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Commentary. The big issue is ultra-processing

Why bread, hot dogs – and margarine – are ultra-processed

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Introduction

This series of commentaries began a year ago, in November 2010. The *WN* editors tell me that the number of times readers have accessed the ten commentaries published up to last month amount to around 75,000. Here is the eleventh in the series.

The twelfth and final commentary will be published not next month, but provisionally for March 2012. This will be an expanded, revised and updated edition of the first commentary. It will take into account comments from readers and colleagues. It will also include new findings from original investigations conducted by researchers in a number of countries. These will provide a sound basis for recommendations on the maximum quantity of ultra-processed products in any food supply, dietary pattern, or personal diet that is consistent with prevention of disease and good health and well-being. Work examined so far validates the ultra-processing thesis.

The gap between this and the final commentary will enable readers to make their own comments. These are very welcome and will be taken into account. Please use the response facility at the foot of this commentary, or contact me by the email given above. Substantial comments, when used, will be credited.

In this short commentary I respond to many questions asking why bread, and why various meat products, are classified in group 3 as ultra-processed. I also make a revision. Margarine, which up to now has been classified with butter in group 2 as an ingredient, is now reclassified as a group 3 ultra-processed product.

Discussion

This series of commentaries classifies food supplies, dietary patterns and personal diets into three groups, according to the degree, nature and purpose of their processing. The groups, also identified elsewhere, (1-3) are:

Group 1 foods Unprocessed or minimally processed foods
Group 2 ingredients Processed culinary or food industry ingredients
Group 3 products Ultra-processed products

How many groups?

My colleagues and I have been tempted to make a more complex classification, to allow for significant differences within all of the three groups. A classification with more or many more divisions could be made. There is a good case to do so, particularly if the intensity of processing is taken into account. Examples are the three foodstuffs briefly reviewed here. There are obvious differences in quality between so-called wholegrain and other freshly baked breads, delicious by themselves, and mass produced wrapped sliced 'plastic' bread. The same goes for the meat part of a burger when made from freshly minced meat, and the products made from unknown and often degraded ingredients produced in factories and trucked to fast food outlets. It is perhaps a pity that the entire range of foods and products in these categories are known as 'bread' or 'meat'.

There are also differences in social, economic and environmental aspects. The products of family farms and small businesses protect rural livelihoods and local economies, whereas transnational corporations displace and undermine national and local enterprises and exploit human, living and physical resources. Similarly, there are many types of margarine or comparable non-dairy spreads.

Each of the three groups includes a range of items some of which are more, or less, processed than others. Much of the discussion I have shared with colleagues has been on this point. But the more we work on this project, the more we feel that public health and the public interest are best served by simplicity. Qualifications and exceptions can be included in more comprehensive guides, and those adapted for national and specialist circumstances. Our system is grounded in common sense. Anybody can easily understand it, and it does not knowledge of food chemistry, or a magnifying glass, calculator and food composition tables, needed to make sense of nutrition labels.

The three groups

Group 1 foods
Unprocessed or minimally processed foods

Unprocessed foods are those found in nature that can be consumed fresh in whole form. In a sense these are also processed. Plant and animal breeding could be seen as a type of processing, but on the whole it seems better to identify foods that are edible whole, as unprocessed.

The methods used to produce group 1 minimally processed foods do not substantially change the nutritional properties of the original unprocessed foods, and may improve them, intrinsically or in effect. Such processes include and are not confined to cleaning, removal of inedible fractions, grating, squeezing, draining, flaking, drying, parboiling, bottling (without additions other than water), chilling, freezing, fermentation (when the result is not alcoholic), pasteurisation, vacuum and gas packing, and simple wrapping.

The purpose of group 1 processing is to extend the duration of unprocessed foods, to enable extended storage, and often to reduce the time and effort involved in their culinary preparation, without altering the basic nature of the unprocessed food. The results are minimally processed foods, classified as group 1, together with fresh, perishable, unprocessed foods. Meat and milk, cereals (grains), pulses (legumes), nuts, and fruits, and vegetables, roots and tubers sold as such, are usually minimally processed in various ways.

