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Public Perceptions of Food Safety in Animal-Food Products

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Per capita disappearance of red meat declined 2.5 percent for the period 1975-1985 (National Research Council). Various reasons include changing price relationships between the meat substitutes, changing diet and health concerns, and increasing concerns with food safety issues (Stucker and Parham). In a review of surveys on consumer attitudes toward food safety risks, respondents identified spoilage, pesticides, residues, insecticides or herbicides and chemical use, in open-ended questions, as the greatest threats to food safety. In closed-ended questions, consumers listed antibiotics, hormones, additives and preservatives as serious health hazards (van Ravenswaay). These results show the concerns of consumers about the health hazards posed by the use of chemicals and pesticide residues along with antibiotics and hormones in food products.

The chemical-drug industry along with the animal farm sector have a major stake in consumers' reaction to the increasing use of chemicals in animal-food production. In the U.S., producers feed about 85 percent of poultry, 75 percent swine, 60 percent of the beef cattle, and 75 percent of the dairy cows with antibiotics at sometime in their lives. Roughly 45 percent of antibiotics produced in the U.S. are given to animals (CAST, 1985).

To date, a small but growing body of literature has focused on consumer understanding and attitudes toward food safety issues. This has especially been the case within each of the major food safety policy areas such as pesticides, animal drugs, environmental contaminants and food additives among others (van Ravenswaay). Public perceptions could differ in these various food safety policy areas because of differences in situational or individual characteristics (Blaylock). Situational characteristics could include differences in familiarity with and information access to the various food safety policy areas and individual characteristics could include differences in demographics. In addition, past studies have surveyed consumer attitudes without identifying the possible causes of different consumer perceptions toward food safety. Knowledge of how and why consumers perceive food safety risks provides insights into the effec-

tiveness of formal and informal educational programs and the understanding of consumer policy preferences. These perceptions may reveal consumers' desire for additional government regulations, willingness to pay for risk reduction in food production and the demand for types of products.

The objective of this paper is to contribute to the further understanding of food safety issues particularly in the use of chemicals in the production of animal-food products. The specific objectives of the study are to first examine consumer attitudes about the use of various chemical compounds in the production of animals for food. Second, to determine the relationship between demographic characteristics and attitudes toward chemical compounds such as vitamin supplements, antibiotics, growth promotants and feed additives. Third, to identify target areas and target groups for educational programs that address public concerns about the use of chemicals in the production of food animals.

Current Perspectives

The public's concern over the use of chemicals in the production of animal-food products and residues in food have recently increased. While most feed additives contain required nutrients, many non-nutritive feed additives including antibiotics, flavors, preservatives and pesticides are now used in the production of food animals. In the U.S., we have used antibiotics in the production of food animals for over 35 years. Producers include small, subtherapeutic amounts of antibiotics in animal feed to prevent or reduce the incidence of infectious disease and to improve feed efficiency and growth. A report from the Council for Agricultural Sciences and Technology (1980) estimated that antibiotics use in swine saved U.S. pork consumers about \$200 million per year.

The use of hormones, also known as anabolic agents, in cattle production increases feed efficiency and weight gain. A Food Marketing Institute survey in 1987 showed that 61 percent of consumers believed that hormone-treated meat pose a serious health hazard. According to Kenney and Fallert, a U.S. ban on anabolic agents will cost beef producers a financial loss ranging from \$1 to \$3 billion annually. The same study showed that scientists at the World Health Organization and FDA have found that residues from properly administered hormones pose no threat to human health.

Food-safety concerns with the use of antibiotics in food-animals production arise from two potential human complications; 1) consumers of products from antibiotic-treated animals might be allergic to residual antibiotics or develop allergies to residual antibiotics when consuming animal products which contain antibiotic residues, and 2) antibiotic-resistant strains of human disease organisms might develop, uncontrollable by treating humans with the antibiotics in

question. Researchers have not found scientific evidence to link properly used chemicals with adverse health effects (Castro).

