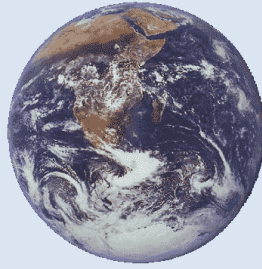


THE FOOD SYSTEM

The big issue for nutrition



A new classification of foods

Implications for assessment of diets,
promotion of good health and well-being,
and prevention and control of obesity and
related chronic non-communicable diseases

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Food processing is now the main shaping force of the global food system, and the main determinant of nature of diets and related states of health and well-being. To reveal this, we have here created a new classification of foods. This is more relevant than existing classifications, which give little attention to food processing.

Group 1 is of foods

Group 2 is of culinary ingredients

Together, these are made into meals, as symbolized by the cooking pot.

Group 3 is of food products

These are made ready-to-consume, as symbolized by the cheese-bacon-burger.

This document is a summary statement of work in progress being carried out at the Center for Epidemiological Studies in Food and Nutrition, at the School of Public Health, University of São Paulo, Brazil, in partnership with colleagues in other countries. Spanish and Portuguese versions of this document can be obtained at www.fsp.usp.br/nupens. For more details please access the references provided at the end. Please contact the team at nupens.usp@gmail.com or carlosam@usp.br if you wish to support our work or to collaborate as partners with us.

Introduction

Here we outline a new classification of foods, with its implications for the promotion of good health and of wellbeing, and for the understanding, prevention and control of the worldwide epidemic of obesity and related chronic non-communicable diseases. It is designed to replace previous and existing classifications. These were originally devised and developed in the first half of the last century. At that time, the most critical and often epidemic nutrition-related diseases were caused by deficiencies of energy and nutrients.

Until now, classifications have grouped foods according to their nutrient profile: for example, meat and legumes (pulses) as sources of proteins, fruits and vegetables as sources of vitamins and minerals, grains (cereals) as sources of carbohydrates and energy. These classifications have been of fundamental importance, but now have an increasingly diminished value.

Linked reasons include the phenomenal development of sophisticated methods of food science and technology, the creation of lightly regulated globalized food systems no longer based on foods but on ready-to-consume products, and the corresponding penetration of established food systems by colossal transnational food product manufacturers. They also include an increased recognition of the social, political and economic drivers of food systems, the shift of public understanding of what constitutes healthy food, and the worldwide uncontrolled epidemic increase of obesity together with rapid rises of related chronic non-communicable diseases.

The new classification includes every substance containing nutrients that may be consumed by humans. It gives primary importance to the nature, extent and purpose of food processing. Our division is into a first group of foods, a second group of culinary ingredients, and a third group of ready-to-consume food and drink products. By ‘processing’ we mean all methods and techniques that are used to transform farmed or reared (or gathered) sources of food, which therefore excludes all forms of agriculture. ‘Food’ includes drinks.

This classification is described below, together with its implications for promoting good health and well-being for all.

Group 1. Foods

Foods are either unprocessed or minimally processed.

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) shortly after harvesting, gathering, slaughter or husbanding.

Minimally processed foods are unprocessed foods altered in ways that do not add or introduce any substance, and usually subtract parts of the food, without significantly changing its nature or use.

Most unprocessed foods spoil or rot fairly quickly. Only some can be eaten straight away. Many are edible and safe only after preparation and cooking. Minimal processes preserve foods, make them suitable for storage, help their culinary preparation, can enhance their nutritional quality, and make them more enjoyable to eat and easier to digest.

Most minimal processes are originally ancient and most can be carried out by hand or with domestic tools. These include cleaning, scrubbing, washing; winnowing, hulling, peeling, flaking; skinning, boning, carving, portioning, scaling, filleting; drying, skimming; pasteurization, sterilizing; chilling, refrigerating, freezing; sealing, wrapping, and vacuum packing. Malting, which adds water, is also a minimal process, as is fermenting, which adds living organisms, when it does not generate alcohol.

