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Omega-3 Dietary Intakes, Knowledge, And Attitudes In Patients Screened For Colon Cancer

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OMEGA-3 DIETARY INTAKES, KNOWLEDGE, AND ATTITUDES IN PATIENTS SCREENED FOR COLON CANCER

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OMEGA-3 DIETARY INTAKES, KNOWLEDGE, AND ATTITUDES IN PATIENTS SCREENED FOR COLON CANCER

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Colon carcinoma is one of the most prevalent malignancies and the second cause of cancers in industrialized countries. An increasing amount of evidence implies a relationship between high-level fat intake and colorectal cancer risk with epidemiological and experimental evidence supporting a protective role for omega-3 (n-3) polyunsaturated fatty acids (PUFAs) against the development of colon cancer. Cultures with higher consumption of fish, which contain n-3 PUFAs have subsequently lower rates of colon cancer when compared to North Americans, (Kato et al, 2007).

The 5-year death rate (2002 –2006) for colon cancer in Nebraska was 19.6 deaths per 100,000 individuals, which was above the total U.S. death rate of 18.2 per 100,000 individuals. The number of deaths from colorectal cancer average 379 per year, (Nebraska Health and Human Services 2010). Although current rates declined, the Healthy People 2010 objective of 13.9 deaths per 100,000 was not met. In 2007, colorectal cancer was the fourth most frequently diagnosed cancer among Nebraskans, accounting for over 1050 new diagnoses (Nebraska Health and Human Services 2010).

Consumption of fish rich in n-3 is thought to reduce colorectal cancer risk through an inhibition of the arachidonic acid cascade. This cascade plays a role in inflammation and has been linked to carcinogenesis (Geelen et al, 2007).

In a meta-analysis, a significant 12% lower risk of colorectal cancer for individuals in the highest fish consumption category was found. There was a 22% lower risk in studies in which the difference between the highest and lowest categories of fish consumption was at least seven times per month. In a per-unit analysis, a lower risk of colorectal cancer was found for each extra time that fish was consumed per week and for each extra 100 g of fish intake per week (Geelan et al, 2007).

A large study, the European Prospective Investigation into Cancer and Nutrition study, found a 70 g/day difference in fish intake between the highest and lowest intake categories. The results from this study provide strong evidence that a protective effect from fish consumption exists. Another study, currently unpublished, the Physicians Health Study, found that men who ate fish five or more times per week had a 40 percent lower risk of developing colorectal cancer compared to men who ate fish less than one time per week (Geelan et al, 2007).

A study completed in Nebraska examined colon cancer, during the 1970-1977 time period. Two counties, Butler and Colfax, were identified as having high colon cancer rates compared to other U. S. counties, (Pickle et al, 1984). The study examined dietary habits of these individuals, and indicated that fat intake might be a problem. Type of fat intake in the diet was not identified. Marine life is not plentiful in

Nebraska, as it is in the coastal areas of the United States, and therefore, n-3 fatty acid intake is low in Midwest diets. Lewis et al, 1995 conducted a telephone survey to identify the types and cuts of meats consumed by Nebraskans and validated low fish/seafood intakes.

By evaluating n-3 intakes of individuals at risk for colon cancer, consumer trends could be identified. Examining the knowledge and attitudes these individuals maintain could be used to develop strategies to overcome barriers to changing diet and type of fatty acids consumed. These three components taken together provide the background needed to design education programs focused on areas where the knowledge of fatty acid contributions to the diet and health risk is low and to address specific attitudes that prevent consumers from making changes. The examination of the aforementioned components could also help to identify and target the benefits of increasing consumption of n-3 fatty acids to the consumer's needs.

Estimating consumption patterns could also provide background information to begin educating individuals to the benefits and ways to increase consumption of n- 3 fatty acids. The purpose of this study was to determine fatty acid consumption of colonoscopy patients, and to identify their attitudes and knowledge of fatty acids.

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INTRODUCTION

Epidemiological studies have suggested that populations that consume high fat diets have an increased risk of colon cancer (Narayaman et al. 2003). Low colon cancer rates in Alaskan Eskimos are related to the high consumption of fish products rich in n-3 polyunsaturated fatty acids, which suggests that fish oil might be a protective factor in colon carcinogenesis (Kato et al. 2007). Marked international differences in the incidence and mortality of colon cancer and increase of risk in populations migrating from low to high-risk areas such as from Japan, China, and the Philippines to the United States within one or two generations suggest that environmental factors, specifically dietary habits, rather than genetic factors play an important role in the etiology of cancer (Reddy 2004).

Cancer statistics in Japan for 2001 published by the Foundation for Promotion of Cancer Research indicate an upward trend in age-adjusted mortality rates for colon cancer from 1955 to 1999**.** Death rates/100 in Japanese men and women in 1955 were 2.9 and 3.0 respectively, and increased to 14.7 and 9.8 in 1999. This upward trend in death rates due to colon cancer is mainly attributable to the Westernization of Japanese food habits. The report by the Foundation for Promotion of Cancer Research provided data on the time trends in food consumption. These data show an increase in the consumption of animal fat and meat and a decrease in the consumption of whole grains in Japan, from 1960 to 1999. For example, animal fat consumption in 1960 was about 25 g/day (per capita), whereas in 1999 it had increased to 58 g/day. Meat intake increased from 19 to 78 g/day (per capita). Grain consumption had decreased from 453 to 245 g/day during this same time period (Reddy 2004).

Several preclinical studies using well-established colon cancer models strongly support the concept that the colon tumor-promoting effect of dietary fat or lack of such effect depends on fatty acid consumption. The American Institute for Cancer Research/World Cancer Research Fund reported consensus that evidence for an association between the intake of saturated/animal fat and colon cancer risk is very strong, whereas high dietary fish oil or fish reduces this risk. A study of mortality data for colorectal cancer in 22 European countries, the United States, and Canada suggest there is a correlation between colorectal cancer and consumption of animal fat. A Mediterranean diet rich in olive oil and fish is associated with a low risk of colorectal cancer (Reddy 2004).

Another possible mode of action for dietary fat in colon carcinogenesis is the production of secondary bile acid. Metabolic epidemiological studies indicate that populations at high risk for colon cancer excrete high levels of secondary bile acids. In humans, individuals at increased risk for colon cancer have abnormal patterns of cell proliferation, including higher rates of DNA synthesis in normal-appearing colorectal mucosa. These changes precede tumor development and therefore constitute a key step in colon carcinogenesis (Reddy 2004).

The metabolism of primary into secondary bile acids takes place in the intestine by bacteria. These compounds are known to be cytotoxic and have been associated with colon cancer more than 30 years ago Studies show secondary bile acids induce cell proliferation and act as promoters for cancer of the colon (Reddy 2004,).

Diets high in beef tallow, lard or corn oil increase the concentration of colonic luminal (fecal) secondary bile acids, whereas diets high in fish oil have no such enhancing effect.

Intestinal Anatomy

The large intestine (colon) is about 5 to 6 feet long and a little less than three inches in diameter. Its main function is to absorb moisture from the chyme. Cancer begins when the cells on the inner lining of the intestine mutate and grow out of control. Deeper and deeper layers of cells are affected as the growth progresses. Left untreated, these growths can become cancerous, causing damage to the intestine, penetrating from the inner surface to the outer surface of the intestine, and spreading to other parts of the body (Levin 1999).

The colon wall is made up of several distinct layers, much like rings that are visible in a tree trunk. There are four main rings; mucosa, submucosa, muscle and serosa. The innermost ring is known as the mucous membrane or the mucosa. The mucosa is made of an epithelium layer which are cells that line the colon. These cells form columns with spaces (called crypts) between them. Most colorectal cancers begin as changes in the cells found along these crypts. The cells of the epithelium are supported by a thin layer called the basement membrane. Beneath that layer is a layer of connective tissue (lamina propria) and finally, a thin layer of muscle like tissue (muscularis mucosae). This membrane contains mucosal glands, formed by cells, which secrete the fluid that makes mucus. The next major ring is the submucosa, a layer that contains connective tissue, blood vessels, lymphatic vessels and nerves. The next layer is muscular tissue, which contracts and expands to move feces towards the rectum. The outer most layer is called. the serosa. Between the serosaand the muscle layer is a band of connective tissue referred to as the subserosa (Levin 1999).

The lymphatic system plays a role in the spread of cancer from the colon. Cancerous cells that break off from a tumor can be picked up in the lymph fluid and then transported to other tissues. During colon surgery, a number of neighboring lymph nodes will be removed (Levin 1999).

Colon Cancer Etiology

Cancer in the colon usually begins as noncancerous polyps (adenomas) which can transform into malignant tumors (carcinomas). The adenoma-carcinoma sequence begins with normal cells in the colon or rectum. These normal cells lie within the crypts of the intestine. Some type of event occurs that results in abnormal cells rapidly multiplying. In normal crypts, the cells are in a continuous process of self renewal (Levin 1999). Colonic cells undergo mitotic activity in the lower part of the crypts and acquire differentiated phenotype during linear migration to the upper crypt regions. Once colonic cells have fulfilled their biological purpose, the cells die and are sloughed off into the colonic lumen. In humans, colonic cells are replaced completely every 4 to 8 days. Cell death (apoptosis) is a recognized process of the homeostasis inintestinal mucosa.

In abnormal crypts, new cells may be produced closer to the surface of the mucous membrane. So many cells grow that the lesion begins to bulge above the surface. This bulge is a polyp. If the polyp begins to change and grow into the connective tissue of the adjacent normal areas of the colon, the polyp has crossed the line from being benign to cancerous. If left alone, this adenocarcinoma penetrates the deeper layers of the intestine and eventually the outer layer of the wall (serosa). As the layers of the intestine are invaded, cancerous cells can break free and enter the bloodstream or lymphatic system and are carried to other parts of the body (Levin 1999).

Colon cancer develops through several stages. The first stage is characterized by growth of new cells as a result of mutations in genes responsible for DNA repair and, sometimes, an uncontrolled hyperproliferation of colonic crypt cells. Subsequent to this, mutations in genes controlling the cell cycle may occur and lead to the transformation of normal cells into clonal expansion of tumor crypt cells. The transformation that occurs may then spread to multiple sites of the colonic mucosa and gives rise to polyps that remain preinvasive and premalignant at this stage. The abnormal growth of cells can become invasive by crossing the basement membrane of the epithelium and making their way into other tissues. Colon cancer etiology involves both genetic and environmental factors. Genetic predispositions increase the risk of developing colon cancer by the age of 21. Among environmental factors, dietary habits play a major role. Low intake of fiber, fruit and vegetables and high intakes of fat have been linked with increased risk of colon cancer. Total amount of fat as well as fat quality is also important in predisposing to colon cancer. (Roynette et al. 2004)

In 1997 the American Cancer Society recommended colorectal cancer screenings by age 50. Two methods were recommended. An annual fecal occult blood test with sigmoidoscopy (every 5 years) or a total colon examination, either by colonoscopy every 10 years or by double-contrast barium enema (every 5 to 10 years).

Physiological Effects of N-3 Fatty Acids in the Body

Alpha-Linolenic Acid (ALA) cannot be synthesized in the body; therefore, ALA is considered essential and must be consumed in the diet to maintain adequate body pools. ALA is a precursor to eicosanoids (Institute of Medicine, 2010). Eicosanoids are short lived, hormone like lipids with chain lengths of 20 carbon atoms. They are biologically

potent and have a wide array of activities; they modulate inflammatory and immune responses, play a role in platelet aggregation, and cellular growth and differentiation (Larson et al. 2004). Rich sources of ALA are vegetable oils such soybean and flaxseed. Fish oil also contains the longer chain fatty acids, because plankton and algae, which are at the base of the food chain for tuna, salmon, herring and other fatty fish, are rich in ALA and the longer chain fatty acids.

