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Foreword Symposium on Beverages and Health

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German proverb: Nichts wird so heiß gegessen, wie es gekocht wird.

Verbatim translation: Nothing is eaten as hot as it is cooked.

In science, new findings are rarely as good or as bad as they first appear or as expressed by those viewing them in isolation. The issue of the role of beverages in a healthful diet is a case in point. People drink for myriad reasons. The most fundamental is to meet hydration needs and beverages presently provide about 80% of that requirement (Food & Nutrition Board). Despite dietary (1,2) and sales (3) data indicating beverage consumption has increased over the past three decades, there is evidence that hydration needs are not adequately met in segments of the population (4) especially when under heat, exercise and gastrointestinal stress (5-10). Thus, beverages, in any form (11), may help to address this problem. Additional functions of drinking include aiding chewing, swallowing and intestinal passage of foods, provision of sensory stimulation and facilitation of social interactions. Beverages also deliver nutrients (e.g., calcium in milk, protein in meal replacement products) and other compounds (e.g., antioxidants in tea and wine; caffeine in teas, coffee, cola; ethanol in beer, wine and spirits; electrolytes in sports beverages) associated with reduced risk of chronic diseases. If not abused (e.g., ethanol), there is little to criticize on this score. Their efficiency at delivering energy can also be an advantage in some populations (e.g., individuals with early satiety such as the elderly or selected patients with cancer or HIV). However, this is a role that has attracted more concern than commendation due to the greater issue, in terms of individuals affected, of overweight/obesity.

The contribution of beverages, primarily sweetened energy-yielding varieties, to positive energy balance and weight gain has engendered fierce debate. As is often the case with nutrition issues, the scientific literature is divided. Recent reviews and meta-analyses support (12-14) and refute (15,16) a role for beverages in weight gain. A good deal of the controversy stems from the narrow focus of most reviews in terms of the types of evidence or sub-groups (e.g., children (15) versus adults (12)) of the population included, so the bases of comparisons are limited and not easily extrapolated to the general population. Reviews of the totality of the data (e.g., including observational data, studies of appetite and acute dietary compensation, long-term interventions) more strongly implicate beverage consumption in overweight/obesity (13,14). Nevertheless, in the absence of a clear science-based consensus, and with a high level of consumer interest, the media has trumpeted sequentially published findings, primarily those

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that raise health concerns or quick solutions, resulting in inaccurate lay impressions that each new finding is definitive.

The divergence in views about beverages is exemplified in Figure 1. The left panel is a public health message produced by the New York City Health Department aimed at reducing sweetened beverage consumption. The right panel depicts a concept promoted in some diets that increased water aids weight loss. The science behind both conceptions is questionable and the opportunity for misconceptions great. In the left panel, the uninformed reader could conclude clear sweetened beverages contain fat, which they don't, and that the sweetener they contain is effectively converted into fat in the body, which is not the case (17). In the right panel, an implication is that water displaces fat intake, which is untrue (18) or that water flushes fat from the body, which is incorrect.

A consequence of such overly simplified messaging has been increasing consumer demand for draconian actions to address the problem. This, in turn, has prompted legislation to limit the availability of selected beverages (19) and promotion of water and juice intake in schools (20) when the evidence suggests most energy-yielding beverage consumption occurs outside of schools (1). It has stimulated proposals to levy taxes on certain products (21,22) when evidence for the effectiveness of taxation at reducing intake is uncertain (23). Some argue that these actions are reasonable given the nutrient profiles of the targeted products and low-probability of an adverse outcome. Others are less convinced of the logic and warn that recent prior experience with efforts to reduce the total and saturated fat content of foods, undertaken with similar confidence in the benefit-to-risk ratio, should warrant a more cautious position as fat replacers failed to reduce energy intake and trans fat consumption rose due to their substitution for saturated fats. At present, reasoned arguments can be made for both positions and the most appropriate balance between them is unclear.

