REVIEW

Chronic diseases are first associated with the degradation and artificialization of food matrices rather than with food composition: calorie quality matters more than calorie quantity

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Abstract

Purpose For decades, it has been customary to relate human health to the nutritional composition of foods, and from there was born food composition databases, composition labelling scores and the recommendation to eat varied foods. However, individuals can fully address their nutritional needs and become chronically ill. The nutrient balance of a food is only a small part of its overall health potential. In this paper, we discussed the proof of concept that the increased risk of chronic diseases worldwide is primarily associated with the degradation and artificialization of food matrices, rather than only their nutrient contents, based on the assumption that "food matrices govern the metabolic fate of nutrients".

Methods An empirico-inductive proof of concept research design has been used, based on scientific data linking the degree of food processing, food matrices and human health, notably on the glycaemic index, nutrient bioavailability, satiety potential, and synergistic effects.

Results We postulate that if the nutrient content is insufficient to fully characterize the diet-global health relationship, one other dimensions is necessary, i.e., the food matrix through the degree of processing. Both matrix and nutrient composition dimensions have been included under the new concept of the 3V index for Real (Vrai), Vegetal (Végétal), and Varied (Varié) foods. The Real metric, reflecting the integrity of the initial food matrix, is the most important, followed by the Vegetal (nutrient origin) and the Varied ("composition" effect) metrics.

Conclusion Concerning their effects on health, food matrix comes first, and then nutrient composition, and calorie quality matters more than calorie quantity.

Keywords Food matrix · Chronic diseases · Ultra-processed foods · The 3 V index · Food synergy · Nutrient contents

Introduction

For decades, the diet–health relationship has been based on and explained almost exclusively by food composition (i.e. calorie, macro- and micronutrient contents) [1], leading to recommendations of reducing sugar, salt and fat [2] and indirectly suggesting that fully addressing the recommended dietary intakes would be sufficient to stay healthy. To date, the dominant tendency in nutrition research has therefore been to analyse food through the perspective of the

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"nutrient gate". However, in view of the accumulating scientific evidence during the last decades, i.e. mainly that linking food processing and human health [3–6], and the food matrix effect with human metabolism—especially for cereal- [7], fruit- [8] and dairy-based products [9]—this priority given to nutrients must be strongly questioned. Notably, education in dietetics, medical, and agro-food engineering schools is still largely based on the nutrient paradigm, as are the numerous recently developed nutrient-based food composition scores worldwide, as the primary health policy tool to help consumers buy healthy foods [10].

However, as recently reported by Aguilera [11], "*The concept of food matrix is extensively used by food and nutrition scientists to try to explain why a component or nutrient behaves differently in a food than in isolated form*". To say it differently, two foods with identical compositions but differing structures (i.e. food matrices) may have different