In the body, ALA is a substrate for enzymes which convert it to Eicosapentaenoic acid (EPA). EPA is converted by the action of enzymes, into prostaglandins (PGs), thrombaxanes (TXs) and leukotrienes (LTs) (Larson et al. 2004).

Mounting evidence shows that dietary n-3polyunsaturated fatty acids (PUFAs) inhibit the promotion and progression stages of carcinogenesis. Several molecular mechanisms whereby n-3 PUFA's potentially affect carcinogenesis have been proposed. These mechanisms include: 1) suppression of n-6 derived eicosanoid biosynthesis, which results in altered immune response to cancer cells and modulation of inflammation, cell proliferation, apoptosis, metastasis, and angiogenesis (Gerber et al. 2005) 2) influences on transcription factor activity, gene expression, and signal transduction , which leads to changes in metabolism, cell growth, and differentiation, 3) alteration of estrogen metabolism, which leads to reduced estrogen-stimulated cell growth, 4) increased or decreased production of free radicals and reactive oxygen species, and 5) mechanisms involving insulin sensitivity and membrane fluidity (Larson et al. 2004).

Animal Studies

Greenlee, et al. (2000) reported that cancer of the large bowel is one of the leading causes of cancer deaths in both men and women in Western countries, including the

United States, where 150,000 new cases of colorectal cancer and 56,000 related deaths were reported for the year 2000.

Rao, et al. (2001), conducted a study with male rats that were randomly assigned to one of three dietary groups, Low Fat Corn Oil, (LFCO) High Fat Fish Oil (HFFO),or High Fat Mixed Lipid (HFML).All diets were adjusted to provide the same amount of protein, calories, vitamins, minerals and fiber. The LFCO diet contained 5% corn oil, and HFFO contained 17% fish oil and 3% corn oil. The HFML diet was formulated to simulate the fat content of the American diet. The HFML diet contained 20% fat content with mixed lipids derived from beef tallow(16%), lard (10%), butter fat (12%), hydrogenated soy bean oil (30%), peanut oil (5%) and corn oil (27%). Each dietary group was then divided into a group where colon carcinogenesis was induced and a group without colon carcinogenisis. The composition of the experimental diets was adjusted so that all the diets would offer the same amount of calories, protein, vitamins, minerals and fiber. All rats were weighed twice monthly for the duration of the study. Food consumption was monitored at two time points for a period of 2 weeks. During the course of the study, groups of rats were killed at 8, 23, and 38 weeks. Rats sacrificed at 23 and 38 weeks were examined for intestinal tumors and the location, number and size were assessed. Rats fed the HFML diet showed 100% incidence of adenocarinomas compared with incidences of 63% and 69% in the rats fed the LFCO and HFFO diets, respectively. There were no significant differences in the incidences of colon tumors between the rats feed the LFCO and the HFFO diet. This study demonstrated that the administration of the HFML diet significantly promotes the formation and growth of preneoplastic lesions in the ratcolon, whereas the HFFO diet rich in n-3 fatty acids had no such enhancing effect.

Also, long-term feeding of the HFML significantly increases the percentage of the lesions. This indicates that, in addition to the amount and type of dietary fat, the duration of exposure to these fats is important. This reinforces that both the type and the amount of fatty acids in the diet play a critical role in colon carcinogenesis.

Human Cell Studies

Swamy et al. (2003) designed a human cell experiment to assess the effectiveness of Docosahexaenoic Acid (DHA) and celecoxib (COX-2 Inhibitor) individually and in combination on cell proliferation and induction of apoptosis (Appendix A-15). The authors concluded that their past and present studies support the hypotheses that diets rich in omega-3 fatty acids such as DHA suppresses colon tumorigenesis by modulating COX-2 expression and activity. Furthermore, the colon cancer-preventing potential of DHA can also be attributed to its ability to induce apoptosis.

Narayanan et al 2003 explored the mechanisms of chemopreventative efficacy of DHA in colon carcinogenesis. The results indicated that DHA had a profound effect on various functional groups of genes, such as the proinflammatory, cell cycle regulatory and apoptosis-inducing genes. They also indicated that DHA inhibited cell growth by greater than 54%, partly by inducing apoptosis.

Calviello et al. (2005) demonstrated that cotreatment of invitro colon cancer cell lines with DHA and 5-FU (an antineoplastic drug) produced a greater antineoplastic effect than when the agents were administered individually. This study demonstrated that DHA is able to induce apoptosis as early as 24 hours, even if added at low concentrations. The low concentrations of 5-FU used in this study were also able to induce apoptosis in the

cells. DHA administered concomitantly with 5-FU markedly potentated apoptosis showing a clear positive synergistic effect.

N-3 Fatty Acid Intakes

The World Health Organization and the North Atlantic Treaty Organization have made formal population-based dietary recommendations for N-3 fatty acids (Kris-Etherton et al, 2002). Recommended N –3 intakes for the normal healthy population are 1.1 g/day for females and 1.6 g/day for males based on average ALA intake, (Institute of Medicine, 2010). The intake of total N-3 fatty acids in the United States is 1.6 grams per day or approximately 0.7% of energy intake. Of this, ALA accounts for approximately1.4 grams per day, and only 0.1 to 0 .2 grams per day comes from EPA and DHA (Kris-Etherton et al, 2002). In the Midwest reported dietary intakes of N-3 fatty acids are even lower (0.62 g/day) (Heidal et al. 2004).

Typical recommendations are 0.3 to 0.5 g/d of EPA and DHA and 0.8 to 1.1 g/d of ALA. The Food and Nutrition Board, the Institute of Medicine and The National Academies, in collaboration with Health Canada released the Dietary Reference Intakes for Energy and Macronutrients. The acceptable Macronutrient Distribution Range for ALA is estimated to be 0.6% to 1.2% of energy, or 1.3 to 2.7 g/d on the basis of a 2000-calorie diet. The lower boundary of the range is based on an adequate intake set for ALA, which represents median intake levels that prevent an essential fatty acid deficiency. The upper boundary corresponds to the highest ALA intakes from foods consumed by individuals in the United States and Canada. The intent of the range for n-3 fatty acids is to provide guidance for healthy people and not to prevent chronic disease. These recommendations can easily be met by following the American Heart Association

(AHA) Dietary Guidelines to consume two fish meals per week, with the emphasis being placed on fatty fish (salmon, herring, and mackerel), and by using liquid vegetable oils containing ALA (Kris-Etherton et al. 2002). Commercially prepared fried fish (from restaurants and fast food establishments), as well as many frozen convenience fried fish products should be avoided because they are low in n- 3 fatty acids.

The intake of total N-3 fatty acids in the United States is 1.6 grams per day or approximately 0.7% of energy intake. Of this, ALA accounts for approximately1.4 grams per day, and only 0.1 to 0 .2 grams per day comes from EPA and DHA (Kris-Etherton et al, 2002). In the Midwest reported dietary intakes of N-3 fatty acids are even lower (0.62 g/day) (Heidal et al. 2004).

Several studies with population subgroups show n-3 fatty acids are being consumed less frequently than other types of fatty acids. In the Midwest reported dietary intakes of n-3 fatty acids are (0.62 g/day). Lewis et al. (1995) in a study of low-income pregnant Midwestern women, found that mean n-3 fatty acid consumption was 78% of the Canadian Recommended Nutrient Intake (RNI) (Scientific Review Committee, 1990). Approximately one-half of the women (47%) consumed <75% of the Canadian RNI, and 7% consumed < 50% of the RNI. Only 17% met or exceeded the RNI for n-3 fatty acid intake. The rank order of food sources of n-3 fatty acids consumed by these women were reported. Dairy products provided 22% of the n-3 fatty acid intakes, while fats, oils and salad dressings provided 17%. Vegetables provided 7%, white fish and seafood provided only 2% of the total n-3 fatty acids consumed. Fish and seafood provided 83% of the EPA and 65% of the DHA intakes. Women from racial groups other than Caucasian had higher intakes of EPA and DHA. This was attributed to their high

consumption of fish and seafood.

Nutritional Knowledge, Attitudes and Consumption

Eighty-nine percent of consumers acknowledge that eating a healthy diet is important and they are concerned about nutrition. Knowledge does not translate into healthy eating behaviors or motivate them to make changes. Data indicate that less than 12% of the US population actually achieves a healthy diet when compared to government- issued dietary guidelines. Seventy-one percent of the diets fall into the needs improvement range (Borra et al. 2001).

Reasons for this lack of follow-through to consumer a healthy diet are varied. Most individuals were uncomfortable with their dietary choices. Discomfort stemmed from emotions of guilt, worry, fear, helplessness and anger. Consumers probed about food messages indicated that most lacked a clear understanding of what saturated and unsaturated fats are. Consumers also indicated that it was an unrealistic expectation for them to change their diets without considering the preferences of their families. Consumers responded that food messages needed to be more specific. Studies have focused on the association between nutrition knowledge, attitudes toward diet and nutrtion and eating behavior. Knowledge influences behavior through attitudes (Packman 2000).Therefore; increasing knowledge may likely influence behavior. However, many consumers have poor nutritional knowledge and are confused about what constitutes a healthy diet (Packman 2000). Evidence shows that there exists a poor level of nutritional knowledge of the fat content of many foods. Seventy percent of the respondents believed they were consuming a low fat diet, when only 49% actually consumed a diet at or below the 30% of their energy from fat. The results also indicate consumers have

misperceptions about their diet (Packman 2000).

Packman reported that nutritional knowledge may have an indirect effect on behavior by influencing attitudes and attitudes are a good predictor of fat intake. People with positive attitudes toward a high fat food have a high fat diet while those with a negative attitude towards a high fat food have a low fat diet (Packman 2000). It would therefore follow that consumer knowledge of fats in general but more specifically n-3 fats would be lacking in regard to colorectal cancer patients. A lack of knowledge would translate into low intakes of n- 3 fats.

Summary

Current research on n-3 fatty acids strongly indicates the complicated and many faceted roles it plays as a protectant against colorectal cancer. Various studies have also shown that individual consumption in population subgroups remains lower than the current recommended intakes. Given the amount of research that supports the protective effect of n-3 fatty acids for colon cancer it is important to understand what consumers at risk for this disease know, understand and believe about n-3 fatty acids and their relationship to colon cancer. Assessments of colonoscopy patient current intakes of n-3 fatty acids provide baseline information. Results of colonoscopy patient's fatty acid knowledge, and attitudes toward a healthy diet will provide information to design programs to educate these consumers. Thus this study was designed to discover the attitudes and beliefs consumers at risk for colorectal cancer hold, their level of knowledge of the types of fatty acids, particularly the n-3 fatty acids, and if their intakes are reflective of other population subgroups. This study hypothesizes that consumers at risk for colon cancer will have little knowledge of n-3 fatty acids dietary sources and their intakes will be low.

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OMEGA-3 DIETARY INTAKES, KNOWLEDGE, AND ATTITUDES IN PATIENTS SCREENED FOR COLON CANCER

Abstract

Objective: The purpose of this study was to estimate Omega-3 (n-3) fatty acid intakes in colonoscopy patients and to examine knowledge and attitudes held about dietary fats.

Subjects/Methods: Men (n=32) and women (n=47) patients were recruited from a Midwestern gastroenterology clinic. A dietitian obtained informed consent, a food recall and response from a 152-item n-3 food frequency questionnaire (n-3 FFQ) at the clinic using visuals and food models. Two additional 24-h recalls, including a weekend recall, were returned by mail. A questionnaire measuring diet fatty acids knowledge, diet attitudes and beliefs was also obtained.

