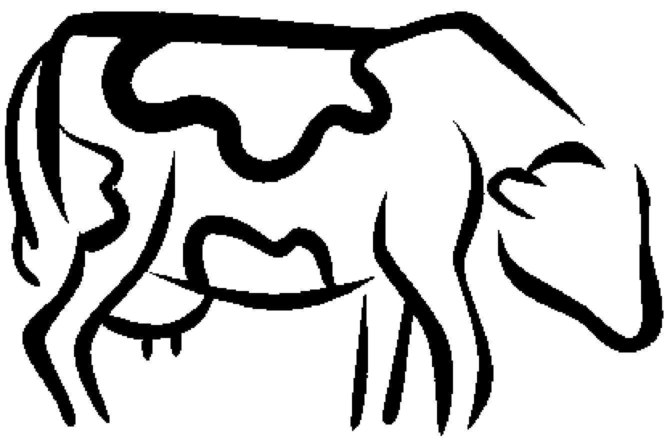
PROCEEDINGS OF THE 42nd ANNUAL

FLORIDA DAIRY PRODUCTION CONFERENCE

Hilton University of Florida Conference Center
Gainesville • Florida • May 3, 2005



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IFAS EXTENSION

Sponsored by the Department of Animal Sciences, Florida Cooperative Extension Service and the Agricultural Experiment Station of the Institute of Food and Agricultural Sciences, with the cooperation of State Dairy Organizations and Allied Industry

UNIVERSITY OF FLORIDA
IFAS
Department of Animal Sciences

PO Box 110910
Gainesville, FL 32611-0910

Gainesville, May 2005

To: **Florida Dairymen, Allied Industry and Others**
Re: **42nd Annual Florida Dairy Production Conference**

Welcome to the 42nd Annual Florida Dairy Production Conference! This conference provides an opportunity for representatives from all aspects of the Florida Dairy Industry to focus on information and ideas for improving profitability and sustainability of the Florida dairy industry for the future.

The planning committee has planned this program in hopes that you will take home some information that will be of benefit in the planning and operation of your business. The speakers have been chosen with careful consideration for subject matter of timely significance. We believe that their information will be useful to you.

The proceedings are provided as a reference and record of the conference. Additional copies are available by contacting the UF/IFAS Department of Animal Sciences. You will also find the proceedings posted on the UF/IFAS Dairy Extension website at http://dairy.ifas.ufl.edu.

Thank you for your participation in the 2005 conference. Please feel free to provide any comments that can be used in planning future Florida Dairy Production Conferences.

F. Glen Hembry
Chair, UF/IFAS Department of Animal Sciences

Albert de Vries
Coordinator, 42nd Florida Dairy Production Conference

42nd Florida Dairy Production Conference
May 3, 2005

Location

Hilton University of Florida Conference Center
1714 SW 34th Street
Gainesville, FL 32607

Planning Committee

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Table of Contents

Program Schedule

Tuesday, May 3, 2005

AM **Century Ballroom**

Presiding - Glen Hembry, University of Florida, Gainesville

10:00 Welcome and Remarks
Glen Hembry, Chair, Department of Animal Sciences, University of Florida, Gainesville

10:05 Frequent Milking in Early Lactation: Considerations for Implementation
Geoff Dahl, Department of Animal Sciences, University of Illinois, Urbana

11:00 Crossbreeding: Why the Interest? What to Expect
Les Hansen, Department of Animal Science, University of Minnesota, St. Paul

11:45 Lunch

PM

Presiding - Brent Broaddus, University of Florida, Seffner

12:45 Awards

1:00 The State of IFAS
Jimmy Cheek, Senior V.P. Agriculture and Natural Res., University of Florida, Gainesville

1:15 How to Make the Most of My Multicultural Workforce
Miguel Morales, Monsanto Agricultural Sector, Clovis, California

2:00 Reducing Variability in Your Breeding Program Using a Systematic Approach
Richard Wallace, Department of Veterinary Clinical Medicine, University of Illinois, Urbana

2:45 Break

3:15 Let There be Light: Photoperiod Management of Cows for Production and Health
Geoff Dahl, Department of Animal Sciences, University of Illinois, Urbana

4:00 Update: Barn Cooling, Tunnel and Otherwise
Dave Bray, Department of Animal Sciences, University of Florida, Gainesville

4:45 Adjourn

Wednesday, May 4, 2005

AM **Dogwood Room**

9:00 PCDART Workshop
Dan Webb, Department of Animal Sciences, University of Florida, Gainesville
Richard Wallace, Department of Veterinary Clinical Medicine, University of Illinois, Urbana

noon Adjourn

Speakers and Program Participants

David Bray, Extension Specialist IV, Department of Animal Sciences, University of Florida, Gainesville

Brent Broaddus, Extension Agent I, Hillsborough County, University of Florida, Seffner

Jimmy Cheek, Senior V.P. for Agriculture and Natural Resources, University of Florida, Gainesville

Geoff Dahl, Associate Professor, Department of Animal Sciences, University of Illinois, Urbana

Frankie Hall, Associate Director of the Agricultural Policy Division, Florida Farm Bureau Federation, Gainesville

Les Hansen, Professor, Department of Animal Science, University of Minnesota, St. Paul

Glen Hembry, Chair, Department of Animal Sciences, University of Florida, Gainesville

John Miller, Bureau of Dairy Inspection, Florida Department of Agriculture & Consumer Services, Tallahassee

Miguel Morales, Monsanto Agricultural Sector, Clovis, California

Richard Wallace, Associate Professor, Department of Veterinary Clinical Medicine, University of Illinois, Urbana

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2004 Florida Dairy Quality Honor Roll

Dairy Division – Florida Department of Agricultural and Consumer Services

Dairy Name	Location	Rank	SPC	SCC	Score
Norman Nickerson Dairy (7)	Wauchula	1	1,930	214,000	98
Brantley Dairy Farm, Inc. (2)	McAlpin	2	1,580	394,000	93
Oak Shade Farms (4)	Century	3	2,689	325,455	94
Davie Dairy, Inc. #2	Okeechobee	4	2,636	388,182	96
H W Rucks & Sons #2 (2)	Okeechobee	5	3,555	352,727	93
Kurtz & Sons Dairy (3)	Live Oak	6	4,056	310,000	98
Walker & Sons Farms, Inc.	Monticello	7	4,760	297,000	92
Pine Island Dairy, Inc.	Arcadia	8	5,627	253,182	97
Aprile II	Temple Terrace	9	4,482	345,455	96
Rockin' W	Vernon	10	5,127	315,455	99
Southeast Dairy (2)	Bell	11	5,770	326,000	91
McArthur Farms, Inc. #4	Okeechobee	12	5,864	323,636	94
Milking R Dairy	Okeechobee	13	6,409	297,273	95
Aprile Farms	Temple Terrace	14	5,775	389,231	93
Dairy Production System #1	Bell	15	6,170	395,000	93
Levy County Dairy	Chiefland	16	6,244	392,222	92
Ten Mile Grade Dairy	Zolfo Springs	17	14,083	202,500	92
Ronnie Land Dairy	Mayo	18	7,575	391,250	93
Dairy Land Dairy	Mayo	19	8,980	358,000	92
Shenandoah Dairy	Live Oak	20	9,173	370,000	96
TOP 20 AVERAGE			5,624	332,028	94
FLORIDA AVERAGE			23,521	466,886	92

(*) Indicates consecutive years on Top 20 Honor Roll

NOTE: "Top 20" producers were determined by multiplying the average annual bacteria count (SPC) by the average annual somatic cell count (SCC). To be considered for the "Top 20", a producer must have met the following minimum standards during the year:

a) No drug residue violations.

b) An average inspection score of 90 or more.

c) An average bacteria count of less than 15,000/ml.

d) An average somatic cell count of less than 400,000/ml.

2004 DHIA Production Recognition of High Florida Herds

				RHA	RHA	RHA	Data Collection Rating	
Producer	City	Brd	Milkings	Milk	Fat	Protein	Milk	Components
CONDALE FARMS	Anthony	H	3X	25916	971	747	102.4	87.5
B&D FARMS	Greenville	H	3X	23410	861	714	96.9	63.0
NORTH FLORIDA HOLSTEINS	Bell	H	3X	22660	783	669	82.2	63.2
UNIV FLA DAIRY RESEARCH	Hague	H	3X	22652	817	667	82.6	70.4
EICHER DAIRY	Walnut Hill	H		22029	795	679	98.8	92.8
SUWANNEE RIVER DAIRY	Live Oak	H	3X	21159	718	649	99.5	89.1
J-LU FARMS	Live Oak	H	3X	20411			98.7	
SHENANDOAH DAIRY	Live Oak	H	3X	20201	708	607	96.6	89.0
DAIRY PRODUCTION SYSTEMS #2	Bell	H	3X	19910	702	589	96.5	88.9
SUWANNEE DAIRY, INC.	Live Oak	H		19835			99.2	74.9
AURORA DAIRY GROUP FL UNIT 3	Morriston	H	3X	19448	707	579	96.8	89.1
VANWAGNER DAIRY	Citra	H		19389	666	585	99.6	93.9
MILK-A-WAY	Brooksville	H		19122			73.8	
T.J. SMITH & SON DAIRY	Brooksville	H	3X	19021	655	583	96.6	89.0
SHIVERS DAIRY	Mao	H		18889			93.8	
BRANTLEY DAIRY FARM,INC	Live Oak	H		18783			99.3	
CALVIN JOHNSON	Jacksonville	G		14153	634	473	99.5	93.8
REX RUN FARM	Hawthorne	J		14088	655	494	99.6	94.1

Production as of December 31, 2004

Southeast DHIA - Testing cows in Florida and Georgia

2004 Florida DHIA Herd Performance Averages*

	1993	1995	2000	2001	2002**	2003***	2004
No. Cows	55,648	43,476	37,278	33,488	30,879	56,366	57,510
No. Herds	122	90	57	52	47	92	82
Average Herd Size	456	483	654	644	657	613	698
% Days in Milk	86	87	86	84	85	84	84
Pounds of Milk	17,761	17,906	19,054	18,661	19,461	18,160	18,307
Peak Milk - 1st Calf (lbs./day)	67	68	71	69	72	70	68
Peak Milk - 2nd & Later (lbs./day)	88	87	88	87	87	88	87
Fat %	3.5	3.7	3.5	3.6	3.7	3.8	4
Pounds of Fat	622	656	676	672	729	683	672
Pounds of Protein	592	607	610	593	599	541	546
Value of Milk ($)	2,658	2,595	2,779	3,048	3,065	2,579	3,210
Projected Minimum Calving Interval	14.1	14.4	15.2	15.7	15.6	16.0	15.6
Days Dry	69	67	72	74	75	78	77
% Cows Dry > 70 Days	19	18	19	21	21	37	36
Days to 1st Breeding	77	83	96	97	102	107	106
Days Open	148	158	183	197	194	197	192
% cows Open > 100 at 1st Breeding	14	16	29	34	22	33	28
No. Breedings per Conception	4.0	4.1	3.1	3.5	3.3	3.0	3.0
% Possible Breeding Serviced	52	48	29	26	28	26	25
Age at 1st Calving (months)	25	25	25	25	25	25	25
Age - All Cows (months)	44	43	43	44	65	44	43
% With Sire Identity	34	36	29	33	33	23	25
Average PTA$ Sires	151	67	124	147	177	86	149
Average PTA$ Service Sires	210	141	111	298	329	344	354
% Left Herd	40	40	32	33	34	39	33

* September 30, of the respective year
** Cows in Herds on official types of test (01 - 34)
*** Cows in Herds on all types of test (01-74)

Frequent Milking in Early Lactation: Considerations for Implementation

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Take Home Messages

- Labor availability and parlor capacity are key factors when considering a change in milking frequency.
- Increases in early lactation milking frequency may provide a better return when labor supply is limited than 3X milking.
- Cow movement and time budgets must be optimized for any increase in milking frequency to succeed.

A number of management factors need to be evaluated when a shift in milking frequency is under consideration. Besides the obvious labor supply and schedule questions, these include nutritional factors such as feed availability and time at the bunk, cow movement and distance to the parlor, and throughput of the milking system. In addition, when to implement the higher frequency of milking, throughout lactation or only in the early weeks, is also a factor that must be considered. While not an exhaustive list, the objective of this paper is to highlight major decision points that require investigation before movement from the typical twice daily (2X) schedule is implemented.

As with other mammals, when cows are milked more frequently they produce more milk. Because milk yield is ultimately a function of the number of mammary epithelial cells that are active and the relative metabolic activity of those cells, it is reasonable to expect that more frequent milk removal influence both of those endpoints. However, <u>when</u> in the lactation cycle mammary cell number versus metabolic activity is affected may differ. More complete knowledge regarding when and how frequency responses change during lactation will allow for more appropriate management decisions to optimize production and profitability.

The most common milking frequency of 2X removal likely evolved as the trade-off between labor efficiency and milk output. Twice daily milking provides significant yield advantage over milking once a day, and that advantage is magnified as the absolute level of production increases. For example, the depression of yield that occurs with a decline to once daily milk removal has been estimated to be as little as 20%, yet most of the studies examining that effect were completed in late lactation cows, at relatively low production levels, and under challenging nutritional conditions of late season pasture. Though direct comparison of 1X versus 2X milking under conditions more typical of North American management is not available, it is likely that yield depression on 1X would far exceed the 20% reported.

In contrast to the 1X vs. 2X comparison, a number of studies have compared 2X to 3X and greater frequency under intensive management conditions. Summaries of those experiments suggest that an average increment of 8 lb/d of milk can be expected throughout lactation with 3X compared to 2X. Because the increment is fixed over a range of production levels rather than increasing as production rises, the 8 lb/d value (or less) should be used in economic decisions rather than a herd specific value based on an expected percentage increase. Using percentage increases, particularly in higher production herds, can result in overestimation of the expected increase in production as well as inaccurate estimations of feed resources required to support that production response. The same consideration should be applied to continually milking 4, 5 or 6X.

Rather than milking cows at a higher frequency than 2X over the entire lactation, recent studies suggest that cows milked at a frequency of 4 to 6X in early lactation, and then returned to 2x or 3X, continue to produce more milk throughout the remainder of that lactation. For example, one study compared a 6X frequency to 3X frequency for the first 21 days of lactation, from which time all animals were milked 3X until they went dry. Cows in the 6X group produced over 2000 lbs. more milk than the 3X cows, and the higher yield persisted long after they were returned to the 3X frequency. Similar effects on persistency have been noted when cows were milked 4X for the initial 21 d in milk and then milked 2X. That is, the 4X cows produced more milk when milked at the higher frequency, and continued to yield more milk than 2X cows through 40 weeks of lactation.

Potential Collateral Benefits

In addition to the positive milk yield responses, there are some other potential benefits that may accrue from increasing milking frequency, especially in the early lactation phase. Some studies indicate that higher milking frequencies are associated with improved udder health. The most common endpoint for udder health is somatic cell count (SCC) or score. Relative to 2X, cows milked 3X over the entire lactation have lower SCC. There is some evidence that even the transient high frequency milking in early lactation, i.e. 4-6X for the first 21 d in milk, can produce persistent reduction in SCC well into lactation. In situations where premiums are offered based on milk quality, lower SCC must be considered as another potential revenue benefit to offset additional costs of implementation.

Although less tangible, behavioral benefits of higher milking frequency have also been noted. Increasing the number of visits to the parlor may accelerate training of first lactation animals to the parlor and milking procedures. Because transition cows tend to be immuno-suppressed relative to later lactation animals, they are prone to a variety of diseases, both primary and secondary to an infection. Surveillance of cows during this critical period, including temperature monitoring, is useful to detect and treat disease events early and limit the overall effect on the cow. Thus the increased number of observations on a cow that is milked at a higher frequency should provide for earlier detection of problems and limit progression of those incidents.

Cost Considerations

The major cost factors associated with higher frequency milk removal are feed, labor, and supplies and utilities associated with each milking. With regard to diet, it appears that increasing milking frequency does not require a change from normal feeding practices. That is, cows fed ad libitum will increase intake to meet the greater caloric demand of higher milk production. In fact higher intakes in early lactation have been observed with higher frequency milking in early lactation. Of interest there is little indication that 3X milked cows consume more feed than cows milked 2X in the same study. However, the duration of those studies that directly compare 2X to 3X feed consumption may not have been extended into lactation long enough for significant divergence in intakes to appear. It is likely that 3X cows will have to replace body condition in later lactation and so increased intake should be assumed and budgeted for. Further, any factors that limit feed consumption, either physical (e.g. bunk space limitations) or environmental (e.g. heat stress), are likely to have a negative influence on the ability of cows to respond to higher frequency milking no matter what stage of lactation that it is imposed on.

Labor cost and capacity must both be considered before shifting to a higher frequency scheme. Moving from 2X to 3X is often viewed as a low input approach to improve production efficiency. Certainly it is expected that returns from 3X milking will cover variable input costs (Table 1 and 2), but capacity of the labor supply to sustain a 3X schedule may vary by farm and cow number in particular. In the case of a single owner-operator milking 100 cows, implementation of 3X is likely to be impossible to sustain, yet a 2X/4X system may be easily integrated into the schedule, and ultimately produce 60 to 70% of the revenue of 3X (Table 1). Conversely, a dairy milking 1200 cows 2X may be able to add a shift of milkers to increase to 3X, if there is a reliable supply of labor available.

Management Factors

An area of concern with greater milking frequency is that of time budgeting for other activities to support optimal lactation. Research suggests that cows spend approximately 21 hrs/d resting, ruminating, and feeding, so it is easy to envision a situation where doubling the frequency of milking could negatively impact a cow's ability to meet baseline needs for performance. It is critical that factors such as distance traveled to the parlor, relative mobility (i.e. lameness), and standing time on concrete in the holding pen be managed appropriately so that a response is not negated by other limitations. Particularly in the case of fresh cows milked at high frequency (i.e. 4X to 6X), time away from stalls, feed and water should be minimized. Fresh cows should be housed in a pen close to the parlor, grouped so that extra time in the holding pen is minimized, and lame cows may not be candidates for increased milking frequency. Indeed, even if cows are typically milked 3X (or more) for the entire lactation, managers may want to consider penning lame cows separately and reducing the number of milkings for that group in order to maximize their ability to rest and feed.

Milking frequency is just one of a number of management options to increase milk yield per cow so how does it impact responses to other techniques such as bST or photoperiod? There is evidence that increasing milking frequency, either early or throughout lactation can be effectively combined with bST with the expectation of an additive response. Many producers use long day photoperiod to increase milk yield, yet there are no studies that have directly examined the combination of greater milking frequency and extended light exposure. While there is no reason to believe that well-fed cows would not respond to higher frequency milking and long days, it is critical that lights not be left on continuously to sustain the response. That is, the increased milking frequency must be accomplished within the constraints of an 18 hr light period so that cows will continue to have a 6 hr period of darkness. Heat abatement that prevents declines in milk yield can also be combined with greater frequency, though again care should be taken to ensure that cows are exposed to fans and soakers in holding pens if they are spending more time there.

A number of milking system and performance factors need to be evaluated before increasing milking frequency. The first question should relate to parlor capacity and flow dynamics. If parlor capacity is already maximized, then increasing milking frequency early or throughout lactation may not be an option. But milking cows more frequently in early lactation requires less capacity than if the frequency is maintained throughout lactation, because only 8 to 12% of the herd will be fresh at any point. Another important area to evaluate is milking system settings. Particularly when milking at 4Xor 6X, the additional milkings may lead to teat end damage if they are continued to long into lactation. If the extra milkings are not at even intervals, the cows may experience a less robust oxytocin release, and milk ejection may be delayed. This can lead to periods of low flow at the beginning of milking. At the end of milking care must be taken to avoid excess manipulation of the teats from over milking. Thus, flow rates for automatic take-offs should be set at the higher rather than lower end of the scale so that teat end strain is avoided.

Examples

Given the previous discussion it is useful to develop some examples for the decision process producers may encounter as they consider a management shift from 2X to another milking scheme. First, let’s examine a herd of 100 cows, where all labor is provided by the owner and the family; a typical situation on many dairy farms in the upper Midwest and Canada. Parlor size is sufficient to support additional throughput of cows, and feed resources are adequate for more cows or greater intake of cows already on the farm. With a desire to optimize cash flow and production efficiency, the question becomes should they go from 2X to 3X or 2X/4X fresh cows? Or, should more cows be added? Critical areas to review for the decision are housing and labor. In the case of housing, the barn has 100 freestalls, so even though additional cows could likely be accommodated in the parlor, overstocking would be necessary in the barn. Labor is the larger issue, as there is no extra labor to assist with the third milking, and even with hiring a milker the revenues of 2X/4X are expected to be about 70% of all cows being milked 3X (Table 1). Therefore, 2X/4X is likely to be the choice for this producer over 3X, even though the daily cost of the extra milkings in early lactation is not profitable. That is because the cost is recovered from milk revenues after frequent milking ends at 21 days, whereas 3X milking requires sustained input throughout lactation.

