‘Ultra-processed foods’:

implications for health and EU food policy

A briefing for discussion

1. Ultra-processed foods: an emerging food-health category

‘Unhealthy foods’ have traditionally been described as “foods high in saturated fats, trans-fatty acids, free sugars or salt (i.e. energy-dense, nutrient-poor foods)”.[1] Or in other words: foods high in fat, sugar and salt (HFSS).[*]

Today, there is strong emerging evidence about another class of foods that may be inherently problematic from a health perspective – so-called **‘ultra-processed foods’** (UPFs). In many cases these foods overlap with the HFSS category. However, evolving evidence seems to indicate that **UPFs pose health concerns beyond nutrient composition**.

As one recent review concludes:

> “*There is now a considerable body of evidence supporting the use of UPFs as a scientific concept to assess the ‘healthiness’ of foods within the context of dietary patterns and to help inform the development of dietary guidelines and nutrition policy actions*.”[2]

An **increasing number of voices are calling for policy interventions** to curb the availability and advertising of UPFs and re-shape price incentives.[3] For instance, UPFs provide cheap calories: a study calculated that in Belgium, 100kcal of UPFs costs on average 0.55€, while 100 kcal of minimally processed foods costs on average 1.29€.[4,5] There are also calls to ensure that food technology is primarily used for public health aims rather than out of commercial considerations.[6]

This discussion briefing aims to give a short overview of what UPFs are, the observed health issues related to these foods, and to reflect on ways to approach UPFs as part of European food policy-making.

2. What are ultra-processed foods?

Over the last decades, Western diets have shifted away from the consumption of more basic, minimally processed foods towards more and more processed products.[7] Processed foods are now all over supermarket shelves and **play a dominant role in modern diets, contributing up to 60- 80% of daily energy intake across European countries**.[8]

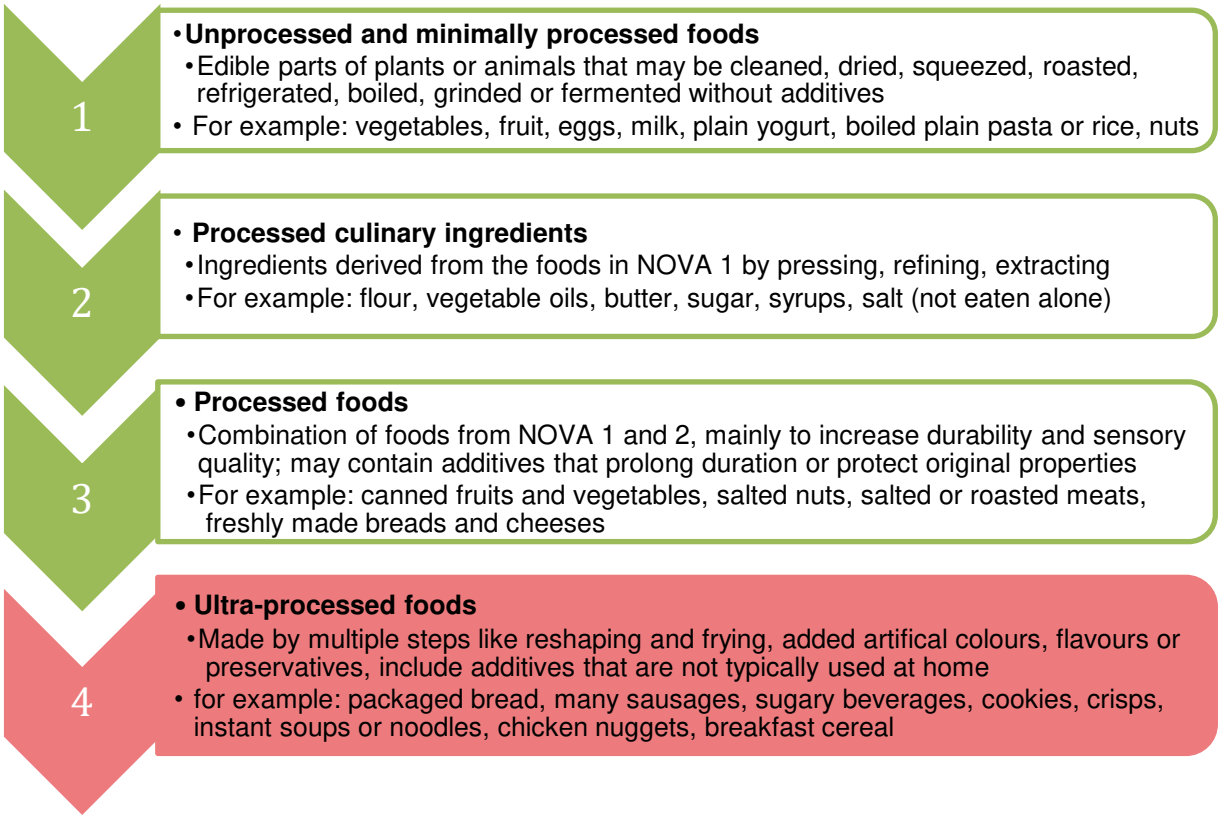
[*] For this paper, drinks – i.e. non-alcoholic beverages – are covered by the definition of ‘food’.

