

## Who gets it right?

### Consumer Experiences with Mandatory Labeling of Dairy Products containing rBST

This paper examines the factors that influence a consumer's probability of noticing rBST labels on dairy products and the probability of obtaining the correct information from the labels. Empirical results based on survey data suggest that gender, age, urbanization and environmental concerns affect both the probability of noticing and obtaining the correct information from labels. The latter probability is also affected by income, town size, and source of information.

Jane Kolodinsky, Ph.D., University of Vermont<sup>1</sup>

David Conner, University of Vermont<sup>2</sup>

Qingbin Wang, Ph.D., University of Vermont<sup>3</sup>

#### Introduction and Background

The Vermont state law that mandated the labeling of dairy products produced with recombinant Bovine Somatotropin (rBST), provides an excellent test case of the ability of consumers to obtain proper information from a label and the ability of legislation to provide consumers with the information to make knowledgeable purchasing choices.

rBST is a genetically engineered version of a naturally occurring hormone in cows. Its main benefits are that it increases the production of milk per cow, and therefore the efficiency with which feed is used. Proponents claim that it is an effective tool that should be at the disposal of dairy herd managers. In addition, the U.S. Food and Drug Administration (FDA), whose mandate is to ensure that such products offered on the market are safe and effective, determined that milk produced with rBST and milk from untreated cows are indistinguishable, and that therefore no health risk exists. However, many individuals have lingering concerns about the long-term health effects of rBST milk, as well as rBST's possible detrimental economic effect on the state's dairy industry. These concerns led to demand for a labeling law on milk and dairy products produced with rBST.

It was the intent of the labeling law to place the burden of labeling upon those who do use the product as opposed to those who do not, so that the labeling law does not incur costs to those who do not use rBST, (Moyer, 1995). However, in practice, the burden of labeling fell upon the retailer, (Griffin, 1996). The law required all products produced with rBST to be labeled with either a blue dot on the

package, a blue overlay over the product's unit price marker, or to be listed on a sign posted in the store that indicates which products were produced with rBST. No description of the meaning of the label was required on the label itself. Therefore, to understand the label consumers had to make an extra effort beyond simply noticing the label in order to obtain the information.

The law was immediately challenged in court by the International Dairy Foods Association and the Grocery Manufacturers of America, who argued that the law discriminates against milk made with rBST and that it implied rBST was unsafe despite the FDA's ruling. The law was originally upheld by Federal Appeals Judge Murtha in November 1995; following this ruling, the law was implemented and continued until its suspension following the Appeals Court decision in August 1996.

Descriptive and anecdotal evidence imply that consumers didn't change their behavior or just didn't care about the label (Ring, 1996; Wang et al., 1996). And, despite the fact that the law was hailed as a victory to the consumer's right to information, in practice it failed to provide a majority of Vermonters with the needed information to make purchasing decisions about dairy products (Wang et al., 1996). This study examines the factors that influence the probabilities that an individual notices and obtains the correct information from the rBST label.

#### Literature Review

The literature has little to say about who obtains the correct information from food labels. Research has focused on the Nutrition Labeling and Education

Act of 1990 (NLEA) (Burton & Biswas, 1993; Jensen & Kesavan, 1993; Navder, 1993; Padberg, 1992; Wang, Fletcher & Carley, 1995). Mueller (1991) found that labels are a consumer's most important source of nutrition information, with 66% of consumers indicating that they used them. Only 24% obtained information from television or magazines. Higher income consumers have been found to utilize nutrition and more label readers are women and/or health conscious (Burton & Biswas, 1993; Mueller, 1991; Wang et al., 1996). Educational attainment is also associated with label usage (Bass, 1991; Moorman, 1990). Wang et al. (1996) found that consumers in the Northeast are less likely to use nutrition labels. The effect of age on label use is inconclusive (Burton & Biswas, 1993; Mueller, 1991; Wang, Halbrendt, Kolodinsky & Schmidt, 1996).

