

# Food from synthetic cooking has no relationship with the fiction food that is discussed in the movie *Soylent green*

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## Abstract

The concept of “synthetic food”, produced from ingredients that are pure compounds rather than animal or plant tissues, has sometimes been compared to the dystopian food depicted in the film *Soylent Green*. This analogy is misleading: synthetic food is not derived from the human bodies. Synthetic cooking, and the associated culinary trend called “note by note cuisine”, expand the technical and art possibilities of cooking by enabling precise control over flavor and nutritional content. This article examines the historical roots of resistance to new culinary techniques, to better understand the scepticism surrounding synthetic food. Finally, strategies to improve public acceptance of synthetic cooking - emphasizing transparency, sustainability and education - are proposed.

## Keywords

food, synthetic cooking, note by note cuisine, food neophobia, history

## Introduction

Synthetic cooking is a culinary technique that was proposed in 1994 (This-Benckhard and Kurti, 1994): it refers to the preparation of dishes from ingredients that are pure compounds or simple mixtures of them, instead of traditional ingredients such as meat, fish, eggs, vegetables or fruits. After 2000, it became the basis for a culinary trend called “note by note cuisine” (This, 2014), which has been spreading through lectures, articles, books and culinary contests (ICMPG, 2025a). However it is sometimes

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criticised, or rejected. For instance, instances of student resistance to test it have been observed (Burke, 2024). Synthetic dishes have also been compared to the food discussed in the movie *Soylent Green*. In this Opinion article, this comparison is shown to be wrong, and the reasons for the possible fear of the new technique are discussed, from an historical perspective, moving from the more recent to the oldest examples.

Synthetic cooking: what is it

In the previous paragraph, “synthetic cooking” has been defined, but more details can be given. It was initially proposed as a generalisation of adding pure compounds to dishes – a practice comparable to the addition of spices in cooking. The word “synthetic”, as used in “synthetic food”, does not mean that the compounds from which the dishes are made are chemically synthesised. They can be, of course (for example vanillin made from lignin, in some flavourings)(Fargues *et al.*, 1996), but it is often more economical to extract them from renewable products such as plants, through fractionation methods similar to those used in the wheat or dairy industries, including efficient techniques such as membrane filtration (Soni and Gaur, 1984; Fargues *et al.*, 1996). Using pure compounds or mixtures of certain compounds only (as liquids or powders), all

aspects of dishes can be designed at will, such as the shape of the parts of the dishes, their colors, consistencies, temperatures, tastes, odors, chemostesis (trigeminal effect such as freshness and pungency), somatosensory effects, oleogustation, and calcium sensation (Lundström *et al.*, 2017). Of course, dietetics and toxicology must be taken into account, when designing synthetic food, as it would be for traditional food. The question of “bioactivity” must also be considered, but this is already the case for traditional food: for example, the bioavailability of beta-carotene (provitamin A) is higher in carrot purée than in raw carrots, such as in a julienne salad (van het Hof *et al.*, 1989). In practice, cooking in this new way is so straightforward that the youngest competitor of the Second International Contest for note by note cuisine was a 10-year-old boy from a remote village in the Pyrenees mountains, between France and Spain (ICMPG, 2014).

The current context in which synthetic cooking has been developing

The development of note by note cuisine (the artistic style based on synthetic cooking) (Figure 1) occurs at a time when the media extensively discuss food safety and poor dietary habits, often encouraging the rejection of food additives. The expression “ultra-processed food” has been

