Carbohydrate: Friend or Foe? Summary of Research Needs

Barbara O. Schneeman

Department of Nutrition, University of California, Davis, CA 95616

ABSTRACT This symposium evaluated the current state of science relative to the role of carbohydrates in human health and identified priority research topics to address gaps in our knowledge about carbohydrates and health. Future revisions of dietary guidelines will benefit from an expanded research agenda leading to a better understanding of the benefits and risks of consuming diets high in carbohydrates.

KEY WORDS: carbohydrates, fiber, triglycerides, dietary guidelines

The traditional view of dietary carbohydrates has focused on carbohydrate as an energy source or as nondigestible bulk associated with dietary fiber. Research in the past 20–30 yr has expanded our understanding of carbohydrates in the diet. This emerging view of carbohydrate encompasses the traditional view of energy source and bulk but has expanded to several new areas. These emerging areas include consideration of the glycemic effects of carbohydrate-rich foods, the importance of fermentable carbohydrate for bowel health and the changes in physical characteristics of gut contents, such as viscosity, as well as recognition that carbohydrate-rich foods contain a variety of physiologically active phytochemicals that may be involved in lowering the risk of chronic disease.

Dietary guidelines in the United States and other countries have consistently encouraged diets in which carbohydrates are the primary source of energy as well as adequate in fiber. However, as evidenced in the report from the 2000 Dietary Guidelines Advisory Committee (1), some concern has been raised about the sources of carbohydrate in the diet. The objectives of this symposium were to evaluate the current state of science relative to the role of carbohydrates in human health and to identify priority research topics to address gaps in our knowledge about carbohydrates and health. The presentations focus on areas of current interest related to carbohydrate intake, including the changes in carbohydrate intake in the U. S. population, the effect of modifying carbohydrate intake on triglyceride and insulin concentrations and the role of carbohydrates in food intake regulation and energy balance. Each presentation outlines specific research needs identified by the author. This summary highlights four themes for future research that cut across the presentations.

Adequacy of our monitoring data

We are interested in linking carbohydrate intake to health outcomes, yet our databases provide only limited information on the types of carbohydrates in foods. Much of the data are based on measurements of carbohydrate by difference. Newer analytical approaches are available and should be used to create new databases of the various chemical forms of carbohydrates in foods (2). In addition, we must develop new ways to monitor intake among the populations, especially given the complications due to underreporting of certain food categories. Energy intake values are typically reported in absolute amounts, which are difficult to compare across study variables, such as age, sex, body mass index, physical activity, etc. Researchers need to develop standardized approaches—such as energy reported relative to body weight—to improve the interpretation of studies and comparability of data used to develop guidelines (3). It is only with improvements in food composition and monitoring approaches that we will be able to adequately answer questions about carbohydrate intake and health outcomes, including energy balance.

Variability in response to carbohydrate-rich diets

The benefits of increasing carbohydrate intake seem to vary among individuals. In some cases, this variability in the response to diets relatively high in carbohydrate have been used to challenge recommendations to consume diets moderate in energy from fat and high in energy from carbohydrates (4). However, the variability highlights that research is needed on the interaction of genetic, dietary and lifestyle factors that influence individual response to dietary change. For example, factors brought up during the discussion that might influence the response to high carbohydrate diets include level of physical activity, types and sources of carbohydrate, body mass index and weight loss associated with dietary change, lipoprotein particle phenotype and other genetic variables. Elucidating the effects of these factors as well as their interactions will enable better prediction of individuals who might benefit from increases in carbohydrate consumption. The relative definition of high vs. low carbohydrate diets is needed to clarify comparisons being made. In the 2000 Dietary Guidelines, low and moderate fat diets were defined as < 20%.
energy and 20–30% energy, respectively; however, various investigators may differ in how they have defined high or low carbohydrate diets.

Variability related to disease and risk factors

Several studies point to an increase in plasma triglycerides when high carbohydrate, low fat diets are consumed. However, we do not know whether this increase in triglycerides is predictive of cardiovascular risk and we do not understand its consequence in the face of decreases in plasma cholesterol, including both LDL and HDL cholesterol. Does the increase in triglyceride in individuals with normal triglyceride concentrations have similar or different implications from elevated triglyceride levels in hypertriglyceridemic individuals? Various forms of insulin resistance exist—does carbohydrate play a role in all situations or only in certain types of disorders? Frequently, the long-term effects of carbohydrate-containing diets are extrapolated from short-term studies. This dilemma is especially a challenge in understanding the role of carbohydrate on food intake regulation and energy balance and how the source and type of carbohydrate will influence energy balance over the long-term.

Metabolic response to various forms of carbohydrates

Not only do we need to determine whether the different chemical forms of carbohydrate have differential effects on metabolism, but we also need to understand these distinctions in the context of sources of carbohydrate. Do other factors in foods interact with the metabolic response to carbohydrate feeding?

The 2000 Dietary Guidelines for Americans encourage consumption of diets that are high in fruits, vegetables and grains—foods that are typically good sources of carbohydrates, including dietary fiber. However, these guidelines also encourage sensible choices to moderate intake of foods and beverages that provide primarily sugars and few additional nutrients. Future revisions of the dietary guidelines will benefit from an expanded research agenda, leading to a better understanding of the benefits and risks of consuming diets high in carbohydrates.

LITERATURE CITED