Results: Daily intake of n-3 fatty acids was 0.91 ± 0.59 g (mean ± SD) from food recalls and 1.05 ± 0.63 g from the n-3 FFQ. Pearson correlation of n-3 fatty acids intake between the food recalls and n-3 FFQ was 0.35 ($p<0.01$). Ninety percent of n-3 fatty acid intake as estimated with n-3 FFQ was provided by 56 foods. The top three food category contributors and percent of n-3 fatty acid intake were nuts/seeds (21), seafood (15), fats/oils (13). Correct scoring ranges for saturated fats, monounsaturated fats, polyunsaturated fats, n-3 fats and omega- 6 fats were 44 – 84 %, 27 – 40%, 11 – 34%, 10 – 41%, and 3 – 4% respectively. The majority of participants felt that food choice affects disease status (63%) and healthy food choices reduces the chance of contracting diseases (96%).

Conclusion: Twelve percent of men and 30% of women colonoscopy patients met the recommended Adequate Intake for n-3 fatty acids as assessed by 3-24 h recalls. The top

n-3 fatty acid food contributor and food category were of plant origin and marine sources were second. Colonoscopy patients overall knowledge about the types of fatty acids was low. They were most knowledgeable about saturated fatty acids. This may partially explain why low n-3 intakes were found.

Both men and women generally held positive beliefs about n-3 fatty acids and colorectal cancer. Both genders indicated a willingness to make a change but did not have the information needed to do so.

Introduction

The recommended daily intake for n-3 fatty acids is 1.1 grams per day for females and 1.6 grams per day for males (Food and Nutrition Board, 2002). Several studies have shown that n-3 intakes fall below this recommendation (Krish-Etherton et al. 2002, Lewis et al. 1995). Evidence suggests links between dietary fat intake and cancer. Studies have shown a relationship between nutritional knowledge, attitudes and behaviors (O'Brien et al. 2000, Packman 2000, Potvin et al. 2000, Shepherd, 2007). Do colonsocopy patients have similar intakes below recommended amounts as observed in other groups?

What are their knowledge and their attitudes about fatty acids? Are their behaviors reflective of their knowledge and attitudes? The purpose of this descriptive study is to measure dietary intakes of n-3 fatty acids and assess the relationships between dietary n-3 intakes, knowledge, and attitudes, in colonoscopy patients.

Methods

Study design and population

Individuals scheduled for colonoscopies were recruited from a Midwest gastroenterology clinic. Patients were given information about the study and consent forms along with clinic literature at the time of the appointment (Appendix B-1). After reading the information, interested patients were asked to sign forms that allowed the interviewer to make telephone contact with them (Appendix B-3). During telephone contact a meeting was arranged for interested participants to return to the clinic to complete the study material. One hundred forty-seven patients agreed to be contacted and

92 participated in the study. All components of the study were approved by the University of Nebraska Institutional Review Board at the University.

Survey Development

An instrument was developed to collect demographic information, cancer risk, behaviors, attitude towards healthy nutrition and knowledge of fatty acids (Appendix B-2). The instrument was pilot tested among consumers, and was modified for clarity.

Dietary Intake Methods

Two methods of dietary intake assessment were used: three day food records and a previously validated frequency questionnaire (Ritter-Gooder et al. 2007) (Appendix B-4, B-7). One day of the food record was completed at a meeting arranged at the clinic. To understand portion concepts, visual aids such as food models were used in the clinic setting. The patients were also instructed on comparisons of hand parts to normal measuring devices. For example, a fist is approximately equal to one cup of a food item. Sheets with these comparisons and standard portion sizes for the various food groups were provided for recording food intakes at home (B-5, B-6). Participants were asked to complete food records for one weekday and one weekend day at home on the sheet provided and to mail the completed records back to the interviewer. Next, instructions were given for completing the survey and an n-3 FFQ. Both forms were completed while at the clinic.

Food Processor 10.6.0 (ESHA Research, Salem, Oregon) was used to analyze the food recalls. N-3 consumption from the FFQ was calculated using the procedures of Ritter-Gooder et al. 2007.

Statistical Analysis

Data were analyzed using the Statistical Package for the Social Sciences (version 18.0.0, 2009, IBM, Somers, N. Y.). Means and standard deviations for n-3 fatty acid intakes were calculated from the food records and from the n-3 FFQ. Pearson correlations were used to assess the association between mean intakes of the three-day records and the FFQ. Frequencies were used to determine percent of individuals responding to each category of attitudinal, knowledge and demographic variables. Spearman correlations were used to assess the association between intakes and overall knowledge and knowledge of individual fatty acids groups. They were also used to assess the association between intakes and attitudes.

Results

Seventy-nine participants completed all components of the study and approximately 47 (59 %) were females and 32 (41%) were males. The majority of participants were Caucasians and between 40 and 79 years of age.. Eighty-five percent had 1 year or more of college. About 80 percent were married and more than 50% had incomes above $50000 (Appendix a-13). Forty-four percent have had polyps and half the participants' body mass index (BMI) was in the range of 20 -29 while more than 25% of participants had BMI's of 30 and over. (Appendix A-5).

Dietary Intake

Table 1 presents mean daily intake of n-3 fatty acids using the two methods of assessment. The intakes calculated from the n-3 FFQ were higher than those of the three-day record. The mean intake of the total population was 0.91$\pm$0.588 grams per day from the three-day food record and 1.1$\pm$0.634 grams per day from the FFQ. Men consumed

0.92 ± 0.589 grams per the food record and 0.96±0.575 grams by the FFQ. Mean consumption by females was 0.90+0.594 grams from the food recall and 1.1±0.670 grams from the FFQ. The mean intake from the food records indicated that 13% of the males and 30% of the females met the DRI's while results from the FFQ indicates that 9% of the males and 38% of the females met the DRI's.

Knowledge

Table 2 presents a summary of participants knowledge and understanding of fatty acid sources. Correct responses in the saturated fats category ranged from 44 – 84%. Men had a higher percentage of correct responses than women in this category except for the peanut versus palm kernel oil question. Correct knowledge responses in the n-3 categories ranged from 10 - 41%. Women consistently scored a higher percentage of correct answers than men in this category. There was a small association between knowledge and n-3 dietary intakes (r=.119) (Appendix A-1).

Attitudes

Table 2 also summarizes the attitudes held by participants. There were small associations between attitudes and n-3 intakes. Correlations ranged from r= -.108 to .041 (Appendix A-1). Almost 60% of the participants felt that food choice does have an effect on whether they will develop a major disease. More than 75% of the participants expressed at least some agreement that eating the right kinds of food could reduce the chance of developing a major disease. About 80% of the participants believed that colon cancer may be related to what food or drink is consumed. Most participants felt that eating more fiber, reducing the amount of fat intake, and eating more fruit and vegetables would help an individual reduce their risk of getting colon cancer.

Although participants generally disagreed with the statement that consuming more saturated fatty acids would help a person reduce the chance of getting colorectal cancer over 20% didn't know for sure. When asked if they believed n-3 fatty acid consumption in the diet would decrease the chances of getting colon cancer, 15% were in agreement, while 42% of patients answered "don't know."

Over 75% of the participants felt that a healthy diet tasted good, but over half (56%) felt that eating a healthy diet was not easy. Participants were slightly more likely to perceive that healthy foods cost more (49%) as compared to those (34%) who did not. Twenty-two percent of the men and 11% of the women were either neutral or did not know whether healthy food costs more. A large majority (92%) was willing to make dietary changes and 61% were willing to change the types of fats they were eating. About 75% of the participants felt they had the confidence necessary to make these changes, but almost 80% felt they needed more information on n-3 fatty acids.

Appendix A-6 provides information on food items that provided the highest intakes of n-3 fatty acids. The number one contributor of n-3 fatty acids was English walnuts. Salmon, whitefish and tuna were the only seafood items that contributed of n-3 fatty acids to participants diets. The groups that were not high contributors of n-3 fatty acids were eggs, herbs and spices.

When food items were collapsed into food categories, nuts/seeds (21%), seafood (15%), and oils (13%) were the top three food groups providing n-3 to colonoscopy patients diets. The top three food group sources for both men and women were nuts/seeds, seafood and oils Appendix A-11, A-12). Men consumed more meat, dairy and spices while women ate more legumes, grains and eggs.

Discussion

This study investigated the nutritional knowledge and attitudes of colonoscopy patients towards fat consumption with emphasis on n-3 fatty acid consumption. Various studies have found that there is a relationship between intakes levels of fat and overall healthy diet and demographic variables. (Speakman et al. 2005, Hulshof et al. 2003 Potvin et al. 2000 van Rossum et al. 2000, Caillavet 2005). Low education and income have been associated with a less healthful diet, higher fat intake and obesity. A current study in the U.S indicates that 63% of individuals 20 – 59 years old and 71% of individuals 60-74 years old were overweight or obese (Howarth et al. 2007). Approximately 1/3 of the patients in this study were overweight or obese. The participants in this study had higher levels of education and income (Appendix A-13).

N-3 dietary intakes

Colonoscopy participants' consumption of n-3 fatty acids was estimated with an n-3 FFQ and three-day food record. N-3's potentially contributes to reducing cancer risk (Shepherd 2007, Swarmy et al. 2004). Estimated n-3 intakes from this study were comparable with the findings of previous studies and were below the recommended AI's. (Ritter-Gooder et al. 2006, Givens 2008, Lorra et al 2010). A Pearson correlation between the food recall and the FFQ was 0.35 ($P< 0.01$), comparable with Ritter-Gooder's findings. The top 4 food items contributing to n-3 fatty acids consumed in both studies were English Walnuts, salmon, canola, and mircle whip (Ritter-Gooder et al. 2006).

Knowledge of dietary fatty acids

The AI for n-3 fatty acids was not met by various groups, including the colonoscopy

participants in this study, which makes understanding their knowledge and attitudes very valuable to determine appropriate interventions (Heidal et al. 2003,Lorra et al. 2010). The relative contribution of nutritional knowledge and attitudes in influencing dietary behavior has been widely studied (Packman 2000). Knowledge influences food choice and dietary behavior, with a high level of knowledge playing a role in bringing about dietary behavior change. Many consumers have poor nutritional knowledge and are generally confused about the basic principles of a healthy, balanced diet (Packman 2000). It has been suggested that knowledge represents the precondition to changing a behavior, so if individuals do not have sufficient knowledge, they will have no reason to change old behaviors or adopt a new one (White et al. 2010). In this study patients were generally knowledgeable about saturated fats but less knowledgeable about other types of fatty acids . One explanation for the difference in knowledge could be patients have more extensive exposure over a longer period of time to education about saturated fats compared to the other fatty acids. Surprisingly men had higher correct responses in all but one category. This result was unexpected as they comprise a group that is traditionally less likely to have interest in approaches to health promotion (Packman 2000) and have demonstrated lower knowledge scores in a previous study (Shepherd 2007). Possible reasons for this finding are that men are increasing in awareness and interest in their diets. Women had a higher percentage of correct answers for the omega-3 and omega-6 groups. This was to be expected, as women have historically been the individuals more interested in providing for their families nutritional needs. Neither gender scored above 50% correct answers for any of the categories. This indicates that these colonoscopy patients do not have adequate knowledge on dietary fats. Lower

knowledge scores found in this study agree with several other studies (O'Brien et al. 2000, Verbeke et al. 2004, Harper 2001).

