

# ULTRA-PROCESSED FOOD RE-FORMULATION FOR GUT HEALTH AND ORGAN PROTECTION: PART I INTRODUCTION



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### Abstract

Ultra-processed food disrupts metabolism. It increases adiposity, lowers mitochondrial efficiency, and promotes insulin resistance. It also alters growth and increases morbidity and death in humans. Companies selling consumer packaged goods (CPG) are realizing these negative effects. They have started using substitution techniques to reduce salt, sugar, and fat. However, such straightforward alternatives do not lessen the complex negative effects of ultra-processed meals.

The researcher worked with Bahrain dairy companies in the Middle East. Together, they conducted a thorough scientific analysis of their entire commercial food and beverage portfolio. They examined macronutrients, micronutrients, additives, and toxins in each product. They also studied how processing affects health. The goal was to determine the specific nature of each product's contents. The researcher formed a Scientific Advisory Team (SAT). They created a three-layered "Metabolic Matrix" based on three scientific principles: (1) safeguard the liver, (2) nourish the gut, and (3) support the brain.



The Metabolic Matrix classifies each product and offers metrics, criteria, and suggestions for formulation or modification. For these processes to be successful, real-time communication with the executive and operations teams was essential. This scientific exercise has helped the company improve health, well-being, and sustainability in their products. They have kept the flavor intact. Economic viability has been preserved. Fiscal viability remains unchanged. This process is easily transferrable, and the researcher is sharing this effort and its approaches as a proof of concept. The main goal of this endeavor is to improve customers' metabolic health and wellbeing worldwide. This will be achieved by reformulating ultra-processed food. It will also involve encouraging other food firms to do the same with their products.

### Keywords

ultra-processed food, insulin resistance, metabolic health, brain health, nutrition, re-engineering, re-reformulation.

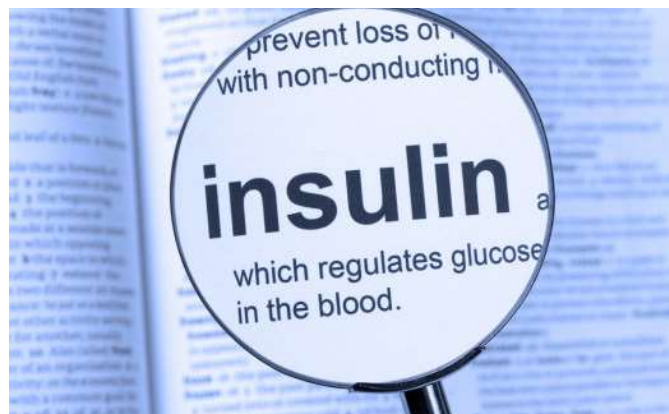
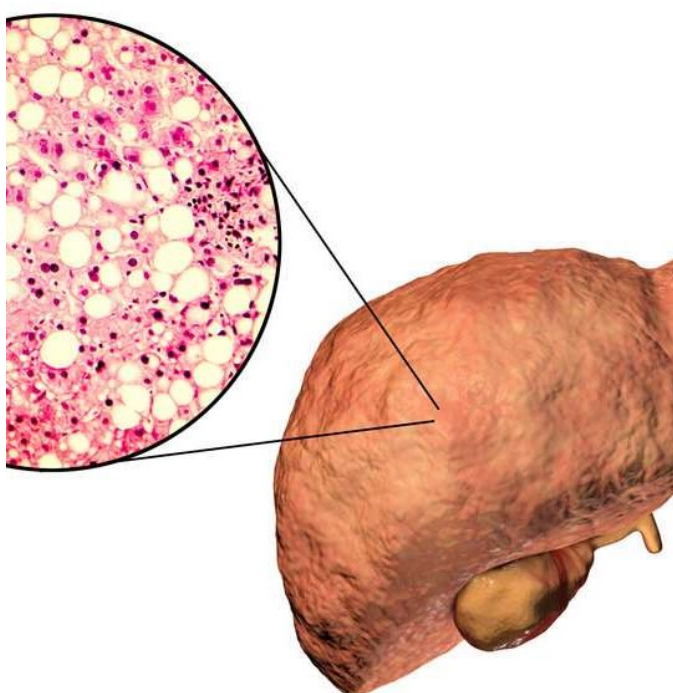
**Insulin Resistance**

Chronic metabolic conditions are now widespread. They affect both industrialized and developing nations. These conditions include type 2 diabetes, hypertension, and dyslipidemia. They also include cardiovascular disease, cancer, and dementia.

Additionally, polycystic ovarian disease and non-alcoholic fatty liver disease are included. The prevalence, severity, and proportion of global healthcare costs dedicated to these disorders are all increasing (1). Each of these chronic metabolic illnesses alters cellular processes. These changes lead to modified mitochondrial energetics. This results in the phenomenon of insulin resistance. Where does this insulin resistance come from, and why has it gotten worse over the past 50 years? These are the two main topics.

