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2020 – 3 years to go and counting!

The impact of ingredient and processing developments
on R&D

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A Leatherhead Food
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‘2020’ has long featured in research & development strategies as a key milestone date, but now with only 3 years to go, food and beverage companies must decide where to focus their efforts. In this white paper, Dr Pretima Titoria plots key industry trends against the new ingredients and latest processing technologies to identify what can realistically be achieved.

Balancing near term and long term innovation priorities is an enduring challenge for the food and beverage industry. Interviews with sector leaders conducted for Leatherhead’s *Poised for an age of innovation* report considered the role innovation plays across four key areas (see figure 1): protecting the existing portfolio, stretching the product category, acquisitions & mergers and developing next-generation products.

A strategic approach

Innovation success ultimately depends on meeting or exceeding consumer demands. Yet ingredient capabilities and processing technologies can be a limiting factor. It’s a little bit ‘chicken and egg’: is it the consumer / market trend that truly drives innovation or the availability of ingredients and technologies to facilitate change?

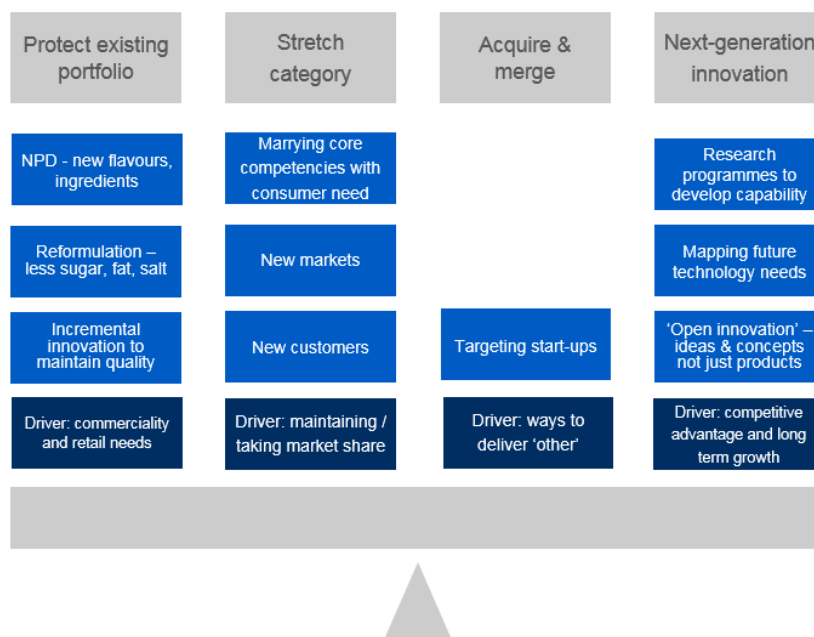


Figure 1: Key activities where innovation plays a role

Plotting consumer and market trends against emerging ingredients and processing technologies can reveal opportunities and challenges. Adoption of the traditional stage-gate exercise or a Technology Readiness Level (TRL) study will ensure that relevant ideas/concepts are incorporated within company strategies at the appropriate time and pace.

This paper considers current food and beverage industry trends (see figure 2) alongside relevant ingredient and processing developments. It shows how short term innovation can play a strategic role in achieving longer term goals.

What is going on in the ingredient market?

Sugar reduction continues to be a crucial theme within the wider health trend, particularly in light of high profile targets set by public health bodies. The most recent of these is the Public Health England guideline for the

industry to achieve a 20% sugar reduction in certain categories by 2020 (with a 5% reduction in 2017).

Current sugar reduction strategies include optimal use of intense and bulk sweeteners. Stevia and agave are gaining attention due to their 'natural' label and the availability of various formats and grades. Expert knowledge can help identify the best sweeteners or sweetener blends for different applications while avoiding detrimental impact on flavour profiles or costs.

Exploitation of flavours is another emerging sugar reduction tactic, as evidenced by the recent DouxMatok development. The company claims to have developed a flavour-carrying particle enabling sugar content and calories to be reduced by more than 50% without losing sweetness or raising costs¹. This proprietary product is expected to be available in Europe by 2018. Potential applications include yoghurts, baked goods, breakfast cereals and

