Transforming Nutritional Value into Commercial Gain: The Impact of Intensive Food Production

Abstract

Two thousand years have passed since Hippocrates (Hippocrates of Kos, 460 BC) coined thefamous phrase: "let food be your medicine", with which he wanted to indicate the high biologicalvalue of food and its therapeutic content.
But in the time of Hippocrates, man and food went hand in hand to provide all the resources andnutrients essential for survival.
Two thousand years later, the industrial revolution completely overturned that profound bond. Food has lost its natural biological and therapeutic value, and has been replaced by symbolic contents,surrogates of the original meaning, but essential for a society based on consumption.
Furthermore, the symbiotic bond between man and mother nature, which represents the essence oflife itself, has been broken, making us lose track of our origins.
The need to implement production to satisfy the growing global demand for food has led to the use of chemical substances that are effective in combating biological pests that destroy foodstuffs.
These substances remain throughout the production chain even after transformation intoready-to-eat foods.
So, if on the one hand chemistry has solved production problems, on the other it has generatedserious consequences for the health of consumers.
The objective of this work is promoting consumer food awareness for responsible andsustainable consumption of food.

Keywords: Food, food production, environmental pollution and additives, alternative food sources.

Introduction

The global population explosion that has occurred in recent years has increased the demand forbasic necessities, among which food occupies first place.
Traditional food production methods are no longer suitable to meet growing needs.
The methods introduced by the industry are capable of large-scale production and have respondedto the demand for food by offering increasingly numerous and elaborate food products.
Unfortunately, the increased quantity of food produced has not been matched by equal quality; theneed to optimize production and consequently the derived profit has transformed the nutritionalvalue of food into pure business and commercial value, and has subverted eating needs and habits.
and consumer diets.
The new economic assumptions on which the food industry is based have forever subverted thebiological value of food celebrated in Hippocrates' famous motto " Let food be your medicine ", and
have transformed it into a consumption.
As such, it does not satisfy vital needs, but is used with the powerful conditioning of advertising to convey symbolic contents with high appeal, such as beauty, well-being, physical efficiency andyouth, and has thus become an essential means to always be up to the performance required byfrenetic social activity [1].

In order to follow the fast-paced and demanding pace of the challenges we face every day in industrialized society, we need to consume more and more products rich in health promises and beneficial effects.
Thus, the symbolic content of food takes on more value than the real nutritional content.
This has transformed food and everything that revolves around nutrition into a means of showcasing and implementing the audience and advertising impact that must fuel and accelerate consumption
In the last decade our habits and approach to food have been changing, which have been transformed into goods to be displayed on all media stages, and to increase the profits of the food industry, "related" to the chemical industry and pharmaceutical.

In fact, numerous programs and television shows dedicated to food have seen the light which represent challenges between aspiring chefs on a daily basis, while in others culinary art courses are broadcast which occupy more than 50% of the show programming on all channels.
More than a trend, the interest in the culinary art (which sees Italy occupying positions of excellence) has become a collective obsession, a challenge between increasingly numerous competitors to obtain the coveted title of chef.

In these shows, food is considered not only for its nutritional content, but also for the aesthetic aspect with which the exotic dishes that the competitors propose to the renowned jury of eminent "experts" are presented and elaborated.

As in any self-respecting show, it is the stage set that counts together with the artistic ability of the contestants, that mix the most extravagant nutrients with the result of a kaleidoscope of aromas and flavors, where their biological content is totally obscured.
It is undoubtedly the most successful expedient to fill the cultural void widely spread in the consumer society, it is an effective means of mass distraction and dissuasion to mask the real problems that afflict various countries, capable of distancing the population from effective participation to civil activity and social life.

In this pseudo-cultural climate, which hypnotizes and distracts the people of the post-industrial society based on entertainment, parodies of information and food education are broadcast.
And this is how the activity of the food industry thrives in this consumerist society, whose aim is to increase the productivity and economic profitability of foods rather than their biological value.

The objective of maximum profit must be pursued by every lawful or permitted means, where lawful should mean the high biological value of food, is constantly hidden, for the benefit of what is permitted, which includes the dark compromises for accepting the limits of additives tolerated by law.
So we shouldn't be surprised if along the production chain and in all the phases that foods go through, from their primary production to the consumer's table, chemical substances and additives are widely used, which in terms of quantity and quality even surpass all types of foodstuffs. food produced.

The need to satisfy the growing number of consumers has pushed the food industry to intensive production to maximize profit.
In all production processes, be it agricultural products, fish products, farm animals, or ready-to-use preserved foods, chemical substances are widely used which ensure an increase in production and long times for their conservation. [2-3]
Furthermore, considering that the main source of food information is advertising, it is inevitable that consumer choice is influenced more by marketing than by awareness of the real benefit of foods.

Role of nutrition

Nutrition is the main activity of living beings for maintaining physiological homeostasis and can be schematically represented as in Fig.1:

Nutrition: Is the process by which living organisms take selected nutrients from the outside and transform them into their own constituent elements and the energy necessary for their growth and reproduction.