Conceptual Framework

Extensions of food demand studies have focused on relationships between selected demographic characteristics and various food consumption expenditures (Sexauer; Salathe). These studies have found food demand related to household composition, size, age, geographic location and race. However, these approaches limit the inference relative to the demand for product characteristics/qualities. For example, increasing age influences the increased expenditure on chicken as older consumers view chicken to have less fat and cholesterol. Little research has focused on the influence of demographic factors on product characteristics/qualities demand. Adrian and Daniel found income to be a significant factor influencing the consumption of selected nutrients except carbohydrates. Burke found that socio-demographic variables such as age, race, family size, meal adjustment, degree of urbanization, and employment status impact nutrient intake. Coons observed that small families with high incomes and college educated homemakers often had diets that did not meet nutritional allowances. McGuirk et al. found that education, gender, age and ethnic background influence consumers attitude toward food safety issues.

This study will investigate relationship between demographic characteristics and consumer food safety attitudes. We base the theoretical framework relating attitudes, demographic characteristics and food demand on the works of Prais and Houthakker and Lancaster. Prais and Houthakker have argued the importance of socio-demographic variables in consumer food demand analysis. Lancaster stated that consumers demand commodities because of the utility they provide. In return, the utility of a commodity arises from the attributes/characteristics inherent in the commodity. Combining these two concepts, attributes/qualities affect the demand for food. Furthermore, consumers with different socio-demographic characteristics like education, may have different attitudes toward the negative and positive attributes inherent in a particular food product. Thus, attitudes toward the food safety attributes of animal-food products affect consumer demand for animal-food products. We can hypothesize that consumers with different socio-demographic characteristics may have different attitudes about food safety attributes.

The Survey Design, Data and Methodology

We collected data from a mail survey of American households in five metropolitan areas representing the four census regions of the United States; Atlanta,

Chicago, Los Angeles, New York, and Philadelphia. We designed the survey to gain a better understanding of how consumers perceive and react to the chemicals now used on animals to produce food. These regional population centers were chosen to yield a representative sample of U.S. urban adult population. We randomly selected about 2,000 households, stratified by income class, from each study city. We used three annual household income strata—less than \$15,000, between \$15,000 and \$35,000, and over \$35,000—in the sampling procedure. We employed this stratification procedure to ensure a desirable representation of income distribution in the sample.

In addition to the responses concerning attitudes toward the use of chemicals in animals to produce food, the survey also collected information on demographic characteristics of the respondents. These characteristics included levels of education, gender, household size, age and ethnic background. As shown in Table 1, the U.S. adult population is well represented with the exception of educational attainment. To account for this response bias and to improve sample representativeness, the study used a weighting procedure developed by Cochran. This was done to make the necessary adjustments regarding the level of education to meet objective one and part of objective two.

We mailed a self-administered questionnaire to the selected households during June and July 1988. Respondents completed the survey in September with a result of 1,106 total usable returns, representing a response rate of 12 percent. The usual cautions about the bias introduced as a result of any voluntary response, especially through the use of a mail survey apply here. Those respondents that have an interest in the survey's subject area are more likely to respond. For objective one, we used descriptive statistics adjusted for educational bias. For objective two, we used a measure of dependency to determine the association between attitudes and respondents' demographic characteristics. The Chi-square statistic was used to test the dependence/independence of the bivariate relationship between a given response and demographic characteristic. The null hypothesis for this test is that the characteristic and response are independent.

Results and Discussion

We asked the public their degree of concern with the specific use of vitamin supplements, feed additives, growth promotants, and antibiotics to produce animal-food products. In addition to exploring the degree of concern with specific chemical use, we asked the respondents to what extent they agreed that the chemical compounds used were natural substances and whether or not the chemicals increased the risk of human illness.

