Product Development Opportunities
Through Federal Research

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I. INTRODUCTION

This report provides an overview of Federal research activities, their goal and objectives, which pertain to the relationship between dietary factors and the prevention of chronic disease. The agencies examined in this report are the institutes comprising the National Institutes of Health (NIH), NIH's newly established Office of Alternative Medicine, the Agricultural Research Service (ARS) of the Department of Agriculture (USDA) and one private organization, the American Institute for Cancer Research.

Part II of this report provides an overview of each agency, institute and organization, describing the major thrust of diet-related research, annual dollar expenditures for the research, and the methods used to achieve coordination with other agencies and the private sector.

Parts III through VI are organized topically, in terms of specific nutrients, foods, diseases and populations that are the subjects of research. They also contain short descriptions of specific research projects so as to convey the scope and depth of Federal government research. Although Parts III through VI report on 168 specific projects, which are representative of present Federal research activities, this report is by no means comprehensive. ARS alone is conducting or sponsoring 900 studies at any given time; and NIH spent over $428 million on nutrition research. Consequently, a comprehensive and statistically precise assessment of these research activities would require a separate report.

All of the 168 specific research projects described in this report can be expected to yield important findings of great potential value to Kraft, regardless of whether a specific project is directed explicitly at dietary habits or focuses more narrowly on specific nutrients. We conclude our report with a brief discussion of possible steps that could be taken by Kraft to exploit the great potential of the Federal research effort delineated herein.
II. AGENCIES AND ORGANIZATIONS CONDUCTING RESEARCH

A. National Institutes of Health:

Major Thrust of Research and Reason Therefor: NIH is the lead agency in the Federal government supporting biomedical research and training in nutrition as it relates to health maintenance, human development throughout the life cycle and disease prevention and treatment. NIH has identified nutrition as a "major priority area within the Department." NIH's Nutrition Coordinating Committee (see discussion at page 6 below) has targeted the following four areas for future research: (1) clinical nutrition throughout the life cycle; (2) nutritional factors in the development of disease; (3) disease prevention; and (4) disease treatment. See also discussion immediately below.

Institutes Within NIH Conducting Nutrition Research: NIH is comprised of the following 17 institutes, each of which conducts diet/prevention research:

National Cancer Institute (NCI): See separate entry below.

National Heart, Lung, and Blood Institute (NHLBI): See separate entry below.

National Institute of Dental Research (NIDR): NIDR promotes research on the development and maintenance of both hard and soft tissues of the oral-facial complex. NIDR supports research and research training on (1) the influence of diet and nutrition on oral health and disease (e.g., dental caries, periodontal disease, herpes, salivary gland disorders, and oral cancer); (2) craniofacial development and congenital anomalies (e.g., cleft lip and palate); (3) salivary gland function; and (4) wound healing.

National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK): NIDDK is generally concerned with nutrition research and training in the following broad areas of fundamental and clinical nutrition, in order to advance knowledge concerning the requirements and functions of nutrients and the role of diet in the maintenance of health and prevention of disease.

Specific focal points of NIDDK sponsored research are broken down into five branches:

Nutrient Metabolism Program: This Program supports basic and clinical studies related to the requirement, bioavailability, and metabolism of nutrients and other dietary components at the organ, cellular, and subcellular levels in normal and disease states. Research interests include: (1) understanding the physiological functions and mechanisms of action/interaction of nutrients
within the body; (2) the effects of environment, heredity, stress, drug use, toxicants and physical activity on problems of nutrient imbalance; (3) nutrient requirements in health and disease; (4) alternative forms of nutrient delivery, such as total parenteral nutrition; and (5) methods for nutritional status assessment.

**Obesity and Eating Disorders Program:** This Program emphasizes research on the biomedical and behavioral aspects of obesity, anorexia nervosa, bulimia and other eating disorders. The goals of this research are to establish a clear understanding of the etiology, prevention and treatment of these conditions through studies on the physiological, metabolic, psychological and genetic factors that affect food intake, eating behaviors, appetite, satiety, energy utilization and thermogenesis, and adipocyte growth and development.

**Obesity/Nutrition Research Centers:** The Centers create or strengthen focus within biomedical research institutions for multidisciplinary research in obesity and nutrition. Specific research focal points are: (1) the development, treatment and prevention of obesity and eating disorders; (2) control and modulation of energy metabolism in obesity; and (3) disorders associated with abnormalities of energy balance and weight management, such as anorexia nervosa, AIDS and cancer.

**Clinical Nutrition Research Units:** Each Unit provides an integrated array of research, educational and core laboratory activities focused on human nutrition, health and disease.

**U.S.-Japan Malnutrition Panel:** A component of the U.S.-Japan Cooperative Medical Sciences Program, the Panel is "one of the main avenues through which NIH supports international nutrition research activities."

**Other Programs:** NIDDK sponsors programs in digestive diseases, diabetes, metabolic diseases, hematology, kidney diseases. These programs include nutrition research relating to the etiology, prevention and treatment of these disorders.

**National Institute of Neurological Disorders and Stroke (NINDS):** NINDS supports studies investigating the reciprocal relationship between nutrient intake and nervous system development and activity.

**National Institute of Allergy and Infectious Diseases (NIAID):** NIAID supports research in the broad field of nutrition interrelationships with immunity and infection. Nutrition studies are an integral part of the NIAID's research efforts to lessen the adverse health consequences of allergic and infectious diseases.
National Institute of General Medical Sciences (NIGMS): NIGMS supports basic biomedical research and research training which undergird all biomedical investigations. The focus is on expanding knowledge of fundamental biological structure and function at the cellular and molecular levels.

National Institute of Child Health and Human Development (NICHD): NICHD's research program focuses on the continuum of human development, from conception through infancy, childhood and adolescence. NICHD recently developed and published a Five Year Plan for Nutrition Research and Training, which includes the following focal points: (1) nutrition epidemiology; (2) trace elements and micronutrients; (3) nutritional therapy of inborn errors of metabolism; (4) obesity and energy metabolism; (5) feeding low birth weight and term infants by enteral and parental nutrition; (6) lipoproteins and antecedents of adult vascular disease; (7) nutrient interactions; (8) nutrition and gastrointestinal development; (9) maternal-fetal nutrition; (10) fetal growth factors; (11) nutrition and nervous system function; and (12) human milk research.

National Eye Institute (NEI): NEI's nutrition related research is aimed at reducing the prevalence of blindness, visual impairment and eye disease, both within the U.S. and worldwide. Xerophthalmia, a potentially blinding vitamin A deficiency disease, is the leading cause of nutrition related blindness and visual impairment among the world's children.

National Institute of Environmental Health Sciences (NIEHS): See separate entry below.

National Institute on Aging (NIA): See separate entry below.

National Institute on Arthritis and Musculoskeletal and Skin Diseases (NIAMS): NIAMS supports research in the fields of (1) arthritis; (2) musculoskeletal diseases; (3) bone biology and bone diseases; (4) muscle biology; and (5) skin diseases.

National Institute on Deafness and Other Communication Disorders (NIDCD): NIDCD supports research in the fields of (1) hearing; (2) balance; (3) smell; (4) taste; (5) voice; (6) voice; (7) speech; and (8) language. Nutritional areas related to these fields include reciprocal interactions between nutrient intake and the chemical senses of smell and taste.

National Institute of Mental Health (NIMH): See separate entry below.

National Institute on Drug Abuse (NIDA): NIDA supports research on the role of dietary, nutritional and environmental factors on the pharmacology of
tolerance to and physical dependence on drugs of abuse.

National Institute on Alcohol Abuse and Alcoholism (NIAAA): NIAAA supports nutrition research to identify the complex relationships between alcohol consumption, nutritional status and health.

National Institute of Nursing Research (NINR): NINR supports nutrition research relating to health promotion, disease prevention and acute and chronic illnesses and disabilities.

National Center for Research Resources (NCRR): NCRR supports the development of critical research technologies that underpin health-related research to maintain and improve citizens’ health. Specific studies have examined diet composition; effectiveness of low-fat, high-carbohydrate diets; nutritional therapies; and the relationship between nutrients and behavior/ performance.

Fogarty International Center (FIC): FIC is responsible for international cooperation in the biomedical and behavioral sciences. FIC supports nutrition related research through several FIC competitive mechanisms, including individual fellowships, small research grants, scientific exchange programs and international agreements.