Table 1. Comparison of predicted milk response and potential economic benefit from derived from milking all cows 4X for the first 21 days of lactation, or milking all cows 3X for the entire 305 day lactation, in a 100 cow herd. Note that labor and supply costs are presented on a per day of treatment basis (i.e. for 21 d in 2X/4X), but are spread over 305 days for the calculation of lactation returns.

	2X/4X Day	2X/4X 305 Day	3X Day	3X 305 Day
Additional milk/cow	4 lb	1220	8 lbs	2440 lbs
Labor[a]	$0.42	$17.50	$0.20	$61.00
Feed[b]	0.14	$42.70	0.28	85.40
Supplies, utilities[c]	0.12	$2.52	0.06	18.30
Milk revenue[d]	0.44	$134.2	0.88	268.40
Marginal profit/cow[e]	-0.24	71.48	0.34	103.70
Marginal profit/farm[f]	$-24.00	$7,148	34.00	$10,370

[a] Labor cost of $10/hour and 4 turns/hr; 2 parlor turns/d for 2X/4X of 12 cows, 8 turns/d for 3X of 100 cows.

[b] Dry matter at $.07/lb; 0.5 lb DM for each lb of milk increase.

[c] Cost for supplies for an extra milkings including dip, towels, utilities, detergent, and sanitizer.

[d] Milk at $11.00/cwt.

[e] Estimate is for each day of a typical 305 day lactation, during and after milking frequency treatment is imposed.

[f] Calculated from profit/cow for 305 day lactation for 100 cow herd.

Next let's look at a herd of 600 cows milked in a double 20 parlor. Cows are currently milked 2X, but the herd size will be doubled over the next 12 months to better utilize the facilities on hand. Milking parlor capacity is in excess now, and a good labor force is available. As indicated in Table 2, the best option now is to milk 3X and milk fresh cows at the higher frequency because facilities are overbuilt and that scenario maximizes cash flow and efficiency. However, parlor capacity will be limited after expansion to 1200 cows (i.e. it will take 7.5 hrs to complete each milking), so 3X/6X would not be an option after expansion. In addition, animal movement and time away from stalls may become a negative factor after expansion because of the relatively low parlor throughput, and that would potentially limit the effectiveness of the additional milkings in early lactation.

Table 2. Comparison of predicted milk response and potential economic benefit from derived from milking all cows 4X for the first 21 days of lactation, or milking all cows 3X for the entire 305 day lactation, in a 600 cow herd. Note that labor and supply costs are presented on a per day of treatment basis (i.e. for 21 d in 2X/4X), but are spread over 305 days for the calculation of lactation returns.

	2X/4X Day	2X/4X 305 Day	3X Day	3X 305 Day
Additional milk/cow	4 lb	1220	8 lbs	2440 lbs
Labor[a]	$0.19	$3.94	$0.07	$21.35
Feed[b]	0.14	$42.70	0.28	85.40
Supplies, utilities[c]	0.12	$2.52	0.06	18.30
Milk revenue[d]	0.44	$134.2	0.88	268.40
Marginal profit/cow[e]	-0.01	85.04	0.47	143.35
Marginal profit/farm[f]	$-6.00	$51,024	34.00	$86,010

[a] Labor cost of $10/hour and 4 turns/hr; 6 parlor turns/d for 3X/6X of 80 cows, 15 turns/d for 3X of 600 cows.
[b] Dry matter at $.07/lb; 0.5 lb DM for each lb of milk increase.
[c] Cost for supplies for an extra milkings including dip, towels, utilities, detergent, and sanitizer.
[d] Milk at $11.00/cwt.
[e] Estimate is for each day of a typical 305 day lactation, during and after milking frequency treatment is imposed.
[f] Calculated from profit/cow for 305 day lactation for 600 cow herd.

This article originally appeared in the Proceedings of the 4-State Dairy Management Seminar, February 21-24, 2005

Notes

Crossbreeding: Why the Interest? What to Expect

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Summary
- Crossbreeding is the opposite of inbreeding depression.
- Inbreeding depression and hybrid vigor should be greatest for cow fertility in dairy cattle.
- Crossbreeding is NOT genetic improvement.
- Continuous use of top progeny-tested A.I. sires is essential for genetic improvement.
- Hybrid vigor is a bonus that dairy producers can expect on top of the individual gene effects from the use of top A.I. sires within breed.
- The bonus from hybrid vigor should be about 6.5% for production and at least 10% for fertility, health, and survival of dairy cows.
- Crossbreeding systems should use three breeds to allow for an adequate level of hybrid vigor, without the complication involved with using more breeds.

Circumstances Have Changed

Interest in crossbreeding is at perhaps an all-time high among commercial dairy producers internationally. Over the past 50 years, North American Holsteins have steadily increased as a percentage of the national dairy herd in most countries. However, circumstances have changed regarding the historical superiority of pure Holsteins compared to crossbreds. In recent years, milk pricing in most markets has continued to place an increasing emphasis on solids in milk rather than the fluid carrier. The reproductive decline of Holsteins, on both an observed and a genetic basis, has been clearly documented in most countries of the world including the U.S. Post-partum complications of Holsteins have become more pronounced in recent years in most environments. The typical Holstein cow has become too large for optimum longevity, and sometimes she has difficulty fitting in stalls that are inadequate in size.

Perhaps, most importantly, Holsteins have become more inbred over time. At this time, two bulls (Chief and Elevation) make up about 30% of the gene pool of U.S. Holsteins. Globally, the problem with the “narrowing of the genetic base” is almost as severe as in the U.S., because U.S. Holstein genetics has replaced native breeding stock internationally. As an example, one bull (Starbuck – a son of Elevation out of an Astronaut – both American) has a 20% relationship to Canadian Holsteins. Inbreeding is increasing at a constant rate of about 0.1% per year for U.S. Holsteins, and heifers born in 2004 had an average inbreeding of 5.0%. The recommendation for commercial milk production is that inbreeding shouldn’t surpass 6.25%. With an average of 5.0%, many individual Holsteins surpass the 6.25% threshold. The first negative consequence of inbreeding should be reduced cow fertility, because an inbred embryo is more likely to be non-viable and sloughed.

Introduction

The perceived decline in fertility and survival of pure Holsteins led owners of seven large dairies in California to mate Holstein heifers and cows with imported semen of the Normande and Montbeliarde breeds from France and of the Norwegian Red and Swedish Red breeds. Because the Swedish Red (SRB) and Norwegian Red (NRF) share similar Ayrshire ancestry and exchange some sires of sons, we have regarded the two breeds collectively as "Scandinavian Red". Crossbred cows began calving in June 2002, and all early crossbreds were Normande-Holstein. Montbeliarde-Holstein and Scandinavian Red-Holstein crossbreds began calving about one year later than the Normande-Holstein crossbreds. Some cows in the seven California dairies remained pure Holstein, which has permitted comparison of pure Holsteins and crossbreds.

Production

All cows calved from June 2002 to December 2004 for a study of the production of crossbreds versus pure Holsteins. Sires of all cows were A.I. sires with assigned sire codes. Furthermore, the Holstein maternal grandsires of all cows (both purebred and crossbred) were likewise required to be A.I. sires with assigned sire codes. This edit removed all cows from the study that had natural service Holstein sires or maternal grandsires and provided for fairer comparisons. Test days for cows with 3X milking were pre-adjusted to 2X milking.

The analysis of daily production data from milk recording included adjustment for stage of lactation within breed (five 30-day intervals from calving to 150 days postpartum), age at calving, herd-year-season of calving (3-month seasons), and transmitting ability (PTA) of each cow's Holstein maternal grandsire. Effects of breed composition, sire, and cow (within breed and sire) were key factors in the statistical analysis. Table 1 has a summary of the number of daily observations from milk recording, cows, and sires represented in the production data.

Table 1. Number of observations for production.

Breed	Milk recording observations	Cows	Sires
Holstein	1,855	419	73
Normande-Holstein	1,033	231	24
Montebeliarde-Holstein	2,034	468	22
Scandinavian Red-Holstein	1,356	305	13

Results for production during the first 150 days of lactation of first lactation cows are provided in Table 2. Only results for the first 150 days of lactation are reported to date, because 305-day lactational production of cows will need to be adjusted for differences in reproductive status. Cows with very short days open are penalized for 305-day production, and cows with long days open or do not become pregnant have inflated 305-day production. Results for 305-day production adjusted for days open will be available later in 2005.

Table 2. Average daily production (2X basis) for the first 150 days of first lactation.

	Holstein	Normande-Holstein	Montebeliarde-Holstein	Scandinavian Red-Holstein
Milk (lb)	66.0	58.4	63.4	65.6
Fat (lb)	2.32	2.16	2.29	2.37
Protein (lb)	2.02	1.88	1.99	2.06
Fat + Protein (lb)	4.34[a]	4.04[b]	4.28[a]	4.43[a]
% of Holstein		-7%	-1%	+2%

[a, b] Different letters of superscripts indicate significant differences ($p<.05$)

Production was gauged as fat plus protein (lb) on a daily basis. The Scandinavian Red-Holstein crossbreds (+2%) and Montbeliarde-Holstein crossbreds (-1%) were not significantly different from pure Holsteins for production; however, Normande-Holstein crossbreds had 7% less production than pure Holsteins. Some have questioned the genetic level of the sires of the pure Holsteins; however, these California dairy producers historically have used high-ranking Holstein A.I. sires. The current PTA (November 2004) of the sires of the pure Holstein cows in this study are +1224 lb milk, +34 lb fat, +40 lb protein, despite the fact that these cows were born several years ago.

Calving Difficulty and Stillbirths

Number of observations for births was much greater than for production. Calving difficulty was measured on a 1 to 5 scale, with 1 representing a quick and easy birth without assistance and 5 representing an extremely difficult birth that required a mechanical puller. Scores of 1 to 3 were combined and regarded as no calving difficulty, and scores of 4 and 5 were combined and represented calving difficulty. Stillbirths were recorded as alive or dead within 24 hours of birth. It is important to keep in mind that calving difficulty and stillbirth are traits of both the sire and the dam.

Breed of Sire

For analyzing effects of breed of sire, dams of calves were separated into first calving heifers versus cows calving for the 2nd to 5th time. Adjustments were made for sex of calf and herd-year-season of calving. Across breed of sire for first-calf heifers, calving difficulty averaged 15.5% for bull calves and 7.3% for heifer calves, and stillbirth rates were 18.8% for bull calves and 5.6% for heifer calves. Clearly, the bulk of calving difficulty and stillbirths were for bull calves. Table 3 provides the number of births, calving difficulty rate, and stillbirth rate by breed of sire. Inadequate numbers prevented the use of Normande sires. Scandinavian Red sires had significantly less calving difficulty and stillbirth than Holstein sires when dams of calves were first-calf pure Holsteins.

Table 3. Calving difficulty and stillbirths for breed of sire when pure Holstein dams calved for the first time.

Breed of sire	Number of births	Calving difficulty (%)	Stillbirth rate (%)
Holstein	371	16.0[a]	15.7[a]
Montebeliarde	158	12.0[a]	13.2[a,b]
Brown Swiss	224	11.9[a,b]	12.0[a,b]
Scandinavian Red	1,016	5.5[b]	7.9[b]

[a, b] Different letters of superscripts indicate significant differences (p<.05)

As expected, cows calving for the 2nd to 5th time had much lower rates of calving difficulty and stillbirth than first-calf heifers. Bull calves again were much more of a problem than heifer calves. Bull calves had almost twice the rate of calving difficulty (7.9% versus 4.4%) and twice the rate of stillbirth (8.4% versus 4.3%) as heifer calves. Table 4 has number of births, calving difficulty rate, and stillbirth rate for multiparous cows. Again, calves sired by Scandinavian Red sires had significantly less calving difficulty than Holstein-sired calves. Furthermore, Holstein-sired calves had significantly greater stillbirth than all other breeds of sire.

Table 4. Calving difficulty and stillbirths for breed of sire when pure Holstein dams calved from the 2nd to 5th time.

Breed of sire	Number of births	Calving difficulty (%)	Stillbirth rate (%)
Holstein	1,241	7.7[a,b]	11.8[a]
Normande	327	9.1[b]	6.5[b]
Montebeliarde	2,385	5.7[a]	4.4[b]
Brown Swiss	527	5.4[a,c]	4.9[b]
Scandinavian Red	516	2.6[c]	4.2[b]

[a, b, c] Different letters of superscripts indicate significant differences (p<.05)

All breeds of sire had (for first-calf heifers) or tended to have (for 2nd to 5th lactation cows) fewer stillbirths than Holstein sires. Dams of all calves for the breed of sire analysis were pure Holsteins, so calves sired by Holstein sires were purebreds, whereas calves sired by bulls from the other breeds were crossbreds. Therefore, inbreeding probably caused the remarkably higher stillbirth rate for Holstein-sired calves.

Breed of Dam

To estimate differences in breed composition of dam for calving difficulty and stillbirths, breeds of sire were limited to Brown Swiss, Montbeliarde, and Scandinavian Red, because numbers of births by sires of other breeds were small and not well distributed across breed composition of dam. Therefore, all births analyzed for breed of dam were for crossbred calves. Adjustments were made for breed of sire, sex of calf, and herd-year-season of calving. Cows calving for the first time were analyzed separately. Across breed composition of dam, calving difficulty rates were 11.4% for bull calves and 4.2% for heifer calves, and stillbirth rates were 13.6% for bull calves and 2.2% for heifer calves for cows calving the first time. Table 5 has number of births, calving difficulty rate, and stillbirth rate for 2,301 first births of cows.

Table 5. Calving difficulty and stillbirths for breed of dam at first calving.

Breed of dam	Number of births	Calving difficulty	Stillbirth rate
		(%)	(%)
Holstein	1,398	9.3[a]	11.8[a]
Normande-Holstein	269	9.2[a,b]	7.8[a,b]
Montebeliarde-Holstein	370	8.1[a,b]	7.1[a,b]
Scandinavian Red-Holstein	264	4.7[b]	4.9[b]

[a, b] Different letters of superscripts indicate significant differences (p<.05)

Scandinavian Red-Holstein crossbreds (4.7%) had significantly less calving difficulty than pure Holsteins (9.3%) at first calving. Stillbirth rates tended to follow the averages for calving difficulty respective to breed composition of dam, and Scandinavian Red-Holstein dams had a significantly lower stillbirth rate than pure Holstein dams at first calving.

Survival

First-lactation cows in the seven California dairies that calved from June 2002 to October 2004 were compared for survival to 30 days postpartum, 50 days postpartum, and 305 days postpartum. Survival rates were adjusted for herd-year of calving. Table 6 has the survival rates for pure Holsteins and crossbreds. These survival rates are for 692 pure Holsteins and 1,554 crossbreds. Pure Holsteins left these dairies sooner than crossbreds, with 86% of pure Holsteins remaining 305 days postpartum compared to 92% to 93% of crossbreds.

Table 6. Survival during first lactation.

Breed	Number	30 days (%)	150 days (%)	305 days (%)
Holstein	692	95[a]	91[a]	86[a]
Normande-Holstein	465	98[b]	96[b]	93[b]
Montbeliarde-Holstein	655	98[b]	96[b]	92[b]
Scandinavian Red-Holstein	434	98[b]	96[b]	93[b]

[a, b] Different letters of superscripts indicate significant differences (p<.05)

Reason for disposal was recorded and 1.7% of pure Holsteins died by 30 days postpartum. Death percentage grew for Holsteins to 3.1% by 305 days postpartum and was more than double any of the crossbred combinations.

Normande-Holstein crossbreds (n = 118) were compared to pure Holsteins (n = 283) for percentage that calved a second time within 20 months of first calving. Only 66% of pure Holsteins re-calved within 20 months; however, 82% of Normande-Holstein crossbreds had a second calf within 20 months of first calving. This is a huge difference from an economic point of view, and likely easily compensates for the 7% lower production of Normande-Holstein crossbreds compared to pure Holsteins.

Fertility

Fertility of the pure Holsteins and crossbreds was measured as actual days open for cows that had a subsequent calving or had pregnancy status confirmed by a veterinarian. To be included in the analysis, cows were required to have at least 250 days in lactation, which means the Holsteins were a more highly selected group compared to the crossbreds, because a smaller percentage of them survived to 250 days postpartum. Cows with more than 250 days open had days open set to 250. Adjustment was made for herd-year of calving.

The 520 pure Holsteins had average days open of 150 days (Table 7), and all of the crossbred groups had significantly fewer days open. The 375 Normande-Holstein crossbreds had average days open of 123, which is a difference of 27 days from the pure Holsteins. A difference of this magnitude for fertility, coupled with the difference for survival, certainly more than compensates, economically, for the somewhat lower production of Normande-Holstein crossbreds than pure Holsteins.

The distribution of days open for cows indicated 38% of the pure Holsteins versus 52% of the Normande-Holstein crossbreds, 43% of the Montbeliarde-Holstein crossbreds, and 44% of the Scandinavian Red-Holstein crossbreds had 35 to 99 days open. Furthermore, 21% of the pure Holsteins versus only 14% of the Normande-Holstein and the Scandinavian Red-Holstein crossbreds had at least 250 days open.

Table 7. Days open during first lactation with a maximum of 250 days.

Breed	Number of cows	Number of sires	Days open
Holstein	520	76	150[a]
Normande-Holstein	375	24	123[b]
Montbeliarde-Holstein	371	22	131[b]
Scandinavian Red-Holstein	257	10	129[b]

[a, b] Different letters of superscripts indicate significant differences ($p<.05$)

First service conception rate was 22% for pure Holsteins compared to 35% for the Normande-Holstein crossbreds, 31% for the Montbeliarde-Holstein crossbreds, and 30% for the Scandinavian Red-Holstein crossbreds. All three crossbred groups were significantly different from the pure Holsteins for first service conception rate.

Conclusions and Recommendations

Dairy producers must not regard crossbreeding as a genetic improvement program – it is not! Continuous use of high-ranking progeny tested A.I. sires within breeds is essential for genetic improvement. Unfortunately, some dairy producers have viewed crossbreeding as an excuse to turn to natural service. That would be an unfortunate consequence of renewed interest in crossbreeding.

Hybrid vigor is a bonus that dairy producers can expect on top of the individual gene effects acquired by the use of top A.I. sires within breed. The bonus from hybrid vigor should be about 6.5% for production and at least 10% for fertility, health, and survival of dairy cows. Therefore, the impact on profit could be substantial for commercial milk production. Research on crossbreeding has been initiated at many of the major agricultural universities in the U.S. and around the world. The rate of increase in inbreeding of U.S. Holsteins (+0.1% per year) might make crossbreeding almost essential at some point in the future.

Crossbreeding systems should make use of three breeds. Use of two breeds limits the long-term impact of hybrid vigor, and the use of four breeds limits the long-term contribution of any single breed to herd composition and makes the mating system more complex. The three breeds should be carefully chosen for the unique conditions (facilities, climate, nutritional regime, management system, and level of management) of a specific dairy operation to optimize a crossbreeding system.

Notes

How to Make the Most of my Multicultural Workforce

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The success of a dairy operation today results from the right people doing the right things. As dairies grow in complexity –just like any other agricultural and business enterprises- managers are forced to expand their functions and deal with labor issues like never before. Managers are faced with the challenge of attracting the right person and subsequently develop and retain employees able and willing to perform their jobs.

To meet the workforce demands in different regions, dairies have hired Hispanic people to assist on the farm. As a result, a multicultural environment is created and Hispanic employees become a very valuable part of the workforce. The fundamental goal of the manager turns out to be the establishment of an environment that promotes productivity. This is a setting that values differences and facilitates communication. Ultimately it is creating a “way to do things” unique to the operation that allows the team to reach common objectives.

Dairy Management: A Paradigm Shift?

By definition managers ought to use resources effectively. As a consequence, oftentimes energy is exclusively directed to those material resources, overlooking the one that makes other systems work: the human resource. Managers have been forced to expand their role to become “Managers of People” more than only resource, or cow managers. We can say this is a Paradigm shift, from managing cows to leading people.

We could summarize the role of the manager in 5 broad functions:

1. Planning. Developing the business purpose, philosophy, goals, and strategies.
2. Organizing. That is establishing a system of roles that allows achieving goals. It involves defining and dividing work.
3. Staffing. Attracting, developing, and retaining people able and willing to perform the jobs
4. Leading. Directly influencing people and facilitating their work.
5. Controlling. This is assessing results against objectives and correcting where required.