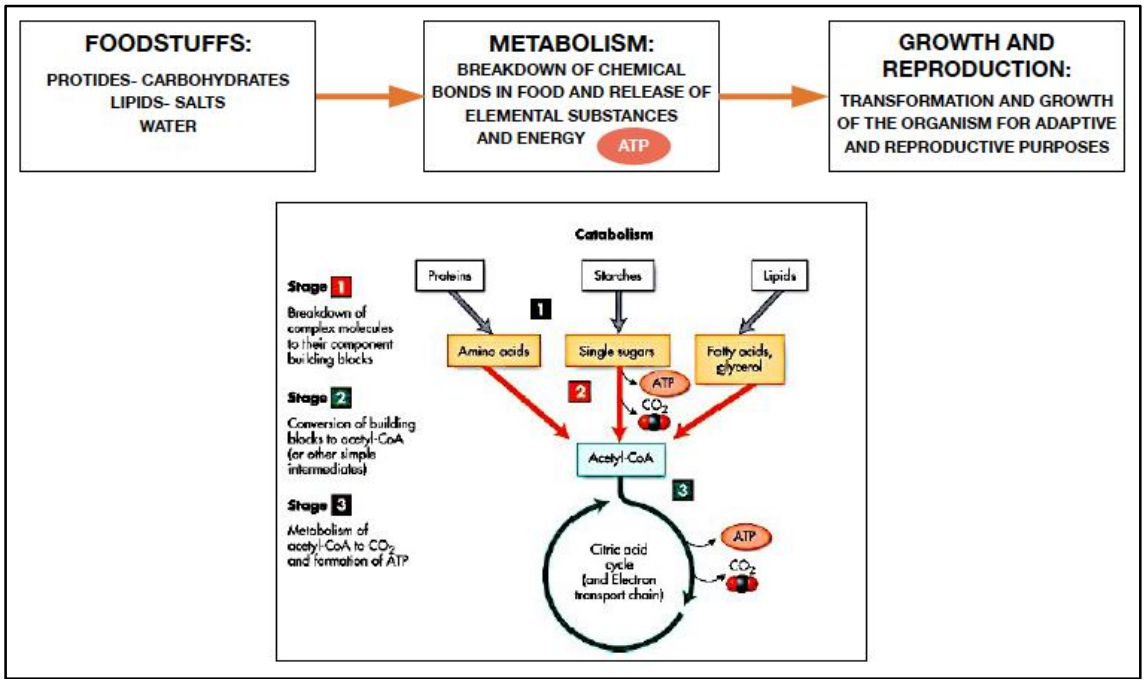


Figure 1 – Schematic representation of the food cycle

Figure 1 schematically illustrates the common fate of foods and their metabolic cycle.

It is difficult to evaluate the effects that a certain nutrient can have on humans: genes, eating habits, lifestyle and environment vary from person to person, making it difficult to understand the impact on individual health.

Intensive food production goes through various phases that begin with the production of raw materials to then be transformed into the vast range of food products and enrich the diet of consumers.

Primary production includes the processing of primary sources used for food fig.2.

Fig.2 – Primary sources of food

Even if all food sources contribute to the maintenance of physiological homeostasis and the well-being of living beings, it should be kept in mind that the same nutrients of different origins have a different biological value, which essentially depends on the composition of the individual constituents.

In fact, it is important to know that each nutrient provides a different contribution both in terms of chemical composition and bioenergetic value. And it is essential that there is the participation of all the components and that the qualitative and quantitative balance that must be preserved is respected.

The traditional nutritional approach divides foods based on their caloric content and prescribe the diet based on the calculation of calories introduced by meals.

The classic schemes show the typical food pyramids, in which the fundamental nutritional groups find the correct placement in compliance with the needs of their relative intake.
Classically, our average daily calorie requirement must be obtained 50-55% from carbohydrates (or carbohydrates), 30-35% from lipids and 10-15% from proteins.

The most recent nutritional guidelines assign greater value not only to caloric intake, but also to the characteristics of individuals, based on genetic composition, microbiota, lifestyle and general health conditions.
And there is unanimous consensus in respecting, to the extent possible, a personalized diet calibrated to the biological profile of each patient, a diet that we can define as Biocompatible.

Intensive industrial production

Forresponding to the growing market demands, food production must adoptintensivemethods that increase quantity but compromise the quantity of the final harvest.
The main problems that hinder the abundance of cropsfrom production areas depend on contamination by various type of pest organisms which can impact production negatively.

To these causes of natural contamination we must add those produced by environmental pollution with waste and the spillage of toxic substances and waste, dioxin and heavy metals, resulting from industrial processes.
Earth, air and seas are the open-air landfill where materials and industrial waste of all kinds accumulate, resistant to environmental degradation, and remain for many years as a future memory of the senseless destruction of natural resources.

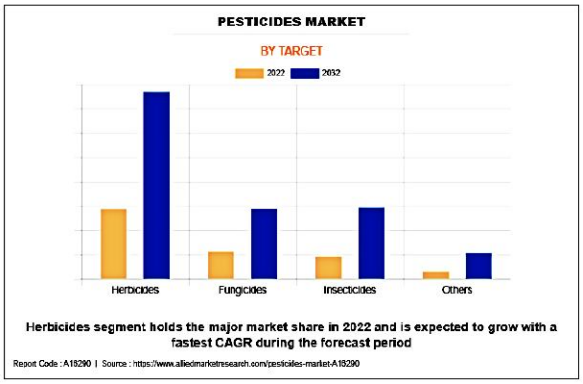
But the main cause must be found in climate change which has upset the ecosystem and biological balance and has created an environment hostile to the survival of numerous animal and plant species, and has favored the emergence of exotic animal species resistant to the changed climate and favored in the predation of native species

Types of production of different raw materials, fig. 2.