Observing the rise in processed foods and their association to diet-related diseases, a group of researchers started to question the lack of attention in dietary assessments and recommendations to processing and its (potential) health impacts. This saw the development of the "**NOVA**" classification system, which aims to classify foods and drinks based on their degree and type of processing, launching the debate on UPFs.[9]

2.1 NOVA classification

NOVA proposes to classify foods into four categories according to the nature, extent and purpose of the processing they undergo.[10]

Figure 1. Summary of the four groups of the NOVA classification based on Monteiro et al., 2018



Ultra-processed foods (UPFs) make up for the fourth category and are characterised by a **combination of multiple processing steps** like hydrogenation and reshaping, often resulting in a loss of the original physical properties of the food and **the addition of ingredients** like flavour or preservation enhancers.

> *"Ultra-processed foods are formulations of ingredients, mostly of exclusive industrial use, typically created by series of industrial techniques and processes (hence 'ultra-processed')."*[10]

An easy **rule of thumb** to identify UPFs, is to check the ingredients list for **additives that usually are not used in a home-kitchen**. Therefore, this categorisation could be used to make a difference between artisanal or home-made items like some breads only containing yeast, water and flour and industrially products like bread with preservatives for example.[11,12]

"Generally, the practical way to identify if a product is ultra-processed is to check to see if its list of ingredients contains at least one item characteristic of the ultra-processed food group. These are either food substances never or rarely used in kitchens, or classes of additives whose function is to make the final product palatable or more appealing."[10]

3. Health issues associated with ultra-processed foods

There is now a considerable body of evidence associating UPFs with unhealthy diets and negative health outcomes. The effects of UPFs can be associated with unhealthy nutritional composition of foods, and – the more novel part – probably with factors related to the processing itself.

Generally, UPFs tend to be nutritionally imbalanced, and a higher consumption of UPFs is associated with an overall unbalanced diet, including: **Error! Bookmark not defined.**,9

- Too much fats, sugars and/or salts;
- High in saturated fatty acids and/or containing trans-fatty acids;
- High energy density (more kcal per gram);
- Limited in fibre and other micronutrients.

High intakes of salt, sugar, saturated fatty acids or trans-fatty acids are known to be **risk factors for several non-communicable diseases (NCDs)**, whereas fibre on the other hand has health-promoting properties.[13]

Higher daily consumption of UPFs has been associated with:

- Increased **metabolic syndrome** prevalence;[14,15]
- Higher **cardiovascular disease** risk;[16]
- Higher **type-2 diabetes** risk;[17]
- Increased **obesity** prevalence;[18,19]
- Increased risk of **all-cause mortality**;[20,21]
- Increased risk of **several cancers, including breast cancer;**[22]
- Increased risk of developing **depression.**[23]

At the same time, evidence is growing that the unhealthful characteristics of UPFs are **not only due to their nutrient composition, but also due to the nature of processing itself**. The changes made to the food structure during ultra-processing leads to different metabolic responses in the body than eating their unprocessed or minimally processed equivalents.