Table 1.
Stratification Categories and Descriptive Statistics: Respondents vs. U.S. Census¹

Characteristic	United States	
	Respondent	Census
	Percent	
1. Age		
(18-34)	29	39
(35-54)	39	32
(55+)	32	29
2. Income		
< \$15,000	19	21
\$15-35,000	34	36
> \$35,000	47	43
3. Education		
H.S. graduate and below	39	63
College and above	61	37
4. Gender		
Male	48	49
Female	52	51
5. City		
Atlanta	25	NA ²
Chicago	17	NA
Los Angeles	18	NA
New York	16	NA
Philadelphia	24	NA
6. Household Size		
1 - 2	64	54
3 - 4	28	34
5 +	8	11
7. Race		
White	83	79
Non-White	17	21

1. Data obtained from the Statistical Abstract of the United States. 1989.

2. Not applicable.

Table 2 shows the percentage response distribution adjusted for education bias. About 50 percent of the respondents said they were very concerned with the use of feed additives, growth promotants and antibiotics. Aside from vitamin supplements, only about 15 percent of the respondents were not at all concerned with the use of chemicals. When asked about their concern, over 50 percent strongly agreed that the chemicals will increase the risk of human illness and that they are not natural substances.

Table 3 presents the relationships between demographic characteristics and public attitudes about the general use of chemicals in animal food production.

Table 2.

Response Distribution of Food Safety Concerns Adjusted by Education Bias

Food Safety Issues	Agree	Somewhat Agree	Disagree
		Percent	
Not Natural Substances	51.8	26.2	22.0
Increases Risk of Human Illness	55.0	21.8	23.3
	Very Concerned	Somewhat Concerned	Not Concerned
	Percent		
Vitamin Supplements	26.6	42.8	30.6
Feed Additives	45.8	39.2	14.9
Growth Promotants	50.4	35.4	14.2
Antibiotics	51.2	33.5	15.3

The results of the Chi-square test statistics showed significant relationships between the demographic characteristics and concern with the general use of chemicals, except the age and income categories. Across demographic characteristics, the female, more educated, non-white and low income respondents had the highest level of concern that chemicals are not natural substances. When we asked respondents if the general use of chemicals will increase risk of human illness, the younger, female, more educated respondents expressed the most concern. For the Chi-square test statistic for independence, we found only the income variable to be independent of attitude. We found the age, gender, education and race categories to have significant relationships with attitudes toward the general use of chemicals which may increase the risk of human illness.

Table 4 shows the relationship between demographic characteristics and attitudes toward the specific use of vitamin supplements and feed additives. In general, most of the respondents were somewhat or very concerned. Overall, a higher percentage of the respondents were very concerned with the use of feed additives than with the use of vitamin supplements. The Chi-square test results for the vitamin supplement and demographic characteristics showed significant relationships except age. For the feed additive question, we found the education category to be independent of characteristics. Female, less educated, non-white and lower income respondents were more concerned with the use of vitamin supplements while female, non-white respondents were very concerned with use of feed additives. Although age did not have an impact on attitudes toward the

Table 3.

Relationship Between Demographic Characteristics and Public Attitudes Toward General Chemical Use in the Production of Animal-Food Products

Demographic Characteristics	Chemicals are not natural substances			Chemicals increase the risk of human illness		
	Agree	Somewhat agree	Disagree	Agree	Somewhat agree	Disagree
	Percent					
Age						
<25	57.7	38.5	3.8	60.9	39.1	0.0
25-34	58.9	29.7	11.4	67.6	25.0	7.4
35-44	59.6	27.1	13.1	77.6	18.4	4.0
45-54	58.8	25.5	15.9	66.2	27.2	6.6
55-64	54.5	30.9	14.6	61.4	31.9	6.6
>65	51.2	34.9	13.9	56.4	31.6	12.0
χ^2 (prob)	8.8 (0.724)			24.2 (.019)		
Gender						
Male	49.2	31.2	19.6	59.4	30.5	10.1
Female	65.1	27.7	7.2	74.1	21.9	4.0
χ^2 (prob)	36.0 (.000)			22.7 (.000)		
Education						
<High school	37.5	29.2	33.3	25.0	29.2	45.8
High school	61.7	19.8	18.5	55.6	22.2	22.2
Some College	50.9	26.6	22.6	47.8	21.7	30.5
College Grad.	57.3	26.9	21.8	59.2	21.4	19.4
χ^2 (prob)	37.4 (.000)			22.7 (.000)		
Race						
White	53.8	31.1	15.1	66.9	25.3	7.8
Non-White	72.1	24.3	3.7	65.2	31.8	3.0
χ^2 (prob)	37.4 (.000)			5.3 (.069)		
Income						
<\$15,000	64.2	26.4	9.4	68.8	25.5	5.7
\$15,000-35,000	59.7	29.7	10.6	66.5	24.8	8.7
>\$35,000	52.9	30.6	16.5	66.9	26.9	6.2
χ^2 (prob)	10.1 (0.38)			2.1 (0.716)		