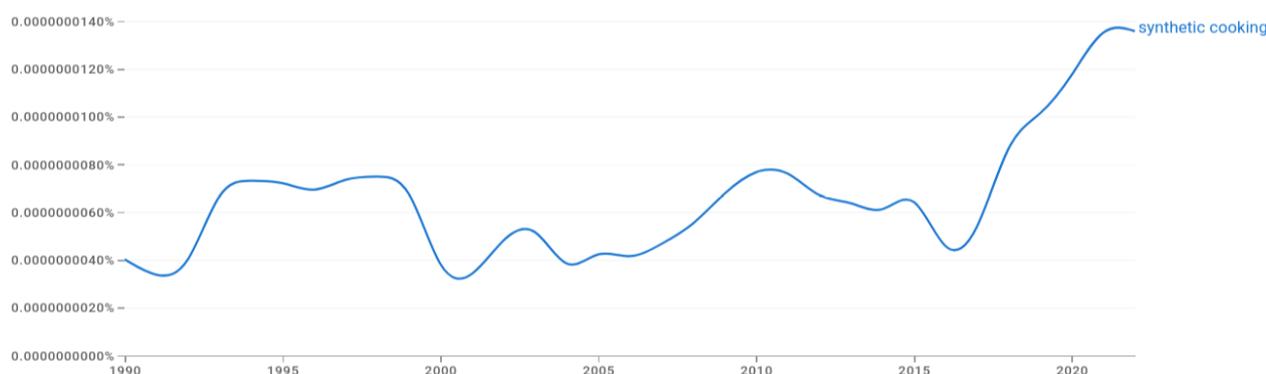


Figure 1. The number of occurrences of the name "synthetic cooking" in the last years (Google).

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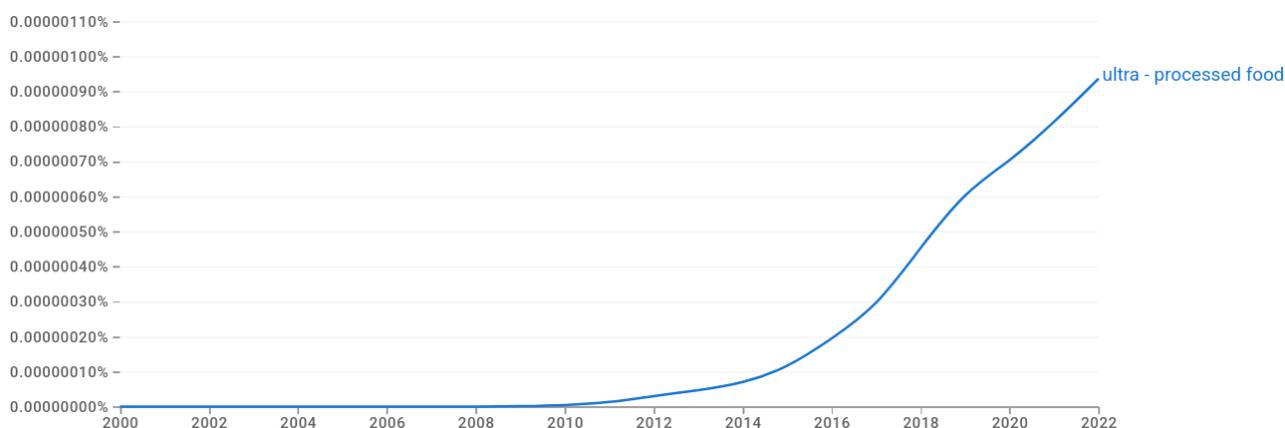


Figure 2. The number of occurrences of the expression "ultra-processed" in the past years (Google).

frequently used (Figure 2) despite the vagueness of its definition: even the developers of the Nova classification have admitted the need to clarify the definition of ultra-processed foods and to reduce the unintended effects of using such a vague term, which often conflates processing with high energy density (This vo Kientza, 2022; Fleming, 2025).

It is true that many of the ingredients used in synthetic cooking are classified today as additives, technological auxiliaries, or flavourings (for example, solutions in neutral oil of odorant compounds such as 1-octen-3-ol); others fall in the category of dietary supplements, with different regulations depending on the countries, such as phenols extracted from grapes (EFSA, 2024a; 2025).

Besides the public debates about food, there are epidemiological facts: it is well documented that the main health concerns have to do with such harmful factors as smoking, alcohol consumption, excess salt and fat (especially some triglycerides containing trans fatty acid residues), excessive sugar intake, and smoked food (e.g., barbecued meat, which contains far more benzopyrenes than permitted in industrially smoked products) (Kazerouni *et al.*, 2002; Canadian Cancer Society, 2025).

Finally, regarding the food of the world population,

the main challenges are the population growth (the world population should reach 10.3 billion in 2050), climate change, pollution, and the obesity pandemic, particularly among poorer groups (United Nations, 2024; 2025; World Health Organization, 2025).

### Former criticisms about “molecular cooking”

The reluctance of part of the public to accept synthetic food, or to cook note by note, is not new (Canard enchaîné, 2025). Before the proposal of synthetic food, the technique called molecular cooking has been also rejected, before being eventually accepted (Morabito, 2011).

