rBST Use in the California Dairy Industry

by L.J. (Bees) Butler

BOVINE somatotropin is a naturally occurring (peptide) hormone produced in the pituitary gland of cows. It was discovered in the 1920s, and originally called bovine growth hormone or BGH. Experiments in the 1930s revealed that BGH, when extracted from the pituitary gland of a cow and injected into another cow, could increase milk production in the recipient cow. In the late 1970s, Dr. Dale Bauman, an animal scientist at Cornell University, successfully transferred the gene responsible for BGH production in cows to a bacterium. The resulting product was called recombinant bovine growth hormone, or rBGH. Simple multiplication of the bacterium meant that it could easily be produced in commercial quantities at a very reasonable cost. Several pharmaceutical and nonpharmaceutical companies became very interested in the product in the early 1980s. Despite the fact that rBGH is a peptide hormone and not a (much-maligned) steroidal hormone, to avoid the stigma associated with hormones, the industry agreed to change its name to bovine somatotropin (BST). Thus, its synthetic analog would be called recombinant bovine somatotropin, or rBST. Today, both names (rBGH and rBST) are still used.

Four companies involved in rBST research applied for patents for their particular brands of rBST in the early 1980s, which resulted in many misstatements, exaggerations and misunderstandings. Congressional hearings were held in June 1986. From these hearings emerged the alleged last word on rBST. The basic findings were:

- rBST, when injected into a cow, could cause a 10-25 percent increase in milk production.
- There was also a 10-15 percent increase in feed efficiency. This means that there was an effective decrease in feed costs per unit of milk produced, and therefore a lower average cost of production.
- rBST appeared to be safe both for human milk consumption and for cows.

It took until November of 1993 to gain FDA approval, and rBST was not released commercially until February of 1994. However, the controversy surrounding rBST that has existed since 1983 continued. Specifically, questions were raised about adverse health effects on animals treated with rBST, the appropriateness of the technology for an industry plagued with surpluses, the effects of increased milk production on milk prices, and the plight of the family farm in the U.S. Media coverage about the impacts of rBST has been intermittent since 1983, but increased substantially from 1988-1993.

In 1987 a survey of California dairy producers was carried out to determine their attitudes and concerns about rBST. A sample of 152 producers (about 7 percent of the total) was drawn randomly from a complete list of all Grade A dairy producers in California.[1] Grants from the Giannini Foundation and the University of California Biotechnology Research and Education Program allowed the author to continue to survey the same producers every year (except 1995) to the present. In 1990, the original survey sample was increased to 262 producers to represent approximately 10 percent of the total California dairy producer population.

The overall objective of this long-term research was to survey a continuous sample of California dairy producers prior to, during, and after the commercial availability of rBST to determine a timetable of adoption and diffusion patterns. A review of the results collected to date provides an interesting perspective on the prospective adoption of the new technology prior to and during its release. For example, the results indicate that as more information regarding a new technology becomes available, opinions and attitudes toward the new technology change, thus significantly modifying the responses to the survey.

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Survey Results Before rBST Availability (1987-1993)

Prospective Adoption Rates

Survey participants were asked whether they would use rBST immediately after it became available, wait to use it, or would not use it at all. Over the 7 years of the survey prior to the commercial availability of rBST, responses to this question varied considerably. As more information became available and as the controversy surrounding rBST increased, survey respondents dramatically reduced their desire to use it immediately after it became available.

The proportion of respondents who said they would *not* use rBST at all increased 33 percentage points between 1987 and 1993. Similarly, the number of those who said they would use rBST dropped from a high of 55 percent in 1988 to 30 percent in 1993.

Concerns about rBST

Those who said they would not use rBST expressed a variety of reasons for not using it, but these opinions changed over the years. For the seven years prior to the commercial availability of rBST, the major reason for not using it was concern about negative consumer reaction and its effect on milk sales. The proportion of respondents expressing this concern increased dramatically from 1987 to 1990. A consistent secondary concern of respondents was concern over cow health as a result of using rBST.

