Spring of 2005 marks the beginning of the North Carolina Dairy Producers Association's 10th year. During the past nine years the Board of Directors has worked hard on behalf of the state's dairy farmers. We have been involved in a variety of issues over the years, such as:

Environmental - Air and Water Quality
Animal Health - Johne's and Foreign animal Disease Control
Economic - Dairy Compact, MPC Legislation, MILC legislation
Legislative - visits and contacts with Congressional and General Assembly legislators
Educational - NC Dairyman's Conference and other educational programs

Attention - Attention - Attention - Attention
The North Carolina Dairy Foundation has generously provided the financial support for printing and mailing this newsletter for the last three years. The North Carolina Dairy Producers Association has agreed to pay the production and distribution expenses for the next four quarterly issues of the newsletter. The support of both of these organizations is greatly appreciated.

If you would like to receive an e-mail copy of future newsletters instead of a printed copy, please send a note with your e-mail address to donald_pritchard@ncsu.edu.

You can access this newsletter and future issues that will be posted in September, December, March and June at the following web site: http://www.cals.ncsu.edu/an_sci/extension/dairy/Dairyh~1.htm. Once you are at that site, click on Dairy Subject Matter Information, and then click on NCSU Dairy Extension Publications. If you want to access the newsletter through the web site and not receive a printed copy, send an email note to donald_pritchard@ncsu.edu. Thank you.
Since the Annual Meeting in February, the Association sent seven North Carolina dairy farmers to Washington, DC for two days to meet with our legislators and their ag staffers. Back home in the General Assembly we met with House and Senate Ag Committee members at a Legislative Breakfast and then participated in the Agricultural Products Dinner for legislators.

The NCDPA is supporting legislation in the General Assembly that would establish the North Carolina Dairy Stabilization and Growth Fund to provide critical support for the dairy industry. We have sent letters opposing legislation that would give the Governor the authority to appoint the Commissioner of Agriculture rather than being elected.

During the late fall of 2004 all of North Carolina's dairy farmers should have received a Dairy Farm Security Resource Materials Manual. This manual provides information that could help you prevent or minimize disaster situations. This year the NCDPA will be working with other representatives of the dairy industry to develop a Dairy Business Continuity plan. This plan will help the industry recover and begin shipping milk to market in the event of a foot and mouth disease outbreak.

As you can see, the North Carolina Dairy Producers Association continues to represent the state's dairymen in a variety of issues, both at the state and national level. Thanks to the members for their support. We encourage others to show their support of the NC dairy industry by joining the NC Dairy Producers Association. There is a membership application form on the enclosed brochure about the NCDPA. Please complete the form, send it along with your membership fee, and become a member of the state's dairy organization that is working on behalf of all producers.

Now that the hotter and more humid months of the year are upon us, trying to keep your cows cool and comfortable should be a priority for all dairy producers. The information presented in the following brief articles will hopefully provide you with suggestions and ideas of practices you can implement that will help your cows be more productive and profitable this summer and fall. If you have specific questions about any of the topics discussed, contact the Extension specialist who wrote the article or your Extension agent. The contact information for the specialists and agents who are members of the "Dairy Success" program is shown on the last page of this newsletter.

**General Heat Stress Information:**
Heat stress occurs when a dairy cow's heat load is greater than her capacity to dissipate heat. Effects of heat stress include: increased respiration rate, water intake, and sweating; decreased dry matter intake and slower rate of feed passage; decreased blood flow to internal organs, lowered milk production and poor reproductive performance.

The heat that is generated in a cow's body is dissipated through four routes: conduction (physical contact with surrounding objects), convection (air layer next to skin is replaced with cooler air), radiation (body heat is dissipated into the cooler air around the cow), and
evaporation (sweat that evaporates or is expelled with increased respiration removes body heat).

