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# Optimizing BST Response Through Nutrition And Feeding Management

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**B**ST is here. Now the challenge is to maximize profit through its use. Someone said, "BST is a shortcut to genetic progress." Genetic progress for milk in Holsteins has been about 260 lbs per year. In 10 years this is 2,600 lbs. If BST is used beginning at 63 days postpartum and it is continued for 242 days and an average response of 10 lbs/day is obtained, then 2,420 lbs more milk will be obtained in one lactation. This is equivalent to over 9 years of genetic progress in one lactation. Adopting BST is like a very sudden shift to a higher gear in a machine with an engine capable of delivering the torque to move at the higher speed.

Studies with the respiration chambers at USDA-Beltsville, MD, showed that neither digestive nor metabolic efficiency was changed when BST was used. Therefore, the increased milk which occurs with BST use must be paid for with increased feed. There is no free lunch with the increased milk from use of BST. Cows respond to BST in 3 ways:

- a). They produce more milk.
- b). After a lag they eat more feed.
- c). They produce more heat.

Therefore, use of BST affects two primary management systems: nutritional management and environmental management.

### Nutritional Management – Dry Period

The dry period presents a window of opportunity to:

- a). Replenish nutrient reserves if needed.
- b). To prepare tissues of the cow for the stresses of parturition and lactation which follow.
- c). To eliminate mammary gland infections if they are present.

Stopping the use of BST should be part of the drying off procedure because production will decline following its removal. Body condition score should be about 3.5 at the end of the dry period. This simple, though subjective, method of evaluating body energy reserves is one of the most useful and critically needed tools to make the results of BST a continuing success. For whatever reason(s), a number of cows are finishing lactation without the nutrient reserves needed to begin a new lactation with the

production which they are capable of achieving. Therefore, the dry period provides the time to restore these reserves and body condition score is the tool to show how much replenishment is needed.

The NRC (1989) gives a pregnancy allowance for energy of about 30% of maintenance. Both can be met by 25 lbs. of an excellent grass hay. With regard to lead feeding, I recommend 4-6 lbs./cow/day during the three weeks prepartum, of the concentrate fed to the lactating cows. Oetzel et al. (1988), showed that even with prepartum diets high in calcium, 100g/d each of ammonium chloride and ammonium sulfate for 21 days prepartum reduced the incidence of milk fever from 17% to 4% in 48 Holstein cows. I suggest to use these anionic salts with great caution.

### Nutritional Management – Postpartum Cow

Under drylot housing, the totally mixed ration (TMR) system in which cows are fed for ad libitum consumption is a superb way to feed cows. Definition: A TMR is a quantitative mixture of all dietary ingredients, blended thoroughly enough to prevent separation and sorting, formulated to specific nutrient levels and offered free choice. When cows are given a choice of feeds, a significant minority of cows will "unbalance" their rations. Examples of choices include:

- a). alfalfa hay vs. corn silage
- b). mineral supplements
- c). whole cottonseed vs. other feeds.

Diet formulation should begin with comprehensive water, forage and feed testing. Drinking water may carry from 50% to 100% or more of the requirements for sodium, sulfur, chloride, and other mineral elements. The reason book values cannot be used for precise formulation is that there is great variation in economically important nutrients. And probably greater variation occurs in most of the byproducts than occurs in conventional feed grains.

In formulation, one should consider:

- a). cost
- b). palatability
- c). predicted dry matter (DM) intake (optimal water)

- d). energy (NEI), fats, nonstructural carbohydrates
- e). fibers, ADF and NDF
- f). protein, with a range in degradable/undegradable protein
- f). 7 macro and 7 micro mineral elements, including buffering capability
- h). water consumption and composition
- i). excesses as well as deficiencies.

The intended nutrient profile in the final mixture should be confirmed. Strive for maximal energy in early lactation. We won't be able to close the gap between feed energy eaten and energy required, but with good nutritional management, it is possible to elevate both curves. However, if there is a weakness or deficiency in the formulation, it will likely manifest itself more severely with use of BST.

An advantage for feeding supplemental fats (SF) is the increased energy density and the lower starch which results if the SF is substituted for cereal grains. This suggests that by increasing energy density, an increase in energy consumption will result. This is true if dry matter intake is maintained or nearly so. Negative effects sometimes occur with SFs; these include lower fiber digestibility, reduced feed intake, and usually reduced milk casein synthesis. But both forms of SF are needed: oilseeds and ruminally inert fats.

