Sugar and Fat—From Genes to Culture

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Added sugars and fats account for >50% of dietary energy in the typical American diet (1). Their consumption is rapidly approaching record levels. Excessive consumption of sugar and fat is being blamed for a wide range of chronic diseases, from coronary heart disease to obesity and diabetes. Among structural and policy options for the prevention of obesity are proposals to restrict or otherwise limit the consumption of energy-dense, sweet or high fat foods. This interaction among metabolism, physiology and public health is the focus of this symposium.

One question is whether appetites for sugar and fat are an inborn human characteristic. Another question is whether regulatory mechanisms that have evolved to deal with scarcity and starvation can also cope with the current conditions of plenty. There is need for further discussions of the economics of food choice that might serve as a basis for fiscal and food policies. Focusing on sugar and fat, the present reports cover a wide range of topics, from molecular biology to public health and agricultural policy analysis. Establishing a scientific base for public health interventions is one goal of this symposium.

There is much evidence for the notion that the brain is one of the major regulators of dietary behavior. The traditional approach to the physiology and psychology of food choice is shown below (Fig. 1). Virtually all neurochemicals have all been implicated in the neurobiology of food selection. Central regulatory mechanisms may be responsible for the selection of sugars and fats in preference to other nutrients. As documented later (2), what may be affected is the consumption of preferred foods, rather than specific macronutrients. However, palatability and energy-density are often linked (3). Foods containing sugar and fat tend to be both energy dense and highly preferred (3). Moreover, studies now show that sustained consumption of sweet and high fat foods can lead to neurochemical changes in brain sites involved in feeding and reward (2). In other words, sustained dietary behavior can have permanent consequences in the brain.

This represents a reversal of the traditional research paradigm. Whereas many animal studies of feeding behavior had treated food choices as the outcome variable, current approaches examine the metabolic consequences of long-term sugar and fat feeding. Arguably, this approach is closer to consumer behavior and food choices. Marketing studies suggest that food choices are made on the basis of taste, cost and convenience, with health and variety playing a subsidiary role (Fig. 2). Fats and sweets seem to appeal to emotions and are the dominant object of food aversions and food cravings. Clinical disturbances in the control of food intake such as bulimia nervosa and the binge-eating disorder also involve cravings for energy-dense, sweet or fat-rich foods (4).

Sweet and fat-rich foods have assumed a dominant place in the food supply: they are energy dense, good-tasting, inexpensive and convenient to use. Perhaps most important, they provide dietary energy at remarkably low cost. That the share of income spent on food declines as incomes rise is a standard economic finding, otherwise known as Engel’s law (5). It is less appreciated that diet structure is equally influenced by poverty and wealth. Higher income nations consume more added sugars and fats per capita than do lower income nations. Lower income consumers within rich nations derive more energy from added sugars than do higher income consumers. The burden of obesity and diabetes in rich societies falls disproportionately on minorities and the poor.

Data from the U.S. Department of Agriculture Economic Research Service suggest that low income families are most likely to consume high energy-density diets. Energy cost of oils, fats and refined grains is considerably less than the cost of lean meats, fish, vegetables and fruit. Recognizing that food costs can be a barrier to dietary change, researchers have...
begun to explore the viability of pricing interventions as a potential strategy in public health nutrition. Reports of some promising studies are presented here (6). Individual strategies for dietary change have also been supplemented with more structural, policy-based approaches. Discussed here also are policy-based strategies, some of them based on subsidies and price supports (7). The continuing challenge is how to apply scientific findings to health policy goals. A better understanding of the effects of genetics, physiology, culture and food availability on eating habits is likely to lead to improved strategies for dietary change for health promotion at community level.

LITERATURE CITED