

# Strategy and Policy in the Food System: Emerging Issues

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EDITED BY

Julie A. Caswell and Ronald W. Cotterill

*Proceedings of NE-165 Conference  
June 20-21, 1996  
Washington, D.C.*

## PART FOUR: Consumer Preferences and Labeling

### **13. Consumer Risk Perception Profiles for the Food-Related Biotechnology, Recombinant Bovine Growth Hormone (rbGH)**

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**Keywords:** Consumer risk perception, biotechnology, bovine growth hormone

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## **Consumer Risk Perception Profiles for the Food-Related Biotechnology, Recombinant Bovine Growth Hormone (rbGH)**

*Deana Grobe, Robin Douthitt, and Lydia Zepeda<sup>1</sup>*

Despite an abundant, safe food supply, there exists consumer concern and feelings of vulnerability to modern food risks (Slovic 1990). Often these concerns vary in magnitude among consumers, given different perceptions of the product's riskiness. Even with similar food risk knowledge, differences emerge among consumers because of unique values and experiences (Sapp et al. 1994). Consumers also differ in their response to risk contexts (van Ravenswaay 1995). For example, some consumers may perceive a greater personal threat or susceptibility to the risk than others. The extent of this perception may motivate a behavioral response from the consumer to minimize their perceived personal risk. Engaging in a self-protective behavior is one such response. A self-protective behavior is defined as an "averting" behavior used by consumers to reduce the chance of an adverse outcome, or as an action taken to reduce personal or group vulnerability to a risk (Ehrlich and Becker 1972). Self-protective behaviors to reduce food-related risks could involve changing food preparation methods, reducing consumption of the suspect food, substituting other comparable foods, or preventive health behavior (Eom 1993).

Krimsky (1995) contends that the life cycle of a controversy can provide insights into the process of risk selection. The life cycle controversy of recombinant bovine growth hormone (rbGH), a food-related biotechnology used in milk production, was described by Krimsky (1995) as having a 13-year gestation period with peaks of intense public debates in the years 1990 and 1993, right before its approval for commercial use. While still in the development stage, the rbGH product drew skepticism from environmental and sustainable agricultural groups (Krimsky 1995). Although there was public apprehension toward the product, there was no dramatic incident or single health hazard such as with other food products or additives (e.g., Alar). Such dramatic events are said to heighten risk perceptions, as well as to shape risk behavior (Kasperson 1992). The broad but less intense public concern associated with the rbGH product primarily focused on health and equity concerns, in addition to social and ethical issues of the product (Krimsky 1995). Yet strong support from professional organizations, as well as scientific evidence showing rbGH was safe for human consumption and had no adverse impact on cattle, ultimately led to the Food and Drug Administration (FDA) approval of rbGH for commercial use in 1994 (Ropp 1994). Because the FDA ruled there was no difference in the milk from treated versus untreated cows' milk they did not require any special labeling of meat or dairy products from cows treated with rbGH (Ropp 1994). Despite this, some consumers remain concerned. As a result, the controversy around rbGH has turned to whether there should be mandatory labeling laws to enhance consumer choice.

In summary, public apprehension has been expressed about the rbGH product since its development (Smith and Warland 1992). According to Krimsky (1995), how the controversy develops can impact the consumers' sense of risk and their decision to engage in self-protection strategies. The extent to

which this controversy elicits a self-protection response will be indicated by the consumers' level of perceived risk toward milk produced with rbGH.

Modifying Weinstein's (1988) self-protection stage theory assists in classifying different perceived risk typologies associated with milk from cows treated with rbGH. Weinstein characterizes self-protection as a "... series of distinct stages" reflecting individual behavior differences at different points in the self-protection process (1988: 358). For this study, these stages are useful because they allow us to categorize consumers as to how they respond to different typologies of risk perception toward the use of rbGH. The intent of this study is to determine the characteristics of consumers at each risk perception typology.

With the use of new technologies in the food supply and increased knowledge of the link between diet and health, consumers have a greater interest in food quality and safety issues (Huang 1991). Risk communicators could more effectively respond to this interest if they were aware of the various consumer risk perception profiles for a particular product. After reviewing Weinstein's theory, risk perception typologies toward rbGH are formulated. Using nationwide consumer survey data, the characteristics of consumers for the risk perception typologies are investigated. The results are presented with a discussion of policy implications.

### **Weinstein's Self-Protection Process**

Current theories used to evaluate consumer risk prevention focus on the decision-making process. These include the theories of health belief, reasoned action, subjective expected utility, and protection motivation (Cleary 1987). These theories are based on the premise that a rational decision maker will weigh the expected benefits of the self-protection action against the costs and adopt the action if the outcome is favorable (Weinstein 1988).

