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Focus on Ultra-Processed Foods

Classification, Evaluation, and Future Approaches

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Introduction

The public and scientific debate on ultra-processed foods – known as ultra-processed foods (UPFs) – has gained considerable momentum in recent years. In this context, questions about the health effects, technological processes and the role of such products in a sustainable diet are increasingly becoming the focus of attention for consumers, politicians, the media and researchers.

To date, the NOVA classification has been considered the primary tool for assessing the degree of food processing; it categorizes foods into four groups based on their degree of processing (Monteiro et al., 2019). Although it was originally intended as a critical impetus for food processing that reduces or prevents the adverse effects on consumers resulting from the consumption of processed foods, the system lacks the ability to differentiate. As a result, many foods fall into the fourth and final category (see Figure 1, p. 4) of ultra-processed foods, regardless of their nutrient composition, functional properties, or contribution to a more resource-efficient diet (Louie, 2025).

This expert analysis highlights which technological and nutritional aspects are taken into account in classification systems for evaluating (highly) processed foods and where their limitations lie. In particular, the NOVA classification system and the French SIGA model (see Figure 2, p. 6) will be considered.

1. Objective, purpose and development of food processing

For thousands of years, people have been processing primary produce to make it easier to digest, ensure it is safe to eat, extend its shelf life and improve its flavour. Food processing involves a wide range of physical, biological and chemical processes that cannot be defined as a single, homogeneous step. These processes generally alter the structure and composition of the ingredients, affect the chemical and physical properties of the food, and at the same time fulfil a wide range of technological and nutritional functions (Behsnilian et al., 2023; Forde, 2023).

The term **ultra-processed foods (UPFs)** refers to industrially manufactured products that have undergone numerous processing steps and often contain ingredients, additives or formulations that are not available in a normal household kitchen (Gibney, 2020). They are generally characterised by the use of flavourings, colourings, emulsifiers or other processing aids which, in accordance with Regulation (EC) No 1333/2008, fulfil a technological function during processing. However, they remain in the final product only in unavoidable trace amounts and contribute, for example, to the creation or enhancement of sensory properties. Nevertheless, there is no standard definition of UPFs (FoodDrinkEurope, 2024). Depending on the version, different criteria are taken into account, such as additives, the purpose of processing, the number of ingredients or technological processes (Gibney, 2020).

Processing remains a key component of modern food systems as well. The reason for this is that a key purpose of processing is to ensure food safety: Processes such as pasteurisation, fermentation or the use of natural preservatives reduce microbiological risks and extend the shelf life of perishable products. Furthermore, certain processing steps are necessary to make food edible in the first place, such as the heat treatment of potatoes or pulses to deactivate toxic or hard-to-digest substances. In addition, the nutritional quality or bioavailability of food can be improved through specific processing steps (Behsnilian et al., 2023). This lays the foundations for the development of foods that meet the specific nutritional requirements of different consumer groups.

Access to processed foods makes everyday life easier and promotes social inclusion by reducing time-consuming, labour-intensive preparation steps, thereby improving access to a balanced diet. Convenience products, the majority of which fall into the category of ultra-processed foods, can provide a quick yet nutritious meal, particularly in hectic situations. This is a factor that is becoming increasingly important in modern consumer behaviour (see Poore & Nemecek, 2018; HLPE, 2017; Llobet et al., 2022). The EPIC study shows that in Nordic and Central European countries, 50–90 per cent of nutrient intake comes from ultra-processed foods (Gibney, 2019).

Despite these advantages, food processing also has potential drawbacks. Certain processes can lead to nutrient losses (Moyo, 2024) or alter the natural food matrix, which can affect energy density and satiety (Fardet, 2017). Moreover, intensive thermal treatment can lead to the formation of undesirable process contaminants, and the use of additives or processing aids is the subject of critical debate in some of the literature (Vidhya et al., 2024).

Overall, it is clear that food processing fulfils a wide range of functions and plays a central role in modern food systems – one that must be considered in a differentiated manner.

2. Classification of foods according to NOVA

Food-based dietary guidelines have formed the basis of health advice for over half a century. In recent years, there has been an increased focus on the degree to which food is processed and its impact on health. The growing interest in the topic of ultra-processed foods and the assumption that these contribute to increased energy intake has led to the inclusion of guidelines and restrictions on the consumption of processed foods in national dietary guidelines (Forde, 2023). Belgium, Brazil, Ecuador, Israel, the Maldives, Peru and Uruguay have explicitly included “highly processed” as a criterion in their dietary guidelines (Koios, 2022).