Use of BST will cause an increase in milk yield within 2-4 days of first use, although maximal response requires 4 to 6 weeks of continuous use. A recent survey showed that dairymen were getting an average of 10.7 lbs of milk per cow per day from BST use. Ten pounds of additional milk will require about 4 lbs more of feed dry matter of a well balanced TMR. But there is a lag of 4-6 weeks before the appetite increases for the additional feed. During this lag period, the nutrients to pay for the additional milk must come from body stores, feed, or a combination of the two.

There is no free lunch here; the increase in milk yield must be paid for with feed nutrients at some point. Feed nutrients must be available when the appetite increases so that cows have the chance to replenish nutrient reserves as lactation advances. A recent study from Michigan (Speicher et al., 1994) shows that the effects of BST and 3X milking are additive, but not completely so. The primiparous cows responded more to the combination of 3X and BST than did the multiparous cows (see Table 1 below).

#### Heat Stress Management

Remember, as Dennis Armstrong says: "a cow is a little furnace!" The greater the feed intake, the hotter the furnace. As body temperature increases, the

cow responds by reducing her feed intake, probably as a protective mechanism, and milk production soon drops. During heat stress, a behavioral response of cows fed feeds separately is to reduce hay intake more than or before concentrate. Therefore, fiber intake is reduced with possible problems under this feeding system.

Some nutrient requirements are increased by heat stress:

- a). Largely as a result of panting, a heat-stressed cow will have an energy requirement for maintenance of 120-130% of normal.

**Table 1: Effect Of BST And Milking Frequency (2X vs. 3X) on Daily FCM Production By Multiparous And Primiparous Holstein Cows\***

	Control		BST		Diff. due to BST
	No. Cows	FCM lbs/day	No. Cows	FCM lbs/day	
Multiparous					
3X	16	75.4	16	80.9	5.5
2X	17	65.0	14	78.7	3.7
<b>Difference</b>		<b>10.4</b>		<b>2.2</b>	
Primiparous					
3X	14	65.7	14	75.8	10.1
2X	13	58.6	14	70.8	12.2
<b>Difference</b>		<b>7.1</b>		<b>5.0</b>	

\*Speicher et al., J. Dairy Sci. 77: 2509. 1994.

panting, a heat-stressed cow will have an energy requirement for maintenance of 120-130% of normal.

b). Up to 50% more water will be drunk. As long as the drinking water is cooler than the body temperature of the cow, the consumed water adsorbs some of the cow's body heat. So if one is fortunate to have cold well water, do not bring that cold water up to an open trough where it will warm up, but keep it shaded or use one of the insulated tanks to keep it cold until the cows drink it.

c). Potassium: increase to 1.3-1.5% (West, 1994).

d). Sodium: increase to .35%

e). Magnesium: .35% (West, 1994)

f). Chlorine: .35%?

Are there dietary adjustments that will maintain net energy intake and simultaneously reduce metabolic heat production?

- Chandler (1994) noted that some feed ingredients have lower heat increments than others, and that these should be emphasized in hot weather. Heat increment is defined as the increase in heat production which occurs when animals eat feed. For example, feeds with low heat increment include whole cottonseed, roasted soybeans, tallow and the ruminally escape fats. Low fiber ingredients usually result in less HI than high fiber feeds — corn silage less than most hays.

- Both dietary deficiencies and excesses cause extra heat production.

- Degradable protein and undegradable protein in the appropriate relationship has

reduced heat stress in some trials.