(Rosenberg, 2002)

In the end, managers need to make things happen through people. And this is where a manager can become a leader. Perhaps the most important function in this sense would be the ability to guide people; the ability to inspire employees by setting a compelling example. A leader understands where the business wants to go and in communicating this vision provides perspective and gives a sense of purpose and meaning to what people do (Estrada and Morales, 2001).

A Brief Comment on Cultural Differences

The workforce demands in different regions of the U.S. have motivated dairies to hire Hispanic people. This creates a setting where employees speak different languages and share their diverse cultural backgrounds. In a very practical way, the manager needs to make sure that her team is productive and effective. A manager needs to communicate what needs to done and how. Therefore, she needs to overcome language, and cultural barriers. It is the role of the manager to promote an environment that respects and values the cultural differences of individuals. A first step is to be open to see certain behaviors as just different instead of judging them as “better or worse than my own.”

For example, when communicating, we could notice a tendency to see the following differences:

	Anglo- American	**Hispanic**
Communication	Exchange information	Build relationships
Distance (speaking)	2 ft	Closer
Touch	No need, at times uncomfortable	Sign of friendship, hugging, shake hands
Meaning	Derived from words	Derived from context (setting, status, nonverbal)

Please keep in mind there is no right or wrong way. It is impossible to label people or define behavior exclusively by culture, education or experience.

In an attempt to understand the reasons for some differences, we can consider four dimensions that can be compared from one culture to another:
1) Power Distance, 2) Collectivism vs. Individualism, 3) Femininity vs. Masculinity, 4) Uncertainty avoidance (Hofstede.)

A detailed description goes beyond the scope of this paper. We could mention that in general terms, in Latin American countries there will be a greater power distance between groups which causes those in authority to be more respected and not questioned. These societies tend to be more collective which means that interaction at work is important and expected, relationships are placed before business or tasks, there is an important sense of belonging (family, friends). These characteristics contrast with the U.S. more individualist society where the individual success prevails over the group, children are taught to be independent, employees want to be seen as individuals. The Hispanic culture would be more feminine, which means more emphasis on people and warm relationships, a high sensitivity to insult and the establishment of a friendly workplace. For more information please refer to the excellent review by Maloney, 2004

Managers can better relate to and guide their Hispanic or multicultural workers when they care and make an effort to understand some of these differences. They can even use them to motivate. Little details can go a long way, for example recognizing important dates such as the Independence Day of their countries, birthdays and other celebrations and promoting group interaction.

The Culture of the Business

From a dairy management perspective we will now use “Culture” or “Business Culture” to describe “the way we do things around here.” The culture of the organization is the set of norms and values, the ways to act, react, and handle problems.

Every business develops a culture. Sometimes there is a conscious effort, other times it happens mechanically and even unwillingly by repetition. Let me illustrate this. There may be rules to be on time for milking, or to speak respectfully, or to handle cows with care. What happens when some of the employees with more experience are often late with no consequences? What is really acceptable when the herdsman is allowed to insult subordinates? What is the culture if nobody reacts when an impatient worker hurts an animal? In the end the culture of the business is the way we do things and is to be cultivated all the time.

Employees learn the culture through “heroes” or exemplary actions; through language and symbols such as pictures, logos, dress; through stories and rituals, such as the celebration of accomplishments, anniversaries, and birthdays. (Erven, 2004) Having regular meetings, a clean working place and recognizing labor special efforts become all part of the culture.

When dealing with employees from different backgrounds e.g. Hispanic Labor, the business culture can play an even more important role. There is a greater sense of collectiveness, a need to belong to a group and to be accepted. A strong positive culture provides the needed framework. It sends a message without words about the accepted behaviors such as timeliness, respect, accountability, and valuing opinions. Hispanic individuals, Latin Americans and other “high context” groups are highly sensitive to this kind of unspoken communication. The take-home message: Communicate the business culture with words, but more importantly live the culture with consistent actions.

Making Things Happen

The manager of a dairy is ultimately responsible for reaching productivity and business goals. To do that he needs to communicate, guide, control and monitor the different aspect of the system. A multicultural environment enjoys the benefit of having diverse ways of looking at things, different experiences that can be applied to solve problems or improve. On the other hand a multicultural labor force also presents challenges with communication and organization. The following are ideas of tools to help smooth the process, increase consistency and facilitate communication. They are useful in any dairy, but they might be even more significant in dairies with employees of diverse cultural backgrounds:

1) Develop a simple but informative employee handbook.
2) Define the needs of the dairy and develop job descriptions.
3) Establish Standard Operation Procedures
4) Establish a formal training program.

1) Employee Handbook. Include a welcome statement, organization chart, mission of the business, general guidelines and norms of conduct. Include also policies, safety norms, information about benefits and wages.
2) Job Descriptions are an important management tool. They define responsibilities and clearly describe what the job is. Well-designed jobs make sure that the necessary work is done timely; in addition they can keep employees challenged and motivated. Job descriptions also provide a means for evaluating job performance. When a farm hires Hispanic Workers, the language barrier increases the need for maximum clarity about what is needed and expected. Job descriptions can enhance communication and facilitate the definition of goals and responsibilities. A written job description can become an excellent reference, and base for training and evaluation. The job description generally includes the title of the job, a brief summary of the job, relationships, working conditions and salary. To better communicate, some dairy operations are providing a job description both in English and Spanish. Include a clear job title, a job summary, the job responsibilities, relationships, working conditions and salary.
3) Standard Operating Procedures (SOPs). These materials both in English and the language of the employee (in this case Spanish) help create a mental image of the tasks to be performed. They are excellent training tools and they set the ground for evaluation.
4) Training in a dairy should be an ongoing and active process. It could be narrowed down to five points: Explain, Show, Practice, Observe, Praise (Blanchard, 1994):

    1. Explain. Describe the procedure and explain why each step is important. It needs to be clear and delivered in a simple manner.
    2. Show. This is demonstrating every step of a procedure paying special attention to the key points.
    3. Practice. Let the employee try. This gives a great opportunity to answer any questions he/she could have. It could be necessary to show certain points again, but investing time here will prevent future misunderstandings.
    4. Observe. Make sure that the procedure is being implemented correctly. It is easier to modify behavior early in the process than trying to change habits developed over a long time.
    5. Praise. Praise for a job well done. Even if you need to correct some steps, praise for the ones done right and help the employee modify whatever is needed.

Dairies have the opportunity to make training a great motivator, because it helps the employee understand the importance of her job. Training can trigger new interest in employees and open opportunities to take new roles. Training can also help workers see the big picture and imagine the future. In a multicultural environment communication is a challenge. The nature of the dairy operation usually restricts the time available for training and limits the attention span of the audience. Every individual will also show a preferred learning style. Usually the trainer doesn't know the student that well and therefore is better to send a message touching as many senses as possible. With time managers can identify individual needs, but in general, there are a couple factors to consider with a diverse workforce. Román-Muñiz mentions that based on the collectiveness sense of Hispanic and Latin American labor, an ideal training environment is group learning. Creating an environment where they are invited to ask questions and even to disagree is important. The concept of "power distance" refers to the degree to which power, prestige and wealth are unequally distributed in a culture. According to Wlodkowski, for the Anglo American the sense of power distance is relatively low, but for Latin American countries it can be greater based on the magnitude of inequity of power and wealth (Wlodkowski, cited by Román-Muñiz, 2004.) That means that the laborers could see in the trainer (farm manager, veterinarian, farm owner) an authority far separated from them. To improve communication, an environment should be created, where everyone is welcome to share experiences and points of view without fear of negative consequences. A very common complaint I hear from workers in dairies is that management will not listen to them: "they either don't have the time, or don't think it is important."

The Manager as a Leader

Let's go back to the five broad functions of the manager: planning (forces me to define goals and vision), organizing (sets the ground to reach those goals), staffing (not only attracting, but also retaining and developing people), leading and controlling. Controlling refers to assessing performance against objectives. It involves providing feedback, negative feedback to correct, but also positive, to reinforce. Positive feedback is in itself a form of recognition, a very powerful way to motivate employees, particularly employees from a Hispanic background.

Now let's talk briefly about leading. As a manager this can be the most important function long term, for the business and the workers. The best leaders in a dairy operation inspire their employees. This is a great responsibility but a very rewarding one. It helps management stay focused and enthused at the same time as it is inviting people to follow. Management needs to lead by example. "I expect my employees to complete every task they committed to perform, by the same token I don't break my promises and I make every effort not to forget what I offered."

The manager as a leader is charged with helping workers develop and enrich their jobs. A good way to help employees understand the importance of their role is to ask them to put together a task list for the different days of the week. Ask them to rank tasks in order of importance. Compare it to what you think should be a regular week of work. This process actually makes employees contribute in the design or redesign of their jobs. This simple analysis will give the employee a sense of ownership and control; done right it will even identify areas for improved efficiency. This could be the first step in keeping people motivated and challenged. It could result in employees wanting to enrich their current jobs and take on more responsibility.

As a leader, the manager should communicate a compelling vision. Employees in dairies many times feel isolated from the rest of the business. Language differences can accentuate this isolation. A good example is the one of milkers who spends many hours in the parlor with little communication with the rest of the operation. When these employees are able to see their jobs as a very important component of a “bigger whole”, it will be easier for them to feel proud of it. When they know they are valued, it will be easier for them to contribute ideas to improve the operation. This is important with any labor team, but it could be even more powerful with a Hispanic group.

As a leader, you set expectations: Expect a lot from your employees.

Research shows there is a powerful influence of one person’s expectations on another’s behavior. It has been proven that the way managers treat their subordinates is subtly influenced by what they expect of them. So, when managers’ expectations are high, productivity is likely to be high. It could be said that the way a subordinate performs is largely determined by what the manager expected of that person (Livingston, 1988).

A Final Comment

With dairies growing in complexity the workforce demands increase and often times a multicultural environment is created. The manager of a dairy is suddenly dealing with labor issues like never before. The role of the manager has been expanded. Although the cow remains the central figure in a dairy, the intricacy of the operation requires management to divide tasks, to delegate and depend on more people. A new level of organization and communication are needed to be effective, a new level of leadership. Enjoy being that leader, communicate your vision of the business, help people develop and contribute, inspire them to reach common goals. As a manager you are challenged with making the most of the workforce: a great responsibility but a very rewarding one.

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Notes

Reducing Variability in Your Breeding Program Using a Systematic Approach

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Take Home Messages

- Consistent and persistent timed insemination programs can improve reproductive efficiency.
- Reproductive parameters typically analyzed through DHIA records will not show improvement for at least one year after implementation of timed AI programs.
- PreSynch and CoSynch alone improved reproductive efficiency at the University of Illinois Dairy, but increase emphasis on improving heat detection is warranted.

Reproductive efficiency on dairy farms is dependent on cows being presented for breeding or service. Most farms rely on someone to provide artificial insemination (AI) for their cows. Some farms still use a bull for primary service, but most often, bulls are used to “clean up” any cows that did not conceive after several attempts at AI. Assuming that all cows are bred by AI on first service, the success of the breeding program will depend on the proportion of cows presented for service as soon as possible after the voluntary waiting period (VWP). Traditionally, heat detection has been the means by which cows are initially presented for AI service. You would have to follow each individual cow around for 24 hrs/day for 21-24 days to detect each and every heat. Even then, you could not expect to achieve 100% heat detection due to all the variables involved with expression of estrous. With the introduction of reproductive schemes that not only synchronize heats but also synchronize ovulation (OvSynch), we can achieve nearly 100% service rates within 21 days of the voluntary waiting period.

Beginning in September 2002, the University of Illinois Dairy implemented a timed breeding program. All fresh cows were started on a PreSynch/CoSynch program and any open cows were started on just the CoSynch program. The VWP was moved from 45 days to 60 days and the program was designed to have all fresh cows receive their first service between 61 and 67 days in milk (PreSynch/CoSynch). The program was also designed so that cows were only locked up twice a week, on Tuesdays and Thursdays (CoSynch). Cows not conceiving to the first service were re-bred on observed signs of heat within 18 days after the initial AI. Weekly herd checks were performed and first pregnancy check was done at day 33 post breeding. Cows found open by rectal palpation were restarted on the CoSynch program. Table 1 below outlines the breeding program we have followed for the past two years.

The success of the program can be seen in the Figures 1 and 2. Because many reproductive parameters have statistical momentum, typically there is a lag in time before improvements can be seen once a new management program is implemented. Historically, the average days to first service (ADFS) hovered around 80 days prior to the program (Figure 1). Within a few months a decrease can be seen as more and more fresh cows became enrolled in the program. By November 2004, the ADFS was 66 days and this was consistent across all lactation groups. Initially, the average days open (ADO) decreased to a historical low of 135 days, but climbed significantly as many cows late in lactation became pregnant through the new reproductive program (Figure 1). Now in the second year of this breeding program, the ADO has dropped dramatically and is averaging 120 days for the whole herd.

The services per conception for pregnant cows and all cows can be seen in Figure 2. Historically, services per cow was never below 4 and often exceeded 4 services while services per pregnancy hovered around 2.5. Services per conception peaked at 5.5 for all cows and 3.3 for pregnant cows one year after the program was initiated. Concern was voiced regarding the amount of semen required to maintain the program. Much of the increase in units of semen used was required to catch cows up to the program. In year two, as the whole herd entered the program after calving, the services per conception began to fall. As of November 2004, services per cow is at a historic low of 3.4 and services per pregnancy is also historically low at 2.3 and falling.

The nine month 21-day pregnancy rate has also improved over the past two years. Table 2 shows the current 21-day pregnancy rate by days in milk at service as of November 2004. Almost all (94%) of first services are by CoSynch at 61-81 days in milk (DIM). At that first CoSynch service, 31 percent become pregnant. Heat detection is required to present cows for service at the second cycle (82-102 DIM). Only 19 percent of eligible cows are detected in estrous and only 3 percent of cows eligible for pregnancy during that time frame become pregnant. During the third cycle (103-123 DIM) after the VWP, 77 percent of cows are presented for service due to a second CoSynch program. Pregnancy rates for this cycle are 30 percent. The following cycle (124-144 DIM) requires heat detection for cows to be presented for service. Again, the service rate is only 33 percent and the subsequent pregnancy rate of eligible cows is only 7 percent.

Improvements in heat detection, especially 18-24 days after the CoSynch breedings would take this reproductive program to the next level. Traditionally, suggestions for improvements in heat detection have emphasized more frequent observations of cows. While this practice will, no doubt, increase the number of cows presented for service, all efforts at improving heat detection cannot be placed on more observations alone. Environment, nutrition, physiology as well as the human labor force all play a role in enhanced heat detection efficiency. Environmental factors that can reduce heat detection efficiency include slippery surfaces, time spent on concrete, time in holding pen, poor freestall design and use, over-crowding and subsequent lameness. Nutritional factors include energy balance, mineral status, feeding management that may lead to rumen acidosis and lameness. Animal factors may include socialization and grouping strategies, body condition, other diseases and physiologic problems. Fixing these problems will help the workforce at the dairy by allowing the cows to naturally express estrous behavior. Then, enhancements in heat detection efficiency rest on the labor force. Providing visible cow identification, use of heat detection aids (tail chalk, heat patches, pedometers, etc.), and making observations a routine chore can then be accomplished.

Table 1. PreSynch CoSynch program used at UI Dairy since September 2002.

Day in Milk	Hormone or Action	Days Pregnant	Day of Week
26-32	PreSynch PGF1		Thursday
40-46	PreSynch PGF2		Thursday
52-58	GnRH1		Tuesday
59-65	PGF		Tuesday
61-67	CoSynch - GnRH2 and Timed AI	0	Thursday
80-90	Rebreed if showing signs of heat	18-24	
94-100	Rectal palpation		Tuesday
	If pregnant, recheck in 7 d	33	
	If open, GnRH1		
101-107	Rectal palpation		Tuesday
	If pregnant, recheck at 90 d	40	
	If open, PGF		
103-109	GnRH2 and TAI for open cows	0	Thursday
120-130	Rebreed if showing signs of heat	18-24	
	Repeat CoSynch one more time	If still open	

Table 2. 9-Month 21-day Pregnancy Rate Summary by Days in Milk.

DIM	Heats			Pregnancies		
	# Eligible	#Observed	%Observed	# Eligible	#Reported	PG Rate
19-39	6	6	100	0	0	
40-60	13	6	46	1	0	
61-81	185	173	94	137	43	31
82-102	125	24	19	90	3	3
103-123	110	85	77	84	25	30
124-144	75	25	33	55	4	7
145-165	63	44	70	48	11	23
166-186	44	15	34	38	4	11
187-207	37	22	59	27	6	22
208-228	29	11	38	18	3	17
229-249	21	11	52	14	3	21
250-270	14	7	50	9	0	
>271	26	10	38	9	3	33
Total	750	439	59	531	105	20

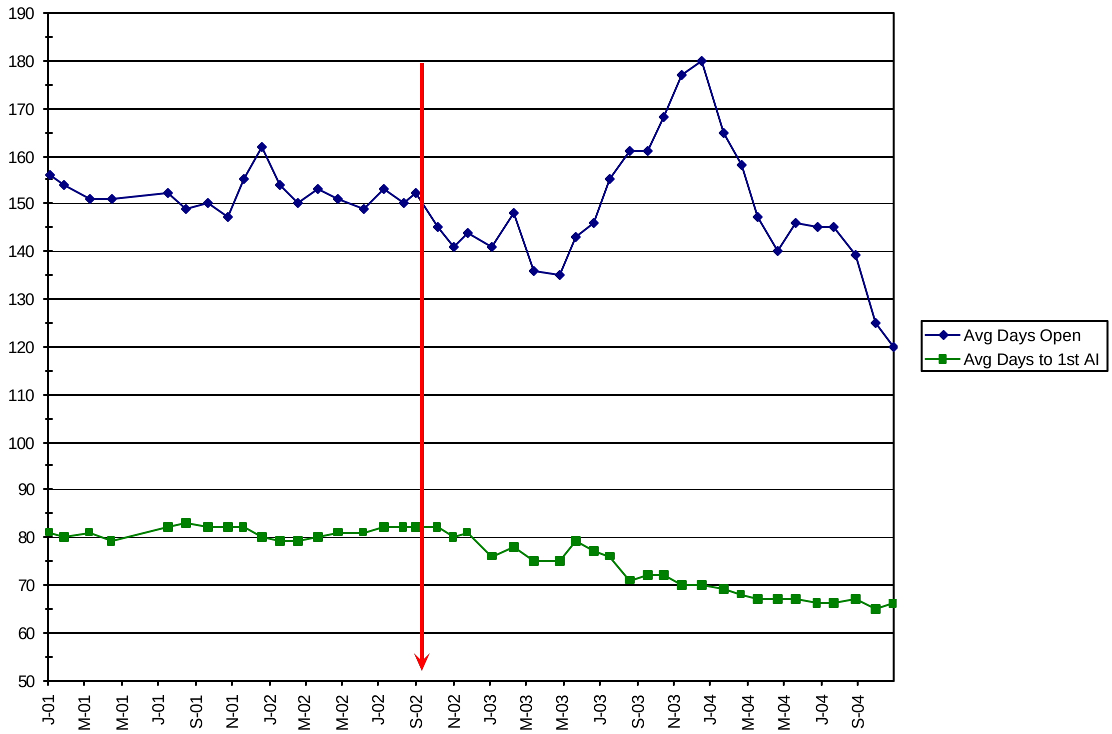

Figure 1. Average days to first service and average days open. Program started September 2002.

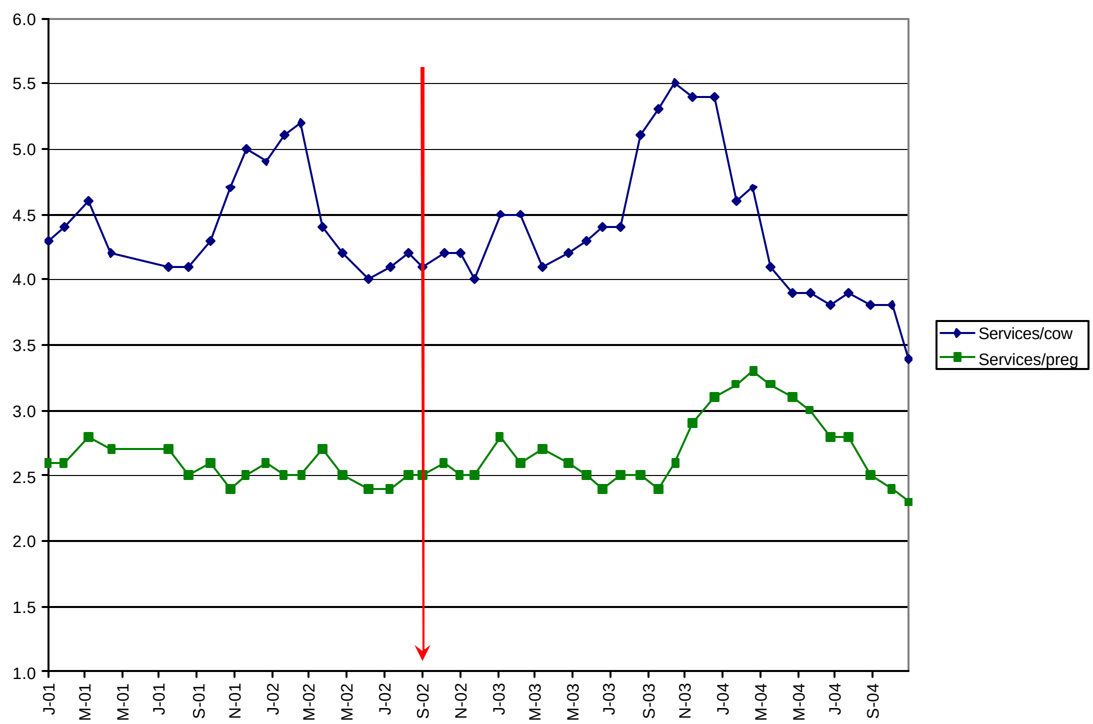

Figure 2. Services per conception for pregnant cows and all cows.