Douthitt (1991) explored the issue of biotechnology and mandatory product labeling for dairy products. The study focused on risk perceptions of food-related biotechnologies (Grobe et al., 1996a; 1996b; 1996c). They conclude that consumers' overestimation of the degree of risk associated with rBST's safety may reflect the loss in consumer's confidence in the ability of regulators to protect them in the market place. Grobe, Douthitt and Zapeda (1996a) also indicate that perceptions of risk associated with rBST have not mitigated over time, as is the usual case with new technologies. They found that 77% of Wisconsin households would prefer milk from cows not treated with rBST if they could obtain the information from a label.

A similar study conducted in Vermont indicated that 90% of consumers agree with the statement "dairy products containing milk produced from cows treated with rBST should be labeled." Wang et al. (1996) reported that 33.3% of consumers always read labels when they purchase dairy products and 48% of those said they noticed a change in the way these products were labeled during 1995. Only about 21% of individuals who noticed the change in label obtained the correct information from the label that "the product may or may not contain milk from rBST treated cows." However, since 16% responded incorrectly that the milk "definitely contains rBST," about 39% of consumers obtained correct information by default.

The literature that specifically addresses issues of biotechnology and labeling consider *whether* or not a product should be labeled. Studies about the NLEA give indications of variables associated with the *use*

of food labels, but not necessarily the *correctness* of information gleaned from labels. Jacoby et al. (1977) found that although the vast majority of consumers want information on labels, most consumers do not obtain the correct information from labels. The literature clearly indicates that consumers want to be aware of food products produced using biotechnologies. However, it is silent about whether these labels provide the correct information to these consumers. This study estimates the impact of variables found to be associated with label use and goes on to estimate the probability that a consumer will obtain the correct information from the label.

## Methodology

Empirical Model. The method used in this study is based on consumer theory and previous studies on consumer demand for and utilization of information.

The probability that an individual obtains the correct information from a dairy product with one of the required labels informing them the product may contain rBST is written:

$$\log \frac{\text{Probability (yes)}}{1 - \text{Probability (yes)}} = \beta_0 + \beta_1 Z_1 + \dots + \beta_k Z_k \quad (1)$$

where the Z's represent the attributes of individuals that influence whether or not an individual obtains the correct information (there are k attributes) and Probability (yes) represents the probability that an individual obtains the correct information. Equation (1) can be estimated using the logit regression procedure, but the fact that only individuals who have noticed the new labels can identify whether they obtain correct information from that label creates a situation of sample selection bias. Therefore, this analysis uses Heckman's procedure, using a probit regression with member status (if the individual has noticed the new labels) as the dependent variable. The estimated inverse Mills ratio is then included as an independent variable in equation (1).

## Data Source and Variable Definition

A random sample of Vermont households with at least one registered voter was contacted by telephone in December of 1995 as part of the annual Vermonter Opinion Poll. This poll collects information of a variety of issues of interest to policy makers in the state. 702 respondents completed the survey. Table 1 provides summary statistics. A comparison with the state's averages from the 1990 U.S. Census of Population and Housing suggests that the random sample is representative of the Vermont population in

terms of major socio-demographic characteristics.

The portion of the survey on rBST related issues began with the following statement about rBST and federal regulation:

Bovine somatotropin (also known as rBST or bGH) is a naturally occurring hormone in cows that stimulates milk production.

Respondents were asked a series of questions about their attitudes and behaviors toward milk and processed dairy products produced using rBST and their use of the mandatory labels.

Based on previous research discussed in the literature review (Bass, 1991; Burton & Biswas, 1993; Moorman, 1990; Mueller, 1991; Wang, Halbrendt, Kolodinsky & Schmidt, 1996), we include variables representing **gender, educational attainment, income, where a consumer obtains label information** and **age** in our equations. Gender is a dummy variable with female as the omitted category. Educational attainment is measured as a dummy variable, with the omitted category being having less than a high school education. Income is measured using two dummy variables: one indicates whether a respondent's family income was less than \$15,000 in 1995, and the other indicates whether a respondent's family income was greater than \$45,000 in 1995. These variables were used because the data for income were collected as a categorical variable representing quartiles, not a continuous one. In preliminary analysis no new information was gained from including all categories. Two variables represent where individuals obtain information about the rBST labels: the first is a dummy variable that indicates whether information was obtained via television, the other whether information was obtained from the newspaper. Because individuals could obtain information from more than one source, there is no omitted category. Age is a continuous variable representing the age of the respondent.