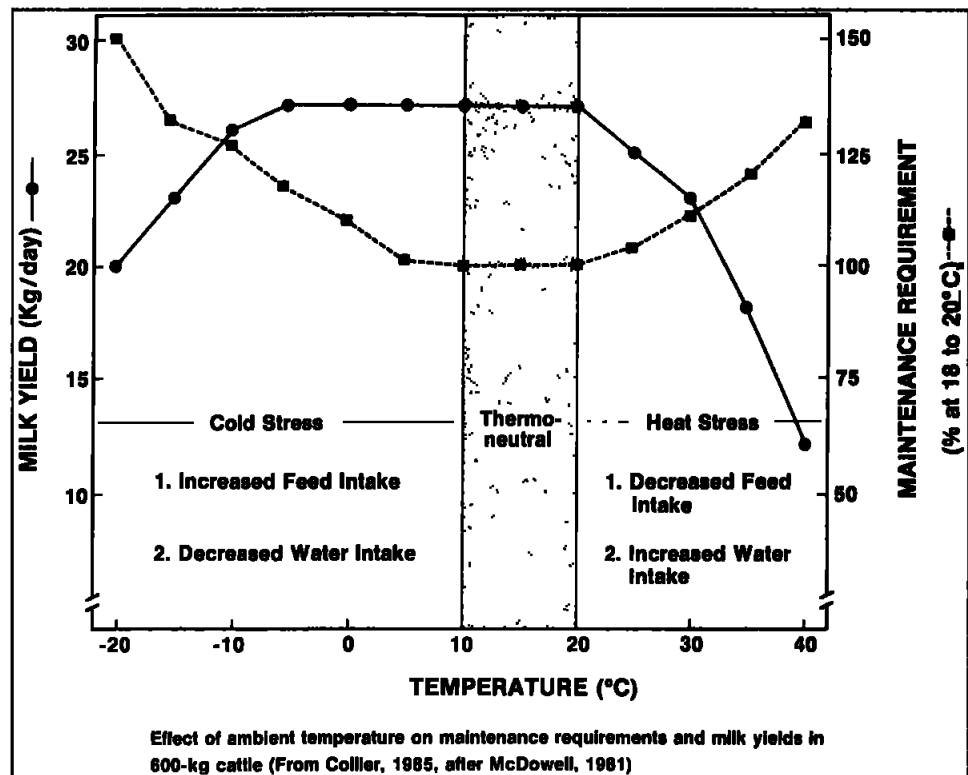
High yielding cows produce more heat than low yielding cows. Technologies not economic at low production may become so at yields achievable with BST. In other words, use of BST will help to pay for the heat stress technology which allows it to work in hot weather.

**Shades.** The black and white cow does not belong in the sun in the Southern U.S. during summer.

a). In a Georgia summer study (West et al., 1990), cows with shade as the only heat stress alleviation and given BST produced more milk, ate equal dry matter (DM), had higher body temperatures, but lost body weight and condition.

b). In an Arizona study (Huber, 1994) from March through August, cows given BST maintained a 10 lbs. advantage over controls, even though both groups dropped more than 20 lbs. per day during this interval. But the cows in this study were cooled with high technology evaporative coolers.

c). Relevant to more humid areas, Florida work-



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these two devices – 1.5 minutes sprinkling and 14 minutes of fan. These are especially valuable in the holding areas as well as in freestall barns and over cows at the feed manger.

Armstrong (1994) has an excellent summary on cooling options with the following priorities:

- a). Solid shade for all milking and dry cows.
- b). Holding pen cooling.
- c). Exit lane cooling.
- d). Corral shade cooling.
- e). Feed manger cooling.
- f). Covered feed manger.

#### Other Management Features

Use of BST will make longer calving intervals (C.I.) more profitable. Over 10 years ago, Holmann et al. (1994) showed that in contrast to the usual recommendation of a 12-mos. C.I. as being ideal, 13 months actually produced slightly more income over feed cost per cow per day of C.I. (\$4.11 vs. \$4.08), and a 15-mos. C.I. showed no substantial loss (\$4.08) compared to 13-mos. This was a budgeting simulation study which assumed that TMR income maximizing rations were fed, 65 days dry were provided, and 30% of the cows were <36 mos. of age and 70% were older than 36 mos.

As Ferry (1994) recently noted, "Regardless of breeding strategy, BST supplementation prolongs the period of profitable production, widening the window of opportunity to achieve conception, and increasing average herd life". In turn, cows that fail to rebreed or are deliberately marked to not rebreed will have longer and more profitable herd lives through the use of supplemental BST.

#### Summary:

1. Use of BST makes cows of all genetic abilities better cows that produce more milk. When they eat more feed, they produce more heat.
2. Greater milk yields mean correspondingly greater nutrient requirements; fortunately, increased appetite occurs in BST treated cows some 4-5 weeks after treatment begins, which allows restoration of body reserves in later lactation if feed nutrients are available.
3. Diet formulation should be comprehensive and based on detailed feed and water testing.

4. Some nutrient requirements are increased by heat stress, but careful diet formulation can resolve most of these.

5. A cow is a little furnace — she has much heat to get rid of. Some reduction in heat production by the cow can be achieved by selection of feedstuffs which have lower heat increments.

6. An array of technologies is now available to help the cow dissipate the large amount of heat she produces, plus the heat she receives from her environment. Use of BST will help to pay for the heat stress technology which allows it to work in hot weather.

7. In summer, cows will produce as much milk as the heat stress management allows them to produce. We have bred dairy cows to be heat-generating animals, metabolic thoroughbreds that will punish themselves with elevated body temperatures and sharply increased respiration rates in order to sustain the high yields they were bred to produce. If continuing increases in yields are to be sustained, cows must have protection from the high radiant heat of summer, have help in dissipating the large amounts of heat they produce, and receive diets which minimize the heat associated with the digestion and metabolism of feed.

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### notes

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