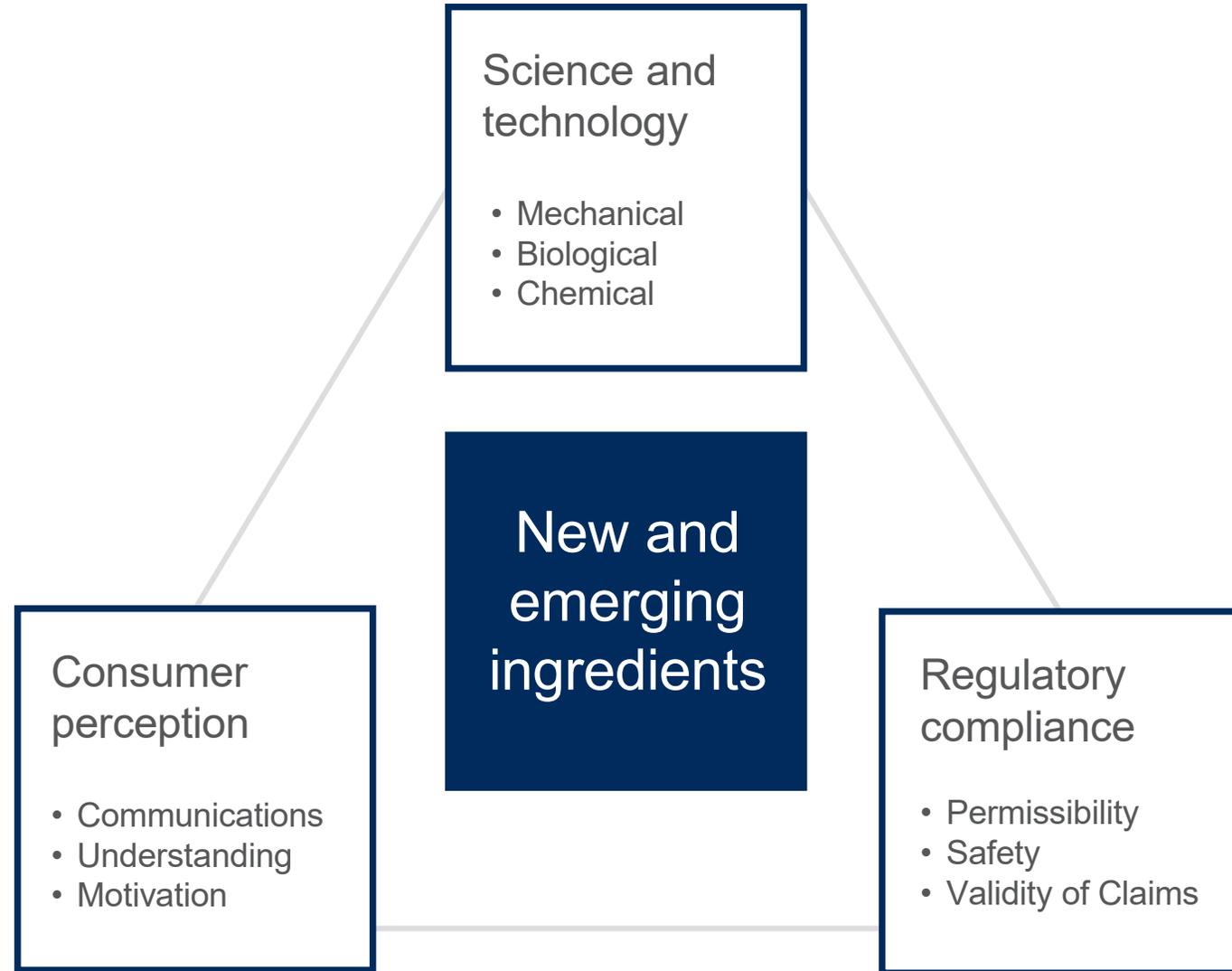


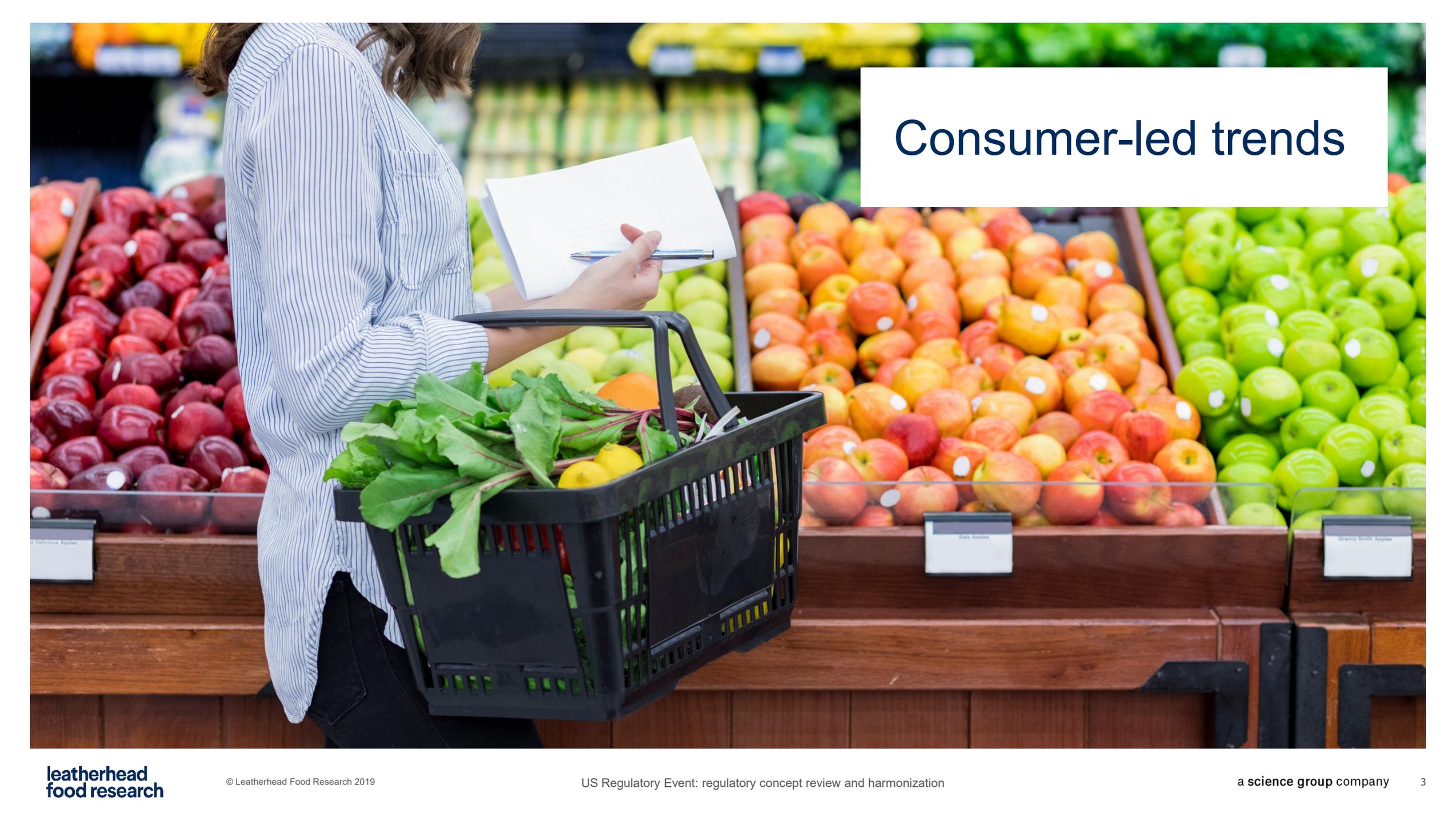
# New food ingredients – Keeping up with the consumer

An overview of current consumer, scientific and new ingredient trends and how those ingredients are regulated in the EU.

# New and emerging ingredients

a balance between consumer perception, technological success & regulatory compliance





# 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

## Help me achieve my goals

44%

are trying to eat  
less **sugar**

14%

are trying to eat  
less **meat**

1 in 20

are trying to cut  
**gluten** from  
their diet

8%

are trying to eat  
