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DAIRY & ANIMAL SCIENCE DAIRY DIGEST

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Another Alternative for Synchronizing Estrus in Dairy Heifers

In previous issues of the Dairy Digest, I reviewed the concept of using the CIDR (controlled internal drug-releasing device) as an estrous synchronization program for dairy heifers. It is an effective program. An older program, melengestrol acetate (MGA) in conjunction with prostaglandin (PG) has also regained some popularity as a synchronization program.

Last month during the combined professional meeting of the American Dairy Science Association and American Society of Animal Science, research was presented evaluating MGA/PG as a tool for synchronizing estrus in dairy heifers. This research was conducted by *Pharmacia Animal Health* and *Agway Feed & Nutrition* at the heifer facility in Shippensburg, PA. Approximately one hundred and sixty heifers were randomly assigned to either a control group using PG or the MGA/PG (80 per group) for synchronization of estrus. The MGA group received 0.5 mg MGA/head/day in their feed for 14 consecutive days. The control group did not not receive MGA. Nineteen days following withdrawal of the MGA from the feed, all heifers in both groups received an injection of PG. Heifers were observed for estrus during the next 7 days and those in estrus were inseminated. Heifers not observed in estrus received a second PG injection 14 days after the first injection and those observed in estrus during the next seven days were inseminated. Any heifers not observed in estrus or returning to estrus continued on the study and were bred based upon signs of heat. The results are presented in the following table.

System	MGA/PG	PG
% heifers inseminated after 1st PG	91.8%	71.6%
Pregnancy rate 1st 15 days after 1st PG	71.2%	52.6%
Days from 1st PG to AI	5.0	8.8
Days from 1st PG to 90% heifers pregnant	13.5	23.0

These results illustrate that more heifers were inseminated and conceived earlier with the MGA/PG program than the PG program. The researchers also noted there was less variation in days from the first PG injection to first breeding for those heifers that expressed heat.

In summary, based upon the results of the CIDR/PG synchronization information presented in previous articles and the results described above, there are effective synchronization programs for dairy heifers. Both programs use progesterone or a progesterone-like product in conjunction with PG which has several advantages over PG used alone. The synchrony of estrus is better and a percentage of anestrous (non-cycling) prepubertal heifers will begin to cycle. Prostaglandin is only one effective when used on heifers that are cycling. If an artificial insemination program for heifers has been unsuccessful because heat detection cannot be performed on a consistent basis then consideration should be given to implementing one of these synchronization programs. Such systems allow for heifers to be managed in groups so time for heat detection can be focused during specified periods, more timely first service can be achieved, labor used more efficiently and more quality replacements are available at a younger age.

Michael O'Connor
Dairy and Animal Science Extension

Drought Stressed Corn for Silage

Corn plants that have been severely stressed by lack of moisture for a long period of time will be short and usually completely lacking in ears. This material will often have 75 to 95 % of the energy value of normal corn silage and often has a higher protein percentage on a dry matter basis than normal corn silage. Tonnage per acre is obviously severely decreased. The reason for the higher protein level is that the protein is found in the plant and not the ear, so with no ears, the protein level of this silage is greater. It should be noted that most of the protein in this corn silage is more degradable in the rumen than normal silage protein. It is important to check levels of soluble protein in the silage before feeding, as they may often be quite high. Also do not add any form of non-protein nitrogen to the silage prior to ensiling, as this will further increase the NPN levels and often beyond what is usable by the dairy cow. Drought corn silage requires incorporation of higher levels of rumen undegradable protein to balance rations for lactating cows or other groups of animals.

Drought corn silage must still be made in the normal range of dry matter. Be aware that most of the moisture in corn plants is in the stalk and while it may seem very dry, droughty corn silage is often quite high in water content. Check dry matters BEFORE harvesting large amounts of the silage.

