



# New and emerging ingredients

A critical part of your R&D strategy



# Welcome to Leatherhead's member only webinar

## New and emerging ingredients

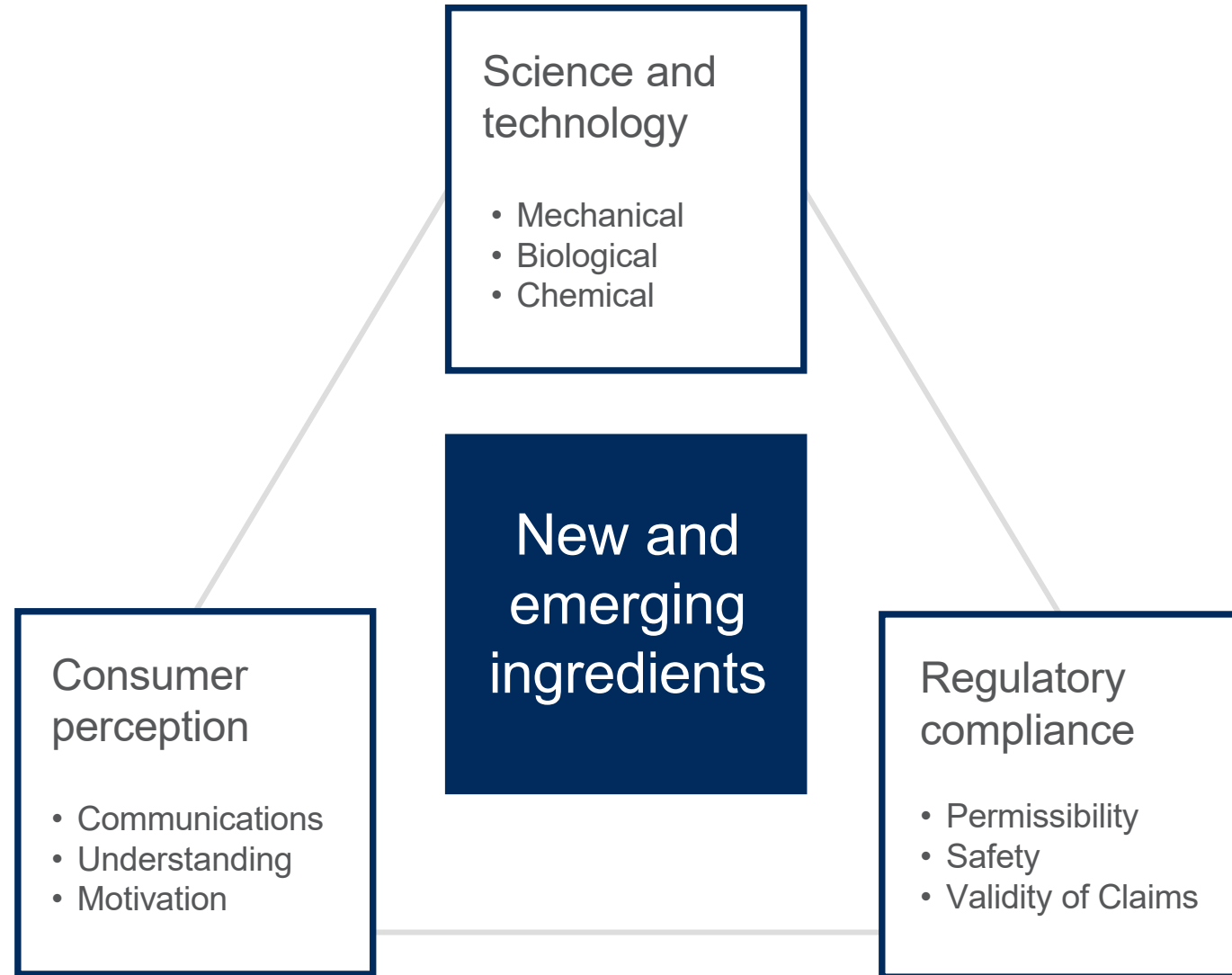


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# New and emerging ingredients





We've operated a membership programme since 1919, giving our members preferential service. Today, our 1,200+ member companies range from start-ups to the largest household brands all over the globe.