more **protein**

6%

are trying to cut  
**dairy** from their  
diet

1/4

are trying to cook  
more from **raw**  
**ingredients**

1 in 5

are trying to drink  
less **alcohol**



# Business models

Start afresh



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



## Chemical

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



# Key themes for development of new and emerging ingredients

1.  
**Saturated fat reduction**  
(mechanical)

2.  
**Clean label**  
(biological)

3.  
**Increasing dietary fibre**  
(biological)

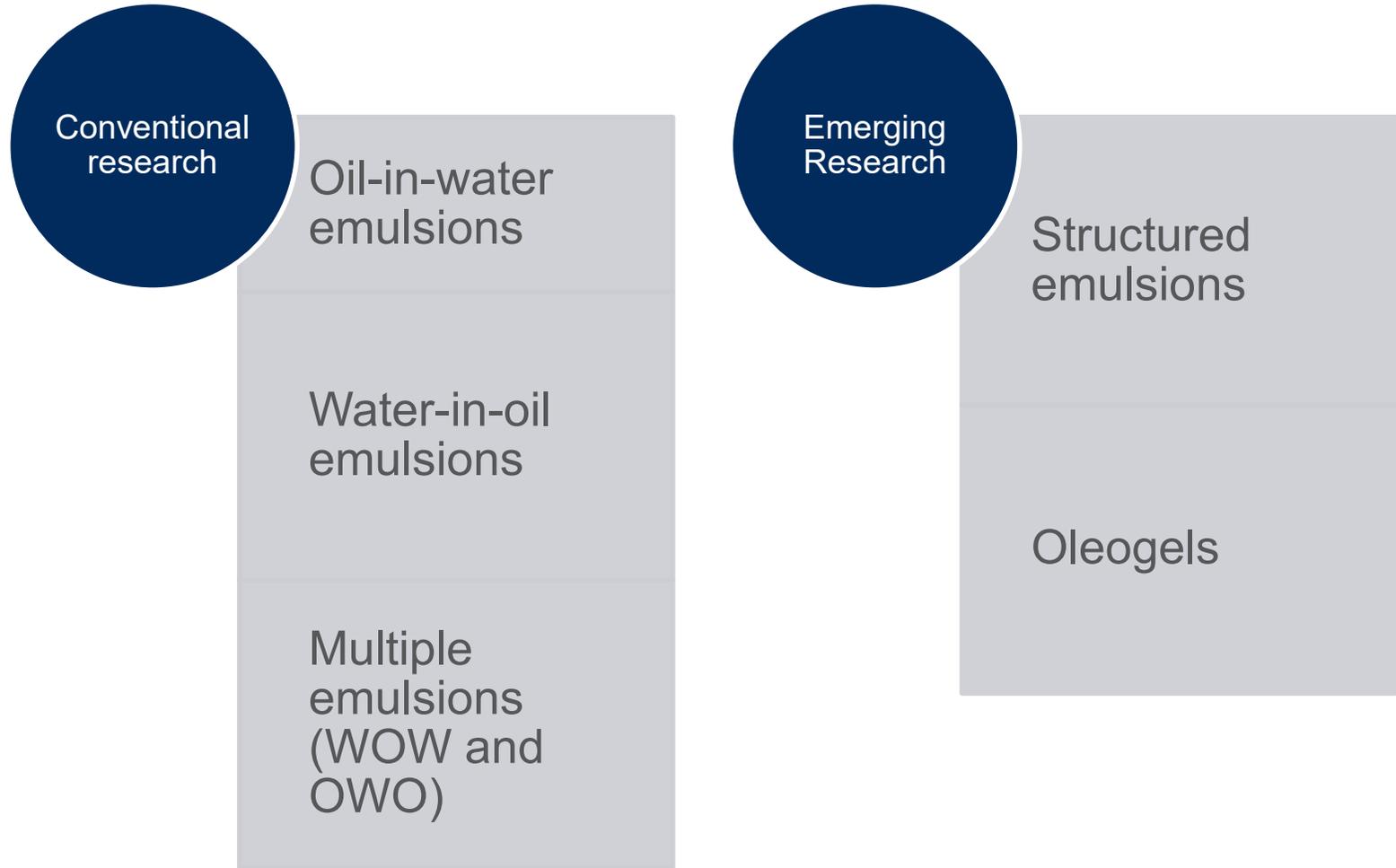
4.  
**Sugar reduction**  
(biological)

