



# Assessment of the Knowledge and Beliefs Regarding Probiotic Use

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## ABSTRACT

**Background:** Although there is mounting evidence of the benefits of probiotics, many consumers are unaware of the definition of probiotics and are unable to state which foods contain these live microorganisms. **Purpose:** This study attempted to determine if participants were able to state the definition of probiotics, whether they utilize these products regularly and if they would consider consuming probiotics if it were recommended by a health professional. **Methods:** The subjects were evaluated via an 18-item questionnaire. A total of 335 surveys were returned completed. **Results:** This study demonstrates that 38.5% of respondents had heard of probiotics, but only 27.2% stated that they knew what probiotics are. Those participants who stated they knew what probiotics are were more likely to try them when recommended. Participants who were able to state the benefit of probiotics, consumed them in greater frequency. **Discussion:** The results of this study support the hypothesis that many consumers are unaware of the definition of probiotics and are unable to state which foods contain these live microorganisms. **Translation to Health Education Practice:** These results indicate a need for further education of the general public in regards to the definition, benefits, and sources of probiotics.

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## BACKGROUND

Probiotics are defined as “live microorganisms which when administered in adequate amounts confer a health benefit on the host.”<sup>1</sup> People have consumed probiotics in the form of fermented milk for thousands of years with the belief that ingestion provides health benefits.<sup>2</sup> There is growing interest by both health professionals and consumers in the potential health benefits of probiotic foods. Between 2002 and 2007, there were more than 800 peer-reviewed articles published pertaining to probiotics, while there were only 25 articles in the previous 25 years.<sup>3</sup>

Because the relationship between diet and health is becoming increasingly recognized, the market for foods that promote

health is thriving. There is an increasing number of probiotic products on the market and consumers are at a disadvantage in attempting to choose between them.<sup>4</sup> Myriad studies have indicated a relationship between intake of foods containing probiotics and various health benefits.<sup>5-12</sup> Unfortunately, these products may be underutilized due to a lack of public familiarity with probiotic products and low awareness of their benefits. It has been shown that following an education program, most participants show an interest in increasing intake of functional foods including yogurt. It was also reported that age, gender and health benefit awareness influence participants’ intention to change dietary habits.<sup>13</sup>

In addition, a previous study reported

that providing health benefit information concerning a probiotic juice increased consumer acceptance.<sup>14</sup> In a study by Wardle, there was a strong association between nutrition knowledge and intake of fruits, vegetables and fats.<sup>15</sup> This study concluded that nutrition knowledge makes a strong contribution to a person’s meeting nutritional recommendations. The Health Belief Model by Becker hypothesizes that individu-

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als are more likely to change a behavior if they recognize that they are threatened by a negative health condition and if changing their behavior will provide benefits that exceed the costs.<sup>16-18</sup> Therefore, it is important for consumers to learn of the benefits related to probiotic consumption in order for behavior change to occur.

Unfortunately, little research is available to show that the information regarding the benefits of probiotics is reaching the general public. Hekmat and Koba undertook a study to determine the probiotic knowledge and consumption patterns of Canadian consumers. They determined that convenience, price, taste and health benefits influenced consumption of probiotic foods. They also noted that decreased familiarity with these products was associated with decreased awareness of their health benefits, which the authors concluded may result in decreased intake.<sup>19</sup> Studies with other products such as functional foods, genetically modified products and medications have been undertaken to determine the influence of consumers' perceived benefits on attitudes and behaviors. These studies underline the importance of accurate, understandable, and effective health messages to improve the health knowledge, attitudes and behavior of the consumer.<sup>13,20-22</sup>

## PURPOSE

The purpose of this study was to examine the knowledge and beliefs of a randomly selected sample of upper Midwestern residents regarding probiotic use. Although there is mounting evidence of the benefits of probiotic foods in the treatment of a variety of diseases and conditions, many consumers are unaware of these products. This study was designed to test the hypothesis that consumers are unaware of the definition of probiotics and are unable to state which foods contain these live microorganisms.

## METHODS

A total of 1503 questionnaires were distributed to a random sample of the general public residing in the upper Midwest. The General Mills Bell Institute of Health and

Nutrition provided financial support in the form of a research grant as well as coupons, which were used as incentives. In addition, this work was supported by the United Dairy Institute of Michigan who provided Post-It® notepads, which were also used as incentives for survey completion. Participants were greater than 18 years of age and of any gender, ethnicity and socioeconomic status. The only inclusion criterion was participants' age (greater than 18 years). Subjects were not included or excluded based on health status. Questionnaires that were returned with greater than 50% of the questions unanswered were excluded.