Minimal processing is usually undertaken by the primary producer, packing house, distributor or retailer, as well as by manufacturers, for eventual sale to consumers.

Group 2 ingredients
Processed culinary or food industry ingredients

Food ingredients are produced by extraction from unprocessed foods. Processes used include pressing, crushing, milling, 'refining', 'purifying', hydrogenation, hydrolysation, extrusion, and use of enzymes and other additives. Combinations of such processes are commonly used to make manufactured products.

One purpose of these processes is to convert unprocessed foods into culinary ingredients. These are used in preparation and cooking of unprocessed or minimally processed foods in the home, or in catering outlets such as restaurants, cafes and street markets where meals are made on site. The other purpose is to convert

unprocessed foods into food industry ingredients used in the industrial development of ultra-processed products (see below).

Examples of group 2 ingredients are oils, fats, sugar and sweeteners, flours and pastas (when made of flour and water), and starches. Most ingredients are depleted or even devoid of nutrients and essentially provide energy. They are not palatable by themselves apart from sugar (which however is not commonly eaten neat), and are not edible by themselves. 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. Pastas are the base for dishes that include vegetables, meat and other group 1 foods, and also oil. Table sugar is used to prepare fruit- or milk-based desserts. And so on.

This group also includes industrial ingredients usually not sold directly to consumers, such as processed remnants of meat or poultry, high fructose corn syrup, lactose, milk and soy proteins, gums, preservatives, and cosmetic and other additives. In modern food systems, the processing of such ingredients is mostly undertaken by specialist firms, for sale to food manufacturers.

Traditionally, food supplies, dietary patterns and personal diets have been mostly made up from group 1 foods and group 2 ingredients, prepared at home to make meals and dishes. There are however some group 3 ultra-processed products that have made up usually a small proportion of food systems and dietary patterns for hundreds or even – in the case of bread – thousands of years.

One thesis of these series of commentaries is that obesity and chronic diseases of which diabetes, heart disease and various cancers are examples, become epidemic and eventually pandemic, as a consequence of group 1 foods and group 2 ingredients needed to make meals and dishes, becoming displaced by group 3 ultra-processed products, often consumed as energy-dense snacks or sugared drinks. This thesis may seem to be impossibly simple, but I maintain that it is the best fit with the facts.

Group 3 products
Ultra-processed products

Group 3 processing, identified as ultra-processing, combines the already processed group 2 ingredients, such as oils, fats, sugars, salt, flours, starches, remnants of meat, with some (often only a small or even minuscule amount) of unprocessed or minimally processed group 1 foods. Sometimes no group 1 foods are included, and are instead imitated. Specific processes include baking, battering, frying, deep frying,

curing, smoking, pickling, canning, use of preservatives and cosmetic additives, addition of synthetic vitamins and minerals, and sophisticated types of packaging.

The purpose of type 3 food processing is the creation of durable, accessible, convenient, attractive, ready-to-eat or ready-to-heat products. Such ultra-processed products are formulated to reduce microbial deterioration ('long shelf life'), to be transportable for long distances, to be extremely palatable ('high organoleptic quality') and often to be habit-forming. Typically they are designed to be consumed anywhere – in fast-food outlets, at home in place of domestically prepared and cooked food, and while watching television, at a desk or elsewhere at work, in the street, and while driving. This is why they are also termed 'fast' or 'convenience' foods. Some such products are so degraded that they are termed 'junk' food.

Ultra-processed products are themselves of two types. One is soft drinks including carbonated 'sodas', and ready-to-eat savoury or sweet snacks, or products liable to be consumed as such. The other includes pre-prepared ready-to-heat products designed to replace dishes and meals in the home or on site in catering establishments. Their processing is undertaken by food manufacturers, or by caterers such as those that supply burger and pizza outlets, or food retailers such as bakeries.

From the public health point of view, ultra-processed foods are problematic in two ways. First, their principal ingredients (oils, solid fats, sugars, salt, flours, starches) make them excessive in total fat, saturated or *trans*-fats, sugar and sodium, and short of micronutrients and other bioactive compounds, and of dietary fibre. Taken together this increases the risk of various serious diseases. Second, their high energy density, hyper-palatability, their marketing in large and super-sizes, and aggressive and sophisticated advertising, all undermine and overwhelm the normal processes of sensible choice and appetite control, cause over-consumption, and therefore cause obesity, and also diseases many of which are associated with obesity.

