Considerations on food classification according to their degree of transformation (NOVA classification)

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SYNTHETIC SUMMARY

• The food classifications on which the official recommendations to promote a healthy diet are based draw on a broad body of science linking it to their nutritional composition (macro and micronutrients) and their energy density.

• The health value of foods (and even more of the diet) cannot be reduced to the simple addition of their components but many other dimensions that are difficult to analyse and quantify, could be taken into account (various interactions between components, effects of the transformations they undergo, or hedonic, cultural and symbolic aspects).

• The NOVA classification attempts to be innovative by isolating a group of so-called «ultra-processed» foods (UPF) defined according to the objective, the nature and the extent of the transformations which they underwent during their (industrial) manufacture to which is added the number of additives and ingredients used for their preparation. Any reference to the nutritional composition is excluded from the classification.

• As it stands, the NOVA classification lacks robustness, rigor, precision and consistency. The diversity of the characteristics of foods in the ultra-processed class, and probably of their effects on health, prevents them from belonging to a single category.

• While the diet of consumers of high-volume of UPF is generally of lower nutritional quality, there is no evidence of deleterious effects on health, but some approaches exist, deserving complementary studies.

• As it stands, NOVA cannot be used as a basis for valid, differentiated and appropriated recommendations.

• Simplistic public dissemination of the NOVA classification, which opposes the nutritional classification, of which Nutri-Score is an example, can only add to the food cacophony.

• All the issues raised by the transformations and formulations of food, industrial or not, as well as the potential synergies between additives, justify in-depth studies in order to achieve a well-supported classification.

• The FFAS wants to put in place a multidisciplinary reflection to try to establish scientifically the interest of the concept of processed foods.

SUMMARY

Considerations on food classification according to their degree of transformation (NOVA classification)

INTRODUCTION

Food classifications that are usually used to guide dietary recommendations have varied over time, but take as their basis the compositions in macro or micronutrients, microconstituants and the energy densities.

The complex links, positive or negative, that their «excessive» or insufficient consumption maintain with various pathologies form on the whole a fairly well-established body of science, and classifications according to the «nutritional profile» of foods appeared, such as the Nutri-Score in France and other systems elsewhere in the world.

These classifications, which give food a global score, do not take into account potential synergies or antagonisms between the nutrients or ingredients they contain, nor the texture (matrix) influencing their bioavailability and likely to be altered by domestic or industrial manufacturing processes from raw materials to consumption.

For the past ten years, several classifications - different and not superimposable - based on the degree of food processing (not their nutritional composition) have been proposed and recently discussed by FAO. Among these is the so-called NOVA classification developed since 2009 by Brazilian authors. NOVA is now used by more and more scientific works (except those made by EPIC) to seek associations between the consumption of so-called «ultra-processed» foods (UPF) - essentially industrial processes - and a series of deleterious effects on health. Their media impact is obviously important in a context where consumer confidence in the food supply is strongly shaken.

The Fonds français pour l'alimentation et la santé (FFAS) wished to provide an objective analysis of the NOVA classification and of published data about it.

THE NOVA CLASSIFICATION

The NOVA classification characterizes foods according to «the extent, nature and purpose of processing they have had» by adding as additional criteria the number of ingredients used, the addition of sugar and various additives.

Originally distinguishing three categories, NOVA has evolved over time to classify foods into four categories:

1. Raw foods, not or little processed by simple procedures such as peeling, water cooking, freezing, sterilization or grinding (some of which however change the texture). In addition to fresh or cooked fruits, vegetables and legumes, we find fruit juices without added sugar, meats and poultry, eggs, milk and natural yogurt, nuts, flour, tea and coffee...

2. Culinary ingredients added to Group 1 foods obtained by refining, milling, grinding and vegetable oils and lard, sugar, salt, starch, stabilizers, purifiers and other additives.

3. Foods processed by cooking other than water, drying, smoking, salting, fermentation, canned with salt, sugar, oil; cheeses, breads (unpackaged), salted seeds and fries are also part of this group.

4. Ultra-processed foods :

Their presentation varied between 2009 and 2016 by successive additions or withdrawals. The most recent one designates them as industrial formulations containing at least 5 ingredients, often much more, hydrogenated oils, fat, sugar, salt, antioxidants, stabilizers and preservatives, using technologies such as extrusion cooking and high temperature cooking, adding micronutrients (fortification) and additives (flavourings, colorants, sweeteners, emulsifiers) not used in domestic cooking preparations with the aim of imitating natural flavours or hiding unpleasant flavours... in order to provide consumers with cheap, pleasant, energy dense, ready to use products.

Thus, among the ultra-processed foods, we find almost all the products present in the supermarket shelves, from margarines to spreads, from fruit yogurts to cooked dishes, from nuggets to ice cream, from breakfast cereals to packaged breads and brioches, from infant formulas and milk to energy bars, all charcuterie products, etc.

