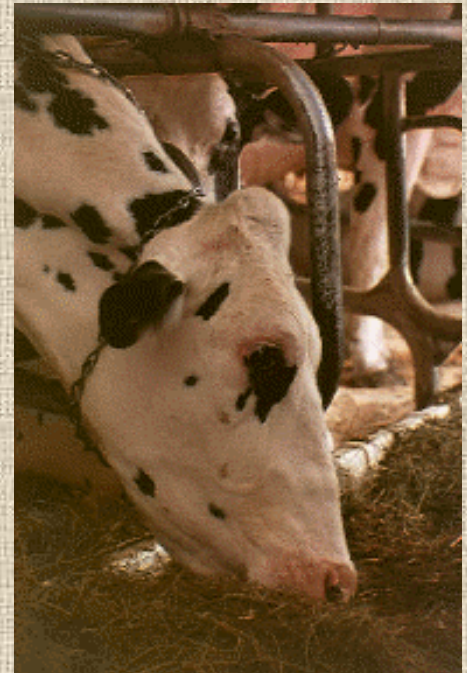


Cost Effectiveness of Feed Additives

Mary Beth de Ondarza, Ph.D.
Paradox Nutrition, LLC
West Chazy, New York



Outline

- **How Is The Additive Supposed to Work?**
- **Evaluating Additive Research**
- **Factors That Affect Responses**
- **Did the Additive Work on the Farm?**
- **Is the Additive Still Working After 6 Months?**

What Is Product X Supposed To Do?

- Reputable companies tell you how their product works in the cow
- Laboratory Research should be conducted before Cow Research
- Understanding a feed additive's mode of action will help you decide if a product has a good chance of working on a particular farm.

Examples of What Feed Additives Can Do

- Increase rumen microbial growth
- Increase fiber digestion
- Control rumen pH
- Increase rumen efficiency by increasing rumen propionate production
- Increase rumen undegraded protein
- Reduce ketosis
- Improve immune response

Overlapping Technologies??

Evaluating Additive Research

**Does the
Product
Really
Work?**



Testimonials

- Be Very Suspicious if a Company Just Presents Testimonials

“John Doe’s cows were more healthy and vet bills were reduced when they fed Product X”

- Daily Changes on the Farm Make it Very Difficult to See a Two-Pound Response in Milk Production

“Off, On Trials”

- Typically, No Better Than Testimonials
- Can Appear to be “Research Trials” with lots of numbers and graphs that look impressive

What else changed between July when the cows were not fed Product X and October when Product X was fed?

Real Cow Research

- Cows receive their “Control” or “Treatment” Diets at the same time (Side-by-Side)
- Control and Treatment Cows are in the same barn, eating the same forages, under the same management, and subjected to the same environmental temperatures

More Cows Per Treatment The Better

Real Cow Research

- Treatment groups must be balanced (same mean and SD) before the trial begins
 - Milk Production
 - Days in Milk
 - Lactation Number
 - Previous ME305

Lower the SD,
The Better

Swapping the Control and Treatment Groups
Mid-Trial can further Improve Statistical Power

Statistical Analysis of the Data

Was a change in production really due to Product X or was it due to just plain “chance”?

- Researchers should Include Covariates in the Statistical Model.
- A Covariate is a secondary variable that could affect cow responses. Covariates are included in the analysis even when cow groups were balanced at the trial start.

Covariates help to explain the variation

Probability Values or “P-values”

- **$P < 0.05$...”Significant”.....** There was less than a 5% chance that the production difference between two treatment groups occurred due to “hit or miss” or random events.
- **$P < 0.10$...”Trend or Tendency”...** Less than a 10% chance that the difference was due to “hit or miss” or random events.

Watch Out for Wrong Conclusions

- **Type 1 Error – “False Positive”**
 - Deciding an additive had a positive effect when it did not
- **Type 2 Error – “False Negative”**
 - Deciding an additive did not have an effect when it did
 - Lose Competitiveness if don't use products that work

$P < 0.10$

“True” Affect of Treatment

	Positive	No Effect
Added Cost	\$0.10/cow/d	\$0.10/cow/d
Extra Milk (\$0.13/cwt)	\$0.39/cow/d	0
Net Return	\$0.29/cow/d	-\$0.10/cow/d

Higher Cost Products Need Lower P-values

Weiss, 2006

Is the Response Repeatable?

- Good companies invest in many experiments with many different feeding situations.
- If their feed additive performs consistently in a number of trials, you can be more confident that it will perform in your situation.

Is the Research Product-Specific?

- Yeast Products Come in Different Strains
- Fat Products and Mycotoxin Binders Have Different Chemical Structures
- Bypass Amino Acids Have Different Coating Technologies
- You Cannot Be Sure that One Company's Feed Additive is the Same as Another's
- Companies Should Do Their Own Research!