Other factors related to UPFs that may contribute to overconsumption and or/health risks:[2]

- Lower satiety potential and higher glycaemic response;[24]
- Possible disruption of gut-brain signalling responsible for overall food intake;[25]
- Quasi-addictiveness due to abnormal appetitive properties.[26]

Highlight: Results from the only randomised controlled trial (RCT) on UPFs so far

Findings from the, so far, only **randomised controlled (cross-over) trial** [27] considering UPF consumption and health, indicate that the reasons for negative health outcomes go beyond the nutrient content of UPFs.

Hall et al. investigated the **weight gain and total energy intake of following an ultra-processed diet for two weeks, compared to an unprocessed diet** in 20 adults from the U.S.. Although the meals were matched for calories, sugar, fat, sodium, fibre and macronutrients, as well as for taste qualities, the ultra-processed diet lead to a **significant higher consumption of about 500 kcal** per day compared to the unprocessed diet. Furthermore, the higher energy consumption was associated with an **almost 1kg weight gain** during the two weeks of consuming the ultra-processed diet.

The study authors offer several hypotheses for the observed weight gain:

- UPFs are easier to chew and therefore easier to be eaten;
- UPFs were eaten faster than minimally processed foods and eating faster often results in eating more;[28]
- Blood measures taken during the trial showed lower ghrelin (appetite stimulating hormone) levels and higher PYY (appetite suppressing hormone) during unprocessed diets. The authors could not show an explanation for this observation.

While explanations for these observed effects have to be found with further research, the present evidence strongly suggests that it may be beneficial to limit the intake of UPFs, not only due to their often poor nutritional properties, but also due to factors related to the nature of processing itself.

4. Other ways to classify ultra-processed foods

Although the NOVA system is well-known and used in many publications, it has been subject to some criticism. For instance, the NOVA classification can be difficult to apply in practice and it does not consider nutrients. NOVA, for example, makes no distinction between the amounts of added salts, fats or sugars in different UPFs.[29]

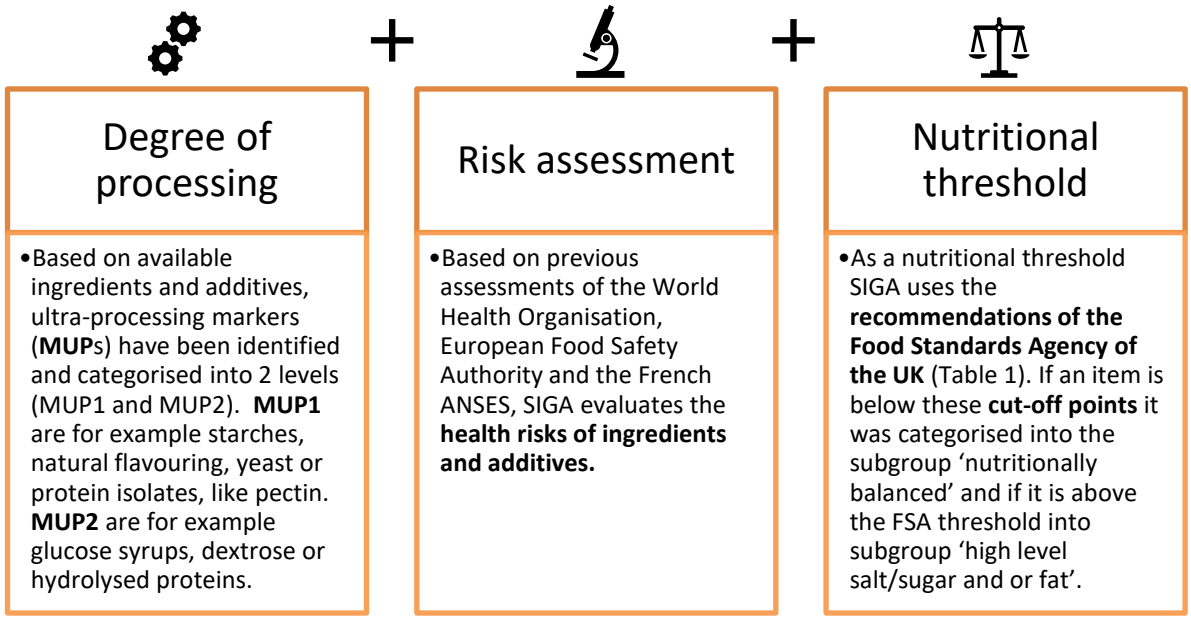
Other classification systems have been proposed, including the relatively recent "SIGA" system. Compared to NOVA, SIGA adds further detail to the classification by differentiating between various steps in the intensity of processing, and takes nutritional composition into account.[30] SIGA has however not been commonly used in publications,[30] and the system seems not yet to have been scrutinised by independent observers.