Different types of food vary in energy density and their content of nutrients such as fats, carbohydrates, proteins, and their fractions, and vitamins, minerals and other bioactive compounds. No single type of food can provide human beings with all necessary energy and essential nutrients in adequate balance, except for breast milk in the first six months of life. Thus in general, foods of animal origin are good sources of various amino acids, vitamins and minerals, but contain little or no dietary fiber. Quite often they are energy-dense and high in unhealthy fats. Foods of plant origin are usually good sources of dietary fiber and low in energy density. Some are good sources of amino acids and many are low in some micronutrients.

This is why the human species has evolved as omnivorous. It explains why a great variety of traditional and long established food systems have been developed that have in common, the combination of plant foods with complementary nutrient profiles, such as grains (cereals) with legumes (pulses), or roots with legumes, or grains with vegetables, usually also with modest amounts of foods of animal origin.

In appropriate combinations, all foods in this group are the basis for healthy diets. The distinction between unprocessed and minimally processed foods is not especially significant. By contrast, all foods

in this first group are fundamentally different from the processed culinary ingredients and the processed products in the second and third groups below.

Group 2. Culinary ingredients

Culinary ingredients are substances extracted from constituents of foods, such as fats and oils, flours, starches, and sugar, or else obtained from nature, such as salt.

These ingredients are often very durable. While some can be produced by hand with simple tools, most require heavy machinery. The methods that produce them, also mostly ancient in origin, have become very much more efficient and widespread as an aspect of industrialization.

Processes include pressing, milling, crushing, grinding, pulverizing, 'refining', and some of the methods used for minimal processing. Stabilizing or 'purifying' agents and other additives may also be used.

In isolation, they are unbalanced, being depleted in some or most nutrients. Other than salt, they typically supply 400 or 900 kilocalories per 100 grams. This is around 3-6 times more than cooked grains and around 10-20 times more than cooked vegetables.

A crucial point here though, is that these ingredients are not edible, or else normally not consumed by themselves. Their function is to be combined with foods to make palatable, diverse, nourishing and enjoyable meals and dishes. Oils are used in the cooking of cereals (grains), vegetables and pulses (legumes), and meat, and are added to salads. Flours are made into pastry used as a covering for meat or vegetable dishes or as a basis for cakes. Table sugar is used to prepare fruit- or milk-based desserts. Their nutritional significance should therefore not be assessed in isolation but in combination with foods.

Culinary ingredients are usually cheap, and can be over-used. When used carefully they result in meals and dishes that are nutritionally balanced, with an energy density much lower than the average energy density of ready-to-consume food products, an account of which now follows.

Group 3. Food products

Food products are processed, or ultra-processed, and include alcoholic drinks.

These are foods altered in ways that add or introduce substances that substantially change their nature or use (processed food products); or are processed using methods that create alcohol (alcoholic drinks); or are formulations made mainly from industrial ingredients, usually containing little or no whole foods (ultra-processed products).

They are very durable products. They are edible, drinkable and palatable by themselves, and are made ready-to-consume or ready-to-heat.

Processed food products

These products are manufactured by adding substances such as salt, sugar, or oil to whole foods, in order to make them durable and more palatable and attractive.

The resulting products are directly derived from foods, and are still recognizable as versions of the original foods. They are generally produced to be consumed as part of meals or dishes, and also may be consumed by themselves as snacks. Most are highly palatable.

Food products include canned or bottled whole vegetables or legumes (pulses) preserved in brine; whole fruits preserved in syrup; tinned fish preserved in oil; some types of processed meat and fish such as ham, bacon, pastrami, and smoked fish; and cheese, to which salt is added.

As with culinary ingredients, most methods used to make processed food products are originally ancient, and can be and are still used domestically or artisanally. But now almost all are industrial products. Processes include canning and bottling using oils, oils, sugars, salt; and methods of preservation such as salting, salt-pickling, smoking, and curing. The ingredients infiltrate the foods. The processes alter their nature.

Processed food products usually retain the basic identity and most constituents of the original food, but the methods of processing used make them nutritionally unbalanced, because of the addition of oil, sugar or salt. Except for canned vegetables, their energy density ranges from moderate (around 150-250 kilocalories per 100 grams for most processed meats), to high (around 300-400 kilocalories per 100 grams for most cheeses).