Heat stress severity is calculated using a temperature humidity index (THI). The THI takes into account both the ambient temperature and relative humidity. Signs of heat stress in dairy cows in North Carolina and throughout the Southeast start to appear during the hotter months of the year when the THI gets above 72. This THI value is reached when the temperature climbs above about 78°F. The humidity will usually be high enough at that temperature to cause some level of stress. The higher the temperature and/or humidity, the greater the amount of stress.

An excellent, large on-line library of heat stress management references and other pertinent web site addresses are available from Monsanto Dairy Business through their Dairy Online Connection internet web address. Go to http://monsantodoc.com and after you sign-up for a free membership, do an advanced library search for heat stress literature. Many of the articles listed can be printed.

**Cow Nutrition Heat Stress Management Tips:** (Dr. Lon Whitlow)

High humidity makes it difficult to cool dairy cows during the heat of summer. Therefore, in North Carolina we must look at every way possible to prevent heat stress. Nutrition and feeding management practices can help manage summer heat stress.

**Adequate drinking water:** Cows should have free access to clean, cool drinking water. Milk is 87% water (100 lb of milk contains 10 gallons of water). Loss of water through sweating and respiration helps dissipate heat, and water consumption increases by up to twice normal during heat stress (35 to 45 gallons per cow daily). Water should be available when cows leave the parlor and also throughout the freestall barn or wherever cows are housed. In freestalls, water troughs should be located in areas such as crossovers with sufficient space and access so that boss cows do not dominate and prevent others cows from drinking freely. A sufficient number of troughs and trough space should be provided to eliminate competition for water. Approximately 10 feet of water trough perimeter is needed for 75 to 100 cows. Some recommend at least one trough for every 20 cows. There needs to be adequate water flow to refill the trough quickly. Troughs should be shaded to keep water cooler. Check troughs for stray voltage that can limit water intake. Periodically clean troughs to remove sediment and algae. Routinely test water for content of nitrates, iron, sulfates and coliform bacteria.

Some research has shown that offering chilled drinking water in the parlor can reduce heat stress, but other research did not show a benefit. It is questionable if this is a profitable practice in many situations.

**Feeding management.** Use only high quality, palatable feed ingredients. Excellent management of the silage feeding face is needed to avoid spoilage and reheating in the feed bunk. Including any spoiled feed in the feed mix or allowing feed to heat in the bunk can reduce intake and feed value. Prudent use of preservatives can help prevent spoilage and heating. Intake can be increased by frequent feeding, routine pushing up of feed and keeping bunks sanitary. Although feed should be available more than 20 hours daily, the bulk of feed should be available late in the day and early in the morning when temperatures
are lower. Feed bunk areas should be shaded, and cooled with fans and water, but avoid excess wetting of the feed.

**Nutrition.** The goals are to formulate summertime diets that do not create as much heat during digestion, that are palatable and encourage good intake, that are energy dense to compensate for lower feed consumption, and that provide the special needs of heat stressed cows such as electrolytes, vitamins, or digestive aids.

Rations formulated to produce less heat are “cooler” and are formulated to provide more energy but with less fiber and more fat and carbohydrates. **CAUTION:** Maintenance of a healthy rumen is essential. Both heat stress and added dietary fat depress feed intake, further lowering consumption of fiber. Lower fiber consumption can result in acidosis. The heat stressed cow is already prone to acidosis due to increased losses of salivary and urinary buffers and respiratory loss of carbon dioxide. **RECOMMENDATION:** Feed the highest quality most palatable forages during heat stress periods. Maintain minimal effective fiber levels in the ration by ensuring a sufficient percentage of fiber with an adequate length of chop for good roughage value. Encourage feed consumption by using high quality, palatable ration ingredients, by judicious use of ration additives and preservatives, and by increased management of the feed bunk. Add rumen inert fats or whole cottonseed at moderate levels not to exceed 6% total fat in the diet. Add buffers such as sodium bicarbonate at amounts of 0.33 to 0.50 lb/cow daily to increase intake, help prevent acidosis, and maintain electrolyte balance. Some minerals concentrations are recommended to be increased such as sodium 0.35 to 0.45%, potassium 1.20 to 1.5% and magnesium 0.30 to 0.40%. Additives like monensin sodium that improve feed efficiency, may reduce heat load and help maintain production. Some research has shown a benefit to the addition of yeast and niacin during hot weather.

