PART F: RESEARCH RECOMMENDATIONS

GENERAL OVERARCHING RESEARCH RECOMMENDATIONS

1. Investigate the impact of following adult-based dietary guidelines on nutrient intake and health or metabolic effects in children and later in life. Determine the impact of establishing dietary guidelines in childhood on dietary intakes and patterns later in life.

    Rationale: Research on the effectiveness of using adult-based dietary guidelines for children is limited.

2. Conduct clinical trials to determine the effect of intake of foods from various commodity food groups (i.e., fruits, vegetables, cereals, dairy foods, and meat, fish, or poultry) or whole diets on body mass index (BMI), lipid metabolism, cardiovascular disease, type 2 diabetes, cancer, and osteoporosis.

    Rationale: This report relied heavily on observational studies that assessed the relationship of foods to health outcomes. Available trials typically evaluated the relationship between specific nutrients or food components rather than whole food groups or diets.

3. Establish a system for ongoing systematic reviews on key nutrition and physical activity topics relevant to dietary guidance for the general public.

    Rationale: A system to conduct ongoing evidence-based reviews on topics relevant to dietary guidance for the general public will streamline the tasks for the next Dietary Guidelines Advisory Committee and is in keeping with the Federal Data Quality Act.

4. Develop a scientifically valid definition for "nutrient density" that could be useful on the food label. Determine what criteria are necessary for foods to meet this definition.

    Rationale: Over the past decade, a widespread concern has been that some foods may be classified as less nutrient dense than others and these foods may be eaten at the expense of other foods that are, by comparison, better sources of essential nutrients. To assist consumers in making wise food choices, a method is needed to convey the nutrient density of a food on the label.

5. Conduct studies to determine the barriers for complying with the *Dietary Guidelines* among children, low-income populations, and various ethnic groups. Identify various mechanisms to motivate individuals to change their eating behaviors and habits.

Rationale: Currently, compliance with the *Dietary Guidelines* is poor. There is a need to understand what barriers prevent compliance and how to motivate individuals to change their eating behaviors and habits and increase compliance with the *Dietary Guidelines*.

6. Develop and test both individual-based and population-based interventions designed to implement *Dietary Guidelines*.

    Rationale: Achieving all *Dietary Guidelines* may be challenging. For instance, it might be difficult to increase the intake of key nutrients without inadvertently increasing calorie consumption. Additionally, the extent to which increased physical activity enhances the ability to meet nutrient needs has not been assessed. Strategies that assist the general public and health care professionals will be needed, along with evaluation of those strategies.

SPECIFIC RESEARCH RECOMMENDATIONS

1. Establish the effect of various food components (e.g., flavonoids, other antioxidants, citrate) on metabolism and indicators of health. Develop food composition databases to accurately assess the intake of these food components and conduct human studies to determine the biological function of these dietary constituents.

    Rationale: A growing body of scientific evidence suggests that food components may affect the risk of chronic disease, but data are lacking on the intakes of these dietary constituents, their biological function, and their health effects independent of nutrients.

2. Investigate the dietary requirements of vitamin D in vulnerable groups (i.e., older adults, house-bound individuals, and those with dark skin). This research requires the development of a database for the vitamin D content of foods, estimates of usual vitamin D intake from foods, determination of the indicators of vitamin D status and the effect of latitude and seasons on those indicators, and the vitamin D intake required to maintain adequate status in various age and ethic groups.

    Rationale: Vitamin D is supplied mainly by synthesis in the skin with sunlight exposure, and this synthesis may be adequate in fair-skinned people who are active outdoors, especially in southern States. Older, less active people who stay indoors and those with darkly pigmented skin are more prone to having vitamin D insufficiency. The National Health and Nutrition Examination Survey, which monitors vitamin D status only in northern latitudes during the summer months, may not adequately detect insufficiency.

3. Investigate the vitamin E requirements of individuals consuming various types and amounts of dietary fat, the bioavailability of vitamin E from various food sources,

and the effect of vitamin E status on the risk of chronic disease. Develop a comprehensive nutrient database for the vitamin E content of foods.

Rationale: Current data suggest that the vitamin E intakes of Americans are inadequate compared with the Recommended Dietary Allowances. However, the health consequences of chronically low vitamin E intakes are uncertain.