- ***Vegetable production***

Statistics provided by the National Institute of Food and Agriculture , United State Department of Agriculture ,USDA, present the following figures of the damage caused by pest organisms :
"Between 20% to 40% of global crop production is lost to pests annually. Each year, plant diseases cost the global economy around $220 billion, and invasive insects around $70 billion, according to the Food and Agriculture Organization of the United Nations. Weeds are another significant biotic constraint on global food production."[4].

In order to deal with the dramatic economic and production situation resulting from the destruction of foodstuffs of plant origin, we resort to the use of herbicides that eliminate weeds that damage vegetable production, and we also use insecticides and fungicides to contain the infestation and destruction of fruit and vegetables by insects Fig.3.



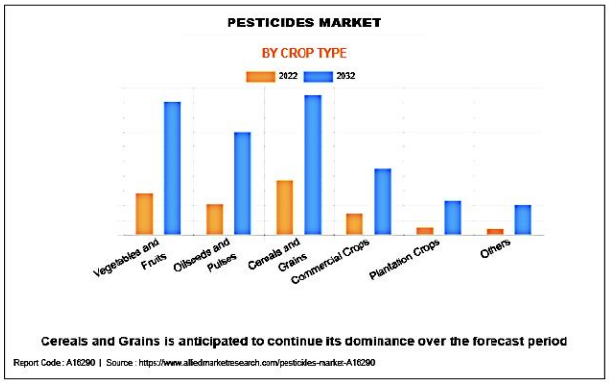


Figure 3 - From: Pesticide Market - Allied Market Research

Unfortunately, while on the one hand the use of these substances improves production volumes, on the other their residual presence in the environment and in crops produces numerous direct and indirect negative effects on public health [5-10].
The direct negative effects are consequent to the diffusion of the toxic substances used in the air and soil, the indirect effects are consequent to their ingestion with the foods that contain them.
The most used herbicides are Tab.1:

Herbicide	Half-Life (Days)	Toxicity Class Based on LD50
Atrazine	13–58	III
Butachlor	5–24	III
Fluazifop-p-butyl	8–24	III
Fluchloralin	12–46	IV
Dithiopyr	11–25	IV
Imazethapyr	57–71	IV
Isoproturon	13–21	III
Chlorsulfuron	31–93	IV
Chlorimuron	60	IV
Flufenacet	9–22.5	V
Metribuzin	23–49	III
Metolachlor	8–27	III
Oxyfluorfen	12–29	III
Pendimethalin	15–77	IV
Pretilachlor	10–11	IV
Sulfosulfuron	3–27	IV
2,4-D	7–22	II–III
Metsulfuron-methyl	70–147	IV
Thiobencarb	19–24	III
Pyrazosulfuron-ethyl	16–21	IV

Table 1. Half-lives of some herbicides in soil

- ***Animal production***

Even more serious is the situation of intensive animal farming for meat production.
Intensive farming is designed to ensure the highest possible yield for the smallestcost, operate without regard for public health, the environment, food safety, the health of the animals themselves and the resident communities [11].
Intensively raised meat animals are:

- Chickens
- Cattle
- Sheep/goats
- Equines
- Rabbits
- Ducks
- Geese

Intensive breeding facilities are true torture apparatuses, where animals live in horrible conditions of filth and overcrowding, they are continuous cycle extermination chains, which would horrify the mostevil of torturers.

In China the systems of sacrificing farm animals reach the highest levels of perversion, the sacrificial production process uses all types of animals for food purposes with a particular predilection for exotic animals, dogs, rats, bats and all species of food that are unavailable in other cultures.

*"Since the 1970s, global meat production has tripled: today more than **60 billion animals** are used for the production of meat, eggs or milk and, if current trends persist, the global livestock population could exceed **100 billion by 2050** – more than 10 times the human population."* [11].

The substances used to optimize production are:

- Hormones that promote rapid growth;
-Antibiotics to prevent rapidly spreading infectious diseases;
-Food additives to develop particular organoleptic qualities

All these chemicals are concentrated in the parenchyma and remain in the meat after slaughter. Thus,they enter directly into the consumers' diet.

The ***Food and Feed Information Portal Database*** describes a list of numerous additives, 411 to be exact, allowed for food use up to now and for each additive it contains notes for correct use and maximum concentration limits allowed [12].

- ***Aquaculture*** for the breeding of marine species also presents the same problems

critical issues. The use of antibiotics and other drugs is the norm, dyes are currently used to improve the appearance of fish meat and their organoleptic properties.

- ***Pastry and bakery products***

In this food sector chemistry reigns, with cocktails of colourants, sweeteners, emulsifiers, thickeners, which are added to flours, egg extracts, condensed milk, fats, already polluted at the origin, all for the delight of more demanding consumers.

- ***Soft drinks and beverages***

The expression that best identifies this sector of the market is: ***"they give it to us to drink".***

Carbonated soft drinks is in fact a gigantic business estimated at over 400 billion units sold every year worldwide, which corresponds to an equal quantity of solid waste from containers abandoned in the environment [13].

With drinks, sophistication has reached its golden rule, the gold standard in production, in this market everything has been experimented with, from carbonated drinks to energizing ones, passing through fortified ones, where colourants, sweeteners and preservatives are added more absurd substances, from fat-soluble vitamins (insoluble in watery drinks), organophosphates, carbonic acid (for effervescence), etc.

Added to these substances are microplastics, formed from the residues of environmental degradation of the infinite plastic products, which form real floating continents in the oceans, and which we find not only in drinks, but also in other foodstuffs. They are made up of imperceptible microscopic plastic particles present in solution in variable quantities.

