





# What's Pushing Innovation in the Food Industry?

- Customer demand
- Competition
- Regulations
- Efficiency
- Cost reductions
- On the horizon:  
Food companies identify **external and internal collaboration** as well **as universities and research centers** as **key factors for innovation**.



# What's Pushing Innovation in the Food Industry?

- **Customer demand**

For some time, food companies have been showing their interest for meeting new demands of the consumer such as more **healthy food, convenience, or transparency** in the provenance of food.

- [Global sales of health products](#) are expected to reach one trillion dollars by 2017 according Euromonitor

## Last year, these trends caused US companies to reformulate 180,000 products

March 14, 2017 | Beth Kowitt

For years Big Food lured consumers to its processed and packaged products with an irresistible combination of sugar, fat, and salt.

Now it seems at least some of those consumer packaged giants are reversing course. A new study released by the Consumer Goods Forum found that the 102 companies it surveyed ranging from Walmart (WMT, +1.10%) to Nestle reformulated more than 180,000 of their products to “support healthier diets and lifestyles and address public health priorities.” That’s an increase from just 84,000 products in 2015 and 22,500 in 2014.

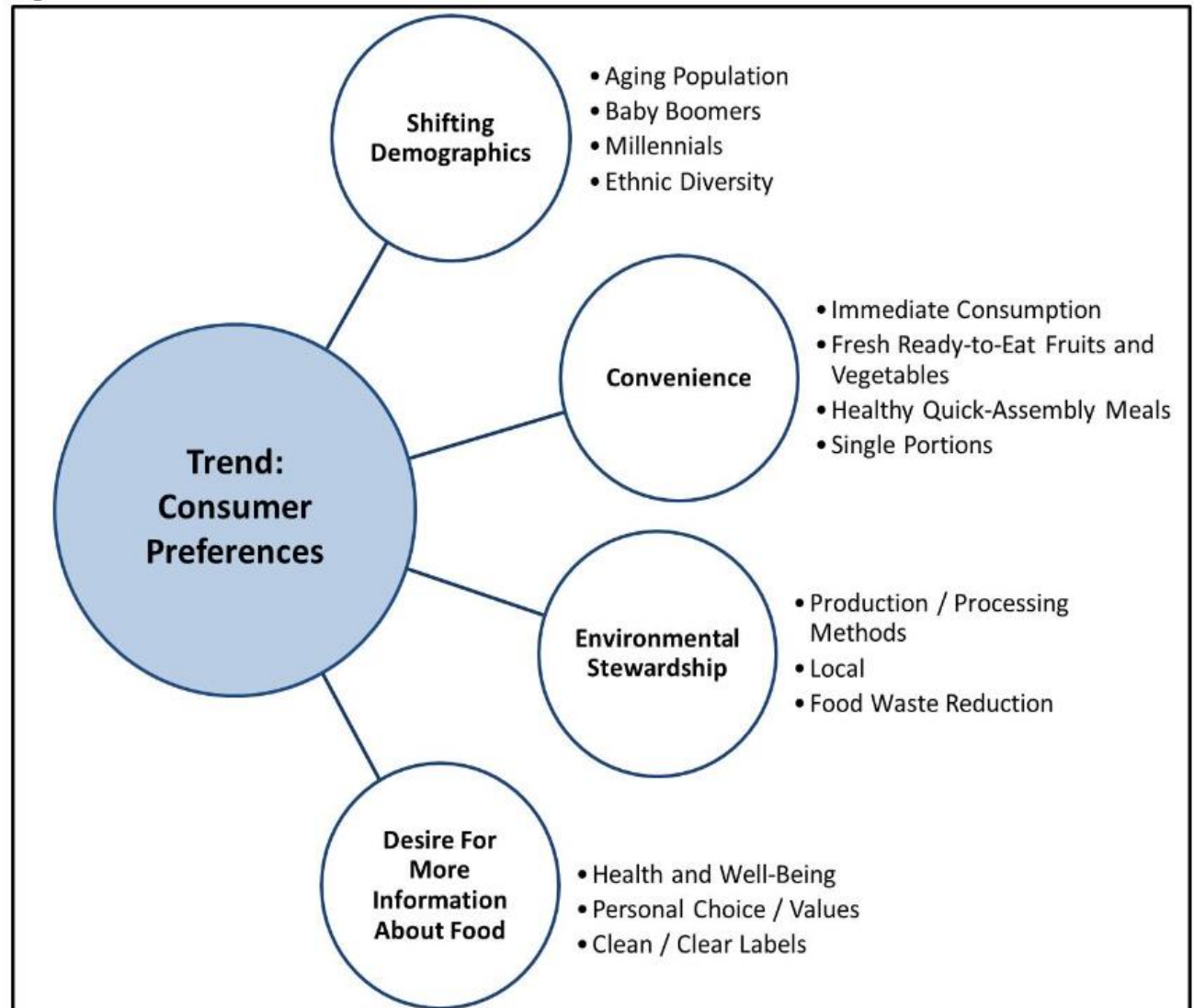
The number one ingredient the companies—representing some \$1.8 trillion in 2015 revenue—were looking to remove was sugar. Sodium came in second, followed by trans fats and saturated fats. Whole grains and vitamins were the top two elements companies added to recipes.