Although nitrate levels in drought corn silage are often high at harvest, ensiling will reduce these levels by more than half. The silage bacteria reduce nitrates to ammonia for use by the silage bacteria. It is often recommended to test drought silage for nitrates after ensiling especially if the crop had high levels of fertilizer applied. Nitrate nitrogen (NO3-N) levels of 0 to 1,000 ppm are generally considered safe to feed to dairy cattle under most conditions. Levels of 1,000 to 1,700 require special attention for use by cattle and levels over 1,000 ppm Nitrate Nitrogen require severe restrictions as to the amount to be fed to any group of animals. If you are concerned about the levels in your silage, test your forage before feeding.

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Hot June and July of 2002

The months of June and July of this year have been very hot and this hot weather has undoubtedly had an effect on the performance of dairy cows throughout the state. Just how hot is this summer? Hourly weather data are available on-line from the Pennsylvania State Climatologist at the web site (http://pasc.met.psu.edu/PA_Climatologist) for 32 sites throughout the state. These hourly measurements include dry-bulb temperature, dewpoint temperature, relative humidity, barometric pressure, wind speed and direction, visibility, precipitation, and cloud cover. Hourly climatic data for Middletown (Dauphin County) were obtained from the web site and then analyzed to describe the heat characteristics of June and July.

The hourly temperatures (all temperatures are in degrees Fahrenheit) for June and July for Middletown can be summarized concisely with the hourly values for temperature bins as follows:

$t \leq 60$	45 hours	$80 < t \leq 85$	259 hours	$t_{max} = 98$
$60 < t \leq 65$	172	$85 < t \leq 90$	130	$t_{min} = 54$
$65 < t \leq 70$	236	$90 < t \leq 95$	59	
$70 < t \leq 75$	253	$95 < t \leq 100$	5	
$75 < t \leq 80$	252	$100 < t$	0	

The interpretation of the above temperature bin data is that, for example, there were 252 hours in June and July when the air temperature was greater than 75 but less than or equal to 80 F. Likewise, there were 59 hours when the temperature was greater than 90 but less than or equal to 95 F.

"It's not the heat; it's the humidity." I'm sure you've heard that expression many times and it is just as true for dairy cows as it is for humans. The THI (Temperature-Humidity Index) has been shown to be effective in correlating the combined effects of temperature and humidity on the performance of dairy cows. The hourly calculated values of THI for June and July for Middletown are presented below in the format of THI bins.

$THI \leq 70$	584 hours	$78 < THI \leq 80$	88 hours	$THI_{max} = 85$
$70 < THI \leq 72$	189	$80 < THI \leq 82$	70	$THI_{min} = 58$
$72 < THI \leq 74$	162	$82 < THI \leq 84$	34	
$74 < THI \leq 76$	148	$84 < THI \leq 86$	7	
$76 < THI \leq 78$	129	$86 < THI$	0	

Research activities conducted in numerous states throughout the United States have shown that comfort levels of dairy cows (and hence production levels) begin to decline whenever THI exceeds the mid-70's. The performance levels of cows drop very quickly with sustained THI levels above mid-70. Anytime the THI exceeds 80, the cows are experiencing high levels of heat stress. The heat stress not only reduces the milk production of the cows, but the reproductive efficiency of the animals as well. The above THI data indicate that heat stressing conditions existed for 328 hours (the hours that the THI is greater than 76) in June and July. Data for the entire summer of 2002 will be presented in October. Please contact the author if comparable information is desired for another site in Pennsylvania.

Note: The hourly values of temperature and THI do not total 1464 (the number of hours in June and July) because of missing data for 53 hours during this two-month period.

Dennis Buffington
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Innovative Business Arrangements – Think of the Possibilities

With a focus on building greater business profitability and sustainability, many producers are turning to non-traditional business arrangements to improve efficiency and profitability. Innovative arrangements can serve as a vehicle for both the dairy producer and the individual(s) he is partnering with to profit. Each member to an arrangement should have something to bring to the table. It could be a set of machinery, production or marketing expertise, investment capital, or even the enthusiasm to learn and work hard to make the business a success.

