JOURNAL OF MEDICINAL FOOD
Volume 4, Number 3, 2001
Mary Ann Liebert, Inc.

Relation of Soy Consumption to Nutritional Knowledge

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ABSTRACT

Is it reasonable to believe that the consumption of medicinal and functional foods such as soy is driven by nutritional knowledge? A national survey of 770 U.S. consumers indicated that 39% of male and female subjects did not know of any health benefits associated with soy. Among those who know of soy's nutritional benefits, consumption occurred only among those who perceived these benefits as specifically relevant to themselves. People who had even a slight familiarity with functional foods were more likely to consume soy. Improving the taste properties of soy appeared to have a more dramatic potential impact on the consumption of those who were knowledgeable about functional and medicinal foods than on the general population.

WHAT MAKES CONSUMERS adopt a medicinal or functional food such as soy? Although taste, convenience, and price are often suggested as drivers, many believe that nutritional knowledge also influences consumption.[1] It has been proposed that the adoption of healthy products is partly linked to a causal hierarchy of food knowledge that moves from attribute-level knowledge ("this food is high in calories") to consequence-related knowledge ("this food makes me fat").[2] This study focused on the types of knowledge consumers have about soy and how this knowledge—and knowledge of medicinal and functional foods in general—relates to their consumption of soy products.

Those consumers who have no knowledge about the attributes of medicinal or functional foods, such as soy, are unlikely to purchase them. Yet, product attribute knowledge, on which much research has been focused, deals with only one part of the hierarchy.[3] We contend that a medicinal or functional food is most likely to be accepted when consumers understand what attributes the food has and how these attributes will personally benefit them (i.e., their consumption consequences).

To better understand the relation between nutritional knowledge and consumption, this study focused on soy because of the October 1999 U.S. Food and Drug Administration health claim and because of growing consumer acceptance of soy products.[4] Furthermore, the acceptance of soy is important because of its health benefits. The phytochemicals in soy are believed to be responsible for its short-term and long-term health benefits such as reduction in the rates of certain cancers; reduction in risk of cardiovascular disease; prevention of osteoporosis; prevention of hereditary, chronic nosebleeding; and reduction in risk of autoimmune diseases.[5,6]

It is often assumed by those in the area of nutrition that if consumers know that a food is nutritious or has functional properties, they will consume it.[7] In this study we were interested in addressing this critical question[8]—

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specifically, (1) what consumers know about soy and (2) whether soy consumption is related to a basic level of knowledge about functional foods.

METHOD

A 12-page survey was sent to a random national sample (obtained from U.S. Census data) of 1,002 adults, and $6.00 was paid per return. Of the total number of surveys sent, 770 responses (59% female; average age, 44 years) were returned in a timely enough manner to be included in the study. The survey consisted of questions regarding soy-related food preferences, soy-related knowledge, soy-related consumption, and knowledge of functional foods. Most knowledge-related questions were asked first as open-ended questions and then on 9-point Likert scales (1 = "strongly disagree"; 9 = "strongly agree"). The respondents were often the primary shopper (74%) and meal planner (78%) of the household. Forty-three percent of the respondents had attended some college, and the typical respondent was an Anglo-American (70%) parent with an annual household income between $30,000 and $49,000.

RESULTS

What do consumers know about soy?

Thirty-nine percent of the respondents did not know of any health consequences that soy has to offer, and 4% thought that soy had no health benefit at all. Results in Table 1 show that 35% of respondents who had knowledge about soy cited mainly attributes ("low in fat"), and only 15% mentioned health consequences ("helps me lose weight"). Of those who cited specific attributes, 28% cited high protein content and 24% noted a decreased fat content. Respondents seldom mentioned attributes such as low calories, antioxidants, isoflavones, carbohydrates, and other phytochemicals.