**READ FULL ARTICLE AT:**

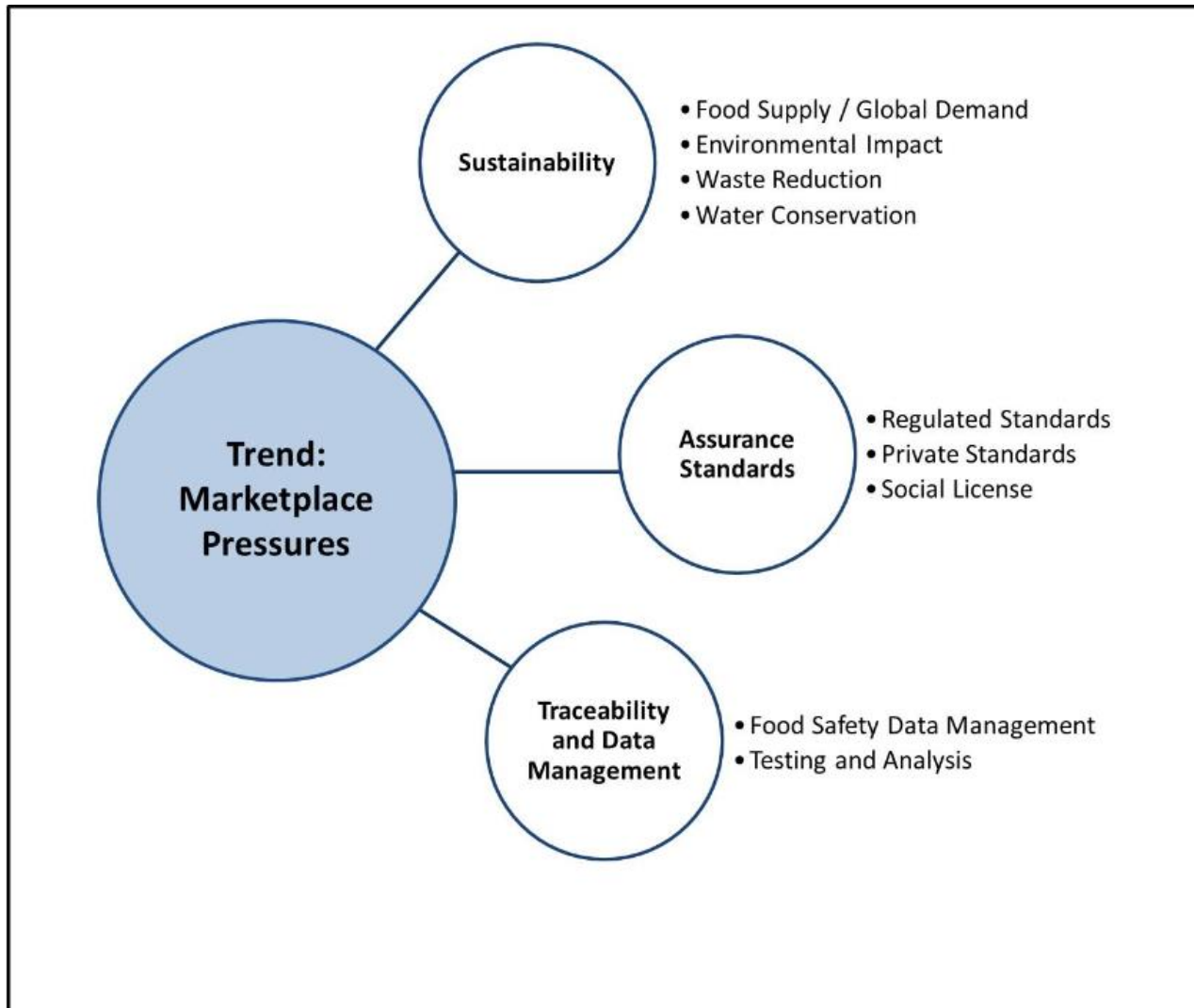
**<http://fortune.com/2017/03/14/food-industry-salt-sugar-fat-reduction/>**