5.  
**To increased nutrient content**  
(mechanical and chemical)

# Theme 1:

## Reducing saturated fat content

### Going beyond conventional emulsions to reduce saturated fat content



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

# Theme 1:

Reducing saturated fat content

## OLEOGELS



1. Biphasic gels

A diagram showing two yellow lipid droplets with blue heads and green tails, connected by green wavy lines representing protein chains. The droplets are set against a light blue background.



2. Lipid-based gelators

A diagram showing two yellow lipid droplets with blue heads and green tails, stacked vertically. The droplets are set against a grey background.

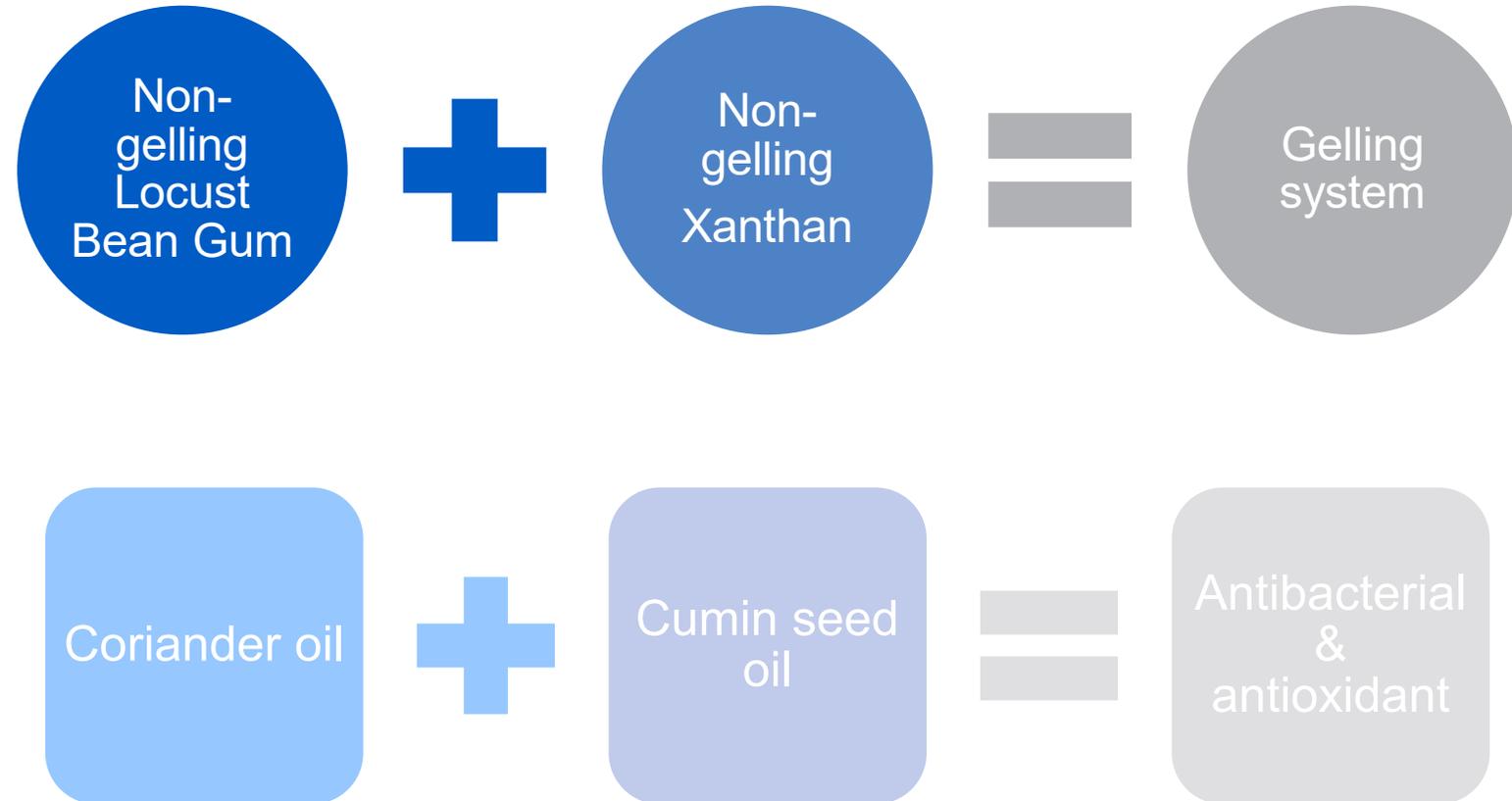


## Theme 2:

Removing artificial additives and preservatives

### Utilizing 'natural' ingredients for preservation of food

Mixing ingredients for synergistic effects

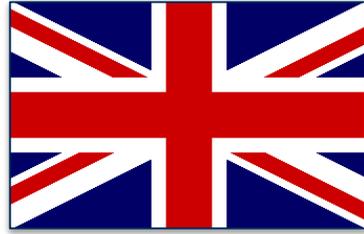


Source: [https://www.researchgate.net/publication/279537588\\_Evaluation\\_of\\_Synergistic\\_Antibacterial\\_and\\_Antioxidant\\_Efficacy\\_of\\_Essential\\_Oils\\_of\\_Spices\\_and\\_Herbs\\_in\\_Combination](https://www.researchgate.net/publication/279537588_Evaluation_of_Synergistic_Antibacterial_and_Antioxidant_Efficacy_of_Essential_Oils_of_Spices_and_Herbs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

## Theme 3:

Incorporating dietary fibres