Member benefits include:

- on-demand access to our experts
- Member-exclusive insight
- Discounted fee rates
- Networking





Membership provides on-demand access to expertise, information and insight. It is the simplest way to do business with us.

**Benefits:**

- Access to a diverse team of highly skilled food & beverage consultants
- An independent perspective to challenge thinking
- Ability to focus on the things that matter

**EXPERTISE**

On-demand access to Scientific and Regulatory Affairs, Technical and Consumer Science expertise for short enquiries. A discounted rate on larger projects

**INFORMATION**

Regular updates making it simple to stay abreast of industry news and developments

**INSIGHT**

Content and events exclusive to members, addressing key trends





# Consumer-led trends

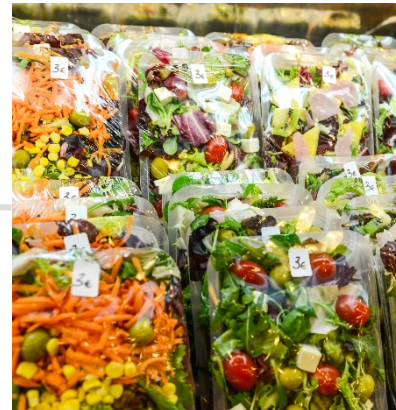


# Traditional focus on scale and efficiency

Scale and efficiency of production



The changing consumer



Emerging trends



# New focus on personalisation

Personalisation



The  
changing  
consumer



Emerging  
trends





# Consumer drivers

Key  
consumer  
drivers

Lack of trust

Moving away  
from processed  
food

Changing diets

New ingredients  
need to work  
harder



# Consumer demands

Key  
consumer  
drivers

Changing diets

Lack of trust

Moving away  
from processed  
food

New ingredients  
need to work  
harder

Meeting  
consumer  
demands

Sustainability  
and ethical  
sources

Health and  
wellbeing

Clean and  
natural

New sensory  
experiences

New sources



## Different approaches.....

Start a  
fresh



Stretch and  
protect





# New technology opportunities



## 3 areas of technology to develop new and emerging ingredients



### Mechanical

- Grinding
- Extrusion cooking
- High/ultra-high pressure
- Emulsification



### Biological

- Enzymatic
- Microbial
- New sources



### Chemical

- Acids & alkalis
- Cross-linking agents
- Solvent treatments





# Key themes for development of new and emerging ingredients

1. Saturated fat reduction  
(chemical and mechanical)

2. Clean label (biological)

3. Increasing dietary fibre  
(biological)

4. Sugar reduction  
(biological)

5. To increase nutrient content  
(mechanical and chemical)

## Challenge 1:

### Reducing saturated fat content

## Going beyond conventional emulsions to reduce saturated fat content

### Conventional Research

- Oil-in-water emulsions
- Water-in-oil emulsions
- Multiple emulsions (WOW and OWO)



### Emerging Research

- Structured emulsions
- Oleogels

Enhanced delivery of functional properties of current mainstream ingredients

Miao, S. (2014) Novel structured emulsions for delivery of engineered food flavours [www.teagasc.ie](http://www.teagasc.ie)  
Patel, A. R. (2016) Edible oil structuring: an overview and recent updates *Royal Society of Chemistry* 7 pp. 20 -29



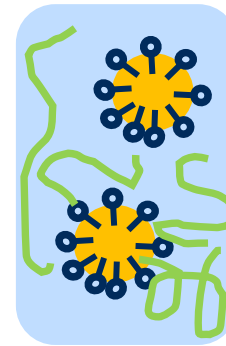
## Challenge 1:

### Reducing saturated fat content

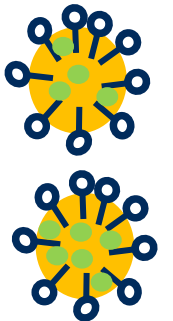
## OLEOGELS

A process of converting liquid oil into gel-like material without modifying the chemical characteristics of oil

1. Biphasic gels – using thickening and gelling agents to create viscous or gelled systems capable of carrying oil droplets



2. Utilisation of lipid-based gelators – Adding waxes or fatty acids or fatty alcohols into the oil phase above their melting points and cooling to lower temperatures under shear or stationary conditions



### Bakery fats

- high solid content – high saturated (solid) fat content
- Reduce saturated fat content by using liquid (low sat) oil – structure it into gel-like consistency

### Meat products

- Reduction of total fat content in meat products – replace animal fat with oleogels
- Improve fatty acid profiles – use structured “liquid oil”

Miao, S. (2014) Novel structured emulsions for delivery of engineered food flavours [www.teagasc.ie](http://www.teagasc.ie)  
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## Challenge 2:

### Removing artificial additives and preservatives

## Utilising 'natural' ingredients for preservation of food

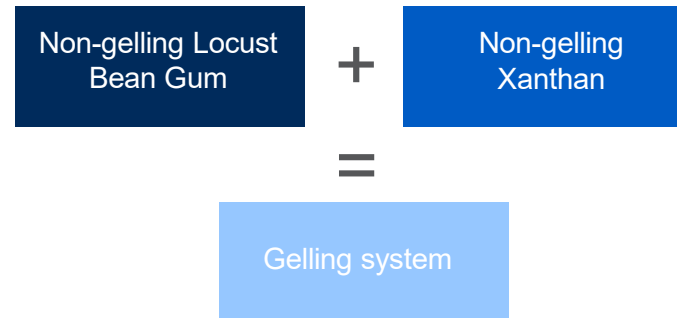
### Key challenges

1. Consumers want 'natural' products prepared with 'natural' ingredients
2. Matching the efficiency and effectiveness of synthetic/ chemical preservatives in terms of microbiological spectrum and shelf life period, in soft drinks, desserts and baked goods

### Mixing ingredients for synergistic effects

All about creating mixtures that would deliver more than the sum of the functional properties of their individual components

- Working with currently available ingredients
- Reduced pressure on cultivating new ingredients



“...a consequence of interaction among different chain polymers and formation of mixed junction zones...”

- Plant-based oils from common crops
- A combination of coriander oil and cumin seed oil exhibited synergistic antibacterial activity
- The synergistic interaction may increase their antibacterial and antioxidant efficacy at sufficiently low concentrations
- Could be used as a potential source of safe and potent natural antibacterial for the pharmaceutical and food industries

[https://www.researchgate.net/publication/279537588\\_Evaluation\\_of\\_Synergistic\\_Antibacterial\\_and\\_Antioxidant\\_Efficacy\\_of\\_Essential\\_Oils\\_of\\_Spices\\_and\\_Herbs\\_in\\_Combination](https://www.researchgate.net/publication/279537588_Evaluation_of_Synergistic_Antibacterial_and_Antioxidant_Efficacy_of_Essential_Oils_of_Spices_and_Herbs_in_Combination)



## Challenge 3:

### Incorporating dietary fibres

## Exploiting new technologies: to improve dietary fibre content & solubility

Key challenge:

1. Meeting country fibre targets
2. Incorporating dietary fibre into a wide range of products which influence taste, texture, shelf life and stability

Increasing dietary fibre content and solubility

### Using enzymes (biological)

“...a controlled natural enzymatic process that breaks guar gum down into small units...” that has been applied to guar gum (SunFiber)