As microplastics move up the food chain, they concentrate in apex predators.

Some magazines have drawn up a ranking of drinks containing microplastics, from those with a higher content to those with a lower concentration, but these are always microplastics.

And what about containers?

This is a real jungle, where there are no rules establishing the substances allowed for the internal lining of packages and their maximum tolerated concentration.

The cans are in fact covered internally and externally with a layer of synthetic resins, not declared, including plastics such as polyester, which weigh about 3% of the packaging.

In industrialized societies, deregulation, the mystification of information, the sophistication and adulteration of foods with the addition of additives of all kinds dominate, and at every stage of the production chain, as we have documented. So, we ask ourselves, what is the point of adopting the hygiene rules codified in the HACCP system if all food products are polluted?
It is as if we wanted to cure or prevent diseases and intoxications with other toxic substances, as happens with drugs, it is no coincidence that the word drug in Greek means POISON.

Contaminating food with additives is allowed.

In fact, polluting is allowed, you just need to respect the permitted limits.
The authority responsible for food safety, EFSA: European Food Safety Authority, dictates the rules and acceptable levels of additives.
Here is what he writes and how he justifies the widespread use of these substances [14]:

Overview

"*Chemical substances can play an important role in* ***food production and preservation****.*
Foodadditives can, for example, prolong the shelf life of foods; others, such as colors, can make food more attractive. Flavorings are used to make food keyboard. Food supplements are used as sources of nutrition.
Food packaging materials *and containers such as bottles, cups and plates, used to improve food handling and transport, can contain chemical substances such as plastic, elements of which can migrate into food. Other chemicals can be used to fight diseases in farm animals or crops, or can sometimes be found in food as a result of a production process such as heating/ cooking or decontamination treatment."*

Consequences of the use of additives for health

In a special edition of the journal Molecules, (ISSN 1420-3049) entitled "Food Additives and Food Supplements", the Authors, Dr. Raffaella Boggia & Dr. Federica Turrini observe [15]:
"Recent technological advances, population lifestyle changes, and socioeconomic trends around the world point to the need for new and, possibly, minimally processed foods and food ingredients, with high health benefits. Today, foods are not only intended to satisfy hunger and provide the necessary nutrients but should confer additional health benefits to humans by improving physical and mental well-being and preventing diet- related diseases.
On the global market, the demand for dietary food supplements, as health-promoting products, is continuously increasing. In addition, there is also a growing demand for new natural food additives to replace synthetic ones."
However, the use of additives in the food industry is widespread and widely adopted and tolerated.

Todate, the substances allowed in foods in America and Europe are codified by the FDA and EFSA, respectively, let's see what they are and how many there are:

FOOD AND DRUG ADMINISTRATION Food Additive Status List provides guidance on using the list: https://www.fda.gov/food/food-additives-petitions/food-additive-status-list , [16]

"This Food Additives Status List, formerly called Appendix A of the Investigations Operations Manual (IOM), organizes additives found in many parts of 21 CFR into one alphabetized list. Additives included are those specified in the regulations promulgated under the FD&C Act, under Sections 401 (Food Standards), and 409 (Food Additives). The Food Additives Status List includes short notations on use limitations for each additive. For complete information on its use limitations, refer to the specific regulation for each substance."

According to the FDA, there are approximately 500 permitted substances collected in a list that includes various classes divided by the effectthat they produce, while according to the European Commission there are 411 additives, divided by class and by properties and effects produced Fig.4 [17].
https://ec.europa.eu/food/food-feed-portal/screen/food-additives/search

Additive	% Of Use
Flavors	63,5
Vitamins	6,9
Emulsifiers	5
Buffering substances	3,5
Chelating substances	2,6
Colours	2,1
Preservatives	1,8
Stabilisers	1,8
Antioxidant	1,7
Sweeteners	0,4
Others	10,8

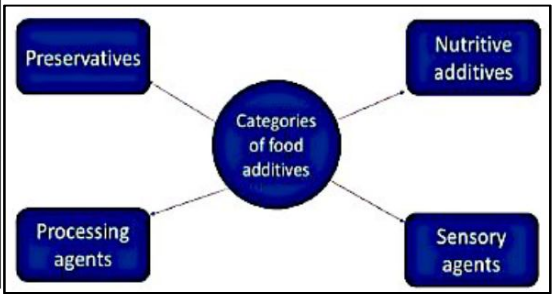


Figure 4 – Different types of additives

A large literature has examined additives used in foods and their potential toxic effects on consumer health, and has documented their pathogenic effect [18-23].

The topic of additives is of primary importance due to the indiscriminate and widespread use of these substances in food, which are then ingested together with food.
In underdeveloped countries, where hunger and malnutrition are the main causes of death, the problem of pollution is less felt.
So the alternative we will face in the not too distant future is: risk getting sick from consuming the adulterated foods that the industry offers us, or die of hunger?
The World Health Organization highlights the following critical issues in the use of food additives Fig.5:

Food safety
WORLD HEALTH ORGANIZZATION
19 May 2022

Key facts

- **Food safety, nutrition and food security are inextricably linked.**
- **An estimated 600 million – almost 1 in 10 people in the world – fall ill after eating contaminated food and 420 000 die every year, resulting in the loss of 33 million healthy life years (DALYs).**
- **US$ 110 billion is lost each year in productivity and medical expenses resulting from unsafe food in low- and middle-income countries.**
- **Children under 5 years of age carry 40% of the foodborne disease burden, with 125 000 deaths every year.**
- **Foodborne diseases impede socioeconomic development by straining health care systems and harming national economies, tourism and trade.**

Figure 5- The economic and health consequences produced by the use of additives

While in-depth investigations highlight the serious consequences produced by additives for the health of consumers, fig.6.