“Me too syndrome”

University vs. Non-University Research

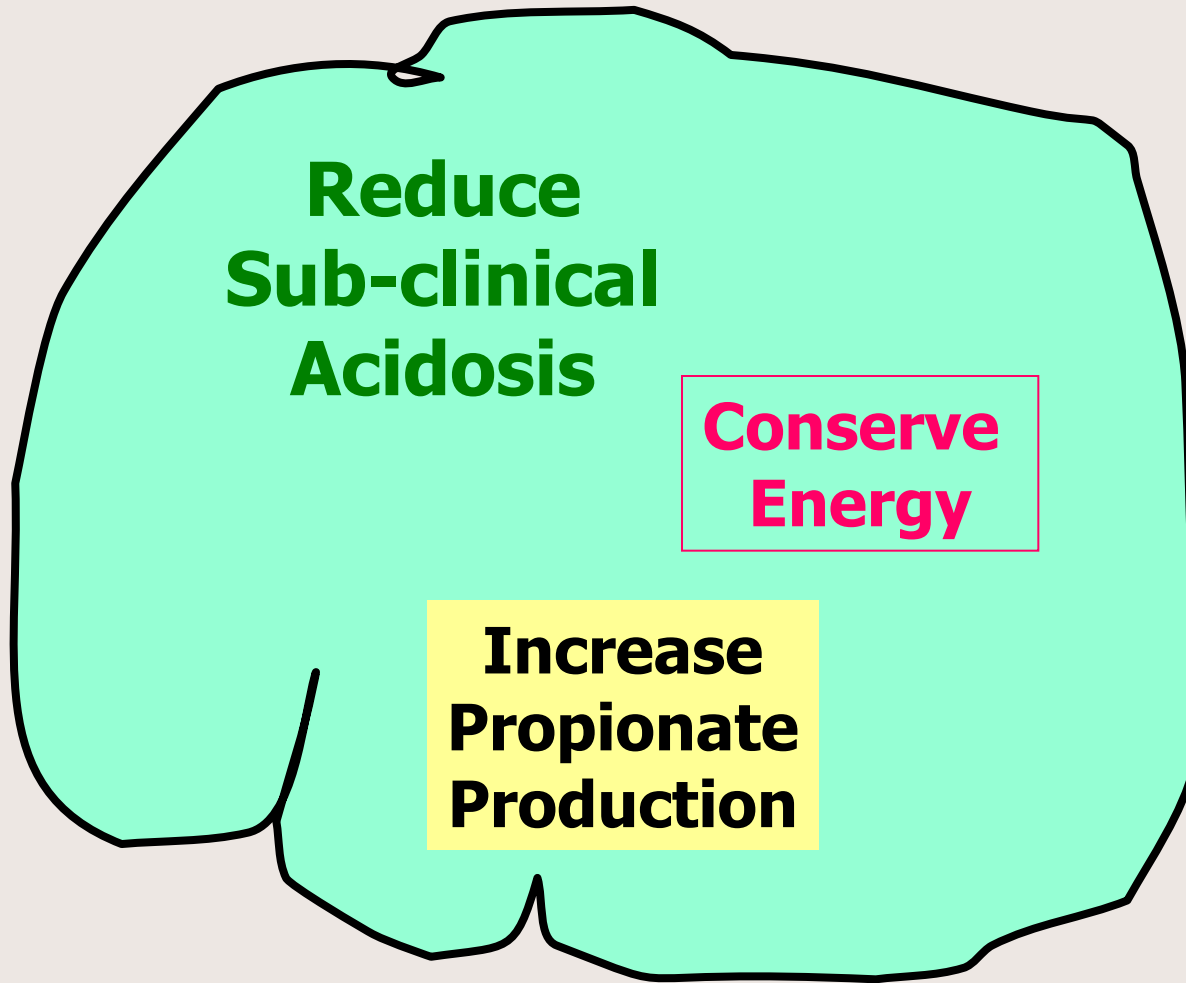
- Some companies imply that research conducted at a university is better.
- Basic research with intensive cow observation and data collection usually can't be conducted on a commercial farm.
- But, commercial dairies with larger numbers of high-producing cows and automatic milk recording can conduct very sound research.
- Side-by-side studies on commercial dairies can be more statistically powerful and more “real-life”

Do All Cows Respond?

- Just Early Lactation Cows?
- Just Mature Cows?