2.1 SIGA classification

SIGA is a more complex classification system compared to NOVA. It is based on 3 core criteria and distinguishing 9 classes of products.

Generally, SIGA considers a food as **ultra-processed** if it contains at least one purified and/or denatured ingredient. Those can be cosmetic additives like colouring or texture enhancers, or additives for preservation, like antioxidants or preservatives that have been assessed as posing a risk to human health.

The three criteria to classify foods are:



Based on the three criteria, the siga classification distinguishes between **9 groups** (Figure 2).

Group A are the un-/or minimally processed foods.

- Group A0 foods have an intact initial matrix like raw fruit, vegetables, eggs, raw fish and meats or milk.
- Group A1 contains products with a degraded raw matrix like fresh juices or stake, but also culinary ingredients used at home like salt, oils and sugar. They can be cooked, grinded, fermented or refined.

Group B consists of processed foods like cheese, bread, canned fish or canned vegetables. Processing can be done by e.g. salting, smoking, sugaring or fermenting.

- Group B1 foods have added sugar, salt and fat proportions within the recommendations.
- Group B2 foods contain at least one of these nutrients is above the threshold.

Group C consist of UPFs and is split in 5 subgroups in total.

- Group C0 contains UPFs with one single MUP1 and based on their salt/fat and sugar content are split into:
  - C01 (below threshold);
  - C02 (above threshold).
- Group C1 foods contain several MUP1.
- Group C2 hold UPFs that contain one MUP2 or multiple MUP1.
- Group C3, contains UPFs with multiple MUP1 and/or MUP2 and a sugar/salt or fat content above the threshold.