Critiques have noted the following limitations of these theories: (a) they rely on a single self-protection response; (b) they do not take into account the complexity of many behaviors; and (c) they assume that individuals commonly seek to "maximize a value-expectancy function" (Cleary 1987, Weinstein 1988). Alternatively, Weinstein suggests that "... people at different points in the precaution adoption process behave in qualitatively different ways and that the kinds of interventions and information needed to move people closer to action will vary from stage to stage" (1988: 358). He proposed a stage approach to understanding the self-protection adoption process. This permits different self-protection responses, allows more complex responses, and these responses may not necessarily be linked to value maximizing behavior.

Weinstein's theory defines stages in terms of "... beliefs people hold about the risk situation" (1988: 359). This approach differs from the above theories because it allows individuals to vary their behavior at each stage. The stage approach assumes that (a) advancing to the next stage requires an acceptance of the idea defining the current stage, and (b) the stages are cumulative (Weinstein 1988).

Weinstein (1988) developed his theory for perception of actual risk, but it can be extended to cases in which a hazard may not exist. The first of Weinstein's (1988) five stages is that a person must have learned or heard about the existence of the hazard (Table 13.1). Weinstein (1988) believes that in most cases a lack of self-protection stems from not being aware that the risk actually exists. Progressing to stage two entails a belief that there is a significant likelihood for others to experience a risk. Many individuals form an erroneous belief that their risk is less than someone else's, or what is referred to as "optimistic bias" (Weinstein 1988). Optimistic bias can be a critical barrier to engaging in self-protection actions. If individuals do not believe a risk exists, they will be less likely to search for information and be less attentive to risk communication. Acceptance of personal risk susceptibility characterizes Weinstein's (1988) stage three. One would have little interest in self-protective behavior unless they felt they were personally vulnerable to the risk, or that it exhibited a personal threat. This

TABLE 13.1 Weinstein’s Stage Approach Theory for the Self-Protection Process

Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
Learn that hazard exists	Believes in significant likelihood for others	Acknowledges personal susceptibility	Intention to act	Takes self-protective action

is a pivotal component in the process of adopting self-protective behavior. Stage four is the intention to take the self-protection action (Weinstein 1988). Necessary conditions for deciding to act are that the person must believe the risk could happen to them and possibly cause personal negative consequences, and they must also evaluate the costs and benefits and their ability to take the self-protection action. Despite the individual’s intention to act, barriers remain such as time commitment or situational circumstances which may create a gap between intention and adoption of a self-protection action. Taking a self-protective action advances one to the fifth and final stage of Weinstein’s (1988) process.

### Risk Perception Typologies for rbGH

Although Weinstein’s theory assists in conceptualizing the systematic differences between consumers along a continuum, for the case of rbGH, the model’s feasibility is questionable. In applying Weinstein’s stages to rbGH it is important to note that the FDA has concurred with the scientific evidence showing that rbGH treated herd milk is safe for human consumption. Despite this, consumers are apprehensive toward this product (for a synopsis of studies see Smith and Warland 1992). Thus, the focus of interest for rbGH is on consumers’ perceived risk, contrary to Weinstein’s theory which presumes an actual risk exists. Weinstein’s self-protection stages were modified to typologies based on the consumers’ perceived personal risk. In contrast, the purpose of this analysis is to determine the characteristics of consumers at each risk perception typology.

Table 13.2 presents the risk perception typologies for the rbGH product. Given the complexity and unfamiliarity of biotechnology applications, a distinction was made between consumers with prior awareness of rbGH’s use and those who were not aware of rbGH’s use.<sup>2</sup> Awareness differences may ultimately influence the formation of consumers’ perceived risk toward this rbGH product.

#### *Not Aware, But Provided Limited Information About rbGH*

**Type 0.** Consumers who lacked awareness of the rbGH product and perceived no ill health risks from consuming rbGH treated herd milk represent this typology. In essence, these consumers who were provided limited information feel the rbGH product is safe.

**Type 1.** This typology is characterized by the consumer with limited information expressing a concern level for the future discovery of ill health effects. Consequently, even if the consumer perceived some future health risk, they may not view this risk as affecting them immediately.

**Type 2.** Those consumers who perceive both a future and an immediate health risk from consuming milk from rbGH treated herds comprise this typology. Although these consumers have expressed a level of perceived personal susceptibility, their lack of awareness of rbGH’s use precludes them from actually engaging in self-protective behaviors.