“An additive should return \$2 or more for each dollar spent to cover non-responsive cows and field conditions that could reduce response. (Hutjens, 2005)”

Example: Propionibacteria May Have Positive Rumen Effects



Example:

Supplemental Propionibacteria (P169)

- High-Producing Commercial Dairy
(234 cows) (142 DIM)
- 8-week Side-by-Side Production Study
P169 (6×10^{10} CFU/d) vs. Control
- Measured & Compared:
 - Daily Milk Production
 - Milk Components (weeks 5 & 6)
 - Pregnancy Rate

de Ondarza and Seymour, 2008

Example:

Supplemental Propionibacteria (P169)

	Control	P169	P-value
Milk, kg/d	43.06	44.31	0.04
3.5% FCM, kg/d	43.54	43.85	0.70
Fat, %	3.57	3.45	0.14

de Ondarza and Seymour, 2008

Example:

Supplemental Propionibacteria (P169)

Milk, kg/d	Control	P169	P-value
Parity 2	42.92	43.51	0.50
Parity 3	43.21	45.10*	0.02
0-100 DIM	44.68	46.17*	0.03
101-200 DIM	43.41	44.53	0.07
201+ DIM	41.10	42.24	0.11

de Ondarza and Seymour, 2008

Factors That Affect Responses

**Reduce the
Risk of
NOT
Getting A
Positive
Response**



Meta-Analysis

- “Meta” – Greek meaning = “After”
- One big statistical analysis of a large number of studies conducted with an additive in different settings with different diets
- Weight data based on study size and variance
- Identify factors that affect response
 - Stage of Lactation
 - Level of Production
 - Diet Variables

Yeast Meta-Analysis (157 Experiments)

Rumen pH	+0.03
Lactic Acid Conc	-0.9 mM
OM Digestibility	+0.8%
DMI	+ 0.44 g/kg of BW
Milk Yield	+1.2 g/kg of BW
Milk fat content	+0.05%

