

ANSWERED: The crucial questions shaping product development

Getting to grips with the sweet stuff

As sugar continues to come under fire, food and drink manufacturers urgently need to step up efforts to reformulate products. Faced with government-backed initiatives to reduce sugar content, along with public health campaigns and widespread media coverage fuelling a consumer backlash, the industry is under considerable pressure to show commitment to the cause.

This has prompted a major drive to work with alternative ingredients, which are capable of replicating one or more of the important functional and flavour characteristics traditionally provided by sugar. This is no easy task. Sugar is unique and cannot be replicated on a like-for-like basis. But one category which offers significant potential is sweeteners.

Encompassing a range of established artificial options, as well as a rapidly expanding group of naturally derived sweeteners, these ingredients are an important consideration in every sugar reformulation strategy – either alone or, more commonly, in carefully blended combinations.

The challenge for formulators is to balance the benefits and drawbacks of each option in different applications – and arrive at a solution which not only performs within technical parameters, but also the wider market trends influencing consumer behaviour.

It's a complex picture, but one which

What are the main issues when formulating with sweeteners? How do they impact taste, functionality and cost? What are the implications for labelling? Carole Bingley, technical specialist for Reading Scientific Services Limited, has all the answers

can be navigated with the help of some fundamental guiding principles.

What are sweeteners?

Sweeteners are defined as substances which impart a sweet taste to foods or table-top sweeteners and can be classified into a number of different types.

High potency sweeteners (HPS) include well established artificial ingredients, such as aspartame, acesulfame-K and sucralose, as well as naturally derived alternatives – of which steviol glycosides are currently the most widely available. Far sweeter than the same amount of granulated sugar, HPS can be used at much lower levels and offer a zero or low-calorie content contribution; the distinction rests on whether the compound is metabolised in the body but is not a game-changing factor. Aspartame, for example, is metabolised in the body but is used in such small quantities that the impact on calorific content is negligible.

Polyols (or sugar alcohols) can also be used as sweeteners. The majority of this group of bulk sugar replacers (low

digestible carbohydrates) contribute 2.4 kcal/g (compared to 4 kcal/g for sugar) – although erythritol is calorie free. Generally less sweet than sugar, these ingredients are used to replace it on a weight-for-weight basis and can provide some sweet taste.

Some sweeteners are subject to EU regulation and it is wise to keep abreast of changing directives. High potency sweeteners and polyols, for example, are classed as additives and must ensure compliance with specific legislation, while monosaccharides, disaccharides, oligosaccharides and foods containing these substances are not.

How do I choose the best sweetener for my product?

When substituting sugar with a sweetener, there are many different factors to consider before deciding on the best approach – but functionality is the most important place to start.

For example, if sugar's main purpose is to provide sweetness in a beverage, then a HPS can be used to deliver similar flavour impact in the reformulated product. But in

many applications sugar is used for more than just its distinctive taste. So when it comes to bakery and confectionery products, where texture is a key component, a different solution is required. Here, a polyol or soluble fibre-based bulking agent would be needed to create the desired product structure, sometimes in combination with a HPS to build the sweetness profile back up.

Again, regulatory directives may also influence to what extent you rely on the use of sweeteners. Current European legislation states that sweeteners can be used either in products with a total energy reduction of 30 per cent or in 'no added sugar' formulations.

This may not present a problem in hard candy, where sugar can be drastically cut to reduce calorie content, but when it comes to products such as biscuits and baked goods, it will be a struggle to achieve a 30 per cent calorie reduction, so the only option is to remove all added sugar. A further limitation is that high potency sweeteners are not currently permitted in fine bakery wares including biscuits and cakes.

Consumer expectations should also be taken into account – particularly in terms of on-pack labelling. Is a natural platform more important than a 'reduced sugar' claim to your target audience? The answer to this and other similar questions will help to govern decisions on ingredient formulation and could make the difference to your product's appeal.

What is the difference between artificial sweeteners and naturally derived sweeteners?

Artificial sweeteners do not exist in nature, so have to be synthesised during production.

Naturally derived sweeteners, such as steviol glycosides, do occur in nature and can be extracted from the plant source but the required molecules are present at low levels. This has prompted the development of new

production methods – such as fermentation and enzymatic conversion of starch or glucose syrup – which can offer more economically viable solutions.

What are bulking agents?

Bulking agents encompass polyols and other low- or non-sweet materials which are used as a weight-for-weight replacement for sugar. They replicate different aspects of sugar's functional role; selected to act as preservative, stabiliser, thickener or fermentation substrate in a range of applications.

Maltitol, isomalt, sorbitol and a number of other well-established types of polyols, for example, work well in terms of providing structure and some sweetness.

Other ingredients, such as polydextrose and soluble fibres, bring other benefits such as fibre enrichment, but the final product may fall short of the desired sweetness intensity so other formulation changes will also be required.

Do all high potency sweeteners taste the same?

No, each HPS has its own unique profile. None is an exact match for sugar and blending is often used to create a more 'sugar-like' profile. For example, artificial sweeteners sucralose and aspartame both have a slightly lingering sweet aftertaste. Acesulfame-K, however, has an upfront sweetness but a bitter aftertaste. Used in combination, the bitterness of one cuts through the persistent sweetness of the other; resulting in a more balanced taste profile.

Naturally derived sweeteners present different challenges in terms of taste quality – the first commercially available stevia extracts tended to have a bitter profile and licorice aftertaste which was difficult to mask. However, recent developments have resulted in extracts with higher concentrations of minor glycosides, such as

Rebaudioside M, which are regarded as having a much closer profile to sugar, with no or lower off-notes.

Why do products containing polyols carry a warning?

Polyols have a lower calorie content than sugar because they are not fully metabolised. This means they can reach the large intestine and result in gastro-intestinal discomfort and laxation at high levels.

In the UK there is a regulatory requirement for all products containing 10 per cent polyol in the formulation to carry the warning: 'Excessive consumption may cause laxative effects'. This is the case regardless of the tolerance of the type of polyol used.

Is it more expensive to use sweeteners?

Cost depends on the product and sweetener used. High potency sweeteners are more expensive than sugar on a weight-for-weight basis, but the small concentrations required means that cost in use is usually lower – assuming water can be used to replace the bulk.

Polyols and other bulking agents also tend to be more expensive than sugar, which results in increased formulation costs. Manufacturers are then faced with a number of difficult choices; charging more for the product, which is not popular with consumers and tends to steer consumers towards full sugar options, reducing pack size and running the risk of 'shrinkflation' complaints, or accepting the impact on margins.

Does a reduction in sugar result in calorie reduction?

Not always; it varies between applications. In products where all or most of the calories are provided by sugar, replacing sugar with a HPS and water will result in a reduction in calories. However, in concepts where sugar needs to be replaced by a bulking agent, the impact on calories will be much smaller. ■

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Carole is a senior associate principal scientist working in the Product and Ingredient Innovation Team at RSSL. She holds a Bachelor of Science in Food Science and a Master of Science in Nutritional Medicine. Carole has worked with a wide range of sweeteners and bulking agents across many food categories during her 25 years in the food industry