The questionnaire was designed to assess the concept of perceived benefits as described by the Health Belief Model. The questionnaire was patterned after a validated survey. The reliability coefficient alpha was 0.89 for the prior survey. Questionnaires collected data such as age, county of residence, gender, marital status, race, education level and occupation as well as participants' diagnoses, type of supplement/herbal usage and knowledge of probiotics. The questionnaire included one Likert scale question to assess frequency of probiotic consumption, and five multiple choice as well as three yes/no/maybe questions to assess knowledge of probiotics. Prior to distribution of the questionnaire, a focus group reviewed the survey items and provided feedback. Based on the results of the focus group, there seemed to be good internal validity. In order to compare upper Midwestern demographic data with responders' demographics, a demographic comparison was undertaken using data from the 2005-2007 American Community Survey.<sup>23</sup>

The Institutional Review Board at Central Michigan University approved the study and written, informed consent was provided to all participants who received the survey. There was no unauthorized access to confidential information in the process of securing this pool of potential subjects. Participation was completely voluntary. Participants' contact information was obtained from Alesco Data Group, which provides contacts for direct mail for a small

fee. The database from Alesco Data Group is compiled directly from U.S. Postal Service information and U.S. Census Bureau data. A random sample of central Michigan area residents was requested.

Data was entered into Excel (Microsoft Corp, Seattle, WA) then imported into the Statistical Program for Social Sciences (SPSS, version 16.0, 2008, SPSS Inc, Chicago, IL) for data analysis. Missing data were scored as missing. Descriptive statistics were utilized to determine demographic information. Correlation coefficients were used to determine quantitative associations between select survey items. Depending on the level of data, Pearson, Spearman or Kendall Tau correlation coefficients were used to assess the association between two variables. Statistical significance was set at P value <0.05. Assessment of trends was calculated using logistic regression.

## RESULTS

A response rate of 22.6% (n=340) was achieved. Five surveys were returned incomplete or blank and were consequently excluded. Therefore, 335 surveys were complete and included in data analysis. Demographic characteristics of the participants are shown in Table 1. The mean age of the subjects was 50.56 (standard deviation =16.42) with a range of 19 to 92. Demographic data showed that 91.8% of participants were white, 63.1% were married, and when asked about education level, 75.1% of subjects stated that they had at least some college.

Of the 335 participants, 38.5% (n=129) stated that they had heard of probiotics. However, only 27.2% (n=91) stated that they know what probiotics are. A large number of participants, 43.9% (n=147) were able to correctly identify probiotics as "live microbial cultures consumed or applied for health benefit." When asked to choose one benefit of probiotics from a short list, 36.7% (n=123) were able to correctly identify "increased immune function." When asked to identify food sources of probiotics from a short list, 38.2% (n=128) of participants chose yogurt, 12.2% (n=41) answered milk and 54.6% (n=183) answered, "don't know."



**Table 1. Demographic Characteristics of a Random Sample of Central Michigan Area Residents: Percentage Distributions (n=335)**

|                        | Percent |                 | Percent |
|------------------------|---------|-----------------|---------|
| <b>Age<sup>a</sup></b> |         | <b>County</b>   |         |
| Young                  | 51.5%   | Mecosta         | 2.7%    |
| Old                    | 48.5%   | Isabella        | 3.0%    |
| <b>Gender</b>          |         | Midland         | 5.7%    |
| Male                   | 53.8%   | Montcalm        | 3.0%    |
| Female                 | 46.2%   | Gratiot         | 2.1%    |
| <b>Marital Status</b>  |         | Kent            | 38.6%   |
| Single                 | 13.8%   | Saginaw         | 9.3%    |
| Married                | 63.1%   | Ionia           | 2.4%    |
| Divorced               | 12.9%   | Clinton         | 3.0%    |
| Widowed                | 7.8%    | Shiawasee       | 5.7%    |
| Other                  | 2.4%    | Barry           | 3.3%    |
| <b>Education</b>       |         | Eaton           | 6.3%    |
| Some High School       | 2.7%    | Ingham          | 14.7%   |
| High School Graduate   | 19.8%   | Other           | 0.3%    |
| Some College           | 25.4%   | <b>Race</b>     |         |
| Associates Degree      | 9.0%    | Asian           | 1.2%    |
| Bachelors Degree       | 25.4%   | Black           | 3.6%    |
| Graduate Degree        | 15.3%   | Hispanic        | 1.2%    |
| Other                  | 2.4%    | Native American | 1.8%    |
|                        |         | White           | 91.8%   |
|                        |         | Other           | 0.3%    |

<sup>a</sup>Young= ≤50 years. Old= >50 years.

When asked if participants would try a probiotic product if it were recommended by a health professional, 41.5% (n=139) answered “yes.”

Table 2 shows correlations between statistically significant survey items. There was a positive correlation between participants who responded that they know what probiotics are (n=91) and the correct answer of “live microbial cultures consumed or applied for health benefit” (n=88). There was also a positive correlation noted between survey items, “Do you know what probiotics are?”

and “Would you try a probiotic if it were recommended to you by a health professional?” Logistic regression analysis was used to determine if participants’ knowing what probiotics are was significantly related to their willingness to try a probiotic product if it were recommended by a health professional. It was determined that knowing what probiotics are made a significant contribution at a level of 0.001. Logistic regression for the question, “Do you know what probiotics are?” showed that education level made a significant contribution at a level of 0.03.