## Challenge 4:

### Reducing sugar content

## Reducing sugar content using proteins

### Key challenges

1. UK SACN report in 2015 Carbohydrates and health - new free sugar intake recommendations of 5% of daily intake and PHE sugar reduction targets in 9 categories
2. A long way from achieving the perfect and identical replacement for sugar – taste and texture must not be compromised alongside with shelf life stability and safety for all sweet products, including confectionery, soft drinks, desserts and baked goods

**Monellin (MNEI)** – isolated from Serendipity berry

*Dioscoreophyllium cumminsii*

- 3,000 times sweeter than sucrose

**Brazzein** – isolated from West African fruit of climbing plant Oubli

*Pentadiplandra brazzeana Baillon*

- 500 – 2000 times sweeter than sucrose

**Miraculin** – glycoprotein isolated from fruit of *Synsepalum dulcificum*

- Not sweet itself but make the sour products taste sweet
- Glycoprotein binds to the sweetness receptors on the tongue, therefore causing sour fruits, sour foods and sour drinks to be perceived as sweet



## Challenge 5:

### Improving the nutrient profiles of products

## Using plant cross-breeding technology to eliminate malnutrition

### Key challenges

1. A better way of increasing nutrient content
2. Supplementation of products is a challenging additional step in the production line, some of the poorest communities may not have access to processed food

### Reformulated baked beans

Assuming baked beans product:

- contain 65% iron-biofortified beans
- has 5% processing loss
- the product could contain just above 2.1 mg/100g iron

Reference Intakes	14 mg [Fe] in UK	Calculated
Source of	15%	2.1 mg per 100g product
High in	30%	4.2 mg per 100g product

Source of iron



Increasing iron, zinc and vitamin A contents of rice, wheat, pearl millet, common bean, maize, cassava, orange sweet potato, banana/plantain, lentils, Irish potato, cowpea and sorghum through  
**CONVENTION PLANT BREEDING**