For molecular cooking (sometimes wrongly called molecular gastronomy) the aim was to make culinary activities technically easier, both for chefs and for home cooks, through the use of tools imported into kitchens from science and technology laboratories: for example, various techniques to control temperature (from very cold to very hot, with greater precision), techniques for increasing or reducing pressure, and fractionation methods (distillation, vacuum distillation, steam distillation, vacuum filtration, membrane filtration), among others. At the same

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time, gelling agents that were new to Occidental chefs were proposed (agar-agar, carrageenans, xanthan gum and other accepted gelling agents) (This, 2008).

Molecular cooking was initially rejected by some chefs and journalists (the “ambassadors” of the public), especially traditionalists. However, in the early 1990’s, thanks to the European Program Inicon (FP5), innovative chefs such as Raymond Blanc (UK), Philippe and Christian Conticini (France), Ferran and Albert Adrià (Spain), Heston Blumenthal (UK), Emile Jung (Alsace) and others adopted the new techniques both as tools for producing innovative food (molecular cuisine) and as a communication assets (TTZ, 2025).

Ultimately, molecular cooking was accepted largely because of the mad cow crisis (World Organisation for Animal Health, 2023) and for economic reasons. During the crisis caused by bovine spongiform encephalopathy (BSE), gelatin was distrusted (CBC, 2001), and new gelling agents such agar-agar, carrageenans, and various accepted gums were adopted.

This was a turning point, because the initial proposal to use these gelling agents had been rejected in the early 1980s by French culinary associations; at that time, chefs even rejected industrial gelatin, preferring calf’s feet (This vo Kientza, 2025b). But with the mad cow crisis, gelatin was abandoned and replaced by other gelling agents, especially those derived from algae, which had different gelling properties. As a result, today in culinary circles, professionals sometimes speak of “plant gelatins”—a misnomer, since gelatin is a specific protein-based gelling agent extracted from animal tissues, and not from plants or algae (Ward and Courts, 1977).

Around the same time, low-temperature cooking also spread. At first, chefs purchased thermo-circulators from laboratory-equipment suppliers, but soon, specialized cooking devices (ovens, water baths, sous-vide machines) were developed. The success of low-temperature cooking is perhaps due to economic reasons: (1) with low-temperature cooking, the mass of the cooked product is

nearly identical to the mass of the raw ingredients purchased; (2) the technique makes it possible to turn tough cuts of meat (cheap) into tender” products; and (3) preparations can be made in advance, so that dishes are ready to serve when needed.

### **Earlier in time, “nouvelle cuisine” and technical advancement were also rejected**

Before the rise of molecular cooking, Western cuisine had already undergone a major transformation in the 1970s, when young chefs began to move away from traditional practices by applying ten “commandments” of the “nouvelle cuisine” (Gault and Millau, 1973): (1) You will not overcook ; (2) You will use fresh, quality products; (3) You will lighten your menu; (4) You will not systematically be modernist; (5) However, you will seek out what new techniques bring you; (6) You will avoid marinades, curing, fermentation, etc.; (7) You will eliminate rich sauces; (8) You will not ignore dietetics; (9) You will not fake your presentations; (10) You will be inventive.

Chefs such as Paul Bocuse, Michel Guérard, and the Troisgros brothers were pioneers of this new way of cooking, which generated heated debates and strong criticism (Pitte, 1991; Wood, 1991).

These controversies were not without precedent. For example, when gas became available in city apartments, some people argued that it was both dangerous and unsuitable for proper cooking. In particular, there was debate about the meaning of roasting, since the humidity inside a gas-heated oven does not produce the same surface results on meat as infrared radiation in a dry environment (Saint-Ange, 1925). At the same time, as scientific nutrition advanced, roux were criticised as unsafe because of heated fat, and bone stocks were said to provide less flavour than stocks prepared only from meat.

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### Food innovation was also rejected in a more remote past

The expression “nouvelle cuisine”, used in the 1960s to describe this culinary movement, was sometimes mocked—because it had already been the title of a cookbook by Pierre François La Varenne in the 17<sup>th</sup> century (La Varenne, 1742). And even then the “new” way of cooking was also criticised by chefs such as Nicolas de Bonnefons (cook to King Louis XIV of France) or by the author who signed only with his initials L.S.R. (L.S.R., 1643; Gagnaire and This, 2007).