# Trend: Consumer Preferences

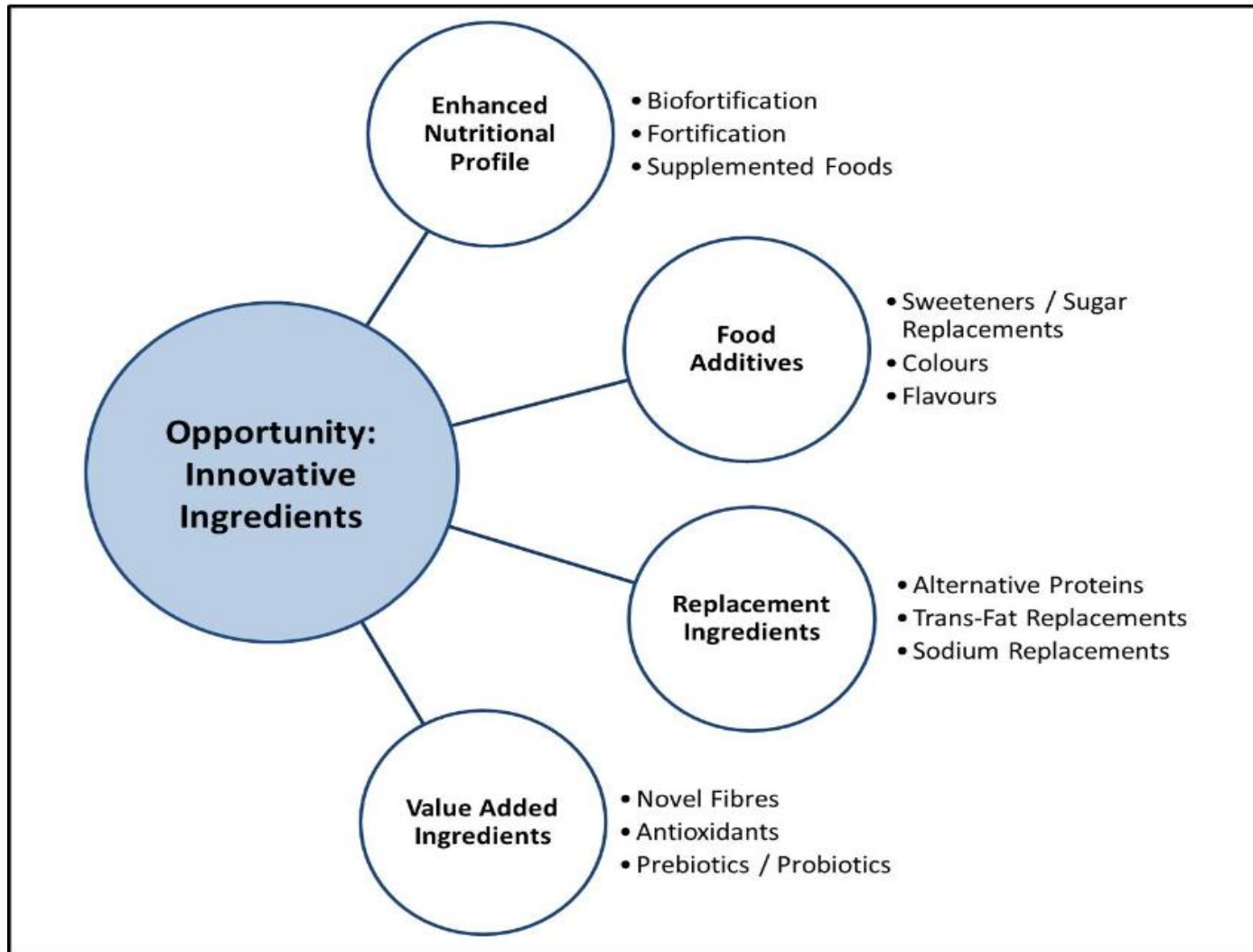
- Price and taste have long been the most important decision factors for the majority of consumers when choosing food.
- But ..