Ultra-processed products are usually not consumed together with unprocessed and minimally processed foods. They are designed to be ready-to-eat or ready-to-heat, and are often consumed alone or in combination with other ultra-processed products, such as savoury snacks with soft drinks, and bread with burgers. Any accompanying fresh food, such as lettuce within a burger, is usually little more than trimming or decoration, added to give an illusion of wholesomeness. For this reason it is right to isolate ultra-processed products in dietary analyses and guidelines.

The issue is one of proportion

As I always emphasise, the classification used here does not imply that ultra-processed products are best never consumed. Nobody has ever become ill as a result of consuming one burger, unless it was infected with pathogenic microbes.

The issue is one of proportion. In general, in most countries now, far too many ultra-processed products are consumed. But I do not recommend that ultra-processed products should never be consumed. Nor have I said that any specific ultra-processed product should be cut out of diets. It should be said though, that many ultra-processed products are formulated to be habit-forming, even to the points of having addictive qualities. Thus, some commentaries identify extracted sugar, and thus ultra-processed products high in sugar, and even fast food in general, as addictive, using conventional criteria that define substances as addictive or toxic (4,5).

Why bread is ultra-processed

There is a vast contrast in quality between freshly-baked rough breads and mass-produced plastic products. Nonetheless, both are ultra-processed

It may well seem counter-intuitive to identify bread as ultra-processed. One reason that this classification may seem surprising is that in some parts of the world bread has been made for thousands of years. It is imprinted in biblical and other sources originating in wheat-growing parts of the world as the Staff of Life, in the Christian tradition is the body of Christ, and is part of various versions of traditional Mediterranean diets (6). But these commentaries are not saying that it is only products made by modern food technology that are ultra-processed.

Another reason for surprise is that bread is recommended in practically all official and other guidelines as healthy and good to consume abundantly. This is a mistake. Bread by itself is fairly energy-dense, and almost all bread now produced and consumed is grossly degraded and palatable only as a vehicle for what are usually fatty or sugary and often also salty spreads, fillings or toppings. Bread is not a good

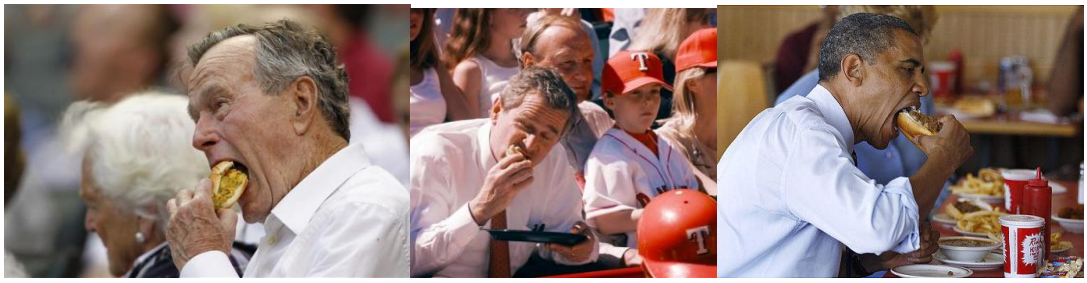
staple food. When I eat it, which sometimes I do, it is the type that is delicious by itself, or as dipped into the juices of fish or meat dishes (7,8).

Further, bread and wheat products should not be promoted in parts of the world where other grains, or roots or tubers, are the main starchy staples. Wheat is not native in most parts of the world, including Brazil, my country, or anywhere in Latin America. Some is now grown in southern Brazil and in temperate countries south of Brazil, but this is a recent phenomenon.

Our indigenous and established starchy crops are manioc (cassava), corn, and rice, all of which when prepared and cooked are group 1 minimally processed foods, and better choices. The mass-produced bread that is sold and consumed everywhere in Brazil now, made as elsewhere in the world with flour from just a few strains of wheat, is at least as disgusting as that which now dominates the bread market in wheat-producing and other wheat-importing countries.