Attitudes

Previous studies have reported that attitudes toward fatty foods are a good predictor of fat intake. Research has also shown that men hold more negative attitudes towards making dietary changes (Packman 2000), while women tend to have more positive attitudes towards healthy eating. Colonoscopy patients overall held positive beliefs about the healthy food choices and the relationship to disease states. Both genders held positive views with females trending with a higher percentage of positive belief and both believed that healthy food tasted good. Neither gender felt it was easy to consume a healthy diet. Women felt that healthy food costs more while men were split on this. Neither gender felt they had information about n-3 fatty acids. This study was not in agreement with a previous study that reported men held more negative attitudes (Packman 2000). Not only were men's attitudes on the whole positive, their responses indicated that they were quite willing to make changes. Like previous studies, women's' attitudes were more positive than men in regards to eating a healthy diet. But women were only slightly more positive (Packman 2000, Shepherd 2007). The results also show that these patients have beliefs and knowledge deficits that could affect their intake of dietary fatty acids. The perceived belief that healthy foods are more costly could be a barrier to prevent healthy eating.

One of the limitations of the current study is that dietary assessment methods did not include the many new food products that are enhanced and marketed with n-3s. All information was self- reported by the patients. The small number of patients in this study may have contributed to the lack of associations between n-3 fatty acid intakes and

knowledge, attitudes, income and education. Future research should compare intakes knowledge and attitudes among colonoscopy patients who've had colon cancer or polyps versus those patients undergoing routine screening with no prior events.

Summary

This investigation studied knowledge, attitudes, and intakes of n-3 fatty acids in colorectal patients. Men and women held positive attitudes toward fat intake, specifically n-3 fatty acids, and indicated a willingness to change. Low dietary intakes of n-3s in this group mirrored intakes found by studies of other population subgroups. Although patients reported a willingness to change their diets, knowledge on fatty acids was low and incorrect beliefs were held. Colorectal patients also reported that they had not been recipients of information on n-3 fatty acids. This study can be utilized to look at held beliefs/barriers and knowledge scores to develop education necessary to increase consumer's knowledge and positively influence their dietary fatty acid intake behaviors.

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Table 1
N-3 intakes and percent of colonoscopy patients meeting the DRI[1] by method of estimation

	Men (n=79) Mean±SD	Women(n=32) Mean±SD	Total Population (n=47) Mean±SD
Three Day Food Recalls (g/d)	0.90±(0.588)	0 .917±(0.587)	0 .961±(.575)
FFQ (g/day)	1.053+(0.634)	0 .901±(0.594)	1.116±(0.670)
(%) DRI's[1] (Recalls)	13	30	
(%) DRI's (FFQ)	9	38	r=.35[2]

[1]DRI's for men = 1.6 g/day and for women 1.1 g/day (ages 18 years and over)
[2]Correlation between FFQ and food recalls $p<0.01$

Table 2
Knowledge and correct answers of colonoscopy patients regarding diet and fats (%)[1]

	Total Population (n=79)	Men (n=32)	Female (n=47)
Knowledge			
Saturated Fats[1, 2]			
Beef or Chicken			
Correct	56(71)	24(75)[5]	32(68)
Whole or 2% Milk			
Correct	68(84)	27(84)[5]	39(83)
Corn or Coconut Oil			
Correct	58(73)	26(81)[5]	32(68)
Peanut or Palm Oil			
Correct	35(44)	14(44)[5]	21(45)
Omega-3 Fat			
Catfish or Salmon			
Correct	8(10)	3(9)[5]	5(11)
Flax Seed or Hickory Nuts			
Correct	32(41)	10(31)[5]	22(47)
Soy or Pinto beans			
Correct	25(32)	10(31)[5]	15(36)
Canola or Wheat Germ Oil			
Correct	11(14)	3(9)[5]	8(17)

1 See complete questions in Appendix B-2

2 Complete fatty acid data in Appendix A-2

Table 3
Attitudinal response of colonoscopy patients regarding diet and fats (%)

	Males (n=32)			Females (n=47)		
	A/SA[2]	D/SD[3]	N/DK[4]	A/SA	D/SD	N/DK
Attitudes						
Food Choice Does Not Effect Disease States	11(34.9)	18(56)[5]	2(6)	15(31.8)	32(69)	0(6)
Correct Food Choices Reduce Diseases	30(94)	0	1(3)	46(98)	0	1(2)
Colon Cancer Is Related To Food Choice	27(85)	2(6)	2(6)	36(77)	0	11(24)
Increasing Fiber Reduces Cancer Chances	25(78)	1(3)	5(15)	44(93)	0	3(6)
Reducing Fat Intake Reduces Cancer Chances	25(78)	0	6(19)	34(73)	1(2)	12(25)
Type of Fat Consumed Effects Cancer Chances	22(69)	0	9(29)	30(63)	0	17(36)
Consuming More Saturated Fat Reduces Cancer	4(12)	18(56)[5]	9(28)	2(4)	31(66)	14(29)

Consuming More Omega-3 Fat Reduces Cancer	16(50)	0	15(47)	20(42)	3(6)	24(51)
Healthy Food Taste Good	24(75)	2(6)	5(16)	38(80)	4(9)	5(10)
Eating Healthy Diet is Easy	8(26)	17(53)[5]	6(19)	14(30)	27(57)	6(13)
Healthy Foods Costs More	12(37)	12(38)[5]	7(22)	27(57)	15(32)	5(11)
Willing To Make Dietary Changes	17(84)	3(9)	1(3)	46(98)	0	1(2)
Willing To Change Type Of Fats Eaten	27(85)	4(12)	0	46(98)	0	1(2)
Have Information About Omega-3 Fats	8(26)	11(34)[5]	12(38)	13(28)	16(34)	18(39)
Have Confidence To Make Change	23(72)	5(15)	3(9)	36(76)	5(11)	6(13)
Need More Information On Omega-3 Fats	20(62)	7(23)	4(12)	40(85)	4(8)	3(6)

[1] Percentages rounded to the nearest whole number
[2] ASA = Agree/ Agree Somewhat
[3] D/DS = Disagree/Disagree Somewhat
[4] DK/N = Don't Know/Neutral
[5] Missing 1 response

APPENDIX A

Appendix A-1

Associations between n-3 intakes, knowledge and attitudes of colonoscopy patients (n=79)[1]

	FFQ	Three Day Recalls
Total Knowledge	.119	-.030
Saturated Fatty Acid Knowledge	.144	-.094
Monounsaturated Fatty Acid Knowledge	.112	-.010
Polyunsaturated Fatty Acid Knowledge	.015	-.001
N-3 Fatty Acid Knowledge	.063	.021
Omega-6 (n-6) Fatty Acid Knowledge	.160	.034
Tastes good	-.082	.021
Eating a healthy diet is easy	-.044	.110
Healthy foods cost more	.041	.092
Receiving encourage to eat healty diet from family and friends is helpful	-.108	.165
Significant other is supportive of dietary change	-.041	.170
I am willing to make changes in my diet	-.048	-.023
I am willing to change the type of dietary fat I eat	-.093	.005
I have the information I need to increase my intake of n-3 fatty acids	.150	.014
I have the confidence to make changes in my diet	-.083	.005
I need more information about n-3 fatty acids to make changes	-.104	-.027

1 Spearman Correlations

Appendix A-2

Dietary n-3 fatty acid intakes of colonoscopy patients

	n-3 fatty acid intake (g/d) Mean±SD		
	Total Population (n=79) Mean±SD	Men (n=32) Mean±SD	Women (n=47) Mean±SD
Three day recall average	0.90 ±.588	0.917 ±.589	0.901±.594
Food frequency average	1.053±0.634	0.961±.575	1.116 ±.670

Appendix A-3

Dietary fat knowledge of colonoscopy patients

	Total Population (n=79)	Men (n=32)	Women (n=47)
		n(%)[1]	
Saturated Fats			
Beef or Chicken			
Correct	56(71)[2]	24(75)[2]	32(68)
Incorrect	22(28)	7(22)	15(32)
Whole or 2% Milk			
Correct	66(84)[2]	27(84)[2]	39(83)
Incorrect	12(15)	4(13)	8(17)
Corn or Coconut Oil			
Correct	58(73)[2]	26(81)[2]	32(68)
Incorrect	20(25)	5(16)	15(32)
Peanut or Palm Oil			
Correct	35(44)[2]	14(44)[2]	21(45)
Incorrect	43(54)	17(53)	261(55)
Monounsaturated Fats			
Butter or Corn Oil			
Correct	27(34)[2]	12(38)[2]	15(32)
Incorrect	51(65)	19(59)	32(68)
Peanut or Safflower Oil			
Correct	21(27)[2]	7(22)[2]	14(30)
Incorrect	57(72)	24(75)	33(70)
Almonds or American Cheese			
Correct	30(38)[2]	10(31)[2]	20(43)
Incorrect	48(61)	21(66)	27(57)
Soybean or Olive Oil			
Correct	26(33)[3]	13(41)[3]	13(28)
Incorrect	51(65)	17(53)	34(72)
Polyunsaturated Fat			
Canola or Safflower Oil			
Correct	9(11)[2]	4(13)[2]	5(11)
Incorrect	69(87.3)	27(84.4)	42(89)
Peanuts or Corn Oil			
Correct	17(22)[2]	8(25)[2]	9(19)
Incorrect	61(77)	23(72)	38(81)
Sunflower Oil or Butter			
Correct	27(34)[2]	11(34)[2]	16(34)
Incorrect	51(65)	20(63)	31(66)
Corn or Palm Oil			
Correct	24(30)[2]	9(28)[2]	15(32)
Incorrect	54(68)	22(69)	32(68)

Omega-3 Fat			
Catfish or Salmon			
Correct	8(10)[2]	3(9)[2]	5(11)
Incorrect	70(89)	32(88)	42(89)
Flax Seed or Hickory Nuts			
Correct	32(41)[2]	10(31)[2]	22(47)
Incorrect	46(58)	21(66)	25(53)
Soy or Pinto beans			
Correct	25(32)[2]	10(31)[2]	15(36)
Incorrect	53(67)	21(66)	32 (68)
Canola or Wheat Germ Oil			
Correct	11(14)[2]	3(9)[2]	8(17)
Incorrect	67(85)	28(88)	39(83)
Omega-6 Fat			
Corn Oil or Butter			
Correct	3(4)[2]	0[2]	3(6)
Incorrect	75(95)	31(97)	44(94)
Soybean Oil or Peanuts			
Correct	3(4)[2]	0[2]	3(6)
Incorrect	75(95)	31(97)	44(94)
Sunflower or Canola Oil			
Correct	2(3)[2]	1(3)[2]	1(2)
Incorrect	76(97)	30(94)	46(98)
Olive or Corn Oil			
Correct	2(3)[2]	1(3)[2]	1(2)
Incorrect	76(96)	30(94)	46(98)

[1]Percentages rounded to the nearest whole number
[2]Missing 1 response
[3]Missing 2 responses

Appendix A-4

Attitudinal responses of colonoscopy patients (%)[1]

	Total Population (n=79)	Men (n=32)	Women (n=47)
Food Choice Does Not Affect Disease States			
Completely Disagree	31(39)[2]	11(34)[2]	20(43)
Disagree Somewhat	19(24)	7(22)	12(26)
Neutral	2(3)	2(6)	0
Agree Somewhat	13(17)	7(21.9)	6(12.8)
Completely Agree	13(16.5)	4(13)	9(19)
Don't Know	0	0	0
Correct Food Choices Reduce Diseases			
Completely Disagree	0[2]	0[2]	0
Disagree Somewhat	0	0	0
Neutral	1(1)	1(3)	0
Agree Somewhat	24(30)	12(38)	12(26)
Completely Agree	52(66)	18(56)	34(72)
Don't Know	1(1)	0	1(2)
Colon Cancer Is Related to Food Choice			
Completely Disagree	0[2]	0[2]	0
Disagree Somewhat	2(3)	2(6)	0
Neutral	4(5)	0	4(9)
Agree Somewhat	26(33)	12(38)	14(30)
Completely Agree	37(47)	15(47)	22(47)
Don't Know	9(11)	2(6)	7(15)