The ultra-processed food group therefore aggregates in the same category very different products in their nutritional composition, their degree and method of processing, the resulting structure of the food and the number of components present as much as in their frequency of consumption or size of their portions.

CRITICAL ANALYSIS OF THE NOVA CLASSIFICATION

The interest of a food classification is primarily based on its operational capacity to evaluate the quality of food for individuals and populations, and to draw health consequences.

The NOVA classification appears to suffer from several weaknesses, including:

1. It excludes, a priori, from groups 3 and 4, craft and household preparations, some of which may contain many ingredients, contaminants, neoformed substances or additives or use transformation processes identical to those of certain industrial products: it is incomplete.

2. It does not always classify foods correctly within groups, which makes it difficult to classify and use (for lack of precision), as reported by various authors who have tried to use it and which induces errors in the studies that used it: it is imprecise.

3. The choice of a number of ingredients distinguishing the different groups is arbitrary (5 or more) and not based on their real utility or their possible negative effects on health.

4. The purpose justifying the NOVA classification «to create (industrial) foods ready to eat, drink or heat» or be «hyper palatable» seems to determine the ultra-transformed group membership while many «homemade» or craft preparations have the same function: it lacks coherence.

5. The inclusion of added sugar in the classification criteria necessarily implies that the foods of the groups 3 and 4 contain; do they really contain more than some household or craft preparations?

Thus, the NOVA classification seems to lack robustness, rigor and consistency.

Apart from these methodological factual criticisms, the main disadvantage of the NOVA classification is to store in the ultra-processed (industrial) category similar products (pizzas, biscuits, prepared dishes, etc.) which compositions in nutrients (carbohydrates, lipids, saturated fatty acids, fibres, salts, etc.) or in number of additives (from 1 to more than 10) vary considerably from one commercial reference to another. Though, the nutrition composition of the overall average diet of an individual or a population is one of the best documented markers of its potential health effects (although uncertainties still exist); it is on it that nutritional recommendations are based, which is the subject of a fairly broad international consensus, although they have varied substantially over time. The nutritional composition of the foods that constitute it, also (provided that frequency of consumption and quantity consumed, two important parameters, are taken into account). This is the reason for being synthetic quality indicators such as Nutri-Score (which is based on an algorithm accurate but not complete) expected to be adopted by the EU countries. Thus, many ultra-processed products receive positive quality scores, which, if properly understood and used, can influence the choice of consumers in a way that is favourable to health.

The emergence of the NOVA classification and its unadorned dissemination to the public can only lead to confusion and cacophony and, as it stands, can not reasonably contribute to valid and differentiated recommendations.

TRANSFORMATIONS AND ADDITIVES

The more or less detailed description and quantification of nutrients in a food is clearly not enough, to reflect the multiple dimensions that make it worthwhile and will make it considered «good to think» therefore «good to eat» in its entirety: the pleasure it provides, its socializing (sharing), cultural and symbolic functions, analysed for a long time but difficult to quantify, are added, according to the societal evolutions, to questions about its origin, its modes of production, the industrial transformations it has undergone to which one would have to add its cost, its availability, its environmental impact... modern problematic, non-meaningless that deserve to be deepened in scientific terms.

Partial approach to these new concerns, are the NOVA classification and its ultra-transformed group currently based on a well-established scientific basis that would justify its potential harmfulness?

Two major criteria that are distinct and not superimposable (and not to be confused) characterize the category of

ultra-processed foods: raw food processing and the processes it uses on the one hand, the formulation of the product after addition of various substances on the other hand, the respective effects of which interact with the characteristics of the final product.

1. Transformation

The processing of raw materials has existed for millennia: conservation over time and increased availability, edibility, health safety are its primary objectives.

All transformation processes, from the simplest to the most complex, involve physical, chemical or biological mechanisms that modify the physicochemical structure of foods to varying degrees and more or less alter the quantity or quality of some of their components. Even the simplest and most commonly used in domestic cooking, as in many simple industrial preparations (cooking, grinding, milling, peeling, dehulling, frying, suga-ring, salting...) modify the initial matrix - in a favourable sense or not - the functionalities of the food: palatability, digestion and absorption, bioavailability...

Some more complex technologies are used only in the mass production of many industrial products: extrusion cooking, separation techniques, high and very high temperatures, hydrogenation, hydrolysis... They are poorly known by the public and not very transparent. Their consequences on the global nutritional value of foods have not been sufficiently studied.

For an adequate classification according to the degree of transformation, it would be necessary to develop, calling on technologists, adapted scientific tools (currently being constituted) to establish an objective and rational classification.

2. Formulation and additives

The use of additives is in the field of formulation (assembly), which leads to the food proposed for consumption, always complex and rarely eaten alone in a dish or during a meal.

De facto, the presence of various additives is much more common in ultra-processed foods because of the manufacturing processes used but their number and nature may vary significantly according to commercial references for the same type of food. They raise questions about their possible toxicity as about their utility in relation or not with the expectations of the consumer (practicality, conservation, palatability...).