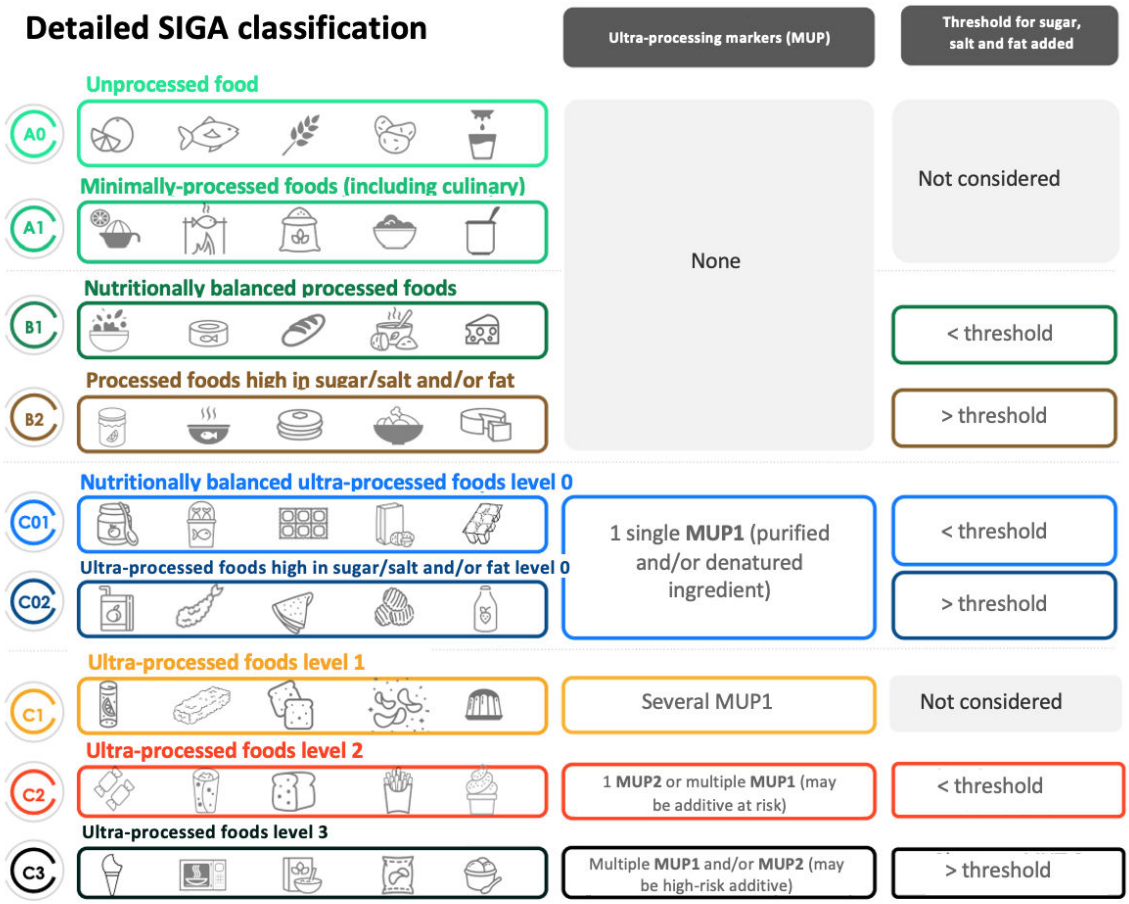


Figure 2. Overview Siga classification translated from Frank et al., 2018

5. Opposing views: food processing as an opportunity

Not everybody shares the premise that UPFs carry intrinsically unhealthy characteristics and that people should limit their consumption. Some counter perspectives include:

- The argument that people simply lack the time to cook meals with fresh ingredients every day, making it unavoidable to have meal options that are quick and easy to prepare, which requires the addition of certain additives to products. What remains most relevant is the types of food eaten and not how processed they are. [31]
- References to the importance of food processing for food and nutrient security. [32] [33] If science and technology are carefully used, it should be possible to create healthy processed foods, or reformulate existing foods to make them healthier. Through technology, the safety, palatability, bioavailability, sustainability and the shelf life of foods can be enhanced. [34]
- The idea that the role of a food, including an UPF, should be seen in light of the wider dietary pattern it is consumed in. A particular version of this argument has been used to discuss the category of plant-based meat substitutes.[35]

- Allegations that the notion of UPF is a "subjective" and "value-laden" proposition which "does not characterize foods in a helpful manner".[36]
- The perception that there is not yet enough consistent evidence about UPFs, and that more studies on the actual impact of UPFs on health are needed.[37] [38]

These perspectives clearly indicate that there is **no general consensus on the question of UPFs**. At the same time, few of these opposing views seem to directly engage with the findings and premises behind the evidence on UPFs. Including the finding of a recent review that *"No study reported an association between UPF and beneficial health outcomes."*[2]

Moreover, the picture is further complicated by some of these analyses showing ties to food industries.[39]

6. Policy implications: the question of UPFs needs to be urgently addressed

Despite perspectives to the contrary, **there is a strong body of evidence associating UPFs with a variety of health issues.** If UPFs, as a food category beyond nutritional composition, do pose intrinsic health concerns, this should have important implications for European Union (EU) food policies.

Therefore, in light of the multiple food policy actions that will be initiated as part of the Farm to Fork Strategy, **the question of UPFs needs to be urgently addressed**.