The dietary guidelines in Germany are published by the DGE (German Nutrition Society) and focus on nutrients and their effects on health; the degree of processing is only taken into account indirectly via typical characteristics (e.g. high sugar or fat content). In 2009, a group in Brazil proposed the NOVA classification, which classifies foods not according to their nutrient content but according to the extent to which they have been processed (Monteiro et al., 2019). This approach suggests that it is not the nutrients in a food that determine its health benefits, but rather that the degree of processing is the most important factor for health (Forde, 2023). The NOVA classification therefore recommends avoiding ultra-processed foods in order to maximise health (Forde, 2023; Monteiro et al., 2019).

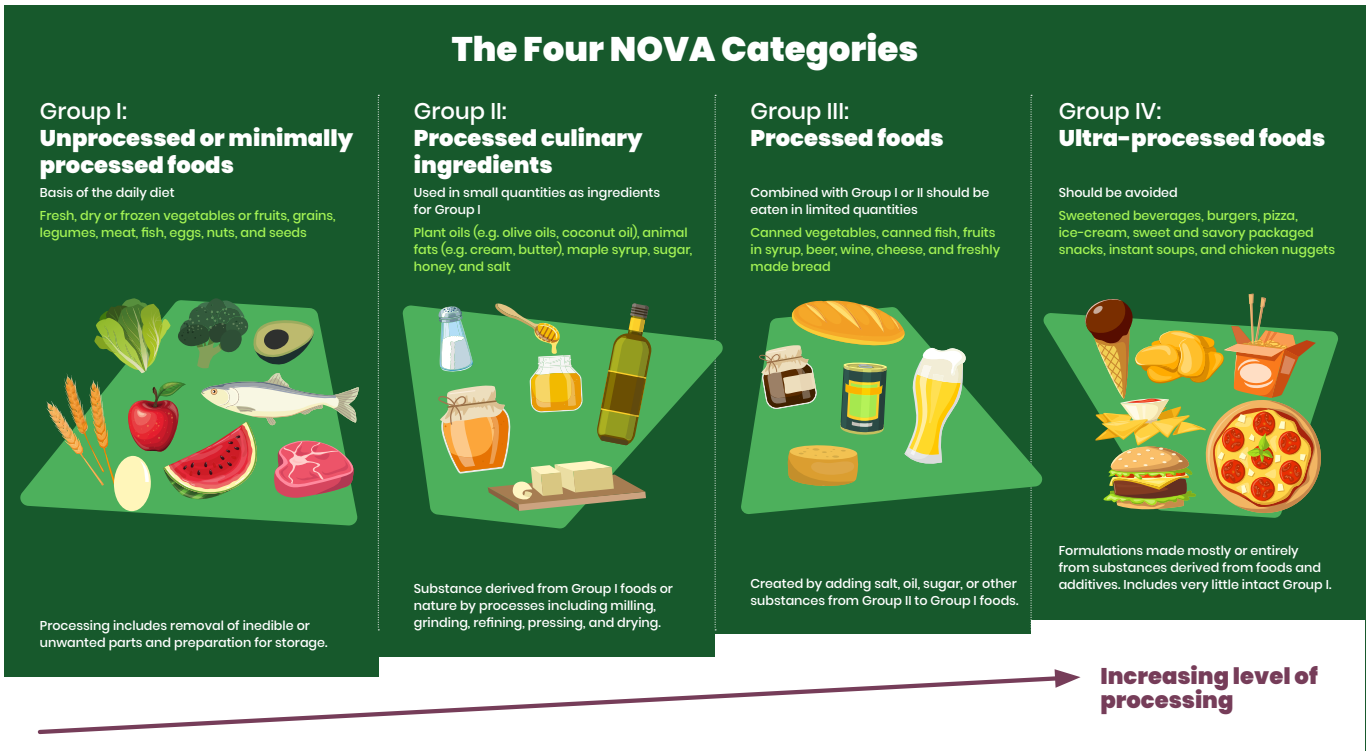

Figure 1: Classification of foods according to NOVA (Planteneers GmbH, 2025 and modified according to Monteiro et al., 2019).