Each arrangement holds its own set of advantages and disadvantages. Additionally, individual management style and business organization may not make the utilization of an innovative business arrangement practical. However, the key to making any innovative arrangement succeed is to have an open mind, plan for the future, communicate, and be willing to work through difficulties in an open and honest way.

Before deciding to incorporate an innovative arrangement into your current organization, you first need to know what your business goals are. This requires planning. Answer some of the following basic questions:

- Where is the business currently?
- Where do you want the business to be in 1, 5, 10, 25 years?
- What obstacle(s) is holding the business back?
- What is the best strategy to get where you want to be?
- How do you implement that strategy?

Having or developing a business plan should provide the answers to these questions. Thoroughly studying both the business plan and financial and production records will make it possible to see where there are opportunities for integrating a innovative arrangement.

There are several issues that must be considered when contemplating an innovative business arrangement.

- How will decisions be made?
- How will disagreements be handled and solved?
- What will be the divisions of responsibility and management?
- How will income and/or expenses be handled?
- Should the arrangement be formalized or remain informal?
- What are the terms for dissolving the arrangement?

These are many of the same issues that must be addressed when going into a formal partnership or corporation agreement. All parties to the arrangement need to come to agreement on these issues to ensure success. If an agreement cannot be reached, it would be better to hold off on committing to the arrangement. Otherwise, irreconcilable differences may occur or legal action could even take place.

This is the first in a series of articles discussing innovative farm business arrangements. Future articles will appear in *Dairy Digest* periodically over the next few months discussing, among others, the following types of arrangements:

- Cooperative (group) farming,
- Buying and marketing clubs,
- Mentoring arrangements.

Sarah Roth
Penn State Dairy Alliance

Mycoplasma (a mastitis agent) – would you be able to identify it in your bulk tank? Part 2

The previous article discussed the potential hazards of mycoplasma mastitis. This disease is not treatable, therefore detection is vital. You will remember that cows infected with intramammary mycoplasma infections have the potential to shed inconsistently, with possible periods of latency. In observing shedding patterns, a good understanding at what level of detection one cow with mycoplasma mastitis can be detected is crucial. We tried to estimate the sensitivity of bulk tank analysis in detecting the presence of cows with mycoplasma. When composite milk samples of cows were reviewed, two independent peaks were present. While an ample fraction of cows did not shed any or enough pathogens to be detected (29%), a majority of the cows shed in excess of 1 million colonies for most of the trial (54%).

Using the following assumptions:
(1) production per infected cow (average per infected research cows 37 lbs.)
(2) production per herd (WA state average 73 lbs.)
(3) number of cows (WA state average 330) and
(4) our data on shedding rates, we estimate that 39% of the bulk tank samples will contain insufficient mycoplasma to detect one infected cow. If cows are shedding at the lowest level as we estimated, and given our previous assumption, then 15 cows would need to be infected to be able to detect mycoplasma in a bulk tank sample. Therefore, if cows are shedding in a low range they are likely to be misdiagnosed.

How to increase detection levels

According to the National Mastitis Council Laboratory Handbook on Bovine Mastitis, the gold standard method for isolation of mycoplasma is culturing milk directly on agar plates. There are laboratory procedures that can be used to enhance diagnosis of mycoplasma intramammary infections that go beyond adherence to the gold standard. In our study, broth was used as an enrichment media to enhance detection levels. Mycoplasma was isolated from milk samples of 8 cows by direct plate inoculation, with and without enrichment. In milk samples from 2 cows, mycoplasma was only detected after enrichment. Additional discrepancies were found when

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comparing the two methods. Sixty-eight percent of the mycoplasma species were isolated from both broth and direct plate culture methods. However, almost one-fourth of the time mycoplasma colonies were isolated through broth culture only. Two of the 10 cows would have gone undetected for mycoplasma infection without the use of enrichment broth, indicating that direct inoculation of individual cow milk samples to agar plates can result in reduced detection of cows with mycoplasma mastitis.

