



Research

Additives in food *an industry perspective*

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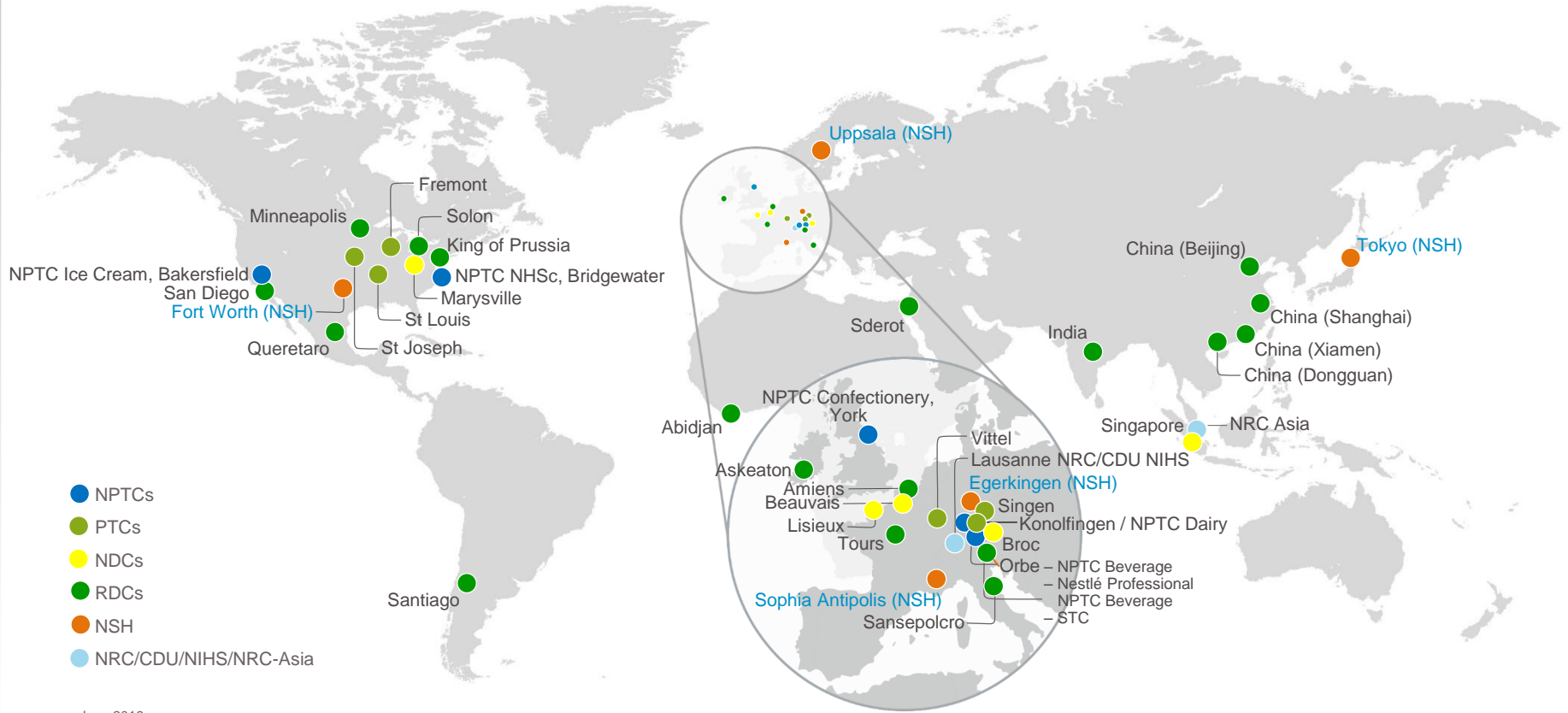
Agenda

- ❑ Nestlé R&D
- ❑ Food additive regulations
- ❑ Role of food additives in foodstuffs
- ❑ Regulatory hurdles in the use of additives
- ❑ Consumers' expectations on clean labels

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Nestlé R&D



June 2016

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Nutrition, Health & Wellness is about People's Quality of Life