Alcoholic drinks

Alcoholic drinks are produced by methods that transform the foods and food constituents from which they are made, with the effect that alcohol is generated. The processes create liquids with different amounts of alcoholic content. They may be consumed with meals, or socially, or on other occasions. They are made to be enjoyable.

Alcoholic drinks include beer, wine and spirits, derived from grains (cereals), fruits, vegetables, roots, or tubers.

As with processed culinary ingredients and processed food products, most methods used to make alcoholic drinks are originally ancient, and can be and are still used domestically or artisanally. But again, now almost all are industrial products. Processes include malting, brewing, fermenting, distilling, and filtering.

Alcoholic drinks contain few or practically no nutrients. Alcohol is potentially addictive and therefore alcoholic drinks are liable to be consumed excessively and to displace meals and foods. Alcohol is toxic.

Ultra-processed products

Ultra-processed products are formulated mostly or entirely from industrial ingredients, and typically contain little or no whole foods.

The purpose of ultra-processing is to devise products that are durable, convenient, highly or ultra-palatable, and profitable. These products typically are not recognizable as versions of foods, although ultra-processing includes techniques designed to imitate the appearance, shape and sensory qualities of the foods processed to obtain the ingredients. Most are designed to be consumed by themselves or in combination as snacks or drinks.

Most of the ingredients used by food manufacturers to make ultra-processed products are not available in supermarkets or other retail outlets, and are not used in the culinary preparation of dishes and meals in kitchens. While some are directly derived from foods, such as oils, fats, flours, starches, and sugar, others are obtained by the further processing of food constituents, by for example hydrogenation of oils (which can generate toxic trans-fats), hydrolysis of proteins, and ‘modification’ of starches.

Numerically, the great majority of the ingredients of ultra-processed products are additives of a variety of types, which include among others, preservatives; stabilizers, emulsifiers, solvents, binders, bulkers; sweeteners, sensory enhancers, flavors, and colors. Bulk may come from air or water. Synthetic micronutrients may be added to ‘fortify’ the products.

Wholly industrial technology includes the hydrogenation and hydrolysis processes, as well as the techniques designed to make ingredients appear to be foods or to invent novelty products, such as extruding, molding, and reshaping. They also include industrial versions of cooking such as pre-processing by frying and baking. Such methods simulate domestic cooking but are typically very different, involving a number of or many processes and processing aids.

Some techniques used to make ultra-processed products are originally ancient or old. But most ultra-processed products now are inventions of increasingly sophisticated food science and technology, as this has developed during and after industrialization. Newer versions of these products are usually initially formulated in industrial laboratories.

The first ultra-processed products included bread and other cereal products made from wheat flour, water, and salt; and animal products made from flour and salt with scraps or remnants of meat. These originally used a small number of ingredients.

Ultra-processed products created as part of industrialization, some of which have been commonly consumed for generations, include cookies (biscuits), preserves (jams); sauces, meat, yeast and other extracts; ice-cream, chocolates, candies (confectionery); margarines; canned or dehydrated soups; and infant formulas, follow-on milks and baby products.

Other products originally formulated and branded some time ago, now very commonly consumed, include many sold ready-to-eat, some with the addition of liquids, or ready-to-drink. Examples are breakfast cereals, cake mixes, 'energy' bars; 'instant' packaged soups and noodles; many types of sweetened breads and buns, cakes, pastries and desserts; chips (crisps), and very many other types of snack product, sugared milk and fruit drinks, and soft cola and 'energy' drinks.

Ultra-processed ready-to-heat products are now very commonly consumed either at home or at fast food outlets. These include pre-prepared meat, fish, vegetable or cheese dishes, pizza and pasta dishes, burgers and hot dogs, and French fries (chips), and poultry and fish 'nuggets' or 'sticks' (fingers). They often appear to be much the same as home-cooked meals or dishes; but they are not. They typically are also ultra-processed, because of the nature of much or most of what they contain, and because of the combinations of preservatives and other additives used in their formulation.

A number of nutritional, metabolic, social, economic and environmental characteristics of ultra-processed products are problematic.