Indirect methods for checking cows for intramammary infections

In our study we found that 60% of cows had a mycoplasma infection in all four mammary quarters. Eighty percent of the time cows were positive in two quarters on the same side of the udder (cows that were positive in the right front quarter were always positive in the right rear quarter). These findings are similar to those of Jasper and colleagues who found that cows tended to be positive in both quarters on the same side, with infection further spreading to all four mammary quarters. The evidence suggests that when a cow has multiple quarters infected, a mycoplasma infection should be suspected.

Somatic Cell Count (SCC) is the measurement most commonly used as an indicator of mastitis. The log (10) SCC for cows with mastitis was 6.5. In this study SCC of quarter milk samples from cows infected with mycoplasma mastitis were elevated and numbers fluctuated little throughout the trial. In comparing the correlation of SCC and Colony Forming Units (CFU), the correlation was highly significant in composite milk samples. These correlations indicate that cows with high SCC could have a mycoplasma infection. Thus, cows with high SCC should be checked for mycoplasma infections within a herd.

In conclusion, we know that:

- cows infected with mycoplasma mastitis do not always test positive on a consistent basis. Our research study found that 39% of the time samples would contain insufficient mycoplasma to be detected even though a cow may be infected.
- There are laboratory procedures such as mycoplasma broth that can be used to enhance diagnosis of mycoplasma intramammary infections.
- Clinical characteristics such as somatic cell count of the cow can also be used as a tool for identifying cows with mycoplasma mastitis.

Veterinarians, milk cooperatives, and producers use bulk tank cultures to monitor a herd's mastitis situation and the presence of mastitis pathogens. There are limitations for uses of such a monitory tool, and perhaps as many as 30% of all samples would be negative although there was one cow with a mycoplasma intramammary infection in the herd.

Storing and Freezing of Mycoplasma

Often, milk samples to be cultured for mycoplasma are frozen before they are cultured. Freezing milk samples has the potential to impact the number of mycoplasma colonies recovered.

Many studies have been conducted to examine the survivability of mastitis pathogens in milk samples during storage. Freezing of milk samples has been documented to affect the survival of mastitis pathogens after storage. However, limited research has been done to examine how mycoplasma species are affected by varying storage regimens.

We designed a study to examine the effects of various storage times and repeated freezing and thawing on the recovery of mycoplasma in milk samples from cows with intramammary infections. Samples were thawed at ambient temperature as compared to thawing a sample in a 37ºC water bath to study the affect of thawing. Recovery of mycoplasma was significantly greater in samples thawed at ambient temperature. This would suggest that a mycoplasma cell is susceptible to injury when thawed too rapidly.

To study the effect of storage, samples were subjected to seven different treatments. There was a significant reduction in the number of mycoplasma colonies as samples were repeatedly frozen and thawed or stored for various periods of time. Fifty-nine percent of the samples were negative after being repeatedly frozen and thawed up to 4 weeks. Forty-five percent of the samples were negative after being stored for different periods of time. These results indicate that storage and thawing of milk samples is harmful to mycoplasma organisms, which could lead to misdiagnosis.

One method of controlling mastitis is identifying organisms in milk samples. The ability to freeze and store milk samples without loss is essential so misdiagnosis can be prevented. Since routine freezing and thawing is not accommodating to mycoplasma, the possibilities of misdiagnosis may be high. Therefore, producers, milk handlers, and veterinarians need to take precautions in handling milk samples. Given that the results indicated up to a 59% loss, it is best to culture milk samples suspected of mycoplasma immediately to keep loss of mycoplasma pathogens to a minimum.

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WA State Univ. Newsletter, July 2002, Volume 11, Number 4

Top Dairies Have EMPOWERED Employees

There is a lot of confusion about empowering employees. Empowered employees have some degree of control over how they do their job and what the outcome will be, while un-empowered employees simply do what they are told. Theory holds that empowered employees will be more motivated and productive than un-empowered ones, and research support this.