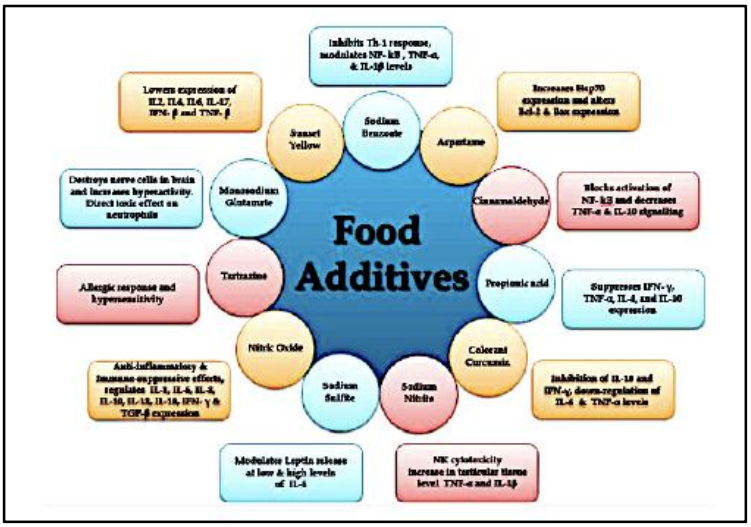


Figure 6- Negative consequences on the general metabolism induced by additives

The most significant pathogenetic effect resulting from the use of these substances is produced at the gastrointestinal level, where the first contact occurs between the chemical compounds, which act with different mechanisms of action, and the intestinal mucosa.
The results of the research are shocking due to the consequences caused on the gastrointestinal system, directly involved by their toxic action.

The gastrointestinal barrier is the first to undergo profound changes, and to lose its essential function of selecting and filtering food substances, thus allowing free access to substances that have no nutritional value, but have a high, and so far unknown, pathogenic potential. Fig.7 [24].

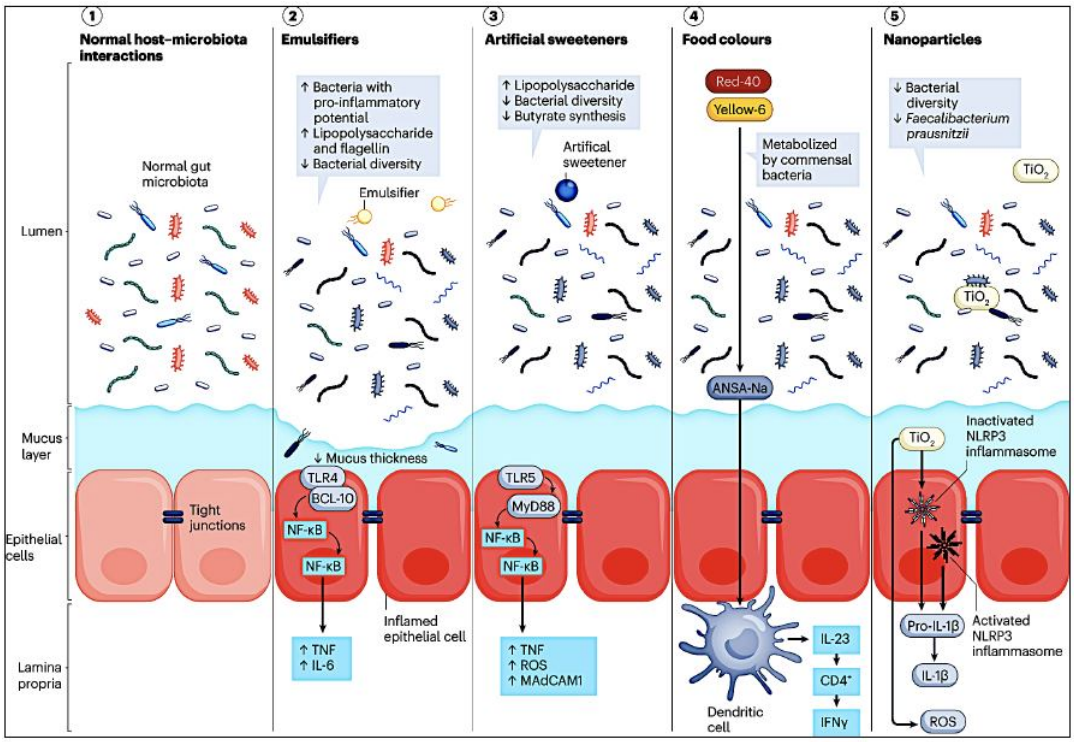


Figure 7- From: Ultra-processed foods and food additives in gut health and disease, nature reviews gastroenterology & hepatology, Published: 22 February 2024

The profits of the food industry

All things considered, if this system of intensive food production presents few nutritional benefits and many risks for the health of consumers, why continue, “cui prodest”? – (Latin expression meaning "who benefits?".

The answer is simple, you just need to look at the enormous profits produced by the junk food trade to understand that the biggest beneficiary, in reality the only one, is the food industry Fig.8.