Start Healthy

Nutritional Needs
Unmet Nutritional Needs
Personalized Nutrition



Stay Healthy

First do no harm
Inspired by nature
Add life to years

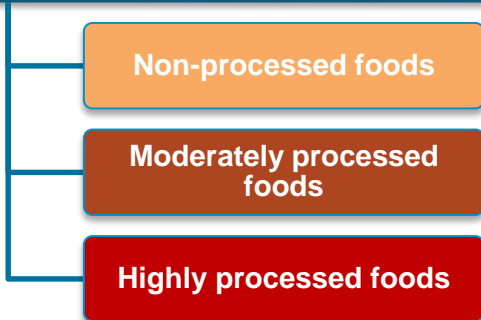
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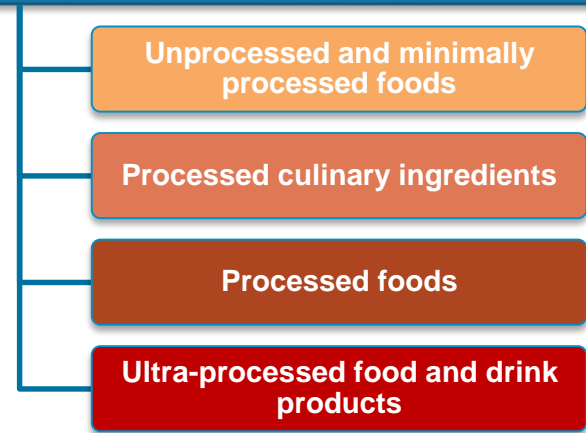
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Perception towards processed food...

Food definition and classification of industrially processed foods and beverages
International Agency for Research on Cancer (IARC)



NOVA classification developed by the Centre for Epidemiological Studies in Health and Nutrition (NUPENS) (C. Monteiro)



‘These two food classification systems are both considered appropriate’

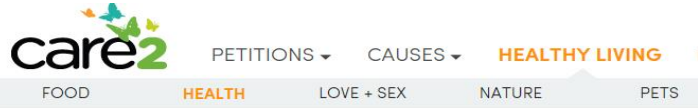
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Perception towards food additives...



This Dangerously Delicious Food Additive Can Cause Brain Damage



The screenshot shows a webpage from MedIndia. At the top, there is a search bar and a navigation menu with options like 'Explore MedIndia', 'Healthy Living', 'News', 'Health A-Z', 'Articles', and 'Calculators'. The main heading of the article is 'Top 12 Dangerous Food Additives'. Below the heading, it says 'Written by Dr. Enozia Vakil' and 'Article Reviewed by Dietitian Julia Samuel on Aug 04, 2014'. There is a rating of five stars and a 'Rate This Article' section. A sidebar on the left contains social media icons for Facebook, Twitter, and LinkedIn, along with a 'References' button. The main text of the article begins with 'Busy lifestyle and rapid industrialization have widening the array of processed foods available...'

The banner features the text 'ONLINE Holistic Health' in a large, teal font. Below it, a quote reads 'It's Your Life...OWN IT!'. At the bottom, there are three navigation links: 'About OHH & The Triad Of Life™', 'About Dr. Michelle Kmiec', and 'What Is T...'



ADHD | MEDICAL & BIG PHARMA HYPOCRISY

Food Dyes & Additives Proven Unsafe!



Dr. Michelle Kmiec 19 Comments Feb 26, 2015

4098	54	60	7763	96	7
Share	Tweet	Email	share	Pinterest	Share

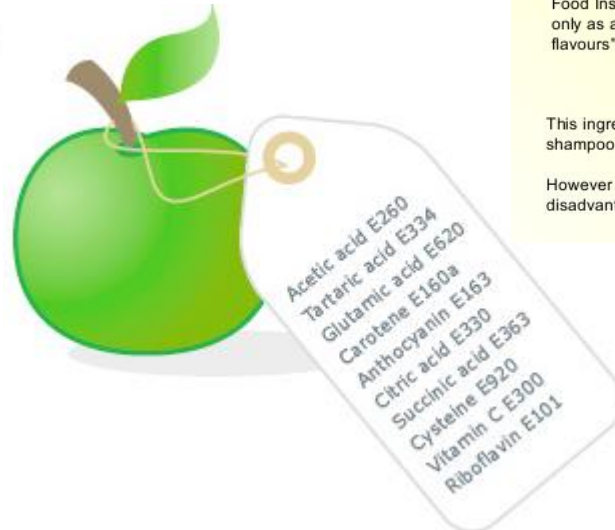
ADHD and Cancer Linked to Food Dyes

(Updated 2015)

Busy lifestyle and rapid industrialization have widening the array of processed foods available... everything is loaded with additives that create havoc on your health. Read on to discover these deadly compounds can affect your health, and how you choices to lower your risk of heart problems, circulatory and ne and cancer.