Respondents noted few health consequences they would receive from consuming soy. The most frequently mentioned health consequences were reduction in the risk of cancer (5%), nutrition (4%), good for menopause and female diseases (4%), and reduction of cholesterol level (4%). Many soy benefits, such as good for diabetics and good for brain development, were infrequently cited. Most respondents who knew of product attributes did not link product attributes to self-relevant consequences. Similarly, most respondents who identified personal health consequences of soy did not link these consequences to specific soy attributes.

The results indicate that most people are aware only of attributes that are relevant to themselves. Male respondents did not display knowledge of product attributes toward female diseases, menopause (0%, versus 7% for female subjects), and estrogen-related advantages (0% versus 4%). Similarly, female respondents did not mention any knowledge of product attributes toward male-centric health issues such as muscle building (0%, versus 1% for male subjects). The knowledge of gender-related issues for the respondent's own gender suggests that respondents regard products in self-relevant knowledge categories. People sort information according to its relevancy to themselves—if the information does not in some way connect to them, they are unlikely to give it much thought. This is an important piece of information. Promotion of soy to women based on the fact that it helps build muscle mass is unlikely to be as effective as a presentation of its estrogen-related advantages.[9] The same would be true for health benefits primarily relevant to men.[10]

One key finding of this study is that 39% of those surveyed did not know of any benefit to eating soy, while 4% saw no benefit. More importantly, many of those who knew about the health-related attributes of soy did not see the personal health consequences of consuming it and therefore did not purchase the products. For instance, although respondents acknowledged that soy has little or no fat content (24%) or cholesterol (11%), there was no indication of knowledge that soy is good for weight control (<1%). This disjointed link between the attributes of soy and the health consequences that these attributes provide may hinder acceptance of soy and soy products.[11]

Table 1. What Are the Health Benefits (If Any) of Eating Soy?

Open-ended elicitation of soy-related health benefits	*Number*[a]	*% of Total*[b]	*% of Females*[c]	*% of Males*[c]
General				
Don't know	299	39	36	42
No benefit	30	4	3	5
Attribute Related				
High protein content	215	28	29	27
No/Less (animal) fat contents	187	24	23	27
No/Less cholesterol level	86	11	11	12
High fiber contents	29	4	4	3
Estrogen or other hormone compounds	20	3	4	0
Contains calcium	19	2	3	2
Vitamins and antioxidants	17	2	3	2
Less or moderate calories	10	1	1	2
Natural vegetable or plant	9	1	1	2
Minerals, zinc, and iron	7	1	1	1
Isoflavones, carbohydrates, and other photochemicals	6	1	0	1
Lactose or allergy free substances	6	1	1	1
Health Consequences				
Reduces the risks of cancer	38	5	7	3
Good for you/healthy and beneficial/provides nutrients	30	4	4	4
Good for menopause or other female diseases	30	4	7	0
Reduces cholesterol level	29	4	5	2
Replaces meat products	22	3	3	3
Reduces heart diseases	19	2	3	2
Helps digestion/easy to digest	16	2	3	2
Good for bones, osteoporosis, arthritis	7	1	1	0
Replaces milk products	5	1	1	0
Gives energy and builds muscle	5	1	0	1
Builds blood and reduces blood-related diseases	4	1	1	0
Good for diet/weight control	3	0	0	1
Good for brain development	2	0	0	0
Good for diabetics	1	0	0	0

[a]Numbers represent multiple responses; total number of subjects was 770.
[b]Numbers represent the percentages of total number of subjects.
[c]There were no significant differences between males and females on any variable other than those related to estrogen, menopause, and female diseases. A total of 435 female and 316 male subjects identified attributes and/or health consequences of soy.

How is a general level of nutritional knowledge related to soy consumption?

We believe that nutritional knowledge influences behavior. Although the information we have does not allow us to show a causal connection between knowledge and consumption, it does allow us to determine whether a correlational relationship exists. To assess this relationship, consumers were divided into groups based on whether they had prior knowledge of functional foods. They were asked to provide their definition of functional foods. Based on this question, 269 (35%) had some knowledge, 138 (18%) explicitly noted that they had no knowledge, and 363 (47%) left the question blank. Because it was unclear why some subjects left the question blank, we conservatively compared the group with some knowledge with the group explicitly claiming to have no knowledge.