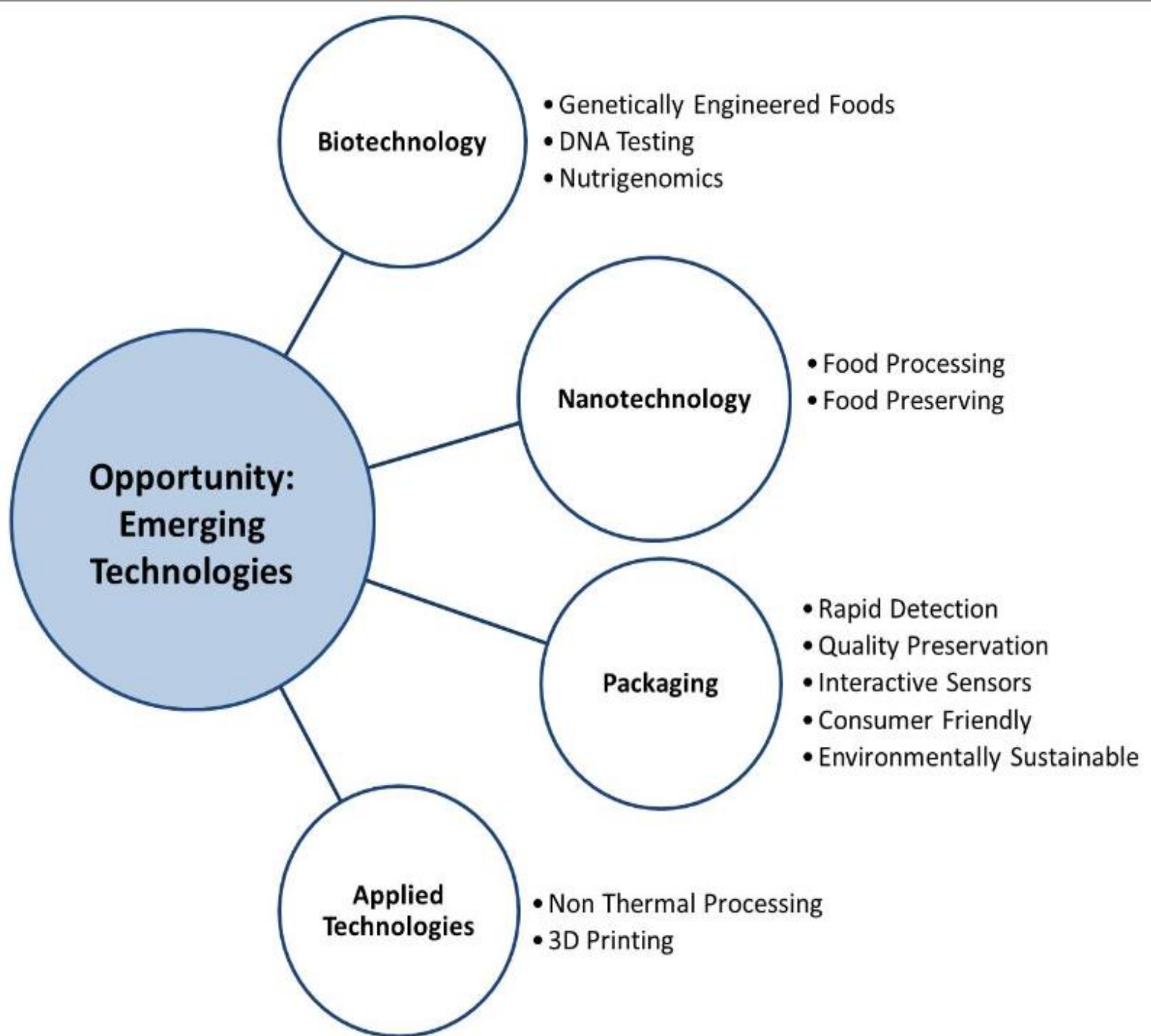
# Trend: Marketplace Pressures



# Opportunity: Innovative Ingredients







# Four Breakthrough Technologies in Food Processing

- **Natural sweeteners**
- **high-pressure pasteurization**
- **resistant starch**
- **robots**



Herbs and spices: A useful approach for reducing salt content in soup



Key challenges in reducing salt intake: An international study

# Food Waste Recovery Trends in 2016: Research, Innovation, Commercialization and Funding



# Reformulation

2017

# *Reformulation targets*

- 50 per cent free sugars reduction within the next 5 years
- 20 per cent reduction in fat (especially saturated fat) within the next 5 years
- 25 per cent reduction in salt within the next 5 years
- The aim is to reduce population free sugars, fat (especially saturated fat) and salt consumption

# Examples of approaches that can be taken

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Changing the composition of food (reformulation)	Reducing energy density (kJ/g food) Reducing the amount of fat, saturates, sugar or salt Changing the fat or carbohydrate profile, e.g. by choice of oil/fat, changing the diet of ruminants, use of structured lipids and blending of oils Removal of <i>trans</i> fatty acids Improving the nutrient profile through choice of ingredient or fortification
Providing more/less choice	Introducing healthier options Introducing smaller portion sizes Choice editing – limiting choice at point of sale Changing the default, so that the easy option/most readily available standard option is the healthier choice
Information provision and education	Information provision on packaging e.g. nutrient composition, guideline daily amounts, front-of-pack information e.g. traffic light schemes and guideline daily amount schemes, allergen and ingredient labelling Information provision point of sale and on websites Provision of cooking skills, preparation tips and recipes Food and health as a core component of schools' curricula
Others	Regulation, e.g. Ofcom rules for advertising to children Taxation, e.g. differential value added tax levels for different food categories;

<https://www.cambridge.org/core/services/aop-cambridge-core/content/view/S0029665112002868>

Proceedings of the Nutrition Society (2013), 72, 61–69

# Mission possible: Most reformulation does not impact consumer acceptance

The majority of reformulation to lower levels of sugar, salt and fat has no impact on consumer acceptance or willingness to pay, says a new EU-backed study.



## Reducing the levels of fat, salt and sugar in food: a guide for SMEs

Salt Reduction

Artificial Trans Fat

Calorie Reduction

Salt in Catering

Fruit and Vegetables

Front of Pack Nutrition Labelling

Saturated Fat Reduction



# Salt issue

- Reduction of sodium by 30–40% without affecting consumer preference
- Sodium reduction of 17%–33% by the use of naturally brewed soy sauce
- Salt reduction of 15% can be compensated by savory aroma compounds (beef/chicken flavor)
- Encapsulated salt enables a reduction of up to 50%
- Use of organic acids such as lactic acid
- Replacement of sodium chloride up to 50% by other salts/salt mixtures (potassium chloride, magnesium chloride, potassium lactate, sodium acetate)
- Reduction of sodium by 30–40% without affecting consumer preference
- Use of salt substitutes (e.g. potassium chloride) and flavor enhancers (e.g. yeast extract)
- Natural flavor enhancers such as garlic, rosemary, oregano and sage
- Snacks Alteration of crystal size: smaller salt particles induce an increased initial perception of saltiness
- Use of spices
- Replacement of salt by starch in extruded snacks

# Free sugar

- A 50 per cent reduction in free sugars would lead to a calorie reduction of approximately 120 kcal per day
- Public Health England based their modelling for free sugars reduction on 50 per cent, as initial work had suggested that a reduction of this magnitude to the free sugars intake from soft drinks would make a substantial impact on free sugars intake in most age groups.
- A 40 per cent reduction in sugar in soft drinks alone has been predicted to prevent 300,000 cases of Type 2 diabetes and reduce 1.5 million people from being overweight or obese over the next 5 years

# Reformulation

Sugars Function	Alternative ingredients
Sweetness	High potency sweeteners, polyols
Mouthfeel/texture	Gums, thickeners, polyols
Bulk	Bulking agents, dietary fibres, polyols, gels, gums
Colour	Colours
Flavour	Flavours
Preservative	Preservatives eg benzoates and sorbat
Humectancy	Polyols, glycerol, humectants

## Strawberry jam ingredients:

Sugar,  
strawberries,  
pectin, citric acid

## Sugar free strawberry preserve ingredients:

Water, strawberries,  
polydextrose, maltodextrin,  
fruit pectin, locust bean  
gum, natural flavour,  
citric acid, potassium  
sorbate, sucralose, calcium  
chloride, red 40 (colour)