Notes

Let There be Light:
Photoperiod Management of Cows for Production and Health

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Introduction

Environmental factors influence reproduction and other productive functions in many domestic species. For example, the negative impact of heat stress is familiar to many dairy producers. For many years, poultry producers have manipulated light to enhance layer and broiler productivity (20). Management of lighting in dairy housing has recently received interest as a method to improve production. As with any management approach, there are certain guidelines that require consideration for successful implementation. The purpose of this paper is to describe the response, outline its physiologic basis, present options for implementation, and evaluate the financial impact of successful photoperiod management in dairy production.

Photoperiod is the duration of light an animal is exposed to within a 24 hr period. Animals use photoperiod to track the length of the day; in this context "daylength" is the number of hours of light. A long day is considered continuous exposure to 16-18 hr of light along with a 6-8 hr period of darkness. Experimentally, a short day is 8 hr of light and 16 hr of darkness, though under normal field conditions anything less than 12 hr of light will yield a short day response. Photoperiod is of interest to dairy producers because at least 9 published research studies show that milk production is increased in cows exposed to long days (LDPP) relative to those on natural photoperiod (Summarized in Figure 1; 2, 7, 8, 10, 12, 13, 14, 17, 18). Photoperiod also affects growth and reproduction in younger cattle (19), and recent evidence suggests that lighting affects immune function (1).

Photoperiod Physiology

Exposure to light suppresses secretion of the hormone melatonin in cows as in other species. Thus, as the length of photoperiod increases, there is a reduced duration that melatonin is at high concentrations in the blood. The pattern of melatonin influences secretion of other hormones, particularly prolactin (PRL) and insulin-like growth factor-I (IGF-I). It is believed that the changes in IGF-I are important to the increase in milk yield observed in lactating cows on long days (6, 7). In contrast, the changes in PRL observed in response to photoperiod may be the mechanism for the effects of photoperiod on dry cows that will be discussed below.

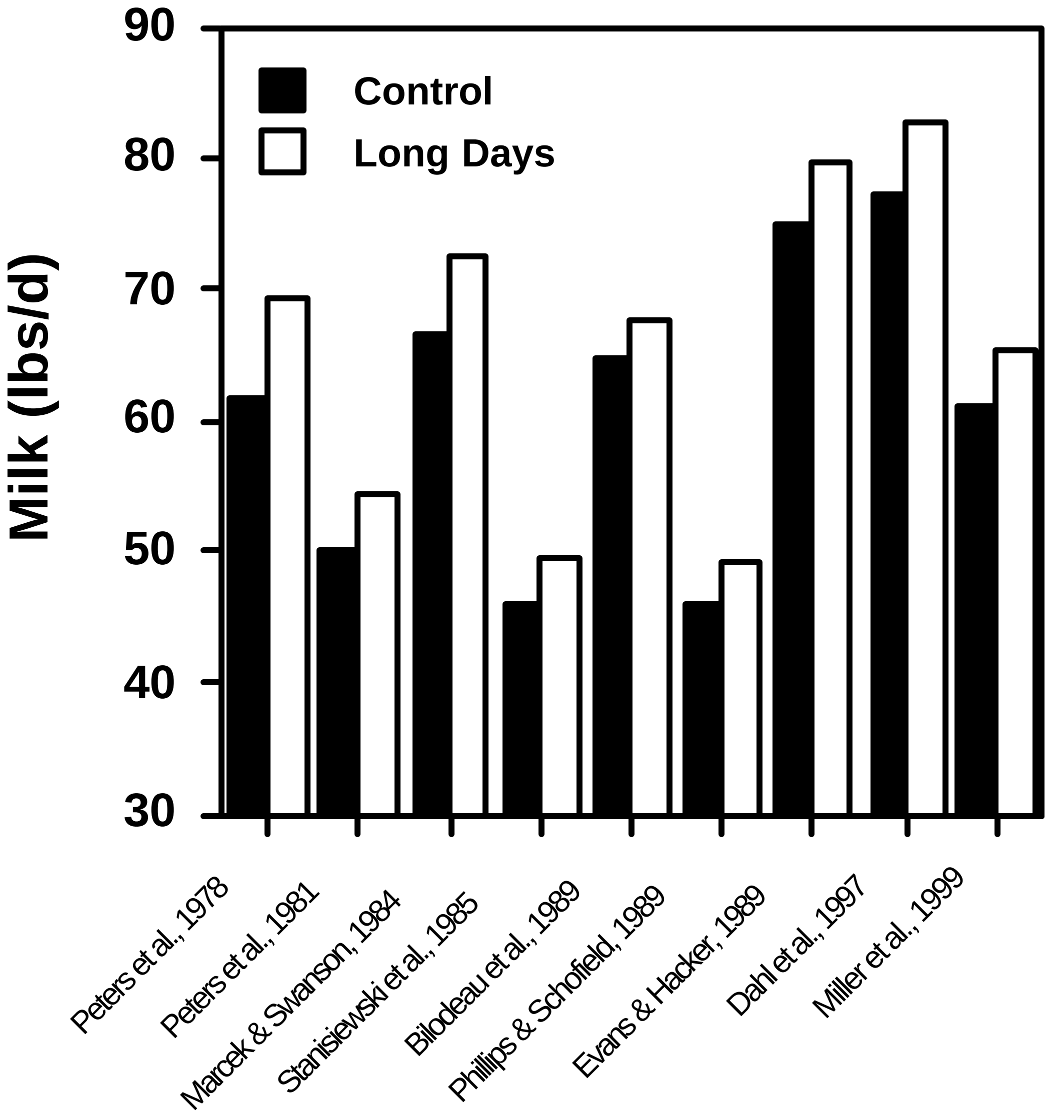

Figure 1. Summary of nine studies reporting the effect of long day photoperiod on milk yield in lactating cows.

How does an understanding of the physiologic basis of the response affect the implementation of photoperiod management? A common misconception about the basis for the response is that lights can be placed only over the feedbunk in a freestall. But, cows do not respond to photoperiod by eating more and then producing more milk. Rather, cows experience a physiologic stimulus to produce more milk and then dry matter intake increases to support the greater milk yield. Because cows spend the majority of their time lying in stalls rather than at the bunk eating (4, 5), putting lights only over the feed alley is severely limiting the exposure to extra lighting.

Cow Responses to Light

As with most management interventions, there is a range in response to LDPP. However, a typical response is 5 lbs/cow/day. Note that the response does not become apparent right away; it usually takes 4 weeks to observe a change relative to normal daily variation in milk production. A metric for producers to use to gauge the response in their cows is the “150 day” or “management level milk” value from DHI records. This allows for comparison of a herd’s response to lighting if all other factors are held constant.

After review of all the published data on the lactational response to LDPP, it is clear that long days stimulate milk production across production levels. For example, cows in the experiment with the lowest average yield of 45 lbs/day had increased milk production to a similar extent as cows in the experiment that averaged 77 lbs/day (Figure 1). In addition, the response appears to be fixed, in the range of 4 to 6 lbs per day. With regard to milk components, there is no effect of photoperiod on milk lactose, protein, or solids. Slight variance in fat has been observed, with an increase in one experiment and a decrease in another. In general, there is no effect on fat or other components. Remember that milkfat yield will increase in response to longer photoperiod, even if there is a slight reduction in milkfat percentage. Similarly, yields of other components will increase as milk yield increases.

As with any stimulation of milk production, LDPP treatment will pull an increase in dry matter intake (DMI), but in response to higher milk production rather than the opposite. In other words, cows don’t eat more and then produce more milk. Rather, they produce more milk and consume more feed to meet the increased demand for energy to make that milk. Given a typical 5 lb/d response to LDPP, a 2 lb/d increase in DMI should be planned for to support the higher milk yield.

Implementing Photoperiod Management

The initial step in adoption of photoperiod management is evaluation of the light presently available in the barn and other areas of housing (e.g. holding pens, outdoor feedbunks). Light is measured in footcandles (FC) or lux (lx), with 1 FC = 10.8 lx. To observe a production response in lactating cows, an intensity of 15 FC at 3 feet from the floor of the stall is recommended. Responses have been observed at intensities as low as 10 FC, but the extra 5 FC gives a buffer for dirty lamps, burned out bulbs, etc. It is critical that the dispersion of light over an area should be as uniform as possible. Appropriate dispersion can be achieved with correct mounting height and distance. Lamps are sold with a recommended range of mounting height, and a rule of thumb for placement of lamps is a mounting distance that is 1.5 times the mounting height (3). Mounting height is measured from the bottom of the lamp to a level 3 feet from the floor of the stall.

Light intensity can be measured using a light meter, which can be obtained from electrical suppliers or photographic shops; they are usually priced between $75 – 125. Light meters are simple to operate and are portable. Regardless of lighting design recommendations, all lighting systems should be tested with a light meter. Because photoperiod *management* requires light intensity to be monitored, a light meter will continue to be used after the initial installation.

What type of lighting is recommended? Responses to long days have been observed in cows exposed to fluorescent, metal halide, and high pressure sodium (HPS) lighting. The choice of lighting type should be made according to efficiency and the mounting height most appropriate to the barn. For example, in tie-stall and stanchion barns the relatively low ceilings allow use of fluorescent lights only (mounting height of 8-10 ft). In freestalls, lights can often be mounted at heights of 12 to 16 ft, thus, metal halide or high pressure sodium lamps are appropriate. One caution to the use of HPS is that many people do not respond well to the yellow light output from those lamps. Therefore, worker acceptability should be considered in lamp choices.

One question that is often asked is "How dark is "dark"?". There is limited data available on the lower limit of light that a cow can detect. However, it appears that cows can not detect light at less than 5 FC. It should be noted that cows may experience a shift in their ability to perceive light depending on the difference in intensity of the light relative to dark.

Many times, producers want to leave a "night light" on in the barn to ensure that cows find feed and water during darkness. This is not necessary, and may detract from the response. Cows are able to find both feed and water in the dark. It is important to remember that at least a 6 hr period of darkness is required, and "night lighting" may interfere with that. Low intensity red lighting (7.5W bulbs at 20-30 ft intervals; mounted 10 ft from the floor) has been used successfully for observation and movement of cows during dark periods.

One critical feature of the long day response in lactating cows is that it is not linear. That is, providing more light relative to natural daylength is good, but leaving lights on continuously is not better. As stated previously, animals use the pattern of melatonin to track daylength. In the absence of any darkness, there is no cue for relative daylength, and it appears that cows default to a short day response. Indeed, cows on continuous lighting do not produce more milk than cows on a natural photoperiod (10), likely because the hormonal shifts associated with higher milk production do not occur.

Photoperiod and other Management Practices

Although no controlled studies have been conducted to verify that cows milked 3X will respond to long days, a number of producers have combined these two approaches with success. Remember to keep a 6 hr uninterrupted period of darkness between two of the three milkings. This may require coordination of milking schedules and darkness in different sections or barns. Again, the management level milk value from DHIA records can be used to evaluate photoperiodic responses after implementation.

Long day lighting can also be combined with bST for an additive response. In an experiment reported from the University of Maryland, cows were treated with bST, long days or the combination and milk yield was compared to natural photoperiod control cows (12). Long days alone increased milk by about 5 lbs/d, bST increased milk by 10 lbs/d, and the cows receiving both produced an average of 15 lbs/d more than the control cows. In addition, cows on LDPP and bST increased dry matter intakes sooner than cows receiving bST under natural photoperiod.

In contrast to lactating cows, recent experiments from the US and Canada indicate that a short day photoperiod is most appropriate for dry cows. Cows on SDPP when dry produced 7 lbs/day more than cows on LDPP when dry (11, 15, 16). We suspect that the short days “reset” the cow’s ability to respond to LDPP in the subsequent lactation. This means that dry cows should not remain under the same lighting as lactating cows. In most situations, pasture or other facilities removed from the barn housing lactating cows will be exposed to less than 12 hours of lighting each day, and that may be enough of a decrease in photoperiod to elicit the response.

Although cows are not considered seasonal breeders, there are some subtle effects of photoperiod on the reproductive axis (reviewed in 9). Exposure to LDPP hastens puberty in heifers. In lactating cows, no direct effect of photoperiod has been observed, but seasonal effects associated with differences in photoperiod occur. Notably, cows calving in the winter, when days are short, have a longer delay in return to estrous cyclicity relative to cows that calve in summer, when days are long.

Table 1. Milk price sensitivity to photoperiod management for a typical 80 cow tie-stall barn.

Milk Price[a]	$14.00	$13.00	$12.00	$11.00	$10.00	$9.00
Milk Response[b]	5	5	5	5	5	5
Milk Income[c]	$0.70	$0.65	$0.60	$0.55	$0.50	$0.45
Feed[d]	$0.11	$0.11	$0.11	$0.11	$0.11	$0.11
Electricity[e]	$0.18	$0.18	$0.18	$0.18	$0.18	$0.18
Total Cost	$0.29	$0.29	$0.29	$0.29	$0.29	$0.29
Net Profit	$0.41	$0.36	$0.31	$0.26	$0.21	$0.16
Profit/Mo	$984.00	$864.00	$744.00	$624.00	$504.00	$384.00
Annual Profit[f]	$9,840.00	$8,640.00	$7,440.00	$6,240.00	$5,040.00	$3,840.00

[a] Mailbox price per cwt.
[b] Average response in lb per cow each day.
[c] Per cow each day.
[d] Assume 1.8 lb increase in dry matter to support 5 lb increase in milk.
[e] Electricity to power supplemental lighting 16 hr/day.
[f] Assumes response only 10 month each year.

Economic Returns from Photoperiod Management

Even in times of low milk prices, photoperiod management offers an attractive return on investment to dairy managers. Table 1 and 2 present examples of the milk price sensitivity with adoption of photoperiod management in two different types of housing options. Although LDPP is profitable on farms of every size, certain economies of scale factor in on larger farms and increase the profitability.

Table 2. Milk price sensitivity to photoperiod management for a typical 250 cow free-stall barn.

Milk Price[a]	$14.00	$13.00	$12.00	$11.00	$10.00	$9.00
Milk Response[b]	5	5	5	5	5	5
Milk Income[c]	$0.70	$0.65	$0.60	$0.55	$0.50	$0.45
Feed[d]	$0.11	$0.11	$0.11	$0.11	$0.11	$0.11
Electricity[e]	$0.04	$0.04	$0.04	$0.04	$0.04	$0.04
Total Cost	$0.15	$0.15	$0.15	$0.15	$0.15	$0.15
Net Profit	$0.55	$0.50	$0.45	$0.40	$0.35	$0.30
Profit/Mo	$4,125.00	$3,750.00	$3,375.00	$3,000.00	$2,625.00	$2,250.00
Annual Profit[f]	$41,250.00	$37,500.00	$33,750.00	$30,000.00	$26,250.00	$22,500.00

[a] Mailbox price per cwt.
[b] Average response per cow each day.
[c] Per cow each day.
[d] Assume 1.8 lb increase in dry matter to support 5 lb increase in milk.
[e] Electricity to power supplemental lighting 8 hr/day.
[f] Assumes response only 10 month each year.

Summary

Photoperiod manipulation is another management technique that dairy producers can use to improve production efficiency and profitability. A website is available at http://il-traill.outreach.uiuc.edu/photoperiod. This site contains more information on photoperiod, worksheets to assist producers in lighting design and cost analysis, expected economic returns, and other contact information.

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Notes

Update: Barn cooling, Tunnel and Otherwise

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We all know the effects of heat stress on dairy cattle in the Southeast United States. Various barn types and cooling methods have been experimented with in the last fifteen years to reduce this high stress. Last year we compared two types of fan and sprinkler barns. A tunnel barn with 50” fans, curtains and feed face sprinklers was compared with an open freestall barn with 36” fans down the length of the barn and feed face sprinklers. The results were about the same as far as cow body temperature was concerned.

New Cooling Methods for Tunnel Barns

Our first study was to compare cow body temperatures in two identical 4 row tunnel barns 700 feet in length and 100 feet wide with fans on the south end of the barns and fully open on the north end. Sidewall height was 11 feet 8 inches and peak height was 13 feet 4 inches with a 1:12 roof pitch. Sidewall curtains were closed during the experiment. One barn was equipped with a high-pressure fogging system that operated when barn temperature exceeded 80 degrees F from 9:30 AM to 9:00 PM. Feed face sprinklers were available in both barns and operated when barn temperature exceeded 72 degrees F. Cycle time was 1.6 minutes on and 4.8 minutes off.

In the first experiment (May 27 to June 1, 2004) 6 cows in each barn were fitted with vaginal temperature devices. In figure 1, the cows in the cooled barn varied in their body temperature and it looks like one cow escaped the barn for a trip outside. Cows in this cooled barn had the high pressure foggers in the daytime and feed face sprinklers at night.

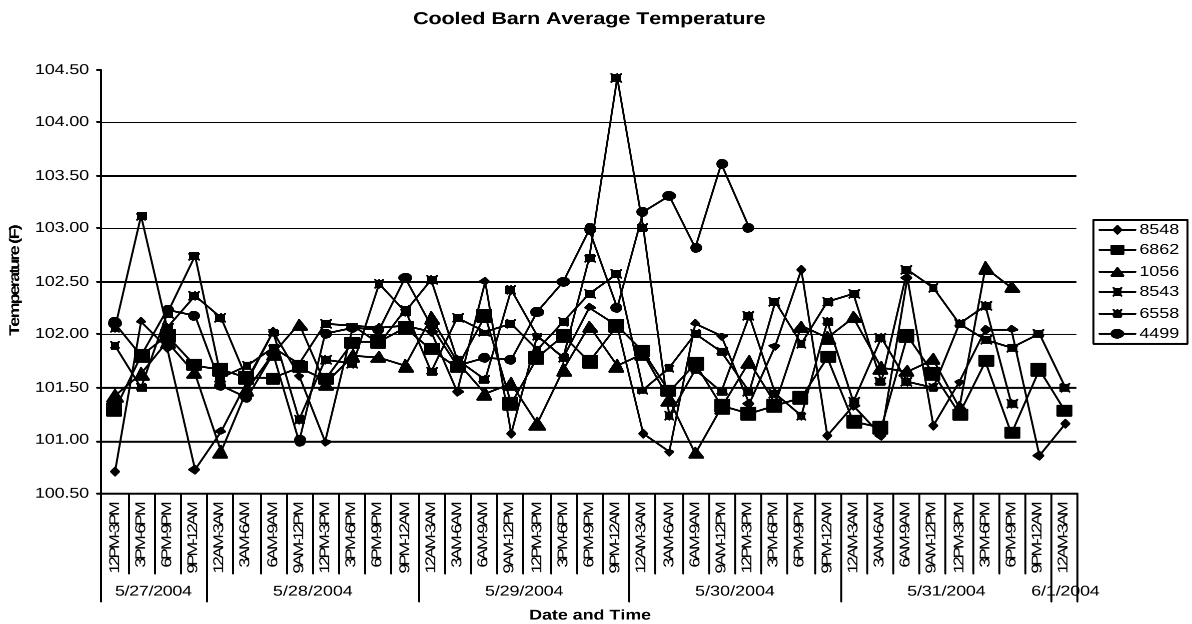

Figure 1. Average vaginal temperatures for cows in cooled barns.

In figure 2 the cows in the un-cooled barn had higher body temperatures but they also varied greatly. These cows had feed face sprinklers 24 hours a day.