The following steps can be envisioned to take this question forward:

1. Find an evidence-informed agreement about whether to address UPFs as a separate food-health category.
2. Launch tender(s) to gain specific additional evidence in case of need.
3. Find agreement on an evidence-informed method to classify UPFs.
4. Consider ways to integrate concerns around UPFs into nutrient profiles and algorithms underpinning at least:
    - Front-of-pack nutrition labelling schemes;
    - Advertising and marketing restrictions;
    - Nutrient profiles for health and nutrition claims;
    - Fiscal policies.

References

[1] World Health Organization; Commission on Ending Childhood Obesity; World Health Organization. *Report of the Commission on Ending Childhood Obesity.*; **2016**.

[2] Elizabeth, L.; Machado, P.; Zinöcker, M.; Baker, P.; Lawrence, M. Ultra-Processed Foods and Health Outcomes: A Narrative Review. *Nutrients,* **2020**, *12* (7), 1955. https://doi.org/10.3390/nu12071955.

[3] Adams Jean, Hofman Karen, Moubarac Jean-Claude, Thow Anne Marie. Public health response to ultra-processed food and drinks *BMJ,* **2020**; 369 :m2391 https://doi.org/10.1136/bmj.m2391

[4] Vandevijvere, S.; Pedroni, C.; De Ridder, K.; Castetbon, K. The Cost of Diets According to Their Caloric Share of Ultraprocessed and Minimally Processed Foods in Belgium. *Nutrients,* **2020**, *12*, 2787. https://doi.org/10.3390/nu12092787

[5]Gupta S, Hawk T, Aggarwal A and Drewnowski A. Characterizing Ultra-Processed Foods by Energy Density, Nutrient Density, and Cost. *Front. Nutr* **2019**, 6:70. https://doi.org/10.3389/fnut.2019.00070

[6] Ludwig, D. S. Technology, diet, and the burden of chronic disease. *Jama*, *305*(13), **2011.** 1352-1353. https://doi.org/10.1001/jama.2011.380

[7] Julia, C.; Martinez, L.; Allès, B.; Touvier, M.; Hercberg, S.; Méjean, C.; Kesse-Guyot, E. Contribution of Ultra-Processed Foods in the Diet of Adults from the French NutriNet-Santé Study. *Public health nutrition* **2018**, *21* (1), 27–37. https://doi.org/10.1017/S1368980017001367

[8] Slimani, N., Deharveng, G., Southgate, D. *et al.* Contribution of highly industrially processed foods to the nutrient intakes and patterns of middle-aged populations in the European Prospective Investigation into Cancer and Nutrition study. *Eur J Clin Nutr*, **2009.** 63**,** S206–S225 https://doi.org/10.1038/ejcn.2009.82

[9] Monteiro, C. A.; Levy, R. B.; Claro, R. M.; Castro, I. R. R. de; Cannon, G. A New Classification of Foods Based on the Extent and Purpose of Their Processing. *Cad. Saúde Pública,* **2010**, *26*, 2039–2049. https://doi.org/10.1590/S0102-311X2010001100005.

[10] Monteiro, C.A., Cannon, G., Lawrence, M., Costa Louzada, M.L. and Pereira Machado, P. Ultra-processed foods, diet quality, and health using the NOVA classification system. **2019**. Rome, FAO. Retrieved from http://www.fao.org/3/ca5644en/ca5644en.pdf (Accessed at 29.09.2020)

[11] Moubarac, J., Parra, D.C., Cannon, G. *et al.* Food Classification Systems Based on Food Processing: Significance and Implications for Policies and Actions: A Systematic Literature Review and Assessment. *Curr Obes Rep*, **2014.** 3**,** 256–272. https://doi.org/10.1007/s13679-014-0092-0

[12] Moubarac, J. C., Parra, D. C., Cannon, G., & Monteiro, C. A. Food classification systems based on food processing: significance and implications for policies and actions: a systematic literature review and assessment. *Current obesity reports*, **2014**. *3*(2), 256-272. https://doi.org/10.1017/S1368980018003762