Dollar Expenditures: In FY 1995 NIH provided $428 million to support nutrition research and research training. Dollar expenditures for specific institutes are as follows:

<table>
<thead>
<tr>
<th>Institute</th>
<th>Expenditure</th>
</tr>
</thead>
<tbody>
<tr>
<td>NCI</td>
<td>$112,781,000</td>
</tr>
<tr>
<td>NHLBI</td>
<td>$73,466,000</td>
</tr>
<tr>
<td>NIDR</td>
<td>$6,408,000</td>
</tr>
<tr>
<td>NIDDK</td>
<td>$75,980,000</td>
</tr>
<tr>
<td>NINDS</td>
<td>$1,738,000</td>
</tr>
<tr>
<td>NIAID</td>
<td>$7,963,000</td>
</tr>
<tr>
<td>NIGMS</td>
<td>$2,503,000</td>
</tr>
<tr>
<td>NICHD</td>
<td>$32,818,000</td>
</tr>
<tr>
<td>NEI</td>
<td>$16,634,000</td>
</tr>
</tbody>
</table>
NIEHS   $   4,826,000
NIA     $   20,516,000
NIAMS   $    3,998,000
NIDCD   $    2,150,000
NIMH    $    8,446,000
NIDA    $    2,621,000
NIAAA   $    3,901,000
NINR    $    3,106,000
NCRR    $   22,130,000
FIC     $     166,000

Coordination with Other Agencies/States/Private Sector: Given the extensiveness of, and overlap in, the 19 programs outlined above, NIH devotes considerable attention to coordinating research activities of its various component institutes, as well as with other agencies. These coordinating bodies are:

Division of Research Coordination (DNRC), NIDDK: Because NIDDK takes the "lead role in nutrition and obesity research," NIDDK's Division of Research Coordination advises the NIH Director on nutrition research issues and works with other NIH components to coordinate research activities.

Nutrition Coordinating Committee (NCC): NCC consists of representatives from NIH's institutes and centers. Other NIH offices (i.e., that are not institutes or centers, USDA, and other non-NIH agencies within DHHS have liaison representatives to the NCC. NCC's goal is to minimize duplication of effort among the institutes and to present information uniformly, and identify areas where enhanced research efforts are needed.

Nutrition Policy Board (NPB): NPB provides a forum to coordinate nutrition policy development and implement programs within DHHS. NPB facilitates the exchange of information on DHHS nutrition activities, provides advice and counsel to the Secretary of DHHS on major nutrition policy issues, and serves as the focal point for nutrition policy matters with other Federal and non-Federal agencies and organizations.
DHHS Task Force on the Nutrition Objectives for the Nation: NIH and FDA are the "co-leads" on this Task Force, which sets nutrition objectives reflected in "Healthy People 2000: National Health Promotion and Disease Prevention Objectives."

Interagency Committee on Human Nutrition Research: ICHNR coordinates nutrition research at the Federal level. It is a subcommittee of the Committee on Health, Safety and Food Research and Development of the National Science and Technology Council, within the Office of Science and Technology Policy. ICHNR's mandate is to improve coordination and increase the effectiveness and productivity of all Federal agencies engaged in nutrition research.

Interagency Board for Nutrition Monitoring and Related Research, NIH: IBNMR was established in 1991 pursuant to the National Nutrition Monitoring and Related Research Act of 1990 to serve as the Federal focus for the coordination, management and direction of Federal nutrition monitoring activities. IBNMR's mandate covers monitoring of nutritional status, as opposed to research activities.

Extramural Research:

The major component of NIH's program is the extramural research program carried out at various universities in graduate science departments, particularly in departments of nutrition, medical, dental and other health professional schools of public health. Significantly, a large portion of the research projects is based on ideas developed and submitted by individual investigators from research institutions, from both the U.S. and abroad. Although most of the research is conducted on the NIH campus in Bethesda, Maryland, the following four institutes have off-campus programs:

(1) The NIA intramural program is carried out at the Gerontology Research Center in Baltimore, Maryland.

(2) The NCI intramural program is carried out at the Laboratory of Nutritional and Molecular Regulation in Frederick, Maryland.

(3) Some NIDDK intramural nutrition research is conducted at the Phoenix Epidemiology and Clinical Research Branch in Phoenix, Arizona.

(4) NIEHS is located at Research Triangle Park, North Carolina.
B. National Cancer Institute:

Major Thrust of Research and Reason Therefor: NCI supports research on the relationship between nutrition and cancer in a variety of general areas, including: (1) prevention; (2) epidemiology; (3) etiology; (4) basic cellular mechanisms; (5) therapy; (6) rehabilitation; (7) research development; and (8) information dissemination. An area of specific research focus is the role of carotenoids in cancer etiology and prevention.

Dollar Expenditures: See above.

C. National Heart, Lung, and Blood Institute:

Major Thrust of Research and Reason Therefor: NHLBI's mission is to help prevent three major diseases: (1) heart disease; (2) lung disorders; and (3) blood diseases:

Heart disease: Research efforts focus on (1) preventing heart attacks; (2) lowering blood pressure and blood cholesterol; and (3) reducing the incidence of atherosclerosis (hardening of the arteries).

Lung disorders: Research efforts focus on (1) evaluating the relationship between diet and genetic factors in determining a person's susceptibility to diseases of the lung; and (2) the potential role of nutrition in the cause and prevention of respiratory distress syndrome and pulmonary abnormalities.

Blood disease: Research efforts focus on (1) evaluating the relationship between diet and genetic factors in determining a person's susceptibility to diseases of the blood; and (2) the potential role of nutrition in the cause and prevention of sickle cell disease.

Focal points of future research: NHLBI anticipates undertaking future research in the following areas: (1) fatty acids; (2) antioxidants in vitamins; and (3) use of diet to prevent atherosclerosis.

Dollar Expenditures: See above.
D. National Institute of Environmental Health Science:

Major Thrust of Research and Reason Therefor: NIEHS research focuses on (1) the uptake of chemicals and compounds and their effect on health; (2) identifying, preventing and treating the adverse health effects from exposure to environmental agents; and (3) the interaction of environmental agents and the nutritional or dietary constituents of biological systems. NIEHS' view of nutrition is to look at chemicals and compounds found in foods, and to study their toxicity and effects on the body. The reason for this focus is NIEHS' belief that diet is a pathway for ingestion of harmful environmental chemicals. Specific research focal points are vitamin D and fatty acids.

Dollar Expenditures: See above.

E. National Institute on Aging:

Major Thrust of Research and Reason Therefor: NIA's mission is to foster research that finds methods to extend years of productive life through improved health, lifestyle and psychosocial status. NIA sponsors research to determine ways in which nutrition influences the onset and progression of aging and diseases of old age. Specific focal points of research are: (1) calory restriction; (2) malnutrition among the elderly; (3) nutrient requirements of the elderly; (4) interaction of nutrients in the body; and (5) examining why energy requirements for the elderly change.

Dollar Expenditures: See above.

F. National Institute of Mental Health:

Major Thrust of Research and Reason Therefor: NIMH supports basic and clinical nutrition studies that deal with behavioral, genetic, biological, psychological and social factors and their interactions as they affect eating behaviors and disease states. [BEHAVIOR]

Dollar Expenditures: See above.

G. Office of Alternative Medicine:

Major Thrust of Research and Reason Therefor: OAM conducts research to determine the efficacy of adding a variety of food additives to the diets of those who have allergy, asthma and immunology problems. OAM's official mandate
has the following four components:

- Facilitate the evaluation of alternative medical treatment modalities.
- Investigate and validate the efficacy of alternative treatments.
- Establish an information clearinghouse to exchange information with the public about alternative medicine.
- Support research training.

Dollar Expenditures: $900,000 for diet research for FY 1996.

Coordination with Other Agencies/States/Private Sector: OAM awarded UC-Davis $900,000 to establish the Center for Alternative Medicine and for the Center to conduct research. Taking food extracts and medicinal plant extracts and putting it into diets of people with allergy, asthma or other immunology problems.

H. **Agricultural Research Service:**

**Major Thrust of Research and Reason Therefor:**

USDA sees its "major role" as "to help individual consumers understand the relationship of food and its nutrients to the maintenance of health and the prevention of diet-related disorders during the different stages of life."

- Normal requirements for nutrients.
- Role of nutrition in promoting health and preventing diet-related disorders.
- Food composition and nutrient bioavailability.
- Food and nutrition monitoring research.
- Food and nutrition information and education research.
- Research on government policies and socioeconomic factors.
Research Focuses of the Five Research Centers:

The ARS is comprised of five research Centers. Research activities among the five Centers are organized as follows:

• **Beltsville, Maryland Human Nutrition Research Center:** This Center defines the role of food and food components in reducing the risk of nutritionally related disorders; nutrient composition; nutritional qualities of food; human performance in relation to energy and nutrient requirements; functions and interactions of nutrients in foods; dietary strategies to delay the onset of nutrition related chronic diseases and ameliorate infectious diseases.