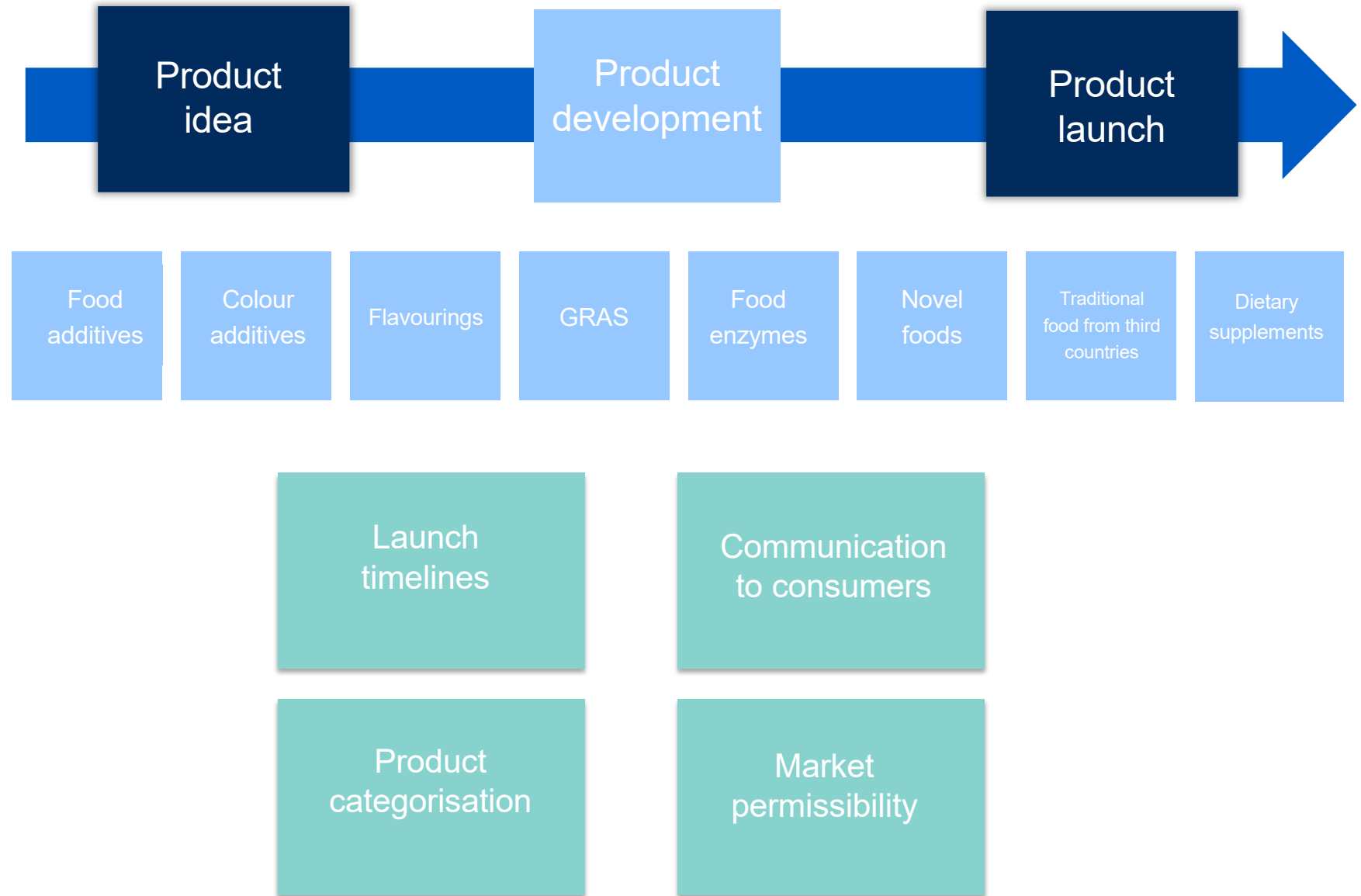
# Regulatory considerations



# Complex regulatory framework



# Market specific advice can accelerate product launch timelines



# Diversity of pre-market approvals between markets



Substance  
for new  
food use

Food additive  
petition

GRAS  
notification



New  
ingredient

Novel foods

Food  
improvement  
agents



# Diversity of pre-market approvals between markets



New ingredients

Novel foods

Food additives



New ingredient

Novel foods

Food additives  
(inc. flavourings)  
Processing aids

Food enzyme

# EU novel food categories



Vitamins and minerals and other substances used in food supplements, fortified foods and foods for specific groups

From animal (including cloned animal)

New molecular structure

From cell culture or tissue culture derived from animals, plants, microorganisms, fungi or algae

From fungi/micro-organism/algae

Engineered nanomaterials

Produced with novel process

From material of mineral origin

From plants or their parts

Food used exclusively in food supplements within the EU before May 15, 1997, intended to be used in foods