# Fructose

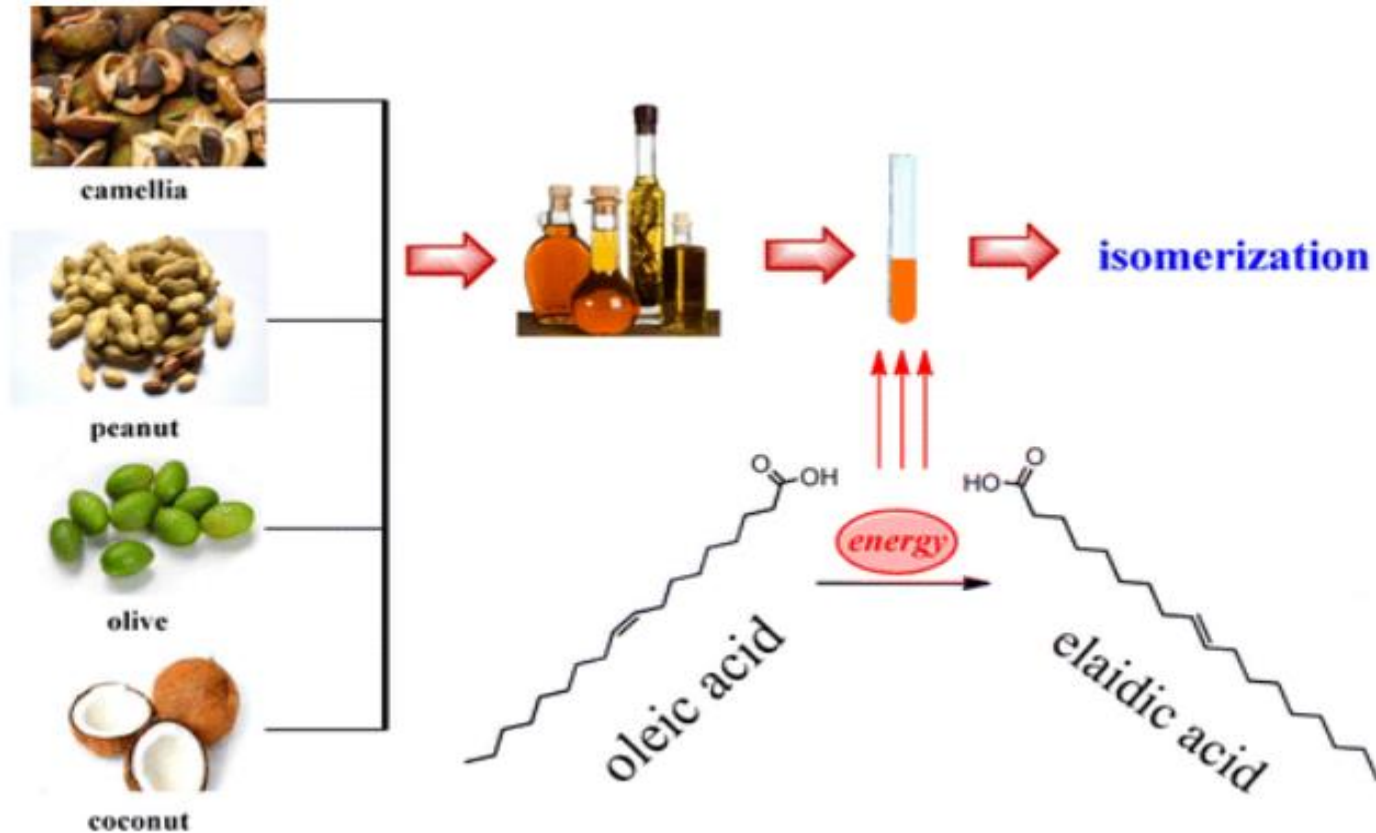


- **The Difference in How Fructose and Glucose Affect Your Body**
- *There is a myth that exists that fructose is a “healthy” sugar while glucose is bad stuff. In fact, in recent years, there has been a rise in sweeteners that contain this “healthy” sugar, such as the dreaded agave nectar, [Carbonated beverage, cola, with higher caffeine \[pop, soda, soft drink\]](#) Fructose: 29760mg*
- **High fructose intake has been associated with:**
- Increased levels of circulating blood lipids
- Obesity
- Fat around the middle
- Lowered HDL
- Increased levels of uric acid (associated with gout and heart disease)
- Liver scarring (cirrhosis)
- Fatty liver
- The formation of AGE’s\* (advanced end glycation products), which can lead to wrinkling and other signs of skin aging

# Food Reformulations to Reduce Trans Fatty Acids

- N Engl J Med 2010; 362:2037-2039 [May 27, 2010](#) DOI: 10.1056/NEJMc1001841
- Consumption of trans fatty acids raises levels of low-density lipoprotein cholesterol and triglycerides, lowers levels of high-density lipoprotein cholesterol, induces an inflammatory response, and even at low levels of intake (e.g., 2 to 4% of total calories) significantly increases the risk of coronary events