[13] WHO. Healthy Diet Factsheet. **2020** Retrieved from https://www.who.int/en/news-room/fact-sheets/detail/healthy-diet (Accessed at 21.09.2020)

[14] Tavares, L. F., Fonseca, S. C., Rosa, M. L. G., & Yokoo, E. M. Relationship between ultra-processed foods and metabolic syndrome in adolescents from a Brazilian Family Doctor Program. *Public health nutrition*, **2012**. *15*(1), 82-87. https://doi.org/10.1017/S1368980011001571

[15] Steele, E. M., Juul, F., Neri, D., Rauber, F., & Monteiro, C. A. Dietary share of ultra-processed foods and metabolic syndrome in the US adult population. *Preventive medicine*, **2019**. *125*, 40-48. https://doi.org/10.1016/j.ypmed.2019.05.004

[16] Srour, B., Fezeu, L. K., Kesse-Guyot, E., Allès, B., Méjean, C., Andrianasolo, R. M., ... & Monteiro, C. A. Ultra-processed food intake and risk of cardiovascular disease: prospective cohort study (NutriNet-Santé). *bmj*, **2019,** *365*. https://doi.org/10.1136/bmj.l1451

[17] Srour, B., Fezeu, L. K., Kesse-Guyot, E., Allès, B., Debras, C., Druesne-Pecollo, N., ... & Monteiro, C. A. Ultraprocessed Food Consumption and Risk of Type 2 Diabetes Among Participants of the NutriNet-Santé Prospective Cohort. *Jama Internal Medicine*, **2020,** *180*(2), 283-291. https://doi.org/10.1001/jamainternmed.2019.5942