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Consumer education needed!



Citric Acid citrated calcium carbamide/ Sodium Citrate / potassium citrate

Citric acid is naturally found in citrus fruits, and is used as a preservative. It is widely used in the world of the food industry, for balancing pH levels, enhancing flavouring, increasing the effectiveness of other preservatives present, and controlling sugar inversion. According to the Canadian Food Inspection Agency, "citric acid is not a flavour but acts only as an acidulant when used in conjunction with natural flavours" (CCS 2010).



This ingredient is considered to be safe and is used in many products including: beverages, candy, shampoo's and cleaning agents, and everything else you could possibly think of.

However some individuals may experience allergic reactions, and this comes as a great disadvantage due to its popularity.

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How food additives are defined in regulations

Codex:

- ❑ *Food additive* means any substance not normally consumed as a food by itself and not normally used as a typical ingredient of the food, whether or not it has nutritive value, the intentional addition of which to food **for a technological (including organoleptic) purpose in the manufacture, processing, preparation, treatment, packing, packaging, transport or holding of such food results**, or may be reasonably expected to result, (directly or indirectly) in it or its by-products becoming a component of or otherwise affecting the characteristics of such foods.
- ❑ The term **does not include contaminants**, or substances added to food for maintaining or improving nutritional qualities, or sodium chloride;

The EU :*

- ❑ A substance deliberately added to foods or beverages for beneficial technological reasons (e.g. to preserve, flavour, colour or ensure a particular texture). **Food additives are not normally consumed by themselves nor used as typical ingredients in food.**

* According to the EFSA glossary

The US FDA:

- ❑ A food additives is any substance the intended use of which results or may reasonably be expected to result, directly or indirectly, in its becoming a component or otherwise **affecting the characteristic of any food** (including any substance intended for use in **producing, manufacturing, packing, processing, preparing, treating, packaging, transporting, or holding food**)

Safety aspect of food additives

Key principles:

- Only those additives that are **explicitly authorized** may be used
- Prior to their authorization, all food additives **must undergo** a rigorous scientific **safety evaluation**
- Food additives may only be authorized if:
 - ✓ there is a technological need for their use,
 - ✓ they do not mislead the consumer,
 - ✓ they **present no hazard** to the health of the consumer
- Safety assessment is under responsibility of relevant scientific expert committees - JECFA, EFSA, FDA etc.
- Most food additives may only be used in **limited quantities** in certain foodstuffs
- If **no quantitative limits** are foreseen for the use of a food additive - Good Manufacturing Practice applies



Why are food additives added to food?

To maintain and improve quality, safety and freshness

Preservatives slow down food spoilage caused by mold, air, bacteria, fungi, yeast.

To enhance flavor or impart desired color

Many *spices and flavors* enhance the taste of food. *Colors* maintain or enhance the appearance of certain food to meet consumer expectation

To maintain product consistency

Stabilizers and *thickeners* give smooth uniform texture. *Anticaking agents* help substances such as salt to flow freely. *Emulsifiers* give product a consistent texture and prevent them from separating



To maintain or improve nutrition value

Vitamins and minerals are added to variety of foodstuff such as milk, flour, cereals etc. to deliver targeted nutritional benefits. Such fortification has helped resolve lack of nutrients in diet

To maintain palatability and wholesomeness

Antioxidants prevent fats and oils in food from becoming rancid or developing off-flavor; prevent cut fresh fruits (e.g. apples) from turning brown when exposed to air.

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Regulatory restrictions limit innovation & renovation: restrictive conditions to use sweeteners

Directive 94/35/EC on sweeteners for use in foodstuffs

The use of intense sweeteners to replace sugar is justified for the production of:

- (i) **energy reduced foods**,
- (ii) non-cariogenic foods;
- (iii) **foods without added sugars**;
- (iv) for the extension of shelf life through the replacement of sugar;
- (v) for dietetic products.