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In the dairy setting, an un-empowered milking staff justs follow the boss's orders. They come to work, perhaps follow a standard operating procedure that the boss developed and handed to them, and leave when the job was finished. They don't worry about any goals, because the boss doesn't share that information with them. Any changes are the responsibility of the boss. Employees in such a situation are unmotivated and turnover is high.

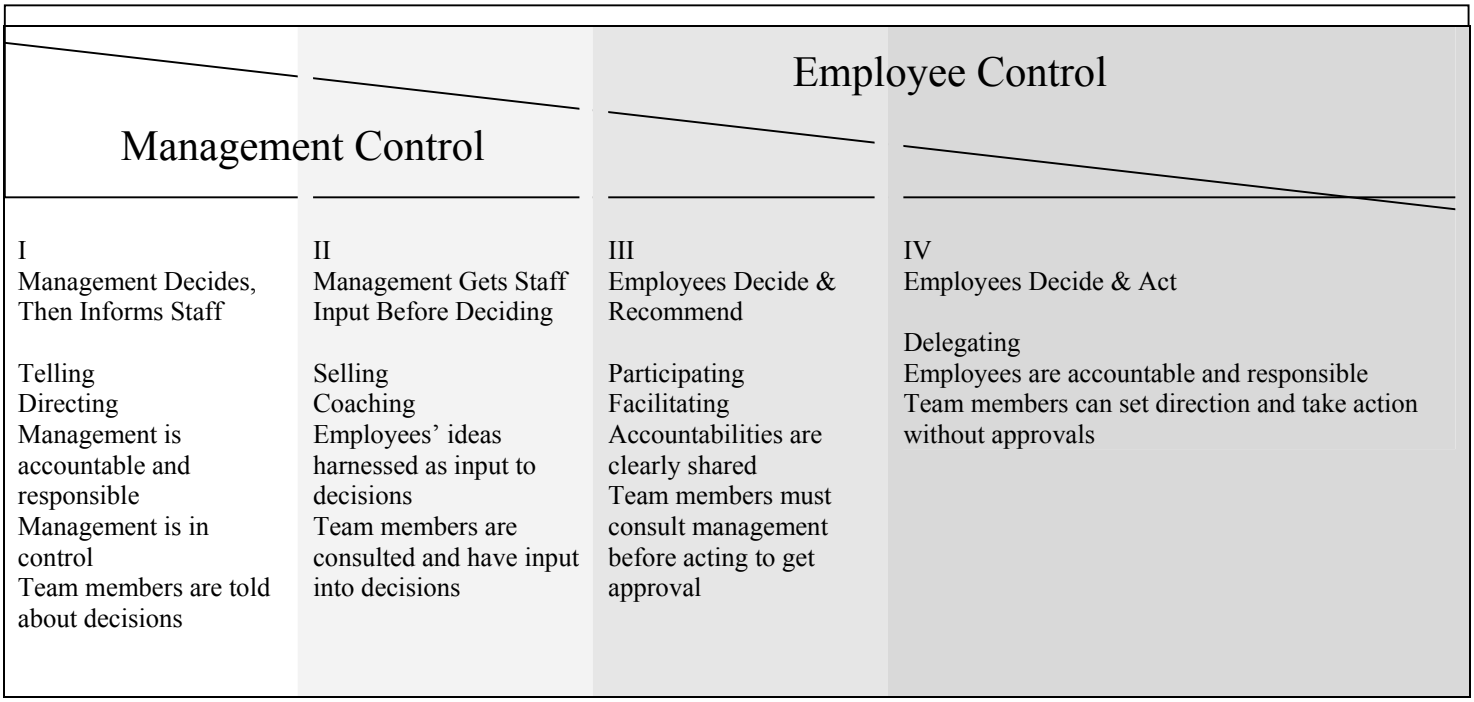
An empowered milking staff, on the other hand, is well aware of the purpose and performance goals of the dairy operation. They have a team spirit of working together to accomplish challenging goals. They learn about dairy management from the farm press, educational meetings, and other sources and bring fresh ideas to the dairy. They even make decisions and plans about how to implement the best ideas in their own operation so that even greater goals can be achieved. Over time such an empowered operation will have a highly motivated and stable workforce that attracts high quality employees. Performance will easily outclass the un-empowered operation.