TABLE 13.2 Risk Perception Typologies for the rbGH Product

	Risk Perception Typology							
	<i>Type 0</i>	<i>Type 1</i>	<i>Type 2</i>	<i>Type 3</i>	<i>Type 4</i>	<i>Type 5</i>	<i>Type 6</i>	<i>Type 7</i>
<b>Not Aware</b> <i>(Provided limited information about rbGH's use)</i>	Perceive no ill health risk	Perceive only future ill health risk from consuming rbGH treated herd milk	Perceive both future and immediate ill health risk from consuming rbGH treated herd milk					
<b>Aware of rbGH's use</b>	Perceive no ill health risk	Perceive only future ill health risk from consuming rbGH treated herd milk	Perceive both future and immediate ill health risk from consuming rbGH treated herd milk, and have the ability to change milk consumption levels, but elect not to self-protect	Perceive both future and immediate health risks, and have the ability to purchase milk from untreated herds, but elect not to self-protect	Perceived personal risk elicits a self-protection response: (1) purchasing milk identified as coming from nontreated herds, (2) changing milk consumption levels			

**Aware of rbGH**

**Type 3.** The third typology represents those consumers who have heard or read something about rbGH's use and feel it is safe. This typology differs from Type 0 as these consumers were aware of the product's existence before forming an opinion about their perceived level of concern.

**Type 4.** These consumers were aware of the rbGH product and expressed concern for the future discovery of health risk from consuming rbGH treated herd milk. However, they were not concerned with an immediate health risk.

**Type 5.** This typology represents consumers who were aware and perceive both future and immediate health risks. Although similar to Type 2, these consumers were aware of rbGH's use and had the ability to change their milk consumption levels, enabling them to engage in a self-protective action. Yet, the consumers in this typology have elected not to self-protect.

**Type 6.** Type 6 represents consumers aware of rbGH, with immediate and future perceived risks who have the ability to purchase an assured milk product, but elect not to self-protect. The ability, in this case, is having knowledge of where one could purchase milk from untreated herds. Information to

this effect may be known through a policy of the store, a brand policy, labeling of milk from untreated herds, and/or labeling of organic milk. Knowledge of this information could increase the consumers' perceived effectiveness of taking the self-protection, as they would be assured milk from untreated herds. Although these consumers have the ability to engage in a self-protective behavior, barriers remain which may prevent actual adoption.

**Type 7.** This typology reflects those consumers who responded to their perceived personal risk by engaging in self-protective behavior. Types of self-protection action include: (a) seeking assurance that purchased milk came from a nontreated herd, or (b) changing milk consumption levels. Specifically, consumers could purchase milk identified as coming from nontreated rbGH herds. The individual may identify the milk through a store, a brand, and/or labeling policy. Consumers could change consumption by: reducing milk consumption, stopping milk consumption altogether, and/or substituting to other products such as soy or goat's milk.

## Data

A nationwide survey of primary household food purchasers' attitudes toward the use of food-related biotechnologies was conducted (from March 1 through June 27, 1995) approximately one year after the FDA approved the commercial use of rbGH. The respondent selected for the interview was the person identified as a household resident "who is age 18 or older and primarily responsible for the household's food purchasing decisions." The data set used to analyze national trends was comprised of a total of 1,910 interviews, averaging sixteen minutes in length. The adjusted response rate for the entire sample frame was 56.1 percent (for details see Douthitt et al. 1996). The 1,910 completed interviews consisted of 969 completions from a National sample frame, 187 completions from a Wisconsin sample frame, 186 completions from a Vermont sample frame, and 568 completions from a Poor sample frame. The sample results in this analysis were weighted to ensure findings were representative of the U.S. population.

The subsample used in this analysis consisted of those respondents (a) who expressed an opinion on whether or not they were aware of rbGH (12 observations lost), (b) who met the parameters of the typologies (398 observations lost), (c) who purchased milk (37 observations lost), and (d) who reported complete data for all variables used (326 observations lost). The final subsample size was 1,137. Of these subsample respondents 74 percent were women, consistent with the screening question for primary household food purchaser. The authors compared this study's subsample to U.S. Census household demographic characteristics to assess whether this subsample was representative of U.S. households. The comparison showed that this study's subsample was more educated than the average U.S. households, with mean age of householder a few years younger than U.S. households (44.7 versus 48.2). Sixty-seven percent of this subsample's respondents were married, with an average household size of 2.93; for U.S. households, the respective figures are 54.9 percent and 2.63. Median income was higher than the U.S. households figure (\$40,000 versus \$31,241). Eighty-five percent of this subsample was Caucasian, slightly higher than with U.S. households.

## Methods and Variable Measurement

In the following analysis, individual differences at each risk perception typology are examined. This study compares the influences of personal characteristics across a particular risk perception typology. The value of such a comparison is apparent when considering effective risk communication for those consumers at each typology of risk perception.