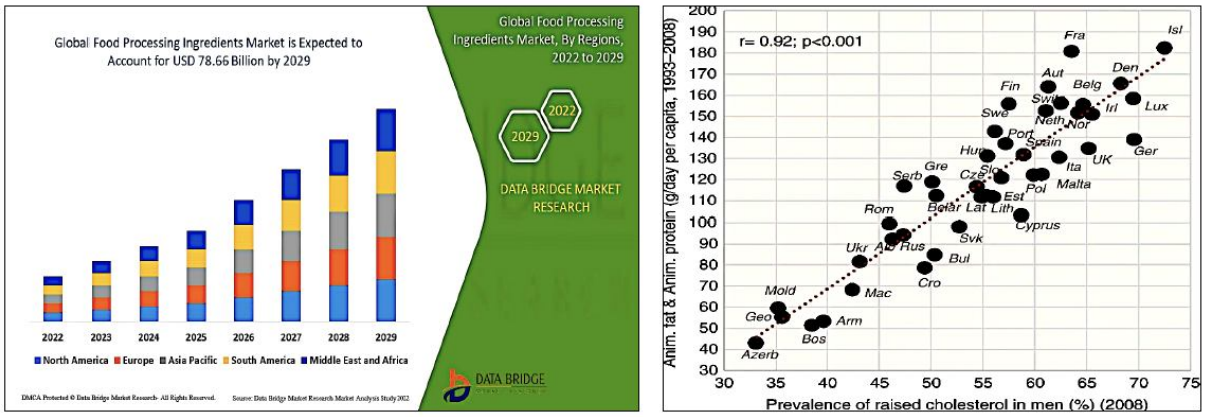


Figure 8- Increase in processed food with increase in cholesterol

As can be seen from the graph, it is a rapidly expanding market, with exponential growth that follows the parallel trend of the increase in pathologies (hypocritically defined as eating disorders) linked to the use of additives and junk food [25].

The agri-food industry represents the leading manufacturing sector in the EU (with over 1,000 billion euros in turnover, 30 billion in positive trade balance, 4.24 million employed. The interests at stake, inevitably, are enormous on various fronts. Large industrial groups vs. PMI, production chains vs. DOs, Northern vs. Southern Europe, balanced foods vs. 'indulgence' foods (or *junk food* depending on your point of view).

In order to obtain the greatest profit from food, the industry has produced ultra-processed foods that induce addiction, similar to that produced by drugs, and stimulate uncontrollable consumption, consumption fuels consumption, in a perverse vicious circle [26-29].

From my previous work describing the direct link between additives and health consequences, I extrapolated the following sentences [30]:

“The success and economic expansion of the food industry can be explained by the fact that food represents a vital biological necessity and is one of the most complete and complex systems of sensory stimulation with olfactory, visual, tactile and gustatory stimuli, which act simultaneously on different nervous centers and reward physiological needs.

Extensive literature has shown that the food industry makes extensive use of ultra-processed foods (UPS) which are characterized by the presence of food additives and processed ingredients, which are not used in home cooking, such as casein, whey, gluten, hydrogenated oils, hydrolysed proteins, modified starches, invert sugar, etc.

Junk food coincides with the category of ultra-processed foods, food and drinks, due to the presence of ingredients (e.g. palm oil) and the excesses of fats and saturated fats, added sugars and/or salt lead to completely unbalanced nutritional values . And it is precisely for this reason that junk food is also identified with the acronym HFSS (High in Fats, Sugar and Sodium).

The close link between consumption of ultra-processed foods and its association with food addiction has been documented”.

The food transition

To solve the problem of the growing demand for food, alternative food sources are being sought which, in addition to offering the same nutritional properties as natural ones, have the apparent advantage of a lower environmental impact.

The natural sources of traditional foods are running out, as a result of intensive industrial production, which does not allow their replacement. Once again, our eating preferences and habits will be put to the test, and for the foreseeable future we are going to have to convert to synthetic foods produced in laboratories.

For now, their production is in an experimental phase and little used, and to replace proteins of animal origin, in addition to synthetic meat, it will be possible to use those obtained from insects, which have been already widely consumed in the canteens of many eastern countries.

The literature on the use of insects as an alternative food source to the natural one is rapidly expanding.

All scientific works agree that insects are a safe and sustainable food.

Thus, we discover that they are rich in nutrients of high biological value, higher than that of traditional foods, and contain numerous beneficial substances, effective in the prevention of many of the most widespread pathologies. A partial list of the prodigious, or rather miraculous, healing activities attributed to the various species of insects is shown in the following Table 2:

Insect Species	Sample Used or Bioactive Compound Identified	Type of Study	Bioactivities
Mealworms (*Tenebrio molitor*), buffalo worms (*Alphitobius diaperinus*), Palm worm larvae (*Rhynchophorus ferrugineus*), Evening cicada (*Tanna japonensis*), Black ants (*Lasius niger*), African caterpillars (*Imbrasia oyemensis*), Silkworm (*Bombyx mori*), Grasshoppers (*Calliptamus italicus*), Crickets (*Acheta domesticus*), Mini crickets (*Acheta domesticus*), Giant water bugs (*Lethocerus indicus*), Scolopendra gigantea (*Scolopendra*)	Water and liposoluble extracts	In vitro	Antioxidant
Crickets (*Gryllodes sigillatus*)	Bioactive peptides	In vitro	Antioxidant, antihypertensive, antidiabetic, antiglycemic, anti-inflammatory
Weaver ants (*Polyrhachis dives*)	Thirteen non-peptide nitrogen compounds (most were identified as alkaloids)	In vitro	Anti-inflammatory, immunosuppressive, renoprotective
House cricket (*Acheta domesticus*) and tropical banded cricket (*Gryllodes sigillatus*)	Chitin and chitosan	In vitro	Hypolipidemic, antimicrobial
Mealworms (*Tenebrio molitor*) and Chinese beetle (*Ulomoides dermestoides*)	Extract with main components of saponins, carbohydrates, and proteins	In vitro	Antioxidant and antimicrobial
Bee pupae	Polypeptide components	In vitro and in vivo	Immunomodulatory
Mealworms (*Tenebrio molitor*)	Supercritical fluid CO_2 extract	In vivo	Immunomodulatory
Green beetle (*Mimela* sp.)	Aqueous extract	In vivo	Antioxidant and immunomodulatory
Mealworms (*Tenebrio molitor*)	Ethanol extract	In vitro and in vivo	Anti-adipogenic and antiobesity
Silkworm (*Bombyx mori*)	Powder	In vivo	Anti-Parkinson activity
Crickets (*Gryllodes sigillatus*)	Bioactive peptides	In vivo	Anticoxidant
House cricket (*Acheta domesticus*) and mealworms (*Tenebrio molitor*)	Polyphenolic ethanol and ethanol: water extracts	In vitro	Antioxidant and antiobesity
House cricket (*Acheta domesticus*)	Polyphenolic methanolic extracts	In vitro	Antioxidant
Mealworm (*Tenebrio molitor*) and grasshopper (*Sphenarium purpurascens*)	Flour fermented with *Lactococcus lactis* strains	In vitro	Antioxidant and antihypertensive
Silkworm (*Bombyx mori*)	Oil	In vivo	Antioxidant and anti-dyslipidemia

Table 2-Various species of insects and their bioactivities

According to the authors who have written articles on this topic, not only are insects an excellent food rich in substances of high biological value, but they have the advantage of preventing practically all pathologies that affect humanity [31-36].

They will soon replace, as stated by scholars, anti-inflammatories, antibiotics, anticancer drugs, immunostimulants, etc.

To our great satisfaction we might finally have many effective low-cost therapeutic remedies available.

But what leaves us amazed is not to discover the celebrated positive properties of insects, but the superficiality with which the authors themselves list the presence of toxic substances in these exotic foods. Pesticides of all kinds, heavy metals, such as cadmium, lead, mercury, are concentrated in the edible parts of these small food resources, which however, as they are keen to underline, ***are below the limits permitted*** by the World Health Organizations.

So that the emphasized biological value of these foods is largely counteracted by their toxic content.

There are no words to comment on the reckless ease with which worthy scholars make such antithetical statements.
The maximum demonstration of reduced critical judgment and logical conflict is reached when the authors themselves complain about the absence of rigorous legislation that effectively regulates the safety of this food resource.

Some Authors they detect that: *"The number of scientific articles increased exponentially, and more than 290 start ups are now engaging in its production and marketing"*, and they askHow come?

And this is how crickets, larvae, and thousands of insect species are present in considerable quantities on the market ready for consumption. We will have to change our diet, from omnivores we will become insectivores, entomophagous, with a surprising biological evolution we will transform insects from threats to our food production into foods themselves.

But if natural food sources are replaced entirely by synthetic food and edible insects, what will happen to our ecosystem? And what fate will the many animal and plant species that are now used for food suffer? Will they be abandoned to their biological fate to maintain biodiversity or will they be eliminated to make room for artificial food production settlements?
The need to use additives is essential in the intensive industrial production system.
It is clear that the same insects present in nature or bred for nutritional purposes must be fed.
Therefore, synthetic foods and edible insects will necessarily have pesticides, additives and heavy metals in the raw materials from which such synthetic foods are produced or are used as insect feed.
This one will perpetuate the recycling of toxic substances, but so rich in beneficial effects.

In the future years there will be an epochal change, and when all food sources are exhausted, and we will no longer have alternative food available, the feared posthumanism, described in literary and science fiction models (Philip K. Dick first and William Gibson then), it will become current and to survive we will have to become cannibals.

Conclusions

In light of the results that research on the topic of nutrition has highlighted, we must ask ourselves what progress industrial food production has brought and will bring in the future, be it natural or synthetic. Was it advantageous to use advanced technologies and sophisticated chemical substances only to improve its production and organoleptic aspect, without bringing any nutritional benefit?
We are not able to give a rational answer to these questions, because the consumer society has subjugated and conditioned us psychologically and has adulterated, together with food, also our critical judgment.

Will we be able to free ourselves from this state of subjection and rediscover the taste for genuine things and for the authentic value of nature, outside of which our destiny, as a civilization, is already sealed.

Let's work hard to achieve this, let's make Hippocrates' motto our own and amplify it:
to the point of also embracing primary prevention, the valorization of nature for the respect and conservation of natural resources.
Let's make food and a healthy lifestyle our priority, and our medicine.