The NOVA classification divides foods into four groups based on their degree of processing:

- **Group I:** Unprocessed or minimally processed foods (e.g. fresh vegetables, rice, milk and meat)
- **Group II:** Processed culinary ingredients (e.g. sugar, vegetable oils and butter)
- **Group III:** Processed foods (e.g. cheese, canned goods and freshly baked bread)
- **Group IV:** Ultra-processed foods (UPFs), mostly industrially produced, with additives such as colourings, emulsifiers, flavour enhancers and aromas (Monteiro et al., 2019)

NOVA's dietary recommendations state that the final group – ultra-processed foods – should be avoided in order to improve nutrient intake, with a focus on fat, salt and sugar (Gibney, 2019).

3. Limitations of the NOVA classification

Numerous association studies show that high overall consumption of UPFs is associated with a significantly increased risk of obesity, type 2 diabetes, cardiovascular disease, certain types of cancer and higher overall mortality (Cordova et al., 2023; Lane et al., 2022; Rauber et al., 2024; Pagliai et al., 2021). However, these are observational studies which highlight statistical correlations without being able to demonstrate causal mechanisms (Bröder et al., 2023). Against this background, classifying foods into defined categories solely on the basis of their degree of processing is particularly problematic, as the general public often assumes – not least as a result of the NOVA classification – that the health benefits of a food inevitably decrease as the degree of processing increases (BVE, 2025). As a result, products from the NOVA Group IV are often regarded as unhealthy. Yet UPFs are by no means a homogeneous category: Many ultra-processed foods fulfil important nutritional functions or, for safety and shelf-life reasons, must undergo certain processing steps (Braesco et al., 2022; Louie, 2025). Staple foods such as potatoes and pulses must therefore be heat-treated in order to be edible and safe to eat. The technological necessity of such processing steps is not taken into account and is not adequately reflected in the NOVA system (Gibney, 2020; Bröder et al., 2023). The issue of classification also becomes clear in the case of plant-based alternatives, which – due to the manufacturing processes required – are typically assigned to Group IV in the NOVA system, regardless of whether they are nutritionally high-quality or offer health benefits.

In addition, the NOVA system is based on fundamental conceptual assumptions that imply a clear distinction between "natural" and "less natural" foods, without defining these terms scientifically or justifying them on technological grounds. The model therefore follows a normative conception of how food should ideally be produced. As a result, various experts have criticised the fact that NOVA is based less on objectively verifiable criteria than on an assessment framework that fundamentally interprets industrial processing as detrimental. This line of reasoning contributes to ultra-processed foods being perceived as unhealthy across the board, even though they constitute an extremely diverse group and their health effects cannot be deduced solely from the degree of processing. Instead, the negative effects of ultra-processed foods observed in some studies could be explained more by certain ingredients that are subject to only minimal regulation in some countries. The question therefore arises for Europe as to whether such findings are transferable at all, given that many of these additives are not authorised here. This suggests that any potential risks are more likely to stem from individual ingredients rather than from the degree of processing itself.

Furthermore, studies show that the classification of foods into the NOVA groups is not entirely clear-cut and is therefore subjective. Experts therefore disagree on how to classify different foods, which suggests that the current NOVA criteria do not allow for a robust, functional classification of foods based on their degree of processing (Braesco et al., 2022).

Moreover, due to its purely process-oriented logic, the NOVA system overlooks key social and environmental realities. On the one hand, studies show that many UPFs are important, affordable sources of nutrients for low-income

groups and that a blanket reduction in their consumption could exacerbate food insecurity (Louie, 2025). On the other hand, environmental analyses suggest that, despite their poor reputation in terms of health, UPFs are often produced more efficiently, consume fewer resources per calorie and, thanks to industrial processes, enable longer shelf life and reduced waste (Louie, 2025).

This illustrates that the NOVA system does not adequately take into account social or environmental aspects, nor key differences in composition, health effects, food safety and nutritional function, and is therefore insufficient as the sole basis for dietary recommendations.

It is therefore necessary to develop a classification system for consumers, policymakers and industry that takes appropriate account of technological, nutritional, social and environmental aspects and does not make sweeping judgements about processed foods. This is evident, for example, in modern plant-based products, which have evolved considerably in recent years and can contribute in many ways to a balanced and sustainable diet (WHO, 2021). Although they are usually classified as “highly processed” in the NOVA system, neither the purpose of their processing nor their nutritional profile or potential health benefits are taken into account. Many protein-rich plant-based raw materials, such as soya, peas, field beans and lupins, must be processed, as their primary products are not fit for human consumption – a fact that is not reflected in the NOVA system. The extraction of these raw materials therefore also contributes to food security. A differentiated, product-specific assessment of foods is therefore urgently needed, both in scientific discourse and in public communication.