Source: © European Union

# EU novel food opportunities



Vitamin K2

Isomaltulose

Clinoptilolite

Nano vitamins

Cultured meat

Chia seeds

Antarctic krill oil

UV-treated mushrooms  
*Agaricus bisporus*

Yeast beta-glucans

Conjugated  
Linoleic Acid  
(CLA)-rich oil

Source: © European Union



# The overarching framework can significantly impact commercialisation

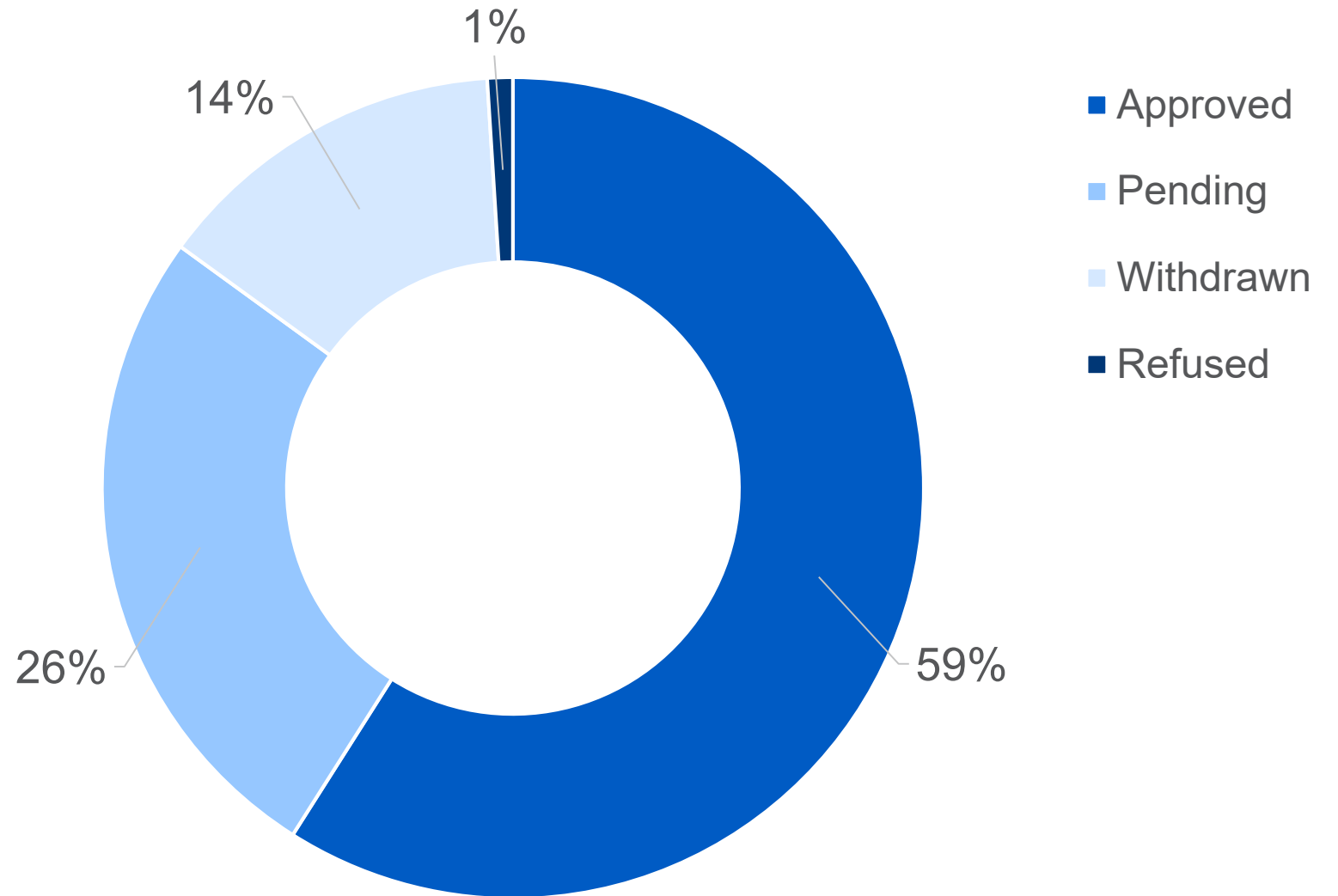


Substance	Applicant	Submissions	Filing	Granted	Total time
D- Tagatose	Arla Foods	GRAS Notice No. 78	11 May 2001	25 Oct 2001	6 months
		EU Novel food	01 March 2005	14 Dec 2005	10 months
Krill oil	Neptune	GRAS Notice No. 242	04 Feb 2008	14 Oct 2008	8 months
		EU Novel food	02 Oct 2006	12 Oct 2009	3 years
Ice structuring protein preparation	Unilever	GRAS Notice No. 117	30 Oct 2002	17 April 2009	6 months
		EU Novel food	16 June 2006	22 April 2009	3 years
Plant sterols	ADM	GRAS Notice No. 61	27 Nov 2000	18 April 2001	5 months
		EU Novel food	02 Nov 2001	31 March 2004	2.5 years
Diacylglycerol oil	ADM	GRAS Notice No. 115	05 Sept 2002	24 Feb 2003	6 months
		EU Novel food	14 April 2002	23 Oct 2006	4.5 years