Exploiting new technologies  
to increase dietary fibre content & solubility



**sacn**  
Scientific Advisory Committee on Nutrition

30g/day fibre target

### Mechanical

- High/ultra-high pressure

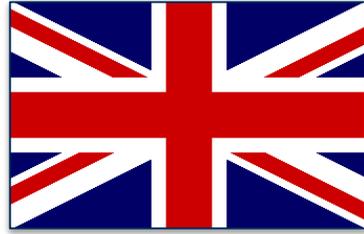
### Biological

- Enzymatic
- e.g. SunFibre*

## Theme 4:

### Reducing sugar content

## Reducing sugar content using proteins



**sacn**  
Scientific Advisory Committee on Nutrition

Free sugars  
= up to 5% total dietary energy

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

## Theme 5:

Improving the nutrient profiles of products

# Using plant cross-breeding technology to eliminate malnutrition



**HarvestPlus**  
Better Crops • Better Nutrition

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**

### Reformulated baked beans

Baked beans product:

- 65% iron-biofortified beans
- 5% processing loss
- Product iron content = 2.1 mg/100g iron



Source of iron

A close-up photograph of a person's hand holding a glass jar of jam. The jar has a blue lid and a blue label with white text. The jam is a thick, reddish-brown color. The background is blurred, showing other people in a crowd.

# Regulatory considerations

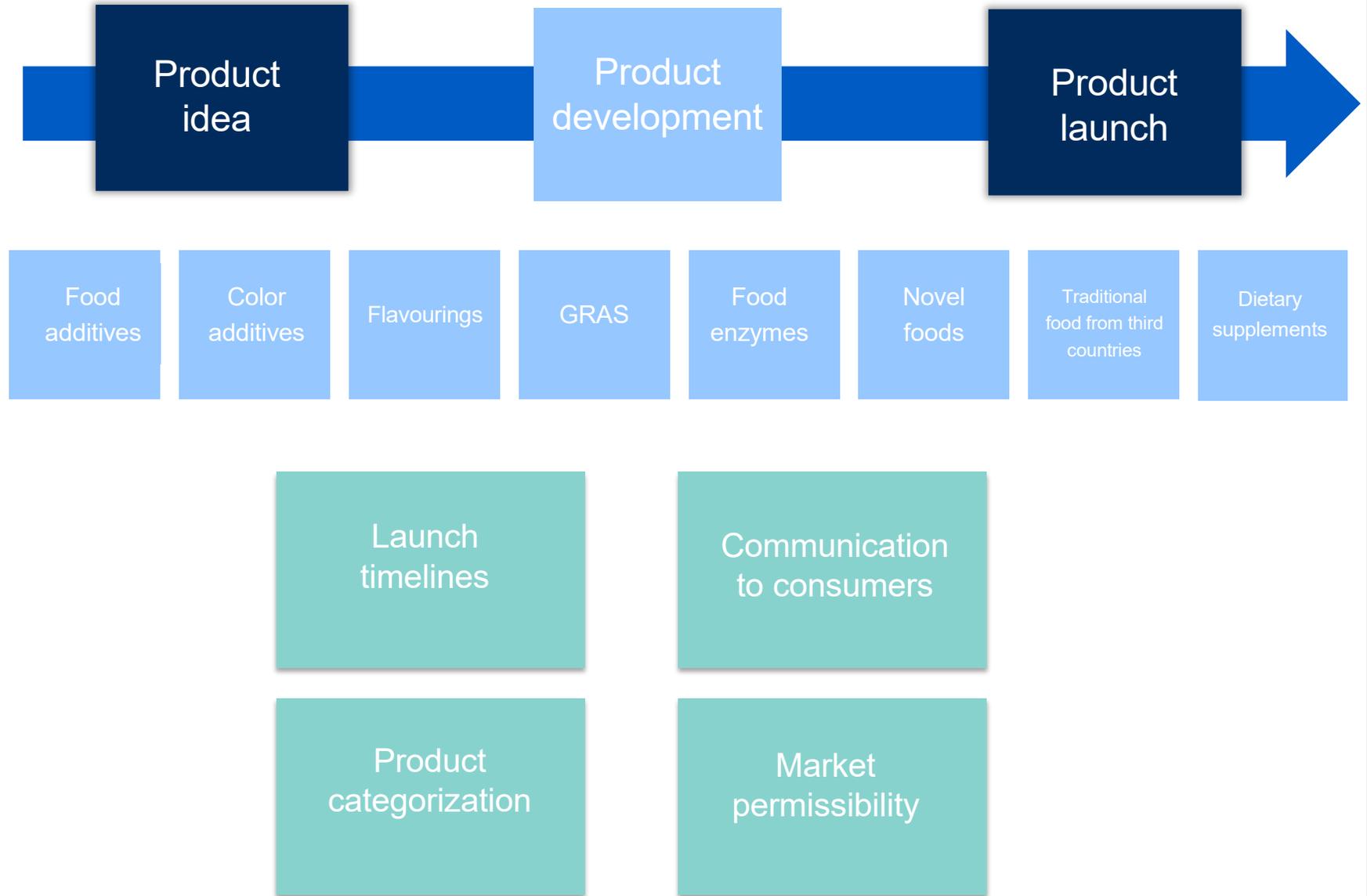
*“The world is full of diversity, so novel foods will continue to come to our table providing new choices, new sources of nutrients.”*