**Protein** in excess (or unbalanced) diverts the cow’s energy away from production and to the job of excreting unusable nitrogen. **CAUTION:** Protein formulation errors may include: too much protein, not enough protein, too much degradable protein, too much non-protein nitrogen, and poor quality proteins that result in amino acid deficiencies. **RECOMMENDATION:** Protein recommendations should be made for your herd with your set of feed ingredients. Protein concentrations, degradable/undegradable protein levels, and protein quality need to be closely examined and balanced during heat stress.

**Feeding Summary:** Provide adequate clean cool water
Use the best, highest quality forages
Encourage feed intake by various methods such as use of quality feed ingredients, excellent management of silage and feed bunks, and feed during cooler hours
Maintain sufficient effective fiber to avoid acidosis
Add fat (up to 6% total ration fat) using inert sources or cottonseed
Add buffers and other research proven feed additives
Fine tune the protein balance to avoid protein wastage
Calf and Heifer Heat Stress Management Tips: (Dr. Brinton Hopkins)
The hot temperatures and high humidity associated with summer in North Carolina affects calves and heifers as well as the lactating cows. Heat stress on these younger animals can affect their immune system and reduce their ability to ward off disease. In addition, as with lactating cows, the younger animals will reduce their feed intake in response to high environmental temperatures and humidity. Heat stress increases respiration rates, sweating and the maintenance energy requirement as the animal tries to maintain a more normal body temperature. This coupled with reduced feed intake means that the calf or heifer will have a reduction in average daily body weight gain. Calves and heifers also require more water intake during heat stress to avoid dehydration. Heat stress creates a challenge for dairy managers to keep the calves and heifers healthy and growing during the hot summer months. This is a good time to review your calf and heifer feeding and management protocol. Consider these tips to help alleviate the effects of heat stress:

- Block direct sunlight from the calves by placing the hutches in a shady area or provide shade cloth over the calf hutches.
- Position calf hutches with enough space between them to allow for good air circulation around the hutches.
- Open all vents on the calf hutches.
- Consider using sand to bed the hutch. Sand is a non-insulative bedding that can help keep the calf cooler when she is lying down. If you keep the sand clean and dry, it can also help control flies in the hutch.
- Provide an attached outside area for the calf to get out of the hutch.
- Make sure that plenty of clean water is available at all times to the calf from the first day of life. This is in addition to the water mixed with the milk replacer.
- Provide a shaded area for older heifers. A movable shade can work well in a pasture situation.
- Provide plenty of clean water in the pasture and close to the area where the heifers are fed.
- Feed a balanced ration.

Reproductive Heat Stress Management Tips: (Dr. Steve Washburn)
As spring ends and summer arrives, it is nearly certain that reproductive efficiency among cows on your farm will decline. A high temperature-humidity index (THI) can adversely affect reproduction in multiple ways.

In hot weather, some cows may have interruptions to estrous cycles and fail to cycle. Cows that do continue to cycle usually are less active sexually making them more difficult to catch in estrus. Actually, not catching heat-stressed cows in estrus can reduce frustration of herd owners because such cows likely would fail to conceive even if they were inseminated.

Insemination of a cow in estrus almost always results in fertilization of the ovulated oocyte. Under moderate environmental conditions, there are typically losses of developing embryos and fetuses such that only 30 to 50% of the fertilized eggs result in pregnancies that go to term. However, with high THI conditions many more of those newly fertilized embryos fail to develop successfully into a growing fetus that can be detected by palpation. It is not unusual to have fewer than 10% of inseminations result in a confirmed pregnancy for cows inseminated during hot weather. If embryonic losses occur before days 15 to 16 after
breeding, then the cow likely will have a repeat cycle of normal length. If the losses occur beyond day 16 or so, the cow usually has an extended cycle before a new estrus and ovulation occurs.

