Nutrition, evolution, misinformation

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Abstract
The history of human dietary habits regards hunting, fishing, gathering and the development of agro-pastoral practices. The economic and social shifts linked to the transition of human societies from agricultural to industrial and the increase in migration of people, diffusion of information and goods linked to globalization influenced food choices, as they relate to the exponential growth in the productivity of the food industry. Especially in the new millennium, media have contributed to the promotion of refined foods and, at the same time, to the dissemination of fake news concerning nutritional topics, persuading people to make wrong and harmful choices regarding their health. In this paper, we highlight the importance of the role of nutrition professionals in providing reliable information to patients and in the dissemination of scientific knowledge to a broader public, using an accessible language to overcome communication barriers.

Keywords: eating habits, health, globalization, fake news, informed choices

Human evolution is strongly connected with environmental conditions with which the subsistence strategies and the availability and variety of food are related and still largely dependent (Boone 2002; Erlich and Erlich 2008). Over their history, human populations have occupied almost every place on the planet, experiencing different possibilities of survival which have inevitably defined various eating habits. The diversity of environmental conditions and food resources led to different selective pressures, favouring adaptations at the local level and determining genetic variation among populations (James et al. 2019).

The relationships among environment, dietary habits and human genetic variation have been extensively investigated especially regarding the neolithic transition from a lifestyle of hunting and gathering to agro-pastoralism (Ammerman and Cavalli Sforza 1984; Bickle 2018; Schulting 2018; Bergström 2021). This cultural change led to a variety of dietary changes in Neolithic populations. Particularly, the introduction of a great quantity of foods rich in starch in the daily diet of the early agropastoral communities. The digestion of starch depends on specific enzymes called amylases. One of them, alpha-amylase, is present in the saliva, while others are released at the pancreatic level. The gene responsible for the synthesis of this enzyme (AMY1) has undergone duplications during human evolution showing extensive copy number variation among populations (Perry et al. 2007). This means that there are people having multiple copies of AMY1 in their genome, a condition contributing to a higher enzymatic availability for their digestion of starch. Perry et al. (2007) highlighted a higher percentage of individuals carrying this genetic pattern among agro-pastoral societies than in communities of hunter-gatherers. More copies of this gene are significantly associated with higher levels of alpha-amylase (Carpenter et al. 2017), representing an improvement in the digestive process in populations with a starchy diet.

The history of human eating habits does not depend only on the development of agricultural practices. Other most recent historical dynamics have contributed to its changing process. Firstly, the economic and social shifts linked to the transition of human societies from pre-eminently agricultural to industrial, which has taken place from the 18th century. Secondly, the increase in movements of people, information and goods linked to globalization, especially starting from the second half of the 20th century and, even more, in the new millennium. All these changes influenced lifestyles and, consequently, food choices, as they relate to the exponential growth in the productivity of the food industry (Mendez and Popkin 2004).

Eating habits in the westernized world

One of the most discussed effects that globalization has on eating habits regards its large-scale "westernization". This transition is not taking place at the same level everywhere, with local contexts where cultural and gastronomic identities are so marked as to curb the success of other external models (Haile et al. 2017; Cuevas García-Dorado et al. 2019; Azzam 2021). However, a great variety of low-cost packaged food products, pivotal representatives of the "Western diet", rich in sugar, salt, and saturated fats, are available virtually everywhere (Kopp 2019). This rapid change could play a crucial role in influencing people’s health and quality of life (Cordain et al. 2005; García-Montero et al. 2021). Understanding these dynamics is useful to identify their effects on the human body at a biological level.

As pointed out by a large body of research evidence, the Western diet is involved in determining imbalance in the gut microbiota. These investigations showed that the gut microbial diversity of hunter-gatherers is richer and varied than those of members of agropastoral groups and, even more, urban western communities (see Gupta et al. 2017 and related citations therein). The main reason of this differences seems to be that a greater diversity of microbial species would confer a better resistance to parasites and efficiency in coping with the not optimal intake of nutrients due to the scarcity of food. The gut microbiota of hunter-gatherers greatly differs from that of the urban societies in terms of the

richness of several genera of bacteria, such as Prevotella and Treponema, very useful for diets rich in fibres (Obregon-Tito et al. 2015). Comparative studies on gut microbiota explain how different lifestyles and eating habits influence the bacterial composition of the human intestinal tract and the impact of its impoverishment on human health.