# 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

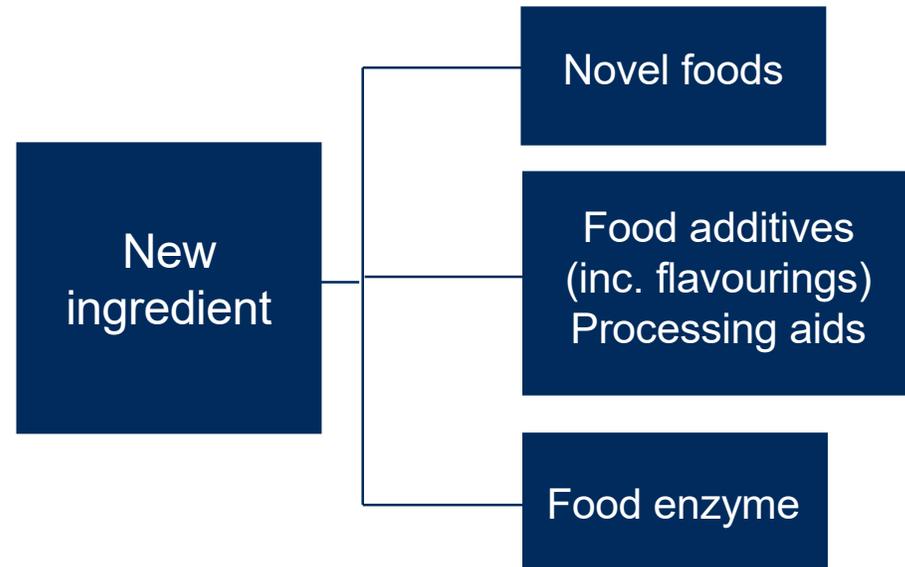
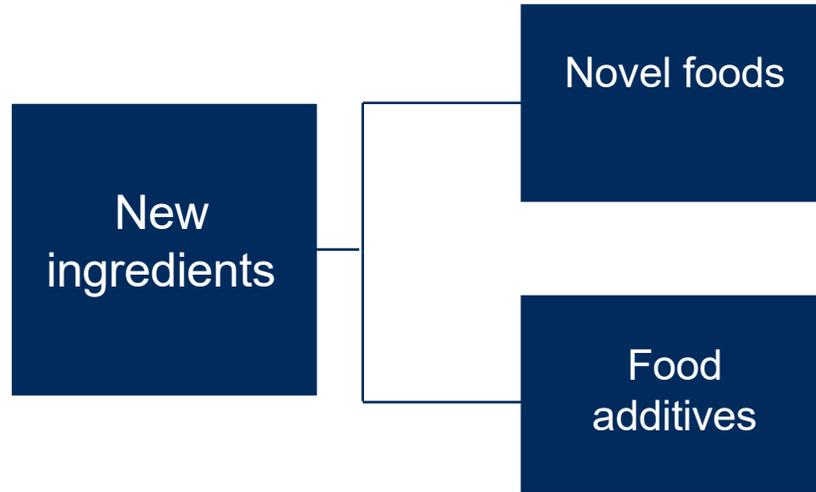
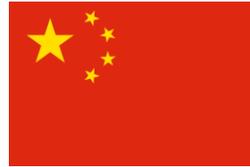


New ingredient

Novel foods

Food improvement agents

# Diversity of pre-market approvals between markets



As of 1 January 2018...



# NEW Regulation (EU) 2015/2283 on novel foods

*Revoking: Regulations (EC) Nos 258/97 and 1852/2001*

Commission Implementing Regulations	Establishing/Setting out
2017/2470	A list of authorized novel foods (as amended)
2017/2469	Administrative and scientific requirements for novel food applications
2017/2468	Administrative and scientific requirements for traditional foods <u>from third countries</u>
2018/456	Procedural steps of the consultation process for determination of novel food status

# Summary changes brought by Regulation 2015/2283



Simpler, faster and more efficient

- Extended novel food definitions
- Whole animals
- Nanotechnologies
- Food derived from cloned animals

- Centralized authorization procedure
- Electronic submission

- Generic approval
- Traditional foods from non-EU countries
- Data protection rules (5 years)



# Pre-market safety assessment: two new procedures



## General procedure

1. Specification
2. Production process
3. EU intake
4. Toxicology
5. Allergenicity
6. Labelling

European Commission + EFSA  
(28 EU Member States)

