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1-1-1993

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Recommended Citation
Brennand, Charlotte P. and Bagley, Clell V., "Bovine Somatotropin in Milk" (1993). *All Archived Publications.* Paper 702.
http://digitalcommons.usu.edu/extension_histall/702

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*Food Safety*

*Fact Sheet*

# Bovine Somatotropin in Milk

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**FN-250.6**

## What is Bovine Somatotropin?

Bovine Somatotropin (BST), also called bovine growth hormone (BGH), is a hormone produced by the cow's pituitary gland. It, like other hormones, is produced in small quantities and is used in regulating metabolic processes. In the early stages of a calf's development, it acts as a growth hormone. During lactation, it serves to mobilize body fat to use for energy and diverts feed energy more toward milk production than for tissue synthesis.

BST is a protein hormone like insulin, not a steroid hormone like the sex hormones and cortisone.

## Why Inject Cows with BST?

BST has the potential to increase the efficiency of milk production. Potentially 10-15% more milk can be obtained from each cow with a cost of implementation of less than 5%.

## Sources of BST/BGH

Early research efforts used crude extracts from bovine pituitary glands. Although the treated cows increased their milk production, the amount of available BST was too limited for commercial use.

Biotechnology research received the impetus to produce hormones using genetically engineered bacteria because of our need for insulin. Insulin is also a protein hormone. The insulin isolated from the pancreas of animals IS active in man when given by injection and was the source of insulin for diabetics for many years. In the early 1980s, biotechnology made it possible, through use of recombinant DNA gene splicing, to produce insulin from bacterial cells. Today almost all insulin used for human injection comes from this manufacturing technique. The procedure for production of BST is conceptually identical. Biotechnology is also used today to

produce human growth hormone to control dwarfism and interferon to treat a form of adult leukemia. BST is the first product approved for use in food animals through this technology.

## Biotechnology Production of BST

The genes responsible for production of BST in cattle were identified in bovine tissue cells; they cause the pituitary cells to produce the biological product BST. These genes were isolated and inserted into a specific bacteria as part of a plasmid, with gene splicing. As these altered bacteria replicate, the new genes are also replicated and passed along to all new bacteria. The presence of these genes causes the bacterial cell to become a little "manufacturing plant" which produces BST in large quantities. Eventually the bacterial cells are killed and removed, leaving the purified BST.

## BST in Milk

There are four different natural forms of the BST hormone, with just slightly different chemical structures. The synthetic form of BST cannot be distinguished in the milk from the natural form. All milk contains minuscule amounts of BST regardless of whether from untreated cows or cows treated with BST. It is not possible, through testing of the milk, to tell if the cow has been treated with BST.

## Effect of BST on Humans

An early test of bovine growth hormone was as a possible treatment for children suffering from hypopituitary dwarfism. Although the bovine hormone was injected in large doses, it did not affect the children. An extract from human pituitary glands was successful. There is not enough similarity between human and bovine growth hormone for bovine produced growth hormone to cause desirable or undesirable effects in humans.

After careful review, the Food and Drug Administration, World Health Organization, American Medical Association, American Dietetics Association, and the National Institute of Health have independently confirmed that dairy products and meat from BST treated cows is safe for human consumption.

BST is digested by humans just like any other protein. Therefore, even if it were active in the human body, one would not obtain the active hormone by drinking milk or eating cheese. About 90% of BST is destroyed during pasteurization and it is also denatured by processing for baby formula.

## Insulin-like Growth Factors

Insulin-Like Growth Factors I and II are involved with growth hormones therefore they need to be considered. IGF-II does not increase when cows are treated with BST; there is a slight increase in IGF-I. It is higher in human milk than in milk from treated cows. If it were injected, IGF-I could be active in humans. IGF-I is not destroyed during pasteurization of milk, however the heat treatment used producing baby formula does destroy this hormone. It is also destroyed when milk or meat is cooked. Since it a protein, it is digested by both adults and infants, and therefore is not considered a problem.

## Composition of Milk from Cows Treated with BST

There are no differences in milk composition from cows treated with BST and from cows which were not treated. All cows produce BST and all milk contains BST. Protein, butterfat, vitamins, calcium and other minerals remain the same. Natural variations occur between cows, but these cannot be related to which treatment the cow received. Flavor of the milk is also not affected. Consumers are not able to pick out the milk from cows treated with BST as compared to milk from control cows.

## Why is the Use of BST Controversial?

First, as a new technology, the use of BST can cause apprehension in some consumers. This in turn worries the processors and the milk producers. They don't want to deter dairy product consumption!

Second, it may affect the dairy economy. More milk can be produced from the same number of cows resulting in an increased milk supply. Some dairymen worry about competition with herds which may be using BST. Economic pressures on the dairy industry will continue regardless of the availability of BST.

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Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, Robert L. Gilliland, Vice President and Director, Cooperative Extension Service, Utah State University, Logan, Utah. (EP/3-95/DF)