4. Investigate the relationship between added sugar intake and various health outcomes, including BMI (or obesity) and type 2 diabetes.

   Rationale: There is a paucity of longitudinal studies that assessed the long-term effects of added sugars on BMI and other health outcomes. Long-term studies, and if possible, dose-response trials are needed to better understand the relationship between added sugar consumption and health in adults and children.

5. Investigate the relationship between portion size and BMI (or obesity).

   Rationale: There is a lack of longitudinal studies that assessed the long-term effects of differing portion sizes on BMI and obesity. It is important to find out whether a campaign to limit portion size would be effective in the prevention of overweight and obesity.

6. Investigate the relationship between the pattern of food intake (i.e., skipping breakfast or other meals or the frequency of food consumption) and BMI (or obesity).

   Rationale: The effect of skipping meals or frequent snacking on BMI (and obesity) is not clear. Current data are poor and short term. It is important in designing strategies for managing body weight to have a better understanding of the role of pattern of food intake on body adiposity.

7. Investigate the relationship between dietary glycemic load and BMI.

   Rationale: The effect of glycemic response on BMI is uncertain, because evidence from observational studies is inconsistent and because there are few randomized trials. Randomized trials are required to establish whether the dietary glycemic load is an important factor in regulating body fat and altering the risk for type 2 diabetes.

8. Determine how the dietary macronutrient ratio affects management of body weight and nutrient adequacy.

   Rationale: The Institute of Medicine (IOM) recommendations for acceptable macronutrient distribution range (AMDR) provide a wide range of carbohydrate, protein, and fat intakes. Various ratios of macronutrients within the AMDR need to be tested in long-term studies to determine their effects on energy homeostasis and

regulation of body weight. Also, nutrient adequacy at the extremes of AMDR (e.g. total protein intake of 35 percent of calories) needs to be assessed.

9. Investigate the effect of various types of fatty acids (i.e., saturated fatty acids, *trans* fatty acids, α-linolenic acid) on the incidence and prevention of cancer.

    Rationale: There is limited evidence on the effect of specific fatty acids on human breast cancer, prostate cancer, and other cancers.

10. Determine the optimal n-6 to n-3 fatty acid ratio in relationship to health outcomes; investigate the conversion factor of α-linolenic acid to eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) and how n-6 intake competes with that conversion rate; compare the effects of EPA and DHA versus fish on lipid metabolism and other health outcomes; and determine the health effects of fish consumption on type 2 diabetes and cancer.

    Rationale: There are few studies comparing the effects of various n-6 to n-3 fatty acid ratios on lipid metabolism and other health outcomes.   The impact of these polyunsaturated fatty acids on health needs to be examined in long-term studies of adults and children.

11. Compare the effects of various sources of *trans* fatty acids on lipid metabolism and health outcomes.

    Rationale: Research is needed to determine whether differences exist in the health effects of industrial versus animal sources of *trans* fat.

12. Investigate the effects of stearic acid intake on lipid metabolism and health.

    Rationale: Stearic acid has attracted interest as a substitute for *trans* fatty acids in prepared foods that require a solid fat. Stearic acid offers the functional properties needed for these foods, but the question arises of how it affects blood lipid values and indicators of cardiovascular disease.

13. Investigate the health benefits derived from the consumption of cereals, fruits, and/or vegetables; ascertain the biological mechanism whereby cereals, fruits, and vegetables alter disease risk; and determine the effects of fiber from these food sources on health (i.e., obesity and comorbidities).

    Rationale: Clinical trials, and if possible, dose-response studies are needed to expand our understanding of the health benefits associated with cereals, fruits, and vegetables and to determine whether those benefits are related to the fiber content of these foods and/or other components.

14. Investigate the implications of the intake of bottled water on fluoride intake and on health outcomes (especially oral health).

Rationale: Most bottled water is not fluoridated. With the dramatic increase in consumption of bottled water, there is concern that the public may not be getting enough fluoride for maintenance or oral health.

15. Compare the effects of foods and beverages that contain added sugars and those that naturally contain sugar on body adiposity and other indicators of health in children and adults.

