

VIEWPOINT

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Processed Food—An Experiment That Failed

Those of us who have participated in science know that 9 of every 10 experiments are failures. Now imagine that the last 50 years has been a grand clinical research experiment, with the American population as unwitting participants, conducted by 10 principal investigators—Coca-Cola, Pepsico, Kraft, Unilever, General Mills, Nestlé, Mars, Kellogg, Proctor & Gamble, and Johnson & Johnson. In 1965, these corporations posed the hypothesis that processed food is better than real food. To determine if the experiment was a success or a failure, we have to examine the outcome variables. In this case, there are 4: food consumption, health/disease, environment, and cash flow, divided into companies, consumers, and society.

Processed food is defined by 7 food engineering criteria; it is mass produced, is consistent batch to batch, is consistent country to country, uses specialized ingredients from specialized companies, consists of pre-frozen macronutrients, stays emulsified, and has long shelf life or freezer life.¹

Furthermore, 11 nutritional properties distinguish processed food.² (1) Too little fiber. When fiber (soluble and insoluble) is consumed within food, it forms a gelatinous barrier along the intestinal wall. This delays the intestine's ability to absorb nutrients, instead feeding the gut microbiome. Attenuation of the glucose rise results in insulin reduction. Attenuation of fructose absorption reduces liver fat accumulation. (2) and (3) Too few ω -3 and too many ω -6 fatty acids. ω -3s are precursors to docahexaenoic and eicosapentanoic acids (anti-inflammatory). Conversely, ω -6s are precursors of arachidonic acid (proinflammatory). Our ratio of ω -6 to ω -3 fatty acids should be approximately 1:1. Currently, our ratio is about 25:1, favoring a proinflammatory state, which can drive oxidative stress and cell damage. (4) Too few micronutrients. Antioxidants, such as vitamins C and E, quench oxygen radicals in peroxisomes to prevent cellular damage, while others, such as carotenoids and α -lipoic acid, prevent lipid peroxidation. (5) Too many trans-fats. These fats cannot be oxidized by mitochondria owing to the trans-double bond, so they line arteries and the liver and generate oxygen radicals. Of note, the US Food and Drug Administration declared in 2013 that trans-fats are not "generally recognized as safe,"³ so they should soon disappear from the food supply. (6) Too many branched-chain amino acids. Valine, leucine, and isoleucine are essential amino acids required for muscle biosynthesis. But when consumed in excess, they are deaminated in the liver and diverted to de novo lipogenesis, which increases liver fat. (7) Too many emulsifiers. Emulsifiers keep fat and water (eg, ice cream or lasagna) from separating. However, emulsifiers are detergents and may strip away the mucin layer that protects intestinal epithelial cells, predisposing individuals to intestinal disease or food allergy. (8) Too many

nitrites. Nitrites (cured meat) can be metabolized into nitrosoureas, which can predispose individuals to colon cancer. (9) Too much salt. Approximately 15% of the population is salt sensitive and can manifest with hypertension and cardiac disease. (10) Too much ethanol. Ethanol is converted into liver fat and drives oxidative stress. While clearly a concern in adults, it is less likely that ethanol poses a metabolic risk in most children, as their access is limited. (11) Too much fructose. Children consume fructose instead. In fact, fructose is metabolized by de novo lipogenesis in the liver exactly like ethanol. Indeed, sugar (ie, sucrose and high-fructose corn syrup) is the "alcohol of the child,"⁴ which is why children now get the diseases of alcohol consumption (eg, type 2 diabetes, dyslipidemia, and nonalcoholic fatty liver disease) without consuming alcohol. Furthermore, 74% of all the items in the grocery store contain added sugar⁵; this makes sugar the marker for processed food.

Let's assess each of the 4 outcome measures in turn. First is food consumption. The United States spends only 7% of gross domestic product on food, allowing us, the most obese nation, to buy more. There's no question that food consumption is way up—an increase in 187 kcal/d in men, 335 kcal/d in women, and 275 kcal/d in teens since 1995. But what are these calories? Not fat, the amount of which has stayed stable. The increase is in refined carbohydrates, half of which are sugar. In the last 30 years, while meat has declined from 31% to 21% of food dollars, processed foods and sweets have increased from 11.6% to 22.9%.

Next is health/disease. There's no question both obesity and type 2 diabetes have increased astronomically. Sugar consumption predicts metabolic syndrome in adolescents, regardless of calories or body mass index. When we substituted starch for sugar in children, their metabolic syndrome resolved.⁶ In fact, research shows that sugar is a proximate cause of type 2 diabetes, dyslipidemia, and nonalcoholic fatty liver disease.⁷

Third is environment. The World Wildlife Federation argues that production of sugar-related crops leads to soil erosion and an annual loss of 6 million hectares of arable land. We certainly see this in the Everglades and the Amazon. Furthermore, crop monoculture (ie, corn and soy) to produce processed food has led to increased atrazine use, increased nitrate contamination, the development of herbicide resistance, and the appearance of "superweeds."⁸

And lastly, cash flow. Until 2012, the processed food, sugar, and beverage companies fared better than the rest of the Standard and Poor 500; however, since 2013, their market performance has been suboptimal, highlighted by the firing of 1800 Coca-Cola employees in 2014 to save \$3 billion and the firing of McDonald's CEO Don Thompson. For consumers, processed food costs half as much per calorie as real food, and its trajectory of increase over

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time is lower; this would ostensibly make processed food a better short-term deal. However, the money spent on insurance premiums, the reduction in years of work due to disability, and the increase in years of life lost due to chronic disease over the long term more than eclipses the savings to consumers. Health care has grown from 2% in 1965 to 17.9% in 2014 of gross domestic product and is estimated to reach 21% by 2020. Currently, the food industry grosses \$1.46 trillion annually, of which 45%, or \$657 billion, is gross profit. However, health care costs \$3.2 trillion annually, of which 75% are spent on the diseases of metabolic syndrome; 75% of metabolic syndrome costs could be prevented if we changed our collective diet. That adds up to \$1.8 trillion dollars wasted; we lose triple what the food industry makes. This is unsustainable. Obamacare cannot stem the tide because there's no prevention to long-term disease other than changing the diet. This is why Morgan Stanley predicted 0.0% economic

growth by 2035 based on our current high-sugar model⁹ and why Credit Suisse called for taxation of sugar to limit the obesity and diabetes crises.¹⁰ (Thus far, public referenda have passed in Berkeley, San Francisco, Oakland, and Albany, California; Boulder, Colorado; Cook County, Illinois; and Philadelphia, Pennsylvania.)

Given these outcomes, the conclusion is clear: processed food is an experiment that failed. Processed food is high in sugar and low in fiber. There's only one recourse—real food, which is low in sugar and high in fiber. Real food is what the world ate for millennia without risk of long-term disease. But that's not what the 10 biggest food corporations are selling. One-third of American mothers today don't even know what real food is or how to cook; they and their children are destined to remain hostages to the processed food industry. Pediatricians provide anticipatory guidance. Dispelling the processed food myth must be priority number 1.

ARTICLE INFORMATION

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