**Risk-Perception Typologies**

The dependent variable, TYPE, represents the mutually exclusive risk perception typologies, resulting in a polychotomous variable (Table 13.3). TYPE was equal to zero when the respondent was not aware of the use of rbGH in milk production and did not perceive ill health effects from consuming the rbGH product (TYPE=0). Five percent of the subsample respondents comprise this typology. Approximately three percent of the subsample respondents were not aware of the use of rbGH in milk production, but were concerned with the future discovery of ill health effects associated with milk from rbGH treated herds (TYPE=1). Being unaware and concerned for both the future discovery and immediate ill health effects included 19.4 percent of the subsample respondents (TYPE=2). TYPE was equal to three, representing almost 10 percent of the subsample, when the respondent was aware and perceived no health risks from consuming the rbGH product (TYPE=3). Six percent of the subsample respondents were aware and concerned only for the future discovery of ill health effects from consuming rbGH treated herd milk (TYPE=4). TYPE was equal to five when the respondent was aware and concerned about potential and immediate health risks, were able to change milk consumption levels, but decided not to self-protect (TYPE=5). Thirty percent of the subsample respondents agreed with this typology. About 5 percent of the subsample respondents met the requirements of being aware, perceiving both future and immediate risks, and had the ability to purchase an assured product (TYPE=6). However, the respondents at this stage did not engage in self-protective behavior. Finally, TYPE is equal to seven when the respondent was in agreement with being aware, perceived both future and immediate health risks, and either purchased milk identified as coming from cows not treated with rbGH or changed their consumption levels (TYPE=7). Twenty-one percent of the subsample respondents engaged in self-protective behavior.

TABLE 13.3 Variable Definition and Sample Statistics for the Dependent Variable

Dependent Variable		Definition				Mean	Standard Deviation	N
TYPE						3.9838	1.9843	1137
TYPE=0	TYPE=1	TYPE=2	TYPE=3	TYPE=4	TYPE=5	TYPE=6	TYPE=7	
A=1	AC=1	ACD=1	B=1	BC=1	BCD=1	BCDE=1	BCDEF=1	
B-F=0	B,DEF=0	B,EF=0	A,C-F=0	A,DEF=0	A,EF=0	A,F=0	A=0	
(5.0%)	(3.3%)	(19.4%)	(9.6%)	(6.1%)	(30.0%)	(5.6%)	(21.0%)	

A = 1 if respondent did not “recall having heard or read anything about the use of rbGH” (were provided limited information about rbGH).

B = 1 if respondent recalled “having heard or read anything about the use of rbGH.”

C = 1 if respondent expressed concern levels of moderate or very concerned about the future discovery of ill health effects associated with consuming milk from rbGH treated herds, 0 otherwise.

D = 1 if respondent expressed moderate or very concerned about current human ill health effects from consuming milk from rbGH treated herds, 0 otherwise.

E = 1 if the respondent knew there were food stores in her or his area where milk from untreated cows could be purchased , 0 otherwise.

F = 1 if respondent indicated that she or he (a) “usually purchases milk identified as coming from nontreated cows” or (b) reduced or stopped milk consumption; 0 otherwise.



### *Personal Characteristics*

The variation in the level of perceived risk among consumers may be due to personal health influences, social and cultural influences, and/or perceived locus of control. Cleary states that it is “necessary to be aware of the broad matrix of factors influencing health behavior if we are to understand variations in preventive actions” (1987: 120). In order to better understand various strategies of risk communication, this study will test whether there are typology differences in the personal characteristics related to individual behavior.

**Personal Health Influences.** Personal experience is believed to impact not only the recognition of risk, but also the intention to take self-protective behavior (Weinstein 1989). Family characteristics, in particular, can be associated with a heightened state of awareness about health, thus increasing the likelihood or readiness of engaging in self-protection strategies (Cleary 1987). Weinstein (1984) found heredity factors to be significantly associated with perceived risk. Similarly, individuals who have developed other food safety concerns may be more health motivated. Schafer et al. (1993) found that those individuals who were more health motivated were significantly more likely to take self-protective food safety behavior than those who were not health motivated. These individuals may also be more open to risk communication strategies.

Variables reflecting personal health influences relevant to food purchases are HEREDITY, PERSONAL CONCERN, and LACTOSE (Table 13.4). HEREDITY was equal to one if the respondent, or anyone in the household has a family history of cancer or heart disease, zero otherwise. PERSONAL CONCERN was equal to one if the respondent changed food habits because of a concern about future personal and family health risks, zero otherwise. HEREDITY reflects family characteristics, as PERSONAL CONCERN represents health motivation. A LACTOSE variable was included not only to control for differences in lactose intolerance among ethnic groups, but as a personal health influence reflecting a physical state. LACTOSE was equal to one if the respondent or other household members are lactose intolerant, zero otherwise.

**Social and Cultural Influences.** “Health behavior may reflect, in part, broad social processes” (Cleary 1987: 132). Schafer et al. (1993) found females, older persons, and larger households to be significantly more likely to engage in self-protective behaviors toward foods than were men, younger individuals, and smaller households. Schafer et al. (1993) posited that education attainment and income affect behavior by influencing the perception of susceptibility. That is, higher educated individuals have the knowledge/information, while those with higher income have the resources to ensure food safety (Schafer et al. 1993). Although their results did not support this hypothesis, other researchers have found education to be associated with health practices, and low-income individuals to have different barriers (social isolation, use of preventive services) affecting their ability to engage in self-protective behaviors (Cleary 1987). Researchers have found ethnicity to be a determinant of “. . . individual’s perception of and response to symptoms” (Cleary 1987: 134), while social support networks were seen as a means of interacting with a person’s beliefs and the beliefs of network members (Cleary 1987).