4. Other classification systems for the assessment of foods

There are various international classification systems for categorising foods, which differ in terms of methodology, objectives and practical application. In addition to NOVA, the French SIGA model and the UNC/IFIC system (USA) are among the tools used to assess the degree of processing. The SIGA model provides a significantly more nuanced assessment of highly processed products for the purposes of health and nutritional classification. This is because, in addition to the degree of processing, it also takes into account the additives used, the processing methods and the nutritional value.

The classification is based on around 300 criteria and comprises up to seven levels, which also allows for intermediate categories of products that have undergone processing necessary for technical reasons but are of high nutritional value. SIGA is increasingly being discussed as a forward-looking approach in research and product development (Medin, 2025).

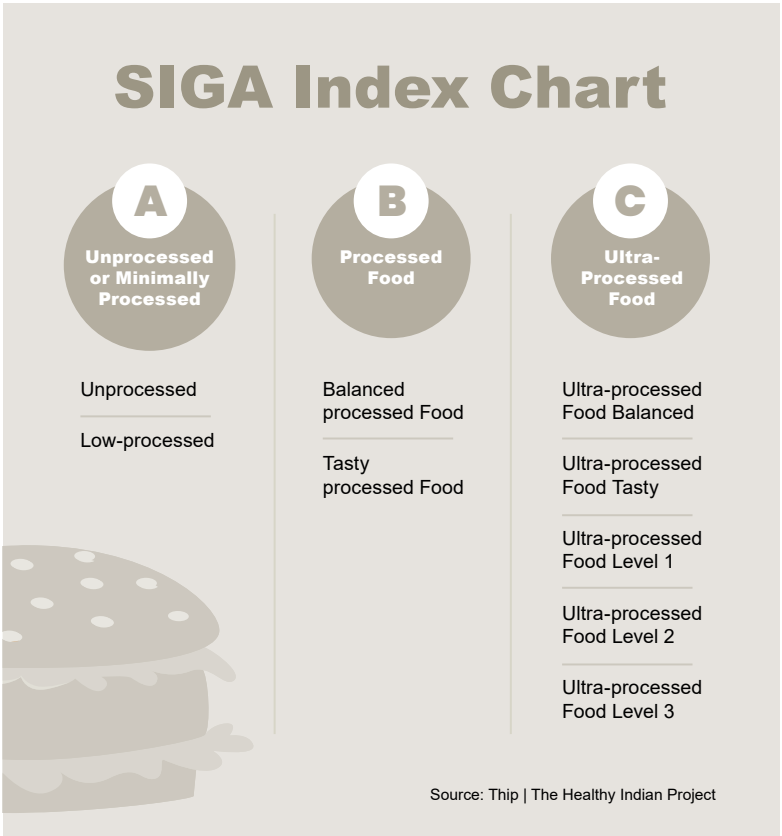

Figure 2: 7-stage rating of processed foods according to the SIGA model.

Despite the significantly more differentiated assessment of the degree of processing, the SIGA system – like other classification models – does not cover all the relevant dimensions that would be necessary for a comprehensive assessment of foods.

One well-established rating system that assesses the nutritional value of food is Nutri-Score. This system classifies the nutritional composition of packaged foods using a five-level colour and letter scale from A to E. The assessment is carried out within a product group and takes into account, above all, factors such as energy content, sugar, saturated fats and salt, as well as beneficial components such as fibre and the fruit and vegetable content. It therefore offers a standardised approach to independent and comparable nutritional assessment. As a single component of a more comprehensive assessment system, Nutri-Score can therefore, in combination with other criteria, contribute to a holistic assessment.

In summary, it can be said that the widely used NOVA system has played a key role in intensifying the debate on ultra-processed foods and drawing attention to the role of industrial processing in the food system. At the same time, it becomes clear that the classification model is based on conceptual assumptions for which there is only limited scientific evidence. This classification is based on a normative conception of “natural” and “less natural”, without defining these terms in technological or nutritional terms. This gives rise to an implicit value judgement: As the degree of processing increases, a food automatically loses its nutritional value. However, this basic assumption is not supported either by the technological necessity of many processing steps or by the heterogeneous composition of the group of so-called UPFs.