Increasing Fiber Reduces Cancer Chances			
Completely Disagree	1(1)	1(3)[2]	0
Disagree Somewhat	0	0	0
Neutral	4(5)	2(6)	2(4)
Agree Somewhat	19(24)	8(25)	11(23)
Completely Agree	50(63)	17(53)	33(70)
Don't Know	4(5)	3(9)	1(2)
Reducing Fat Intake Reduces Cancer Chances			
Completely Disagree	0[2]	0[2]	0
Disagree Somewhat	1(1)	0	1(2)
Neutral	4(5)	2(6)	2(4)
Agree Somewhat	27(34)	14(44)	13(28)
Completely Agree	32(41)	11(34)	21(45)
Don't Know	14(18)	4(13)	10(21)
Increasing Fruit/Vegetable Intake Reduces Cancer			
Completely Disagree	1(1)[2]	1(3)[2]	0
Disagree Somewhat	0	0	0
Neutral	4(5)	2(6)	2(4)
Agree Somewhat	22(28)	9(28)	13(28)
Completely Agree	45(57)	17(53)	28(60)
Don't Know	6(8)	2(6)	4(9)
Type of Fat Consumed Affects Cancer Chances			
Completely Disagree	0[2]	0[2]	0
Disagree Somewhat	0	0	0
Neutral	8(10)	5(16)	3(6)
Agree Somewhat	23(29)	12(38)	11(23)
Completely Agree	29(37)	10(31)	19(40)
Don't Know	18(23)	4(13)	14(30)

Consuming Specific Foods Will Decrease Cancer			
Completely Disagree	6(8)[2]	2(6)[2]	4(9)
Disagree Somewhat	13(17)	6(19)	7(15)
Neutral	15(19)	6(19)	9(19)
Agree Somewhat	14(18)	5(16)	9(19)
Completely Agree	5(6)	2(6)	3(6)
Don't Know	25(32)	10(31)	15(32)
Consuming More Saturated Fat Reduces Cancer			
Completely Disagree	35(44)[2]	11(34)[2]	24(51)
Disagree Somewhat	14(18)	7(22)	7(15)
Neutral	6(8)	3(9)	3(6)
Agree Somewhat	4(5)	3(9)	1(2)
Completely Agree	2(3)	1(3)	1(2)
Don't Know	17(22)	6(19)	11(23)
Consuming More Monounsaturated Fat Reduces Cancer			
Completely Disagree	7(9)[2]	0[2]	7(15)
Disagree Somewhat	4(5)	2(6)	2(4)
Neutral	7(9)	1(3)	6(13)
Agree Somewhat	20(25)	9(28)	11(23)
Completely Agree	8(10)	6(19)	2(4)
Don't Know	32(41)	13(41)	19(40)
Consuming More Polyunsaturated Fat Reduces Cancer			
Completely Disagree	7(9)[2]	1(3)[2]	6(13)
Disagree Somewhat	8(10)	4(13)	4(9)
Neutral	11(14)	5(16)	6(13)
Agree Somewhat	13(17)	3(9)	10(21)
Completely Agree	6(8)	4(13)	2(4)
Don't Know	33(42)	14(44)	19(40)

Consuming More Omega-3 Fat Reduces Cancer			
Completely Disagree	2(3)[2]	0[2]	2(4)
Disagree Somewhat	1(1)	0	1(2)
Neutral	6(8)	3(9)	3(6)
Agree Somewhat	22(28)	11(34)	11(23)
Completely Agree	14(18)	5(16)	9(19)
Don't Know	33(42)	12(38)	21(45)
Consuming More Omega-6 Fat Reduces Cancer			
Completely Disagree	1(1)[2]	0[2]	1(2)
Disagree Somewhat	4(5)	2(6)	2(4)
Neutral	8(10)	3(9)	5(11)
Agree Somewhat	9(11)	2(6)	7(15)
Completely Agree	3(4)	0	3(6)
Don't Know	53(67)	24(75)	29(62)
Healthy Food Taste Good			
Completely Disagree	0[2]	0[2]	0
Disagree Somewhat	6(8)	2(6)	4(9)
Neutral	8(10)	5(16)	3(6)
Agree Somewhat	34(43)	15(47)	19(40)
Completely Agree	28(35)	9(28)	19(40)
Don't Know	2(3)	0	2(4)
Eating Healthy Diet is Easy			
Completely Disagree	4(5)[2]	2(6)[2]	2(4)
Disagree Somewhat	40(51)	15(47)	25(53)
Neutral	11(14)	5(16)	6(13)
Agree Somewhat	14(18)	4(13)	10(21)
Completely Agree	8(10)	4(13)	4(9)
Don't Know	1(1)	1(3)	0

Healthy Foods Costs More			
Completely Disagree	13(17)[2]	5(16)[2]	8(17)
Disagree Somewhat	14(18)	7(22)	7(15)
Neutral	10(13)	6(19)	4(9)
Agree Somewhat	20(25)	9(28)	11(23)
Completely Agree	19(24)	3(9)	16(34)
Don't Know	2(3)	1(3)	1(2)
Family Encouragement Is Helpful			
Completely Agree	1(1)[2]	1(3)[2]	0
Disagree Somewhat	4(5)	1(3)	3(6)
Neutral	5(6)	4(13)	1(2)
Agree Somewhat	22(28)	13(41)	9(19)
Completely Agree	44(56)	12(38)	32(68)
Don't Know	2(3)	0	2(4)
Spouse Supports A Dietary Change			
Completely Disagree	0[3]	0[2]	0[4]
Disagree Somewhat	7(9)	3(9)	4(9)
Neutral	8(10)	1(3)	7(15)
Agree Somewhat	21(27)	10(31)	11(23)
Completely Agree	35(44)	16(50)	19(40)
Don't Know	4(5)	1(3)	3(6)
Willing To Make Dietary Changes			
Completely Disagree	1(1)[2]	1(3)[2]	0
Disagree Somewhat	2(3)	2(6)	0
Neutral	1(1)	1(3)	0
Agree Somewhat	27(34)	11(34)	16(34)
Completely Agree	46(58)	6(50)	0(64)
Don't Know	1(1)	0	1(2)

Willing To Change The Type Of Fats Eaten			
Completely Disagree	1(1)[2]	1(3)[2]	0
Disagree Somewhat	3(4)	3(9)	0
Neutral	0	0	0
Agree Somewhat	26(33)	13(41)	13(28)
Completely Agree	47(60)	14(44)	33(70)
Don't Know	1(1)	0	1(2)
Have Information About Omega-3 Fats			
Completely Disagree	9(11)[2]	1(3)[2]	8(17)
Disagree Somewhat	18(23)	10(31)	8(17)
Neutral	9(11)	5(16)	4(9)
Agree Somewhat	13(17)	5(16)	8(17)
Completely Agree	8(10)	3(10)	5(11)
Don't Know	21(27)	7(22)	14(30)
Have Confidence To Make The Change			
Completely Disagree	3(4)[2]	2(6)[2]	1(2)
Disagree Somewhat	7(9)	3(9)	4(9)
Neutral	6(8)	2(6)	4(9)
Agree Somewhat	33(42)	16(50)	17(36)
Completely Agree	26(33)	7(22)	19(40)
Don't Know	3(4)	1(3)	2(4)
Need More Information On Omega-3 Fats			
Completely Disagree	5(6)[2]	3(10)[2]	2(4)
Disagree Somewhat	6(8)	4(13)	2(4)
Neutral	4(5)	2(6)	2(4)
Agree Somewhat	19(24)	9(28)	10(21)
Completely Agree	41(52)	11(34)	30(64)
Don't Know	3(4)	2(6)	1(2)

[1] Percentages rounded to the nearest whole number
[2] Missing 1 response
[3] Missing 4 responses
[4] Missing 3 responses

Appendix A– 5

Behaviors, risk factors and health information of colonoscopy patients

	Total Population (n=79)	Men (n=32)	Women (n=47)
		n(%)[1]	
BMI[2]			
20-24.9	18(23)[3]	8(25)[4]	10(21)[4]
25-29.9	32(41)	13(41)	19(40)
30-39.9	24(31)	8(25)	16(34)
40 and Over	3(4)	2(6)	1(2)
Current Smoker			
Yes	5(6)[4]	2(6)[4]	3(6)
No	73(92)	29(91)	44(94)
Past Smoker			
Yes	36(46)[2]	17(53)[3]	19(40)
No	41(52)	13(41)	28(60)
Bowel Disease[3]			
Yes	9(11)[3]	3(9)[4]	6(13)
No	68(86)	28(88)	40(85)
Exercise			
None	10(13)[4]	4(13)[4]	6(13)
30 min 1-2x/wk	23(29)	6(19)	17(36)
30 min 3-4x/wk	31(39)	15(47)	16(34)
30 min 5-7x/wk	14(18)	6(19)	8(17)
Drinks Alcohol			
Never	28(35)[3]	7(22)[4]	21(45)[4]
1-2 times per week	37(47)	15(47)	22(47)
3-4 times per week	5(6)	3(9)	2(4)
5-6 times per week	2(25)	1(3)	1(2)
Daily	5(6)	5(16)	0(0)
How Many Drinks			
0-2 per session	72(91)[5]	28(88)[3]	44(94)[4]
3-4 per session	4(5)	2(6)	2(4)
>than 4 per session	0(0)	0(0)	0(0)
Previous Colonoscopy			
Yes	66(84)[4]	27(84)[4]	39(83.0)
No	12(15)	4(13)	8(17
Has Had Polyps			
Yes	35(44)[4]	12(38)[4]	23(49)
No	43(54)	19(59)	24(51)

Has Malignant Polyps			
Yes	3(4)[4]	3(9)[4]	0(0)
No	41(52)	11(34)	30(64)
Not Applicable	34(43)	17(53)	17(36)
Polyps Were Treated			
Yes	6(8)[3]	3(9)	3(6)[4]
No	19(24)	6(19)	13(28)
Not Applicable	52(66)	22(69)	30(64)
Made Changes to Diet			
Yes	3(4)[4]	1(3)[4]	2(4)
No	24(30)	8(25)	16(34)
Not Applicable	51(65)	22(69)	29(62)
Who Does the Cooking			
Self	42(53)[3]	6(19)[4]	36(77)[4]
Spouse	14(18)	12(38)	2(4)
Other Person	21(27)	13(41)	8(17)
Has Received Information on Healthy Diet			
Yes	34(43)	14(44)[4]	20(43)[4]
No	42(53)	17(53)	25(54)

[1] Percentages rounded to the nearest whole number
[2] Body Mass Index – (20-24.9)desirable, (25-29.9)obesity, (30-39.9) severe obesity (Greater than 40) Extreme obesity
[3] Missing 2 responses
[4] Missing 1 response
[5] Missing 3 responses

Appendix A –6

Percentage of colonoscopy patients meeting Dietary Reference Intake (DRI)

	Men (DRI = 1.6g/day)	**Women (DRI = 1.1g/day)**
Three day food recall average	12.5	29.8
Food frequency average	9.4	38.3

Appendix A –7

Food items contributing n-3 fatty acids in diets of colonoscopy patients (n= 79)[1]