More than 300 additives are allowed in Europe. Their safety of use has been assessed and the dose limits indi-vidually set. For some of them, there are uncertainties (nanoparticles for example) and EFSA should soon begin their full reassessment. Various surveys have shown that only a small percentage of tested products exceeded the limits used. However, the potential interactions between these various agents (cocktail effect) - as between pesticide residues or various pollutants that are present in all the categories of the NOVA classification - are essential and remain to be studied more finely, the packaging being an additional player of this complexity.

Additives, very little or not used in domestic cooking, have various functions depending on the type of products and the nature of processing. Some (preservatives, stabilizers, antioxidants, acidifiers or texturants) increase the shelf life of the product, avoid bacterial contamination and act on the texture. This category includes products derived from Group 1 foods.

Others aim to restore the content of micronutrients (vitamins) partially destroyed by the process of production or to enrich a given food, considered as a relevant vector, in certain nutrients (iron, fibres...) whose contributions are considered as deficit in the population. Still others, some once described as «cosmetic», serve to reproduce or amplify the sensory qualities of products: aromas, taste enhancers, colorants, sweeteners.

The terms or figures which designate these additives on the packaging are meaningless for fanes; their large number in the same product can only accentuate their perception as «artificial» and create consumer mistrust in a context where their expectations for more «naturalness» develop.

Ultra-processed products, but they are not the only ones, can be exposed to compound migration from packaging; some like Bisphenol A have been banned.

The great diversity of the products concerned should not lead to their assignment in a unique category.

ULTRA-PROCESSED FOOD AND HEALTH

Despite the vagueness of the NOVA classification, the contribution of UPF to energy intake can be estimated around 50 to 60% in North America, 15 - 25% in Latin America, 36% in France in the Nutrinet Santé cohort (probably more in the general population).

Several international surveys on large cohorts converge, with some differences, to show that a high UPF consumption generally corresponds to a diet of worse nutritional quality: less fruits and vegetables, fibre, vitamins and minerals, more sugars, fats, saturated fatty acids, and higher energy density. The differences, although significant, are on average of low amplitude except for sugar, which is expected since it is part of the definition of UPFs.

Given the known relationships between quality of diet and the risk of pathologies, it is legitimate to attempt to investigate whether a strong relationship between UPF consumption and pathologies can be highlighted.

Different epidemiological studies (but not all, especially in the Nutrinet-Santé cohort) show that consumers of high quantity of UPF have, on average, a higher body mass index but, in the absence of various adjustments on the physical activity in particular, the independence of this relation remains questionable.

The only studies in Brazil attempting to relate UPF consumption to mortality and cardiovascular disease are modelling studies based on the content of salt, saturated or trans fatty acids and sugar, which contrasts with the very concept proposed by NOVA which wants to be detached from the «nutrient» approach.

Regarding the incidence of certain cancers, a significant linear association between UPF consumption and overall cancer risk (prostate, colorectal, breast) was shown on the French cohort Nutrinet-Santé; however only postmenopausal breast cancer is significantly associated with UPF consumption. Notably, this association appears to be independent of various adjustments, notably on the nutritional composition of food, which refers to the possible role of additives and contaminants associated with UPFs. The increase in (relative) risk is, however, low and the authors consider that the track thus raised must be confirmed, this association study not being worth proof to date.

The set of tracks thus explored does not make it possible to distinguish the respective roles that nutritional density of UPF, food categories, changes in the food matrix, changes in the dietary behaviour possibly associated with UPF consumption or the presence of additives and contaminants, can have.

CONCLUSION

The NOVA classification is intended to be the operational expression of an original approach aimed, in its principle, at identifying the evaluation of the nutritional value of food, taking into account only their composition in nutrients.

If we can consider that this global approach (called «holistic without being completely») makes sense, without excluding the interest shown for a long time for so-called «reductionist» approaches, the proposed tools in their present state seem to be little of a scientific approach from which specific requirements could arise.

Inaugurating new lines of thought on the complexity of foods, made up of associations and transformations, unitary or combined units of multiple raw materials from agriculture, it would be useful to understand more precisely what, amongst nutrients, links that unite them, raw materials, the food matrix, residues, additives and neoformed compounds including at home, changes in eating behaviour and culinary and industrial practices, determine the impact of our diet on our health. In this regard, to have comprehensive information on all the constituting elements of a food, including farming methods of its raw materials and their origin, would allow a relevant classification of different foods available. This is the goal of the Num-Alim project developed by the FFAS.

The FFAS believes that a thorough reflection is essential to scientifically establish the existence and the interest or not of an index related to the transformation of raw materials into a food supply, to try to determine a gradient

or even a transformation index that would not fit into a single category most transformation processes, which are often indispensable, and the products that come from them.

The FFAS intends to give itself the means to organize this scientific reflection by inviting to debate, under a form to be determined, a collective of qualified personalities of all origins.

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