Regulation 1333/2008/EC on food additives

Article 7

Specific conditions for sweeteners

A food additive may be included in the Community list in Annex II for the functional class of sweetener only if, in addition to serving one or more of the purposes set out in Article 6(2), it serves one or more of the following purposes:

- (a) replacing sugars for the production of energy-reduced food, non-cariogenic food or food with no added sugars; or
- (b) replacing sugars where this permits an increase in the shelf-life of the food; or
- (c) producing food intended for particular nutritional uses as defined in Article 1(2)(a) of Directive 89/398/EEC.

'**energy-reduced food**' shall mean a food with an energy value reduced by at least 30 % compared with the original food or a similar product;

'**food with no added sugars**' shall mean a food without the following:

- (i) any added monosaccharides or disaccharides;
- (ii) any added food containing monosaccharides or disaccharides which is used for its sweetening properties;

Regulatory restrictions for the use of sweeteners in “Edible Ice” (Water Ice)

how to obtain 30% energy reduction

The correlation between the total solids, energy and sugar reduction in Water Ice

Energy (kcal /100g)	Energy reduction, %	Max Amount of sugars (ref = 20g/100g)	Min sugar reduction (%)	Total solids (TS)
86.2	0	20	0	22.5
81.89	5	19.2	0	20.4
77.58	10	18.1	9.3	19.3
73.27	15	17.1	14.7	18.3
68.96	20	16.0	20.1	17.2
64.65	25	14.9	25.4	16.1
60.34	30	13.8	30.8	15.0

- ✓ In Water Ices the reduction of energy is possible only by reduction of **carbohydrates content which contribute to the total solids (TS)** in Water ice formulations
- ✓ Below 17% of total solids (TS), the risk of the tongue sticking to the ice cream while eating increases

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Consumer concerns and expectations on food additives

Concerns:

- Complex labeling: long, unfamiliar chemical names;
- Use of additives, colors with “negative” reputation in mass media;
- Use of unsafe additives, colors;
- Use safe additives but beyond allowed limit;
- Food adulteration by using colors, flavor enhancers etc.;
- Misbranding and over claim.



Expectations:

- Seek purity and authenticity in foods;
- Education through labeling (consumers desire to know more about vitamins, active cultures in yogurt, omega-6 fatty acids etc);
- Claims are truthful and not misleading;
- “Clean” labels:
 - looking for simplicity and transparency of communication on food labels,
 - prefer foods that contain ingredients that they may recognize



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What “Clean Label” means for the consumer

- Clean label part of an evolution in consumer expectations



- For the consumer, transparency and purity means:
 - Simple label list with fewer ingredients
 - Recognized ingredients (e.g., kitchen cupboard), not perceived harmful
 - Less processed food, more “artisan-like”
 - Authentic and transparent packaging showing the real product
- Natural, GMO-free, free from and Organic are peripheral clean label attributes more and more relevant for consumers

Sources: Datamonitor (2013), Mintel, Food Technology, 09 2015, Innova Market Insights data (2015)

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Clean label in action

3 key principles drive clean label:

- ❑ Remove or replace ingredients/additives that are chemically modified or synthesised;
- ❑ Simplify the ingredient list;
- ❑ Remove or replace ingredients that are not perceived friendly by consumers.

Transparency and Quality

Perception: What is "Clean Label"?





Mushroom Soup Poland

Replaced:

- Modified starch → Potato starch
- Hydrogenated vegetable fat → Chicken fat
- Concentrate garlic → dried garlic

Removed (by optimizing formulation):

- Hydrolyzed wheat protein
- Maltodextrin
- Color (ammonia caramel)

Labeling optimization



An example of the evolution of colours in Europe for SMARTIES



Artificial – pre 2006

E104 Quinoline Yellow
E110 Sunset Yellow
E122 Carmoisine
E124 Ponceau 4R
E133 Brilliant Blue
E120 Carmine
E171 Titanium Dioxide



Non – Artificial 2006 -09

E160a Beta-Carotene
E141 Copper Chlorophyll
E101 Riboflavin
E100 Curcumin
E120 Carmine
E171 Titanium Dioxide
2007 – No blue
2008 – Spirulina



Colouring Foodstuffs 2011

Lemon
Radish
Spirulina
Safflower
Black Carrot
Hibiscus
Red Cabbage
Rice Starch

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To summarize...