With very many colleagues committed to public health nutrition in its social, economic and environmental as well as biological aspects, I am opposed to the promotion of bread in countries with no tradition of wheat. Let's not get starry-eyed about bread, or indeed other wheat products, most of all in parts of the world whose food cultures are based on other grains, or on roots and tubers, such as Africa and Latin America, much of southern Asia, and the Pacific region. This issue here is social, cultural, economic and environmental, as well as biological (7,8).

Why hot dogs are ultra-processed



Hot dogs are made up of white bread in the form of a bun, and a type of sausage, both ultra-processed, together with mustard or other relishes

There are many types of processed meat. Most are fatty and salty. Many types, especially those that are cheaper, are obviously ultra-processed. These are 'fake foods' containing only small amounts of real meat or poultry, and instead may be made using 'mechanically recovered' scraps, skin and offals, centrifuged into a slurry that is then rendered into a substance that looks and tastes like meat. Cheap 'chicken' nuggets are one of many examples. Others use problematic preservation processes, such as salting, salt-pickling, curing or smoking, and nitrates, which do or may increase the risk of some cancers.

An additional reason why most forms of processed meat are ultra-processed is – as shown in the pictures above of the elder and younger George Bush, and of Barack Obama – that they are designed to be ready to eat in any setting, frequently together with cola or other soft drinks, and as such they displace meals. Hot dogs, also known as dogs, frankfurters or wieners, are a type of sausage inserted into a bun, itself ultra-processed, together with mustard, pickles or other relishes, and as such are ultra-processed products.

In the US the average consumption of dogs is 60 per person per year. The public health issue here is not so much the volume consumed, although this is considerable, as the example set by influential people guzzling dogs or burgers in public. See Box 2.

Processed meats vary greatly in quality and nature, and much depends on the context in which they are consumed. For instance, there is a case to say that ham and bacon, and any type of sausage mostly made from real meat with some fillers and herbs, while preserved by methods that are or may be carcinogenic, could be classified in group 1 with fresh meat, when prepared and consumed as part of meals eaten at home. This does not apply to hot dogs. They are meant to be consumed anywhere, and not as one dish within a meal. They are a symbol of individualism.

Box 1

What about burgers?

Woods Staton is the chief executive officer of *Arcos Dorados*, representing the biggest McDonald's system of franchises in the world. He spoke at a recent meeting called by the president of the senate of Chile, designed to make plans to prevent and control obesity, at which he and I and many other colleagues were speakers. He said: 'I am representing an enterprise that does not produce processed food' and McDonald's is 'not a fast food enterprise'. This audacious claim caused some hilarity among the non-industry people present. But he is supported in by some food classifications used in the US and elsewhere that identify hamburgers as fresh meat.

However, he and they are wrong, as is evident from what is said above. First, by any sensible definition, burger outlets sell fast food. That is their purpose and is intrinsic to their profitability. Second, in that context, burgers are ultra-processed. If you buy fresh meat and mince and cook it yourself, together with ingredients such as oil, spices and herbs, and serve it at home, the result is a dish that is a combination of group 1 unprocessed food with group 2 ingredients. If you serve it as a burger inside a bun, it is a hybrid dish. But 'patties' manufactured at distance and trucked into outlets at which they are given their final heating, and inserted into a bun together with cheese, bacon and bits of salad, are ultra-processed products.

Why margarine is ultra-processed

A hydrogenation reactor delivered by boat in India (left). Margarine has long been promoted as healthy, as shown in a 1978 advertisement (right)

Margarine is not an ancient product like bread, but it has been produced and consumed in increasing and now great quantity for a century. For half a century after the introduction of the hydrogenation process margarine, which is roughly 80 per cent fat and 16 per cent water, was made from any suitable and commercially attractive animal fat, such as beef or mutton tallow, pig lard, or whale or fish oils, or from plant oils, singly or in combination. The rest was mostly salt, flour, added vitamins, and an array of additives. Many populations consume a lot of margarine. By 1925 world annual production was around a million tons. The figures for 1950, 1960, 1970, 1980 and 1990 are in round numbers, 2, 4, 5, 7.5 and 9 million tonnes (or billion kilograms) a year (9).