## Comparison of selected US GRAS vs EU Novel Food submission timelines

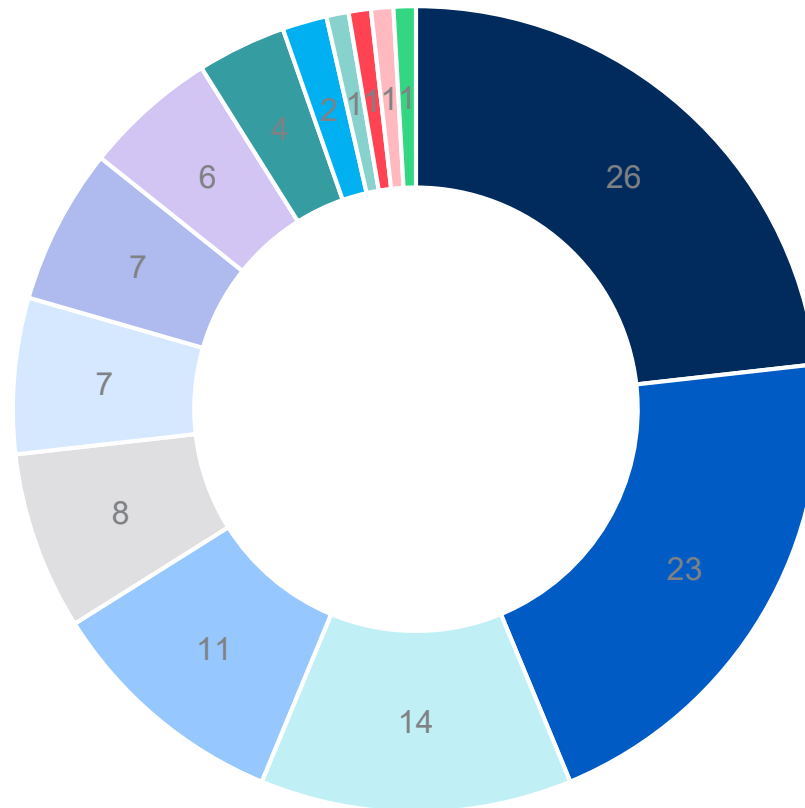
Sources: FDA GRAS Notice Inventory & © European Union

There are high success rates for approvals



Application success of EU novel food dossiers 1997 – present (EC)  
Source: © European Union

And many of these novel foods deliver against consumer needs



- Oil & Lipids
- Botanical extract
- Saccharides (poly-, di-, mono-, tri-, tetra-)
- Exotics (noni, baobab, chia, haskap, sorghum, kippist)
- Protein/Peptides
- Additives as nutritional substance
- New process
- New vitamins/minerals
- Algae extract
- Carotenoids
- Enzyme preparation
- Exotics (noni, baobab, chia, haskap, sorghum)
- Micro-organism
- Plant sterols

The different types of novel foods approved in the EU since 1997

Source: © European Union



A background image showing several clear plastic bowls filled with different food ingredients. In the foreground, there are bowls of almonds, cashews, and white chocolate-covered almonds. In the background, there are bowls of other nuts and possibly dried fruits. The image is slightly blurred, focusing on the ingredients in the foreground.

## In summary

## In Summary

- When using new and emerging ingredients it is key to consider the science, consumer perspective and regulatory requirements in tandem as each product will be different and there is no one perfect solution
- There are a range of existing solutions that can help you but which is the most suitable depends on the product, brand, consumer base and regulatory landscape which will differ in each market.
- Need to be aware that success in one market does not guarantee success in another market.

# Questions