Empowerment doesn't need to be a mysterious concept. The above graphic shows a continuum of four stages of employee empowerment. As one moves from stage I to stage IV there is a gradual shifting of responsibility and authority from management to employees. The benefit to management in moving toward stage IV is better performance and motivation from employees, not to mention increased time and freedom to tackle larger or more long-term projects and responsibilities.

Few dairy managers will ever reach stage IV, but those that do will be truly superior managers. Many managers could reach stage III, where employees are actively engaged and will come to management only for final approval. Stage III managers can have a highly talented and motivated workforce that gives them plenty of time to manage the big issues.

Most dairy managers need to at least be in stage II. If you're not asking for input from your employees then you are not making the best possible decisions for your operation. Those managers who recognize themselves in stage I need to critically evaluate their own performance. Are your employees truly incapable of offering any useful input to your operation? If this is the case, why can't you attract better employees? Stage I managers need to learn to delegate some authority and responsibility to employees so that they can take on other challenges.

The Empowerment Continuum (Bens, 2000)



The good news is that anyone can move along the empowerment continuum. Good managers are made not born. There are specific techniques that managers can learn and implement with their employees in order to move everyone to a state of greater motivation and empowerment. To learn more about this topic, contact the Dairy Alliance office at 1-888-373-PADA and ask about the MEDS program (Management Essentials for Dairy Success).

Reference:
Bens, I. (2000), *Facilitating With Ease: A Step-by-Step Guidebook*. San Francisco: Jossey-Bass Inc.

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Announcement

Ag Engineering Workshop for Ag Professionals

Lewistown, PA: Ag Professionals such as veterinarians, nutritionists, and other consultants wanting to learn more about the basics of dairy housing are invited to attend an Ag Engineering Workshop hosted by Penn State Cooperative Extension. Veterinarians that attend the workshop will also receive 9½ continuing education credit hours.

During the workshop Ag Professionals will expand their knowledge and expertise of Ag Engineering as it relates to dairy housing. Attendees will be better able to identify and help resolve problems associated with facilities and animal environment. Attendees will be provided resources and contacts to assist in future problem solving with their clients. Both freestall and tiestall housing issues will be addressed at the workshop. The emphases of the workshop will be to learn evaluation and troubleshooting skills to be used with existing facilities.

The workshop will be a combination of classroom lecture, round table discussion, and on-farm demonstration and troubleshooting. During day one classroom lectures you will learn key areas in facility evaluation. Topics will include design management and troubleshooting of stalls, ventilation, watering systems, feed areas, biosecurity zones and cow traffic patterns. Day two of the workshop will consist of visits to a parlor/freestall setup and a tiestall facility. Participants will use their skills learned during day one to evaluate and troubleshoot the facilities, with the assistance of Ag Engineering instructors. Recommendations will then be provided to the producer.

This is designed to be an interactive workshop, therefore registration is limited to twenty-five people at each site. The registration fee of $175 per person includes the cost of instruction, program materials, meals, and transportation during the day two farm visits. Late registration fee is $200 for registration received after September 9, 2002.

The Ag Engineering Workshop will be offered at two locations:

- Huntington County Extension Office located in Huntington, PA on October 1 & 2, 2002
  and
- Lantern Lodge Motor Inn located in Myerstown, PA on October 15 & 16, 2002.

For more information about the Ag Engineering Workshop for Ag Professionals, contact John Tyson (717) 248-9618 or jtyson@psu.edu. More information about the workshop and registration information is also available on the web at http://AgEngWorkshop.cas.psu.edu.

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