The effects of high THI described above are considered the acute effects of heat stress. There is also evidence that there is a delayed or chronic effect of heat stress that results in sub-normal fertility for several weeks after environmental temperatures have moderated in the fall. This effect is thought to be associated with environmental conditions that affect the cow’s physiology at the time that follicles begin to grow. For example, a follicle that ovulates during moderate weather in mid-October may have been exposed to unfavorable conditions during early growth in August, thereby yielding a less viable oocyte in October. A similar delayed effect on fertility may occur for cows that have a severe negative energy balance after calving.

So – what can you do about the expected summer slump in fertility?

- Strategies to minimize heat stress as indicated in companion articles (natural ventilation, fans, sprinklers, etc.) will improve chances for lactating cows to conceive.
- Consider using a regimen of estrous synchronization to be sure that all eligible cows are inseminated at least once before the summer heat sets in. For example, the OvSynch program is as follows: use injection of GnRH on day 0 followed by prostaglandin F-2 alpha 7 days later and then GnRH again on day 9. Then, timed insemination can be either at the time of the second GnRH injection on day 9 or up to 16 hours after that injection. This allows all cows to be inseminated and should result in pregnancy rates similar to herd average if accomplished before mid June in most years.
- Because virgin heifers are not producing milk and avoid the added heat production associated with lactation, heifers inseminated during the summer usually will have only mild suppression in fertility. Therefore, if cows calving in spring or early summer are desired to maintain milk production, it might be easier to breed heifers for such calving. With our current genetics, most dairy cows can maintain very productive lactations for much longer than 305 or even more than 365 days. Therefore, heifers or cows calving in spring or summer can easily be held over as lactating cows until the next fall before rebreeding for their next lactations. In order to maintain balanced calving over various seasons, some heifers might be grown on an accelerated program to allow them to be bred to calve at less than 24 months of age.
- Another strategy is to group animals for breeding at certain times of the year to minimize effects of summer heat and so that certain farm chores can be concentrated. One approach would be to define fall and late winter calving seasons so that all breeding would be during cooler times of the year yet still maintain year around production. At the extreme, a herd might be completely seasonal with breeding or calving seasons of 3 months or less and thus avoid breeding or calving any animals during hot summer months. Of course, in order to maintain such a system cow fertility has to be very good. This is the approach we are using at the Center for Environmental Farming Systems at the Cherry Farm Unit in Goldsboro with most calving in October through December.

Optimal strategies will vary from farm to farm. I am available to provide assistance in working through strategies to optimize the reproductive success of your herd.
**Mastitis Heat Stress Management Tips:** (Dr. Donald Pritchard)

Somatic cell counts and the incidence of clinical mastitis increase in most herds during the heat stress months. Cows may be more susceptible to udder infections when they are being stressed, and there is usually an increase in the bacterial load that teat ends are subjected to during heat stress periods. To minimize these two factors as much as possible, the following practices should be followed: **1) the environment** the cows live in should be kept as clean, dry and comfortable as possible. The free stalls should be of the correct size and design to promote cow usage, and the bedding should be kept clean, dry, and replenished weekly. Sand is the preferred bedding, but if it can't be used, use kiln dried sawdust or shavings. Use pine sawdust in preference to hardwood sawdust. Avoid using green, wet sawdust. Products are available to add to the bedding to increase the pH and slow the growth rate of bacteria in the bedding. Such products must be added every 2-3 days. The alleys and lots should also be kept clean and dry, which may mean scraping them several times a day instead of just 1 or 2 times daily. Provide shade if the cows are turned outside during the day. Always provide an adequate supply of clean, cool water for the cows to drink. Water is needed for heat dissipation. Provide cooling systems (fans and water misters) for the cows in their feed alleys, the parlor holding pen and perhaps the parlor return alleys. Supplemental cooling equipment can help greatly in dissipating the excess body heat that cows generate during times of heat stress. When cows are kept cooler, their immune systems usually function better, which can mean more effective control of invading pathogens into their udders; **2) using proper milking procedures** are especially important during times of heat stress, because there may be more bacteria and soil on the teats that needs to be removed prior to milking. Be sure the udder preparation routine includes pre-dipping and stripping, be sure the teats are clean, clean before machine attachment, and always use a post-dip! Barrier dips may be helpful in herds when there are high populations of environmental pathogens. Proper milking machine operation and maintenance is a must - equipment will not operate as designed if not used and maintained properly; **3) proper nutrition** is important for having healthy mammary epithelial tissue and a strong immune system to fight bacteria that invade the udder. Supplemental vitamin A, vitamin E and selenium are needed in most cow rations to help promote a strong immune system. Dr. Whitlow's suggestions (printed above) about feeding during times of stress should be followed.