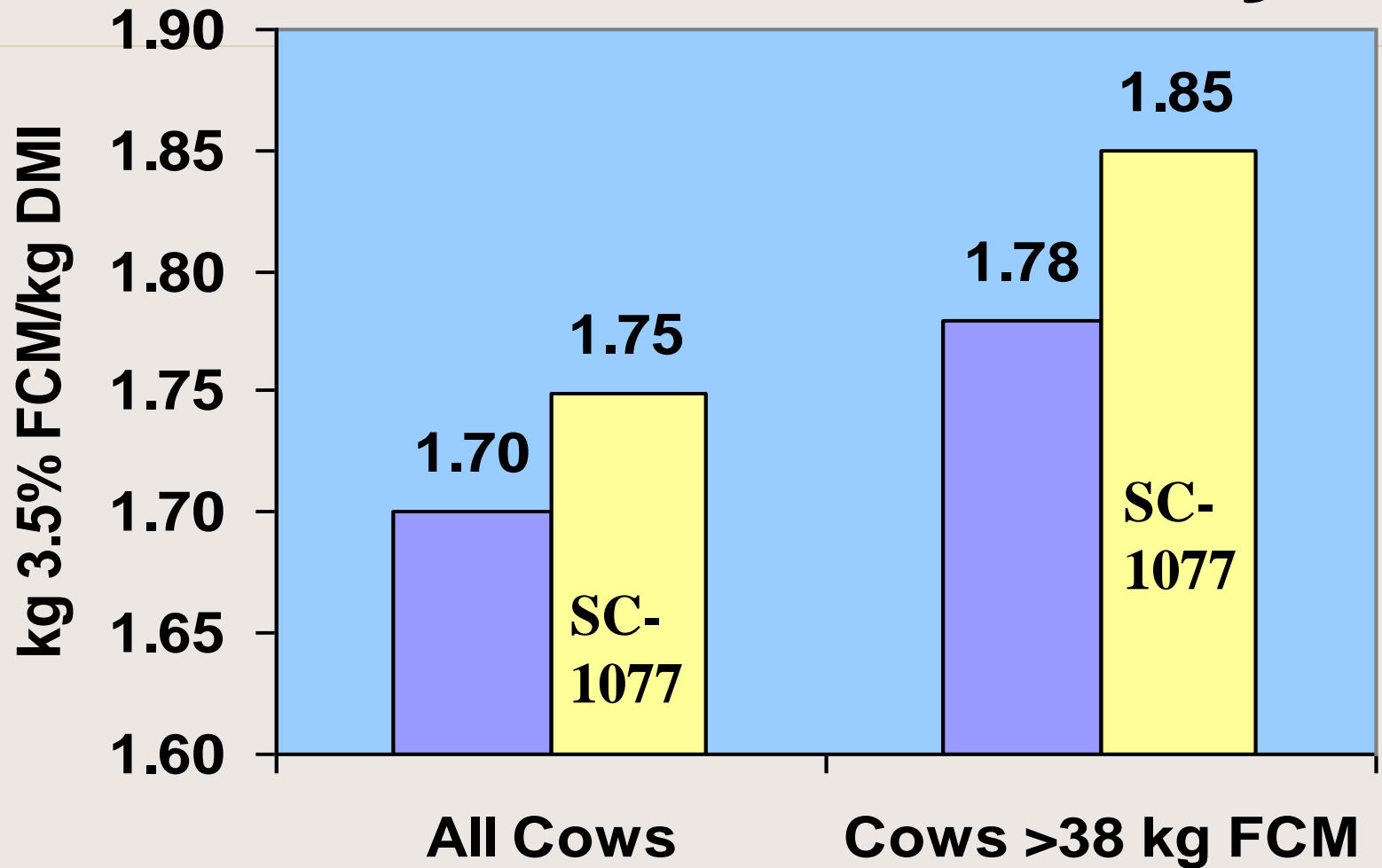
1350 lb Cow
+0.6 lbs DMI
+1.6 lbs Milk

Desnoyers et al., 2009

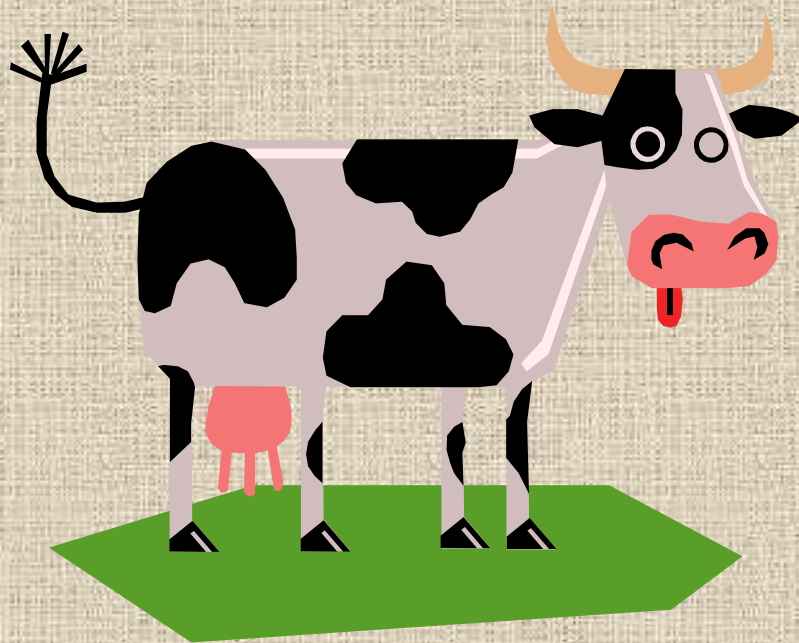
Yeast Meta-Analysis (157 Experiments)

- Higher diet concentrate and DMI → More positively yeast impacted rumen pH