1 month

9 months

7 months

## Notification procedure for traditional foods from non-EU countries

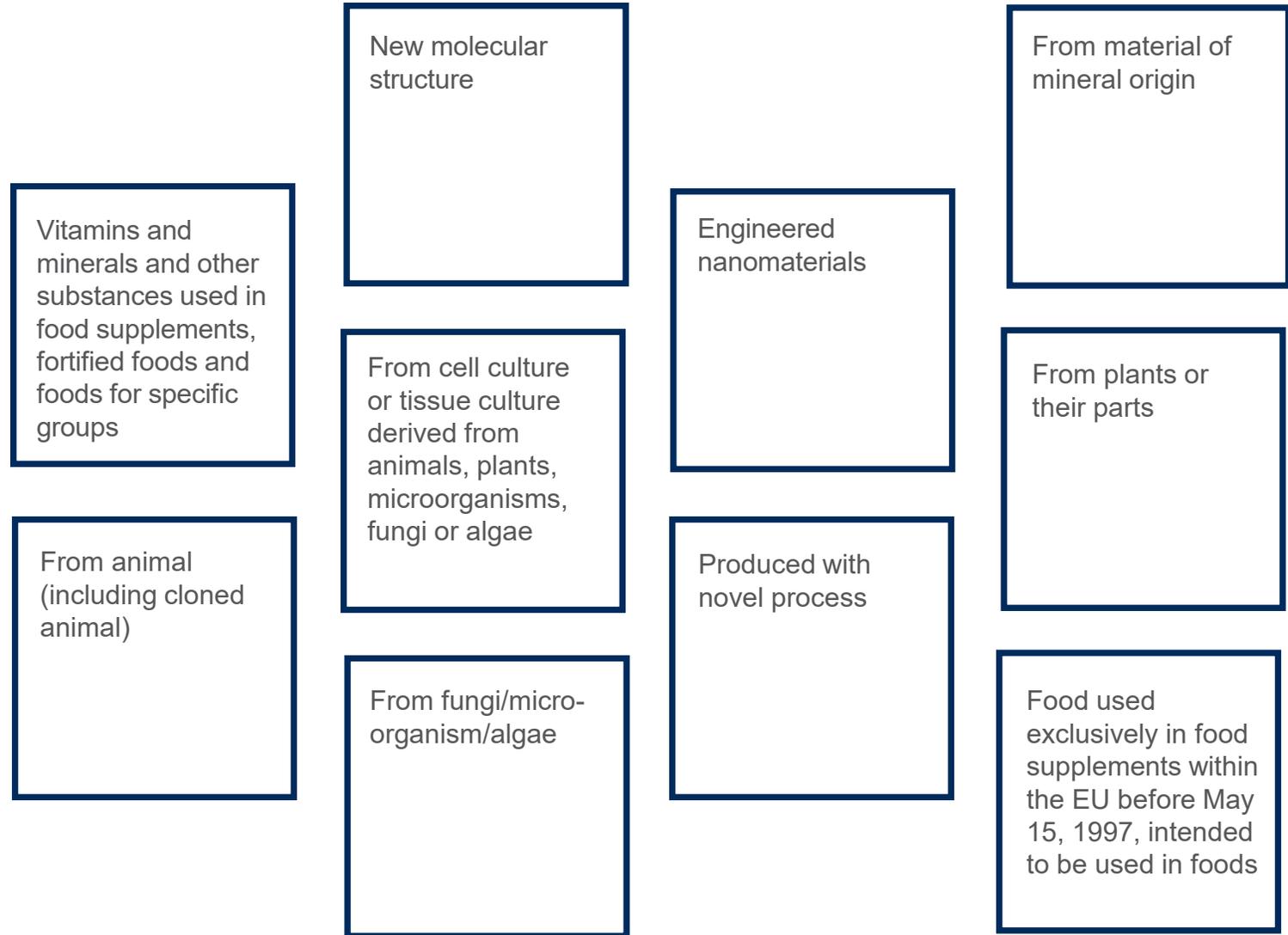
1. Identity
2. Regulatory status outside the EU
3. Characterisation
4. Productions process
5. Composition
6. Continued use data
7. EU conditions of uses