Rank Order	Food	n-3 Fatty Acids (g/d) Mean±SD (Range)	n-3/svg
1	English Walnuts	0.148±0.322 (.000-1.88)	2.37 g/1 oz
2	Salmon	0.076±0.094 (.000-0.381)	1.24 g/3 0z
3	Canola	0.068±0.114 (.000-0.213)	0.42g/1tsp
4	Miracle Whip	0.051±0.063 (.000-0.213)	0.29g/1tsp
5	Beef	0.047±0.045 (.000-0.255)	0.17 g/3 oz
6	Ground Flaxseeds	0.030±0.124 (.000-0.733)	2.00 g/1 T
7	Soybeans	0.028±0132 (.000-1.063)	1.45 g/1/2 C
8	Whitefish	0.025±0.084 (.000 - 0.471)	1.57 g/3 oz
9	Cheddar Cheese	0.024±0.030 (.000-0.150)	0.10 g/ ¼ C
10	Chicken	0.022±0.017 (.000-0.070)	0.09 g/3 oz
11	Loose-leaf Lettuce	0.022±0.032 (.000-0.143)	0.13 g/ ½ C
12	White Bread	0.021±0.040 (.000-0.195)	0.13 g/1 slice

13	Pecans	0.018±0.035 (.000-0.196)	0.02 g/1 oz
14	Almonds	0.017±0.034 (.000-0.220)	0.11 g/3 oz
15	Potato	0.016±0.025 (.000-0.200)	0.04 g/ ½ C
16	Pork	0.015±0.015 (.000 - 0.063)	0.09 g/3 oz
17	Tuna	0.014±0.016 (.000-0.069)	0.23 g/3 oz
18	Uncle Sam's Cereal	0.014±0.570 (.000 - 0.360)	1.20 g/ ½ C
19	Banana	0.140±0.017 (.000-0.080)	0.04 g/1 med.
20	Pinto Beans	0.013±0.023 (.000-0.102)	0.34 g/ ½ C
21	Baked Beans	0.012±0.016 (.000-0.015)	0.160 g/ ½ C
22	Soy Milk	0.012±0.042 (.000-0.240)	0.24 g/ ½ C
23	Wheat Germ	0.011±0.054 (.000-0.400)	0.8 g/1 T
24	Swiss Cheese	0.011±0.018 (.000-0.110)	0.1 g/1 oz
25	Cantaloupe	0.011±0.020 (.000-0.140)	0.07 g/ ½ C

[1]FFQ

Appendix A-8

Food items contributing n-3 fatty acids in the diets of male colonoscopy patients (n=32)[1]

Rank Order	Food	n-3 Fatty Acids (g/d) Mean±SD (Range)	n-3/Serving
1	English Walnuts	0.119±0.327 (.000-1.799)	2.37 g/1 oz
2	Salmon	0.070±0.091 (.000-0.381)	1.24 g/3 oz
3	Beef	0.054±0.053 (.000-0.255)	0.17 g/3 oz
4	Canola Oil	0.052±0.122 (.000-0 .630)	0.42 g/1 tsp
5	Miracle Whip	0.043±0.054 (.000-0.203)	0.29 g/1 tsp
6	Whitefish	0.037±0.097 (.000-0.471)	1.57 g/3 oz
7	Cheddar Cheese	0.026±0.033 (.000-0.150)	0.10 g/ ¼ C
8	Potato	0.022±0.036 (.000-0.200)	0.04 g/ ½ C
9	Chicken	0.022±0.019 (.000-0.063)	0.09 g/3 oz
10	Almonds	0.021±0.047 (.000-0.220)	0.11 g/3 oz
11	Pinto Beans	0.017±0.026 (.000-0.102)	0.34 g/ ½ C
12	Loose Leaf Lettuce	0.017±0.029 (.000-0.953)	0.13 g/ ½ C

13	Pork	0.017±0.017 (.000-0.063)	0.09 g/3 oz
14	Banana	0.015±0.014 (.000-0.080)	0.04 g/1 med
15	White Bread	0.015±0.023 (.000 – 0.091)	0.13 g/1 slice
16	Uncle Sam's Cereal	0.014±0.054 (.000-0.280)	1.20 g/ ½ C
17	Swiss Cheese	0.014±0.024 (.000-0.110)	0.1 g/1 oz
18	Tuna	0.013±0.018 (.000-0.069)	0.23 g/3 oz
19	Baked Beans	0.013±0.013 (.000-0.048)	0.160 g/ ½ C
20	Pecans	0.013±0.035 (.000-0.196)	0.02 g/1 oz
21	Ground Flaxseed	0.013±0.042 (.000-0.200)	2.00 g/1 T
22	Orange Juice	0.012±0.014 (.000-0.045)	0.03 g/ ¾ C
23	Cantaloupe	0.011±0.017 (.000-0.070)	0.07 g/ ½ C
24	Soybeans	0.011±0.060 (.000-0.338)	1.45 g/1/2 C
25	Shrimp	0.009±0.013 (.000-0.042)	0.28 g/3 oz

[1]FFQ

Appendix A-9

Food items contributing n-3 fatty acids in the diets of female colonoscopy patients (n=47)[1]

Rank Order	Food	n-3 Fatty Acids (g/d) Mean±SD (Range)	n-3/Serving
1	English Walnuts	0.168±0.320 (.000-1.885)	2.37 g/1 oz
2	Salmon	0.080±0.097 (.000-0.381)	1.24 g/3 oz
3	Canola Oil	0.078±0.108 (.000-0.462)	0.42 g/1 tsp
4	Miracle Whip	0.056±0.069 (.000-0.213)	0.29 g/1 tsp
5	Beef	0.043±0.040 (.000-0.170)	0.17 g/3 oz
6	Ground Flaxseeds	0.042±0.156 (.000-0.733)	2.00 g/1 T
7	Soybeans	0.039±0.164 (.000-1.063)	1.45 g/1/2 C
8	White Bread	0.026±0.047 (.000-0.195)	0.13 g/1 slice
9	Loose Leaf Lettuce	0.025±1.030 (.000-0.143)	0.13 g/ ½ C
10	Chicken	0.019±0.016 (.000-0.066)	0.09 g/3 oz
11	Pecans	0.022±0.039 (.000-0.140)	0.02 g/1 oz
12	Cheddar Cheese	0.022±0.028 (.000-0.110)	0.10 g/ ¼ C

13	Whitefish	0.017±0.073 (.000-0.471)	1.57 g/3 oz
14	Soymilk	0.017±0.052 (.000-0.240)	0.24 g/ ½ C
15	Almonds	0.015±0.022 (.000-0.081)	0.11 g/3 oz
16	Tuna	0.015±0.015 (.000-0.046)	0.23 g/3 oz
17	Uncle Sam's Cereal	0.014±0.060 (.000 – 0.360)	1.20 g/ ½ C
18	Pork	0.014±0.014 (.000-0.063)	0.09 g/3 oz
19	Soy nuts	0.014±0.052 (.000-0.283)	0.41 g/1 oz
20	Wheat Germ	0.013±0.064 (.000-0.400)	0.8 g/1 T
21	Banana	0.013±0.013 (.000-0.040)	0.04 g/1 med
22	1% Milk	0.013±0.025 (.000-0.120)	0.04 g/1 C
23	Baked Beans	0.012±0.018 (.000-0.075)	0.160 g/ ½ C
24	Potato	0.012±0.011 (.000-0.044)	0.04 g/ ½ C
25	2% Milk	0.011±0.032 (.000-0.140)	0.07 g/1 C

[1]FFQ

Appendix A –10

Food Category Rankings of sources of n-3 fatty acid intakes[1] consumed by colonoscopy patients (n=79)

Rank Order	Food Group	% of n-3 fatty intake[2]
1	Nuts/Seeds	21
2	Seafood	15
3	Oils	13
4	Legumes	10
5	Meat	9
6	Vegetables	9
7	Fruits	8
8	Dairy	7
9	Grains	6
10	Spices	1
11	Eggs	1

[1]FFQ Estimation
[2] Percentages rounded to the nearest whole number

Appendix A -11

Food Category Rankings of sources of n-3 fatty acid intakes[1] consumed by male colonoscopy patients (n=32)

Rank Order	Food Group	% of n-3 fatty intake[2]
1	Nuts/Seeds	18
2	Seafood	17
3	Oils	12
4	Meat	11
5	Vegetables	9
6	Fruits	9
7	Legumes	9
8	Dairy	8
9	Grains	6
10	Spices	2
11	Eggs	1

[1]FFQ Estimation
[2] Percentages rounded to the nearest whole number

Appendix A-12

Food Category Rankings of sources of n-3 fatty acid intakes[1] consumed by female colonoscopy patients (n=47)

Rank Order	Food Group	% of n-3 fatty intake[2]
1	Nuts/Seeds	24
2	Oils	14
3	Seafoods	14
4	Legumes	11
5	Vegetables	9
6	Fruits	7
7	Meats	7
8	Grains	6
9	Dairy	6
10	Eggs	2
11	Spices	1

[1]FFQ Estimation

[2] Percentages rounded to the nearest whole number

Appendix A-13

Sociodemographic characteristics of colonoscopy patients

	Total Population (n=79)	Men (n=32)	Women (n=47)
Characteristics	n(%)[1]	n(%)[1]	n(%)[1]
	79	32(41)[2]	47(59)
Age (y)			
20-39	6(8)	1(3)	5(11)
40-59	38(48)	18(56)	20(43)
60-79	33(42)	12(38)	21(45)
80+	1(1)	0	1(2)
Ethnic			
White	77(98)[2]	31(97)[2]	46(98)
African-American	1(1)	0	1(2)
Education (y)			
< 12	1(1)[2]	0[2]	1(2)
12	10(13)	1(3)	9(19)
13-15	20(25)	5(16)	15(32)
16 or more	47(60)	25(6)	22(47)
Marital Status			
Married	63(80)[2]	29(91)[2]	34(72)
Single	15(19)	2(6)	13(28)
Income			
≤ 10000	2(3)[3]	1(3)[2]	1(2)[4]
10001-15000	4(5)	2(67)	2(4)
15001-25000	6(8)	1(3)	5(11)
25001-50000	23(29)	6(19)	17(26)
50001-75000	17(22)	7(22)	10(21)
75001 or more	24(30)	14(44)	10(21)

[1] Percentages rounded to the nearest whole number
[2]Data presented is missing 1 response
[3] Data presented is missing 3 responses
[4]Data presented is missing 2 responses

Appendix A–14

FOOD SOURCES OF HIGH N-3 CONTENT

Food

Fish/Seafood
Salmon
Whitefish
Herring
Oysters
Sardines
Lake Whitefish
Lake Trout
Anchovy
Sablefish
Mackerel
Atlantic Salmon, farmed
Atlantic Sturgeon

Nuts/Legumes
English Walnuts
Ground Flaxseed
Whole Flaxseed
Butternuts
Chia Seeds
Soybeans

Cereal
Uncle Sam's Cereal

Oils
Wheat Germ Oil
Flaxseed Oil
Red Currant Seed Oil

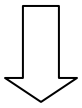
Appendix A –15

FATTY ACID CONVERSION

THE OMEGA-6 FAMILY

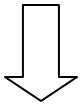
Linoleic Acid (LA)
(vegetable oils, seeds, and nuts)

Your body converts LA into:



Gamma-Linolenic Acid (GLA)
(found in borage and primrose oil)

Your body converts GLA into:

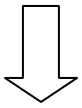


Arachidonic Acid (AA)
(AA is also found in meat)

THE OMEGA-3 FAMILY

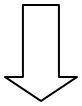
Alpha-Linolenic Acid (LNA)
(green leafy vegetables, flax, flaxseed oil, canola oil, walnuts, and Brazil nuts)

Your body converts LNA into:



Eicosapentaenoic Acid (EPA)
(found in fish oil)

Your body converts EPA into:



Docosahexaenoic Acid (DHA)
(DHA is also found in fish oil)

Appendix B

University of Nebraska Lincoln

COLLEGE OF HUMAN RESOURCES & FAMILY SCIENCES
Department of Nutritional Science & Dietetics
316 Ruth Leverton Hall
Lincoln, NE 68583-0806
PH: (402) 472-3716
FAX (402) 472-1587

Informed Consent Form

IRB#2003-06-325 EX

Title of Research Study

Knowledge, Attitudes and Dietary Intakes in Consumers at Risk for Colorectal Cancer

Invitation to Participate

You are invited to participate in this research project. The following information is provided to help you make an informed decision whether of not to participate. You must be 19 years or older to participate in this study.