- More diet NDF → Less positive effect of yeast on rumen pH
- Higher DMI and diet CP → More positively yeast impacted rumen VFA concentrations

Feed Efficiency



Did the Additive Work on the Farm?



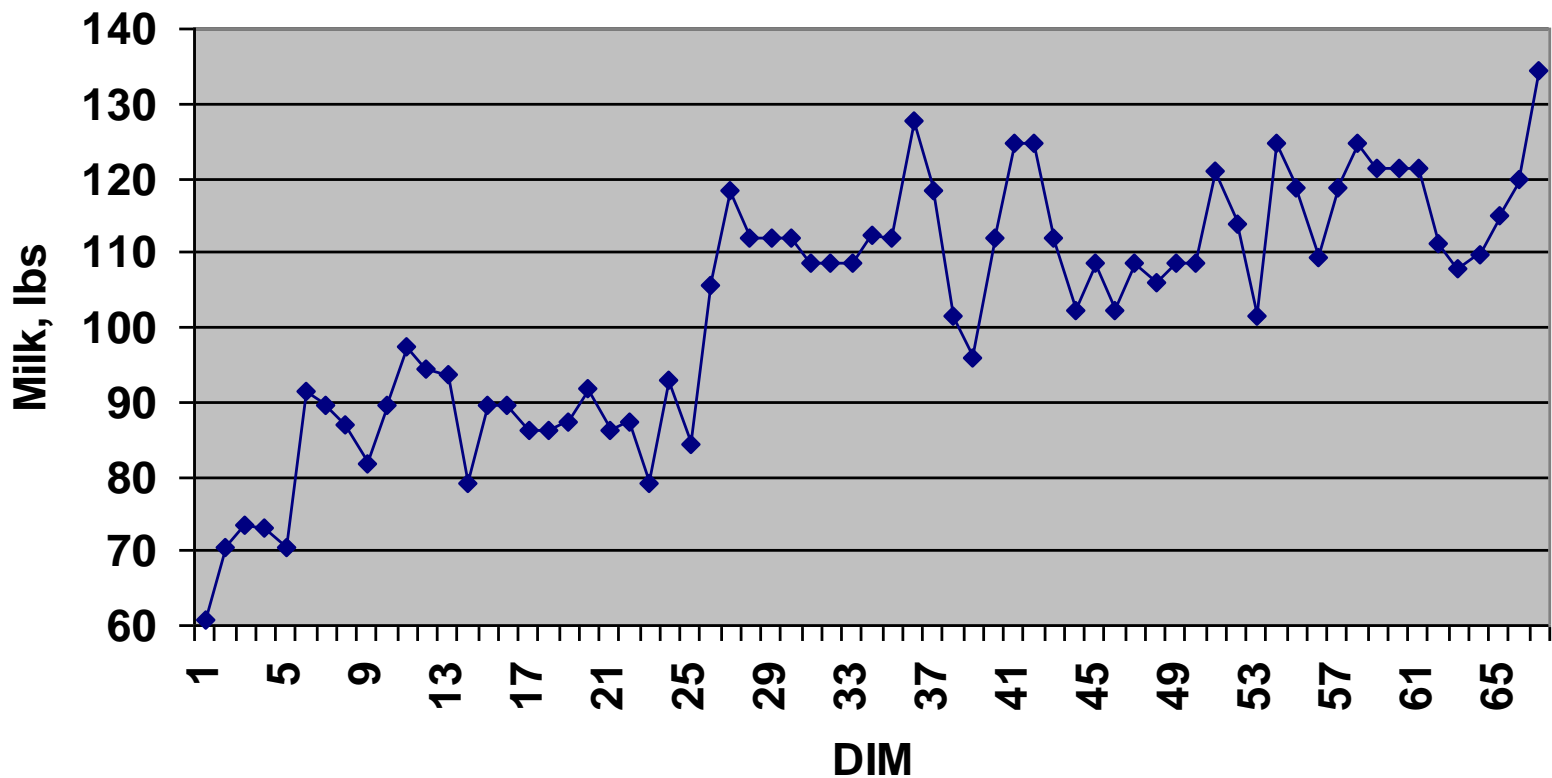
Difficult to Evaluate Additives on Farm But Must Try...

