



# RAFI COMMUNIQUE

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## BOVINE GROWTH HORMONE

**PRODUCT:** Bovine Growth Hormone (BGH) or Bovine Somatotropin (BST)  
**PURPOSE:** Designed to dramatically increase milk production in dairy cattle  
**COUNTRIES AFFECTED:** USA and Europe initially  
**CORPORATIONS INVOLVED:** American Cyanamid, Eli Lilly, Monsanto, Upjohn and Sanofi (France)  
**IMPACT:** Drop in milk prices, loss of 25-30% of U.S. dairy farmers, changes in cropping patterns, narrowing of genetic base of dairy cattle  
**WHEN:** Product now awaiting approval by U.S. Food and Drug Administration; could reach market by 1988 or 1989.

### What is Bovine Growth Hormone?

Bovine growth hormone (also known as bovine somatotropin) is a naturally occurring protein which has the potential to dramatically boost milk production in dairy cattle. If granted approval by the U.S. Food and Drug Administration, it will become one of the first products of agricultural biotechnology available for commercial sale--possibly by 1988 or 1989.

Bovine growth hormone (bGH) is produced naturally in miniscule amounts in the cow's pituitary gland. It is one of the factors that regulates the volume of milk production. Using recombinant DNA technology (genetic engineering), scientists have successfully isolated the gene which is responsible for producing bovine growth hormone, and they have transferred that gene to ordinary bacteria cells. Using a technique known as "fermentation", the altered bacteria can be mass-produced and the growth hormone (produced by the bacteria) can then be isolated and purified for large-scale, commercial use.

Bovine growth hormone is now being tested on 30-40 cows at Cornell University. Daily injections of the hormone at the rate of 44 milligrams (approximately one/ one-thousandth of an ounce) per cow have demonstrated increases in milk<sup>2</sup> production from 23-41%, with feed efficiency improving 10-20%.

Cows receiving daily doses of bGH will require additional

feed to sustain increased milk production, although tests show that, overall, cows will produce more milk per pound of feed. At the farm level, increased feed requirements will result in additional crop production and/or greater off-farm feed purchases. Studies at Cornell University estimate that, depending on feed management and the individual cow's response, the cost of concentrate will increase from 30 to 110 percent.<sup>3</sup>

#### Who Stands to Profit from bGH?

Four major agrichemical corporations, including American Cyanamid (Wayne, NJ), Eli Lilly (Indianapolis, IN), Monsanto (St. Louis, MO) and Upjohn (Kalamazoo, MI) have invested heavily in the development of bovine growth hormones, and will likely compete for a piece of the market once the product is available for commercial sale.<sup>4</sup> These companies are currently conducting field tests on bGH products in the United States and Europe. Sanofi, a French subsidiary of the Elf-Aquitane oil group, is also developing a bGH product.

Monsanto claims that it has spent "in the tens of millions" developing its product and estimates that the worldwide market<sup>5</sup> for bovine growth hormone could reach \$1 billion per year. According to Robert P. Mooney, manager of American Cyanamid's animal product division, "Even in the European system where you have quotas there will still be a market [for bGH] because it allows the farmer to produce a pound of milk at lower cost."<sup>6</sup> Mr. Mooney also foresees<sup>7</sup> the marketing of bGH in milk-deficit countries such as Israel.

U.S. taxpayers are footing the bill for a portion of the research and development of bGH. Approximately \$1.2 million in federal funds support basic and applied research on bGH. Another \$2.5 million in private funds are supporting research at publically-supported schools in the U.S. agricultural research system.<sup>8</sup>

The development of new technology to dramatically increase milk production comes at a time when the United States is already plagued by massive dairy surpluses. The U.S. Department of Agriculture's price support policies have led to a government-owned stockpile of more than 3 billion pounds of dried milk and cheese and a federal dairy program which has cost more than \$1 billion annually in recent years. In April, 1986, the government launched a \$1.8 billion surplus reduction program which pays farmers to slaughter their dairy cows or sell them for export.<sup>9</sup>

#### What Impact on the U.S. Dairy Industry?

Widespread adoption of bGH will undoubtedly cause severe economic dislocation and accelerate the trend toward fewer, larger dairy farms. Surveys of dairy farmers in the U.S. reveal that 80 to 90 percent of dairy farmers will adopt bGH<sup>10</sup> within 3 years after it becomes available for commercial sale.

Bovine growth hormone is already being promoted as a product which "requires no capital investment" and will be "particularly important to the small family farmer."<sup>11</sup> In reality, bGH is only one part of a sophisticated, capital-intensive package, which will require substantial long-term investment:

...the introduction of bovine somatotropin will likely be accompanied by computer programs that optimize feed nutrient levels at the least economic cost. Computerized feeding stations, which tailor the feed mixture and amount of feed provided to an animal's unique performance characteristics, will also be necessary, as will automated environments that reduce the stress to the animal from abnormal weather conditions.<sup>12</sup>

Large dairy farmers will be the first to adopt bGH, and the most likely<sup>13</sup> to survive a major restructuring in the U.S. dairy industry. Commercial sale of bGH will push milk prices down and may force 25 to 30 percent of the nation's dairy farmers out of business. According to Cornell University agricultural economist, Dr. Robert Kalter:

We are estimating that within the first three years of product introduction milk prices may need to fall 10-15 percent, and the number of dairy farms may decline by as much as 25 to 30 percent to restore equilibrium.<sup>14</sup>

The widespread commercial adoption of bGH will also affect livestock numbers and land use changes. By the end of this century, the size of our national dairy herd is expected to decline by 30-40% if growth hormone products are widely used.<sup>15</sup> According to a Cornell University study, "The requirement for less producing cows and changes in cropping patterns may ultimately result<sup>16</sup> in land use changes throughout the agricultural sector."