To better inform public health policy, the scientific community has responded with increased research activity and discourse at professional meetings. Most often, the topic is presented in a debate format where advocates for each view enunciate their positions and organizers hope that those in attendance will distill the truths. However, those most familiar with the science, the speakers, generally remain entrenched in their views and fail to move towards consensus. In other instances, symposia are unabashedly advertised as depicting a certain perspective so the attendee is forewarned to interpret the presentations cautiously. Again, it is those less informed on the science who are expected to mesh the claims made by the speakers in the session with those espoused in other settings. At this point, the topic of beverages and health has polarized the scientific, clinical and public health communities leading to a policy vacuum.

Against this backdrop, the Ingestive Behavior Research Center (IBRC) hosted an international symposium on "Beverages and Health" on September 17-19, 2009 in Indianapolis, IN USA. The format was guided by several observations. First, it was recognized that humans choose to consume a wide variety of beverages. All are effective delivery systems for water, so choices of which to consume are based largely on other properties. Each beverage category contributes a unique set of ingredients with health implications and each fits into social and cultural patterns that dictate the preparation, timing and portion selected. Second, there is evidence that beverage type may differentially influence appetite and dietary compensation (14). Third, because of these two facts, it is essential to weigh the potential benefits of ingestion against the potential risks for promoting positive energy balance separately for each beverage category.

To provide perspective on the dietary importance of beverages, the meeting began with reviews on current patterns of beverage consumption. Data were presented for different beverage categories and segments of the population by Maureen Storey and Barry Popkin, respectively. The ensuing discussion was moderated by Susan Chen. Further background information on

the health effects of beverage consumption was provided through presentations focusing on basic thirst, hunger and fluid physiology and their measurement. Methodological issues and the association between appetitive sensations following beverage consumption and food choice was reviewed by Rick Mattes. The relationship between thirst and hydration was outlined by Simon Thornton with Randall Sakai serving as the discussant for these papers. Five sessions followed, each comprised of paired presentations; one on the non-energy-related health effects of consuming beverages in a specific beverage category and the other on the evidence related to energy balance. An equal block of time was then allotted for an invited discussant to lead a critical consideration of the topic. The goal was to objectively evaluate the benefits and risks associated with use of each type of beverage. It was not possible to single out every beverage category, so those representing the largest dietary sources were selected. These included:

Caffeinated Beverages:

Health (Mario Ferruzzi), Energy (Margriet Westerterp-Plantenga), Discussant (David Mela)

Sweetened Beverages:

Health (Frank Hu), Energy (Susie Swithers), Discussant (Rachel Johnson)

Dairy Beverages:

Health (Connie Weaver), Energy (Arne Astrup), Discussant (Susan Barr)

Alcoholic Beverages:

Health (Arthur Klatsky), Energy (Martin Yeomans), Discussant (Julia Chester)

Meal Replacement Beverages:

Health (Judith Ashley), Energy (Steve Heymsfield), Discussant (Terry Davidson)

In the end, it was clear that the topic is highly nuanced with few clear directives. Drinking is essential in free-living humans and thirst is not an adequate regulator of beverage consumption (6,7). Appropriate choices will require consumer knowledge and purposeful conscious decisions. Both under- and over-consumption can lead to variable health risks depending on the mix and amount of beverages selected. But this is true of any food or food category – too little or too much is not the appropriate amount. At the same time, sensible use of each beverage type can contribute positively to health and the quality of life. The difficulty lies in defining sensible for an individual under specific conditions. Given the current inability to provide personalized nutrition guidance based on genetic and epigenetic profiling, recommendations will have to be made on imperfect knowledge. The juxtaposition of evidence relating to the potential risks and benefits of beverage consumption presented in this special issue should facilitate formulation of rationale interim clinical and public health guidelines for beverage use and spur new directed studies to substantiate or modify these guidelines. One of the most fundamental remaining questions is whether beverages pose unique problems for energy balance. Many believe this is already settled, but in diametrical directions by different groups. Mechanistic and randomized controlled trials are needed to resolve the issue (24). Cost-benefit analyses that weigh energy and nutrient/bioactive compound contributions to health are also needed to inform policy and individual choice.

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Figure 1.