• **Grand Forks, North Dakota Human Nutrition Research Center:** This Center studies the human requirements for trace elements and the physiological and biochemical factors which influence those requirements; bioavailability from common diets and interaction with other components of diet.

• **Western Human Nutrition Research Center, San Francisco, California:** This Center develops improved methods for monitoring and evaluating human nutritional status and to determine human nutritional requirements; factors that lead to malnutrition.

• **Human Nutrition Research Center on Aging, Boston, Massachusetts:** This Center conducts research on the special nutritional needs of people as they age in order to enhance the quality of later life through improved nutrition and health.

• **Children’s Nutrition Research Center, Houston, Texas:** This Center conducts research on the unique nutrient needs of pregnant and lactating women and of children from conception through adolescence. The Center also studies the interactions of dietary components with genetic heritage in growth and physiological and neurological development.
Dollar Expenditures:

1995 research support for the Agricultural Research Service diet related research was as follows:

- Nutrient Requirements/Health Maintenance $37.6 million
- Nutritional Status/Food Intake $7.1 million
- Use of Food/Food Choices $0.4 million
- Nutrient Composition/Bioavailability $6.0 million

TOTAL $51.1 million

Coordination with Other Agencies/States/Private Sector:

Another branch of USDA, the Cooperative State Research Service (CSRS) coordinates research conducted by Federal agencies, 59 State and territorial agricultural experiment stations, and 1,890 academic institutions. CSRS administers funds for this research provided through Congressional appropriations. The focuses of CSRS sponsored research include the following:

- Nutrient bioavailability.
- Health maintenance aspects of dietary recommendations designed to modify lipid metabolism.
- Behavioral and health factors that influence the food consumption of young adults.
- Diet intake and biochemical studies to arrive at a nutritional assessment of older adults.
- Evaluation of effective intervention methods to improve the well-being of rural elders.
- Knowledge, perceived risk and dietary practices in connection with dietary fat and fiber.
• Changing patterns of food demand and consumption behavior.

• Food safety through discovery and control of natural and induced toxicants and antitoxicants.

• Private strategies, public policies and food system performance.

I. **American Institute for Cancer Research:**

*Major Thrust of Research and Reason Therefor:* AICR's goals are to (1) support innovative breakthrough research on the role of diet and nutrition in the prevention and treatment of cancer; (2) gain understanding of the effects of dietary and nutritional factors on the etiology, pathogenesis, prevention and treatment of cancer; and (3) counterbalance what AICR perceives to be the influence of the food industry over Federal government sponsored research.

*Dollar Expenditures:* $4 million per year.

*Coordination with Other Agencies/States/Private Sector:* AICR coordinates its activities with its British sister organization, the World Cancer Research Fund.
III. NUTRIENTS AND OTHER FOOD COMPONENTS

A. Phytochemicals, Including Flavonoids and Carotenoids.

NATIONAL INSTITUTES OF HEALTH:

NCRR is conducting pharmacokinetic studies of anticarcinogenic isoflavones. [1]

NATIONAL CANCER INSTITUTE:

NCI is conducting antioxidant research specifically targeted to carotenoids. The overall goal of this research is to better understand the role of carotenoids in cancer etiology and prevention. Specific objectives are to compare the plasma carotenoid response to dietary sources of carotenoids and to pharmaceutical doses of beta-carotene. The studies attempt to quantify carotenoid content of fruits and vegetables to permit a more valid examination of the relationship between individual dietary carotenoid intake and cancer. [2]

NCI is conducting research into phytochemicals in fruits and vegetables, the primary objective of which is to elucidate which phytochemicals in fruits and vegetables are the most important in reducing the risk of colon and breast cancer. [3]

NCI is conducting research on the epidemiologic applications of the USDA-NCI carotenoid database, the overall goal of which is to improve the understanding of the role of carotenoids in the etiology and prevention of cancer by applying the USDA-NCI carotenoid database to epidemiological studies. The analysis will compare dietary carotenoid intake among U.S. adults by demographic and lifestyle characteristics in order to identify high-risk groups for chronic disease prevention efforts. The objective of the related nurses study analyses is to estimate the relative risks of breast cancer incidence by level of carotenoid intake alone and in relation to recognized risk factors for breast cancer. [4]

NCI is studying ways of measuring phytochemicals in fruits, vegetables and biological fluids, and assessing phytochemicals for their potential role in cancer prevention. [5]

NATIONAL INSTITUTE OF MENTAL HEALTH:
NATIONAL HEART, LUNG, AND BLOOD INSTITUTE:

NHLBI is supporting extramural research on fatty acid analysis and its evaluation in order to expand and improve the database on the nutrient composition of the U.S. food supply, as well as the means of disseminating this information. This research is emphasizing the transfatty acids content of foods in the American diet. Other activities include compilation of data on carotenoids, tocopherols and other antioxidants in commonly eaten foods. [6]

NATIONAL INSTITUTE OF ENVIRONMENTAL HEALTH SCIENCE:

NATIONAL INSTITUTE ON AGING:

OFFICE OF ALTERNATIVE MEDICINE:

AGRICULTURAL RESEARCH SERVICE:

ARS has conducted an analysis of the dietary regulation of sex hormone synthesis and metabolism. Specifically, this study examines whether dietary regulation of estrogen synthesis in fat tissue may influence cancer development in postmenopausal women. Flavonoids and lignans found in fruits, vegetables, grains and legumes were found to inhibit estrogen synthesis to same degree as drugs used in cancer chemotherapy. This work may ultimately lead to dietary recommendations for cancer prevention. [7]

USDA has supported research on carotenoid absorption and metabolism. [8]

AMERICAN INSTITUTE FOR CANCER RESEARCH:

AICR is supporting research to determine whether three carotenoids in fruits and vegetables can prevent the initiation or promotion of breast or bladder cancer. [9]

AICR is sponsoring research on the inhibition of breast cancer by soy bean isoflavones. These studies are looking at: (1) whether a substance found in soy beans inhibits the development of breast cancer by interfering with the effect of estrogen on the growth of certain tumors; and (2) isoflavones and the mechanisms of action that inhibit breast cancer development. [10]

AICR is sponsoring research examining the effects of isoflavones on human breast cancer cells. [11]
AICR is sponsoring research to investigate the mechanisms by which retinoids exert their beneficial effects in cancer prevention and treatment. These studies will result in a better understanding of chemopreventive actions of retinoids and result in optimizing the use of dietary retinoids for the prevention of breast cancer. [12]

AICR is sponsoring research into the regulation of cervical cells by retinoids and aims to elucidate the mechanisms by which retinoids regulate insulin growth factor binding proteins (IGFBP’s). The researcher hypothesizes that retinoids may act as chemopreventive agents by increasing IGFBP-3 levels, which in turn mediate the inhibitory effects of retinoids on cervical cancer cell proliferation. [13]

AICR is sponsoring research to determine if a substance called quercetin, commonly found in vegetables and fruits, can interfere with the development of skin cancer. [14]

AICR is sponsoring research to investigate the efficiency by which various carotenoids quench oxygen radicals and whether the efficiency is dependent on the molecular environment. The major role of carotenoids in cancer prevention is that of quenching oxygen radicals (superoxide and peroxyl radicals). The researcher intends to identify the most effective and useful forms of carotenoids for cancer prevention. [15]
B. **Fibers.**

**NATIONAL INSTITUTES OF HEALTH:**

**NATIONAL CANCER INSTITUTE:**

NCI is conducting studies to investigate the effect of different levels and types of fat and fiber on a number of biologic parameters that may be involved mechanistically in carcinogenesis (e.g., hormone status, fecal mutagenicity, bile acid metabolism, prostaglandins) or that might serve as compliance markers in dietary intervention studies (e.g., serum lipids). Specific studies included as part of this effort are: the premenopausal women’s study; the men’s study; postmenopausal women’s study. [16]

NCI is conducting research aimed at determining the effects of different levels and types of fat and fiber on a number of biologic parameters that may be involved mechanistically in carcinogenesis. [17]

NCI is studying methods of food preparation and processing, as well as ingestion of food, alcohol, fat and fiber, for their role in the prevention of cancer. [18]

A group of NCI investigators is conducting a randomized trial to evaluate the role of dietary fiber and calcium in subjects at elevated risk of developing colon carcinoma. [19]