Logistic regression analysis for the question “Have you ever heard the word probiotics?” indicated that age made a significant contribution at a level of 0.005. Increased age showed less likelihood of having heard of probiotics. Age was also associated with willingness to try probiotics after a health professional recommendation with older respondents more likely to answer yes (p=0.05). This relationship was linear and significant at a level of 0.008.”

Participants who stated they knew what probiotics are, were more likely to try them if it was recommended by a health professional (43% contribution) in comparison to those participants who did not know or were unsure of the definition of probiotics. Logistic regression, where the model included age and the questions “What are probiotics?,” “Do you know what probiotics are?” and “What is one benefit of probiotics?” proved statistically significant as contributions to having ever heard of probiotics at a level of 0.0001, 0.002, and 0.039, respectively.

When the question “What is one benefit of probiotics” was recoded for the correct answer of “increased immune function” versus all other answers, correctly answering this question was significantly related to increased frequency of intake at a level of 0.0001. “Would you try a probiotic if it were recommended to you by a health professional?” also showed a significant contribution at a level of 0.0001.

## DISCUSSION

In order to compare upper Midwestern demographic data with responders’ demographics, data from the 2005-2007 American Community Survey of Michigan demographics was reviewed.<sup>23</sup> The survey results indicate that 91.8% of responders were white. According to the U.S. Census Bureau, 79.6% of Michigan residents are white. The survey results showed 63.1% of responders were married, while 50.2% of Michigan residents are married according to Census Bureau data. The survey results showed that 53.8% of responders were male. According to the U.S. Census Bureau, 49.2% of Michigan residents are male. The survey results showed 75.1%

**Table 2. Correlations between Statistical Significant Survey Items for a Random Sample of Central Michigan Area Residents (n=335): p-values**

| Select Survey Items   | p-value |
|---|---------|
| Age   |         |
| What are probiotics?  | 0.05    |
| What is one benefit of probiotics?  | 0.05    |
| Would you try a probiotic product if it were recommended to you by a health professional? | 0.01    |
| Education   |         |
| Do you know what probiotics are?  | 0.05    |
| How often do you consume probiotics?  | 0.05    |
| What are probiotics?  |         |
| Have you ever heard the word "probiotics?"  | 0.01    |
| Do you know what probiotics are?  | 0.01    |
| What is one benefit of probiotics?  | 0.01    |
| What foods are sources of probiotics  | 0.01    |
| How often do you consume probiotics?  | 0.01    |
| What is one benefit of probiotics?  |         |
| Have you ever heard the word "probiotics?"  | 0.01    |
| Do you know what probiotics are?  | 0.01    |
| What foods are sources of probiotics  | 0.01    |
| How often do you consume probiotics?  | 0.01    |
| What foods are sources of probiotics?   |         |
| Have you ever heard the word "probiotics?"  | 0.01    |
| Do you know what probiotics are?  | 0.01    |
| How often do you consume probiotics?  | 0.01    |
| Would you try a probiotic product if it were recommended to you by a health professional? |         |
| Have you ever heard the word "probiotics?"  | 0.01    |
| Do you know what probiotics are?  | 0.01    |
| What are probiotics?  | 0.01    |
| What is one benefit of probiotics?  | 0.01    |
| What foods are sources of probiotics?   | 0.01    |
| How often do you consume probiotics?  | 0.01    |

of responders had completed some college level work. According to the U.S. Census Bureau, 22.5% of Michigan residents have some college, but do not hold a degree, and 32.3% have an Associates' degree or higher. The discrepancies between the anticipated and actual results in the case of education level may be related to response bias. For example, participants who have completed a degree may be more likely to complete a survey received from a university.

The most significant contribution of this study is the improved understanding of the impact of knowledge and understanding on willingness to consume probiotic products.

There were significant associations between having heard of probiotics and knowing what probiotics are, knowing what probiotics are and correctly answering, "live microbial cultures," and frequency of probiotic consumption and correctly answering the benefit of increased immune function. This study also confirmed that knowing what probiotics are and age influenced participants' willingness to try a probiotic product if it were recommended by a health professional. Overall, results support the hypothesis that many consumers are unaware of the definition of probiotics and are unable to state which foods contain these

live microorganisms.

Study limitations should be noted. The total number of valid questionnaires included in data analysis was only 335. This sample was demographically homogenous with a predominate number of whites. This factor may inhibit the ability to generalize the findings over other racial groups. Therefore, the results of this data may not be representative of the upper Midwest in general.

#### **TRANSLATION TO HEALTH EDUCATION PRACTICE**

These study results indicate a need for further education of the general public in



regards to the definition, benefits and food sources of probiotics. Because participants were more likely to try probiotics if they were familiar with these products, further research is needed to determine the ideal way to educate the public regarding probiotic foods and their nutritional and health benefits. It has been shown that the greater the perceived benefit of the product, the stronger is its acceptance from the consumer.<sup>20</sup> Because the results of scientific studies related to probiotics may be complicated, it is important that this information be translated into simple and understandable messages that the consumer can relate to.

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