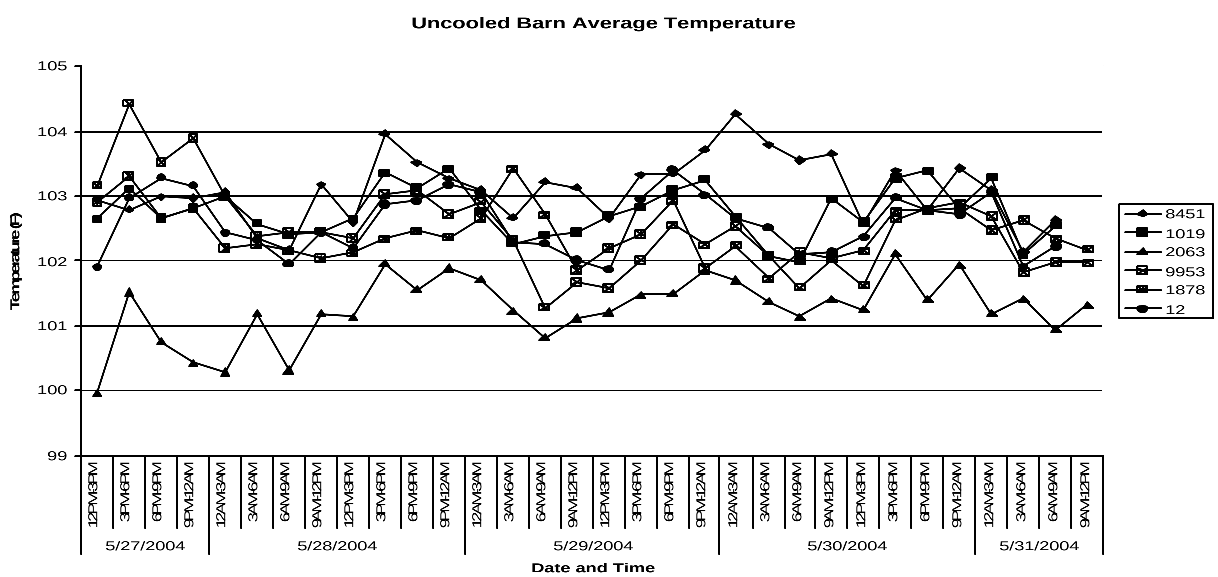

Figure 2. Average vaginal temperatures for cows in un-cooled barns.

In figure 3 we have the combined body temperatures of the cows in the two barns and one cow who was in an outside lot to show the variation. The high spikes of all the cows usually occur at milking time. There were no overhead sprinklers in the holding area of this dairy at this time.

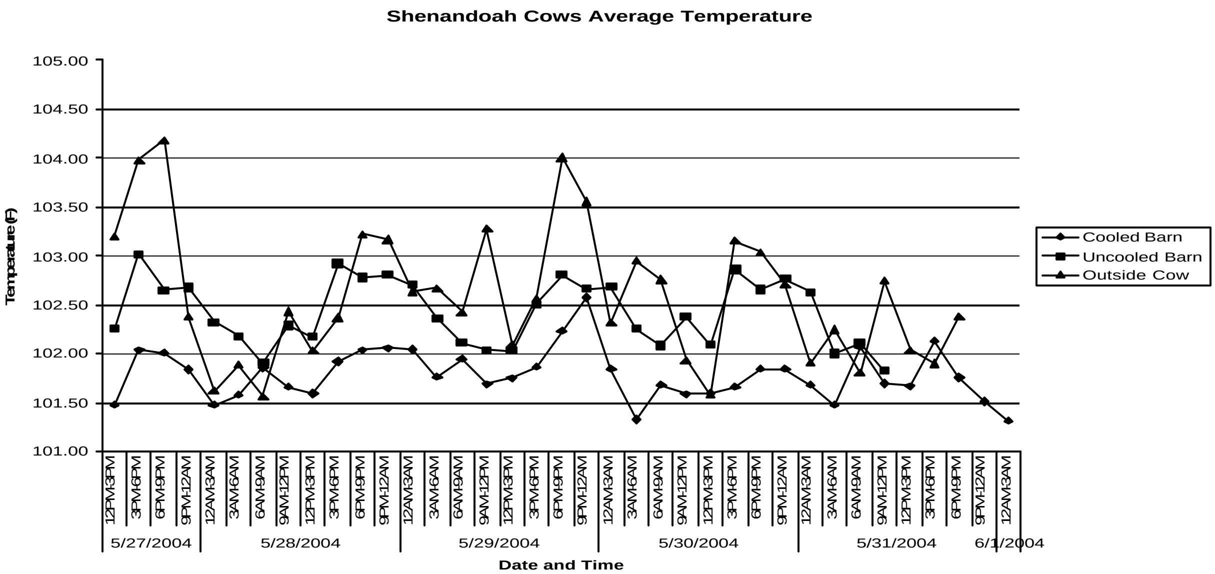

Figure 3. Average temperatures for cows in a cooled barn, un-cooled barn and outside.

In figure 4 is the combined temperatures, RH%, and outside temperature and humidity (pole). In the un-cooled barn you can see the temperature is the same in the barn as the outside temperature (pole). This is not the same week as the body temperatures were taken but the results are about the same.

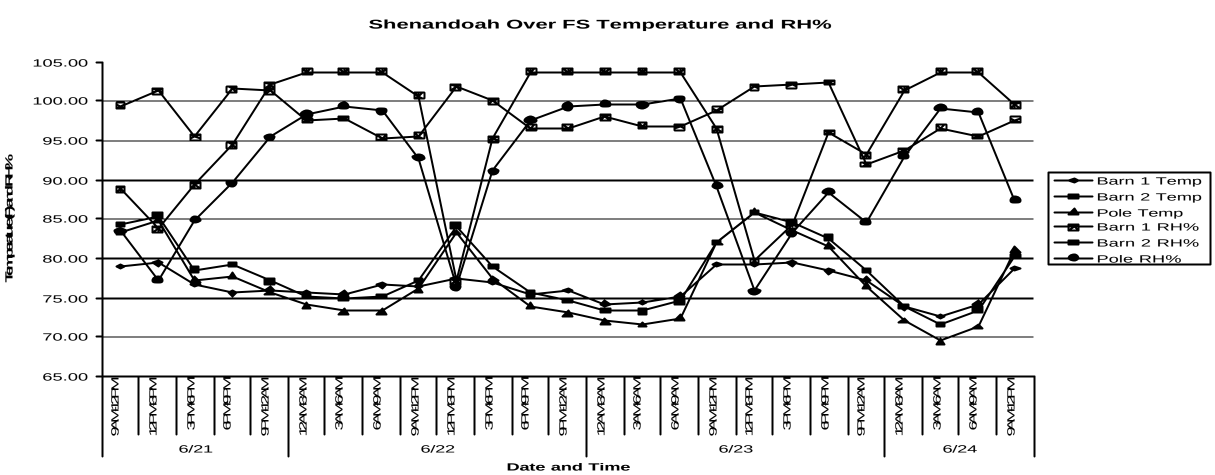

Figure 4. Temperature and RH% for cooled (barn 1) and un-cooled barns (barn 2) compared to ambient temperature and RH%.

Study #2 Tunnel Barn Fall 2004

This study was designed to determine if the use of sprinkler are necessary in a high pressure fogged tunnel barn. The design was to shut off all feed face sprinklers for the first forty-eight hours on one side of the barn and have them on the other side of the barn during the same portion of time, then switch sides for the next forty-eight hours. The final part was to only run sprinklers at night on one side then the other for a night. A hurricane made its approach at the beginning of the experiment and it never got very hot, but the results are given. In figure 5 we see that the cows in pen 4 were cooler on average in the first forty-eight hours than the cows in pen 3 who had no sprinklers during that period. The foggers were working in both pens during the day; the higher temperatures were at night in the pen with no sprinklers. The second forty-eight hours there was not much difference because it was not hot due to the clouds that came in before the storm.

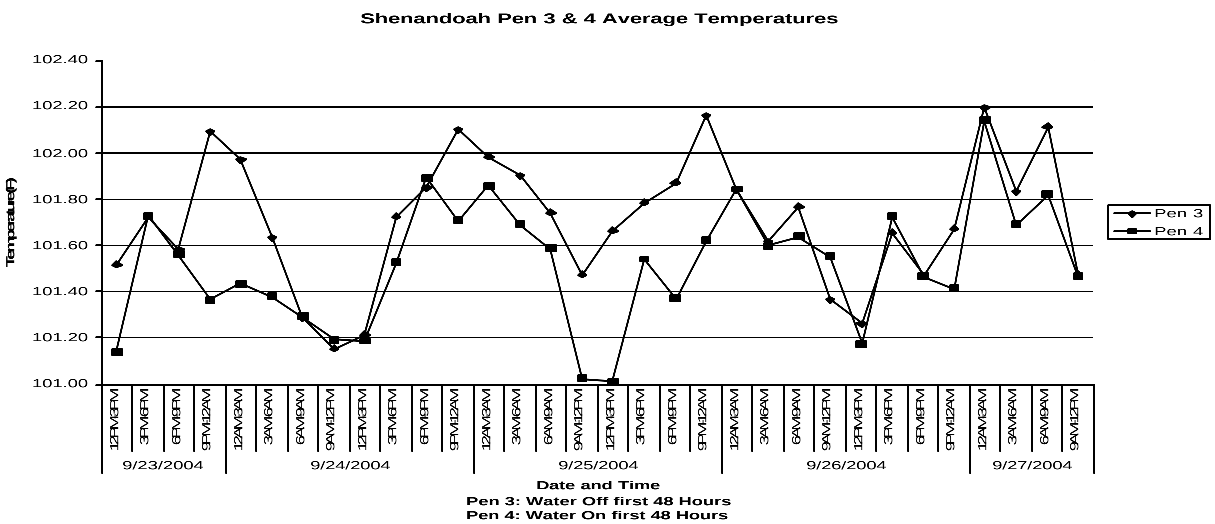

Figure 5. Differences in average cow temperatures in pens with and without feed face sprinklers.

In figure 6 we can see that they ambient temperature (pole) never got above 80 degrees F after the first 48 hours except for September 28th.

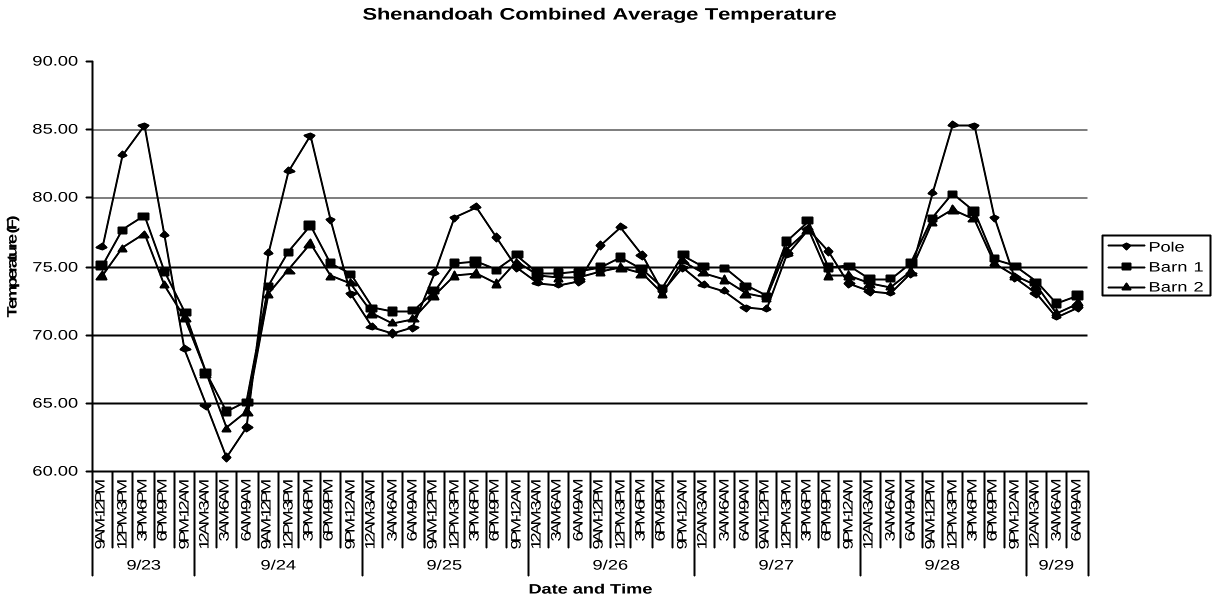

Figure 6. Ambient temperature compared to cooled (barn one) and un-cooled (barn 2) barns.

In figure 7 we have included the RH% for this week, you can see that the humidity stayed very high during the bad weather.

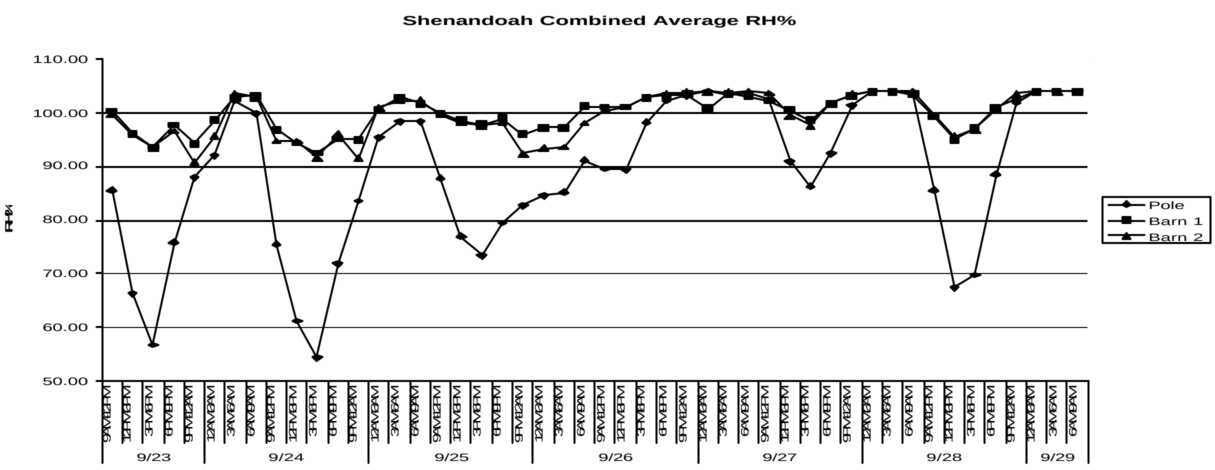

Figure 7. Ambient RH% compared to cooled (barn 1) and un-cooled (barn 2) barns.

2004 DRU Studies

The study was done at the UF Dairy Research Unit. The barn is 200 feet long and 100 feet wide. Eave height is 16' to 20' with a 3' ridge opening and the roof slope was 4:12 pitch.

The first study was designed to compare feed face sprinklers with fans during the day with high pressure foggers (250 PSI) over the feed face and over the freestalls and sprinklers at night versus not at night. This experiment was doomed by a few cows that were very hot and the weather which was not very hot at the end of the experiment.

In figure 8 the north barn cows had higher body temperatures than the south barn cows. The cooling was the same for the first forty-eight hours and both dropped at the end of the experiment.

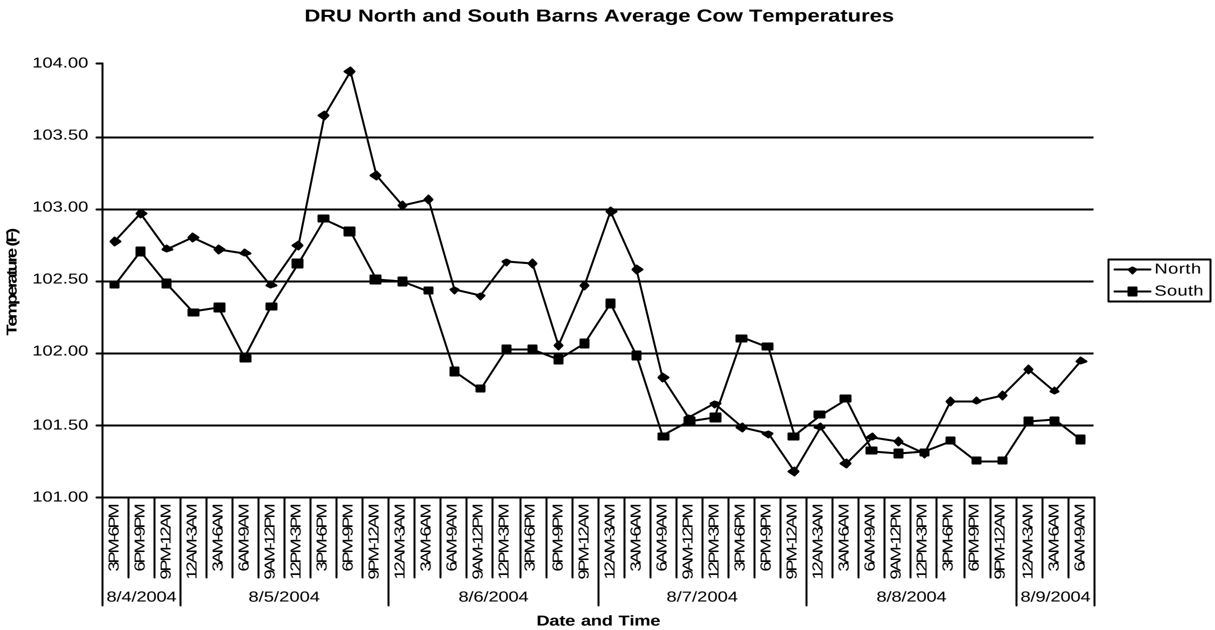

Figure 8. Average cow temperatures in two barns.

DRU Barn Monitoring

There are always many varied experiments being carried out at the DRU, so we monitor barn temperature in about every barn and the ambient temperature (pole), where these have little scientific merit, they may be of interest.

Figure #9 compares the ambient temperature (pole) with Lindsey Blvd. Lindsey Blvd is a long shed with a flat tin roof 12' high. As you can see, under this shed it is hotter that ambient temperature in the afternoon.

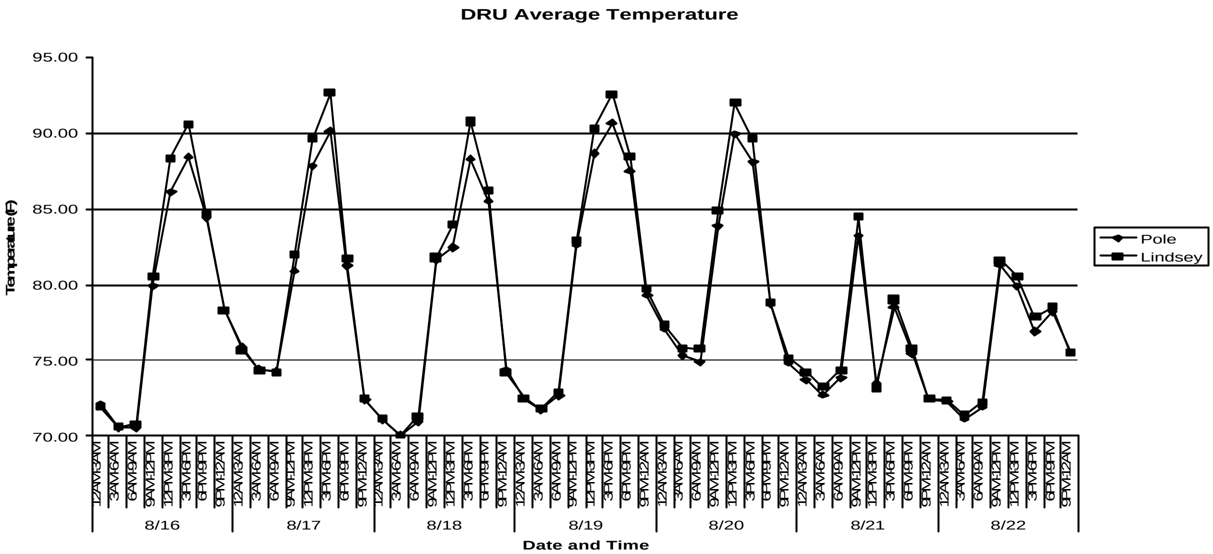

Figure 9. Ambient temperature compared to the temperature under an outside shed.

In figure 10 we compared the ambient temperature (pole) with the Monsanto barn which is a 150' long by 85' wide freestall barn used for nutritional trials. This barn has fans with high pressure foggers but only over the feed face. This demonstrates that one row of high pressure foggers and fans is not sufficient to cool this barn.

