Studying “Total Diet” and Its Impact on Health, Including Cancer Risk

We’re interested in assessing how diet affects health—but in the context of the what, where, when, why, and how we eat.

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Does what we eat and drink affect our risk of developing cancer?

Many studies have asked this question, but answering it is challenging. Foods and beverages, as well as the nutrients and dietary constituents they contain, are consumed together, never in isolation of one another.

To account for this, and to improve the quality of research related to the connection between diet and disease, the research community is shifting how we look at the health impact of diet, and how we assess diet and cancer risk. We’re taking a more holistic approach and looking at dietary patterns versus individual foods or nutrients across the lifespan, and we are developing tools that can incorporate dietary patterns to reflect this shift.

In other words, we’re interested in assessing what eating broccoli or a cheeseburger means for your health—but in the context of a larger dietary pattern and overall diet quality that includes the what, where, when, why, and how we eat.

Expanding the Approach to Diet Research

Research on diet and cancer risk has often taken a reductionist approach, focusing on specific dietary components. That approach, however, assumes that a food or nutrient alone, without consideration of other accompanying foods or nutrients, can induce a specific biological effect that can fuel the formation and growth of cancer cells.

But there are limitations—and unanticipated findings—when only using this approach. For example, in the late 1980s, the Alpha-Tocopherol, Beta-Carotene Cancer Prevention Study was initiated after some studies found that diets high in certain vitamins were associated with a reduced risk of lung cancer. However, taking these vitamins as pills (and not packaged in foods) did not reduce the incidence of lung cancer among smokers, and may actually have caused some

harm.

These apparently paradoxical findings might be explained by recognizing that nutrient and food consumption is closely connected, making it difficult to examine associations between any one dietary factor and chronic disease. Dramatically increasing intake of one nutrient by taking a supplement could have unanticipated effects, such as decreasing the absorption or circulating concentrations of other beneficial nutrients.

There are also likely interactive or synergistic effects among foods and nutrients, such that the totality of diet may have cumulative effects. This may be one of the reasons the NIH-funded Dietary Approaches to Stop Hypertension study, a clinical trial that examined the effect of changing an overall dietary pattern rather than a single food or nutrient, showed positive health outcomes.

By looking at total diet quality, we can try to fit the different puzzle pieces together. We can look beyond a certain food or nutrient and learn how that food was consumed and what other issues might be at play, such as the timing of meals and circadian rhythms. NCI is already funding research investigating these and other factors that can define a total diet.

How NCI is Working to Improve Dietary Patterns Research

Every 5 years, the US Department of Agriculture (USDA) and NCI collaborate to update a dietary tool called the Healthy Eating Index (HEI). This tool is used to assess how closely an eating pattern, or any set of foods in the food supply chain, aligns with the most recent Dietary Guidelines for Americans.

The HEI has been applied by researchers to describe diet quality among the US population. It has also been used to evaluate the quality of foods you'd find in different environments: for example, in a fast food restaurant, a federal food distribution program, a food bank, or a school cafeteria.

The most recent Dietary Guidelines (for 2015–2020) reflect this shift toward focusing on total diet. For example, the guidelines now stress an overarching approach to diet, such as following a healthy eating pattern across the lifespan; eating a variety of foods, with a focus on nutrient density and amount; and limiting calories from added sugars and saturated fats and reducing sodium intake.

Our most recent updates to the HEI, described in three articles in the Journal of the Academy of Nutrition and Dietetics, also reflect this emphasis on total diet.

The fact that tools like the HEI can now be applied to any set of foods in the food supply chain is important because large segments of the population don't have access to, or can't afford, healthy food. If we assess how well a set of foods—for example, those provided by a food bank—align with dietary guidance focused on total diet, we can then work toward improving that set of foods to minimize the risk of cancer and other health conditions.

In an editorial accompanying our articles on the HEI, Barbara Millen, DrPH, RD, chair of the 2015 Dietary Guidelines Advisory Committee, wrote that “the evidence base is stronger than ever before linking the total diet—its dietary patterns, nutrient density, and overall quality—to health promotion and disease prevention across the human life span.”

We agree with Millen that the updated HEI is a “powerful tool to assess total diet quality” and hope other researchers will use the HEI and other evidence-based tools that fully embrace this total diet approach.

And the time is ripe for this shift. There is a growing interest in online platforms and apps for diet and physical activity monitoring that may be integrated with assessment tools like the HEI, providing opportunities for new research, tools, and technologies that eventually will help in the design of tailored nutrition interventions at the individual and community levels.

To assist in measuring dietary patterns, for example, NCI has supported the development of a freely available dietary assessment tool, the Automated Self-Administered 24-Hour Dietary Assessment Tool (ASA24), which enables research participants to report what they’ve consumed within the last 24 hours or in real time as a food record. This tool provides information that previous tools don’t, such as when food was eaten, where, and with what other foods and beverages.

It’s been exciting to see the field of diet and cancer research expand, and we’ll continue to improve methods to incorporate this new approach of looking at the total diet. Our biggest hope is that research like this can better guide efforts to understand how and what we eat affects health, and in turn inform policies and practices that reduce risk and improve health for everyone.

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