First, they are nutritionally imbalanced, as are processed food products. They are characteristically fatty, sugary or salty, or depleted in dietary fiber and various micronutrients and other bioactive compounds.

They are often high in saturated fats or *trans*-fats. Further, the safety of various specific additives, and classes or combinations of additive used in their formulation, is unknown or disputed.

Second, due to their main ingredients and the lack of fiber and water, when solid their energy density ranges from fairly high (around 225-275 kilocalories per 100 grams for bread), to high (around 350-400 kilocalories per 100 grams for ‘energy’ bars) to very high (400-500 kilocalories per 100 grams for most biscuits and also chips (crisps)).

Their ingredients and formulation make all of them hyper-palatable and some habit-forming and even quasi-addictive. They typically have high glycemic loads. They are therefore liable to derange the endogenous processes in the digestive system and brain that signal satiety and control appetite, and to cause passive energy over-consumption.

Third, they are very easy to consume. They are usually in the form of snacks, drinks, desserts or ready-to-consume dishes. Meal tables, and often plates and implements, are not needed. They therefore displace foods, and dishes and meals prepared from foods at home, or outside the home in places where food is prepared on the spot. Typically they are designed to be consumed anywhere – in catering outlets, from drive-ins and takeaways, at home while watching television, at a desk or elsewhere at work, or in the street. This is why they are often termed ‘fast’ or ‘convenient’.

Fourth, many are formulated or promoted in ways that are misleading. They imitate food, for example by being molded and extruded into food-like shapes, or by the use of cosmetic and other additives which may be intrinsically innocuous but which give a false impression of food, usually in a more intense form. Often the only food present is in pictures on the product label or in other forms of advertising. These are additional reasons why they displace foods and meals.

Fifth, many create a false impression of being healthy, by the addition of synthetic vitamins, minerals and other compounds, as a result of which the manufacturers are allowed to make prominent health claims, despite the product remaining unhealthy.

Sixth, most are extremely profitable, being branded products of transnational and other very big corporations able to buy or make processed industrial ingredients very cheaply, and that operate economies of scale. The biggest corporations spend vast amounts of money on advertising and promotion, including cross-advertising between brands, to make their products attractive and even glamorous, especially to vulnerable consumers such as children and young people.

How to use the classification

In epidemiological analyses, the new classification can be applied to information collected by the use of household food purchase surveys, and also by individual food consumption surveys.

The household purchase of foods is readily classified into one of the three groups in the classification. When this includes meals and dishes freshly prepared in restaurants, the classification is made by separating out the foods, ingredients and food products used in preparation and cooking.

The same applies to information from individual food consumption surveys, except that the separating out of meals and dishes into foods, ingredients and food products will be more frequent, because food consumption surveys will include all meals and dishes prepared and cooked at home.

Summary and conclusion

It is apparent that food processing, most of all in relatively new forms, is now the main force shaping the global food system, and the main determinant of dietary patterns.

Our work undertaken for some years (1-2), and regularly published and accepted since 2009 (3-15), consistently indicates that the phenomenal worldwide rise in the production and consumption of what are identified and defined here as ultra-processed products, typically in the form of snacks, ‘fast-foods’, and drinks, have displaced and are displacing dietary patterns mostly based on meals, throughout the world.

This we believe is profoundly significant. The phenomenal and very rapid shift in food systems and supplies, notably since the 1980s, is paralleled by a vast rise in rates of obesity and related chronic non-communicable diseases in the same time period. So far the evidence all points towards one judgment, which is that the relationship between the changes in dietary patterns and disease patterns is causal. That is to say, the transformation of the global food system is what above all is driving what is now pandemic obesity and rapid rises in related diseases. This view so far fits with all relevant types of evidence, and is more plausible than any other hypothesis. It has profound global policy implications

Our work in progress

Our work so far is taking two forms. First, as shown in the previous pages, we have created a new classification in which all substances that may be consumed and that contain nutrients, are divided into foods, culinary ingredients, and food products.

Second, in partnership with co-workers in an increasing number of countries, we are analyzing national dietary surveys and thus trends in consumption of ready-to-consume (group 3) food and drink products, together with indicators of the quality of diets and the frequency of obesity and chronic non-communicable diseases.

