing and placement

MANAGEMENT: NEW RECOMMENDATIONS

- Think about summer and winter as different systems
- Packs must be stirred twice per day every day, no exceptions
- Don’t try to start packs in winter
- Green sawdust is OK (just use more of it)
- Stir pack when new bedding is added (don’t skip milkings)
- Waiting until “bedding sticks to cow” is too late
- Use e.coli vaccines (J5, J-VAC, or ENDOVAC-BOVI) as insurance
- Best stirring strategy is roto-tiller 1X/day with cultivator 1X/day

QUESTIONS

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