Sugars are integral to most food products, providing or enhancing taste, texture, and stability. Because of health concerns, consumers want products with less sugar but still have great taste. Many sugar substitutes are available, but every product system has unique characteristics and trade-offs, and this can create uncertainty for the product developer. Design thinking approaches can provide product developers a way to consider how best to reduce sugar. This article, Part 1 of a 2-part series, discusses sugars and their role in foods. The design thinking framework of desirability, feasibility, and viability is introduced along with practical examples. A separate article, Part 2, will explore how the framework can be applied across a wide range of product examples.

**Keywords:** Sugar reduction, design thinking, sweeteners.

**ABSTRACT**

Sugars are integral to most food products, providing or enhancing taste, texture, and stability. Because of health concerns, consumers want products with less sugar but still have great taste. Many sugar substitutes are available, but every product system has unique characteristics and trade-offs, and this can create uncertainty for the product developer. Design thinking approaches can provide product developers a way to consider how best to reduce sugar. This article, Part 1 of a 2-part series, discusses sugars and their role in foods. The design thinking framework of desirability, feasibility, and viability is introduced along with practical examples. A separate article, Part 2, will explore how the framework can be applied across a wide range of product examples.

**INTRODUCTION**

Sugar, the simplest of all carbohydrates, is a member of the saccharide family. Although more complex carbohydrates such as polysaccharides or oligosaccharides also have a characteristically sweet taste, sugar generally refers to monosaccharides or disaccharides which include glucose, fructose, galactose, lactose and sucrose and maltose (2). Monosaccharides consist of a single sugar molecule while disaccharides are composed of two monosaccharides linked together (3).

In foods, sugars can be naturally occurring (such as in dairy products, fruits, and vegetables) or added (such as in desserts, sweetened beverages, cereals, and candies). Added sugars include monosaccharides, disaccharides, or artificial sweeteners. Artificial sweeteners are either natural products, naturally derived, or synthetic. Many artificial sweeteners are non-nutritive or high intensity that impart sweetness with little to no caloric value (4,5,6).

Despite popular perception, sugar adds more than just a sweet taste. It is a key ingredient that impacts the function and form of many foods.

**AN OVERVIEW OF SUGAR**

Sugar reduction in gelato has long been considered extremely challenging as sugar is needed for flavour, and is also critical to gelato’s velvety texture and mouthfeel. Part of achieving this texture is creating the right ratio of solids to water, typically 32 to 46%. Recently, Carpigiano unveiled a machine that produces gelato with either no added sugar or low-sugar using an Italian artificial sweetener called Diete. Tic. The machine uses computer algorithms and temperature-controlled gas to control the solids to water ratios (14).

<table>
<thead>
<tr>
<th>Sweeteners</th>
<th>Examples of sweeteners</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agave nectar</td>
<td>Agave syrup</td>
</tr>
<tr>
<td>Honey</td>
<td>Maple syrup</td>
</tr>
<tr>
<td>Monk’s honey</td>
<td>Brown sugar</td>
</tr>
<tr>
<td>Cane sugar</td>
<td>Beet sugar</td>
</tr>
<tr>
<td>Rapadura</td>
<td>Sugar alcohols</td>
</tr>
</tbody>
</table>

**Examples of Sugar Reduction Approaches**

With sugar playing a varied and critical role in so many food systems, reducing sugar levels can be challenging. Newer technologies to address the complicated path of sugar reduction include ingredients that either replace the sweetness and functionality of sugar, or block the bitterness often associated with artificial sweeteners.

**Design thinking approach**

Using design thinking to increase sugar reduction options in consumer food products Part 1: Sugar reduction using design thinking framework

**KEYWORDS:** Sugar reduction, design thinking, sweeteners.

**AN OVERVIEW OF DESIGN THINKING**

The role and type of sugar impacts food products, and approaches to formulating or re-formulating products to reduce sugar vary greatly. One such approach to product development is design thinking (15). The design firm IDEO is often credited with popularising design thinking and the Desirability-Feasibility-Viability framework (DFV) which is applicable to food product development. Using design thinking, a developer can find success where desirability, feasibility, and viability intersect. While most product development considers consumer preferences, product capability, sales channels and costs, the DFV framework looks at these factors a bit differently.

**Design thinking**

Design thinking focuses on an empathy for the consumer, while traditional product development often moves quickly to determine if the consumer likes what the current production facility can produce. This is a subtle yet powerful difference. Empathy for the consumer does not mean that other factors are not important or should not be considered. Rather, all aspects of the product – from the formula to the process, package and distribution – must be considered equally to find the best solutions.

**Applying the DFV Framework to Sugar Reduction**

How does design thinking and the DFV framework impact sugar reduction? Whether formulating a product to be low in sugar or re-formulating a product to reduce sugar, the first step is to consider the importance of sugar’s role in the product by utilizing the DFV framework.

**Understanding sugar’s role**

Sugar’s role in foods involves many factors, including taste, mouthfeel, stability, and overall acceptability. The primary role is related to desirability and the overall product flavour, but not to the product’s stability or food safety. In addition, a reduction strategy should focus on delivering a similar taste, but not to the product’s stability or food safety. Therefore, a reduction strategy should focus on delivering a similar taste, but not to the product’s stability or food safety.

**Source: IDEO**

Understanding sugar’s role provides a clearer understanding of the factors that influence sugar’s role in foods. For example, if sugar’s primary role is related to desirability and the overall product flavour, but not to the product’s stability or food safety, then a reduction strategy should focus on delivering a similar taste, but not to the product’s stability or food safety. Therefore, a reduction strategy should focus on delivering a similar taste, but not to the product’s stability or food safety. Therefore, a reduction strategy should focus on delivering a similar taste, but not to the product’s stability or food safety. Therefore, a reduction strategy should focus on delivering a similar taste, but not to the product’s stability or food safety. Therefore, a reduction strategy should focus on delivering a similar taste, but not to the product’s stability or food safety.
SUMMARY

Consumers enjoy what sugar brings to foods but are concerned with excess sugar consumption. Food companies need new approaches to meet these conflicting consumer desires, such as the design thinking approach presented here. Considering the role of sugar in each product formulation and how it impacts desirability, feasibility and viability, can shorten product development timelines and improve outcomes. The upcoming article, Part 2, will illustrate how the DFV framework can guide successful sugar reduction strategies through a wide range of product examples.

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ABOUT THE AUTHORS

Susan Mayer, MS, CFS
Innovation Advisor
Certified Food Scientist with over 25 years of food industry experience in product development, sensory evaluation, and quality systems, and 10 years in innovation and commercialization. Managed project and programs for all phases of the product lifecycle for a wide variety of foods. Adjunct professor at Rowan University Center for Innovation and Entrepreneurship.

Jamie Pero Parker, PhD
Innovation Advisor
Chemist with over 12 years of innovation research experience in technology scouting, forecasting, and commercialization with an emphasis in sustainability, biological, bioanalytical, and biophysical chemistry. Published several articles looking at sustainability in new product development and innovation practices. A highly-regarded trainer in innovation research techniques with extensive international and national experience.