5. Summary

Ultra-processed foods do not constitute a homogeneous category. They include both products that are nutritionally unsuitable and those with clear health, technological or social functions. These range from infant formula to plant-based protein sources, which could not be consumed at all without processing. Numerous studies show associations between high UPF consumption and health risks, but these findings do not allow conclusions to be drawn about causal mechanisms. Against this background, a blanket assessment of processed foods proves to be inadequate. Modern food systems require nuanced, scientifically sound assessment approaches that take equal account of technological requirements, nutritional aspects, food safety, social factors and environmental impacts in order to provide a holistic evaluation of a food product.

A forward-looking assessment of processed foods therefore requires a multidimensional approach that goes beyond the purely processing-based logic of NOVA. Approaches such as the French SIGA system or Nutri-Score highlight further aspects that should be taken into account in a differentiated assessment. Furthermore, current scientific debates make it clear that aspects such as nutritional benefits, environmental efficiency, resource conservation, social inclusion and food safety must also be incorporated into classification models. In future, the key factor will be how these various dimensions can be translated into practical tools that both provide guidance for consumers and do justice to the complexity of modern food production.

Evidence-based nutrition communication should make it clear that processing in itself is neither harmful nor beneficial to health. Only a multidimensional approach to evaluation can enable an appropriate scientific assessment of processed foods in the context of a sustainable, healthy and socially responsible diet. This is of key importance given its growing significance for regulatory matters and consumer perception.