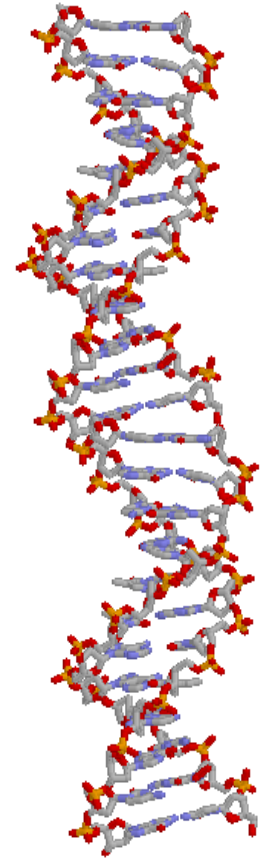
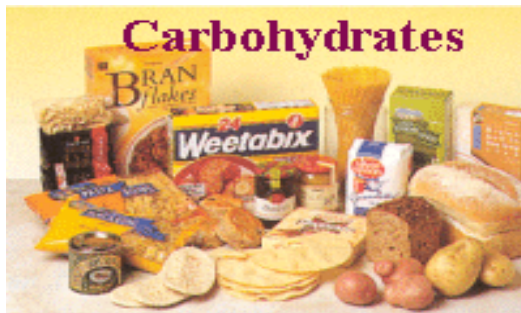
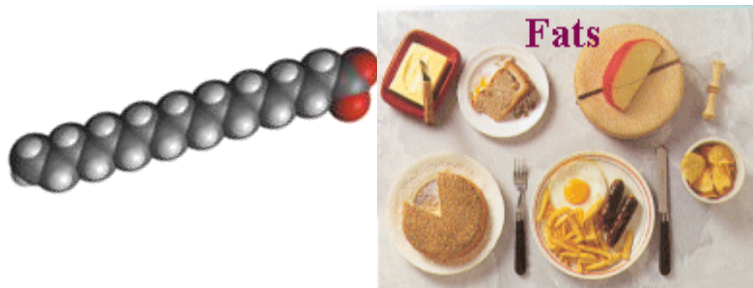
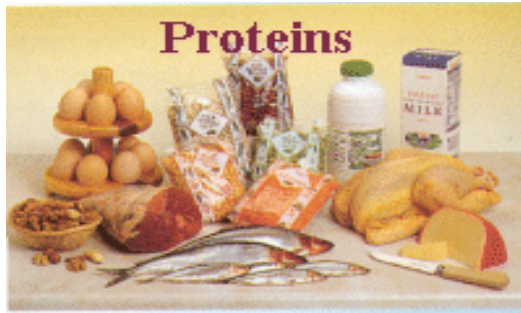
# Mechanism of Formation of TFA under Heating Conditions



*J. Agric. Food Chem.*, 2013, 61 (43), pp 10392–10397

The study results suggest that the heating temperature should be kept under 150 °C, to avoid the risk of trans fatty acid (TFA) intake in daily food.