This raises the question of why new food practices have been rejected. On the one hand, younger generations often seek to create a world of their own, distancing themselves from the authority of their elders (Coon, 1971). On the other hand, human beings exhibit behaviours that have historically helped our species survive in changing environments. In particular, food neophobia - the reluctance to eat, or the avoidance of, new foods (Dovey *et al.*, 2008) - has been a protective mechanism against poisoning by inedible substances. Could this be the reason why synthetic food has been criticised?

When such criticisms arise, arguments are raised (and countered), but some, in particular, invoke the dystopian film *Soylent Green*. This 1973 movie, based on the 1966 science fiction novel *Make Room! Make Room!* (Harrison, 1966), depicts a murder investigation in a devastated environment. The film envisions the (American) world of 2022, with ecocide due to overpopulation, global warming, and pollution, leading to shortages of housing, water, and food. Only the elite have access to clean water and “natural” food; they live in protected compounds with armed guards, while concubines (considered “furniture,” without human rights) are passed from one apartment owner to another. The rest of the population lives in poverty, sharing housing and consuming processed (some would say “ultra-processed”) food manufactured by the Soylent

Corporation: Soylent Red, Soylent Yellow, and a wafer allegedly made from plankton, Soylent Green.

The protagonist, a detective living in shared housing with his brilliant co-worker, is assigned to investigate the murder of a wealthy member of the Soylent Corporation’s board. His inquiry leads him to a priest visited by the victim shortly before his death. Despite being pressured to stop, he continues his investigation, while his colleague discovers reports from the Soylent Oceanographic Survey revealing that the dying oceans could not produce the plankton claimed to be the source of Soylent Green. The shocking truth is that Soylent Green is made from human bodies.

Around the same time (1976), the French film *The Wing or the Thigh* satirised the food industry by depicting a secret factory that synthesised food entirely (e.g., synthetic chicken), causing illness. This comedy was a critique of fast-food restaurants and the rapidly expanding food industry—anticipating today’s strong ideological currents opposing the food industry, food additives, and so-called “ultra-processed food”.

### Discussing openly synthetic cooking

If synthetic cooking is to be developed in order to help feed the projected 10.3 billion people in 2050 (United Nations, 2023), under the predicted conditions of climate change, a public non-ideological discussion must be engaged about the techniques that will make such food production possible.

This analysis must also take into account the current obesity epidemic (World Health Organization, 2025), the impact of meat consumption on climate change (Mbow *et al.*, 2019), and the scale of food waste and losses (though the proportions are debated) (Eurostat, 2025). Both food safety and food security must be ensured. Regarding food safety, danger should not be confused with

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risk (EFSA, 2024b). For example, while plant products - particularly pulses - are essential for sustainable human diets, they are not without danger. For example, raw beans contain lectins that must be neutralised through thermal processing (FAO, 2025a). Similarly, some technical innovations have drawbacks: in molecular cooking, pumps were initially proposed for making foams, but chefs preferred siphons, whose nitrous oxide cartridges (unsustainable) have also been misused as narcotics (European Monitoring Centre for Drugs and Drug Addiction, 2022). Liquid nitrogen, too, was proposed because it makes sherbets and ice cream with smoother consistency, but it has sometimes been mishandled (without glasses or gloves, in closed vessels), leading to two widely publicised accidents - one in a London bar and one in Germany (The Telegraph, 2009; Guardian, 2015).

Indeed, any action or tool can be dangerous. For example, knives are used to kill, nutmeg contains myristicin in such a quantity that one nut can poison an adult (Green, 1959), and cinnamon contains coumarin (IUPAC: 1-benzopyrane-2-one), for which the daily intake is exceeded by some German people at Christmas times (Bundesinstitut für Risikobewertung, 2006). It would be therefore unfair to criticise new foods or new culinary techniques solely on the basis of danger. As noted above, only risk should be assessed and minimised. Synthetic cooking must certainly be carefully - and openly - analysed and implemented. Below this is analysed from the culinary process to the social effects.