We also include variables representing a consumer's **willingness to pay for measures to protect natural resources and to maintain the state's agricultural base**, and a variable representing respondent perceptions of **how well the state is doing on environmental issues**. These are all measured using dummy variables. The omitted category on the two willingness to pay variables include respondents NOT willing to pay for natural resources or agricultural initiatives at a state level. The omitted category on the grading of environmental efforts include respondents who rated the initiatives less than grade "A." The inclusion of

these variables is justified by the facts that 58% of Vermonters are willing to pay up to 10 cents more per gallon for rBST-free milk (Wang et al., 1996), and that use of rBST maybe harmful both to the environment and to the dairy industry. Rayburn (1993), in a comparison of the ecological effects of confinement and rBST use versus rotational grazing, found the model using rBST led to increased use of machinery, pesticides and increased soil erosion and manure contaminations as well as other ecological hazards. Thus, there may be a connection between a consumer's view of the environment and their awareness and understanding of labels associated with rBST use. Kinnucan et al. (1990) and Barnes and Nowack (1990) found that larger farms with greater numbers of cows are more likely to adopt rBST. In addition, mid-sized farms have decreased in number over the past decade (Center for Rural Studies, 1995). Therefore, consumers may wish to buy rBST-free milk, even at a premium, in order to support an agricultural technology that is more environmentally friendly and is less likely to accelerate the loss in number of farms in the state. A variable representing consumer ratings of how well the state does in the environmental arena is also included. Taken together, inclusion of variables representing consumer views on natural resources and agriculture gives an indication of whether or not interest in specifics related to rBST in other arenas impacts on consumers' awareness and understanding of the labels.

Finally, three variables representing **where a respondent resides** are included in the estimation. These are three dummy variables that measure (1) whether an individual resides in a rural county, (2) whether that county is adjacent to a metropolitan county, and (3) whether the town a respondent lives in has fewer than 2,500 inhabitants. These variables are included to ascertain the degree to which the rBST issue is centered in rural towns and counties with many farms, or if the issue is more widespread. The symbols (+) and (-) in Table 1 indicate the expected direction of effect of each variable.

## Results

Table 1 provides results of the logit estimation of both the log odds of noticing the rBST label and the log odds of obtaining the correct information from the label. Four variables are significant at least at the 0.10 level in the equation used to estimate whether or not a respondent notices the rBST label. **Males** are

less likely to notice the label, a result that coincides with findings of other studies that examined nutrition labeling in general and were expected (Burton & Biswas, 1993; Mueller, 1991; Wang, Fletcher & Carley, 1995). **Older individuals** are less likely to notice the label. While previous research has been inconclusive as to the effect of age on noticing nutrition labels (Burton & Biswas, 1993; Mueller, 1991; Wang, Halbrendt, Kolodinsky & Schmidt, 1996), the result was expected in this case of rBST labeling. Individuals willing to invest in natural resource protection were more likely to notice the label. This finding corresponds to results found by Rayburn (1993). Interestingly, although previous research has linked rBST mainly to the agricultural

label, according to the results of this study. Contrary to previous research on labels in general, the effect of income, both higher or lower, was insignificant.