European Commission + EFSA  
+ 28 EU Member States

1 month

4 months

# EU novel food categories



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 commercialization

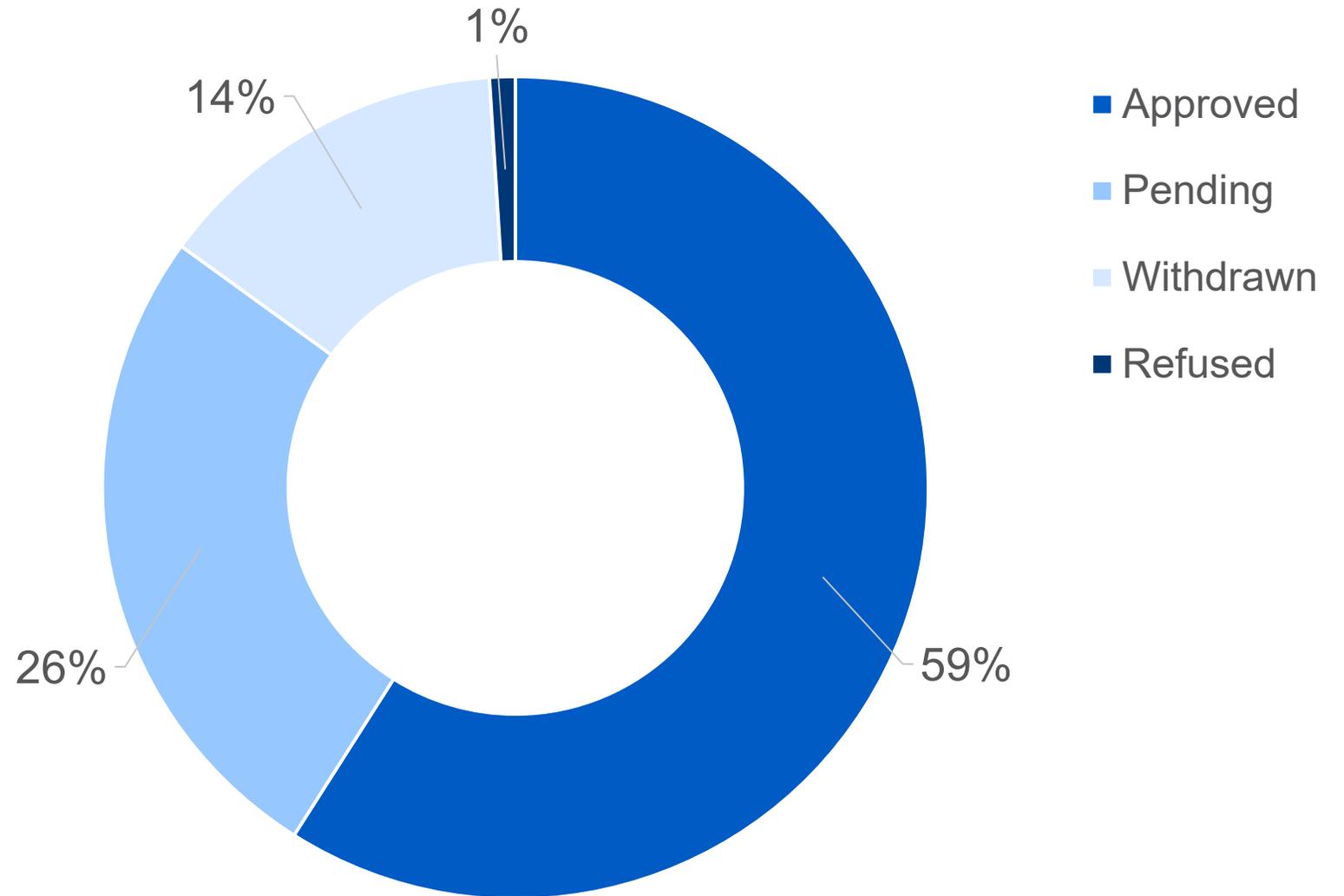


Substance	Applicant	Submissions	Filing	Granted	Total time
D- Tagatose	Arla Foods	GRAS Notice No. 78	11 May 2001	25 Oct 2001	6 months
		EU Novel food	01 March 2005	14 Dec 2005	10 months
Krill oil	Neptune	GRAS Notice No. 242	04 Feb 2008	14 Oct 2008	8 months
		EU Novel food	02 Oct 2006	12 Oct 2009	3 years
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

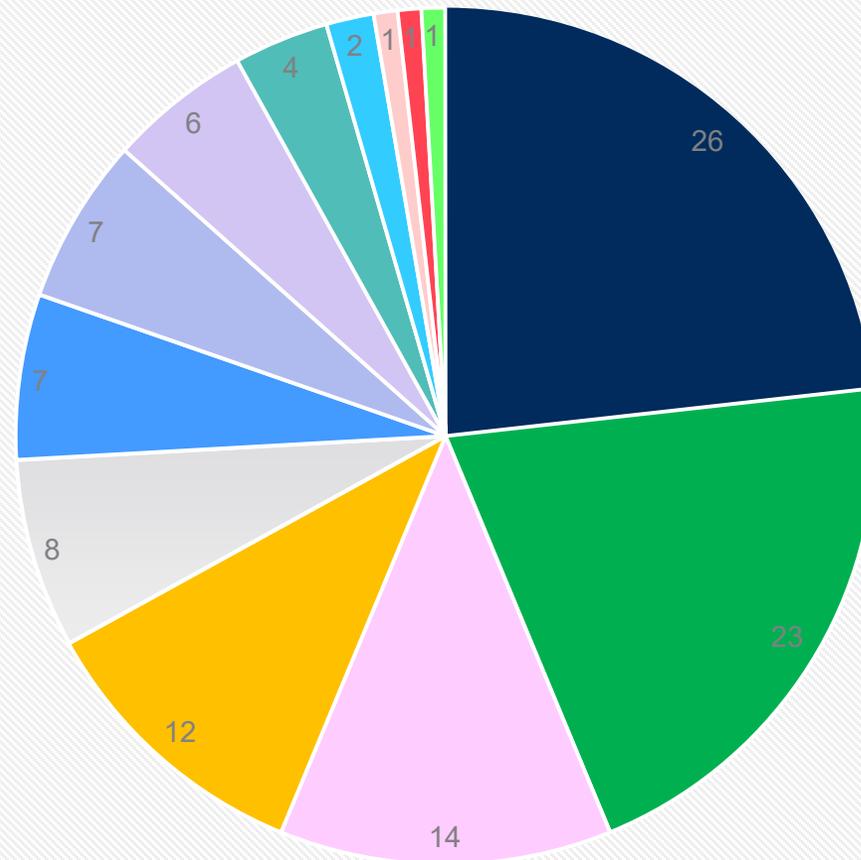
**Comparison of selected US GRAS vs EU Novel Food submission timelines**

Sources: FDA GRAS Notice Inventory & © European Union

There are high success rates for approvals



And many of these novel foods approved in the EU....