    Rationale: Studies are needed to determine the impact of different types of sugar on human health.

16. Compare calcium salts that provide equivalent amounts of calcium to that in milk and milk alternatives (i.e., calcium-fortified soy products) on bone health, insulin resistance, blood pressure, and weight management.

    **Rationale*:* There are very few studies that compare sources of calcium and their impact on bone health, energy metabolism, insulin resistance, and blood pressure.

17. Investigate the role of increased total fluid intake as a means to prevent chronic diseases.

    Rationale: The IOM report identified a few studies suggesting that increased fluid consumption is associated with a reduced risk of bladder cancer, urinary tract infections, kidney stones, and colon cancer. However, this evidence was insufficient to make recommendations on fluid intake.

18. Conduct trials that assess the effects of salt intake on clinical outcomes other than blood pressure.

    Rationale: Numerous studies have documented a direct relationship between salt intake and other outcomes, including urinary calcium excretion and left ventricular hypertrophy. In view of these findings, trials with clinically relevant outcomes, such as bone mineral density or left ventricular mass, are needed.

19. Conduct trials that test whether increased potassium intake or potassium-rich foods increase bone mineral density.

    Rationale: A consistent body of evidence from observational studies indicates that increased intake of potassium from foods is associated with greater bone mineral density and with evidence of reduced bone turnover. Data from small trials also have documented that increased intake of potassium reduces bone turnover.

20. Conduct dose-response trials that test the main and interactive effects of sodium and potassium intake on blood pressure and other clinically relevant outcomes.

Rationale: There remains a need for dose-response trials, particularly for potassium, that span a clinically relevant range of dietary intake. Also, the interactive effects of sodium and potassium are of considerable interest.

21. Investigate the relationship between moderate alcohol consumption and obesity.

    Rationale: The data on the relationship between alcohol consumption and weight gain and/or obesity are inconclusive. Consumption of one or two drinks per day is associated with increased caloric intake. However, there is no apparent association between consuming one or two drinks a day and obesity.

22. Investigate the impact of adding calorie information to the labels of alcoholic beverages, including whether, for educational purposes, it would be sufficient to include only calories (i.e., not nutrients).

    Rationale: The caloric content of alcoholic beverages varies widely. Consumers do not have easy access to this information. Since alcoholic beverages provide calories and few nutrients, a more detailed label may not contribute useful information.

23. Investigate the impact of banning alcohol advertising when and where it might increase underage drinking (e.g., during college sports events).

    Rationale: Underage drinking is a major problem in the United States, and effective strategies to decrease the problem are needed.

24. Investigate the impact of unified Federal messages on alcohol and health through increased collaboration across agencies or consolidation of authority under one Federal agency.

    Rationale: With diverse groups responsible for messages on ethanol and health and with a variety of audiences, a consistent message has been difficult to achieve. Increased collaboration or consolidation would provide a unified message and have the potential to increase knowledge and promote healthful attitudes and behaviors related to alcohol consumption.

25. Investigate the effects of different types of cleaning on various surfaces. This research requires quantification of the type and counts of bacteria likely to be present on the surface before and after cleaning.

    Rationale: Food safety guidance needs to be continually updated as food consumption and preparation practices change and new pathogens emerge or adapt and change. Currently, insufficient data exist to clearly quantify the types and counts of bacteria likely to be present on surfaces before and after cleaning; such information is needed to set priorities for consumers.

26. Conduct research to improve methods to assess the risk of food safety (or the health benefits of a food) versus other factors (i.e., environmental contaminants of fish).

     Rationale: As scientific technology grows, risk assessment methods become more important in the complex task of prioritizing the public health issues and communicating key safety messages. When providing food safety information to consumers, it is important that they understand the message. This requires knowledge of the risk assessment of food safety versus other factors (i.e., environmental contaminants in fish). This knowledge allows the consumer to prioritize various messages, which can be weighed, based on science. In this way, the information critical to food safety can be conveyed so that the consumer does not have an inordinate number of other issues to consider.

27. Conduct consumer research to evaluate food safety messages and corresponding changes in behavior.

     Rationale: Changing lifestyles have increased the need to assist consumers in recognizing the symptoms and sources of foodborne disease so that corrective action can be taken.