**The Economics of Managing Heat Stress:** (Dr. Geoff Benson)

As the previous articles show, heat stress affects herd performance in multiple ways and the effects persist after the hot weather subsides. Lower milk production is the largest single component of economic losses. These losses include both the direct effects of stress on milk production and the indirect effects caused by reduced reproductive performance. Estimates of the effect of heat stress on milk production vary between 5% and 20% of a herd's typical production level in winter, depending on the productivity of the cow and the severity of the heat stress. For example, a herd with a normal production level of 65 pounds per milking cow per day and a $14/100 lb mailbox milk price, the effects translate into a milk loss of 3.25 to 13 pounds per cow per day worth $0.455 to $1.82. Many factors affect daily milk production and each producer should use his or her herd production records to assess the effects of heat stress on their herd.
Different strategies are available to help reduce lost milk production. However, there are costs associated with heat stress abatement. To evaluate the likely pay-off from adopting a particular heat stress management practice we must consider the following costs

- Higher milk production comes with higher feed intake and additional ration cost that goes along with it. One thumb rule is that one pound of feed dry matter produces two pounds of milk. If the ration costs $120 per ton of dry matter, then the added feed cost of each additional pound of milk is three cents.
- Increases in other operating costs such as electricity for fans and maintenance
- The annual fixed costs associated with new investments such as fans and sprinklers. The two major fixed cost components are depreciation and interest on the investment.

Here are some ideas that are likely to be profitable, individually and in combination.

1. There may be limitations imposed by the original design of an existing facility but the following approaches can help reduce the effects of heat stress with little or no added investment.
   - Balance the ration for the weather as well as the cow, in order to maximize milk income over feed costs and mitigate the contribution of the diet to heat stress.
   - Cows need adequate amounts of clean water. Monitor cow behavior to see if additional tanks are required.
   - Reduce the time cows are bunched up, for example, in the holding pen

2. Adding fans and sprinklers is a common retrofit of an existing dairy facility. Parlors need good ventilation and fans and sprinklers can be added in holding pens and free stalls. A number of studies have shown these to be profitable. Kansas State University dairy researchers studied herd performance with and without fans and sprinklers in free stall barns. They estimated increases in milk sales of to $1.03 to $1.28 per cow per day and feed costs, operating costs and fixed costs of $0.34 to $0.67 per cow per day. Net returns were $0.55 to $0.74 per cow per day. The authors looked a several economic scenarios and in almost all cases the investment in fans and sprinklers was profitable.

3. If the existing facility does not provide shade and a cool environment at all times, adding shade is an option. Estimate the annual fixed cost charge of providing shade to see if it is likely to be a good investment when compared to the expected effect on milk production. Include added feed costs and any annual maintenance costs too.

4. If a new free stall barn is being built, make sure the orientation maximizes shade for the cows. Siting decisions are unlikely to increase the cost of the facility. The building design should provide good natural ventilation through appropriate eave heights and ridge vents, and should incorporate fans and sprinklers into the design.