First, when a dish is produced, toxicity is obviously to be avoided, taking into account daily intake thresholds. Regarding nutrition, a question is sometimes asked about the possibility to feed daily with synthetic cooking, fearing that some nutrients would be missing or in excessive quantity. About the first part of the question, it is worth recalling that parenteral nutrition is used daily in hospitals, including for patients in a coma, sometimes for years or even decades (Protheroe,

2019); more generally synthetic dishes include exactly what has been decided to be put in them. In particular, at a time when food allergies are increasing in prevalence (Florsheim, 2023), cooks can use scientific knowledge about the molecular mechanisms of allergies in order to avoid the allergy-generating compounds, be it particular glycoproteins or particular compounds (such as sulfites). During cooking, two important questions arise: production costs and time for production. After a 100 % note by note dinner served in 2016, in Ammerschwihr (Alsace, France), the chef Julien Binz estimated that the ingredients costs were halved, compared to a traditional dinner of an equivalent standing, and that it required 2.5 times less preparation time (Binz, 2016).

Finally, the culinary process includes an artistic dimension, and here two aspects have can be considered: the technical possibilities for producing now artworks, and the price of the art pieces. Regarding the first question, synthetic cooking deserves to be compared to synthetic music, using synthesisers: many more technical possibilities are offered. Regarding the price of the culinary art pieces, it is useful to compare culinary art with painting: the price of a painting by Pablo Picasso has nothing to do with the price of the paper and of the ink.

Regarding selling dishes, loyalty is key, as it is one of three pillars of the food trade, with safety and the requirement of being merchantable (European Commission, 2025; FAO, 2025b). For example, vanillin is not vanilla, and a solution of 1-octen-3-ol is not mushroom, even if they respectively smell like vanilla and mushroom; terminology must be accurate (European Union, 2023).

Now presentations of note by note cuisine sometimes trigger the question about the energy needed for fractionating the plant tissues. This can be answered by comparing the energy needed for transporting fresh products, which contain a lot of water (about 80 % in carrots, 95 % in tomatoes, and up to 99 % in salads) (Ciquel, 2025), and with cold techniques that



*Figure 3. The dish proposed by Cormac Rowe, at the 2025 International Contest for Note by Note Cuisine.*

also consume energy. Finally, in recent times, sustainability has been considered as a main characteristic, and synthetic cooking has many advantages in this regard: ingredients do not need to be stored in the cold (other energy savings), they do not spoil (an asset in view of food security), and many can be obtained from renewable plants.

As a whole; more information can usefully be given to citizens to help them accept this new culinary technique. The topic of the 14th international contest for note by note cuisine, “reducing time and cost of production, without losing flavour”, should contribute to helping the public understand the advantages of the new technique (ICMPG, 2025c).

### **A classic strategy for promoting synthetic cooking**

Promoting innovation in the kitchen—whether synthetic cooking or molecular cooking—requires a strategy, not only to raise awareness of new techniques, but also to counter criticisms. The strategy used by the French chemist Augustin Parmentier at the turn of the 18th century has been serving as inspiration for promoting molecular cooking, in the past decades, and synthetic cooking more recently (Block, 2008).

Being imprisoned in Prussia (between 1757 and 1760), Parmentier recognized the nutritional value of potatoes at a time when they were

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rejected by the French Academy of Medicine (it was claimed that this tuber of the Solanaceae family, *Solanum tuberosum* L., could transmit leprosy), while the French population was starving due to repeated crop failures during the Little Ice Age (Le Roy Ladurie, 1971). Having discovered the advantages of potatoes while in a Prussian prison, Parmentier later studied them chemically after returning to France (Parmentier, 1773). To overcome public reluctance, he cultivated potatoes on land near Paris granted to him by the king, and he served potato dishes to the royal family and to the intellectual and aristocratic circles of Paris. The strategy worked: the population was soon convinced.

Following his example, renowned contemporary chefs were shown molecular cooking after the 1980s, and synthetic cooking later (TTZ, 2025). This indirect approach has disadvantages: it takes time and may give the impression that the new food is designed for the wealthy. Concerning the last possible criticism, it must be observed the high prices of food in some fine food restaurants are high because what is paid is (culinary) art, rather than the ingredients. The same holds for painting: when a Picasso painting is sold at 115 million dollars (Villa, 2021), this amount is not for the ingredients, but for the art.

As a conclusion, the same strategy that was successful for molecular cooking could be efficient for synthetic cooking, but probably more efforts have to be done. Future outreach initiatives should prioritise engaging professional chefs. This can be done through the International Contest of Note by Note Cuisine (Figure 3).

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