- **Try to make one change at a time**
- **Consider doing own side-by-side test**
- **Consider more than the bulk tank...**
 - Milk components
 - Body Condition
 - Reproduction
- **Consider lag time...**
 - Some products take a few weeks to have an effect while other responses are immediate

On-Farm Evaluation Tools

- **Herd Health Profiles**
- **Heifer Growth Charts**
- **DHI Milk Records**
 - **Peak Milk**
 - **150-day Standardized Milk Production**
 - **Persistency**
 - **Milk Components**
 - **Reproductive Summaries**

Variation in Daily Milk Production An Early Lactation Cow



Example:

10-Week Side-by-Side Study

- **Balance groups pre-trial for:**
 - **Lactation number, DIM**
 - **ME305 and Pre-Trial Milk Production**
 - **Cows split equally as freshen in to study**
- **Analyze only cows on study > 2 weeks**
- **Covariates included in analysis**
 - **Previous milk production and components**
 - **Previous ME305 Milk**
 - **DIM and Lactation Categories**

Example:

10-Week Side by Side Study

- **Pen A – 234 Cows**

- DIM = 157 +/- 84

- Lact # = 3.08 +/- 1.25

- Previous ME 305, lbs
29721 +/- 6209

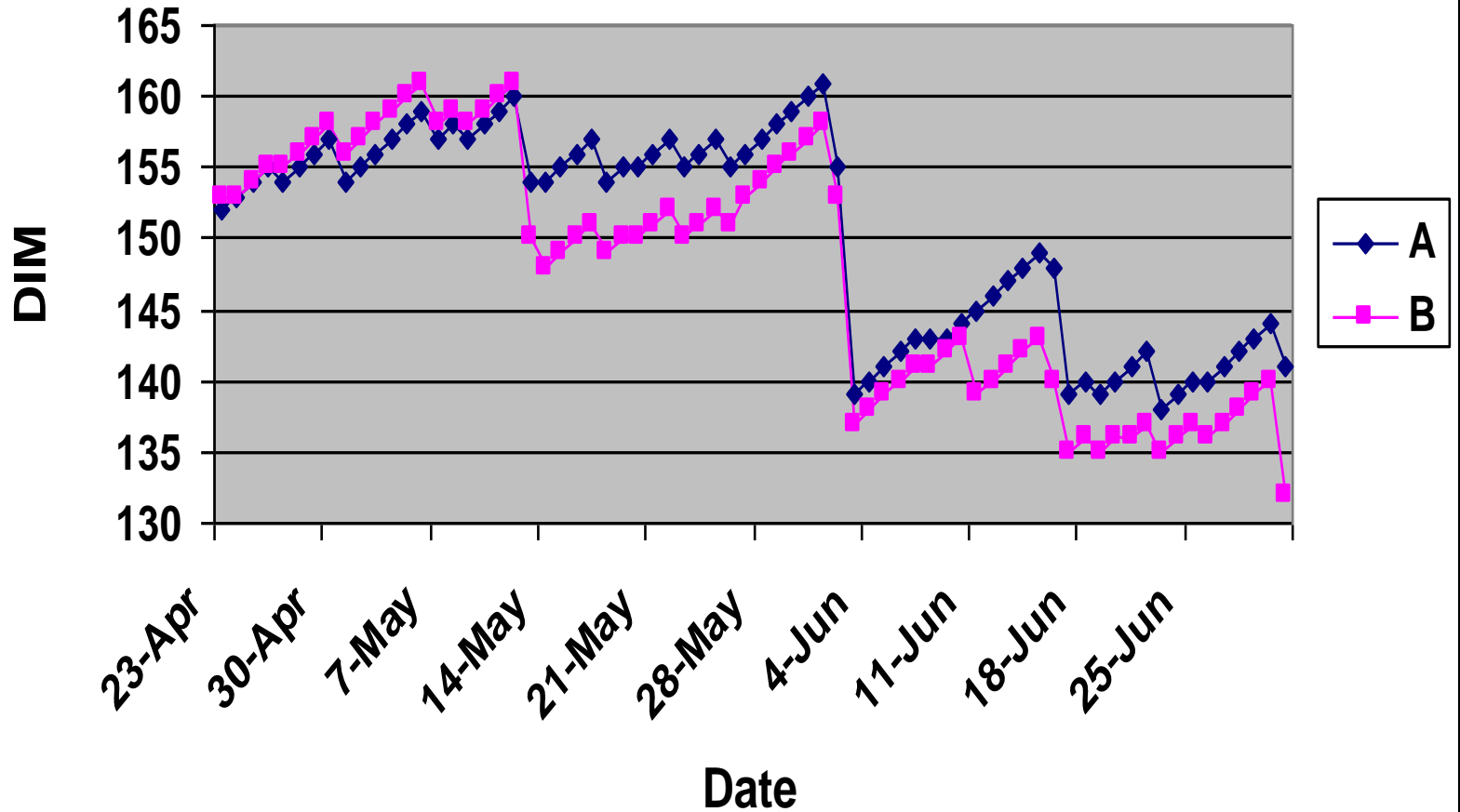
- **Pen B – 234 Cows**

- DIM = 155 +/- 86

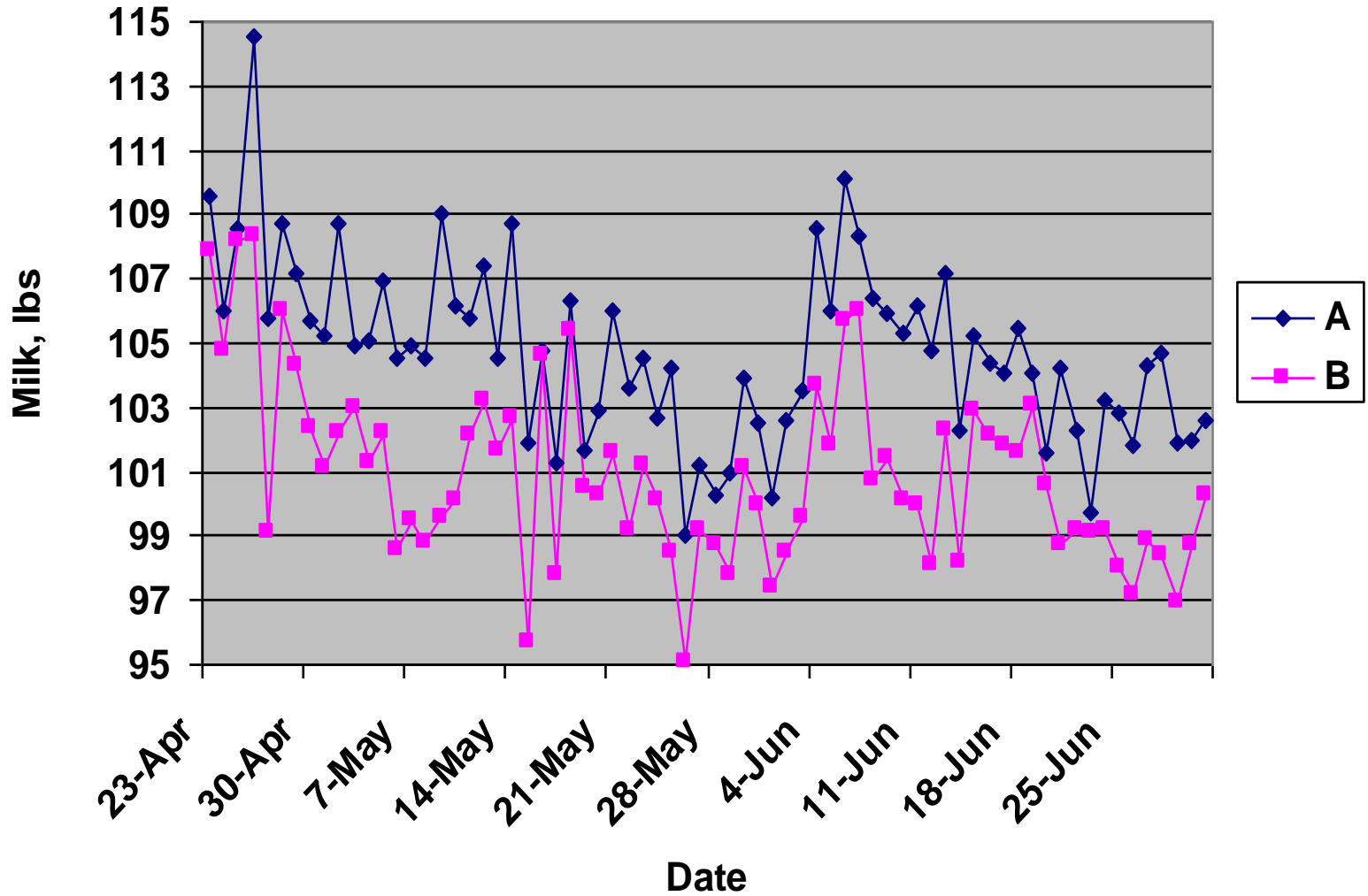
- Lact # = 3.07 +/- 1.26

- Previous ME 305, lbs
29419 +/- 5685

DIM of Trial Groups



Milk Production of Trial Groups



Example:

10-Week Side by Side Study

- **Statistical Analysis of Milk Means**

- **A= 105.1 (SE=1.2)**
- **B = 101.25 (SE=1.2)**
- **3.85 Difference**
 - (P<0.05)

- **Group Milk Means**

- **A= 104.7 (SD=2.8)**
- **B = 100.9 (SD=2.8)**
- **3.8 lb Difference**

Still Need to Look at FCM and Components

Is the Additive Still Working After 6 Months?

**Or, Should It
be Taken out
To Save
Money?**

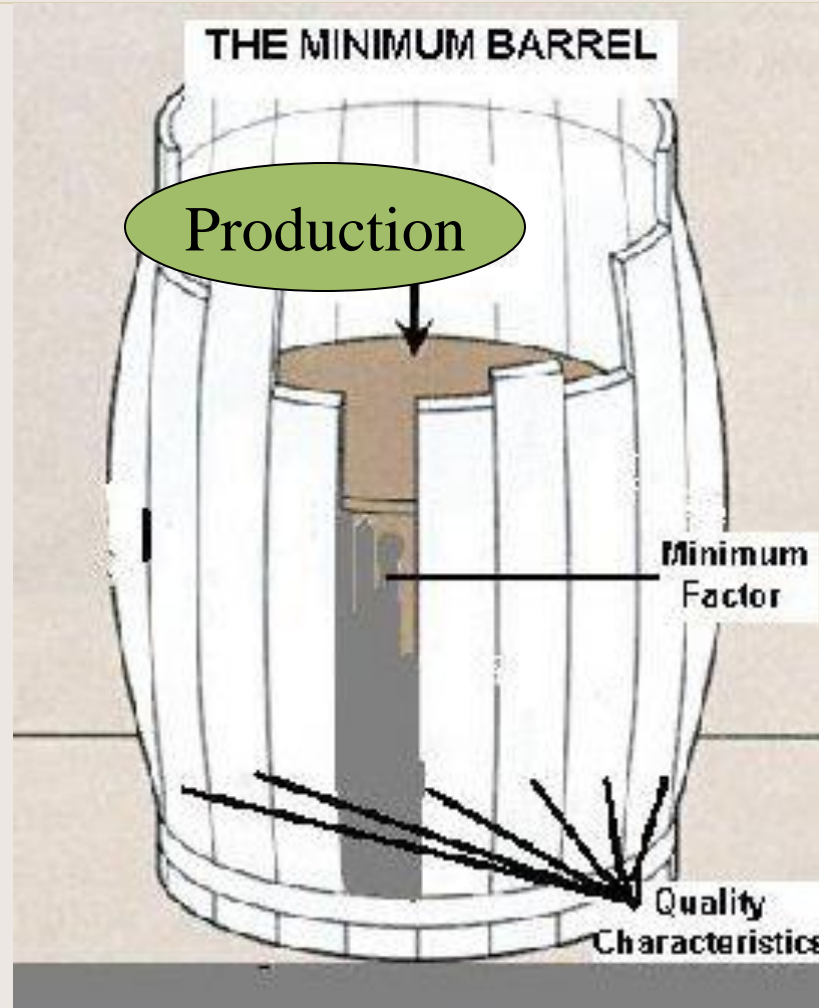


What Has Changed in the Last Six Months on the Farm?