Variables reflecting social and cultural influences are GENDER, POOR, EDUCATION, AGE, HOUSEHOLD SIZE, ETHNIC, ENVIRONMENT, and ANIMAL RIGHTS (Table 13.4). All but age and household size were binary variables. GENDER was equal to one if the respondent/primary household food purchaser was female, zero if male; POOR was equal to one if the respondent qualified as poor under the February 9, 1995, USDA poverty guidelines, zero if nonpoor; and EDUCATION was equal to one if the respondent had greater than a high school degree, zero otherwise. Age and household size were continuous variables where AGE indicated the respondent’s age in years, and HOUSEHOLD SIZE indicated the number of persons living in the household counting all adults and children. ETHNIC was equal to one if the respondent was African American, Asian, Native American, or of Hispanic origin, zero if they were Caucasian. Group affiliation variables measure the respondent’s level of identification with environmentalists (ENVIRONMENT), and the level of identification with animal rights groups

TABLE 13.4 Variable Definition and Sample Statistics for the Independent Variables

Independent Variable	Definition	Mean	St. Dev.	N
<b>Personal Health Influences</b>				
HEREDITY	= 1 if respondent or any of the household members have a family history of cancer or heart disease; 0 otherwise	0.5699	0.4953	1137
PERSONAL CONCERN	= 1 if respondent changed food habits because of concern about future personal and family health risks; 0 otherwise	0.8780	0.3275	1137
LACTOSE	= 1 if respondent or any of the household members are lactose intolerant; 0 otherwise	0.1767	0.3815	1137
<b>Social and Cultural Influences</b>				
GENDER	= 1 female; 0 male	0.7405	0.4386	1137
POOR	= 1 if poor (qualified as poor under the February 9, 1995, USDA poverty guidelines); 0 nonpoor	0.0625	0.2423	1137
EDUCATION	= 1 if greater than a high school degree; 0 otherwise	0.7313	0.4435	1137
AGE	Age in years	44.7010	14.6772	1137
HOUSEHOLD SIZE	Number of persons living in the household counting all adults and children.	2.9339	1.4063	1137
ETHNIC	= 1 for African American, Asian, Native American, or of Hispanic origin; 0 for Caucasian	0.1539	0.3610	1137
ENVIRONMENT	= 1 if respondent strongly identified with environmentalists; 0 otherwise	0.3690	0.4827	1137
ANIMAL RIGHTS	= 1 if respondent strongly identified with animal rights groups; 0 otherwise	0.2501	0.4332	1137
<b>Perceived Locus of Control</b>				
LOCUS OF CONTROL	= 1 if respondent strongly agreed with the following two statements: "I worry about the future that today's children are facing"; "More and more, I feel helpless in the face of what's happening in the world today"; 0 otherwise	0.4439	0.4971	1137

(ANIMAL RIGHTS). Both variables were coded as one if the respondent strongly identified with that particular group, zero otherwise.

***Perceived Locus of Control.*** Locus of control, or the individual's perceived control over life events is seen as a common barrier to self-protection action. Research suggests that feelings of external control were associated with less initiative and effectiveness at carrying out behavior to protect oneself (Cleary 1987). This was indicated by results finding perceived control to be significantly related to the intention, and ultimately influencing self-protective behavior (Cleary 1987).

Perceived locus of control was measured by creating an index of two variables (Table 13.4). The first variable was based on agreement to the statement, "I worry about the future that today's children are facing," while the second variable measured agreement to the statement, "More and more, I feel helpless in the face of what's happening in the world today" (Seeman 1991). LOCUS OF CONTROL is equal to one if the respondent strongly agreed with the two statements, zero otherwise.

## **Results**

The purpose of this study was to understand individual differences at the various typologies. Thus, we estimated a multinomial logit model of the typologies, using personal characteristics as explanatory variables. Table 13.5 presents the marginal effects for each personal characteristic at each risk perception typology. The overall multinomial logit model for the typologies variable had a significant overall chi-square value at the 0.0001 level (Table 13.5). The LIMDEP econometric software was used for the multinomial logit procedure (Greene 1995).

### ***Limited Awareness and Feel the Product is Safe (TYPE=0)***

The marginal effects indicate that those with a high school education or less (EDUCATION) were more likely to be unaware of rbGH and feel the product is safe, than those with greater than a high school education. This result can be compared with McGuirk et al. (1990) who found higher educated individuals to be more aware of food safety concerns and also more likely to act on those concerns. One may assume less educated consumers are less aware, considering the complexity and/or availability of information on biotechnology produced products.