Seeing margarine as an ultra-processed product may also seem counter-intuitive, because of the intensive advertising of some types of margarine as 'heart-healthy'. Discussion about table fats and human health usually centre on their chemical composition. Since the 1960s butter has been identified as harmful to heart health, when consumed in substantial quantities, whereas margarine has been seen as a better choice, because the softer versions are lower in saturated fats, and often also contain types of fat that are regarded as positively beneficial.

In the last 20 or so years the story has changed, because of general agreement that the *trans*-fats in margarine that are created by the hydrogenation process that is intrinsic to margarine manufacture, while chemically being an artificial type of unsaturated fat, are at least as harmful to heart health as naturally saturated fats found in meat and dairy products such as butter. Because margarine is a product of food technology, manufacturers are able to reduce the quantity of *trans*-fats in margarines

and even to advertise them as *trans*-fat free and therefore as health products. This process continues.

However, the nature of the processes used to produce butter and margarine are so different, that on reflection and after discussion, it is more appropriate to classify margarine as a group 3 ultra-processed product, whereas butter remains in group 2. Here is why.

One reason is the complexity and intensity of the processes used to make margarine. The first stage in the manufacture of margarine is the refining of oils from plants and seeds such as corn, cottonseed, soybean, sunflower, safflower, or rapeseed. Some of these have fatty acid compositions said to be relatively healthy or even protective against heart disease. These are 'purified' to become a uniform base ingredient. They are then mixed with nickel or other chemical compounds, which catalyse the chemical reaction during the hydrogenation process. The oils are then put under high temperature and pressure in a reactor. Hydrogen gas is introduced and hydrogen atoms forced into the oil molecules.

If the oil is partially hydrogenated, it turns from liquid into a semi-solid substance, made smooth with emulsifiers, which are types of soap. *Trans*-fats are formed during partial hydrogenation. If the oil is fully hydrogenated, it becomes solid. The result is steam cleaned and bleached. Synthetic nutrients, colour, and flavours are then added.

On the whole, the processes used to make margarine are so complex and intensive that for this reason alone, it seems best to identify margarine not as a group 2 ingredient but as a group 3 ultra-processed product. Another reason for this reclassification is that most margarines other than those labelled as suitable for vegans, also contain some milk product in the form of whey. While mass-produced butter is also a complex product, it remains in group 2 as an ingredient. On the whole when used sparingly, butter is a better choice than margarine, as are relatively unrefined oils such as olive or corn oil, or more expensive types such as those made from nuts. Customers and consumers convinced by the marketing of margarine that some of these help to prevent heart disease are free to make their choice.

Box 2

Why US presidents just don't get it

Presidents Clinton and Obama, with their wives, following the Rockefeller Doctrine. After multiple by-pass surgery, Bill Clinton's diet is plant-based

Why are successive US governments so slow to agree that Big Snack and the other transnational manufacturers of ultra-processed products need to be regulated? Here is a reason. Nelson Rockefeller, once US vice-president, observed: 'No candidate for any office can hope to get elected in this country without being photographed eating a hot dog'. Pictured above are a recent and the current US president stuffing themselves with two of the ultra-processed items identified here – and, if their dogs are lubricated with 'healthy' margarine, with all three.

Before and while he was US president, Bill Clinton was a notorious gorger of ultra-processed products, including 'diet' soda. As president his weight increased to 235 pounds or close to 17 stone (107 kilograms) at which point he was obese and had a number of health problems. After leaving office and becoming a private citizen, in 2004 he underwent quadruple heart bypass surgery. On the advice of his daughter Chelsea he consulted the radical low-fat diet physician Dean Ornish, and is said to eat mostly whole foods, and to weigh 192 pounds or well under 14 stone (88 kilograms). The Ornish regime is promoted as very low fat, which it is, but it is more accurately identified as a dietary pattern very low in ultra-processed products.

Barack Obama is often photographed eating in the street or at fast food outlets. Evidently so far he does not accumulate body fat. Resistance from the US government to regulation of Big Snack and the other transnational ultra-processed product manufacturers may in part stem from US presidents who follow the Rockefeller Doctrine.