**NATIONAL INSTITUTE OF MENTAL HEALTH:**

**NATIONAL HEART, LUNG, AND BLOOD INSTITUTE:**

**NATIONAL INSTITUTE OF ENVIRONMENTAL HEALTH SCIENCE:**

**NATIONAL INSTITUTE ON AGING:**

**OFFICE OF ALTERNATIVE MEDICINE:**
**Agricultural Research Service:**

ARS has conducted a study to determine whether zinc absorption is greater from beef than from a high-fiber breakfast cereal. The researchers found that zinc absorption is about fourfold higher from hamburger than from breakfast cereal. This finding is important, because it suggests that more zinc-rich foods may need to be included in the diet of persons who consume lower amounts of meat and higher amounts of dietary fiber. The finds suggest that cereal manufacturers should consider the merits of adding zinc to their high fiber cereals. [20]

**American Institute for Cancer Research:**

AICR is sponsoring research to study different types of dietary fiber which could effect the physiology of the large intestine and subsequent development of colon cancer. [21]
C. **Fats.**

**NATIONAL INSTITUTES OF HEALTH:**

NIDDK is investigating the mechanisms by which nutrients such as fatty acids or amino acids might affect renal function. [22]

NIAMS is researching the effects of omega-3 fatty acids administered as fish oil supplements on the pathogenesis of rheumatoid arthritis and other diseases characterized by chronic inflammation. [23]

NIAAA is supporting research on the possible role of fat composition of the diet on induction of fatty liver or liver cirrhosis. [24]

NCRR is studying the effects of a low-fat, high-carbohydrate diet on serum and breast ductal fluid hormones in healthy premenopausal women. [25]

A Fogarty scholar-in-residence has prepared a comprehensive review of articles on vitamin A absorption, transport, cellular uptake and storage; and on dietary fat and blood lipids. [26]

**NATIONAL CANCER INSTITUTE:**

NCI is conducting clinical trials to evaluate the effectiveness of low-fat dietary patterns in preventing the recurrence of breast cancer, skin cancer and adenomatous polyps. [27]

NCI is conducting a Polyp Prevention Trial to determine whether a low fat, high vegetable and fruit eating plan will decrease the recurrence of adenomatous polyps of the large bowels. [28]

*See also* entries ## 16, 17 and 18.

**NATIONAL INSTITUTE OF MENTAL HEALTH:**

**NATIONAL HEART, LUNG, AND BLOOD INSTITUTE:** NHLBI is evaluating the association between diet and triglyceride metabolism and the relationship between metabolism of triglycerides and development of coronary artery disease. [29]

NHLBI is studying the role of physical activity and calorie restriction on weight reduction over the long term; examining the risks conferred by obesity or body fat distribution; and evaluating approaches to risk reduction by population groups. [30]
NHLBI is attempting to determine the effectiveness and safety of a cholesterol-lowering diet in children and adolescents. [31]

NHLBI is conducting research to determine the long-term safety, efficacy, acceptability of a modified fat diet in children with elevated serum LDL cholesterol. The study is expected to be extended for seven years to assess long-term effects of dietary intervention on the growth and development of children and adolescents. [32]

NHLBI is conducting a variety of studies examining how reduction of cholesterol levels in childhood will yield benefits in adulthood. [33]

NATIONAL INSTITUTE OF ENVIRONMENTAL HEALTH SCIENCE:

NATIONAL INSTITUTE ON AGING:

OFFICE OF ALTERNATIVE MEDICINE:

AGRICULTURAL RESEARCH SERVICE:

ARS has conducted research comparing the impact of a diet patterned after the "Dietary Guidelines for Americans" with that of a diet reflecting the nutrition intake recorded by the 1974 "Health and Nutrition Examination Survey." This study confirms a significant Guidelines-mediated impact on serum cholesterol and LDL cholesterol levels. [34]

ARS has conducted research to determine whether transfatty acids cause plasma total and LDL-cholesterol elevation similar to, but no greater than, those from a diet with equally high levels of saturated fatty acids. Thus, partially hydrogenated vegetable oils may continue to be consumed in moderation as a part of a healthy, fat-controlled diet. ARS concludes that the results of this study are important to consumers, as well as to farmers and manufacturers in the oilseed industry who want to produce healthy foods. [35]

USDA has supported research on lipid responsiveness to dietary lipid in black and white women. [36]

AMERICAN INSTITUTE FOR CANCER RESEARCH:

AICR is sponsoring research to determine how the intensity, duration and timing of exercise, together with the level of fat, effect the development of
breast cancer. [37]

AICR is sponsoring research to investigate how dietary fat in the form of omega-3 (fish oil) fatty acids might alter the immune response and prostaglandin metabolism, influence the rate of tissue protein synthesis, and inhibit the growth of breast cancer cells. [38]

AICR is sponsoring research to determine how exercise, either voluntary or involuntary, combined with a high-fat or low-fat diet, can affect the development of pancreatic cancer. [39]

AICR is sponsoring research to determine if lowering the amount of fat in the diet to 20% of calories can lead to a reduction in the levels of the hormones estrogen and biologically-active prolactin circulating in the blood of women who are suffering from severe cystic breast disease and may be at special risk of developing breast cancer. [40]
D. **Vitamins.**

**National Institutes of Health:**

NIDR is conducting research on the effect of dietary factors on the initiation and progression of oral cancers and the role of vitamin E and vitamin A related compounds in the control or reversal of cancerous lesions. [41]

NEI is conducting studies aimed at the prevention of vitamin A malnutrition, including methods of assessing the relative vitamin A status of individuals. [42]

NEI is researching the roles of vitamins E and C in nourishing ocular tissues and in maintaining visual acuity during natural and induced chronic and acute exposure to oxidants. [43]

NIAMS is conducting research to determine the role of vitamin D metabolism in the pathogenesis of the vitamin D refractory diseases. [44]

NIAMS is studying the direct effects of vitamin D on bone cells in culture. [45]

NIAMS is researching the photobiology of vitamin D. [46]

NIAMS is researching the possible therapeutic uses of vitamin A and its synthetic derivatives, the retinoids, in skin biology. [47]

NIAAA is supporting research on the interaction between chronic alcohol intake and the bioavailability of water-soluble vitamins such as thiamine, riboflavin, vitamin B6, folic acid, vitamin B12 and vitamin C. [48]

NIAAA is supporting research on the role of thiamine in the etiology of Wernicke-Korsakoff syndrome. [49]

*See also* entry # 26.

**National Cancer Institute:**

NCI is conducting an Alpha-Tocopherol, Beta-Carotene Cancer Prevention Study to evaluate the effectiveness of beta-carotene and alpha-tocopherol (vitamin E) supplementation in preventing lung cancer in a high risk group, secondary objective is to study the effect of beta-carotene and vitamin E supplementation on occurrence of cancer at other sites. Conducting intervention trials to test the effect of nutritional and chemical preventive
agents and diet modification in reducing cancer risk. [50]

NCI is studying the bioavailability of ascorbic acid administered in different forms, including tablets, fruits and vegetables. A secondary objective is to evaluate the effects of ascorbate depletion on selected functional parameters (e.g., plasma cholesterol, immune function and status of other antioxidants). Results to date indicate that ascorbic acid ingested as equal amounts of cooked broccoli, orange juice or fruit (or in synthetic form) appear to be equally bioavailable. [51]

NCI has conducted, and is now evaluating the results of, a study on lung cancer prevention using chemoprevention agents in Finland and multiple vitamin and mineral-based study of the prevention of esophageal cancer among 34,000 subjects in China. [52]

National Institute of Mental Health:

National Heart, Lung, and Blood Institute:

NHLBI is conducting a number of clinical trials to assess the role of antioxidants such as beta-carotene, vitamin C and vitamin E in the prevention of cardiovascular disease. [53]

NHLBI is conducting an examination of antioxidants and atherosclerosis in order to determine whether the oxidation of blood LDL plays an important role in the pathogenesis of atherosclerosis. This study will examine whether individuals in the lower quintile of vitamin C, vitamin E and carotenoid consumption are at higher risk of asymptomatic atherosclerosis than those consuming greater amounts. [54]

See also entry # 6.