### ***Limited Awareness, Future Health Concerns, But No Immediate Concerns (TYPE=1)***

The personal characteristics of HEREDITY, LACTOSE, and ENVIRONMENT were significant covariates for those respondents with limited awareness and who expressed a concern for future health risks. Respondents who do not have a family history of cancer and/or heart disease (HEREDITY), those who are lactose tolerant (LACTOSE), and those who do not or only somewhat identify with environmentalists (ENVIRONMENT), were more likely to be in this typology than those with a history of hereditary diseases, lactose intolerant individuals, or those who strongly identify with environmentalists. The results may reflect that individuals without personal health factors, or those who do not identify with a particular social group tend to feel the information has less personal salience. This suggested conclusion could also be influencing these individuals' concern for potential, but not immediate perceived health risks from consuming rbGH treated herd milk.

### ***Limited Awareness, Concerned About Future and Immediate Health Effects (TYPE=2)***

There is significant evidence that those with a high school education or less (EDUCATION), respondents whose ethnicity is African American, Asian, Native American, or of Hispanic origin (ETHNIC), and those who feel a lack of control over life events (LOCUS OF CONTROL), were more

TABLE 13.5 Marginal Effects, the Probability of Being in One Typology for a Change in the Independent Variable

Independent Variables	NOT AWARE			AWARE				
	TYPE=0	TYPE=1	TYPE=2	TYPE=3	TYPE=4	TYPE=5	TYPE=6	TYPE=7
Constant	-	-	-	-	-	-	-	-
HEREDITY	0.013	-0.026***	-0.005	-0.036**	0.005	0.002	0.017	0.030
PERSONAL CONCERN	-0.013	0.016	-0.033	0.009	-0.022	0.098**	-0.010	-0.045
LACTOSE	-0.010	-0.048**	-0.014	-0.027	-0.019	0.083**	0.016	0.019
GENDER	0.004	0.002	0.048	-0.068***	-0.026	0.036	0.009	-0.005
POOR	0.027	-0.024	0.045	0.042	-0.001	-0.129	0.019	0.022
EDUCATION	-0.030**	-0.005	-0.114***	0.041	0.019	0.027	0.019	0.044
AGE	-0.001	-0.001	-0.002	0.001	-0.001	0.003***	-0.001	-0.001
HOUSEHOLD SIZE	-0.004	-0.001	-0.003	-0.001	0.001	-0.007	-0.001	0.014
ETHNIC	0.003	0.001	0.084***	-0.037	-0.033	0.023	-0.030	-0.010
ENVIRONMENT	-0.017	-0.025**	0.005	-0.014	-0.013	-0.034	0.021	0.078***
ANIMAL RIGHTS	-0.007	-0.006	0.053	-0.048**	-0.016	0.044	-0.002	-0.018
LOCUS OF CONTROL	-0.026	0.015	0.061**	-0.088***	-0.038***	0.103***	-0.029**	0.002

Log-Likelihood -1950.62 Chi-Squared 237.33\*\*\*

Note: \*\* denotes significance at the 5 percent level and \*\*\* denotes significance at the 1 percent level.

likely to have limited awareness and be concerned for both future and immediate health risks compared to those with greater than a high school education, Caucasians, and those who perceive control. These results are consistent with Savage (1993) who suggested that people with lower levels of education and African Americans have greater fear of risk, in that they perceive more personal exposure to the risk compared to higher educated and non African Americans. A similar conclusion could be suggested for those who perceive a lack of control over life events.

***Aware of rbGH and Feel the Product is Safe (TYPE=3)***

The personal characteristics of HEREDITY, GENDER, ANIMAL RIGHTS, and LOCUS OF CONTROL were significant influences on being aware of rbGH and feeling that this product was safe. The marginal effects imply that respondents who do not have a family history of cancer and/or heart disease (HEREDITY), males (GENDER), those who do not or only somewhat identify with animal rights groups (ANIMAL RIGHTS), and those who perceive control over life events (LOCUS OF CONTROL), were more likely to be in this typology than those with a history of hereditary disease, females, those identifying with animal rights groups, and those who perceive a lack of control. These results are comparable to Weinstein (1984) who found hereditary factors to be significantly associated with perceived risk, Savage (1993) who found women to perceive greater risks than men, and Douglas and Wildavsky (1982) who believe that those who are involved in certain social groups tend to emphasize certain risks as a way of maintaining the group. One may also assume that feelings of control over life situations could increase one's confidence in the perceived safety of the rbGH product. Furthermore, increased exposure and/or understanding of available information on the use of rbGH could explain why these particular consumers were more aware than others.

***Aware of rbGH, Future Health Concerns, But No Immediate Concerns (TYPE=4)***

Respondents who perceive control over life events (LOCUS OF CONTROL) are more likely to be in this typology than those who perceive a lack of control. Thus, the probability of being aware and concerned about future health risk increased for consumers with a greater sense of control. This result indicates that those who perceive control over life events may feel less control over a potential or unknown health risk, or are possibly seeking further information.