Disclaimer (Artificial intelligence)

Authors hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

References

[1]Advertising in the Food Industry, https://smallbusiness.chron.com/advertising-food-industry-10634.html

[2]Nath, C.P.; Singh, R.G.;Choudhary, V.K.; Datta, D.; Nandan,R.; Singh, S.S., Challenges andAlternatives of Herbicide-Based Weed Management,Agronomy 2024, 14, 126

[3]Adrianna Kubiak et al; The Problem ofWeed Infestation of Agricultural Plantations vs.the Assumptions of the European Biodiversity Strategy

[4] National Institute of Food and Agricolture; Researchers Helping Protect Crops From Pests, February 6, 2023, https://www.nifa.usda.gov/about-nifa/blogs/researchers-helping-protect-crops-pests

[5] Emerging chemical risks in Europe PFAS > Emerging chemical risks in Europe PFAS

[6] Eloi Chazelas et al; Exposure to food additive mixtures in 106,000 French adults from the NutriNet□Santé cohort, Scientific Reports, Naatureportfolio, (2021) 11:19680

[7] Inetianbor, J. E., et al; EFFECTS OF FOOD ADDITIVES AND PRESERVATIVES ON MAN- A REVIEW, Asian Journal of Science and Technology Vol. 6, Issue 02, pp.1118-1135, February, 2015

[8] Sunday P. Ukwo et al; Food Additives: Overview of Related Safety Concerns, Food Sci Nutr Res. 2022; 5(1): 1-10.

[9] Mary M. Mwale; Food Additives: Recent Trends in the Food Sector, intechopen.109484

[10]From the Food Intolerance Network: www.fedup.com.au- All food additives are listed below by code numberand by name, Date of last update October 2023

[11] Cristian Perinelli; Allevamenti Intensivi, Animali come "Macchine da Riproduzione", Green Marketing 17 OTTOBRE 2022

[12]*European Commission; Food and Feed Information Portal Database, Food additives (411 matching records) ;* ***https://ec.europa.eu/food/food-feed-portal/screen/food-additives/search***

[13]Dati 2017, fonte *Food Drink Europe*, su https://www.fooddrinkeurope.eu/publication/data-trends-of-the-european-food-and-drink-industry-2017/

[14] EFSA EUROPEAN FOOD SAFETY AUTHORITY Chemicals in Food , 14 October 2020, https://www.efsa.europa.eu/en/topics/topic/chemicals-food

[15] Raffaella Boggia, Federica Turrini; Food Additives and Food Supplements, A special issue of ***Molecules*** (ISSN 1420-3049).

[16] U.S. FOOD & DRUG ADMINISTRATION; Food Additive Status List, 09/26/2023

[17] EUROPEAN COMMISSION; Food additives (411 matching records), https://ec.europa.eu/food/food-feed-portal/screen/food-additives/search

[18] Carol L. Roberts et al; Hypothesis: Increased consumption of emulsifiers as anexplanation for the rising incidence of Crohn's disease, Journal of Crohn's and Colitis (2013) 7, 338–341

[19] Aaron Lerner, Torsten Matthias; Changes in intestinal tight junction permeability associated with industrial food additives explain the rising incidence of autoimmune disease, Autoimmunity Reviews 14 (2015) 479–489

[20] Emanuele Rinninella et al: Food Additives, Gut Microbiota, and Irritable BowelSyndrome: A Hidden Track, Int. J. Environ. Res. Public Health 2020, 17, 8816

[21] Patrick Sauvant; The More we Offer «Light-Food» To the Consumers, the More Obesity Increases: Could Emulsifiers be Responsible?, J Nutr Health Food Eng 2015, 3(2): 00104

[22] Emma P. Halmos et al ; Review article: emulsifiers in the food supply and implicationsfor gastrointestinal disease, Aliment Pharmacol Ther. 2019;49:41–50.

[23] G. Pagliai1 et al; Consumption of ultra-processed foods and health status: a systematic reviewand meta-analysis, British Journal of Nutrition (2021), 125, 308–318

[24] Kevin Whelan et al; Ultra-processed foods and food additives in gut health and disease, nature reviews gastroenterology & hepatology, Published: 22 February 2024

[25] STATISTA , Food Market , Market Insights Consumer, https://www.statista.com/outlook/

[26] Beyer, F. et al ; Neuroanatomical correlates of food addiction and obesity in the general population, this version posted September 7, 2018 ; https://doi.org/10.1101/411504

[27] The food System ; *World Nutrition Volume 7, Number 1-3, January-March 2016 .*

[28] *Exploring the consumption of ultra-processed foods and its association with food addiction in overweight children,Andrea RochaFilgueiras et al ;* **AppetiteVolume 135**, 1 April 2019, Pages 137-145

[29]Behavioral AddictionsCriteria, Evidence, and Treatment 2014, Pages 143-184, Chapter 7 - Food Addiction: Evidence, Evaluation, and Treatment, Yvonne H.C.Yau et al.
[30] B.Riccardi et al.; From Nutrigenomics to Microbiomics: New Interpretations. Journal of Biotechnology & Bioinformatics Research. SRC/JBBR-129. *Volume 3(1): 1-8* March 20, 2021
[31] José E. Aguilar-Toalà et al; Beyond Human Nutrition of EdibleInsects: Health Benefits and SafetyAspects. Insects 2022, 13, 1007.
[32] Donatella Aiello et al; Edible Insects an Alternative Nutritional Source of BioactiveCompounds: A Review, Molecules 2023, 28, 699.
[33] Yaxi Zhou et al; Nutritional Composition, HealthBenefits, and Application Value ofEdible Insects: A Review. Foods 2022,11, 3961.
[34] Arnold van Huis et al ; Edible insects:future prospects for food and feed security, food and agriculture organization of the united nations, Rome, 2013
[35] Arnold van Huis; Nutrition and health of edible insects, Current Opinion in Clinical Nutrition and Metabolic Care · February 2020
[36] Andrea M Liceaga ; Processing insects for use in the food and feed industry, Current Opinion in Insect Science 2021, 48:32-36