- Food additives help to ensure the availability of flavorful, nutritious, safe, colorful and affordable food that meets consumer expectations;
- Food additives are strictly regulated, monitored by Authorities around the world;
- Consumer perception has changed, clear demand for clean labels
- The challenges now are to obtain the same effects without additives, or provide suitable natural alternatives to satisfy consumers' demand.

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Backup

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Food additives - supporting innovation/renovation

- ❑ Enable new product formats
 - ✓ e.g. milk beverage + juice or milk beverage + cacao powder;
 - ✓ Emulsifiers & stabilizers enable mixing together ingredients that normally would not mix (e.g. fat + water)
- ❑ Improve sensory profile of products
 - ✓ Refine on mouth-feel and keep it stable through the desired shelf life
- ❑ Ensure proper organoleptic characteristics of products during the shelf life
 - ✓ Stabilizers prevent separation, retain or intensify an existing color of a foodstuff;
 - ✓ Carbon dioxide is one of the beverage additives which retains the taste and functions of some carbonated drinks.

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R&D approach for clean label

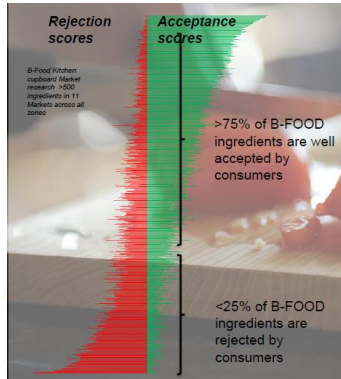
Assessment



Potential solutions identified



Development of
Toolboxes
S&T BB program



Consumer insight

CML: Options for cleaner label

Hydrocolloids

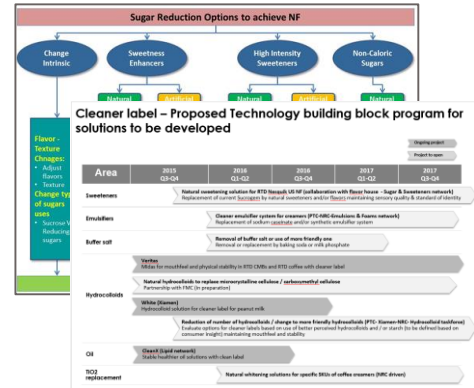
RTD coffee: Options for cleaner label

Buffer salt

RTD CMBs: Options to simplify &/or clean

Hydrocolloids

Current system	Approach	Potential new system	Timing	Cost	Process	Shelf-life	Sensory	Regulatory
Nesquik US example	Replace with 1 or 2 more blends natural hydrocolloid (reduce list by 1 or 2)	More blends Change in ingredient number	New labeling					
Conseguent Gellan gum Cellulose gel Modified Corn starch Cellulose gum	Replace with carrageenan	Hydrocolloid 3-4	Knowledge + 0-2 (30 months)	Low	High	High	High	High
Replace with potato, agglomerated dairy or non-dairy proteins (Masa)	1	Lactic acid or Milk proteins, lactic acid or Plant proteins, lactic acid	0-2 (18 months)	Low	High	High	High	High



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Overall ingredient replacement priority

Based on **preliminary analysis** from the status of each category

- **Artificial colors**
- **Artificial flavors** and flavor enhancers (e.g., MSG)
- Artificial high intensity sweeteners (e.g., aspartame, sucralose)
- Preservatives (e.g., potassium sorbate, sodium benzoate)
- Synthetic and artificially perceived texturizers and stabilizers (e.g., cellulose gum, carrageenan, chemically modified starch)
- Synthetic antioxidants (e.g., TBHQ, BHA)
- Synthetic emulsifiers (e.g., DATEM, PGPR)
- Synthetic or chemically perceived buffer salts and acidifiers (e.g., sodium hexametaphosphate)
- Sequestrants (e.g., EDTA)
- Anti-caking agents (e.g., Sodium aluminosilicate)

Notes: 1. this evaluation is preliminary and needs further consolidation. It will need to be reviewed and prioritized once all categories have a global view of their consumer insight and have defined their priorities.

It also does not consider Petcare products.

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Food def. and classification system developed by IARC

Highly processed foods

- Foods that have been industrially prepared, including those from bakeries and catering outlets, and which require no or minimal domestic preparation apart from heating and cooking (such as bread, breakfast cereals, cheese, commercial sauces, canned foods including jams, commercial cakes, biscuits and sauces).