We invite colleagues in other research centers to work with us.

Purposeful guidelines

A prime purpose of our food classification, which we believe reflects the realities of the 21st century, is to be the basis for population goals and personal dietary guidelines designed to promote health and well-being and protect against disease.

Such recommendations will be vitally different from those so far issued, which are usually based on nutrients and nutrient-based food groups. Thus, recommendations to consume culinary ingredients moderately, is conceptually different from warnings against such ingredients as energy-dense, because they are consumed in combination with food in the form of meals and dishes. Indeed, few current dietary guidelines make any mention of meals, and are consistent with the mistaken notion that diets dominated by ‘fast’ food and other ultra-processed products can have the same health value as diets based on meals made with food and culinary ingredients.

We should make clear that while by their nature processed products are unhealthy, we are not suggesting that they are all best avoided. Not at all. When consumed occasionally and usually in small amounts, they are normally harmless. Products using wheat flour such as bread are obvious examples, as are many products consumed as delicacies or treats or as part of occasional feasts. It is when they make up a large part or most of food supplies, dietary patterns and diets, and when any of them is consumed constantly in large quantities, that they are harmful.

Rational policies and effective actions

Prevention and control of obesity and related chronic non-communicable diseases requires control and restriction of the products that, consumed in current quantity, cause these conditions.

We see the issue of ultra-processed products as being much the same as that now well understood with alcoholic drinks. They are designed and promoted to be highly or ultra-attractive. They are liable to be consumed excessively. They are nutritionally unbalanced. Many are habit-forming and have addictive qualities. Some contain toxic substances. They require statutory regulation and control.

In all countries, policies need to be designed to check and reduce the volume in particular of ultra-processed products in food systems and supplies. These products need to be identified, isolated and categorized as such, their contribution to population energy consumption quantified, and their supply regulated. Processed products and alcoholic drinks, when consumed, also need to be eaten or drunk in small amounts.

The ‘market’ system that has led to the current explosion of processed products may well be seen as part of an overall failure. In these circumstances, the protection of public health and public goods has over-riding importance.

Conclusion

Ultra-processing, carried out on its present and projected scale, amounts to a vast global experiment undertaken without attention to its nature or consequences. Indeed, our classification is the first to identify and account for ultra-processed products as such.

Obesity with all its implications is out of control. It is a global crisis projected to be a catastrophe. With the most relevant classification of food as an essential tool, United Nations agencies and other international organizations, together with national governments at head of state level, need to combine with other actors to protect, support and develop healthy food systems and supplies. These will not be untested inventions. They correspond to traditional and long-established sustainable and appropriate methods of agriculture, horticulture and manufacture that remain in place, though threatened, in many countries.

The significance and impact of ultra-processed products can be fully understood only in a broad economic and political context. Dominant policies of privatization, deregulation and globalization of world food systems have concentrated food manufacture, distribution and supply into the hands of a relatively small number of gigantic transnational corporations, some with annual sales the size of the gross national products of medium-size countries. Dietary patterns and diets in most countries, now and in the near future, are or are liable to be largely determined by these transnational corporations. Manufacturers use their products as ways in which to penetrate ‘emerging markets’ in the global South, and also to increase their control of the global food system.

We believe that interventions designed in the public interest, which at least initially may be opposed by commercial interests, will be, when properly presented, generally popular. The control and eventual prevention of obesity will include a more diverse food industry, more rural employment, and better educated children, as well as appreciation and development of the world’s great cuisines, themselves a source of employment and wealth.

Processed food products, and in particular alcoholic drinks and ultra-processed products, also have other profound social (including cultural), economic, political and environmental impacts. These are not elaborated here.

Last word

Classifications of foods and food products are an essential basis for dietary recommendations. As such they are a necessary foundation for public policies and actions designed to enhance well-being, to

protect health, and particularly to prevent and control obesity and diet-related diseases at any level, from local to global.

To this end, a method of food classification that recognizes the significance of different types of food processing is essential. We believe our classification is a sound basis for the work needed to protect and improve food, nutrition and public health in all societies and circumstances worldwide

Some of the team's work so far

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