- 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
- Micro-organism
- Plant sterols

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

Source: © European Union

....deliver against consumer demands



Meeting consumer demands

Sustainability and ethical sources

Allanblackia seed oil can be added to fat spreads as a substitute to palm oil.

Health and wellbeing

Oil extracted from squids, Antarctic Krill oil rich in phospholipids from *Euphausia superba*

Low fat cacao extract  
Sugar cane fibre  
Fermented soybean extract

Isomaltulose, D-Tagatose

Lycopene from *Blakeslea trispora*

Clean and natural

New sensory experiences

Exotic products: noni, baobab fruit pulp

Magnolia bark extract.

New sources

Algal oil from the microalgae *Ulkenia* sp., *Schizochytrium* sp. oil rich in DHA and EPA, *Schizochytrium* sp. (ATCC PTA-9695) oil, *Schizochytrium* sp. (T18) oil

Rapeseed Protein, Potato proteins (coagulated) and hydrolysates

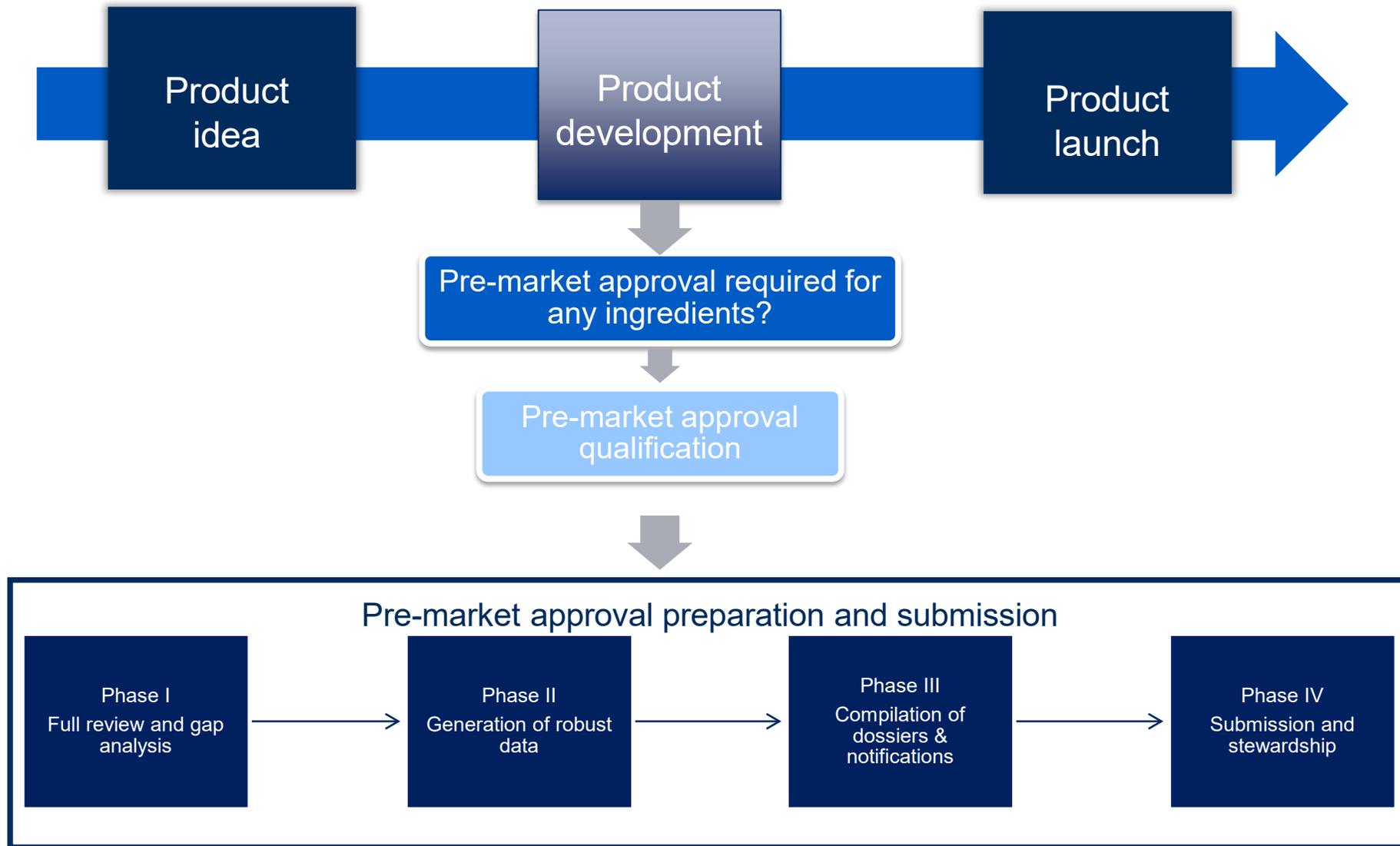
A close-up photograph of several clear plastic containers filled with different types of nuts, including almonds, cashews, and pistachios. The containers are arranged in a grid-like pattern, and the focus is sharp on the nuts in the foreground, with a slight blur on the ones in the background.

## 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.

# Pre-market approval qualification, preparation and submission



## What next for the future of food ingredients?

- ✓ Continue to see innovation in natural and functional
- ✓ Anticipate US market to act as a test-bed for new technologies
- ✓ Real growth opportunity in developing nations



# Thanks for listening!

Annie-Laure Robbins – Regulatory Manager

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# Questions

# leatherhead food research

innovate | access new markets | realise global opportunities