Many independent variables significantly affected the receipt of the correct information from the rBST labels. Being a woman and having a willingness to pay to protect the environment both increased the likelihood of obtaining the correct information. Having a higher income, being older, living in a more rural area, indicating a willingness to pay to support agriculture, and receiving information from newspapers all decreased the likelihood of obtaining the correct information. The literature has had little to say about who receives correct information from food labels. Our hypotheses were formed on the basis of literature that examined risk associated with food related biotechnologies. The logical next step was to hypothesize that the variables connected with concern would lead those individuals to seek out information about the products they purchase in the marketplace. For the most part, with the exceptions of the signs on the variable representing a willingness to pay to support agriculture and being in a higher income group, the expected directions of effects were borne out by the estimation. The coefficient on lambda, the inverse of the Mill's Ratio, was significant, indicating that there is sample selection bias in the sample used.

Table 1  
Parameter Estimates

Legend: A=Name and Definition; B=Mean/SD; C=Expected effect, Notice; D=Parameter estimates, Notice; E=Expected effect, Right; F=Parameter estimates, Right

A	B	C	D	E	F
LOWINC	1=low income .17 (.37)	-	.29 (.16)	-	1.60 (1.16)
HIGHINC	1=high income .38 (.49)	+	-.79-02 (.13)	+	-.41** (.20)
GENDER	1= male .46 (.50)	-	-.35*** (.11)	-	-2.43* (1.40)
EDHS2	1=>HS ed .79 (1.00)	+	-.66-01 (.12)	+	-.41 (.34)
AGE	age 46.09 (16.98)	-	-.9E-02*** (.35E-02)	-	-.78E-01** (.40E-01)
NONADJ	1=nonmetro/ adjacent county .24 (.43)	?	-.27* (.12)	?	-1.98* (1.11)
RURAL	1=town pop<2500 .32 (.46)	?	.52E-01 (.131)	?	.68** (.32)
NONNON	1=nonmetro/ nonadjacent county .33 (.47)	?	-.22-01 (.148)	?	-.51** (.25)
GRADEA	1=gave A grade on environment .35 (.48)	+	-.37-01 (.11)	+	-.18 (.24)
PAYAG	1=will pay to support ag .55 (.50)	+	-.58E-01 (.12)	+	-.55* (.30)
PAYNR	1=will pay to support Nat Res .65 (.48)	+	.27** (.12)	+	2.03* (1.14)
INFTV	1=got info from TV .78 (.41)	-	-.10E-01 (.13)	-	-.21E-01 (.21)
INMAG	1=got info from print .82 (.38)	-	-.69-01 (.15)	-	-.64* (.36)
LAMDA	n/a	n/a	n/a	n/a	10.34* (6.45)
NOTICE	1=noticed the label .50 (.50)	n/a	n/a	n/a	n/a
RIGHT	1= got label right .43 (.50)	n/a	n/a	n/a	n/a
N			545		279
CHISQ.			33.08***		23.83***

Note: \* denotes sig. >.10; \*\* denotes sig. >.05; \*\*\* denotes sig. >.01

economy, making it a rural issue (Kalter, Milligan, Lesser, Magrath & Bauman, 1985; Preston, McGuirk & Jones, 1991; Rayburn, 1993), individuals residing in rural areas were less likely to notice the rBST

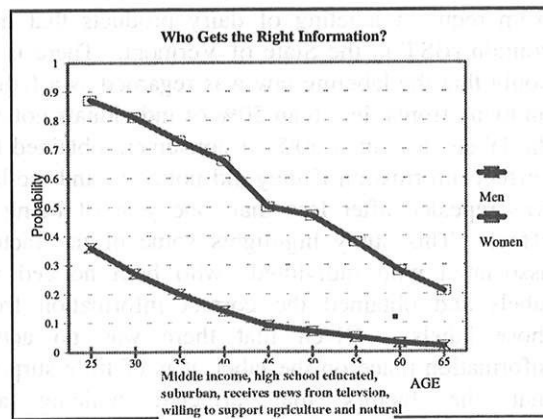


Figure 1. Differences in Obtaining The Correct Information From Labeled Dairy Products

