Redesigning Consumer Foods to Improve Metabolic Health in the Middle East: a Corporate Case Study

Wolfram Alderson, M.S.[1]. Rachel V. Gow, Ph.D.[2] , Andreas Kornstädt, Ph.D.[3] , Timothy S. Harlan, M.D.[4], and Robert H. Lustig, M.D., M.S.L.[5]

[1] Kuwaiti Danish Dairy Company, Kuwait City, Kuwait; [2] Nutritious Minds Trust, London, UK; [3] Perfact, Hamburg, Germany;
[4] George Washington University School of Medicine, Washington, D.C., USA; [5] University of California, San Francisco, CA, USA

Abstract

By acting through endocrine disruption, ultraprocessed food increases adiposity, reduces mitochondrial efficiency, drives insulin resistance, and contributes to decrements in human metabolic health. Some consumer-packaged goods (CPG) companies are starting to realize the detriments of the food they market, and have employed substitution strategies to reduce salt, sugar, and fat. However, reformulating ultraprocessed foods is far more complex than any single component, and not ameliorable by simple substitutions.

Over the past two years, the authors have worked with Kuwaiti Danish Dairy Company (KDD) to conduct a complete and scientific evaluation of their entire portfolio. Assay of macronutrients, micronutrients, additives, and toxins in each of their products was undertaken to determine not just what is in the food, but what has been done to the food via food processing. We have developed a "Metabolic Matrix" based on three science-based principles: protect the liver, feed the gut, support the brain. The Metabolic Matrix categorizes each food and provides criteria and metrics for improvement.

Real-time collaboration with corporate executive and operations teams was critical to carry the procedures through to fruition. Through this scientific exercise, we have helped KDD to improve the health and wellbeing of their entire product line, while maintaining both taste and economic and fiscal viability. These procedures are exportable to other food processors. We offer this effort and its approaches as a "proof-of-concept" to make ultraprocessed food "healthy" in order to improve metabolic health and wellbeing globally.

Introduction

1. Chronic metabolic diseases continue to increase in prevalence globally.
2. These diseases are now highly prevalent in children.
3. Insulin resistance is a primary hallmark of metabolic pathology.
4. Ultraprocessed food is a driver of insulin resistance; consumption is correlated with both prevalence and severity of these diseases.
5. Ultraprocessed food has multiple nutrient excesses and deficiencies that contribute to insulin resistance.
6. Clinical strategies that reduce processed food consumption improve metabolic status, exclusive of calories or obesity.
7. Unfortunately, most consumer-packaged goods (CPG) companies worldwide produce edibles that are detrimental to metabolic health.

Methods

1. The Kuwaiti Danish Dairy (KDD) Company, a CPG company in the Middle East/North Africa (MENA) region, asked two questions: "Can we make healthy food tasty? Can we make tasty food healthy?"

2. KDD commissioned the authors of this presentation as a Scientific Advisory Team (SAT) in a 2-year project to:

a) Develop exportable principles based on metabolic health;

b) Institute a metric for evaluating the healthfulness of processed food;

c) Evaluate their current portfolio based on that metric;

d) Evaluate the content analytically of all their food items; and

e) Re-formulate specific products based on these principles of metabolic health, and to recommend changes that could be implemented systemically.

Results

1. The SAT conducted an exhaustive literature search, including academic articles, policy briefs, and those produced by the food industry.
2. Numerous internal reports were generated to justify incorporation of new concepts into food formulation practices and policy.
3. The SAT formulated a set of principles to determine the quality of food, called The Metabolic Matrix.
4. The SAT adopted a stance of "poison A + antidote B is still dangerous." We developed a tiering system so that a product with negative properties cannot make it into a higher tier even if it has many laudable qualities.
5. We focused on metabolic impact instead of just countable micro- and macro-nutrients, detailed nutritional breakdown provided from reliable supplier specifications. absence of political or corporate influence, and broad applicability not only to finished products but also to product design.
6. We developed a recommendation engine (Perfact) to screen ingredients for specific nutrients and develop alternatives.
7. Tiers are:
   - III: Harm reduction
   - II: Compensating deficiencies, esp. for MENA region
   - I: Additional benefits, including sustainability
8. Example of re-designed chocolate ice cream (Table 1):

Table 1: Redesigned chocolate ice cream

Available Recipe at KDD

INGREDIENTS: WATER, SUCROSE, FULLY HYDROGENATED COCONUT OIL, COW'S SKIMMED MILK POWDER, ALKALIZED COCOA POWDER, SWEET WHEY POWDER, MILK FAT, STABILIZER (VEGETABLE MONO-AND DIGLYCERIDES, LOCUST BEAN GUM, GUAR GUM).

Revised KDD Ingredients

INGREDIENTS: WATER, MILK FAT, ERYTHRITOL, COW'S SKIMMED MILK POWDER, POLYDEXTROSE, ALKALIZED COCOA POWDER, SWEET WHEY POWDER, SOLUBLE GLUCOFIBER, MONK FRUIT, STABILIZER (VEGETABLE MONO-AND DIGLYCERIDES, LOCUST BEAN GUM, GUAR GUM), NATURAL SWEETENER (STEVIA).

	Original Nutrition	Revised Nutrition
Calories (kcal)	195.54	154.56
Calories from Fat (kcal)	91.2	91.28
Carbohydrates (g)	23.67	25.85
Total Dietary Fiber (g)	1.48	8.93
Starch (g)	0.39	0.42
Total Sugars (g)	21.48	6.52
Added Sugar (g)	16.48	0
Sugar Alcohol (g)	0	8
Net Carbs (g)	22.18	8.91
Fat (g)	10.17	10.32
Saturated Fat (g)	9.05	6.91
Trans Fatty Acid (g)	0.12	0.48
Cholesterol (mg)	5.35	21.5
Protein (g)	3.23	3.77
Vitamin A - IU	77.2	330.6
Vitamin D - IU	0	0
Calcium (mg)	92.28	108.96
Sodium (mg)	39.84	45.97

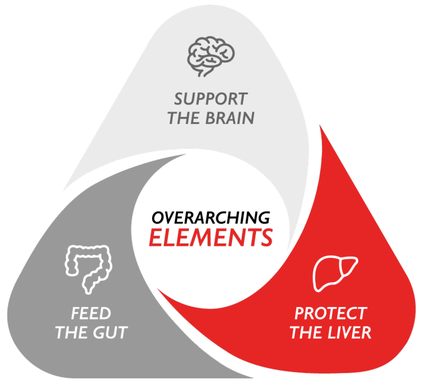

Figure 1. The Metabolic Matrix

Protect the liver:
Fructose reduction
Reduce glycemic load
Appropriate hydration
Reduce environmental toxins

Feed the gut:
Reduce risk of "leaky gut"
Reduce pro-inflammatory omega-6 fatty acids
Fiber contributes to microbiome health
Increase long chain fatty acids

Support the brain:
Healthy brain-essential fats
Plant-based and marine polyunsaturated essential fatty acids
Increase omega-3 fatty acids EPA and DHA for neurotransmission, pregnancy, lifespan, ADHD, depression
Increase brain-selective nutrients

Conclusions

1. Ultraprocessed food is metabolically unhealthy at several levels, including the addition of excess sugar, the removal of fiber, and deficiencies of omega-3 fatty acids and various brain-specific nutrients.
2. We conducted a scientific, evidenced-based "deep dive" into KDD's portfolio to improve the metabolic health profile of its products.
3. We have successfully implemented these revisions to develop a healthier product, with a taste profile and economic price point that is achievable.
4. Clinical trials and real-world sales data are forthcoming.

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