***Aware, Future and Immediate Health Concerns, But Elect Not to Self-Protect (TYPE=5)***

PERSONAL CONCERN, LACTOSE, AGE, and LOCUS OF CONTROL were significant determinants influencing being aware, perceiving personal susceptibility toward the use of rbGH, and having the ability to change milk consumption levels, but choosing not to self-protect. Those who changed their food habits because of a concern about future personal and family health risks (PERSONAL CONCERN) and those with household members that are lactose intolerant (LACTOSE), were more likely to be in this typology compared to those not changing food habits and those lactose tolerant. One may expect that individuals who have engaged in other risk averting behavior would be less likely to evoke optimistic bias, while others may be more likely to see personal risk because of a heightened health awareness as a result of their own personal health.

Additionally, there is evidence that the probability of being in this typology increases with the primary household food purchaser's age (AGE). This was consistent with findings that older individuals have a greater concern with food safety, compared to younger individuals who have a greater optimistic bias about perceived susceptibility (Weinstein 1984, Schafer et al. 1993). For the consumers of this typology discussed thus far, not engaging in self-protection actions may originate from barriers such as time commitments or personal circumstances.

Further, those who perceive a lack of control over life events (LOCUS OF CONTROL) were more likely to be in this typology compared to those perceiving control. This result suggests that individuals who feel their personal effort is futile may be less likely to adopt self-protective behavior, as well as perceive more personal vulnerability. As found by Schafer et al. (1993), those who engaged in food safety behaviors had a greater perceived control than those who perceive a lack of control.

#### ***Able to Purchase an Assured Product, But Elect Not to Self-Protect (TYPE=6)***

Respondents who perceive control over life events (LOCUS OF CONTROL) are more likely to acknowledge personal susceptibility, and although they have the ability to purchase an assured product they do not self-protect. This is in comparison to those who feel a lack of control over life events. It may be that those who perceive greater control in life place a higher regard for perceived health, effecting their perceived personal susceptibility toward the rbGH product. However, their lack of self-protection is in opposition to other researchers who have found that those with greater perceived control believe what they do makes a difference, hence, are more likely to engage in self-protection actions (Cleary 1987). Despite this, it is unknown what limitations these consumers face when attempting to adopt strategies of self-protection.

#### ***Engage in Self-Protective Behavior (TYPE=7)***

ENVIRONMENT showed to have a significant influence on the adoption of self-protective behavior. The marginal effects indicate that those who strongly identify with environmentalists (ENVIRONMENT) were more likely to be aware, perceive personal susceptibility, have the ability to self-protect, and actually engage in self-protective behavior than those who do not or only somewhat identify with environmentalists. That is, these respondents are responding to their perceived health risk by eliciting strategies to obtain a particular level of risk acceptability.

### **Conclusions**

Groups of consumers with the same information have variable beliefs and attitudes relating to their own personal preferences. Given these preferences, consumers are expected to exhibit differences in their evaluation of the outcome of decisions (Hadden 1989). It is important to understand the role consumers play in risk decision making because they evaluate risks in ways that differ from others (e.g., scientific risk assessments). This study is an initial attempt at applying Weinstein's (1988) stages of self-protection to classify consumers in how they respond to their perceived risks toward the use of rbGH. The results show that one cannot characterize consumers' risk perception in one way. There are systematic differences between consumers producing a range of risk perception profiles toward milk produced with rbGH.

This study's results strengthen the idea that consumers with similar information display varying perceptions of risk. For example, those consumers who were unaware of rbGH's use but were provided the same brief description of rbGH (TYPE=0-2), exhibited different risk perception responses from believing the product was safe to perceiving personal susceptibility. For these consumers, perceiving both immediate and potential health risks seems to be contingent on the individual's perceived personal exposure, or fear of risks in general. The results also imply that consumer characteristics such as personal health factors, being older, or perceiving a lack of control appear to influence being aware and perceiving some risk associated with the use of rbGH. The most likely explanation for those consumers who have immediate concerns but do not self-protect is that personal barriers or lack of perceived effectiveness of action prevents self-protective behavior. Results from this study also showed that those

who engaged in self-protective actions were more likely to strongly identify with environmentalists. Overall this result supports the notion that environmental concerns of this rbGH product may be as important as food safety concerns. In addition, Krinsky (1995) was previously noted to posit that how a controversy develops can impact consumers' sense of risk and their decision to self-protect. This statement is reinforced by these findings as environmental groups were skeptical early in rbGH's development, impacting their perceived risk and decision to self-protect.

The implication of these results is that one public policy strategy will unlikely satisfy all consumers (van Ravenswaay 1995). By understanding the way consumers differ in their behavioral response to perceived concern, risk communicators could design more effective risk communication strategies. For example, those who were aware and concerned about potential health risks may indicate a profile of information seekers who would be more attentive to risk information.