National Institute of Environmental Health Science:

National Institute on Aging:

Office of Alternative Medicine:
AGRICULTURAL RESEARCH SERVICE:

ARS is conducting research to determine the associations of folate, vitamin B-12 and vitamin B-6 in order to determine whether they are associated with plasma, homocysteine in older Americans. Recent studies have demonstrated associations between some cardiovascular and neuropsychiatric diseases and elevated levels of homocysteine, a nonprotein that forms amino acid. A strong case can now be made for the prevention of the marginal deficiencies of these vitamins, common among older people, as they may be linked to the risk of cardiovascular disease, the leading cause of death in this population. [55]

ARS is conducting research to determine whether oxidative damage was increased while women subjects were fed a low carotene diet. The results of this study suggest which carotenes may form an important part of the antioxidant defense system. [56]

ARS is conducting research to determine if a normal diet low in carotenes and normal diet high in carotenes would prevent oxidative damage. If this experiment is substantiated, it will show that carotenes can protect people from oxygen damage, which may contribute to some diseases. [57]

USDA has supported research on the effect of calcium supplementation of young adult white women on bone mass. [58]

AMERICAN INSTITUTE FOR CANCER RESEARCH:

AICR is sponsoring research to examine the possible protective effects of dietary and aerosol vitamin E and glutathione against lung cancer resulting from oxidizing pollutants. [59]

AICR is sponsoring research to determine whether the addition of beta-carotene to the diet can prevent the growth of salivary gland tumors and whether beta-carotene affects the functioning of the membranes in normal glands and in tumors. [60]

AICR is sponsoring research to determine whether selenium and vitamin E might enhance the conversion of beta-carotene to vitamin A. Independently, selenium, vitamin E and beta-carotene have been associated with reduced cancer risk. The combination in our diets might further reduce cancer risks. [61]

AICR is sponsoring research to determine if a deficiency of folate, a B vitamin, in the diet causes a deficiency in folate in the colon tissue and thereby possibly increases the risk for developing colon cancer. [62]
E. Antioxidants.

**NATIONAL INSTITUTES OF HEALTH:**

NIDDK is conducting basic and clinical studies on the effects of nutrient antioxidants on cellular metabolism and function. [63]

NEI is studying the nutrient environment in which cataract and macular degeneration develop and the potential for altering this environment to prevent or arrest the cataractous and degenerative process. Deficits of antioxidant nutrients are under particular scrutiny in efforts to clarify the etiology of cataract. [64]

**NATIONAL CANCER INSTITUTE:**

*See* entries ## 2 and 51.

**NATIONAL INSTITUTE OF MENTAL HEALTH:**

**NATIONAL HEART, LUNG, AND BLOOD INSTITUTE:**

NHLBI is evaluating the effects of natural antioxidants (e.g., alpha-tocopherol, ascorbic acid, and beta-carotene) as antiatherosclerotic agents. [65]

*NHLBI is evaluating the effect of natural antioxidants (e.g., alpha-tocopherol, ascorbic acid, and beta-carotene) as antiatherosclerotic agents.* [66]

*See also* entries ## 6, 53 and 54.

**NATIONAL INSTITUTE OF ENVIRONMENTAL HEALTH SCIENCE:**

NIEHS is supporting research on the biological effects of selenium, an essential trace metal, including antioxidant or free radical scavenging activity. [67]

**NATIONAL INSTITUTE ON AGING:**

NIA is supporting research on preventing protein oxidation in the brain, which may be able to prevent damage following stroke or heart attacks in humans. This research involves using a synthetic antioxidant compound to reduce the level of reactive oxygen species. [68]
OFFICE OF ALTERNATIVE MEDICINE:

AGRICULTURAL RESEARCH SERVICE:

ARS is sponsoring research to determine whether antioxidant nutrients from diet are protective for age-related eye regeneration. Results of this research suggest that antioxidant vitamins may protect against some of the age-related changes in the eye. General supplement use, however, does not appear to be associated with protection. [69]

See also entry # 56.

AMERICAN INSTITUTE FOR CANCER RESEARCH:

AICR is sponsoring research to determine whether antioxidants in foods can protect against damage to DNA and thus lower cancer risk. [70]
F. Proteins.

**National Institutes of Health:**

NIDDK is conducting research to determine the relationship of the role of dietary protein to that of phosphate in protein's effect on kidney function. [71]

NIAID is investigating the relationship between food allergies and the immune response to ingested antigens and orally induced immunological response to proteins. [72]

**National Cancer Institute:**

**National Institute of Mental Health:**

**National Heart, Lung, and Blood Institute:**

**National Institute of Environmental Health Science:**

**National Institute on Aging:**

*See entry # 68.*

**Office of Alternative Medicine:**

**Agricultural Research Service:**

**American Institute for Cancer Research:**

*See entry # 13.*
G. Minerals and Trace Elements.

NATIONAL INSTITUTES OF HEALTH:

NIDDK is studying the detrimental effects of iron deficiency in terms of such factors as work capacity and performance; physical and mental development; function, susceptibility to infection and prenatal morbidity and mortality. [73]

NIDDK is assessing the requirement levels and metabolic roles of trace elements. [74]

NEI is conducting research on the fundamental role played by essential minerals such as zinc, calcium and magnesium in lens metabolism and on the consequences of disturbances in mineral balances to eye health. The association between ascorbic acid levels in ocular fluids and the healing process after corneal trauma is also under investigation. [75]

NEI is attempting to detail the fundamental role of essential minerals that are critical in retinal function, intraocular transport and function. NEI is also attempting to determine whether dietary modifications may be effective in correcting the biochemical abnormalities associated with gyrate atrophy and other retinal degenerative diseases. [76]

NIAMS is conducting studies to determine the optimal intake of calcium and the role of exercise in the development and maintenance of strong, healthy bones; for attaining a maximum adult peak bone mass; for minimizing the rate of bone loss in older individuals; and for preventing osteoporosis. [77]

NIAMS is assessing calcium absorption in humans and its relationship to calcium intake, estrogen status (in women) and age. [78]

NIAMS is conducting studies of the effects of aluminum on bone formation and osteoporosis. [79]

NIAAA is encouraging studies on alcohol effects on the absorption, utilization and excretion of minerals (iron, magnesium, zinc, selenium and calcium) to clarify the role that alcohol-induced changes in these minerals may play in the induction of pathological consequences of chronic alcohol consumption, such as liver fibrosis and hypertension. [80]

NIAMS is investigating the effects of fluoride on the cellular and matrix components of bone. [81]
NATIONAL CANCER INSTITUTE:

See also entries ## 19 and 52.

NATIONAL INSTITUTE OF MENTAL HEALTH:

NATIONAL HEART, LUNG, AND BLOOD INSTITUTE:

NATIONAL INSTITUTE OF ENVIRONMENTAL HEALTH SCIENCE:

See entry # 67.

NATIONAL INSTITUTE ON AGING:

OFFICE OF ALTERNATIVE MEDICINE:

AGRICULTURAL RESEARCH SERVICE:

See entry # 20.

AMERICAN INSTITUTE FOR CANCER RESEARCH:

AICR is supporting research to determine whether the risk of skin cancer is related to the level of selenium in the blood and if selenium supplementation can prevent the development of skin cancer in patients who have increased risk of developing non-melanoma. [82]

AICR is sponsoring research examining the effects of dietary potassium on colorectal cancer. [83]

AICR is sponsoring research to study the role of zinc deficiency and the interaction of zinc with other metals during the growth and development of human colon cancer cells. [84]

AICR is sponsoring research to study the level of zinc in the diet that may be able to block the development of cancer caused by the toxic metal cadmium. [85]

AICR is sponsoring research aimed at preventing skin cancer in patients at high risk of reoccurrence. This project will test the hypothesis that a dietary
supplement of selenium will help prevent recurrent skin cancer. [86]

AICR is sponsoring research to investigate the synergistic effects of allyl compounds within garlic and dietary selenium in the inhibition of experimentally DMBA-induced breast cancer. This study will also examine the mechanism of action by which the various garlic compounds influence the ability of selenite to depress DMBA-DNA induced binding and determine the optimal combination of these substances to maximize the reduction of this binding. [87]
H. Other Nutrients.

**NATIONAL INSTITUTES OF HEALTH:**

NIDDK is conducting fundamental studies exploring nutritional factors that are active in absorption and metabolism, the biological control of such processes, and the identification of unrecognized roles of nutrients or their metabolites. [88]

NIDDK is studying the roles of specific nutrients in cellular and DNA repair mechanisms, and in the maintenance of cell integrity. [89]

NINDS is studying the need for nutrients and cofactors during the prenatal and postnatal development of the nervous system. [90]

NINDS is studying the nutritional requirements of the nervous system for lifelong health. [91]

NIA is researching nutrient requirements and their age-dependent requirements in older people, including determinants of nutrient homeostases with aging and the role of nutrients and other components of foods in neurologic function. [92]

NIA is studying the effects of physiological processes through which nutrients, drugs and other non-nutrient substances are absorbed, metabolized and excreted in humans and in analogous animal models. [93]

NCRR is studying the effects of high concentrations of fructose and aspartame on behavioral and cognitive performance in children. [94]

*See also* entry # 22.