- **Grouping strategy**
 - Can Cows Be Target Fed Better?
- **Fresh Cow Issues**
 - Fewer Fat Cows?
- **Grain changes**
 - Run out of HMSC?
 - No more Wet Brewers Grains?
- **Forage changes**
 - No more Hard Kernel Corn Silage?
 - Feeding More Highly Digestible Forage Fiber?

**Have the
Challenges
Changed?**

What is the Lowest Stave of the Barrel?



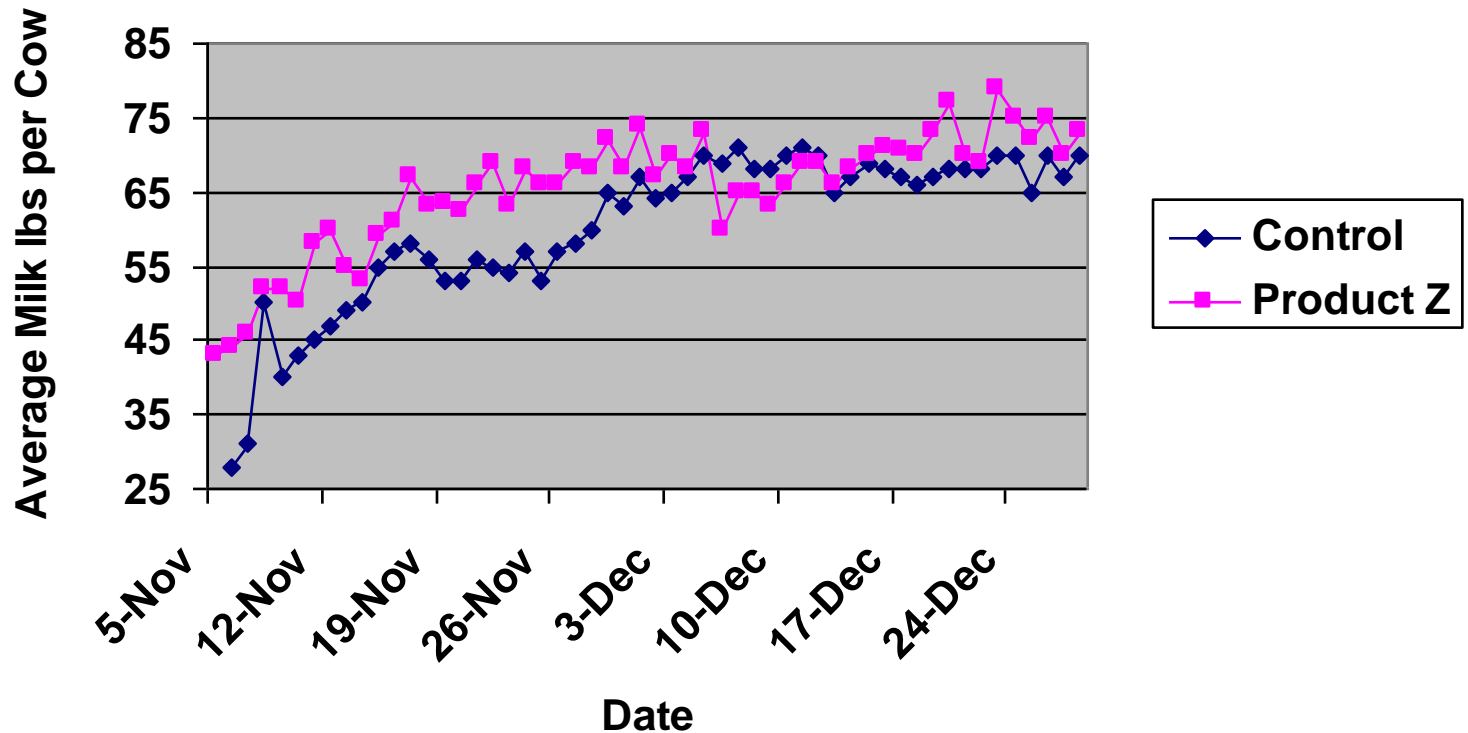
Examples for Discussion



Product Z
Product X
Wisconsin
Off/On/Off
Study

Product Z

Advertised Study



Advertised 5.9 lbs more milk

Product X

- Transition Economics: +\$12,780
- Health Economics: +\$5676
- Cow Inventory Economics: +\$6000
- Reproduction Economics: +\$7824
- **Total Improvement: \$32,280**

Yeast Culture Field Trial

OFF-ON-ON-OFF

- 11 High-Producing WI Dairies
- 22,000 – 28,160 lb. RHA
- 57 g (2 oz.) Yeast Culture over two 30-d DHI test periods
- 585 cows that completed four 30-day periods
- Average DIM=140

Take Home Points

- **Ask for and critically analyze research data presented on additives**
- **Testimonials are NOT Research!**
- **Understand the mode of action of an additive**
- **Try to do side-by-side tests on the farm**
- **Try to control other variables when testing a product on the farm**