# Molecular nutrition



# Nutrigenomika a nutrigenetika





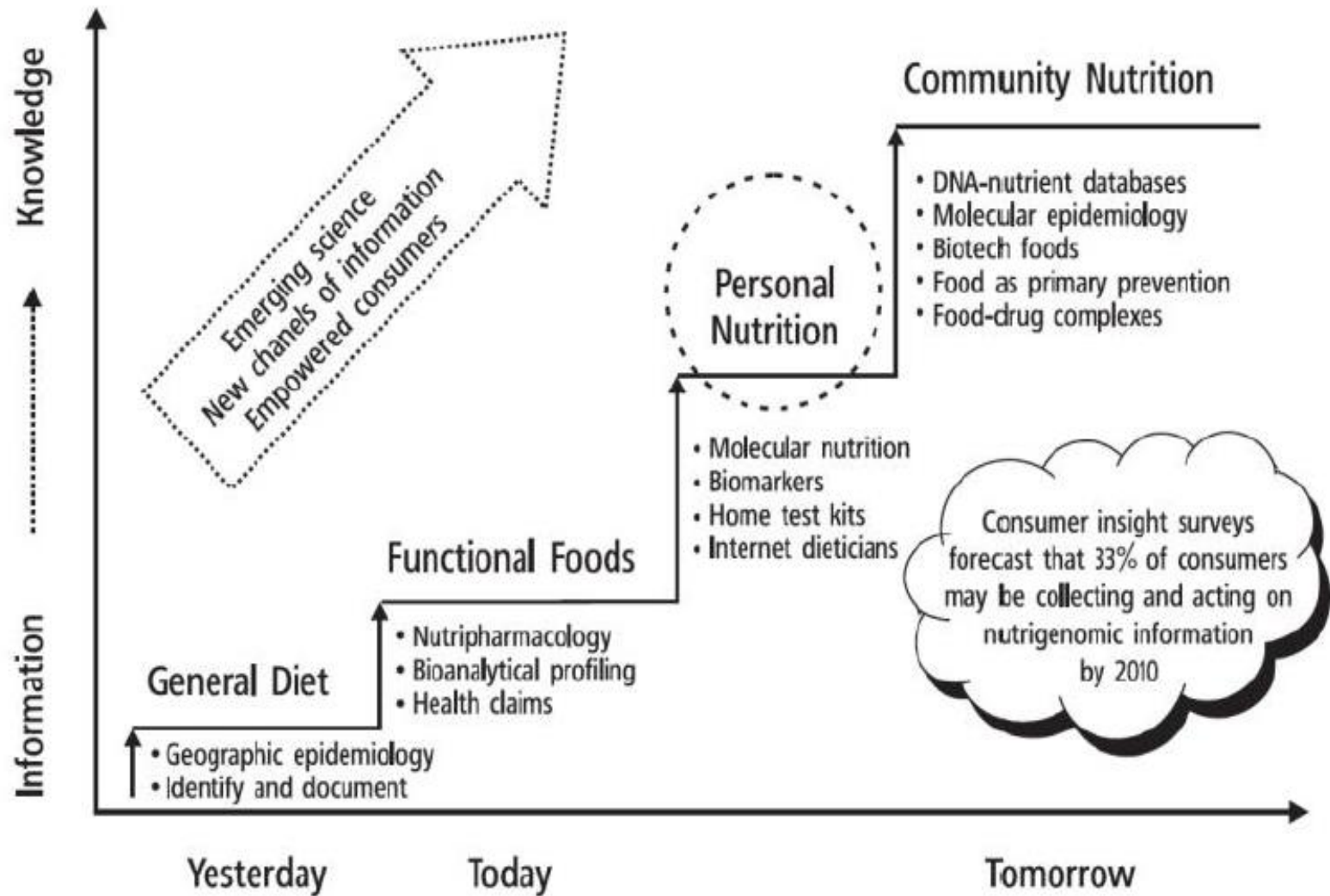
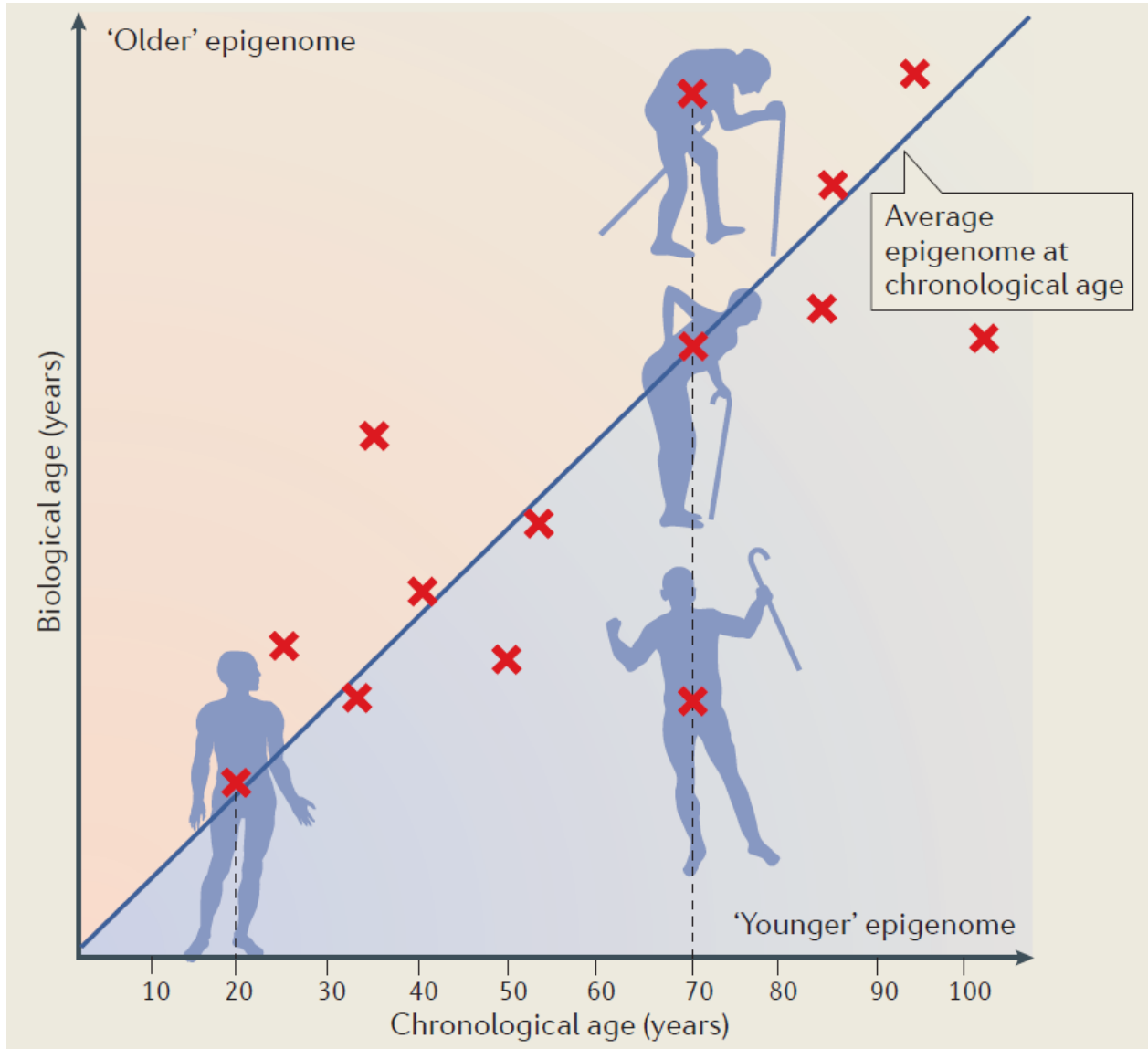


Figure 1. "The Future of Nutritional Science". From the American Dietetic Association, 2003.