Purpose of this study

The purpose of this study is to determine consumer's knowledge, attitudes and consumption of poly-unsaturated fatty acids for those at risk of colorectal cancer. The study will consist of filling out a survey, three-day food record and food frequency questionnaire. You were selected as a potential subject because you are a patient of a gastroenterology clinic undergoing a screening for colorectal polyps.

Explanation of procedures

You will be asked to complete a knowledge and attitude survey, a three-day food record and a food frequency questionnaire. The survey and the food frequency will require approximately 1 hour to complete. Participants will be asked to provide demographic information. This information will include questions regarding age, gender, ethnic group, education, income, health habits and medical diagnosis. The survey and food frequency will be completed at an arranged meeting at Gastroenterology Specialties P. C., 4545 R Street, Suite 205, Lincoln, Nebraska.
You will be asked to take the two-day food record home and complete the information for one week day and one weekend day. You will be provided with stamped addressed envelopes to return the food record. At the end of the study, you may have access to your individual results if you desire.

Potential Risks and Discomforts

No known risks or discomforts are associated with this project.

Potential Benefits

Your personal benefits for participating in this study include access to the results of the survey and the analysis of your food frequencies and three-day food records. Nutritional science educators will gain valuable information about consumers understanding of the link between consumption of fats and colorectal cancer.

Assurance of Confidentiality

Any information collected during this study will be kept confidential. You will be randomly assigned an identification number, and this number will only be known by you. Only the researchers involved and Gastroenterology Specialities P. C. will have access to the individual data. The data collected in this study will be stored for 2 years in room 316 of Ruth Leverton Hall. The information obtained in this study may be published in scientific journals or presented at scientific meetings, but your identity will be unknown and confidential.

Compensation

No monetary compensation will be given for your participation in this study. You may have access to the results of your survey, food frequency and three-day food record if you wish.

Opportunity to Ask Questions

You may ask questions concerning the research before agreeing to participate. You may contact Cindy Kaminski at 402-792-2084 or Dr. Nancy Lewis at 402-472-4633. If you have any questions concerning your rights as a research subject that have not been answered by the researchers, you may contact the University of Nebraska - Lincoln Institutional Review Board at (402) 472-6965.

Voluntary Participation to Withdraw

You are free to decide not to participate in this study or to withdraw at any time without adversely affecting your relationship with the investigators, the University of Nebraska-Lincoln, or Gastroenterology Specialities P. C. Your decision will not result in any loss of benefits to which you are entitled.

Documentation of Informed Consent

You are voluntarily making a decision whether or not to participate in the research study. Your signature certifies that you have decided to participate and have read and understood the information presented. You will be given a copy of this informed consent form to keep.

_____ _____

Signature of Subject Date

Cindy S. Kaminski *Office (402) 472-4633*

Nancy M. Lewis, Ph.D., R.D., F.A.D.A. *Office (402) 472-4633*
Associate Professor

Subject Number_____

GASTROENTEROLOGY PATIENT SURVEY

The purpose of this survey is to obtain information about what Gastroenterology patients think about diet and health.

The responses are set to a scale, with 1: completely disagree (CD), 2: disagree somewhat (DS), 3: neither agree or disagree (N), 4: agree somewhat (AS), 5: completely agree (CD), 6: Don't know (DK). Please respond by checking the number that most accurately reflects your beliefs.

	CD	DS	N	AS	CA	DK
1. What people eat or drink has little effect on whether they will develop a major disease.	1.___	2.___	3.___	4.___	5.___	6.___
2. By eating the right kind of foods, people can reduce their chances of developing major diseases.	1.___	2.___	3.___	4.___	5.___	6.___
3. Colorectal cancer may be related to what people eat and/or drink.	1.___	2.___	3.___	4.___	5.___	6.___
4. Eating more fiber will help a person reduce his/her chances of getting colorectal cancer.	1.___	2.___	3.___	4.___	5.___	6.___
5. Eating less fat will help a person reduce his/her chances of getting colorectal cancer.	1.___	2.___	3.___	4.___	5.___	6.___
6. Eating more fruit and vegetables will help a person reduce his/her chances of getting colorectal cancer.	1.___	2.___	3.___	4.___	5.___	6.___
7. Changing the type of fat consumed will help a person reduce his/her chance of getting colorectal cancer.	1.___	2.___	3.___	4.___	5.___	6.___
8. Other foods/nutrients (eg. Sugar, Salt) will help a person reduce his/her chance of getting colorectal cancer.	1.___	2.___	3.___	4.___	5.___	6.___
9. Eating more saturated fats will help a person reduce his/her chances of getting colorectal cancer.	1.___	2.___	3.___	4.___	5.___	6.___
10. Eating more monounsaturated fats will help a person reduce his/her chances of getting colorectal cancer.	1.___	2.___	3.___	4.___	5.___	6.___
11. Eating more polyunsaturated fats will help a person reduce his/her chances of getting colorectal cancer.	1___	2___	3___	4___	5___	6___
12. Eating more omega-3 fats will help a person reduce his/her chances of getting colorectal cancer.	1.___	2.___	3.___	4.___	5.___	6.___
13. Eating more omega-6 fats will help a person reduce his/her chances of getting colorectal cancer	1.___	2.___	3.___	4.___	5.___	6.___
14.. Healthy foods taste good.	1.___	2.___	3.___	4.___	5.___	6.___
15. Eating a healthful diet is easy.	1.___	2.___	3.___	4.___	5.___	6.___
16. Healthful foods generally cost more than other kinds of foods.	1.___	2.___	3.___	4.___	5.___	6.___
17. Getting encouragement from family or friends to eat more healthy foods is helpful.	1.___	2.___	3.___	4.___	5.___	6.___
18. My significant other would support a dietary change.	1.___	2.___	3.___	4.___	5.___	6.___

Subject Number_____

19. I would be willing to make changes in my diet to reduce my chances of developing colorectal cancer. 1___ 2___ 3___ 4___ 5___ 6___

20. In order to decrease my risk of colorectal cancer I would be willing to change the types of fat I eat. 1.___ 2.___ 3.___ 4.___ 5.___ 6.___

21. I have the information I need to increase? my intakes of omega-3 fats. 1.___ 2.___ 3.___ 4.___ 5.___ 6.___

22. I have the confidence I need to make a change in my diet. 1.___ 2.___ 3.___ 4.___ 5.___ 6.___

23. In order for me to increase omega-3 fats in my diet, I would need more information 1.___ 2.___ 3.___ 4.___ 5.___ 6.___

Please compare the two foods. Check the answer in the column that contains the most fat.
For example; which food contains the most omega-3 fats?
___Pastry __x_Bread ___Both the same ___Don't know or not sure?
(If you thought bread to contain the most fat, you would mark that and move on to the next row).

24. Which has more saturated fats?

1.	___3 ounces Roast Beef	___3 ounces Chicken	___Both the same	___Don't know/not sure
2.	___Whole Milk	___2% Milk	___Both the same	___Don't know/not sure
3.	___Corn Oil	___Coconut Oil	___Both the same	___Don't know/not sure
4.	___Peanut Oil	___Palm Kernel Oil	___Both the same	___Don't know/not sure

25. Which has more monounsaturated fat?

1.	___Butter	___Corn Oil	___Both the same	___Don't know/not sure
2.	___Peanut Oil	___Safflower Oil	___Both the same	___Don't know/not sure
3.	___Almonds	___American Cheese	___Both the same	___Don't know/not sure
4.	___Soybean Oil	___Olive Oil	___Both the same	___Don't know/not sure

26. Which has more polyunsaturated fat?

1.	___Canola Oil	___Safflower Oil	___Both the same	___Don't know/not sure
2.	___Peanuts	___Corn Oil	___Both the same	___Don't know/not sure
3.	___Sunflower Oil	___Butter	___Both the same	___Don't know/not sure
4.	___Corn Oil	___Palm Oil	___Both the same	___Don't know/not sure

27. Which has more omega-3 fats?

1.	___Catfish	___Salmon	___Both the same	___Don't know/not sure
2.	___Flax seed	___Hickory nuts	___Both the same	___Don't know/not sure
3.	___Soybeans	___Pinto Beans	___Both the same	___Don't know/not sure
4.	___Canola oil	___Wheat germ oil	___Both the same	___Don't know/not sure

28. Which has more omega-6 fat?

1.	___Corn Oil	___Butter	___Both the same	___Don't know/not sure
2.	___Soybean Oil	___Peanuts	___Both the same	___Don't know/not sure
3.	___Sunflower Oil	___Canola Oil	___Both the same	___Don't know/not sure
4.	___Olive Oil	___Corn Oil	___Both the same	___Don't know/mot sure

Subject Number_____

Please check the response that most accurately describes you or your situation. When the survey asks for age, height and weight, fill in your own age, weight and height.

29. ____Age ___ft ___in Your height ___ Your weight (Height and weight will be used to determine Body Mass Index.

30. Is your gender?
    1. ___Male
    2. ___Female

31. Which ethnic group race(s) do you belong to?
    1. ___White
    2. ___African-American
    3. ___Asian
    4. ___ American Indian
    5. ___Other

32. Are you either Hispanic or Latino?
    1. ___Yes
    2. ___No

33. What is your current marital status?
    1. ___Married or living as married
    2. ___Single (Never married, divorced, widow(er)).

34. What is the highest grade or year of school you completed?
    1. ___Less than high school
    2. ___High school graduate
    3. ___Some college
    4. ___College degree (Bachelors, Masters, Ph.D.)

35. What is your household income?
    1. ___$0 - $10,000
    2. ___$10,000 - $15000
    3. ___$15000 – $25,000
    4. ___$25,000 - $50,000
    5. ___$50,000 - $75,000
    6. ___$75,000 or more

36. Do you currently smoke?
    1. ___Yes
    2. ___No

37. Have you smoked in the past?
    1. ___Yes
    2. ___No

38. Do you have a history of inflammatory bowel disease?
    1. ___Yes
    2. ___No

39. How often do you exercise?
    1. ___Do not exercise
    2. ___Exercise 30 minutes 1-2 times per week
    3. ___Exercise 30 minutes 3-4 times per week
    4. ___Exercise 30 minutes 5 –7 times per week

Subject Number_____

40. Have you ever had a colonoscopy before?
    1. ___No
    2. ___Yes

41. Have you been diagnosed with colorectal polyps?
    1. ___Yes
    2. ___No

41a. If yes, were the polyps malignant?
    1. ___Yes
    2. ___No

41b. If yes, have you been treated or are you currently undergoing treatment?
    1. ___Yes
    2. ___No

41c. If yes, have you made any changes to your diet as a result of your diagnosis?
    1. ___Yes
    2. ___No

42. How often do you currently drink alcohol?
    1. ___Never
    2. ___1-2 times/week
    3. ___3-4 times/week
    4. ___5-6 times/week
    5. ___Daily

43. When you drink alcohol, do you drink
    1. ___0-2 drinks per/session
    2. ___3-4 drinks per/session
    3. ___More than 4 drinks per session

44. Who does the cooking in your house?
    1. ___Myself
    2. ___My spouse or significant other
    3. ___Other (Please specify) _____

45. Have you received information from a health care professional about how to eat a healthy diet?
    1. ___Yes
    2. ___No

Appendix B3

Form A

PROSPECTIVE PARTICIPATION CONTACT FORM

PURPOSE OF THIS STUDY:

The purpose of this study is to determine what Gastroenterology Specialties patients think about diet and health. The study will consist of filling out a survey, three-day survey food record and a food frequency questionnaire. If you are interested in participating in this study, please indicate so by signing your name and providing your telephone number. Thank you for your time and consideration.