### Narrowing the Genetic Base

Virtually all tests of bGH have been conducted on Holstein dairy cows, the most efficient and productive milk breed. Holsteins now represent well over 90% of the U.S. dairy cattle population and will undoubtedly be the breed selected for commercial application of bGH and other technologies designed to enhance milk production. Adoption of bGH (in combination with a reduction in the number of dairy cattle) will thus facilitate a narrowing of the genetic base of dairy cattle in the U.S. and abroad.

Genetic diversity is vital to the future of modern livestock production. Minor dairy breeds, for example, carry invaluable disease and pest resistance and many other qualities (e.g. hardiness, high butterfat content, better roughage conversion) which Holsteins may not possess. Minor breeds must be maintained in sufficient numbers so that their unique genetic material is available for future breeding programs.

## Vocal Opposition

In April, 1986, a coalition of groups opposing the licensing of bGH petitioned the U.S. Food and Drug Administration to prepare an environmental impact statement on bovine growth hormone. Those seeking to delay and eventually halt the licensing of bGH include the Wisconsin Family Farm Defense Fund, the Foundation on Economic Trends, the Humane Society of the U.S., and Douglas LaFollette, secretary of state in Wisconsin. According to one Wisconsin dairy farmer representing the coalition:

It is legitimate to question whether technological advancements are social progress...Demand for milk will not increase and we already know that the government under the new price support program will not buy the surpluses. Something will have to give...When 20 percent of the farmers are forced out and another 20 to 25 percent will be impacted and pushed toward going out, who is benefitting from the use of bGH?

The petition seeking to delay licensing of bGH is still pending.

## More to Come

Bovine growth hormone is only the first on a long list of biotechnology products which are now being developed to enhance growth and stimulate productivity of livestock. Similar products are also being developed for beef cattle, swine and poultry. Like bGH, these products will have a major impact on feed requirements, farm prices, land use, and, ultimately, on the survival of small and middle-sized family farmers. The widespread use of "superior" breeds will likely narrow the genetic base of our major livestock breeds even further.

- 1 Agricultural Genetics Report, July/August, 1986.
- 2 BIO/TECHNOLOGY, Vol.4, May, 1986.
- 3 Kalter, Robert J. et al. Biotechnology and the Dairy Industry: Production Costs, Commercial Potential and the Economic Impact of the bGH, Dept. of Ag. Economics, Cornell University, Dec., 1985.
- 4 Agricultural Genetics Report, July/August, 1986.
- 5 Chemical Week, April 23, 1986 and BIO/TECHNOLOGY, Vol. 4, May, 1986.
- 6 Telephone conversation with Mr. Mooney, November 10, 1986.
- 7 Ibid.
- 8 National Agricultural Library, pre-publication of Special Reference Brief on Bovine Growth Hormone, 1986.
- 9 Farmline, USDA, Economic Research Service, April, 1986.
- 10 Kalter, Robert J., et al, Biotechnology and the Dairy Industry...., Department of Agricultural Economics, Cornell University, Dec. 1985.
- 11 Robert P. Mooney, Manager of American Cyanamid's animal products division, in testimony before U.S. Congress, June 11, 1986.
- 12 Kalter, Robert J., "The New Biotech Agriculture: Unforeseen Economic Consequences" in Issues in Science and Technology, Fall, 1985, p. 130.
- 13 Ibid., p. 128 and 131.
- 14 Ibid., p.128.
- 15 Kalter, Robert J. and Magrath, William. "Biotechnology: Economic Challenges and Opportunities for Agriculture", N.Y. State Agriculture 2000 Project, Cornell University, no date.
- 16 Ibid.
- 17 The Washington Post, "Dairy-Output Drug Opposed," April 2, 1986.

#### Corporate Profile

MONSANTO (St. Louis, MO) 1985 sales volume: (US) \$6.7 billion, ranks # 53 on Fortune 500, Monsanto is commercializing bGH technology developed by Genentech (South San Francisco, CA).

AMERICAN CYANAMID (Wayne, NJ) 1985 sales volume: (US) \$3.6 billion, ranks # 109 on Fortune 500. American Cyanamid is licensing bGH technology from Biotechnology General (New York City).

ELI LILLY (Indianapolis, IN) 1985 sales volume: (US) \$3.3 billion, ranks # 119 on Fortune 500.

UPJOHN (Kalamazoo, MI) 1985 sales volume: (US) \$2.1 billion, ranks # 176 on Fortune 500. Amgen (Thousand Oaks, CA) is producing bGH under contract for Upjohn.

SANOFI (Paris, France) A subsidiary of Elf Aquitaine. Elf Aquitaine ranks # 10 on Fortune's list of largest industrial corporations outside the U.S., with annual sales of US \$20 billion (\$175 French francs). Sanofi handles all biotechnology research for Elf Aquitaine, which now devotes \$1 billion French francs annually to biotechnology research.

Source: Fortune Magazine, April 28, 1986  
Chemical Week, April 23, 1986  
Fortune Magazine, Aug. 4, 1986