Western diet is also strongly associated with obesity and other diseases, such as cardiovascular diseases and diabetes, which are among the ten with the highest mortality rate worldwide (GBD 2017 Causes of Death Collaborators 2018; Capocasa et al. 2022; Destro Bisol et al. 2022). It is worth noting that more than half of the daily intake of calories in several countries of the western world such as Canada, the United States and the United Kingdom derives from these foods (Monteiro et al. 2019). In the last two decades, the sale of these products is growing dizzyingly also in low- and middle-income countries (Monteiro et al. 2013; Moodie et al. 2021). In 2004, the Food and Agriculture Organization (FAO) published a report entitled "Globalization of Food Systems in Developing Countries: Impact of Food Security and Nutrition", in which authors highlighted how unhealthy food market in developing countries was supported by the television commercials and by the spread of mobile phones and text messages. Emblematic is the case of Brazil, where 58% of TV commercials related to food products concerned those with high fat and sugar contents, only 9% regarding foods based on meat, beans, or eggs, and no commercials dedicated to fresh fruit and vegetables.

Nutrition science, between myths and lies

Television and the Internet have allowed amplification of the promotion of food products. At the same time, they represent the main tools for the dissemination of nutrition and healthy eating contents. However, scientists and nutrition professionals are still struggling to find the right way to communicate efficiently and effectively (throughout these channels) the positive implications for society that their studies could produce. This is because the "translation" of scientific works from the technical language to one suitable for a wider audience is an undertaking that hides several traps, such as oversimplification, sensationalism, and inaccuracy (Secko et al. 2013). This is particularly true in the case of nutrition science as it involves aspects of the daily life of everyone (Rowe and Alexander 2021). Mass media not only have been used to advertise products, but also to disseminate fake news concerning the nutritional values of foods and their effects on human health (e.g. the case of the "milk consumption-hip fractures" controversial relationship; see Michaëlsson et al. 2014, but see also Hidayat et al. 2020). However, even long before the invention of television and the worldwide web, word of mouth worked well for "food mythology" to reach a large audience. An example above all: "spinach is the richest source of iron". This is one of the longest-lived scientific legends, as it is now two centuries old. One version of the story tells about an error brought since the dawn of biochemistry, caused by confusing the iron content in the dry weight of spinach with that of fresh weight (see Rekdal 2014 and related studies cited therein). Other reconstructions refer to a misplaced decimal point in calculation by two different "guilty": Emil von Wolff and Gustav von Bunge (Mielewczik and Moll 2016). None of these stories would be true, however it is true that spinach is one of the vegetables that contain only a fair amount of iron (2.9 grams per 100 grams of fresh product) and that we can assimilate only a small quantity of this micronutrient due to its interactions with other dietary factors (i.e. polyphenols, phytates and calcium; Rodriguez-Ramiro et al. 2019).

This is one of the many examples of food myths that the nutrition sciences have helped to unravel. A particularly arduous task in the globalized world, literally haunted by the proliferation of fake news mainly on the world wide web. The internet is widely used to find out information on nutrition and diets, although it cannot be view as the most reliable source (Wangberg et al. 2009; Goodman et al. 2011). Vosoughi et al. (2018) pointed out the greater speed with which fake information spread on the web compared to truths. They also discussed the role of social networks noting how, through Twitter, fake news are 70% more likely to be shared compared to reliable news. This study clarifies how the

web is a context in which false, or at least inaccurate news, can reach people needing information, leading them to make wrong choices. It is the case of the significant number of people who follow restrictive dietary patterns, such as lactose and gluten-free diets, without having performed the proper medical exams to verify if they have any intolerance (e.g. see Araya et al. 2020).

Towards truly informed choices

The spread of fake news is due to the lack of scientific knowledge that is needed to distinguish which is a reliable information and which should be taken as a joke. As a matter of fact, people process information extrapolated from texts and videos differently, depending on their level of knowledge of the topics. Based on this elaboration, they may be vulnerable and become easily persuaded to make wrong and even harmful choices. The lower the knowledge, the greater the vulnerability and therefore the tendency to rely on the online pull of mixed contents, regardless of its quality. In an increasingly interconnected world, the popularity of social media contributed to make celebrities and influencers as role models. Followers may wonder how this well-known personality “has that physical aspect”, desiring to resemble him/her, and thus wanting to know "what diet is he/she following", "what sporting activity is he/she practicing", or "which supplements are involved". In this way, popular personalities are seen as more reliable as experts, even if they do not have a specific scientific background. All these misconceptions bring people to follow them instead of searching for information from reliable sites, open access scientific papers or, even better, asking directly a nutritional or medical professional. How can we incentivize informed choices?

First, we believe that nutrition professionals should play a primary and decisive role in providing reliable information to patients and their relatives. Particularly, we stress the importance of an accessible language to avoid technicalities that are perceived as hurdle by the patients. As pointed out by Mira et al. (2014), communication barriers lead to a less involvement of patients and their reduced willingness to follow directions and suggestions coming from healthcare professionals. Furthermore, we claim that making a greater effort in the spread of scientific knowledge to the public, organizing public events and publishing easily readable articles on websites, blogs and magazines, could contribute to raise the awareness of the huge influence that eating habits have on human health.

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