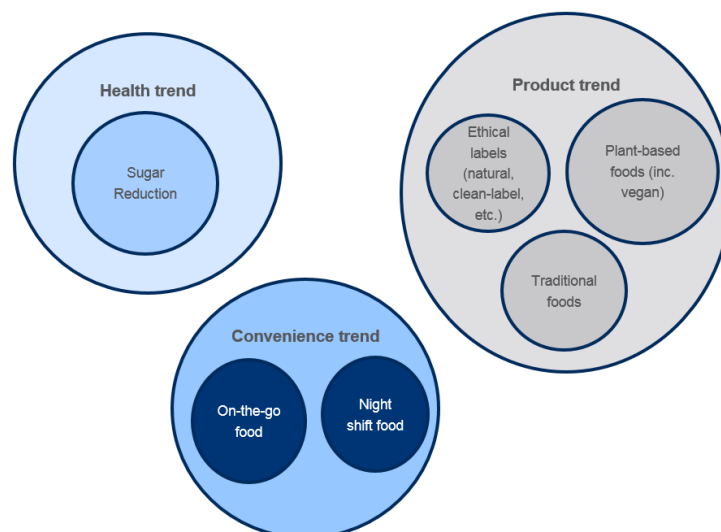


Figure 2: Some of the key trends / mini-trends dominating 2017 and beyond

¹ FoodNavigator.com (2017) Patented sugar reduction molecule will be on shelves next year, says DouxMatok. Accessed: <http://www.foodnavigator.com/Market-Trends/Patented-sugar-reduction-molecule-will-be-on-shelves-next-year-says-DouxMatok>

snacks. In addition, Nestlé² has announced a ‘successful’ modification of the structure of sugar, enabling it to be reduced by 40% in chocolate. Nestlé aims to start using this modified sugar across its chocolate range in 2018. However, it is unlikely to be available to other food and beverage manufacturers.

Proteins	Polysaccharides	Phospholipids	Saponins
Pea	Basil seeds	Sunflower	Quillia
Lupin	Corn fiber	Rapeseed	
Soy	Maillard reaction complexes	Lecithin blends (with other natural emulsifiers)	
Corn germ			

Table 1: Prospective ‘natural’ emulsifiers

Clean label, natural products made with plant-based and/or traditional ingredients are also in high demand. Developing exciting products with clean label or natural additives, especially emulsifiers, remains a challenge however. And replacing chemical emulsifiers with natural versions is far from straightforward. Natural emulsifiers lack the effectiveness and versatility of their synthetic counterparts. However, there is considerable ongoing research focusing on proteins from plant sources, polysaccharides, phospholipids and saponins³. Table 1 summarises some of these ingredients. Once isolation, fractionation, purification and characterisation steps have been completed, the prospects for these pure ingredients are excellent. Currently, a saponin, isolated from the *Quillaja saponaria*

tree is commercially available, marketed by Ingredion as Q-Naturale and by Naturex as SapNov™.

Plant-based and traditional foods are at the top of many consumer wish lists. This is underpinned by evidence showing that use of plants, nuts, seeds and ancient grains can bring nutritional benefits. For instance, meals prepared with beans and peas have been found more satiating and palatable than meals based on animal protein⁴. And there are additional benefits associated with ancient grains, such as the majority being gluten-free.

Developing products with plant/nut/seed-based ingredients and ancient grains is not without challenges. Chickpeas, lentils, fava beans, soy beans, seaweeds and algae are readily available in raw and powdered formats, along with quinoa, spelt, teff, kamut, chia and farro grains. However, their use is application dependent. These ingredients have an impact on textural and taste profiles, so they require expert knowledge of ingredient blending and the interactions between hydrocolloids, starches and proteins. There are also regulatory challenges surrounding labelling. ‘Almond milk’ or ‘soy cheese’ might be the manufacturer’s preferred product name. But items that are not strictly dairy (bar some exemptions) cannot be labelled, advertised or presented using protected terms for milk and milk products. Direct or indirect suggestions of a dairy connection are not allowable for ‘non-pure’ dairy or imitation products.

² FoodNavigator.com (2016) Nestlé develops natural method to cut sugar in chocolate by 40%. Accessed: <http://www.foodnavigator.com/Science/Nestle-develops-natural-method-to-cut-sugar-in-chocolate-by-40>

³ Ozturk B, McClements DJ (2015) Progress in natural emulsifiers for utilisation in food emulsions. *Current Opinion in Food Science*, 7:1-6.

⁴ Kristensen MD, Bendson NT, Christensen SM, Astrup A and Raben A (2016) Meals based on vegetable protein sources (beans and peas) are more satiating than meals based on animal protein sources (veal and pork) – a randomised cross-over meal test study. *Food & Nutrition Research*, 60:32634.

What about processing technologies?

With consumer demand for 'on-the-go' products increasing, 'night shift' food⁵ is also gaining attention. These products can be delivered via exploitation of ingredient knowledge and product development tools. But new processing technologies are a critical enabler to enhance products' quality, appearance and functionality.