[18] da Costa Louzada, M. L., Baraldi, L. G., Steele, E. M., Martins, A. P. B., Canella, D. S., Moubarac, J. C., ... & Mozaffarian, D. Consumption of ultra-processed foods and obesity in Brazilian adolescents and adults. *Preventive medicine*, **2015,** *81*, 9-15. https://doi.org/10.1016/j.ypmed.2015.07.018
[19]Nardocci, M., Leclerc, B., Louzada, M. *et al.* Consumption of ultra-processed foods and obesity in Canada. *Can J Public Health.* **2019,** 110**,** 4–14 https://doi.org/10.17269/s41997-018-0130-x
[20] Kim, H.; Hu, E.A.; Rebholz, C.M. Ultra-processed food intake and mortality in the USA: Results from the third National Health and Nutrition Examination Survey (NHANES III, 1988–1994). *Public Health Nutr.* **2019**, *22*, 1777–1785. https://doi.org/10.1017/S1368980018003890
[21] Blanco-Rojo, R.; Sandoval-Insausti, H.; López-Garcia, E.; Graciani, A.; Ordovás, J.M.; Banegas, J.R.; Rodríguez-Artalejo, F.; Guallar-Castillón, P. Consumption of ultra-processed foods and mortality: A national prospective cohort in Spain. *Mayo Clin. Proc.* **2019**, *94*, 2178–2188. https://doi.org/10.1016/j.mayocp.2019.03.035
[22] Fiolet, T.; Srour, B.; Sellem, L.; Kesse-Guyot, E.; Allès, B.; Méjean, C.; Deschasaux, M.; Fassier, P.; Latino-Martel, P.; Beslay, M.; et al. Consumption of ultra-processed foods and cancer risk: Results from NutriNet-Santé prospective cohort. *BMJ* **2018**, *360*, k322. https://doi.org/10.1136/bmj.k322
[23] Gómez-Donoso, C.; Sánchez-Villegas, A.; Martínez-González, M.A.; Gea, A.; Mendonça, R.d.D.; Lahortiga-Ramos, F.; Bes-Rastrollo, M. Ultra-processed food consumption and the incidence of depression in a Mediterranean cohort: The SUN project. *Eur. J. Nutr.* **2019**, *59*, 1093–1103. https://doi.org/10.1007/s00394-019-01970-1
[24] Fardet, A. Minimally processed foods are more satiating and less hyperglycemic than ultra-processed foods: a preliminary study with 98 ready-to-eat foods. *Food & function*, **2016**. *7*(5), 2338-2346. https://doi.org/10.1039/C6FO00107F
[25] Small, D. M., & DiFeliceantonio, A. G. Processed foods and food reward. *Science*, *363*(6425), **2019.** 346-347. https://doi.org/10.1126/science.aav0556
[26] Schulte EM, Avena NM, Gearhardt AN. Which Foods May Be Addictive? The Roles of Processing, Fat Content, and Glycemic Load. *PloS ONE* **2015**. 10(2): e0117959. https://doi.org/10.1371/journal.pone.0117959
[27] Hall KD, Ayuketah A, Brychta R, Cai H, Cassimatis T, Chen KY, Chung ST, Costa E, Courville A, Darcey V, Fletcher LA. Ultra-processed diets cause excess calorie intake and weight gain: an inpatient randomized controlled trial of ad libitum food intake. *Cell metabolism*. **2019** Jul 2;30(1):67-77. https://doi.org/10.1016/j.cmet.2019.05.008
[28] de Graaf, C., Kok, F. Slow food, fast food and the control of food intake. *Nat Rev Endocrinol*, **2010.** 6**,** 290–293. https://doi.org/10.1038/nrendo.2010.41
[29] Gibney, M. J. Ultra-Processed Foods: Definitions and Policy Issues. *Current Developments in Nutrition* **2019**, *3* (2). https://doi.org/10.1093/cdn/nzy077.
[30] Fardet, A. Characterization of the Degree of Food Processing in Relation With Its Health Potential and Effects. In *Advances in Food and Nutrition Research*; Elsevier, **2018**; Vol. 85, pp 79–129. https://doi.org/10.1016/bs.afnr.2018.02.002.
[31] Raul Amaral Rego., et al. "The Myth of Ultra-Processed Foods". EC Nutrition 12.3 (2017): 148-151.
[32] Weaver, C. M., Dwyer, J., Fulgoni III, V. L., King, J. C., Leveille, G. A., MacDonald, R. S., ... & Schnakenberg, D. (2014). Processed foods: contributions to nutrition. *The American journal of clinical nutrition*, *99*(6), 1525-1542. https://doi.org/10.3945/ajcn.114.089284
[33] Johanna T. Dwyer, Victor L. Fulgoni, III, Roger A. Clemens, David B. Schmidt, Marjorie R. Freedman, Is "Processed" a Four-Letter Word? The Role of Processed Foods in Achieving Dietary Guidelines and Nutrient Recommendations, *Advances in Nutrition*, Volume 3, Issue 4, July 2012, Pages 536–548, https://doi.org/10.3945/an.111.000901
[34] Buttriss, Judith L. "Why food reformulation and innovation are key to a healthier and more sustainable diet.". *Nutrition Bulletin* **2020**; 45:244-252. https://doi.org/10.1111/nbu.12455
[35] Kalocsay K, King T, Lichtenstein T, Weber J. Plant-Based Meat: A Healthier Choice? Melbourne: Food Frontier; **2020** Aug 12.
[36] Weaver, C. M., Dwyer, J., Fulgoni III, V. L., King, J. C., Leveille, G. A., MacDonald, R. S., ... & Schnakenberg, D. (2014). Processed foods: contributions to nutrition. *The American journal of clinical nutrition*, *99*(6), 1525-1542. https://doi.org/10.3945/ajcn.114.089284

[37] Gibney, M. J. Ultra-Processed Foods: Definitions and Policy Issues. *Current Developments in Nutrition* **2019**, *3* (2). https://doi.org/10.1093/cdn/nzy077.
[38] R. Botelho, W. Araújo & L. Pineli Food formulation and not processing level: Conceptual divergences between public health and food science and technology sectors, *Critical Reviews in Food Science and Nutrition*, **2018**,58:4, 639-650, https://doi.org/10.1080/10408398.2016.1209159
[39] Simon, M. Nutrition Scientists on the Take from Big Food: Has the American Society for Nutrition Lost All Credibility? *Eat Drink Politics* **2015**