Those who had some knowledge of functional foods also had more favorable beliefs about soy. As noted in Table 2, they were more likely to have bought products containing soy (3.3 versus 0.05 on a 9-point scale; $F_{1,406} = 10.3$; $P < 0.01$) and are less likely to have avoided buying products because they had soy in them (0.07 versus 2.6; $F_{1,406} = 3.1$; $P < .05$). Furthermore, they rated soy as being healthier on al-

most all dimensions compared with those from the group who were unfamiliar with functional foods. They were less likely to be bothered by the taste of soy, particularly if it is prepared properly (6.4 versus 4.5; $F_{1,406} = 29.0$; $P < .01$), and they were also less likely to believe that soy is expensive (4.3 versus 4.9; $F_{1,406} = 3.6$; $P < .05$) or allergenic (4.2 versus 3.7; $F_{1,406} = 2.9$; $P < .05$).

The results show that a basic (even nominal) level of functional foods knowledge is related to soy consumption. The bottom portion of Table 2 indicates that those with some knowledge of functional foods were slightly more likely to buy soy products within the next month (3.0 versus 2.4; $F_{1,406} = 5.2$; $P < .01$); to try a tasty soy dish in a restaurant (5.1 versus 3.6; $F_{1,406} = 15.4$; $P < .01$); to buy a microwave soy meal (4.2 versus 2.9; $F_{1,406} = 8.1$; $P < .01$); or to buy soy-fortified meat (5.7 versus 4.8; $F_{1,406} = 5.6$; $P < .01$). Additionally, if a $5 cut of ground beef were fortified with 25% soy, those

TABLE 2. HOW IS KNOWLEDGE OF FUNCTIONAL FOODS RELATED TO SOY ATTITUDES AND CONSUMPTION?

	Knowledge of functional foods[a]		
Attitude and consumption parameter	*No knowledge* (n = 138)	*Some knowledge* (n = 269)	*F-test* ($F_{1,406}$)
Past soy use			
How many times last year did you . . .			
Buy a packaged good because it had soy in it?	0.5	3.3	10.3**
Not buy a packaged good because it had soy in it?	2.6	0.7	3.1*
Purchase tofu or soy milk?	0.4	2.9	13.8**
Beliefs about soy			
Soy is low in fat	5.8	7.6	19.8**
Soy is high in fiber	5.5	6.6	6.8**
Soy is low in cholesterol	5.6	7.7	35.3**
Soy can reduce the risk of heart disease	5.5	7.2	27.1**
Soy decreases osteoporosis	4.9	5.8	9.7**
Soy is healthy	5.9	7.7	36.9**
Soy helps reduce the risk of cancer	4.9	6.2	25.9**
Soy helps reduce the risk of breast cancer	4.8	5.9	19.7**
Soy is a complete protein	5.3	6.8	14.2**
Soy raises the estrogen levels in women	4.5	4.9	10.4**
Soy will fulfill my protein requirements	4.8	6.2	15.4**
Soy is expensive to add to products	4.9	4.3	3.6*
Allergy to soy foods is common	4.2	3.7	2.9*
Soy tastes bad	5.4	4.6	4.9**
I like the taste of soy	3.4	4.7	11.3**
Soy has an aftertaste	4.8	4.6	1.6
I like products with soy	2.8	4.9	31.6**
Soy tastes good if prepared properly	4.5	6.4	29.0**
Soy consumption intentions (1 = unlikely; 9 = likely)			
Are you likely to buy a soy-related product within the next month?	2.4	3.0	5.2**
If pork or beef were fortified with soy and had the same taste, how likely would you be to buy it within the next month?	4.8	5.7	5.6**
How likely would you be to try a "tasty" soy dish at a restaurant within the next month?	3.6	5.1	15.4**
How likely would you be to try a "tasty" microwavable soy entree within the next month?	2.9	4.2	8.1**
If a $5 package of ground beef were fortified with 25% soy, how much would you be willing to pay?	$3.41	$4.14	4.3**
If you had good-tasting and convenient soy recipes, how many times in the next month would you try a soy recipe *along with* a meat dish?	6.3 times	14.8 times	6.5**
If you had good-tasting and convenient soy recipes, how many times in the next month would you try a soy recipe *in place of* a meat dish?	6.5 times	12.7 times	5.0**

*, $P < .05$; **, $P < .01$.