# Techno-foods and health claims for foods

- **Techno-foods and health claims for foods**
- *'Our supermarket shopping lists are turning into prescription pads:*
- *garlic to prevent heart disease, broccoli and green tea to prevent cancer, milk for strong bones, and Cheerios to keep our cholesterol down.*
- *It does not seem unreasonable to request impartial and evidence based guidance for shoppers as they choose which medicines – foods – to put in their carts.'*
- Douglas Kamerow, Editor, British Medical Journal USA102

# Challenge for Food Industry: Control Epigenetic clock



# Stealth reformulation of private label food can cut calories, study finds

By Will Chu , 23-Aug-2017

Last updated on 23-Aug-2017 at 16:14 GMT

 Post a comment




Related tags: Tesco, REMA1000, Reformulation, Private, Calorie, Sugar, Salt, Fat, Asda, M&S, Albert Heijn

**'Silent' product reformulation, where own-brand food products are modified without explicitly making the consumer aware, may be effective in reducing calorie consumption, say Danish researchers.**

# Vegetarian diet link with lower cholesterol reaffirmed in new study

By Tim Cutcliffe , 25-Aug-2017  
Last updated on 25-Aug-2017 at 16:38 GMT

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© iStock/ Nayomiee

Related tags: Vegetarian diets, Total cholesterol, LDL cholesterol, Blood lipids

**Plant-based vegetarian diets, especially vegan diets are associated with lower total cholesterol (TC) and 'bad' cholesterol levels, finds a new meta-analysis published in *Nutrition Reviews*.**

# 'Impure' proteins can match – or even outperform – pure protein functionality: Wageningen



By Niamh Michail+

05-Sep-2017

Last updated on 05-Sep-2017 at 17:29 GMT

Post a comment



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Related tags: Protein, Functionality, Wageningen University, Nizo, TNO, DSM, Darling Ingredients

**Expensive and energy intensive methods to purify protein may not be necessary because 'impure' proteins can perform as well as, or even better than, pure ones for functionality, a two-year Wageningen-led project has found.**

The two-year Strategic Innovation Project brought together researchers from Wageningen University, Nizo and TNO as well R&D scientists from DSM and Darling Ingredients, to determine whether protein processing is always necessary, and to what degree.

# Preserving structure of plant-based foods limits fat absorption, study finds

By Katy Askew , 25-Aug-2017

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Related tags: [Fat absorption](#), [Processed Foods](#), [Digestion](#), [Almonds](#), [Plant-based](#)

**Preserving the natural structure of plant-based food products during the processing process can limit the amount of fat and energy absorbed by the body, new research suggests.**

# Trimming the fat off dietary guidelines: Study links high carb intake to mortality risk

By Will Chu , 29-Aug-2017  
Last updated on 30-Aug-2017 at 11:44 GMT

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Related tags: Carbohydrate, Fat, Guideline, Income, China, Asia, Africa, Sweden, Canada, United Kingdom, WHO, PURE, Mortality

**Global dietary guidelines should be revisited, according to a *Lancet* study, which found reducing fat intake and replacing it with a high carbohydrate intake may be linked to worse health outcomes.**

Findings from a study involving 135,000 people from 18 countries found that high fat diets (about 35% energy - including saturated and unsaturated fats) corresponded to a lower risk of death.

In contrast, a high intake of carbohydrates (above 60% energy) was associated with a higher risk of death.



# Olive oil enriched dark 'chocolate' has heart health pros, claims study



By Oliver Nieburg+

01-Sep-2017

Last updated on 04-Sep-2017 at 12:07 GMT

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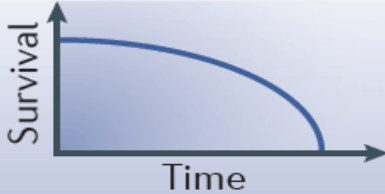
Italian premium chocolate firm Vestri was a private partner to the research and already sells a range of olive oil enriched dark chocolates ©iStock/KMNPhoto

Related tags: Vestri, Cardiovascular, Disease, Health, Chocolate, Dark chocolate, Polyphenols, Cocoa flavanols, Olive oil

**Researchers say commercial prospects for extra virgin olive oil enriched dark chocolate are strong after finding potential cardiovascular health benefits.**

A study presented this week at the European Society of Cardiology (ESC Congress) suggested dark chocolate enriched with 10% extra virgin olive oil may reduce the risk of cardiovascular disease.

# Contract research, BIOCEV, Epimind, Epigentest

 <p><b>Environmental inputs</b></p>	 <p><b>Effects on chromatin</b></p>	 <p><b>Effects on healthspan and lifespan</b></p>
Diet (dietary restriction)	<ul style="list-style-type: none"> <li>• Modulation of chromatin modifiers</li> <li>• Heterochromatin maintenance</li> <li>• rDNA chromatin structure</li> <li>• Inhibition of recombination</li> <li>• Nucleosome positioning</li> </ul>	Increased
Circadian cycle (regular)	Circadian epigenome	Increased
Circadian cycle (perturbed)	Modulation of chromatin modifiers	Decreased
Exercise	<ul style="list-style-type: none"> <li>• Modulation of chromatin modifiers</li> <li>• Chromatin modifications</li> </ul>	Increased
Pheromones	Signalling through chromatin modifiers	Increased
Systemic factors (sex steroid hormones)	<ul style="list-style-type: none"> <li>• Chromatin structure</li> <li>• Chromatin modifications</li> </ul>	Increased

# BIOCEV as a partner

Contract research

Added value products

Epigenetic active ingredients

Salt, sugar (fructose) replacement

HQ protein production (biotech)

Natural stabilizers (longer shelflife)

Beta glucan (soluble form) implementation

Epi food

Cooperation Epigentest, s.r.o.

Epimind, s.r.o.