**Chronic Illness**

One common misperception among medical practitioners is that chronic illness is a natural byproduct of aging. This does not explain why type 2 diabetes and fatty liver disease are now common in young children. These conditions were previously rare in this age group. Now, children as young as the first decade exhibit the same biochemical pathways. In fact, due to abnormal fatal energy partitioning, many neonates have increased adiposity (2-4).



Another common misunderstanding is that the vices of gluttony and sloth directly contribute to the rise in obesity's prevalence and severity. The physiology of three occurrences refutes this assumption, demonstrating widespread involuntary changes in cellular biochemistry. First, captive laboratory animals are gaining weight, indicating a global metabolic insult that is not just affecting humans (5). Second, over the past 150 years, body temperature in the United States has fallen while obesity has increased. This indicates a sub-cellular impairment in mitochondrial beta-oxidation and heat production. Third, environmental obesogens in the commercial food supply threaten all vertebrate life on Earth. Some obesogens directly affect adipose tissue development. Others impact mitochondrial beta-oxidation and promote weight gain, regardless of calorie intake (6).

**Metabolic Health**

The idea that fat and chronic disease are the same thing is a third myth. In contrast, it is important to note that 20% of over weight, people have good metabolic health (7), a normal lifespan and health span, and the predicted biochemical aging indicators, such as normal length telomeres (8). Conversely, one or more chronic metabolic disorders are present in 40% of people with normal weight. Up to 93% of adults in the United States exhibit some form of metabolic abnormality (9), whereas only 65% of people are higher weight (10). These illnesses can also affect people of normal weight, and their incidence is rising in countries with low obesity rates. Therefore, a more extensive and potentially mysterious exposure must explain the high incidence of insulin resistance and chronic disease in societies with low obesity rates.

**Non-Communicable Diseases (NCDs)**

The majority of clinicians incorrectly attribute the rise in non-communicable diseases (NCDs) to fat depots that are visible externally, according to a fourth common myth. This is also incorrect, as two endocrinopathies illustrate the contrast between obesity and chronic disease. First, an Ecuadorian founder-effect cohort known as the "Little Women of Loja" becomes noticeably higher weight despite having a deficiency in growth hormone receptors, protecting them against chronic metabolic diseases, including diabetes and heart disease (11).

Patients with lipodystrophy, on the other hand, lack subcutaneous fat and exhibit significant insulin resistance, as well as ectopic fat in the liver and muscles (12). Disease arises from invisible fat, leading to ectopic fat and insulin resistance in many individuals of normal weight.

**Standard American Diet (SAD)**

The fifth and final myth is that the amount of food ingested in accordance with the "calories" meter is what causes chronic disease. Instead, the type of food we consume influences our insulin sensitivity. Ultra-processed foods in the Standard American Diet (SAD) promote obesity. They also change mitochondrial ATP production. This diet is also known as the Western Diet or the Processed Food Diet (13).



The NOVA classification of food processing has been recently developed, validated, and implemented. It shows that Group 4, which includes ultra-processed foods, carries the highest risks of morbidity and mortality. Many studies from different cultures reveal a link between eating ultra-processed foods and several health issues. These include obesity (14), diabetes (15), heart disease (16), cancer (17), dementia (18), and other mental health disorders (19). In essence, just as different sources of calories are not the same, neither are obesity and chronic disease (20).

**Artificial Sweetener**

Several substances in ultra-processed food have been linked to metabolic disturbances (21). Public health professionals (22) and business interests (23-26) have likely conducted the most research and harshly criticized sugar. The food industry creates non-nutritive sweetener substitutes to replace sugar in its recipes. Many consumer packaged goods businesses have tried to lower the sugar content of their products. They aim to improve the quality of their ultra-processed items. Several start-up companies have also founded a new Alliance to Combat Excessive Sugar (ACES) (27).

However, ultra-processed foods are harmful to human health in a number of ways, including the composition of macronutrients and micronutrients, fiber, the impact of food additives, pollutants, heat exposure, and packaging. Academic researchers have offered a methodology for the reformulation of processed foods to enhance sustainability and health (28). A more scientific approach that considers the varied metabolic impacts of food ingredients and processing is necessary to make ultra-processed food healthier. Research posed the question, "Can we make tasty food healthy?" as opposed to "Can we make healthy food tasty?"

### Bahrain Dairy Experiment

Researchers have collaborated with the Bahrain dairy Executive Team to explore and reinvent their 180-item portfolio to create best-in-class (nutritious, scrumptious, cost-effective, and commercially viable) foods and beverages that support metabolic health and well-being throughout the course of 2020–2022. This re-engineering effort identified three main areas: the food's materials, its processing, and its metabolic effects.

Despite considering the cost of ingredients and procedures, the analysis did not prioritize cost; instead, the researchers aimed to provide recommendations for improving dairy's metabolic health portfolio, leaving sales and marketing to the company's management. The data shown here serves as a proof-of-concept and a guide for other businesses interested in undertaking a similar exercise for the benefit of their businesses and customers.

We will explore the MATERIALS AND METHODS in Part II of this article in next month's issue.



### Data Accessibility Declaration

**The article/Supplementary material contains the original contributions made for the study; further questions should be addressed to the corresponding author.**

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Fig. 1: Different phases of aluminium particle under heating.



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