[a]Total $N = 580$; 190 (24.7%) of the original 770 respondents did not provide their definition of functional foods.

with a knowledge of functional foods were, on average, willing to pay a higher price for the meat than those with no knowledge ($4.19 versus $3.43; $F_{1,406} = 4.3$; $P < .01$).

Most interesting, however, is the dramatic difference in answers to the last two questions of Table 2. If a good-tasting, convenient soy recipe were available, those with a knowledge of functional foods said they would serve soy twice as many times each month than those who had no knowledge of functional foods. That is, they claimed they would serve it both *along with* meat dishes (14.8 versus 6.3 times; $F_{1,406} = 6.5$; $P < .01$), and *instead of* meat dishes (12.7 versus 6.5 times; $F_{1,406} = 5.0$; $P < .01$).

This finding is notable because it contrasts with some prevailing notions; namely, that if the taste of soy were improved and it were made more convenient, it would achieve the greatest levels of acceptance among the general, nutritionally unsophisticated population.[12] These findings show that improving the taste and convenience of soy is likely to have its biggest initial impact on those who already have some knowledge of the benefits of functional foods. Among this group, the prior month's consumption of soy as a substitute for a meat dish was 1.2 times. An increase to 12.7 times per month is an increase of more than tenfold.

DISCUSSION

There are a number of key findings in this study that relate to what consumers know about soy and how a general level of knowledge about functional foods is related to dramatic differences in beliefs and in consumption. Consider these four key findings:

- Thirty-nine percent of those surveyed did not know of any benefit to eating soy.
- Few people knew the "what" and "why" of soy nutrition. Many who knew about the health-related attributes of soy ("what") did not know about the personal health consequences of consuming it ("why") and therefore did not purchase the products.
- A basic knowledge of functional foods provided a nutritional halo that benefited soy. Those who had some general knowledge of functional foods also had stronger beliefs about soy, were less bothered by the taste of soy (particularly if prepared properly), and were more likely to purchase it.
- Improving the taste and convenience of soy would have its biggest impact on those who already have some knowledge of the benefits of functional foods (increase in use from 1.2 to 12.7 times per year).

How can physicians, health-care specialists, educators, and nutritionists target and educate the health-conscious public about the importance of the nutritional attributes of foods such as soy? The results of this study show that there is still an undereducated population that do not know of soy's attributes and are unwilling to try the product. In addition to taste and convenience, a lack of nutritional knowledge also limits adoption of soy products.

Attributes describe the physical properties of the food, but there is more to consumer acceptance of a food that attribute-level knowledge.[13] If all people know is that a food is good for them, they are unlikely to adopt it. This study indicates that, although while many people know about the attributes of soy, they do not link that knowledge with any true health-related consequences. Thirty-five percent of the respondents indicated some degree of food attribute knowledge. Among those who were able to identify some personal health consequences, making a stronger link between these consequences and the attributes of soy that provide them would help accelerate the adoption of soy products.

A general level of nutritional knowledge of medicinal and functional foods appears to be a "rising tide that lifts all ships." It improved acceptance and understanding and was even associated with more favorable perceptions of taste. Nevertheless, linking specific attributes with specific health-related benefits is critical to increasing the adoption of medicinal and functional foods such as soy. Such adoption will also be accelerated by improving the taste and convenience of the product.[14] The biggest initial impact of these improvements is likely to be among those who already consume soy.[15]

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