Bibliography

- Behsnilian D., Bröder J., Tauer J. & Mayer-Miebach E. (2023). Einordnung von Lebensmitteln nach dem Verarbeitungsgrad und Bewertung gängiger Klassifizierungssysteme in der Ernährungsforschung. Deutsche Gesellschaft für Ernährung (Hrsg.): 15. DGE-Ernährungsbericht. (Vorveröffentlichung Kapitel 8.,S. V1-V37). 15-DGE-EB-Vorveroeffentlichung-Kapitel8.pdf
- Braesco, V., Souchon, I., Sauvant, P., Haurogné, T., Maillot, M., Féart, C., & Darmon, N. (2022). Ultraprocessed foods: How functional is the NOVA system? European Journal of Clinical Nutrition, 76(9), 1245–1253. https://doi.org/10.1038/s41430022010991
- Bröder, J., Tauer, J., Liaskos, M., & Hieronimus, B. „(Stark) verarbeitete Lebensmittel“ (2023). Verzehr stark verarbeiteter Lebensmittel und ernährungsmitbedingte Erkrankungen: Eine systematische Übersichtsarbeit. Deutsche Gesellschaft für Ernährung (Hrsg.), 15. DGE-Ernährungsbericht (Vorveröffentlichung Kapitel 9, S. V2–V40). 15-DGE-EB-Vorveroeffentlichung-Kapitel9.pdf
- Bundesvereinigung der Deutschen Ernährungsindustrie (BVE). (2025). Hochverarbeitete Lebensmittel: Warum die Kritik an der NOVA-Klassifikation wächst. (Veröffentlichung 19. Dezember 2025) https://www.ernaehrungsindustrie.de/hochverarbeitete-lebensmittel-warum-die-kritik-an-der-nova-klassifikation-waechst/ (Zugriff am 30. Juni 2026)
- Cordova, R., et al. (2023). Consumption of ultra-processed foods and risk of cancer and cardiometabolic diseases: A multinational cohort study. The Lancet Regional Health – Europe, 35, 100773. https://doi.org/10.1016/j.lanepe.2023.100773
- Europäische Kommission. (2016). Delegierte Verordnung (EU) 2016/127 der Kommission vom 25. September 2015 zur Ergänzung der Verordnung (EU) Nr. 609/2013 des Europäischen Parlaments und des Rates hinsichtlich der besonderen Zusammensetzungs- und Informationsanforderungen für Säuglingsanfangsnahrung und Folgenahrung. Amtsblatt der Europäischen Union, L 25, 1–29.
- Fardet, A. (2017). Minimally processed foods are more satiating and less hyperglycemic than ultra-processed foods: a preliminary study with 98 ready-to-eat foods. https://hal.science/hal-01595479
- FoodDrinkEurope. (2024). Scientific critique of ultra-processed foods classifications. https://www.fooddrinkeurope.eu/wp-content/uploads/2024/04/Scientific-critique-of-ultra-processed-foods-classifications-.pdf
- Forde C. (2023). Beyond ultra-processed: considering the future role of food processing in human health. Proceedings of the Nutrition Society, 82(3), 406-418. https://doi.org/10.1017/S0029665123003014
- Gibney, M., J. (2019). Ultra-Processed Foods: Definitions and Policy Issues. Current Developments in Nutrition, 3(2) https://doi.org/10.1093/cdn/nzy077
- HLPE. (2017). Nutrition and food systems: A report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security (Report No. 12). Committee on World Food Security, FAO.
- Koios D, Machado P, Lacy-Nichols J. (2022). Representations of ultra-processed foods: A global analysis of how dietary guidelines refer to levels of food processing. Int J Health Policy Manag. 11(11):2588-2599. https://doi.org/10.34172/ijhpm.2022.6443
- Lane, M. M., Davis, J. A., Beattie, S., Gómez-Donoso, C., Loughman, A., O'Neil, A., Jacka, F., Berk, M., Page, R., Marx, W., Rocks, T., & Firth, J. (2022). Ultra-processed food exposure and adverse health outcomes: Umbrella review of epidemiological meta-analyses. BMJ, 384, e071370. https://doi.org/10.1136/bmj-2022-071370
- Llobet, E., Cantarero, D., Rivera, B., Pascual, M., & Muñoz, M. (2022). Socioeconomic inequalities and food: The role of food processing in health equity. Public Health Nutrition, 25(7), 1840–1849. https://doi.org/10.1017/S136898002100500X
- Louie J. (2025). Are all ultra-processed foods bad? A critical review of the NOVA classification system. Proceedings of the Nutrition Society, 1-9. https://doi.org/10.1017/S0029665125100645
- Medin A., Gulowsen S., Groufh-Jacobsen S., Berget I., Grini I., Varela P. (2025) Definitions of ultra-processed foods beyond NOVA: a systematic review and evaluation. Food Nutrition Research 16(69). https://doi.org/10.29219/fnr.v69.12217
- Monteiro, C. A., Cannon, G., Levy, R. B., Moubarac, J.-C., Jaime, P., Martins, A. P. B., Canella, D., Louzada, M. L. da C., & Parra, D. (2019). Ultra-processed foods, diet quality, and health using the NOVA classification system. FAO. https://openknowledge.fao.org/server/api/core/bitstreams/5277b379-0acb-4d97-a6a3-602774104629/content (Zugriff am 30. Juni 2026)
- Moyo, H. N. (2024). The impact of food processing techniques on nutrient retention and bioavailability. IRE Journals, 8(2). https://www.irejournals.com/formatedpaper/1706163.pdf
- Pagliai, G., Dinu, M., Madarena, M. P., Bonaccio, M., Iacoviello, L., & Sofi, F. (2021). Consumption of ultra-processed foods and health status: A systematic review and meta-analysis. British Journal of Nutrition, 125(3), 308–318. https://doi.org/10.1017/S0007114520002688
- Poore, J., & Nemecek, T. (2018). Reducing food's environmental impacts through producers and consumers. Science, 360(6392), 987–992. https://doi.org/10.1126/science.aaq0216
- Rauber, F., Gombi, T., Steele, E. M., Louzada, M. L. da C., Millett, C., Monteiro, C. A., & Levy, R. B. (2024). Ultra-processed food consumption and risk of cardiovascular disease: A prospective cohort study. The Lancet Regional Health – Europe, 24, 100515. http://doi.org/10.1016/j.lana.2024.100859
- Vidhya, K., Parveen, S., Rajkumar, P., Arulmari, R., Nisha, K. & Pandiselvam, R. (2024). A comprehensive review on minimizing acrylamide in foods: rethinking ingredients, process tweaks, culinary techniques, and advanced analysis. Journal of Food Measurement and Characterization. https://doi.org/10.1007/s11694-024-02931-x
- World Health Organization (WHO). (2021). Plant-based diets and their impact on health, sustainability and the environment: a review of the evidence. https://iris.who.int/server/api/core/bitstreams/f0fadbba-3ba7-4689-be95-63574cdff400/content

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