use of vitamin supplements, concern with the use of feed additives increased significantly with age. This contrasting result may reflect the positive connotation associated with the label "vitamin supplements" versus "feed additives". In fact, the proportions of very concerned in the feed additive question were higher than the proportions of very concerned in the vitamin supplement question across demographic characteristics. So, as educational level and income

Table 4.

Relationship Between Demographic Characteristics and Public Attitudes Toward Specific Chemicals Used in the Production of Animal-Food Products

Demographic Characteristics	Vitamin supplements			Feed additives		
	Very Concerned	Somewhat Concerned	Not Concerned	Very Concerned	Somewhat Concerned	Not Concerned
	Percent					
Age						
<25	26.9	50.0	23.1	32.0	60.1	8.0
25-34	21.6	46.7	31.7	39.4	45.1	13.5
35-44	34.0	42.1	23.9	58.2	33.5	8.3
45-54	25.2	49.0	25.8	49.4	40.9	9.7
55-64	35.8	37.2	27.0	47.9	39.4	12.7
>65	27.0	47.3	25.7	47.1	39.9	13.0
χ^2 (prob)	17.7 (0.124)			22.4 (.034)		
Gender						
Male	22.1	45.2	32.7	39.6	44.6	15.8
Female	33.5	44.8	21.7	55.0	37.6	7.4
χ^2 (prob)	21.3 (0.000)			29.6 (0.000)		
Education						
<High school	45.8	33.3	20.8	50.0	33.3	16.7
High school	32.9	43.0	24.1	48.2	35.8	16.1
Some College	26.9	42.2	30.9	47.8	35.4	16.8
College Grad.	24.7	43.4	31.9	44.5	41.6	13.9
χ^2 (prob)	29.1 (0.000)			3.6 (0.732)		
Race						
White	24.4	45.7	29.9	43.9	44.1	12.0
Non-White	40.9	43.5	15.6	62.3	28.3	9.4
χ^2 (prob)	72.6 (0.00)			18.2 (0.000)		
Income						
<\$15,000	37.6	44.4	22.8	54.4	39.1	6.5
\$15,000-35,000	29.4	42.7	46.8	48.2	40.1	11.7
>\$35,000	22.8	27.7	30.4	44.6	42.1	13.3
χ^2 (prob)	18.4 (0.001)			8.2 (0.084)		

decreased, being female and non-white, we found the concern with the use of vitamin supplements and feed additives to be higher.

Finally, Table 5 presents the relationship between demographic characteristics and attitudes towards the use of growth promotants and antibiotics. We found the race and income categories to be independent of attitudes toward growth promotants as reflected in the Chi-square test result. We found age, gender and education, on the other hand, to be dependent with attitudes

Table 5.