Busy schedules mean consumers are looking for ways to wind down and relax in preparation for a healthy sleep. Drinking warm milk before bedtime is a popular and traditional habit; milk contains an amino acid called L-Tryptophan which helps the body produce melatonin and serotonin, two chemicals which tell the body to sleep⁶. Functional ingredients under consideration in relation to this 'night shift' trend include GABA, pyridoxine, calcium, potassium and ornithine. These can be found in 'bulk ingredients' such as barley grass powder, maca, panax, whole grains and asparagus powder⁷.

The availability and effectiveness of functional sleep-promoting ingredients is a critical factor. Various new and/or optimised technologies are being used to protect and deliver functional ingredients within product structures. Conventional thermal treatments are making way for non-thermal methods which better satisfy demands for high nutritional value and fresh-like characteristics. Ultrasound and high-pressure processing look

set to play an important role in the development of 'night shift' food in the short-term. Their use was recently found to preserve the fructo-oligosaccharide content of cranberry juice, maintaining its prebiotic qualities, as well as increasing anthocyanin content⁸. This underlines the potential contribution ultrasound and HPP could make to the delivery of high quality functional ingredients. What's more, these technologies represent a non-thermal means to inactivate microorganisms.

Successful 'on-the-go' product development requires manufacturers to embrace new technologies across processing and packaging. Investing in smaller, more flexible and single-pack pouches can represent a quick-win, ideally using 'green' or 'recyclable' materials. Ultrasound and HPP can also offer benefits here, providing the textural properties and microbiological stability of the product can be maintained.

2020 and beyond

So how important is the 2020 R&D milestone? It's all relative. While deadlines can help focus the mind, many industry developments are iterative by nature.

Of the work streams highlighted in Figure 1, 'protecting the existing product portfolio' and 'stretching the category' are likely to dominate the 2020 agenda. While consumer or market needs are an underlying driver of change, the activation of change is dependent on technology and ingredient readiness. 2020 will

⁵ Mintel (2017) Global Food and Drink Trends 2017. Accessed: <http://www.mintel.com/global-food-and-drink-trends>

⁶ HealthGuidance.org (no date) Does milk help you sleep? Accessed: <http://www.healthguidance.org/entry/14622/1/Does-Milk-Help-You-Sleep.html>

⁷ Zeng Y *et al.* (2014) Strategies of functional foods promote sleep in human being. *Current Signal Transduction Therapy*, **9**:148-155.

⁸ Gomes WF *et al.* (2016) Effect of ultrasound followed by high pressure processing on prebiotic cranberry juice. *Food Chemistry*, **218**:216-268.

come and go and innovation must be a strategic long term discipline that is supported – not distracted by – near term goals.

Focusing on areas where emerging ingredients and technologies can quickly be applied to R&D challenges is the surest route to success. Innovation is a journey, not a destination and every step counts.

How Leatherhead can help

With strong links to various ingredient manufacturers/suppliers and emerging technology hubs, Leatherhead can work with you to ensure successful product development with the latest ingredients and technologies. Confidence in the product deliverables can be validated with bespoke product analysis exploring ingredient efficacy, product characteristics and shelf life stability, all of which Leatherhead can assist with. Furthermore, an understanding of the global regulatory landscape can be provided, ensuring that the products you develop comply with any local restrictions. Contact help@leatherheadfood.com for help uncovering the latest consumer, ingredient and processing technology opportunities.

About the author

Pretima graduated with a B.Sc. (Hons) in Food Technology at University of Reading and obtained her Ph.D. in the area of rheological characterisation of food biopolymers/hydrocolloids at Cranfield University. She continued to develop her skills in this area over several years while working at the Institute of Food Research, Norwich and at Dupont Cereal Innovation Centre, Cambridge, before joining Leatherhead Food Research in 2001. Pretima now leads the Nutrition and Product Development Team, managing confidential contract research projects. Pretima has many years' experience in physico-chemical characterisation of ingredients, interim products and final products, focusing on the textural and microstructural properties and their effect on product quality and stability, as well as their role in oral processing. Pretima is also involved with assessment of emerging technologies for the food & beverage industry, and is a Fellow at the Institute of Food Science and Technology (FIFST).

About Leatherhead Food Research

Leatherhead Food Research provides expertise and support to the global food and drinks sector with practical solutions that cover all stages of a product's life cycle from consumer insight, ingredient innovation and sensory testing to food safety consultancy and global regulatory advice. Leatherhead operates a membership programme which represents a who's who of the global food and drinks industry. Supporting all members and clients, large or small, Leatherhead provides consultancy and advice, as well as training, market news, published reports and bespoke projects. Alongside member support and project work, our world-renowned experts deliver cutting-edge research in areas that drive long-term commercial benefit for the food and drinks industry. Leatherhead Food Research is a trading name of Leatherhead Research Ltd, a Science Group (AIM:SAG) company.

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