**NATIONAL CANCER INSTITUTE:**

NCI is studying the quantitative relationships between food, nutrient intake and cancer incidence. [95]

NCI is studying the relationship between levels of micronutrients in blood and tissue and cancer risk. [96]

NCI is seeking nutritional agents that may serve in the chemoprevention of cancer, and is developing methodologies to evaluate the cost-effectiveness of these prevention strategies. [97]
NCI is also conducting a randomized, double-blind, placebo-controlled clinical trial to evaluate the efficacy of nutritional supplements in preventing neoplastic polyps of the large bowels in persons at high risk for this condition. [98]

NATIONAL INSTITUTE OF MENTAL HEALTH:

NATIONAL HEART, LUNG, AND BLOOD INSTITUTE:

NHLBI is conducting studies to develop biomarkers to analyze nutrient metabolism, nutrient interaction, effects of dietary methods to prevent or reverse cardiovascular, lung and blood diseases. [99]

NHLBI is developing biomarkers to study nutrient metabolism; nutrient interaction; and the effects of dietary method to prevent or reverse cardiovascular, lung and blood diseases. [100]

NHLBI is supporting research on the role of various nutrients on nonrespiratory lung functions, one example being the synthesis and metabolism of surfactant and prostaglandins. [101]

NHLBI is attempting to identify behavioral determinants of food consumption patterns and nutrient intake related either to risk of disease or promotion of health. [102]

NATIONAL INSTITUTE OF ENVIRONMENTAL HEALTH SCIENCE:

NATIONAL INSTITUTE ON AGING:

OFFICE OF ALTERNATIVE MEDICINE:

AGRICULTURAL RESEARCH SERVICE:

AMERICAN INSTITUTE FOR CANCER RESEARCH:
I. **Foods and Food Components.**

**NATIONAL INSTITUTES OF HEALTH:**

NIDR is researching the molecular basis of taste and on the development of safe, noncaloric sweeteners that are also noncarcinogenic. [103]

NIDR is conducting research on safe, short-term intraoral methods to assess the caries-producing potential of foods and the effectiveness of anticariogenic agents. [104]

NICHD is studying human milk, cow milk and synthetic formula to assess the requirements for optimal growth and development in normal and low birth weight infants. [105]

NIDCD is exploring the role of salt intake and salt preference in the etiology and management of hypertension. [106]

NIDCD is evaluating the possibility of using specific flavor enhancers (e.g., salt enhancers) to affect food selection and blood pressure management. [107]

**NATIONAL CANCER INSTITUTE:**

NCI is conducting basic studies to understand the fundamental mechanisms of action of dietary patterns and dietary constituents in the initiation, promotion, progression and prevention of cancer. [108]

The NCI in conjunction with the American Association of Retired Persons, is conducting an observational cohort study to investigate the relationship between dietary intake and cancer of the breasts, large bowel, and prostate. Most recent samplings will take account of other dietary intake factors thought to be related to cancer risk: daily servings of fruit and vegetables, daily fiber intake, and daily servings of red meat. [109]

*See also* entries ## 2, 5, 18, 28, 51 and 95.

**NATIONAL INSTITUTE OF MENTAL HEALTH:**

**NATIONAL HEART, LUNG, AND BLOOD INSTITUTE:**

NHLBI is conducting the Dietary Approaches to Stop Hypertension (DASH) study, which is comparing the efficacy of two diets -- one high in fruits and
vegetables, and the other low in fat and high in nonfat or low-fat dairy products -- for lowering blood pressure in individuals with high normal blood pressure or with mild hypertension. Results from DASH are expected to provide additional dietary recommendations for use in public health and patient education efforts, particularly with respect to minorities. [110]

National Institute of Environmental Health Science:

NIEHS is identifying a number of mutagens that are formed when beef is fried or broiled under normal household conditions. This study is indicating the effects of time and cooking temperature on mutagen formation. NIEHS is also attempting to identify biomarkers of exposure and additional mutagens. [111]

National Institute on Aging:

Office of Alternative Medicine:

Agricultural Research Service:

ARS has compiled and maintains a "National Nutrient Databank," which is the primary mechanism for collecting, evaluating, storing and collating data on the nutrient composition of food. The Databank has reference values for over 60 food components in thousands of foods Americans consume. [112]

See also entry # 20.

American Institute for Cancer Research:

AICR is sponsoring research to determine whether the addition of large amounts of cabbage to the diet can prevent the development of breast cancer or the spread of cancer to the lungs. [113]

AICR is sponsoring research to see if "yo-yo" dieting alternating between low and high calorie diets to manage body weight increases the development of breast cancer. [114]

AICR is sponsoring research investigating whether components of the Chinese diet genistein present in soy and green tea, and phytate present in rice prevent the promotion and progression of the initiated prostate cells. These studies aim to clarify the role of dietary components in the prevention of latent early prostate cancer from developing into a clinically significant disease. [115]
AICR is sponsoring research to assess the effect of a soy milk dietary supplement, given to premenopausal women, on levels of ovarian hormones and other parameters of hormonal functions to furnish information on diets that may protect against breast cancer. [116]

*See also* entries ## 9 and 87.
IV. Behavior, Mood, Memory and Depression

A. Behavior.

**National Institutes of Health:**

*See* entry # 94.

**National Cancer Institute:**

**National Institute of Mental Health:**

NIMH is examining the effects of nutrient intake on cerebral functioning, mood and behavior. [117]

NIMH is studying the neurobiological correlates of eating behavior and eating disorders. [118]

NIMH is researching the biological mechanisms that determine and regulate ingestive behaviors such as hunger, thirst, satiety and taste. [119]

NIMH is studying the effects of dieting on appetite regulation and on the metabolic mechanisms underlying eating behavior, dieting and obesity. [120]

NIMH is supporting research examining social, cultural and psychological factors affecting food habits and their relationship to nutritional status and behavior. [121]

NIMH is supporting research on genetic, biological and behavioral factors associated with childhood and adult obesity. [122]

**National Heart, Lung, and Blood Institute:**

*See* entry # 102.

**National Institute of Environmental Health Science:**

**National Institute on Aging:**

36
OFFICE OF ALTERNATIVE MEDICINE:

AGRICULTURAL RESEARCH SERVICE:

AMERICAN INSTITUTE FOR CANCER RESEARCH:
B. Mood.

NATIONAL INSTITUTES OF HEALTH:

NIDCD is investigating the physiological role of chemosensory stimulation in humans by examining the relationship between oral sensory stimulation and nutrient metabolism. [123]

NATIONAL CANCER INSTITUTE:

NATIONAL INSTITUTE OF MENTAL HEALTH:

See entry # 117.

NATIONAL HEART, LUNG, AND BLOOD INSTITUTE:

NATIONAL INSTITUTE OF ENVIRONMENTAL HEALTH SCIENCE:

NATIONAL INSTITUTE ON AGING:

OFFICE OF ALTERNATIVE MEDICINE:

AGRICULTURAL RESEARCH SERVICE:

AMERICAN INSTITUTE FOR CANCER RESEARCH:
C. Memory.

National Institutes of Health:

See entry # 94.

National Cancer Institute:

National Institute of Mental Health: See # 117.

National Heart, Lung, and Blood Institute:

National Institute of Environmental Health Science:

National Institute on Aging:

Office of Alternative Medicine:

Agricultural Research Service:

American Institute for Cancer Research:
D. Depression

NATIONAL INSTITUTES OF HEALTH:

NATIONAL CANCER INSTITUTE:

NATIONAL INSTITUTE OF MENTAL HEALTH:

NIMH is researching possible links between depression and immunity. Among the various questions to be examined in this research are whether such practices as sleep, diet, caffeine and alcohol intake, cigarette use and exercise account for the associations of depression with immunity. [124]

NATIONAL HEART, LUNG, AND BLOOD INSTITUTE:

NATIONAL INSTITUTE OF ENVIRONMENTAL HEALTH SCIENCE:

NATIONAL INSTITUTE ON AGING:

OFFICE OF ALTERNATIVE MEDICINE:

AGRICULTURAL RESEARCH SERVICE:

AMERICAN INSTITUTE FOR CANCER RESEARCH:
V. SPECIFIC DISEASES

A. Heart Diseases.

NATIONAL INSTITUTES OF HEALTH:

See entries ## 80 and 106.