This preliminary research has been useful in stimulating thinking about typologies of risk perception. Research should proceed by implementing a predictive model to determine who would fall into a particular typology. Attention should also be given to the refinement of the typologies to incorporate additional respondents.

### Notes

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<sup>2</sup>Those respondents who were not aware of rbGH's use were provided the following description of rbGH as a basis for answering the remaining survey questions about the biotechnology: Bovine somatotropin (rbGH) is a growth hormone, which when administered/injected in fully grown, lactating cows, increases their milk production, thereby improving dairy farm profits. The milk from cows given rbGH has the same product characteristics as the milk from untreated cows.

### References

- Cleary, Paul D. 1987. Why People Take Precautions Against Health Risks. In *Taking Care: Understanding and Encouraging Self-Protective Behavior*, ed. Neil D. Weinstein, 119-149. Cambridge, MA: Cambridge University Press.
- Douglas, Mary and Aaron Wildavsky. 1982. *Risk and Culture*. Berkeley, CA: University of California Press.
- Douthitt, Robin, Lydia Zepeda, and Deana Grobe. 1996. Comparison of National and Poor Households: Results of a Survey of Consumer Knowledge and Risk Perceptions of Food-Related Biotechnologies. University of Wisconsin-Madison, Institute for Research on Poverty, Special Report No. 68, January (<http://www.ssc.wisc.edu/irp/>).
- Ehrlich, Isaac and Gary S. Becker. 1972. Market Insurance, Self-Insurance, and Self-Protection. *Journal of Political Economy* 80:623-648.
- Eom, Young Sook. 1993. Self-Protection, Risk Information, and Ex Ante Values of Food Safety and Nutrition. NE-165 Conference on Valuing Food Safety and Nutrition, Alexandria, Virginia, June 2-4.

- Greene, William H. 1995. *Limdep Version 7.0 Users Manual*. Econometric Software, Inc.
- Hadden, Susan G. 1989. *A Citizen's Right to Know: Risk Communication and Public Policy*. San Francisco, CA: Westview Press.
- Huang, Chung L. 1991. Attract Consumers for the Wrong Reasons. *Choices* Third Quarter:18-21.
- Kasperson, Roger E. 1992. The Social Amplification of Risk: Progress in Developing an Integrative Framework. In *Social Theories of Risk*, ed. Sheldon Krimsky and Dominic Golding. New York, NY: Praeger.
- Krimsky, Sheldon. 1995. *Three Food Safety Issues: Life Cycles of Technical Controversies and the Social Selection of Risk*. Center for Agriculture, Food and Environment, Tufts University. Discussion Paper #3.
- McGuirk, Anya M., Warren P. Preston, and Amy McCormick. 1990. Toward the Development of Marketing Strategies for Food Safety Attributes. *Agribusiness* 6(4):297-308.
- Ropp, Kevin L. 1994. New Animal Drug Increases Milk Production. *FDA Consumer* May:24-27.
- Sapp, Stephen G., Wendy J. Harrod, and Li-Jun Zhao. 1994. Social Construction of Consumer Risk Assessments. *Journal of Consumer Studies and Home Economics* 18(2):97-106.
- Savage, Ian. 1993. Demographic Influences on Risk Perceptions. *Risk Analysis* 13(4):413-420.
- Schafer, Robert B., Elisabeth Schafer, Gordon L. Bultena, and Eric O. Hoiberg. 1993. Food Safety: An Application of the Health Belief Model. *Journal of Nutrition Education* 25(1):17-23.
- Seeman, Melvin. 1991. Alienation and Anomie. In *Measures of Personality and Social Psychological Attitudes*, ed. John P. Robinson, Phillip R. Shaver, and Lawrence S. Wrightsman, 291-371. San Diego, CA: Academic Press, Inc.
- Slovic, Paul. 1990. The Legitimacy of Public Perceptions of Risk. *Journal of Pesticide Reform* 10(1):13-15.
- Smith, Blair J. and Rex H. Warland. 1992. Consumer Responses to Milk from BST-Supplemented Cows. In *Bovine Somatotropin and Emerging Issues: An Assessment*, ed. Milton C. Hallberg, 243-264. San Francisco, CA: Westview Press.
- van Ravenswaay, Eileen O. 1995. *Public Perceptions of Agrichemicals*. Council for Agricultural Science and Technology, Task Force Report No. 123, 1-29.
- Weinstein, Neil D. 1984. Why It Won't Happen to Me: Perceptions of Risk Factors and Susceptibility. *Health Psychology* 3(5):431-457.
- Weinstein, Neil D. 1988. The Precaution Adoption Process. *Health Psychology* 7(4):355-386.
- Weinstein, Neil D. 1989. Effects of Personal Experience on Self-Protection Behavior. *Psychology Bulletin* 105(1):31-50.