Moderately processed foods

- This category includes two sets of foods.
- First, industrial and commercial foods involving relatively modest processing and consumed with no further cooking, such as dried fruits, raw food stored under controlled or modified atmosphere (e.g. salads), vacuum-packed food, frozen basic foods, extra virgin olive oil, fruits and vegetables canned in water or brine or in own juice.
- Second, foods processed at the household level and prepared or cooked from raw or moderately processed foods (e.g. vegetables, meat and fish cooked from raw fresh ingredients, or vacuum-packed,

Non-processed foods

- Foods consumed raw without any further processing or preparation, except washing, cutting, peeling, squeezing (e.g. fruits, non-processed nuts, vegetables, crustaceans, molluscs, fresh juices).

Group 1: Unprocessed and minimally processed foods

- *Unprocessed foods* are of plant origin (such as leaves, stems, roots, tubers, fruits, nuts, seeds), or of animal origin (such as meat, other flesh, tissue and organs, eggs, milk), consumed shortly after harvesting, gathering, slaughter or husbanding.
- *Minimally processed foods* are unprocessed foods altered in ways that do not add or introduce any substance, but that may involve subtracting parts of the food. Processes include cleaning, scrubbing, washing; winnowing, hulling, peeling, grating, squeezing, flaking; skinning, boning, carving, portioning, scaling, filleting; drying, skimming, fat reduction, as well as cooking, pasteurization, sterilizing, chilling, refrigerating, freezing; sealing, bottling (as such); simple wrapping, vacuum and gas packing. Malting, which adds water, is also a minimal process, as is fermenting, which adds living organisms, when it does not generate alcohol.

Group 2: Processed culinary ingredients

- Food products extracted and refined from constituents of foods, such as plant oils, animal fats, starches and sugar; or else obtained from nature, such as salt.
- Specific processes to produce culinary ingredients include pressing, milling, crushing, grinding and pulverizing.
- Processed culinary ingredients are normally not consumed by themselves. Their main role in diets is to be combined with foods to make palatable, diverse, nourishing and enjoyable dishes and meals. Examples are oils and salt used in the cooking of food or added to salads; sugar used to prepare fruit- or milk-based desserts, or added to drinks.