_____	_____	_____
Prospective Participant	Phone Number	Date

To ensure successful contact and communication between prospective participants and myself, my name will be typed below. This is help the participant to distinguish a call regarding study and meeting details and a phone marketer.

Cindy Kaminski

Appendix B4

Subject Number 138

Three-Day Food Intakes

Please record what you eat for three days. Be as specific as possible. Include brand names if necessary (McDonald's hamburger), portion sizes (Ex. 12 ounces of cola, 1 tsp margarine, 1 ½ cups corn flakes, etc.) and cooking methods (fried. Sautéed, baked, etc).

Food Eaten	Amount	Cooking Method (if applicable)

GUIDE TO GOOD EATING®

Every day eat different foods from each food group.

MILK
Group
3-4 servings

MEAT
Group
2-3 servings

VEGETABLE
Group
-5 servings

FRUIT
Group
2-4 servings

GRAIN
Group
6-11 servings

The Guide to Good Eating can be used in conjunction with the Daily Food Guide Pyramid

GUIDE TO GOOD EATING®

Anyone can eat for good health. Just follow these 2 simple steps:

1. ***Eat foods from all Five Food Groups every day.*** Each food group provides you with different nutrients.
2. ***Eat <u>different</u> foods from each food group every day.*** Some foods in a food group are better sources of a nutrient than others. By eating several foods from each food group, you increase your chance of getting all the nutrients you need.

Every day eat:	*Suggested Serving Sizes*				
MILK *Group for calcium* **3-4 servings**	 Milk 1 cup	 Yogurt 1 cup	 Cheese 1½ – 2 oz	 Cottage cheese ½ cup	 Ice cream, frozen yogurt ½ cup
MEAT *Group for iron* **2-3 servings**	 Cooked, lean meat 2-3 oz	 Cooked, lean poultry, fish 2-3 oz	 Egg 1	 Peanut butter 2 tbsp	 Cooked, dried peas, dried beans ½ cup
VEGETABLE *Group for vitamin A* **3-5 servings**	 Juice ¾ cup	 Raw vegetable ½ cup	 Raw leafy vegetable 1 cup	 Cooked vegetable ½ cup	 Potato 1 medium
FRUIT *Group for vitamin C* **2-4 servings**	 Juice ¾ cup	 Raw, canned, or cooked fruit ½ cup	 Apple, banana, orange, pear 1 medium	 Grapefruit ½	 Cantaloupe ¼
GRAIN *Group for fiber* **6-11 servings**	 Bread 1 slice	 English muffin, hamburger bun ½	 Ready-to-eat cereal 1 oz	 Pasta, rice, grits, cooked cereal ½ cup	 Tortilla, roll, muffin 1

Some foods don't have enough nutrients to fit in any of the Five Food Groups. These foods are called "Others." These foods are okay to eat in moderation. They should not replace foods from the Five Food Groups.

"OTHERS" *category*	
Fats and oils, sweets, salty snacks, alcohol, other beverages, and condiments	

Portion Size: A Handy Guide

Fist - about 1 cup or 1 medium fruit

Palm - (minus fingers) About 4 oz cooked poultry, fish, or lean meat

Cupped Hand - about 1 to 2 oz pretzels (15 small twist, 7 regular)

Thumb - about 1 oz cheese

Thumbtip - about 1 tablespoon

Fingertip - about 1 teaspoon

Food Frequency Questionnaire

Date_____

This form asks about your usual dietary intake over the past month. It takes about 20-30 minutes to complete. Please use the following instruction.

1. **Read each food item. If you have not eaten this food in the past month, mark "none" and move onto the next food item.**

2. **Indicate whether you think your usual serving size is small (S), medium (M), or large (L) by marking the correct serving size box. Please refer to the handout on "*Portion Size: A Handy Guide*" for a visual reference on medium serving sizes.**

   NOTE: A small (S) serving is equal to half (½) the usual serving.
   A medium (M) is equal to the medium servings listed on the form.
   A large (L) is equal to one and a half (1 ½) times as much or more of the medium serving.

3. **Think over the past month. How often do you usually eat each of the following food items? Again, mark the box under the correct heading. Answer each question as best you can; estimate if you are not sure.**

Seafood & Fish	Medium Serving	None	S	M	L	Once a month	Less than once a week	1-2 times a week	3-4 times a week	5-6 times a week	Daily	More than once a day
Tuna	3 ounces											
Salmon	3 ounces											
Whitefish	3 ounces											
Herring	3 ounces											
Walleye	3 ounces											
Lake trout	3 ounces											
Rainbow trout	3 ounces											
Sablefish	3 ounces											
Mackerel	3 ounces											
Catfish	3 ounces											
Flounder	3 ounces											
Perch	3 ounces											
Atlantic cod	3 ounces											
Atlantic bluefish	3 ounces											
Atlantic sturgeon	3 ounces											
Greenland halibut	3 ounces											
Surimi	3 ounces											
Swordfish	3 ounces											
Mussels	3 ounces											
Scallops	3 ounces											
Oysters	3 ounces											
Shrimp	3 ounces											
Sardines	3 ounces											
Anchovy	3 ounces											
Blue crab	3 ounces											
Northern lobster	3 ounces											

* 3 ounces is about the size of a deck of cards.

Meat	Medium serving	None	S	M	L	Once a month	Less than once a week	1-2 times a week	3-4 times a week	5-6 times a week	Daily	More than once a day
Turkey	3 ounces											
Chicken	3 ounces											
Beef	3 ounces											
Pork	3 ounces											

* 3 ounces is about the size of a deck of cards.

Eggs	Medium serving	None	S	M	L	Once a month	Less than once a week	1-2 times a week	3-4 times a week	5-6 times a week	Daily	More than once a day
Regular egg	1 egg											
UNL's Omega-3 enriched egg	1 egg											
Eggland's Best egg	1 egg											

Dairy products	Medium serving	None	S	M	L	Once a month	Less than once a week	1-2 times a week	3-4 times a week	5-6 times a week	Daily	More than once a day
2% milk	1 cup											
1% milk	1 cup											
Skim milk	1 cup											
Chedd cheese	¼ cup											
Swiss Cheese	1 ounce											
Mozz Cheese	1 ounce											
2% fat cottage cheese	½ cup											
1% fat cottage cheese	½ cup											
Feta cheese	1 ounce											
Yogurt- no fat or low fat	8 ounces											

Vegetables	Medium serving	None	S	M	L	Once a month	Less than once a week	1-2 times a week	3-4 times a week	5-6 times a week	Daily	More than once a day
Sweet potato	medium or ½ cup											
Potato	medium or ½ cup											
Green peas	½ cup											
Spinach	½ cup											
Cauliflower	½ cup											
Carrots	½ cup											
Kale	½ cup											
Red radish	½ cup											
Leeks	½ cup											
Broccoli	½ cup											
Eggplant	½ cup											
Snap Green Beans	½ cup											
Romaine lettuce	½ cup											
Iceburg lettuce	½ cup											
Looseleaf lettuce	½ cup											
Cabbage	½ cup											
Zucchini squash	½ cup											
Cucumber	½ cup											
Tomato	½ cup											
Bell Pepper (Any Color)	½ cup											

Fruits and Fruit Juices	Medium serving	None	S	M	L	Once a month	Less than once a week	1-2 times a week	3-4 times a week	5-6 times a week	Daily	More than once a day
Avocado	½ of a medium											
Banana	1 medium											
Cherries	10 or ½ cup											
Raspberries	½ cup											
Strawberries	½ cup											
Cranberries	½ cup											
Cranberry Juice	3/4 cup											
Apple	1 medium											
Apple Juice	3/4 cup											
Orange	1 medium											
Orange Juice	3/4 cup											
Red/green grapes	½ cup											
Grape Juice	3/4 cup											
Pears	½ cup											
Mango	½ cup											
Kiwi fruit	1 medium											
Papaya	1 medium											
Cantaloupe/ muskmelon	½ cup											
Honeydew Melon	½ cup											
Blackberries	½ cup											
Blueberries	½ cup											
Pineapple Juice	3/4 cup											

Nuts/seeds	Medium serving	None	S	M	L	Once a month	Less than once a week	1-2 times a week	3-4 times a week	5-6 times a week	Daily	More than once a day
Walnuts	1 ounce											
Pumpkin seeds	1 ounce											
Flaxseeds	1 ounce											
Butternuts	1 ounce											
Chia seeds	1 ounce											
Hickory nuts	1 ounce											
Beechnuts	1 ounce											
Almonds	1 ounce											
Pistachios	1 ounce											
Pine nuts	1 ounce											
Pecans	1 ounce											
Brazilnuts	1 ounce											
Sunflower seeds	1 ounce											
Sesame seeds	1 Tbsp											
Poppy seeds	1 Tbsp											

* TBSP = Tablespoon

Breads/cereals/ grains	Medium Serving	None	S	M	L	Once a month	Less than once a week	1-2 times a week	3-4 times a week	5-6 times a week	Daily	More than once a day
Banana bread	1 slice											
Pumpkin bread	1 slice											
Whole wheat bread	1 slice											
White bread	1 slice											
Oatmeal	½ cup											
Uncle Sams cereal	½ cup											
All-bran	½ cup											
Special K	½ cup											
Cream of Wheat	½ cup											
Wheat Germ	½ cup											
Barley bran	½ cup											

Fats and oils	Medium Serving	None	S	M	L	Once a month	Less than once a week	1-2 times a week	3-4 times a week	5-6 times a week	Daily	More than once a day
Miracle whip	1 tsp											
Margarine	1 tsp											
Soybean oil	1 tsp											
Wheat germ oil	1 tsp											
Flax oil	1 tsp											
Canola oil	1 tsp											
Olive Oil	1 tsp											
Walnut oil	1 tsp											
Red currant seed oil	1 tsp											
Black currant seed oil	1 tsp											
Gooseberry seed oil	1 tsp											

* tsp = teaspoon

Legumes and products	Medium serving	None	S	M	L	Once a month	Less than once a week	1-2 times a week	3-4 times a week	5-6 times a week	Daily	More than once a day
Soybeans	½ cup											
Garbanzo beans	½ cup											
Navy beans	½ cup											
Lentils	½ cup											
Tofu	½ cup											
Soy milk	1 cup											
Pinto beans	½ cup											
Baked beans	½ cup											
Baked beans with pork	½ cup											
Refried Beans/ frijoles	½ cup											
Red Kidney beans	½ cup											
Blackeyed peas	½ cup											
Great Northern Beans	½ cup											
Lima Beans	½ cup											
Peanut Butter	2 TBSP											
Soy nuts	1 ounce											

TBSP= Tablespoon

Herbs and Spices	Medium Serving	None	S	M	L	Once a month	Less than once a week	1-2 times a week	3-4 times a week	5-6 times a week	Daily	More than once a day
Fresh Spearmint	1 Tbsp											
Fresh Peppermint	1 Tbsp											
Garlic	1 clove											
Black Pepper	1 Tbsp											
Cayenne Pepper	1 Tbsp											
Ground Ginger	1 Tbsp											
Dried Rosemary	1 Tbsp											
Fresh Rosemary	1 Tbsp											
Dried Thyme	1 Tbsp											
Fresh Thyme	1 Tbsp											
Dried Basil	1 Tbsp											
Fresh Basil	1 Tbsp											
Paprika	1 Tbsp											
Cumin	1 Tbsp											

* Tbsp = Tablespoon