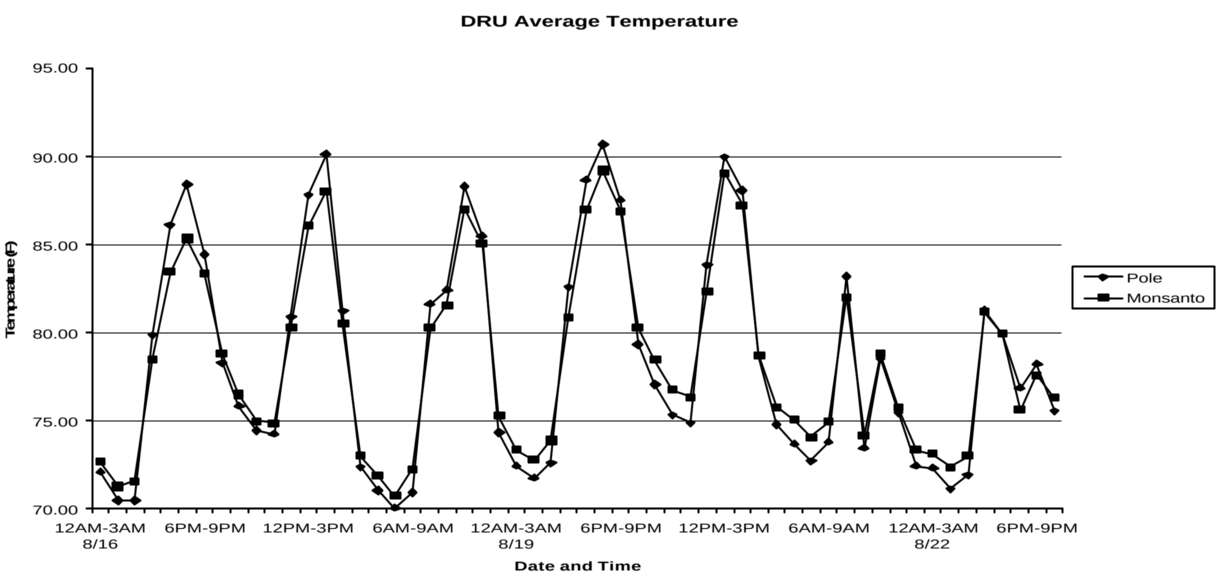

Figure 10. Ambient temperature compared to a barn cooled by high pressure foggers over the feed face.

In figure 11 we compare ambient temperature (pole) with the north and south barn which use high pressure foggers (250 PSI from J&D Manufacturing, Eau Claire, WI) to the transition cow barn. The transition cow barn is a 40' by 90' machinery shed with 12' eaves and an insulated roof and walls. It also has 7 48" belt driven poultry fans at one end and a variable sized opening for feeding at the opposite end. This barn has 3 double fans with 100 PSI foggers (F.I.T. ventilation Clearwater, Fl). This is a work in progress, how to cool this barn. The 7 big fans remove too much air for the three F.I.T. fans to cool the barn; they also suck rain into the barn. We hope to find the right combination to cool this barn to 10 degrees F below ambient temperature. Cows in this barn are not above normal temperatures because the foggers blow on them without wetting the sand below.

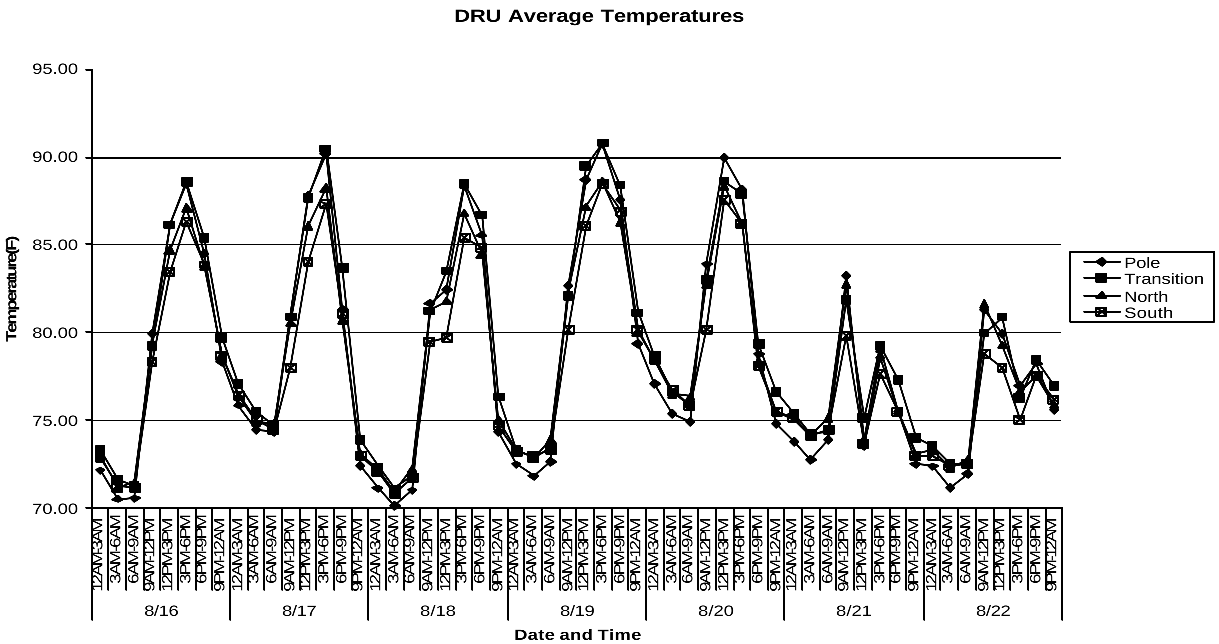

Figure 11. Ambient temperature compared to the transition barn and two barns that are cooled with high pressure foggers.

Planned 2005 Studies

1) Resolve night time sprinkling at large fog barn
2) Add three 1000 PSI foggers and fans to north/south barn to drop barn temperature 10 degrees below ambient temperature.
3) Resolve the transition barn cooling.

Notes

Southeast Milk Inc. Check-Off Program / Project Summaries

Active and Recently Completed Projects per July 30, 2004

Project # 219

Title: **Use of BST in Management of Transition Dairy Cow to Increase Feed Intake, Improve Milk Yields and to Decrease Health Problems.** H. Head

Our objectives were to identify an appropriate amount of bST we could supplement to transition dairy cows to improve their feed intake and that also would have positive effects on blood metabolites and hormones, reduce health problems, and improve their subsequent milk production. In the first study, using 23 multiparous Holstein cows we compared three different amounts of bST (POSILAC; 5.1, 10.2, 15.3 mg bST/day). The two greatest amounts of bST tested before and after calving (10.2 and 15.3 mg/day) caused the desired increases in hormones and also resulted in an increase in feed consumption both before and after calving. Importantly, no apparent negative effects of supplementing bST were seen. In a second study, 48 multiparous Holstein cows were used to evaluate the effects of low doses of bST supplemented beginning 3 weeks before calving, after calving (supplementation starting at calving), or before and after calving compared to non-supplemented controls. Using this evaluation process we showed that bST-supplementation increased feed consumption and several important hormones without causing any negative effects on other hormones and metabolites needed for milk synthesis. The cows supplemented with bST produced more milk, consumed more feed, and better maintained their body weight (BW) and body condition (BCS).

Building upon the first two studies, a total 193 Holstein cows were used during two consecutive years to evaluate effects on milk production, BCS, BW, hormones and some important metabolites. Biweekly supplementation of bST began 21 d before expected day of calving and were continued through 60 days after calving (C vs. I; 0 vs. 10.2 mg bST/d, POSILAC®). After 60 days no cows were injected with bST. We did this to see if there were positive effects of the bST that were maintained even after the injections were stopped. During year 1, IGF-I, INS, NEFA and glucose were measured in plasma samples from 82 cows. During year 2, effects of bST on BCS and BW of 112 Holstein cows were evaluated, but no blood samples were collected. Milk yields of all 193 cows through 100 d were merged and analyzed.

Prepartum supplementation with bST positively affected concentrations of ST, INS and numerically greater non-esterified fatty acids (NEFA) in plasma but bST did not affect mean plasma concentrations of glucose or IGF-I. Postpartum injections of bST resulted in increased concentrations of NEFA, but no effects on the other measures. Mean body condition score (BCS; 1-5 scale) did not differ prepartum, around parturition, or postpartum. Greater milk production was observed for bST-supplemented group during first 30-d (+7.8%) and first 60-d (+6.7%) of lactation. No difference in milk yield was observed during first 100-d period, which included 40-d when cows were not supplemented. Number of cows that were culled due to health problems was not affected by bST supplementation.

Because of the positive effects on 60-day milk yields, BCS and body weight we conclude that the bST likely improved feed intake. Overall, we showed that when we cause small changes in important hormones and were able to modify important metabolites by supplementing bST prepartum and postpartum, that overall these changes had beneficial effects on the cow during the transition from pregnancy into lactation. These beneficial effects were seen as increased feed consumption, increased efficiency of milk production, as well as greater milk production. There were no apparent negative effects on health, and our initial analyses indicate that there may have been positive effects of bST supplementation on health. This project is considered complete.

Project # 220

Title: **Importance of Protein Amounts and Type of Ratio to Energy Intake for Growth Rates and Milk Yields of Heifers.** H. Head

One hundred twenty heifers were assigned to treatments. All, except one heifer completed the growth phase and then all were moved to the heifer breeding herd when they were > 750 lbs., irrespective of their age. We evaluated four protein-energy groups and one-half of heifers in each group also was supplemented with small quantity of bST until they reached breeding age (the peripubertal growth period). Heifers on high energy diets grew faster and, on average, reached breeding age 3 weeks earlier than heifers fed lower energy diets. Heifers supplemented with bST grew slightly more rapidly no matter which diet they were fed, but the increase in growth rate through 750 lb of body weight was fairly small (~3-4% increase) and probably did not justify the cost and labor to do it. Heifers born during Fall-Winter, that had their major growth during the cooler months of year, grew more rapidly than those born during Spring and Summer that had their major growth period during the hotter months of year.

Ninety-six of these heifers calved (about 80%) and 88 heifers (74%) provided usable milk production records (at least 90 days of milk production) to evaluate associations of diet, season they calved, and their body weight and body condition, and on the amount of milk they produced during their first lactation. We also recalculated all the growth rate associations again using only the records for the 88 heifers that actually contributed the milk production records.

For these 88 heifers, no differences in the number of inseminations, age they calved, or in their body condition score or body weight at calving were seen no matter what diet they were fed, or whether they had been supplemental bST, or due to the season they calved. Average milk production through the first 150 days of lactation did not differ due to the diet they were fed during the peripubertal growth period. Supplementing bST also did not improve milk production. Heifers that calved in the cooler months of the year did produce more milk (about 6.2 lb/day more for the first 150 days in the lactation). The body weight and body condition scores of the heifers that contributed milk production records did not differ due to peripuberal growth rates, diets fed, or supplemental bST. Overall, no positive or negative effects of feeding different protein and energy diets or supplementing bST were seen in the breeding or calving traits or on milk production. Therefore, recommendations on growth rates recommended in the new NRC (2001) seem to be adequate to allow growing heifers to meet their energy and protein requirements and allow them to express their full milk production potential during first lactation. Supplementing bST had very limited benefits on growth rates during this stage of life and had no benefits on milk production. This project is complete.

Project # 240

Title: **Nutrient Handling Systems on Florida Dairies.** R. Giesy

Nutrient handling systems continue to evolve. Several demonstration projects are currently studying the feasibility of different systems or products thought to be effective in helping dairies control nutrients and use them to best advantage. Unbiased analysis of these new systems is needed to assist producers in selection of systems most appropriate to their situation. Additionally, an effort will be taken to evaluate the economic efficiency of these systems. This is a continuing program.

Project # 246

Title: **Management of Transition Period in Cows with Short Dry Periods.**
H. H. Head

Effects of short dry periods (30 days) on milk production of cows were evaluated during two experiments. In the first, forty (40) multiparous Holstein cows were assigned and 87 cows were used during the second, when one-half of all cows also were supplemented with bST (0.4 ml, 10.2 mg/day of Posilac) during both prepartum and postpartum periods. Cows were assigned to one of six treatments to evaluate effects of dry period length (60 vs. 30days), use of estrogen (ECP, 15 or 20 ml) to speed up regression of mammary tissue during dry-off, feeding anionic or cationic diets, and use of supplemental bST. Daily feed intake and blood sample collection began at 28 days before expected calving. Body weights and body condition scores were taken beginning at dry-off and biweekly through 70 days postpartum. Milk yields and composition were taken through 100 days of lactation. All health incidences and treatments were evaluated through 100 days of lactation including effects of feeding anionic or cationic diets prepartum on milk production.

For all 124 cows that completed the experiments, no positive or negative effects of using Estradiol Cypionate (ECP) at time of dry-off to speed up mammary involution were detected. We concluded that there was no benefit to injecting estrogen compound to speed up the dry-off process. Importantly, the cows with shorter dry periods had similar body weight and body condition score changes as cows given the standard 60 day dry period, and they also consumed just as much dry matter before and after calving. Overall, results on milk production and feed intake were similar no matter whether cows were fed anionic or cationic diets prepartum.

Importantly, for the 40 cows no positive or negative effects on milk production of cows given 30-day or 60-day dry periods were seen and milk production through 70, 150 and 305-days did not differ between the two dry periods. Similarly, for the 84 cows the average milk production was not affected positively or negatively during the first 150 days of lactation. The full lactation milk yields for the 30-day and 60-day dry period cows also did not differ. Our results support the idea that the short dry period procedure can be used as a management tool with no loss in subsequent milk production of dairy cows. Changes in concentrations of blood hormones and metabolites were improved by supplemental bST and milk production was increased without any negative effects on health. In fact, there was evidence that transition health status was improved in the bST supplemented cows. We are further evaluating this finding by merging all transition cows health records and evaluating disease incidences for this larger group and we consider this project complete.

Project # 248

Title: **Improving Forage Productivity During Late Fall and Early Winter by Making Grass Less Sensitive to Short Days.** P. Mislevy

Research supported by the Milk Check-off Grant program has indicated that the reason bahiagrass does not grow during the winter is due to short day length. Studies during the past several years have focused on developing a new bahiagrass that will produce more forage than Pensacola and Tifton 9 bahiagrass from October through March. Three cycles of breeding have been conducted, incorporating winter production, cold tolerance, seed yield, spreading ability, etc. Two years of harvesting Florida Cycle 3 has just terminated. Clipping results from 2002 to

2004 indicated dry biomass yields during the winter were 3.1, 2.4, and 1.5 T/A for Florida Cycle 3, Tifton 9, and Pensacola bahiagrass, espectively. Dry yields during the summer (April - September) were 7.0, 6.5, and 5.2 T/A for Cycle 3, Tifton 9, and Pensacola, respectively. Digestibility of Florida Cycle 3 averaged 54 and 68% during October and January and was 4 and 1% higher than Tifton 9 and 8.4 and 1.9% higher than Pensacola during the above harvest months. Crude Protein was about 2.0% lower for Tifton 9 and Florida Cycle 3 than Pensacola during the winter period. These 2 yr-data indicate that Florida Cycle 3 out-yielded Tifton 9 and Pensacola bahiagrass by 0.7 and 1.6 T/A dry forage during the winter period, respectively, along with increased forage digestibility. This project is complete.

Project # 267

Title: **Evaluating the Effect of Seasonality on Financial Performance of Southeast Dairy Businesses.** A. de Vries (M. J. Hoekema)

The goal of this project is to study the effect of seasonality found in DHI data on the financial performance of Southeast dairies that participate in DBAP. The 2002 DBAP data has been added to the database and collection of the 2003 data is almost completed. With this larger dataset, it may be easier to estimate the effect of seasonality on dairies' financial performance. Completion is expected in 2005 and is currently ongoing.

Project # 268

Title: **Effect of Monensin on Incidence of Calving-Related Disorders, Milk Production and Reproductive Performance in Florida Transition Cows Fed Diet Containing Citrus Pulp.** P. Melendez

This project has been completed. Objectives of the study were successfully accomplished. Results of this research were part of Dr. Melendez' Ph.D program, who is now assistant professor at College of Veterinary Medicine, University of Florida. Currently two papers are being written to be sent to a scientific journal (Journal of Dairy Science, Journal of American Veterinary Medical Association).

Monensin demonstrated to be beneficial on transition dairy cows, especially cows dried-off with low body condition score. Monensin increased body condition score from dry-off to calving in these skinny cows, therefore lactational performance was improved. In addition, monensin increased calving assistance probably due to larger calves at parturition.

Project # 269

Title: **Effect of Monensin on Volatile Fatty Acids, NH3 Rumen Concentration, Rumen pH and Blood Metabolites in Transition Cows Fed TMR Containing Citrus Pulp.** P. Melendez

This project has been successfully completed. Results of this research were part of Dr. Melendez' Ph.D program, who is now assistant professor at College of Veterinary Medicine, University of Florida. Currently, one paper was written and submitted to the Journal of Dairy Science. Another paper is being written to be sent to the same journal.

The most important finding of this study was that cows supplemented with monensin had less subclinical ketosis than cows without monensin at 14 days postpartum.

Project # 275

Title: **Construction of a Rotational Shade Circle for Livestock on Pasture or Outside Lots**. K. Bachman

Design concepts for the rotational shade circle have been developed with the focus on structural integrity, ease of movement, and shaded area provided. Allocation of fifty square feet per mature cow would require a very large shade structure for even a small number of mature cows. Consequently, construction of the prototype will take place at the heifer replacement unit for the breeding group aged 13 to 15 months (750-850 lbs). This project is ongoing.

Project # 279

Title: **Alleviating The Stresses of Concrete Floors in Florida Feed Barns IV**. D. Bray

This project is ongoing. We will check for longevity.

Project # 284

Title: **How Do We Get the Best Performance When Feeding Citrus, Corn or Molasses in the Milking Herd?** M. Hall

The project was completed in 2004. So we have a better idea of how to work with different byproduct feeds in rations, the study evaluated the effects on production and ruminal effects of changing the type of carbohydrate fed in rations with more or less bypass protein. Rations were formulated so that carbohydrates came from predominantly from starch (corn meal), soluble fiber (citrus pulp), or sugar (molasses + table sugar); less or more bypass protein was provided by feeding all 48% soybean meal, or substituting an expeller soybean meal for part of the 48% soy. The bottom line for the results of the animal study:

- Different nonfiber carbohydrate sources give different milk yields and protein feed efficiencies. More starch gave the best protein feed efficiency; the citrus diet gave the lowest milk and milk protein yields.
- Cows responded differently to bypass protein with the different carbohydrates – for milk and fat yields and feed efficiencies, the responses increased for citrus and sugar when bypass protein was fed, but decreased for starch.
- Fiber digestion in the rumen differed by carbohydrate source, bypass protein amount, and the combination of the two.
- Some things we did not expect at all: the carbohydrate source appeared to change use of protein breakdown products in the rumen. This may change how we need to formulate for protein by carbohydrate source.
- Rumen acidity changed with bypass protein treatment when sugar was fed (lower pH with more degradable protein).

The study gave information we can use in ration formulation on how carbohydrates and protein supply function together. The study raised questions about how some byproduct feeds change the rumen fermentation and how that affects animal performance. Setting up more research funded by USDA to address those questions.

Project # 286

Title: **Can We Use individual Feed Intake Data to Estimate Group Responses During Transition Cow Experiments to Reduce Cost of Transition Experiments.** H. Head

We continue to collect and assemble data from completed and ongoing transition cow experiments to construct a working data set. We selected experiments that provide both feed intake and milk production responses (yield and composition) and some measures of animal body condition, body weights and health status during the transition period and subsequent lactation. We have assembled > 400 individual cow data records that provide the needed measures. Thus far data have been merged and some sorting of data have been completed. Once results of all transition cow studies have been compiled and the data verified we will initiate the data analyses. We consider this project ongoing.

Project # 287

Title: **Smoothing Progress Through the Transition Period by Feeding Glucogenic and Energy Compounds.** H. Head

Multiparous Holstein dairy cows were used to evaluate effects of feeding different glucogenic precursors to cows during the 3 weeks before calving through the first 4 weeks of lactation (the transition period). We evaluated daily feed intake, blood levels of important metabolites, energy status, health variables, and the subsequent milk production of all of the cows. Equal numbers of cows were assigned to be fed 1) cationic diet, 2) cationic diet plus Ca Propionate (NutroCal™), 3) cationic diet plus a mixture of Ca and Na propionates plus propylene glycol and fat (Metaxerol™), or 4) propylene glycol during this approximately 7 week time period. After calving all cows were switched to the herd lactation diet. We measured feed intake, body weights and body condition scores and collected blood samples throughout the trial. Milk yields were recorded during the lactation at each of the 3 daily milkings through 150 days and milk samples were measured through 70 days of lactation. A subset of 40 cows (10/diet treatment) were used to collect liver samples for measure of lipid accumulation and expression of steady state expression of three liver enzymes at -21 prepartum and at + 2, +14, and + 28 days of lactation (see project # 327). Daily health records were collected for each of these trial cows.