Three other frequently expressed reasons for not using rBST were concerns about milk quality and safety, concerns over whether primary handlers would accept milk from cows treated with rBST, and a desire to avoid injecting cows on a daily basis. Finally, a more recent concern has been the cost of rBST. While the companies who manufacture rBST did not indicate a price at which they would sell the product once it was approved for commercial use, the uncertainty surrounding the issue was clearly a concern. Recent research indicates that for every $0.01 increase in the cost of rBST per day, there is $2 per cwt. of milk decrease in net revenues.[2]

Apart from the concerns expressed by those producers who said they would *not* use rBST, over 70 percent of respondents who said they *would* use rBST consistently expressed some concerns about using it, or about its impacts. Three major concerns consistently emerged over the seven years of the survey prior to commercial availability. Most prospective users worried over public opinion and potentially negative consumer reactions to the use of rBST. This concern increased dramatically over the years of the survey and was considered by many to be the major reason why the California dairy industry was skeptical about the use of rBST. Many producers expressed concern over rBST's potential to increase milk production resulting in increased surpluses of milk and a consequent decline in milk prices. Producers also expressed an increasing concern about cow "burn out" reflecting the continuing uncertainty about this issue. Others questioned the cost effectiveness of rBST and the administration method.

1994 and 1996 Preliminary Survey Results

Adoption and Use of rBST

With the FDA approval of rBST in November, 1993 and its commercial availability in February 1994, the survey was modified to solicit responses about current use of rBST, its use in the past, or consideration of its future use. Table 1 is a tabulation of the adoption and use of rBST in 1994 and 1996.

Overall we could conclude that about 20 percent of California dairy producers were currently using rBST. Another 8 percent had used it in the past for a total

Table 1: Adoption and Use of rBST in 1994 and 1996

	% of Respondents		% of Total Avg. Cows Represented		% of Cows Treated		% of Total Cows Treated	
	1994	1996	1994	1996	1994	1996	1994	1996
Current Users	18	18	30	30	25	20	8	6
Past Users	5	8	9	12	23	23	2	3
Prospective Users	18	30	19	28	22	23	4	6
Non Users	59	44	43	30	0	0	0	0

adoption rate of about 28 percent. Another 20-30 percent of producers reported that they would consider using rBST in the future, defined as prospective users. If these figures are an indication of total rBST use in California, and taking into account those who may stop using it, then we might expect a total adoption rate of about 45-50 percent.

If, however, we are to gauge the impact of rBST on total milk production, we must examine the proportion of the total cows that have been treated with rBST. As Table 1 indicates, while about 20 percent of producers have adopted rBST, respondents reported treating an average of about 20-25 percent of cows. Thus, only 5-8 percent of the cows were being treated with rBST at that time. If we include producers who have used it in the past but have stopped, the total proportion of cows treated with rBST in our sample in 1994 and 1996 was about 10 percent.

Assuming cows were treated only during mid and late lactation when 64% of the milk is produced, and an 11% average increase in milk production, then:

10% of the cows
x 11% milk increase
x 64% = 0.00704 which is <1%.

Therefore, we could conclude that rBST use in California in 1994 and 1996 probably resulted in an increase in milk production of less than 1 percent per year.

Of the few producers who reported using rBST in the past but had stopped using it, half said they stopped using it because of the cost of rBST. Presumably these producers have figured that it was not feasible to use rBST either because of the cost of the rBST itself, or because the added cost of producing the extra milk did not noticeably increase profits. The rest reported having reproductive problems with rBST, and one producer was just experimenting.

Most of the current users of rBST reported using their monthly milk testing records or daily milk tank measurements to monitor the increase in milk production from using rBST. Similarly, almost 95 percent of the current users were monitoring changes in feed intake by weight or by total mixed ration programs.

Concerns About rBST

Among those who were currently using rBST, have used it in the past, or were considering using it in the future, over 68 percent still had concerns about it. Table 2 tabulates these concerns.

In 1993 just prior to the commercial availability of rBST, 60 percent of those who said they would use rBST indicated that they had concerns about public opinion. In 1994, this concern had dropped to just 12 percent of those who were current and prospective users of rBST, and increased slightly in 1996. Concerns about administration methods and handler refusal of milk also decreased substantially in 1994 and 1996.