Heat stress is inevitable in our climate but there are few prescriptions. Evaluate the potential benefits and costs of each option to ensure any changes will result in increased profit as well as increased cow comfort.
The 2005 North American Intercollegiate Dairy Challenge (NAIDC) Competition was held in State College, PA on April 8-9, 2005. The NC State University team competed this year for the first time and did very well, earning a GOLD rating (out of silver, gold and platinum). Only three teams in NCSU's division earned a platinum rating. There were a record-setting 27 teams competing in three divisions. The NC State team consisted of Animal Science majors Jessica Hockney of Durham, NC, Lindsay Lyle of Rougemont, NC, Abigail Nelkie of West Branch, MI, and Ag Education major Jesse Ledbetter of Olin, NC. All four are active members of the Dairy Science Club in the Department of Animal Science at NC State University. Dairy Science Club advisors Kas Ingawa, Steve Washburn, and Mitch Hockett helped prepare the team for their first entry into this contest.

The NAIDC is an innovative two-day competition for students representing dairy science programs from Universities across North America. It enables students to apply theory and learning to a real-world dairy, while working as part of a team. Day one begins with each four-person team receiving information about a working dairy, including production and farm management data. After an in-person inspection of one of three designated dairies, participants conduct interviews with the herd managers. Then each team develops a farm analysis and presentation materials, including recommendations for nutrition, reproduction, milking procedures, animal health, housing and financial management. Day two is presentation day. Team members make recommendations to a panel of judges and then field questions from the judges. Presentations are evaluated based on the analysis and recommendations. Generous support from corporate sponsors makes NAIDC possible.

The North American Intercollegiate Dairy Challenge was established as a management contest to incorporate all phases of a specific dairy business. It strives to incorporate a higher-learning atmosphere with practical application to help prepare students for careers in the dairy industry. For more information, please visit the website at http://www.dairychallenge.org.

Team members pictured from left to right are: Jessica Hockney of Durham, NC, Jesse Ledbetter of Olin, NC, Abigail Nelkie of West Branch, MI, and Lindsay Lyle of Rougemont, NC.
The 2005 State 4-H Dairy Quiz Bowl Contest was held on Saturday March 12 in Iredell County. Congratulations to the Randolph County team for placing first in the Junior Division and to Alamance County for placing first in the Senior Division. In the Junior Division, the Alleghany/Yadkin County team won second place, while the team from Rowan County placed third. In the Senior Division, the Randolph County Team won second place and the team from Rowan County placed third.

Shown above, 2005 State 4-H Dairy Quiz Bowl Contest Junior Division Winner: Randolph County. Left to right: Mrs. Margie Grubb (coach), Mickey Jo Grubb, Teri Lane Frazier, Adam Frazier, Mrs. Kirsten Frazier (coach), and Sig McCain (coach).

Shown above, 2005 State 4-H Dairy Quiz Bowl Contest Senior Division Winner: Alamance County. Left to right: Megan Mann, Brittany Thompson, Travis Cate, Brandy Horner, and Robin Mann (coach).
The 2005 State 4-H Dairy Skillathon Contest was held on Saturday March 12 in Iredell County. Congratulations to the Alleghany/Davie team for placing first in the Junior Division and the Yadkin/Alleghany team for placing first in the Senior Division of the contest. Second place in the Junior Division went to the team from Rowan County, while Randolph County placed third. In the Senior Division, the Yadkin/Davie team placed second and the team from Alamance County placed third.

Shown above, 2005 State 4-H Dairy Skillathon Contest Junior Division Winner: Alleghany/Davie County. Left to right: Nancy Keith (coach), Steven Hargis, Adam Anderson, Natasha Hamm, Bridgette Sturgill and J.D. Brooks (coach).

Shown above, 2005 State 4-H Dairy Skillathon Contest Senior Division Winner: Yadkin/Alleghany County. Left to right: Nancy Keith (coach), Dakota Sparks, Landon Hunter, J.D. Brooks (coach), Brenda Crouse and Daniel Rash.
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**NCSU Dairy Extension Web Page Address**


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