To show how the likelihood of noticing the label and receiving the correct information from the label change as characteristics describing the respondents change, we calculated probabilities using various composite individuals. At the means of the data, the model estimated that the probability of noticing the

label is about 50%, but the probability of obtaining the correct information from the label is only 31%. If we examine a woman, with at least a high school education, aged 46, living in an urban area who will pay to support agriculture and natural resources and received her information NOT from television or the newspapers, then the probability of getting the correct information from the label is 96%. At the other extreme, we have a male with at least a high school education, aged 46, living in a rural area, who will not pay to support agriculture and natural resources and received his information from television or the newspapers. His probability of getting the correct information from the label is only 3%. Figure 1 outlines how the probability of obtaining the correct information changes as an individual ages, for men and women with the following characteristics: not high or low income, has a high school education, lives in a suburban area, gets information from television and newspapers, and is willing to pay to support natural resources and agriculture. These characteristics are typical for a Vermont respondent. The probabilities for men and women vary greatly: as one adds age into the analysis, we see a large decline in the probability of obtaining the correct information from the label.

### **Discussion**

This study examined the factors that influence whether a consumer obtained the correct information from required labeling of dairy products that may contain rBST in the State of Vermont. There is no doubt that the labeling law was regarded as a failure on many fronts: less than 50% of individuals noticed the labels, less than 50% of consumers obtained the correct information if they did notice it, and the law was repealed after less than one year of being in effect. This study highlights some of the factors associated with individuals who both noticed the labels and obtained the correct information from those labels. Given that there was no actual information placed on the label, it is of little surprise that the factors that affected noticing and understanding the labels manifested themselves as they did in this study. Previous research on label use indicates that women of younger age would be more likely to use the labels. Our results with regard to these variables is of no surprise.

The on-going desire of consumers for a measure to provide them information about whether a milk product was produced with rBST indicates that the

debate is not dead with the repeal of the mandatory labeling law. Editorials in the local newspaper have called on the legislature to pass another measure, this time a voluntary labeling law that allows producers who do not use rBST to indicate this on a label. Given the difficulties that consumers experience in obtaining correct information, the consideration of this research is important if future difficulties are to be averted.

Gender is one of the most influential variables in the analysis: women are more likely to get the right information. Age, location, and information sources are important as well. Older people, residents in more rural areas and those who obtain their information from television or newspapers are less likely to receive the correct information. Therefore, any education measures that the state develops to teach individuals about the meaning of rBST labels should be planned and implemented with specific provisions of reaching people like those described above.

An important question that must be addressed is that of who ought to implement or pay for these education initiatives. One possible answer is the agents of the Cooperative State Research Education and Extension Service. Those agents that work primarily with rural older males are in a position to reach a particularly under-informed segment of the population. Their mandate in doing so comes from the fact that this research comes from a Land Grant University (LGU), and that extension's duty is to disseminate knowledge generated at LGUs. It is clearly in their domain to do so. Furthermore, given the potential detrimental effects outlined in the literature of rBST use upon consumers, the dairy industry and particularly on the number of dairy farms in the state, extension has a duty to inform consumers how to determine whether a product was made using rBST and to allow the consumer to make an informed purchase decision based on their own values and personal ethics..

### **Acknowledgements:**

Research was supported by The Vermont Poll, conducted by The Center for Rural Studies, 207 Morrill Hall, University of Vermont. Special thanks to Dr. James Cruise for data preparation.