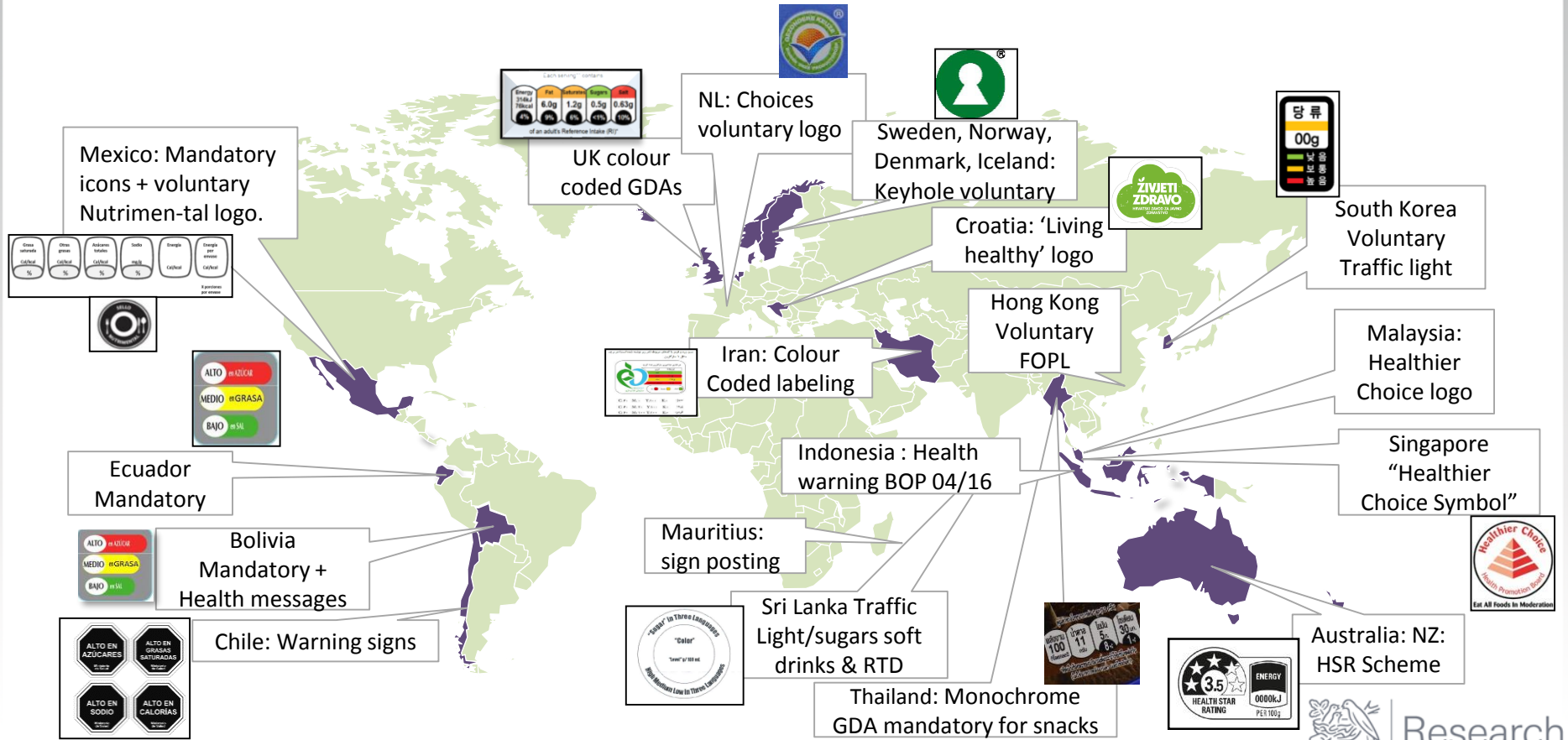
Group 3: Processed foods

- Processed foods are made by adding salt or sugar (or other substance of culinary use such as oil or vinegar) to unprocessed or minimally processed foods, in order to preserve them or to enhance their palatability. The resulting products are based on and recognizable as versions of the original foods, and are not reconstituted from them. They include canned or bottled vegetables or legumes (pulses) preserved in brine; whole or sliced fruits preserved in syrup; tinned whole or pieces of fish preserved in oil; some types of processed meat and fish such as ham, bacon and other unreconstituted meat products, smoked fish, cheeses, and breads when made from wheat flour (or other cereal flours), water, ferments and salt. As with processed culinary ingredients, some processed foods can still be hand-made with simple tools, although now almost all are industrial products. Besides cooking and canning or bottling, specific processes include preservation in oil or syrups, salting, salt-pickling, smoking and curing. Processed foods retain the basic identity and most of the constituents of the original foods, but the substances added infiltrate the foods and alter their nature. They are generally produced to be consumed as part of meals or dishes, but may be used, together with ultra-processed products, to replace food-based freshly prepared dishes and meals.

Group 4: Ultra-processed food and drink products

- A defining characteristic of ultra-processed products is that they are formulated mostly or entirely from substances derived from foods, with little or even no whole food content. They typically are not recognizable as versions of foods, although many are designed to imitate the appearance, shape or sensory qualities of food. Many ingredients used to make ultra-processed products are not available from retailers, and so are not used in the culinary preparation of dishes and meals. Additives are an example. Some of these ingredients are directly derived from foods, such as oils, starches and sugar. Others are obtained by the further processing of food constituents, such as by the hydrogenation of oils, hydrolysis of proteins, and 'modification' or 'purification' of starches. Ultra-processed products characteristically also contain various combinations of preservatives; stabilizers, emulsifiers, solvents, binders, bulkers; sweeteners, sensory enhancers; processing aids; colours and flavours. Bulk may come from added air or water. Micronutrients may be added to 'fortify' the products.
- Ultra-processing also includes techniques designed to make ingredients appear to be foods or else to invent novelty products, such as by extrusion, moulding or reshaping.
- It also involves industrial versions of cooking, such as pre-processing by frying and baking. Such methods simulate domestic cooking but are typically very different, involving a series of processes. Most of the products listed here as ultra-processed are now inventions based on increasingly sophisticated food science and technology.

The world we live in: Front of Pack Labelling



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