Seven observations on ultra-processed products

Here are some preliminary observations on ultra-processed products. My final commentary, provisionally to be published in WN next March, will include a set of observations and recommendations.

1 The more, the worse

The quality of food systems and supplies, and of dietary patterns and personal diets, is a function of the proportion of ultra-processed products in them. While occasional or modest amounts of ultra-processed products are unlikely to be personally harmful, and while traditional dietary patterns often include some such products such as preserved meats and fish, and bread, generally speaking the less ultra-processed products are consumed, the better.

2 Grandmother was right

'Everybody knows' that fresh and minimally processed food is best. This common sense view is correct. Meals and dishes made up from a combination of a variety of such foods with processed ingredients, prepared and eaten fresh, are also generally healthy. It is of course true that any type of diet can be unbalanced, excessive, or generally unhealthy. Genuinely traditional dietary patterns, when these are varied and adequate, have evolved over time, are usually socially, culturally and environmentally appropriate, and as a general rule are the best choice in their setting.

3 Chemicalisation is a mistake

Most ultra-processed products are a consequence of technology that identifies food with its chemical constituents, and manipulates foods and ingredients to be as cheap, profitable and enticing as possible. Unfortunately this shift, which continues to transform the nature of food systems, is supported by conventional science which, from the nutritional point of view, also identifies food with its chemistry. This is a mistake which in its effects, with the emergence of pandemic obesity and diabetes, and increase in other serious chronic diseases, has become a global catastrophe.

4 Underlying and basic impacts

Products are here classified as ultra-processed not only because of their nature as unhealthy edible substances, but also because of their underlying and basic social, economic and environmental consequences. Their main function is to enrich transnational and other very large corporations, collectively known as Big Snack, and also Big Sugar, Big Burger, and Big Cola, together with associated agribusiness, pharmaceutical, chemical and marketing corporations. Taken all together these

businesses currently control a large part of the global economy, and are aggressively penetrating Asian, African and Latin American countries.

5 The question of addiction and toxicity

Many ultra-processed products are formulated so as to be habit-forming, and to 'fool' the body's metabolic processes to induce excessive consumption. Whether these are correctly seen as addictive or toxic processes depends to some extent on how the terms are defined. The idea that any mass-manufactured edible product is or may be addictive or toxic is of course furiously contested by the manufacturers.

6 Aggressive marketing to children

Leading brands of ultra-processed products manufactured by leading transnational corporations are advertised and marketed aggressively. This indefensible abuse of vulnerable people, especially children, is rightly giving the manufacturers a bad name. At the moment, with a few exceptions, manufacturers are successfully resisting any statutory limitation of their activities, which in the US are positioned as commercial free speech. Resistance is also because manufacturers fear 'regulation creep', in which laws of the type used to make cigarettes and alcoholic drinks more expensive, less available, and clearly labelled as hazardous, are used to restrict ultra-processed products. Such laws should be used, in the public interest.

7 Seeing the big picture

The colossal rise of manufacture and consumption of ultra-processed products, especially since the beginning of the 1980s, is a large part of the process by which governments have abandoned responsibility for public health and have surrendered governance to 'the free market' – meaning, transnational corporations. To consume ultra-processed products, is to buy into the current political and economic ideology that, given the linked food, fuel and financial world crises, has systematically failed, as we can all see and experience in our personal and professional lives.

Conclusion

This series of commentaries remains work in progress. With the colleagues who are working with me, I am conscious that some of the judgements being made can be challenged. We remain convinced, as I said in my first commentary, that with food, nutrition and health, the issue is not nutrients, and is not food, so much as what is done to food before we consume it. That is to say, the big issue is ultra-processing. This thesis implies a revolution in thinking about food, nutrition and health at all levels, and also in the teaching and practice of clinical and public health nutrition.

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Acknowledgement and request

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CAM states: Geoffrey Cannon has worked with me on all these commentaries and I regard him as my co-author. All the commentaries have benefited from discussions I have had in the last two years or so with Inês Castro, Renata Bertazzi-Levy, and Rafael Claro, and also with Geoffrey Cannon and Fabio Gomes, who are co-authors with me of other papers, published (2,3) and in preparation. I have no conflicts of interest.

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