We had 124 cows complete their feeding and lactation periods (29, 33, 31, 31 cows in control or fed the three glucogenic precursors). Overall, these cows were all fed the test diets for at least 14 days before they calved normally, and then completed at least 100 days of the lactation. The feed intake during the time before calving did not differ, except that control cows ate more than those fed NutroCal™. The amount of feed that cows consumed decreased 17-31 % the week before calving but the decrease was similar across the four diets, but was greatest during the 2 days before the cows calved. After calving all cows rapidly increased their consumption of feed. Overall, the increase in feed intake after calving was similar across the different diet groups, so it was not affected by the supplements fed.

Milk production of the four groups did not differ during the first 4 weeks after calving, the time when glucogenic supplements were being fed. The only exception was that cows fed propylene glycol produced slightly less milk, perhaps due to reduced palatability. Milk production during 28-70 days after calving and during 4-100 days after calving was essentially the same across all the groups. As we usually observe, cows produced less milk during the hot season of the year and also ate less feed, even though they were housed in a free-stall barn equipped with misters and fans. We saw no effects of feeding supplements on body weight or body condition scores. Overall, cows had similar patterns of feed consumption during the 7 weeks the supplements were added to their TMR diets, they produced the same amount of milk during early lactation and during the first 100 days of lactation, and all maintained body weight and body condition score equally well. We concluded that there were no positive or negative effects of adding glucogenic supplements to the total mixed ration during the transition period. We consider this project ongoing.

Project # 289

Title: **Efficacy of a New Vaccine to Prevent Abortion in Dairy Heifers Naturally Infected with *Neospora caninum*.** J. Hernandez

Neospora caninum is a protozoan parasite originally identified in dogs but now recognized as an important pathogen associated with abortions in cows and occasionally with encephalomyelitis in congenitally infected calves. Despite the recent discovery that dogs can serve as a definitive host for *N caninum*, congenital infection is generally accepted as the primary means of transmission and maintenance of *N caninum* in cattle. During pregnancy, some fetal infections culminate in abortion, whereas most result in a new generation of chronically infected cattle. In commercial dairy herds, the economic importance of infection with *N caninum* is reportedly attributable to costs associated with abortion, increased number of culled cows, and decreased milk production. In dairy herds in which congenital infection is recognized as the major confirmed method by which infection is maintained in herds, producers and veterinarians are interested in developing strategies of selective culling and replacement for control and eradication of the disease. The objective of this study is to assess the efficacy of a commercial vaccine to prevent abortion in cows naturally infected with *N caninum*.

An initial study: Risk of abortion associated with Neospora caninum in dairy cows during different lactations and evidence of congenital transmission (J Am Vet Med Assoc 2002;221:1742-1746) revealed that 102 (22%) of 460 cows were classified as seropositive to N caninum. Incidence of abortion during the current lactation was 19% (19/102) in seropositive cows and 14% (50/358) in seronegative cows. In order to test the efficacy of the commercial vaccine, two groups of 363 N caninum seropositive cows are required in each group (vaccinates vs nonvaccinates) to declare an abortion rate reduction from 19% to 14% as statistically significant (type I error = 0.10; type II error 0.20). The vaccine trial has been postponed until one or two additional herds with a high prevalence of N caninum are included to complete the sample size requirements of this study. This project is ongoing.

Project # 296

Title: **Improving Forge Quality with Fiber-Degrading Enzymes (year 1 of 2).** A. Adesogan

Milk Check-Off dollars funded an investigation that examined the effect of fibrolytic enzyme treatment on the fermentation of Tifton 85 bermudagrass harvested for silage. Four commercial enzyme products were compared (Promote® Agribrand, Canada, Biocellulase X-20® and Biocellulase A-20®, LodeStar, IL, USA; Cattle-Ase® Animal Feed Technologies Inc, Greeley, CO, USA and Biocellulase A-20® LodeStar, IL, USA). Five week regrowths of bermudagrass were harvested, chopped and preserved in mini-silos without treatment or after treatment with each of the enzymes. The enzymes were applied at the rate recommended by the enzyme manufacturer or at half or twice the recommended rates.

Applying the Promote enzyme increased DM recovery and increased the digestibility of DM and that of the usually less digestible fiber fractions. In addition, it resulted in greater sugar concentrations, lower pH values and lower concentrations of ammonia nitrogen, acetic acid, NDF and ADF. This indicates that applying the enzyme reduced shrinkage, and losses of important nutrients like sugars and protein, while improving the quality of the fermentation, and fiber digestibility. These effects probably occurred because the enzymes increased the digestion of the fibrous components in the grass and converted them into sugars. The sugars are required for the growth of lactic acid bacteria and the production of lactic acid which inhibits the growth of undesirable bacteria by lowering the pH. Shrinkage and nutrient losses are minimized when the growth of desirable lactic acid bacteria is optimized in silage.

Application of the other enzymes produced some improvements in fiber digestion, but none was as effective as the Promote enzyme. This suggests that the Promote enzyme has potential for improving the intake and digestibility of bermudagrass, and hence increasing milk production from cows fed enzyme-treated bermudagrass silage. This theory will be tested this fall in an experiment that will examine the effect of the following treatments on milk production in dairy cows:

1. Promote enzyme application to bermudagrass at ensiling
2. Promote enzyme application to bermudagrass at feeding
3. Promote enzyme application to the concentrate at feeding
4. Promote enzyme application to the TMR at feeding.

The results of the study described above were presented at the recently completed joint meeting of the American Dairy Science Association and the American Society of Animal Science at St. Louis in July. We gratefully acknowledge funding for the work from the Milk Check-Off. This project is complete.

Project # 299

Title: **Multi-Lingual Milking Videos for Florida Dairies.** D. Bray

We have completed forty videos made on Florida dairy farms. In addition to these, we have also completed an SMI driver training video. This project is complete.

Project # 301

Title: **When to Purchase Replacement Animals, How Many, and What You Can Afford to Pay for Them.** A. de Vries

In this project methods are developed to study the economics of cow replacement, give general guidelines, and be able to do farm specific analyses. Cow replacement has consequences for the number of cows that are milking, dry, open and pregnant over time. Coupled with the seasonality in milk production, reproduction, and involuntary culling, a systems analysis is needed to account for all effects and calculate the best course of actions. A computer program has been completed that is able to optimally rank cows in the herd for future profitability, support culling decisions, and suggests when to enter heifers in the herd. The program has been extended to calculate the economics of different reproductive strategies. An article has been accepted in Journal of Dairy Science. The program has been used in various extension meetings. Talks are underway with DRMS in Raleigh, NC, about implementation of the program in their software (e.g. PCDart). This project is ongoing.

Project # 303

Title: **Dairy Business Analysis Project – Georgia.** L. Ely

The Dairy Business Analysis Project had 41 dairies submit financial data for 2001. Thirty-nine dairies were included in the summary with complete data. Of these, 27 were located in Florida, 11 in Georgia and 1 in Alabama. The average herd size was 977 cows and 477 heifers with 17,170 lbs. of milk sold per cow. The average culling rate was 36%. There was an average of 10 FTE workers per farm with 51.5 cows per FTE worker and 880,000 lbs. Milk sold per FTE worker. Total revenue per cwt. was $20.00/cwt. with $18.24/cwt. milk income. The average total expense was $17.75/cwt. The largest expense items were purchased feed, $7.32/cwt.; labor, $2.69/cwt. and livestock, $1.64/cwt. Net farm income from operations was $2.25/cwt. and net farm income was $2.39/cwt. The debt to equity ratio was .72, rate of return on assets was .09, rate of return on equity was .11, operating profit margin ratio was .09 and asset turnover rate was .90. The net farm income for herd size was $1.88/cwt for <400 cows, $2.31/cwt. for 400-900 cows and $2.76/cwt for >900 cows. The net farm income for level of production was $1.98/cwt. for <16,000 lbs./cow, 42.25/cwt. for 16,000-18,000 lbs./cow and $2.94/cwt. for >18,000 lbs./cow. This project is complete.

Project # 306
Title: **Pilot-Scale Recovery of Phosphorus from Flushed Dairy Manure**. W. Harris

The objective of this project was to demonstrate the possibility of recovering phosphorus from flushed dairy manure. Recovery of nutrients in a form that can be managed by dairy farmers could ultimately alleviate restrictions and high land area requirements for sprayfields, while also reducing environmental risks and liabilities. Our process is based on utilizing a fluidized-bed reactor to recover calcium phosphate as a pellet formed by crystallization on a suitable seed material, e.g. sand. The overall goal is to “harvest” phosphorus from flushed dairy manure wastewater as a recoverable nutrient rather than producing a high-phosphorus waste sludge.

We have completed the development and construction of a pilot-scale reactor (15 gal) at the UF/IFAS Dairy Research Unit. The unit is made of molded polyethylene, stands 5 foot high, and has an 8 inch top access hatch. The reactor is a tapered column design. Since the column widens at the top, the greater cross-sectional area decreases the upflow velocity, which promotes sand retention. Wastewater from the top of the column is recycled back into a central duct leading to the apex. This internal recirculation of the wastewater creates a uniform flow velocity for sand fluidization and also facilitates the sand-bed fluidization independent of process flow.

Our efforts are now focused on phosphorus precipitation and recovery at this scale. In order to crystallize the phosphorus onto the seed material, a driving force is created by pH adjustment. The high buffering capacity of the flushed dairy manure wastewater means that alkali addition for pH elevation poses both a materials handling and cost challenge. However, using our reactor design, we have demonstrated the efficacy of air sparging for pH elevation. This achievement obviates the need for and cost of alkali addition. Also, air sparging will not permanently elevate the pH of the final effluent, since CO_2 will be generated by microbial activity during storage. Non-chemical pH adjustment also avoids increasing the salinity of the wastewater. This project is complete.

Project # 308
Title: **Effects of Lameness on Ovarian Activity, Maintenance of Pregnancy, Reproductive Performance, Milk Production and Efficacy of Corrective Foot Trimming Procedures to Prevent Lameness in Dairy Cows (year 1 of 3).**
J. Hernandez

Lameness is one of the top 3 health problems that cause premature culling of dairy cows in the United States. The National Animal Health Monitoring System Dairy 2002 Study reported that lameness was the reason for culling 16% of dairy cows sent to slaughter. The economic importance of lameness is reportedly attributable to cost of treatment and control methods, impaired reproductive performance, decreased milk yield, increased risk of culling, and decreased carcass value of culled cows In addition, because of the pain, discomfort, and high incidence of lameness in dairy cows, this disorder is an animal welfare issue of concern. Four studies were designed to (1) to examine the relationship between lameness and delayed ovarian cyclicity during the first 60 d postpartum, (2) lameness and milk yield, (3) lameness and the calving-to-conception interval, and (4) to assess the efficacy of corrective hoof trimming at dry-off and mid-lactation (200 DIM), compared correcting hoof trimming at to dry-off only in Holstein cows.

The first study has been completed: *Effect of lameness on ovarian activity in postpartum Holstein cows* (J Dairy Sci 2004, in press). We hypothesized that because lame cows experience a more pronounced loss in body condition (hence a prolonged state of negative energy balance) during the early postpartum period, lame cows are at higher risk of delayed ovarian cyclicity than non-lame cows. Two hundred and thirty-eight cows from a 600-cow dairy that calved during a 12-mo period were used (rolling herd average milk production, approx 12,000 kg). Cows were classified into 1 of 6 categories of lameness during the first 35 d postpartum by using a locomotion scoring system. Cows were blood-sampled weekly for detection of plasma progesterone (P_4) concentrations during the first 300 d postpartum. Analysis of results of the study reported here support the hypothesis that lameness has a detrimental effect on ovarian activity in Holstein cows during the early postpartum period. Cows classified as lame (score = 4) had 3.5 times greater odds of delayed cyclicity than non-lame cows (score ≤ 2) ($P = 0.04$). Delayed ovarian cyclicity in lame cows would be reduced by 71%, if lameness had been prevented. Cows classified as modertaly lame (score = 3) had 2.1 times greater odds of delayed cyclicity than non-lame cows (score ≤ 2) ($P = 0.15$). Although cows classified as moderately lame (score = 3) did not have significantly greater odds of delayed cyclicity than non-lame cows ($P = 0.15$), the relationship was numerically in the same direction as for lame cows with a score of 4. We recommend that preventive measures such as examination of cows feet and use of corrective foot trimming techniques be targeted at moderately lame cows (score = 3), as they represented 42% of the study population. This project is ongoing.

Project # 310

Title: **Risk Balancing Strategies for Florida Producers.** R. Kilmer

The study compares the minimum risk level attainable using futures and options under various policy, production risk and capital structure scenarios. This research found that the minimum risk hedge ratio decreases drastically when the producer is completely covered under MILC. The preceding result can be explained by the fact that that the deficiency payments received under MILC are similar to the payments received from an option. This yields a substitution effect limiting the effectiveness of class III futures and options. Production risk also decreases the minimum risk hedge ratio although not nearly as drastically. The firm's use of debt shifts the risk measure by the amount the producer pays in interest. The producer's ability to risk balance is limited by the risk faced. Michael Zylstra finished his dissertation in May 2004. Project is completed.

Project # 313

Title: **Testing Dairy Cattle Embryos for Enhanced Embryo Survival and Reduced Embryo Transfer Costs.** K. Moore

Maintenance of recipient cows is the most expensive component of embryo transfer, especially if the fetus is lost late in gestation. Improving our ability to select embryos that are genetically normal will increase chances of survival to term and decrease costs associated with maintaining open recipients. This will make the newer reproductive technologies, such as embryo transfer, in vitro embryo production, cloning, and genetic selection more economically feasible for the dairyman. The goal of this project was to develop genetic tests for pre-screening dairy cattle embryos prior to transfer, allowing us to quickly eliminate genetically abnormal embryos and even select for embryos with beneficial traits. The first objective, which was to optimize embryo biopsy and fusion techniques for producing metaphase spreads for genetic analysis has been completed. Three methods are now available, cell fusion, piezo injection and our latest improvement chemically induced condensation. The later is the method of choice, as it bypasses the fusion and injection procedure, making it easier and more efficient. Substantial progress has also been made on the second objective, through optimizing karyotyping procedures. Future efforts will complete the project by optimizing the process of fluorescent in situ hybridization. A University of Florida Opportunity Grant was obtained to further the progress of this project. The proposed project is not yet complete.

Project # 314

Title: **A New Approach and Evaluation for Detection of *Mycobacterium paratuberculosis* (Johne's disease) in cattle**. O. Rae

Objectives: To explore an alternative method for detection of *M. paratuberculosis* in infected cattle, by subiliac lymph node biopsy; to assess the sensitivity and specificity of individual and serial test results using different diagnostic methods in Johne's positive cattle; and to explore methods to improve the sensitivity of subiliac lymph node biopsy techniques for early detection of Johne's disease.

Procedures: About 150 cattle will be utilized (67 animal samples have been processed at present). Animals have been selected from Johne's-ELISA tested animals at IFAS research units. Animals are from 2-10 years of age, and may or may not have signs suggestive of Johne's disease. Each study animal is identified by number, age, sex, breed, and evaluated by weight, body condition scores, and previous results of Johne's ELISA tests. Blood is collected for ELISA and AGID Johne's testing. A 100 gm fecal sample is cultured for *M. paratuberculosis*. A subiliac lymph node biopsy is taken or a whole lymph nodes taken at slaughter/necropsy. An impression smear of the lymph node cut-section is stained on a microscope slide (Zeihl Neelson) for microscopic evaluation. The remainder of the lymph node sample is placed in formalin and saved for later histopathological evaluation.

Peripheral lymphnode biopsy results (LN) compared to agar gel immunodiffusion (AGID) and ELISA test results for *Mycobacterium avium subspecies paratuberculosis* in study cattle.

		ELISA test resulets					
AGID	LN	Neg	Susp	LPos	MPos	HPos	Total
Neg	Neg	17	16	8	21	3	65
	Pos	0	0	0	0	0	0
Pos	Neg	0	0	0	2	0	2
	Pos	0	0	0	0	0	0
	Total	17	16	8	23	3	67

Tentative results: The causative organism *M. paratuberculosis* has not been detected in peripheral lymph nodes of any sampled animals. In 6 of 17 study animals that were followed to markets or necropsy, the organism was recovered and identified in gut wall tissue and(or) mesenteric (gut) lymph nodes. The project is ongoing.

Project # 318
Title: **Feeding Value of Whole Fuzzy Cottonseed with Elevated Concentrations of Free Fatty Acids.** J. Bernard

Twenty-four lactating Holstein cows were used in an 8 wk randomized block trial to determine the effect of feeding whole cottonseed with elevated concentrations of free fatty acids in the oil on intake and performance. Three lots of whole cottonseed were obtained that contained 6.8 (Control), 24.1 (HFFA1), and 22.3% (HFFA2) free fatty acids in the oil. Compared with control and HFFA1, the HFFA2 contained slightly more moisture, less oil, and were discolored. There were no differences in concentrations of ADF, NDF, or minerals among treatments. Cows were fed one of three experimental diets differing in source of cottonseed which was included at 14% of the total dry matter. Dry matter intake (DMI) was highest ($P < 0.01$) for cows fed the diet containing HFFA2 (51.7 lb/d) compared with control and HFFA1 (47.5 and 48.4 lb/, respectively). No differences in milk yield (average 76.4 lb/d) were observed among treatments. Milk fat percent was lower ($P < 0.01$) for diets containing WCS with elevated FFA (4.22, 3.64, and 3.58% for control, HFFA1, and HFFA2, respectively). Percentage of milk protein, lactose, and SNF was similar among treatments. The efficiency of converting DMI to milk tended to be lower ($P < 0.07$) for diets containing whole cottonseed with elevated concentrations of free fatty acids (1.62, 1.55, and 1.50 lb milk/ lb DMI, respectively). No differences were observed in concentrations of MUN although values were numerically higher ($P = 0.15$) for diets containing WCS with elevated FFA.

Results of this trial indicate that feeding WCS with high concentrations of FFA does not alter intake or milk yield. The reduced concentration and yield of milk fat suggest altered ruminal fermentation and fiber digestion. In our previous trial ruminal pH decreased linearly as the FFA concentration increased, but not differences were observed in concentrations of volatile fatty acids typically associated with decreased milk fat percentage when Holstein steers were fed diets containing WCS with FFA up to 18%. The fatty acid profile of the oil in WCS with 3 and 12% FFA was similar in our previous research, so reduced milk fat percent is not likely related to changes in dietary fatty acids that would alter transfer of fatty acids into the mammary gland. The FFA content of WCS used in both trials was higher than that used previously, so ruminal fermentation may have been altered in a manner to reduce milk fat synthesis but did not limit total protein or energy availability in support of milk and milk protein synthesis. This project is complete.

Project # 319
Title: **$1000 Milk Check-Off Scholarship**. K. Braun

Project # 320
Title: **Evaluation of Environmental Bedding Materials for Mastitis Pathogens.** D. Bray

We continue to acquire samples of various bedding materials from dairies in Florida and Georgia. This project is ongoing.

Project # 321
Title: **Multi-Lingual Milking Videos for Florida Dairies.** D. Bray

We continue to do new videos and are starting to remake previous videos as dairymen change their procedures. This project is ongoing.

Project # 322
Title: **Environmental Modifications for Reducing Summer Stress on S. E. US Dairy Farms.** D. Bray

This year's project pointed out the need to continue feed line sprinklers during the nighttime hours. Found that cooling fans in tunnel ventilation barns became dirty faster than in open barns. This project is completed.

Project # 323
Title: **Florida Mastitis and SCC Reduction Study.** D. Bray

This was the first year of this project. We acquired mastitis data on 10 dairy farms on DHIA and are developing a program to use the "Hot List" more effectively. We also obtained volumes of data on bulk tank and cow pathogens, and their effect on mastitis levels and bulk tank SCC levels. This project continues.

Project # 325
Title: **Dairy Business Analysis Project - Georgia-2003**. L. Ely

Twenty-nine dairies submitted financial data in 2002. Twenty-seven dairies were included in the summary results. Of these, 18 were located in Florida, 8 in Georgia and one in Alabama. The average herd size was 1,168 cows and 583 heifers with 16810 lbs. milk sold per cow. The average culling rate was 34%. There was an average of 20 FTE workers per farm and 1,010,000 lbs milk sold per FTE worker. Total revenue per cwt. was 17.67 / cwt with $16.05 / cwt milk income. The average total expense was $17.88 / cwt. The largest expense items were purchased feed ($7.00 / cwt), labor ($2.88 / cwt), and livestock ($1.04 / cwt). Net farm income

from operations was on average $-.21 / cwt and net farm income was $-.10 / cwt. The debt to equity ratio was 1.10, the rate of return on assets was -0.02, the rate of return on equity was -0.08, the operating profit margin was ratio was -0.03. There is no clear association income, expenses or returns with herd size in 2002. Milk price / cwt was lowest for <500 cows ($15.81) but other income was highest (42.25 / cwt) resulting in the highest total income ($19.24 / cwt) and net farm income $.57 / cwt. Milk price, total income, total expenses increased with production level. net farm income was highest for medium production level.
Data collection for 2003 is being conducted. This project is complete.