## References

- Barnes, R. C., & Nowack, P. J. (1990). BST's Scale Neutrality and Constraints to Adoption. In S. Gendel, A. D. Kline, D. M. Warren, & F. Yates (Eds.), Agricultural Bioethics: Implication of Agricultural Biotechnology. Ames, IA: Iowa State University.
- Bass, V. F. (1991). Food Labeling and Consumer Satisfaction. Journal of Home Economics, (Spring 1991), 2-5.
- Burton, S., & Biswas, A. (1993). A Preliminary Assessment of Changes in Food Labels Required by the Nutritional Labeling and Education Act of 1990. The Journal of Consumer Affairs, 27(Summer), 127-144.
- Center for Rural Studies. (1995). Agricultural Handbook for Vermont Counties. Burlington, VT: University of Vermont.
- Douthitt, R. A. A Consumer's Perspective on Proposed Commercial Use of the rBST. (1991). Madison, Wisconsin: LaFollette Issues Paper.
- Griffin, N. (1996). Vermont Retailer Chafe at rbST Labeling. Supermarket News.
- Grobe, D., Douthitt, R., & Zepeda, L. (1996a) Exploring Consumers' Risk Perceptions of rBST and rPST Growth Hormone by Income and Gender. Report. Madison WI.
- Grobe, D., Douthitt, R., & Zepeda, L. (1996b) Measuring Consumer Knowledge and Risk Perceptions of Food-Related Biotechnologies. Report.
- Grobe, D., Douthitt, R., & Zepeda, L. (1996). A Model of Consumers' Risk Perceptions Toward rbGH. In K. F. Folk (Ed.), American Council on Consumer Interests. (pp. 395-422). Washington, DC: Consumer Interests Annual.
- Jacoby, J., Chestnut, R. W., & Silberman, W. (1977) Consumer Use and Comprehension of Nutrition Information. Journal of Consumer Research, 4 (September), 119-128.
- Jensen, H. H., & Kesavan, T. (1993). Sources of Information, Consumer Attitudes on Nutrition, and Consumption of Dairy Products. The Journal of Consumer Affairs, 27(2 Winter), 357-376.
- Kalter, R. J., Milligan, R., Lesser, W., Magrath, W., & Bauman, D. Biotechnology and the Dairy Industry: Production Costs, Commercial Potential, and the Economic Impact. (1985). Cornell U. Agriculture Economics. 85-20,
- Kinnucan, H., Hatch, U., Molnar, J., & Venkateswaran, M. (1990). Scale Neutrality of BST: Ex Ante Evidence from the Southeast. Southern Journal of Agricultural Economics, (December 1990), 1-12.
- Moorman, C. (1990). The Effects of Stimulus and Consumer Characteristics on the Utilization of Nutrition Information. Journal of Consumer Research, 17(December), 362-374.
- Moyer, B. Anonymous. (1995). Classroom Presentation at the University of Vermont.
- Mueller, W. Who Reads the Label? (1991). American Demographics Inc.
- Navder, K. P. (1993). Food and Nutrition Labeling: Past, Present and Future. Journal of Home Economics, (Summer 1993), 43-50.
- Padberg, D. I. (1992). Nutritional Labeling as a Policy Instrument. American Journal of Agricultural Economics (1992), 1208-1212.
- Preston, W. P., McGuirk, A. M., & Jones, G. M. (1991). Consumer Reaction to the Introduction of BST. In J. Caswell (Ed.), Economics of Food Safety. NY, NY: Elsevier Science Publishing Co.
- Rayburn, E. B. (1993). Potential Ecological and Environmental Effects of Pasture and BGH Technology. In W. C. Leibhart (Ed.), The Dairy Debate. Davis, CA: UC Davis Sustainable Agriculture Research and Education Program.
- Ring, W. (1996). Labeling Impact Minimal. No Change Noted in Vt. Dairy Sales. The Burlington Free Press, 5A
- Wang, G., Fletcher, S. M., & Carley, D. H. (1995). Consumer Utilization of Food Labeling as a Source of Nutrition Information. Journal of Consumer Affairs, 29(2 Winter), 368-380.
- Wang, Q., Halbrendt, C., Kolodinsky, J., & Schmidt, F. Consumer Acceptance of bST and the Effectiveness of bST Labeling. (1996). Burlington, VT: University of Vermont, Department of Community Development and Applied Economics.

## Endnotes

1. Associate Professor, Department of Community Development and Applied Economics (CDAE). 202 Morrill Hall, University of Vermont, Burlington, VT 05405. Jkolodin@zoo.uvm.edu
2. Graduate Student, CDAE.
3. Assistant professor, CDAE.