Table 2: Concerns of Past, Current and Prospective Users of rBST in 1994 and 1996 Compared to 1993

(numbers do not sum to 100 due to multiple responses)

	1993	1994	1996
Public opinion	60	12	17
Adverse prices	20	26	19
Cow "burn out"	23	52	56
Cost effectiveness	31	21	25
Application method	17	7	0
Milk quality / safety	6	5	6
Reproductive problems	17	31	16
Handler refusal of milk	20	2	12
Not enough research	11	7	0
Other	17	21	44

More recently, users were clearly more concerned about the potential impacts of rBST on the health of their herds. For example, whereas only 23 percent of those who said they would use rBST in 1993 were concerned about cow "burn out", 52 percent of current and prospective users were concerned about it in 1994. This increased slightly in 1996. Similarly, only 17 percent of those who said they would use rBST in 1993 were concerned about reproductive problems; 31 percent were concerned about it in 1994, but this decreased to 16 percent in 1996.

In 1994 and 1996 there was clearly still some uncertainty about rBST among its current and prospective users. Apart from concerns about the health of their herds, concern about adverse prices due to increased milk production also increased slightly in 1994 but decreased in 1996. And although concerns about the cost effectiveness of rBST decreased from 31 percent in 1993 to 21 percent in 1994 and 25 percent in 1996, this concern still ranked fourth among the concerns of current and prospective users.

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There were some interesting differences between those who were currently using rBST, or who used it in the past, and those who said they would consider using rBST in the future. Current and past users clearly had fewer if any concerns about public opinion or adverse prices and were mostly concerned about herd health and cost effectiveness. Prospective users of rBST, on the other hand, still had concerns about public opinion and adverse prices as well as herd health.

We asked each respondent who said they would consider using rBST in the future what single factor would play a major role in their decision to use rBST. A major proportion of them (45 percent) felt that they would only use it if economic forces compelled them to adopt it. That is, many producers felt that there were better ways of increasing herd productivity than using rBST, but they were not prepared to neglect the technology in their decision making; they would use it if they needed to in order to remain competitive. Another 26 percent of respondents said they would use rBST in the future if they could obtain a release from the affidavit they signed with their cooperative or creamery agreeing not to use it. The rest of the respondents gave a variety of reasons for considering using rBST in the future, including consumer acceptance, recommendation from the veterinarian, easier administration methods, and waiting until the issues had played themselves out.

Conclusions

A panel survey of about 260 California dairy producers between 1987 and 1993 indicated a declining interest in using rBST immediately after it became available. Preliminary results of the survey (of the continuous sample) in 1994 and 1996 indicated that about 10 percent of the total California herd was currently being treated with rBST. Average milk yield response appeared to be about 11 percent. Therefore, rBST use in California in 1994 and 1996 probably resulted in an increase in milk production of less than 1 percent per year.

There was clearly still some uncertainty about rBST use among its current and future users. Concerns about public opinion and the effect on milk sales have diminished dramatically. However, current and prospective users still had concerns about the effect of rBST on the health of their herds, adverse prices as a result of increased milk production, and the cost effectiveness of the new technology.

Future use of rBST will depend largely on how producers adapt the new technology to their current management styles and the effect that it will have on their profit margins in the next 2-3 years. A 1997-98 study is in progress, in which a greater number of dairy producers are included in the survey.

Publications Cited

The citation numbers below correspond to those used in the text.

1. Zepeda, L. The Potential Economic Effects of Bovine Somatotropin on the California Dairy Industry. Ph.D. Thesis. Davis: University of California Department of Agricultural Economics, 1988.
2. Butler, L.J. and G. Cohn. The Economics of New Technologies in Dairying: BGH vs. Rotational Grazing. Chap. 5 in *The Dairy Debate*. W.C. Liebhardt, ed. Davis: University of California, Sustainable Agriculture Research and Education Program, 1993.

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Environmental—*cont. from page 2*

A higher environmental standard in the short-run can increase firms' profitability and scale. In the long-run it can encourage more firms to enter the industry than would be the case with a lower standard, and, despite the possibility of lowering each firm's output level, expand the industry's aggregate supply. Importantly, these positive effects can be obtained in addition to improvements in environmental quality and increased social welfare.

The analysis shows that each firm must achieve a *minimum* amount of pollution abatement to stay in the market. That amount is higher in *less* efficient industries.

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