Relationship Between Demographic Characteristics and Public Attitudes Toward Specific Chemicals Used in the Production of Animal-Food Products

Demographic Characteristics	Growth promotants			Antibiotics		
	Very Concerned	Somewhat Concerned	Not Concerned	Very Concerned	Somewhat Concerned	Not Concerned
	Percent					
Age						
<25	33.3	58.3	8.4	37.5	54.2	8.3
25-34	46.9	42.9	10.2	50.2	38.4	11.4
35-44	64.9	27.5	7.6	65.1	28.2	6.7
45-54	53.7	40.3	6.0	56.0	36.7	7.3
55-64	50.0	39.3	10.7	52.1	34.3	13.6
>65	49.0	39.6	11.4	50.7	38.0	11.3
χ^2 (prob)	25.1 (0.015)			20.4 (0.059)		
Gender						
Male	43.4	43.2	13.4	46.4	40.4	13.2
Female	61.4	33.3	5.3	62.1	30.9	7.0
χ^2 (prob)	36.9 (0.000)			36.0 (0.000)		
Education						
<High school	39.1	39.1	27.1	33.3	41.7	25.0
High school	47.5	31.3	21.3	48.2	32.1	19.8
Some College	48.7	32.7	18.6	50.9	32.3	16.8
College Grad.	52.0	37.0	11.0	52.6	33.9	13.6
χ^2 (prob)	16.2 (0.013)			23.9 (0.001)		
Race						
White	50.5	40.0	9.5	52.7	36.6	10.7
Non-White	58.8	32.0	9.2	62.3	30.5	7.2
χ^2 (prob)	3.8 (0.150)			5.0 (0.084)		
Income						
<\$15,000	61.7	30.3	8.0	64.4	66.5	66.9
\$15,000-35,000	51.6	37.7	10.7	53.6	24.8	26.9
>\$35,000	50.0	41.3	8.7	50.9	8.7	6.2
χ^2 (prob)	8.6 (0.730)			9.6 (0.047)		

toward growth promotants. For the antibiotic question, we found all the demographic characteristics to be significantly related. In addition, the concern was greater with the use of growth promotants and antibiotics than feed additives and vitamin supplements. The older, female, and more educated respondents showed a higher level of concern with the use of growth promotants. Similarly, the female, highly educated, and lower income respondents were more concerned with the use of antibiotics.

We found the relationships of various demographic characteristics with the use of specific chemicals and the general use of chemicals in animal food production to reflect a high level of awareness and concern among the respondents. It reflects the traditional negative understanding of the public about the use of chemicals in food production. In particular, the older, female, non-white, and lower income respondents tend to be more concerned with the food-safety issues examined in this study. We found an interesting pattern for the education category. The results showed that the more educated a respondent, the less likely she was concerned with the use vitamin supplements and feed additives but was more concerned with the use of growth promotants and antibiotics.

Implications

The Federal Drug Administration carefully restricts and controls the use of antibiotics, hormones and other chemicals used in the production of food animals. Although there are no scientifically substantiated cases of human illness linked to chemical use in animal production, it is clear from the results of this study that the public still perceives the use of chemicals as food safety risks. The level of concern is higher for non-nutritive compounds such as antibiotics than it is for nutritive compounds such as vitamin supplements. Furthermore, most of the respondents expressed concern that chemicals are not natural substances and may increase the risk of human illness. We have traditionally associated food purchasing with the female members of a household. Combined with the concern for children and other family members, we found female respondents to have a higher concern for food safety issues over male respondents. It should be interesting to analyze how the rapidly changing female workforce participation rate will affect the role of gender in food safety issues. The relationship between educational levels and food safety concerns was mixed. Although highly educated respondents were not concerned with vitamin supplements and feed additives, we found the same group more concerned with growth promotants, antibiotics and how chemicals may increase the risk of human illness. These results imply that education can be a major tool in product acceptance for animal-food products. Since the use of vitamin supplements and feed additives is easier understood than growth promotants and antibiotics. So, highly educated respondents were not as concerned than the less educated respondents.

The results of this study also show that the public may not have enough understanding of the effects of growth promotants and antibiotics on animal-food products. Furthermore, we must develop a better information and educational system to raise the level of awareness of the public that chemical use in

animal-food production will not result in an increase risk of human illness. This research shows that those involved in the production and processing of animal-food products need to sponsor educational programs and materials which address the safety and risks associated with their products.

Notes

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