NATIONAL CANCER INSTITUTE:

NATIONAL INSTITUTE OF MENTAL HEALTH:

NATIONAL HEART, LUNG, AND BLOOD INSTITUTE:

NHLBI is attempting to determine the long-term effects of a dietary pattern that would be successful in lowering blood pressure in the general population and determine which dietary components cause this reduction in blood pressure. [125]

NHLBI is attempting to determine the long-term effects of a dietary pattern that would be successful in lowering blood pressure in the general population, and to determine which dietary components cause such a reduction in blood pressure. [126]

NHLBI is attempting to determine the role of body weight, weight distribution and diet in cardiovascular disease and its risk factors. [127]

NHLBI is promoting research on cardiovascular health effects of physical activity and diet. [128]

NHLBI is exploring the role of nutrition in intervention studies of cardiovascular disease risk. [129]

NHLBI is analyzing the role of nutrients and other dietary factors in the genesis, treatment and prevention of blood vessel obstruction. [130]

See entries ## 29, 31, 54, 65, 99, 100 and 110.

NATIONAL INSTITUTE OF ENVIRONMENTAL HEALTH SCIENCE:
NATIONAL INSTITUTE ON AGING:

See entry # 68.

OFFICE OF ALTERNATIVE MEDICINE:

AGRICULTURAL RESEARCH SERVICE:

See entry # 55.

AMERICAN INSTITUTE FOR CANCER RESEARCH:
B. Cancers.

NATIONAL INSTITUTES OF HEALTH:

FIC is conducting a study on developing a new biostatistical method for the analysis of disease prevention research, which will allow the consideration of multiple risk factors, including nutrition. [131]

See also entries ## 1, 41 and 103.

NATIONAL CANCER INSTITUTE:

See entries ## 2, 3, 4, 5, 16, 17, 18, 19, 27, 28, 50, 52, 95, 96, 97, 98, 108, 109 and 165.

NATIONAL INSTITUTE OF MENTAL HEALTH:

NATIONAL HEART, LUNG, AND BLOOD INSTITUTE:

NATIONAL INSTITUTE OF ENVIRONMENTAL HEALTH SCIENCE:

NIEHS is undertaking a project to determine the potential carcinogenicity of certain foodborne toxicants. This program focuses on potential carcinogens to which intermittent human exposure at low levels is virtually unavoidable and that have been established as risk factors for human cancers by epidemiologic studies. [132]

NATIONAL INSTITUTE ON AGING:

OFFICE OF ALTERNATIVE MEDICINE:

AGRICULTURAL RESEARCH SERVICE:

See entry # 7.

AMERICAN INSTITUTE FOR CANCER RESEARCH:

See entries ## 9, 10, 11, 12, 13, 14, 15, 21, 37, 38, 39, 40, 59, 60, 61, 62, 70, 82, 83, 84, 85, 86, 87, 113, 114, 115 and 116.
C. **Blood Diseases.**

**NATIONAL INSTITUTES OF HEALTH:**

*See entry # 107.*

**NATIONAL CANCER INSTITUTE:**

**NATIONAL INSTITUTE OF MENTAL HEALTH:**

**NATIONAL HEART, LUNG, AND BLOOD INSTITUTE:**

NHLBI is evaluating the relationship between diet and genetic factors in determining a person's susceptibility to diseases of the blood. [133]

NHLBI is attempting to elucidate the role of nutrients and other dietary factors in the genesis, treatment and prevention of blood vessel obstruction. [435]—

*See also* entries ## 99 and 100.

**NATIONAL INSTITUTE OF ENVIRONMENTAL HEALTH SCIENCE:**

**NATIONAL INSTITUTE ON AGING:**

**OFFICE OF ALTERNATIVE MEDICINE:**

**AGRICULTURAL RESEARCH SERVICE:**

**AMERICAN INSTITUTE FOR CANCER RESEARCH:**

44
D. Kidney Diseases.

NATIONAL INSTITUTES OF HEALTH:

See entry # 71.

NATIONAL CANCER INSTITUTE:

NATIONAL INSTITUTE OF MENTAL HEALTH:

NATIONAL HEART, LUNG, AND BLOOD INSTITUTE:

NATIONAL INSTITUTE OF ENVIRONMENTAL HEALTH SCIENCE:

NATIONAL INSTITUTE ON AGING:

NIA is researching the role of nutrition factors in prevention and treatment of age-related degenerative diseases, including diabetes, osteoporosis, neurologic disorders, immune deficits, heart disease, cancer, gastrointestinal diseases, problems of the oral cavity and kidney diseases. [136]

OFFICE OF ALTERNATIVE MEDICINE:

AGRICULTURAL RESEARCH SERVICE:

AMERICAN INSTITUTE FOR CANCER RESEARCH:
E. **Neurological Diseases.**

**NATIONAL INSTITUTES OF HEALTH:**

**NATIONAL CANCER INSTITUTE:**

**NATIONAL INSTITUTE OF MENTAL HEALTH:**

**NATIONAL HEART, LUNG, AND BLOOD INSTITUTE:**

**NATIONAL INSTITUTE OF ENVIRONMENTAL HEALTH SCIENCE:**

**NATIONAL INSTITUTE ON AGING:**

**OFFICE OF ALTERNATIVE MEDICINE:**

**AGRICULTURAL RESEARCH SERVICE:**

*See entry # 55.*

**AMERICAN INSTITUTE FOR CANCER RESEARCH:**
F. Other Diseases, Ailments and Disorders.

NATIONAL INSTITUTES OF HEALTH:

NIDR is conducting research on the effects of nutrition on the biology of bone and soft tissue; the etiology and prevention of oral ulcerative diseases; and wound healing. [137]

NIDR is studying nutritional and dietary factors in oral bone loss, osteoporosis, and oral diseases in older persons and other high-risk populations. [138]

NIDDK is studying the causes of wasting, malnutrition and other nutritional disorders that occur in renal failure. [139]

NIDDK is conducting research on the role of calorie intake and physical activity, and subsequent weight control, in the prevention of type II diabetes. [140]

NINDS is studying the role, if any, of specific dietary factors in the etiology or prevention of neurologic disorders such as stroke, Alzheimer's disease, and Parkinson's disease. [141]

NINDS is conducting studies to elucidate the influence of neuropeptides on satiety, regulation of food intake, food avoidance and pathogenic eating disorders. [142]

NINDS is conducting research to find the most efficacious dietary treatments to prevent brain damage in newborns with genetic deficits in amino acid metabolism. [143]

NIAID is researching the interaction between nutrition and infection in American hospitals. [144]

NIDCD is evaluating the association between nutritional status and problems of the senses of taste and smell in order to develop effective preventative interventions, such as drug therapy, for individuals with various diseases. [147]

NIDCD is attempting to determine optimal dietary management practices for patients with smell and taste disorders. [148]

NCRR is conducting research on dietary intervention in children with hypercholesterolemia. [149]
A Fogarty fellow is studying the nature and magnitude of differential reporting bias in food intake data in several European countries. These anthropological research techniques will facilitate the collection of valid food consumption data for use in cross-cultural comparisons and analysis by identifying cultural sources of systematic bias in the study of diet-disease relationships. [150]

See also entries ## 23, 24, 42, 44, 49, 64, 75, 76, 77, 79, 80 and 136.

NATIONAL CANCER INSTITUTE:

NATIONAL INSTITUTE OF MENTAL HEALTH:

See entry # 118.

NATIONAL HEART, LUNG, AND BLOOD INSTITUTE:

NHLBI is evaluating the relationship between diet and genetic factors in determining a persons susceptibility to diseases of the lung. [151]

NHLBI is exploring the role of nutrition in preventing respiratory muscle dysfunction in acute and chronic pulmonary disease. [152]

NHLBI is studying the effects of nutritional status on defense functions in developing and adult lungs; the effects of malnutrition on normal resistance to pulmonary infections; and the role of nutritional factors in development of bronchopulmonary dysplasia. [153]

NHLBI is exploring the role of nutrition in preventing respiratory muscle dysfunction in acute and chronic pulmonary disease. [154]

NHLBI is examining undernutrition as a risk factor for tuberculosis, through alterations in immune defenses of the lung and nonimmune mechanisms. [155]

NHLBI is conducting research on energy balance and nutrient requirements among children with sickle cell disease. [156]

NHLBI is conducting studies on the benefits of appropriate dietary intervention and nutritional supplementation on growth and development and on morbidity of children with sickle cell disease. [157]

NHLBI is studying nutritional factors in management and clinical variability of sickle cell anemia. [158]
NHLBI is attempting to characterize the relationship of nutritional deficiencies and immune dysfunction in sickle cell disease. [159]

See also entries ## 99, 100, 101 and 102.