Project # 326

Title: **Do Carbohydrate Blends Give the Same Amounts of Nutrients as Individual Carbohydrates? (Do Associative Effects Help or Hurt Us?).** M. Hall

Continuing. The last of the fermentations for this study were completed in June 2004. Sample analysis is being completed. Project should be fully completed by December 2004.

Project # 327

Title: **Use of Management Strategies Throughout the Transition Period of Dairy Cows to Improve Their Liver Function, Health and Milk Production.** H. Head

We studied whether multiparous Holstein transition cows fed glucogenic compounds (n=124) or supplemented with bST (n=103) showed changes in blood metabolites and liver fat accumulation and steady-state expression of mRNA of specific enzymes for glucose and lipid metabolism that favored better milk production and health. In the first group, multiparous Holstein cows (n=124) were used to evaluate effects of supplementing glucogenic compounds in daily TMR fed during the transition period (-3 wk to +4 wk). Some results of these treatments are described in project # 287. The second group of cows were given biweekly bST-supplementation (0.4 mL, 10.2 mg/d, POSILAC®), which began 21 d before expected calving and continued through 70 DIM. In the second experiment the TRT were I=no bST, n=26; II=bST postpartum, n=25; III=bST prepartum, n=27; IV= bST prepartum and postpartum, n=25. During both experiments, blood samples were collected 3 times a week from all cows during the transition period (21 d prepartum through 28 days of lactation) to measure non-esterified fatty acids (NEFA) and β-hydroxybutyrate (β-HBA) concentrations in plasma. Liver biopsies were taken from a subset of 9-11 cows/TRT (80 total cows) at ~-21 d, around calving, and +14 and +28 d postpartum and analyzed for total liver fat (wet weight basis) and steady state expression of messenger RNA for important liver enzymes [pyruvate carboxylase (PC), phosphoenolpyruvate carboxykinase (PEPCK), and microsomal triacylglycerol transfer protein (MTP-I)].

Overall, blood measures followed expected patterns for Holstein cows during this time period. Cows supplemented with MET and PPG had slightly higher mRNA abundance of PC compared to CON and NUT supplemented cows, but the other (PEPCK mRNA abundance) was similar across treatments and no differences in concentrations of glucose were detected across treatments. Abundance of MTP mRNA was unaffected by treatment and no incidences of fatty liver or treatment effects on percentage liver fat were detected, although liver of NUT supplemented cows had numerically greater fat percentage (+~30%) compared to CON and PPG supplemented cows, and ~58% more than MET supplemented cows. Greatest percentages of fat in liver was on d +14 (9.9%) compared to the other three sample days. Adding glucogenic compounds to TMRs fed in transition cow diets did not alter the expected changes in plasma insulin, IGF-I, metabolites or liver lipids around calving, although small differences were detected due to including supplement in TMR during this period

bST supplementation did cause some changes in liver enzyme RNA levels for PC mRNA but they did not differ among bST-supplemented groups of cows. Results indicated that supplemental bST caused increased MY and postpartum plasma IGF-1 concentrations, but did not affect plasma glucose, or hepatic PC mRNA. Also for bST treatments, no effects were detected on NEFA and β-HBA – both were within the expected normal concentrations indicating no greater tendency of a ketosis. No effects were detected on amount of liver fat, but there was greater expression of MTP-I during the postpartum period. We concluded that when bST was supplemented only during the postpartum (TRT II), β-HBA was increased after calving. The fat clearance from the liver of these cows was not greater than for cows of other treatments. Associations of observed effects on liver measures and incidences of specific diseases are in progress. This project is ongoing.

Project # 328

Title: **Milk Check-Off Recovery Funds.** G. Hembry

No summary report necessary.

Project # 329

Title: **Evaluation of the Effectiveness of Decreasing the Dose of GnRH Used in Ovsynch Protocol for Synchronization of Ovulation and Timed AI in Dairy Cows.**
L. McKee

The objective of this study was to determine the effectiveness of decreasing the dose of GnRH (Cystorelin®, Merial Limited, Duluth, GA) used in the ovulation synchronization (Ovsynch) protocol. First service lactating Holstein cows (n=100) at the University of Georgia Dairy Center in Athens were randomly assigned to 1 of 4 treatment groups (25/trt). All cows received 25 mg of PGF2a (Lutalyse®, Pfizer Animal Health, New York, NY) 11 days (d -11) prior to starting Ovsynch. Cows in treatment 1 received 100 µg GnRH on day 0, 25 mg PGF2a on day 7, and 100 µg GnRH on day 9. Treatment 2 received 50 µg GnRH on day 0, 25 mg PGF2a on day 7, and 100 µg GnRH on day 9. Treatment 3 received 100 µg GnRH on day 0, 25 mg PGF2a on day 7, and 50 µg GnRH on day 9. Treatment 4 received 50 µg GnRH on day 0, 25 mg PGF2a on day 7, and 50 µg GnRH on day 9. All injections were given i.m. Blood samples were collected on days -11 and 0 for progesterone anaylsis. All cows were artificially inseminated (AI) 16-20 hours after the second GnRH injection. Pregnancy was checked via ultrasound at 35-40 days and 55-60 days after AI. Data was analyzed by Chi Square. The 100 cows averaged 2.3 lactations, 68 days in milk and 88 lb of milk on DHIA.
Pregnancy rates at 35-40 days were 52%, 32%, 44%, and 56% for treatments 1, 2, 3, & 4 respectively (P>.05, NS). At 55-60 days, the rates were 36%, 28%, 36%, and 48% (NS). Embryonic losses between day 40 and 60 were 16%, 4%, 8%, & 8%. Overall pregnancy rates were 46% at 40 days and 37% at 60 days (NS). A total of 14 of the 100 cows were considered to be noncyclic (both samples < 1.0 ng/ml) and only 2 of these were pregnant at 35-40 days versus 44 of the 86 cyclic cows (either or both samples > or = 1.0 ng/ml). A total of 28.8% of 28 were pregnant at 55-60 days when the highest temperature-humidity index (THI) on the day bred was > or = 80, 45.2% of 31 when the THI was between 70-79 and 36.6% of 41 when the THI high was 69 or < (NS). During the 11 months of this study, days open on DHIA decreased 34 days. This project is ongoing.

Project # 330

Title: **The Value of Postpartum Rectal Temperature and Calving Status in the Prediction of Metritis and Milk Production in Dairy Cows.** C. Risco

Introduction: Metritis is a serious condition in dairy cows since it affects production, fertility and can be life-threatening. A better understanding of calving-related factors that predispose cows to metritis would aid in the prevention, diagnosis and treatment of this condition. The objectives of this study were to: evaluate the association of calving status, parity and season on the incidence of postpartum metritis in lactating dairy cows; examine the role of rectal temperature as a predictor of this condition, and document the effect of metritis on subsequent reproductive performance.

Materials and Methods: This prospective longitudinal study was conducted in a 1000-cow dairy farm in north Florida between August 1, 2002 and April 15, 2003. The farm employed a postpartum health monitoring program, and calving status was determined by whether or not the cow experienced dystocia, retained fetal membranes (RFM) and twins. Cows with a normal calving status (Nc) were those without any calving related problems. Cows with an abnormal calving status (Ac) were those with dystocia, RFM with or without dystocia or twins at calving. Daily rectal temperature (RT) of all cows was taken between 0700 and 0900 h from days 3 to 13 post partum, and health examinations were performed by the on-farm veterinarian. Cows that appeared sick (depressed, eyes tented) or had a RT = 103.0o F were examined for metritis. The criterion for diagnosis of metritis was the presence of a watery, brown-colored, fetid discharge from the vulva (noted after rectal palpation of the uterus), with or without a RT = 103.0o F. Cows diagnosed with metritis were treated with systemic antibiotics, anti-inflammatory agents, calcium and energy supplements. The thermal heat index (THI = td – [.55 - .55RH] [td – 58]) was calculated using the daily ambient temperature (td) and percent relative humidity (RH) recorded at the closest weather station. Two seasons were defined based on THI: a cool season THI < 76.2 from October to April and a warm season THI = 76.2 from May to September. Data for the incidence of metritis by calving status, parity and season for the 13 days post partum period were analyzed by survival analysis (Proc Life test and Cox regression). Two-and three-way interactions between the main effects (calving status, season, parity) for the incidence of metritis were tested by the General Linear Model procedure of SAS. Data for daily rectal temperatures were analyzed from days 3 to 13 post partum and for the 5 days prior to diagnosis of metritis. Rectal temperatures were analyzed with the Mixed Model Procedure of SAS to evaluate the effect of calving status with or without metritis, parity and day as main effects as well as two-and three-way interactions. Repeated measurements of RT also were analyzed by testing homogeneity of regression curves for day trends. A single polynomial regression for day was fitted for RT, and the differences from fitting individual regressions for the effect of calving status, metritis, parity and their interactions were tested. Pregnancy was determined per rectum palpation of the uterus between 40 to 47 days after insemination. Accumulated pregnancy rate up to 150 days post partum was analyzed by Logistic Regression.

Results: Of the 450 calvings evaluated during the study period, 327 (73%) were normal and 123 (27%) were abnormal. Cows with a normal calving status had a lower incidence of metritis compared to cows with an abnormal calving status (43/327 [13%] vs. 51/123 [41%], respectively; $P < 0.01$). For primiparous cows the incidence (± SE) of metritis was higher in the cool season regardless of calving status (Nc-cool: 28 ± 4 % > Nc-warm: 0 ± 7 %; Ac-cool: 63 ± 5 % > Ac-warm: 30 ± 12%). In contrast, no difference in the incidence (± SE) of metritis was detected in multiparous cows for either cool or warm seasons (Nc-cool: 6 ± 3 % and Nc-warm: 13 ± 6 %; Ac-cool: 27 ± 5 % and Ac-warm: 28 ± 7%; calving status x season x parity; [$P < 0.01$]). In both primiparous and multiparous cows, rectal temperatures (during days 3 to 13 post partum and for 5 Days prior to the diagnosis of metritis) were higher in cows that developed metritis regardless of calving status. Rectal temperature measurements delineated three categories of cows: without metritis and no change in RT (mean = 101.5o F; n = 356); metritis cows that had an elevated RT (mean = 102.0o F; n = 55) without an increase in RT during the last 48 hours prior to diagnosis; septic metritis, cows that had an elevated RT (mean = 102.2o F; n = 38) with an increased RT during the last 48 hours to a mean of 103.6o F at diagnosis. All cows experiencing metritis and septic metritis were treated therapeutically as described above. There were no detected differences in accumulated pregnancy rate by 150 days post partum (mean = 50%) among normal cows and cows experiencing metritis and treated for the condition. As expected, a season effect was detected (Cool season [40 %] > than warm season [28 %; $P < 0.02$]).

Significance: Occurrence of metritis was higher in cows experiencing an abnormal calving. Primiparous cows had a greater incidence of metritis in the cool season for both normal and abnormal calvings. In contrast, multiparous cows showed no seasonality in the occurrence of metritis. Evaluation of daily RT distinguished septic from non-septic metritis prior to diagnosis; sequential increases in RT on two consecutive days prior to the actual diagnosis can serve as a predictor of septic metritis and warrants an earlier treatment. Likewise, cows experiencing metritis had a mean increase in basal RT of 0.5o F. Early therapeutic treatment of all cows diagnosed with metritis or septic metritis resulted in pregnancy rates comparable to normal or abnormal calving status cows, not experiencing metritis. This project is complete.

Project # 331

Title: **The Development of Corn Silage Varieties and a Year-Round Cropping System for South Florida Dairy Farms.** B. Scully

Corn Silage: Spring silage experiments were planted at sites in Okeechobee (1) Lorida (1), Avon Park (1) and Belle Glade (2). Additionally, three summer/fall corn experiments were planted in Avon Park (1), Okeechobee (1), and Belle Glade (1). For the spring crop over 2000 lbs of seed were distributed to five dairy farms growers including: 'Tex-Cuban', Cubano-Argentino, an 'Upright Leaf' population and an insect resistant population known as the 'CIMMYT' composite. The 'Upright-Leaf' population is being developed for crop densities of ±45,000 plants/ac, while the 'CIMMYT' population is being developed as *refugia* variety with endogenous insect resistance.

In the spring, corn breeding blocks were planted in the Everglades Agricultural Area for the development at EREC in Belle Glade and a dozen inbreds were selected for the production of silage hybrids. In the fall, these inbreds along with those developed in previous years were crossed in various permutations. A total of 800 test hybrids were developed for the testing in the upcoming year. Among these new hybrids over forty brown-midrib hybrids were assembled.
Winter Legume: Previously, a continual cropping system has been proposed to improve land productivity and Phosphate uptake. A three-crop cycle that begins with corn silage grown from March through June (Cycle #1); sorghum grown from July through October (Cycle #2); and a winter legume grown from November through February (Cycle #3). A number of freeze tolerant legumes have been considered such as the Faba bean, Austrian pea or Egyptian clover. Only the faba bean has proven robust enough to warrant consideration. This past fall an eight-acre test plot of the variety 'Banner' was planted at 23,000 plants/acre in Okeechobee County on November 11, 2004. Although yields were below expected plants attained an average height of 30 inches. This project is complete.

Project # 332

Title: **Thin Soles in Dairy Cattle. Investigation of Factors Affecting Sole Wear.**
S. Van Amstel

Over the past 10-15 years dairy herds have continued to expand and in the process move more cows to confinement conditions. This has permitted improved feeding, heat stress and manure management, all of which have contributed to improved performance and environmental compliance on dairy farms throughout the southeastern United States. On the other hand, the confinement of cows to harder, wetter and more abrasive surfaces with varying amounts of manure slurry contamination have contributed to reduced foot health. One of the more common of lameness disorders in recent years has been "thin soles". The claw horn capsule's primary purpose is to protect the underlying corium (or quick). When it becomes so thin that it looses it's ability to support the cow's body weight without damage to the underlying tissue, lameness occurs. The most common lesion, beyond direct bruising of the corium, is white line disease affecting the toe region. The initial lesion is associated with thinning of the sole and separation of the white line followed by abscess formation in the toe that frequently extends to the 3rd phalanx (bone within the claw capsule). Excessive wear is thought to be the primary cause of this problem, however experience has shown that over-trimming may also increase the risk of problems due to thinning of the soles in dairy cattle. Since 1996, these authors have addressed the trimming-related issues through the Master Hoof Care Program. A primary objective of this course is to train trimmers in techniques designed to avoid excessive trimming which might lead to lameness as described above. The over-trimming issue was also addressed by these authors in studies 1 and 2 listed below. The problem of excessive wear is equally complex, and prior to the initiation of this study not well understood. It is likely that excessive wear is a problem involving a combination of animal, feeding, housing (flooring), management and environmental factors. We began our study into thin soles through excessive wear by evaluating the moisture content of sole horn in thin soled and normal cows. High moisture content is believed to significantly reduce horn hardness. Results of our study (published in the Journal of Dairy Science and listed below) indicated that the moisture content of horn was higher in rear claws and in claws with thin-soles. Thirty percent of rear feet with thin soles had claw lesions: white line disease (72%) or sole ulcers (28%). This study supports the view that the moisture levels in claw horn are likely important contributing factors to the excessive wear rates and thin sole problems experienced in many dairy herds. Our work on this project is continuing as we will try to address other factors influencing the rate of claw horn wear in modern dairy facilities.

1. Van Amstel, SR, Palin, FL, **Shearer, JK**, and Robinson, BF: Anatomical measurement of sole thickness in cattle following application of two different trimming techniques. The Bovine Practitioner, 2002, 36(2):136-140.
2. Van Amstel, SR, Palin, FL, Rohrbach, BW, and **Shearer, JK**: Ultrasound measurement of sole horn thickness in trimmed claws of dairy cows. JAVMA, 2003, 223(4):492-494.
3. Van Amstel, SR, **Shearer, JK**, and Palin, FL: Moisture Content, Thickness, and Lesions of Sole Horn Associated with Thin Soles in Dairy Cattle. J Dairy Sci, 2004, 87:757-763.

Project # 333

Title: **Dairy Herdsman Seminars and Cow College in Spanish**. J. Shearer

A significant number of employees on dairy farms in the southeast are Hispanic and speak no, or only a limited amount, of English. As a consequence, we proposed development of training programs, such as the Dairy Herdsman Seminar and Cow Colleges, in Spanish. Over the past year we have been preparing and/or acquiring training materials sufficient to support training programs in the areas of reproduction, udder health and milk quality, replacement rearing, and hospital barn management. We are now in the planning stages for presentation of our first series of training programs. Participating faculty members decided that "Management of Obstetrics and Problems Associated with Calving" be our first offering in this series. This will be followed by programs on "Management of Cows in the Early Postpartum Period" and "Reproductive Management and Artificial Insemination Techniques". Select Sires has offered to assist with the AI training portion of the latter course. Future programs will address other key areas of dairy management. Present plan is to keep each of the training programs highly focused with emphasis on the "hands-on" training aspects. When possible, training programs will be limited to 1-day session (a half day of classroom instruction and half day of laboratory exercises). Of course, all training sessions and course materials will be in Spanish. Participants will receive a certificate of attendance for participation in the training programs. This program will continue and is expected to become an annual dairy extension program offering.

Project # 334

Title: **Reproductive Efficiency of Natural Service and Artificially Inseminated Dairy Herds in Florida and Georgia.** C. Steenholdt – summary by A. de Vries

We used DHI data (1995-2002) from all herds on DHI located in Florida and Georgia to study the effect off the breeding system (AI, natural service bulls, or a combination) on pregnancy rates and change in milk production. Pregnancy rates in the summer (18%) were twice as high as those in the summer (9%), but the effect the type of breeding system that the herd used was very small or non existent. Milk production was lower in the natural service bred herds, but the change in milk production over time was not significantly different. We submitted a paper to Journal of Dairy Science and are preparing a paper and talk to be presented at the Dairy Business Conference in October 2004. This project is complete.

Project # 335

Title: **Use of a Degradable Deslorelin Implant (2.1 mg) in Lactating Dairy Cows to Enhance Uterine Involution.** W. Thatcher

Holstein cows received subcutaneously one (DESL1, n=15) or two (DESL2, n=14) biodegradable DESL implants (2.1 mg) within 0.5 to 1.5 days postpartum (dpp) for comparison to control cows (CON, n=18). Enrollment consisted of normal cows (no dystocia, stillborns and milk fever) with BCS = 2.75. Cows diagnosed with retained fetal membranes were included. Ultrasound (US) was used to monitor number of ovarian follicles (Class 1, < 5 mm; Class 2, 6-9 mm; Class 3, = 10 mm), number of CL, diameters of previous pregnant (PH) and non-pregnant (NPH) uterine horns at 4 cm past the intercornual ligament, and diameter of cervix on 8 ± 1, 15 ± 1, 22 ± 1, 29 ± 1, 36 ± 1 and 43 ± 1 dpp. At 44.5 ± 2.4 dpp, cows entered a pre-synch/Ovsynch protocol. DESL1 and DESL2 implants reduced mean diameter of the PH (2.64 ± 0.08, 2.58 ± 0.10 < 2.95 ± 0.09; P<0.01), NPH (2.20 ± 0.05, 2.11 ± 0.05 < 2.42 ± 0.06; P<0.01), and cervix (3.67 ± 0.08, 3.53 ± 0.1 < 3.82 ± 0.08; P< 0.05) for the monitoring period. Cows that developed metritis had lower concentrations of Prostaglandin $F_{2\alpha}$ measured in the blood compared to cows that did not have a metritis event. Lower concentrations of Prostaglandin $F_{2\alpha}$ are indicative that their immune function may be less and these cows are predisposed to developing metritis. This observation provides us with new alternatives to increase uterine production of prostaglandins to improve uterine health (e.g., via feeding by-pass fatty acids that may enhance prostaglandin production). The DESL treatments reduced the frequency of cows cycling during presynch (14.81% [4/27] < 94.42% [17/18], P<0.01) and that ovulated following Ovsynch (37% [10/27] < 89% [16/18], P<0.01). The benefit of using a deslorelin implant is offset by the long period of suppressed ovarian activity. This project is complete.

Project # 336

Title: **Florida and Georgia Youth Programs, 4-H activities and Youth Events, Dairy Judging Team Support, Undergraduate Programs and Scholarships.** J. Umphrey

No summary report necessary.