**National Institute of Environmental Health Science:**

NIEHS is supporting studies investigating the combined effects of lead exposure and proper nutrition on childhood development and neurological function. The goal of these studies is to develop nutritional interventions that will reduce the harmful long-term effects of lead poisoning. [160]

**National Institute on Aging:**

NIA is studying the reciprocal effects of nutrition on age-related disorders of the gastrointestinal tract, including chronic atrophic gastritis, hypochlorhydria, diverticulosis and gastrointestinal enzyme and hormone disorders. [145]

NIA is attempting to identify nutritional factors that can retard aging processes and/or prevent, mitigate or reverse age-related pathology. [146]

**Office of Alternative Medicine:**

**Agricultural Research Service:**

See entry # 69.

**American Institute for Cancer Research:**
VI. SPECIFIC POPULATION GROUPS

A. CHILDREN.

NATIONAL INSTITUTES OF HEALTH:

NIDCD is evaluating the effects of age on smell and taste with respect to food selection and nutritional status. [161]

NIDCD is studying the relationships among food intake, hormone levels and taste sensitivity in pregnant women and their infants. [162]

NIDCD is attempting to determine whether providing premature, tube-fed infants with sweet-taste stimulation during feeding enhances and allows earlier progression to oral feeding. [163]

NCRR is studying diet composition for preterm infants. [164]

See also entries ## 90, 105, 143 and 149. + " + " + " + "

NATIONAL CANCER INSTITUTE:

NCI is conducting an "Early Nutrition and Growth Study," the overall goal of which is to investigate the relationship between childhood nutrition and breast cancer risk factors. The primary objective is to evaluate the effect of childhood nutrition at menarche, adult height, weight and fatness. Secondary objectives include tracking the development of overweight and obesity from infancy through young adulthood, identifying possible high risk periods or dietary patterns with respect to the development of obesity in childhood and early adulthood. [165]

NATIONAL INSTITUTE OF MENTAL HEALTH:

See entry # 122.

NATIONAL HEART, LUNG, AND BLOOD INSTITUTE:

See entries ## 31, 32, 33, 156 and 157.

NATIONAL INSTITUTE OF ENVIRONMENTAL HEALTH SCIENCE:

See entry # 160.
NATIONAL INSTITUTE ON AGING:

OFFICE OF ALTERNATIVE MEDICINE:

AGRICULTURAL RESEARCH SERVICE:

AMERICAN INSTITUTE FOR CANCER RESEARCH:
B. Elderly.

**NATIONAL INSTITUTES OF HEALTH:**

NIA is studying the psychosocial aspects of nutrition including studies of diet as a major factor contributing to the quality of life and how diet interacts with other lifestyle variables, including exercise, smoking and alcohol consumption. [166]

NINR is studying the nutritional needs and related issues in elderly persons who require long-term care. [167]

*See also* entries ## 78, 92, 136, 138 and 161.

**NATIONAL CANCER INSTITUTE:**

*See* entry # 109.

**NATIONAL INSTITUTE OF MENTAL HEALTH:**

**NATIONAL HEART, LUNG, AND BLOOD INSTITUTE:**

**NATIONAL INSTITUTE OF ENVIRONMENTAL HEALTH SCIENCE:**

**NATIONAL INSTITUTE ON AGING:**

*See* entries ## 68, 145 and 146.

**OFFICE OF ALTERNATIVE MEDICINE:**

**AGRICULTURAL RESEARCH SERVICE:**

*See* entries ## 55 and 69.

**AMERICAN INSTITUTE FOR CANCER RESEARCH:**

52
C. **Women.**

**NATIONAL INSTITUTES OF HEALTH:**

*See entries ## 25, 27, 78 and 162.*

**NATIONAL CANCER INSTITUTE:**

**NATIONAL INSTITUTE OF MENTAL HEALTH:**

**NATIONAL HEART, LUNG, AND BLOOD INSTITUTE:**

**NATIONAL INSTITUTE OF ENVIRONMENTAL HEALTH SCIENCE:**

**NATIONAL INSTITUTE ON AGING:**

**OFFICE OF ALTERNATIVE MEDICINE:**

**AGRICULTURAL RESEARCH SERVICE:**

*See entries ## 7, 56, 57 and 58.*

**AMERICAN INSTITUTE FOR CANCER RESEARCH:**

*See entries ## 9, 10, 12, 37, 38, 40 and 116.*
D. **Minorities.**

**NATIONAL INSTITUTES OF HEALTH:**

**NATIONAL CANCER INSTITUTE:**

**NATIONAL INSTITUTE OF MENTAL HEALTH:**

**NATIONAL HEART, LUNG, AND BLOOD INSTITUTE:**

NHLBI is supporting extramural research on weight loss for Mexican-Americans in order to evaluate an intervention that combines individual oriented behavioral strategies with more culturally compatible strategies derived from social support theory. [168]

*See also* entries ## 110, 156, 157, 158 and 159.

**NATIONAL INSTITUTE OF ENVIRONMENTAL HEALTH SCIENCE:**

**NATIONAL INSTITUTE ON AGING:**

**OFFICE OF ALTERNATIVE MEDICINE:**

**AGRICULTURAL RESEARCH SERVICE:**

*See* entry # 36.

**AMERICAN INSTITUTE FOR CANCER RESEARCH:**
VII. CONCLUSIONS

- The volume of research conducted by the Federal government is enormous. USDA alone is involved in approximately 900 research projects involving dietary/nutritional issues.

- Although Kraft initially asked MBS to focus on four institutes within NIH, this report demonstrates that virtually all of close to twenty NIH institutes are engaged in research pertaining to diet and disease prevention.

- The scope of research is also very broad, covering a panoply of specific nutrients, foods, diseases, and populations.

- Some Federal agencies, notably the Agricultural Research Service, welcome research partnerships with food manufacturers in the planning, development and funding of research.

- With the wealth of information likely to come from the Federal research planned or underway, the food industry may soon be able to develop products enhanced with nutrients and vitamins known to fight cancer and prevent chronic disease.

- NIH research is emphasizing the protective effects of:

  - Diets high in fiber and very low in fat (in some cases 20% of total calories from fat as opposed to the current guidelines of 30%); and

  - Foods rich in phytochemicals, antioxidants and other nutrients thought to be protective.

- NIH research is examining the protective and preventive qualities of foods as they apply to all of the body's systems and organs.

- By far, the National Cancer Institute has the greatest amount of nutrition research underway at NIH. In FY 1995 NCI spent $112,781,000 on nutrition research of all types.

- A large part of the nutrition research underway at NIH is directed at disease prevention at the organ level or in the whole person. Although a lot of research is aimed at the cellular level, at least fifty percent of the research is directed at the problem of disease prevention in specific organ systems or in the whole person.
• Research on preventing mood disorders and depression appears to be minimal or non-existent. However, MBS has not had the opportunity to assess all of the Federal government databases, which encompass virtually thousands of studies.

• The Office of Alternative Medicine is funding relatively little in the way of research on foods/nutrients/botanicals as preventors of chronic disease. The only study underway involves the use of foods/nutrients/botanicals to prevent allergy and asthma. This research has only recently gotten underway and no information about it is available.

**NEXT STEPS**

• In order to fully exploit the Federal research effort, Kraft could systematically track all Federally sponsored research efforts by agency and subject matter.
  
  **MBS’s paradigm set forth in this report provides a framework for such tracking.**

• Kraft could establish a task force to consider ways in which Kraft could capitalize from the efforts and monies expended by the Federal government, including:

  **-- Taking into account government research activities so as to prevent duplication of research efforts at Kraft;**

  **-- Participating in the process by which agencies plan and develop research agendas;**

  **-- Developing new lines of enhanced products which could be marketed on the basis of government health findings; and**

  **-- Working in cooperation and partnership with agencies such as the Agricultural Research Service to conduct joint research.**

• Federal Focus, Inc., MBS’s non-profit affiliate, could convene a seminar involving the institutes of the NIH, the Agricultural Research Service, and representatives of Kraft and other food companies. The objective of such a conclave would be to bring together Federal research officials and private sector research executives to discuss the Federal government’s objectives for the following years. The benefit to Kraft would be that its executives would have the opportunity to meet with Federal officials responsible for research, and help shape their agenda. The relationships developed at such a meeting
could be of great value to Kraft in:

- Learning what the Federal government is doing on a real-time basis;
- Influencing the directions of Federal research; and
- Developing joint or cooperative projects with USDA and NIH.