IMPACT OF GMOs AND OF FOOD ADDITIVES ON HUMAN HEALTH

IMPACTUL ORGANISMELOR MODIFICATE GENETIC ŞI A ADITIVILOR ALIMENTARI ASUPRA SĂNĂTĂŢII UMANE

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Abstract: *Nowadays, genetically modified soy, cotton, maize, and rape are cultivated on over 25% of the agricultural areas of the world. The genes introduced into these crops confer them resistance to certain herbicides or toxic products used to control specific pests. In the U.S.A., they cultivate almost 2/3 of the bio-engineered crops at global level. Other countries in which genetically modified crops are cultivated in considerable amounts are Argentina, Canada, Brazil, China, and South Africa. ISO standards to be developed will be relevant globally and will contribute to the facilitation of international trade and services through consistent approaches at international level of identification and analysis of genetically modified foods. Additives authorised at present can be used on the market, but once the updating process is complete, any additive not on the authorised additive list will be prohibited. The food industry uses a large number of natural and artificial aromas, i.e. about 2,600 such substances.*

Keywords*: impact, food additives, health*

INTRODUCTION

When the U.S.A. exported, for the first time, in 1996, to Europe, genetically modified soy, the European Union introduced, as a response to public debates, compulsory labelling of foods derived from GMOs. In April 2004, the new legislation came into use, which extended labelling stipulations. Other governments, following the example of the E.U.,

developed labelling regulations for foods obtained from genetically modified produce. Approaches concerning the labelling of genetically modified foods differ considerably from one country to another [1, 3, 6, and 7].

The strategy for the detection of genetically modified materials in foods implies the following:

- a sample of the food produce;
- protein extraction and immune tests;
- DNA extraction;
- RPL quantitative extraction;
- RPL qualitative extraction.

In a period when nutrition is dominated by "artificialised" produce as a result of intensive processing which preserves only a few of the raw material features, the impact of foods on human health is of great importance. This is why we need lots of transparency and to get aware of the need to reduce risks.

Having invaded our daily life so insidiously, toxic foods have become so "natural" that almost nobody sees the real hazard they represent.

Many people would find it exaggerated to give up white sugar, margarine, aroma enhancers foods, synthetic colorants, and so on.

Disguised under all kind of packages and tempting advertisements, coloured in light colours and smelling aggressively tempting, chemical-full foods have penetrated everybody's existence [4].

Most people have adopted, willy-nilly, this type of nutrition, because its effects are not visible in a month or a year, but after longer periods of time.

There are voices, lately, asking more and more insistently, and with solid arguments, a return to the nature.

Marketers have found an ingenuous solution to all that – they write on many of these produce, "natural", "nature champions", "vitaminised produce", "health elixir"", etc. [2, 5].

In fact, processed foods are small mixtures of produce of chemical combinations with a little something organic in them.

Yet, if we study, even very hastily, the list of components of each produce we eat, we can realise the kind of "torture" we subject our bodies day after day.

Science is condemned to live together with uncertainty, even if, from a consumer's point of view, this is difficult to accept.

No matter the constraints, food safety should be the main goal of a civilised society.

MATERIAL AND METHOD

DNA technology, which has lead to genetically modified organisms, has also allowed the development of a characteristic, precise detection method. To see whether a food was obtained from a GMO, the method consists in searching for modified DNA segments and/or new proteins resulted from genetic engineering. The starting point is proper sampling to allow representative samples of the researched produce.

RESULTS AND DISCUSSION

Our daily food hides a series of perils among which those substances with no nutritive value that are used in order to improve quality or to allow advanced processing technologies, i.e. food additives.

Some food additives are obtained form natural sources (e.g., soy, maize, beet root), while other are obtained through chemical synthesis.

The presence of food additives in the composition of processed foods – be they natural or synthetic – is subjected to legislation which establishes the amounts allowed according to safety standards.

At the beginning of the '80s, the European Union standardised the use of food additives by adopting a system of codification. Thus, additives included in the E.U. list are coded "E", from Europe, followed by a number for each of them.

This type of symbolism allows consumers to recognise food additives, no matter the language of the label, showing clearly which are authorised and which are not.

The total number of additives acknowledged according to the C.E.E. is 301, and the total number of food additives acknowledged in Romania, according to the W.H.O. nr. 75/16 December 1998, is 201.

On international lists (as well as on the national one), additives are classified into 25 categories and have specific numbers (Table 1).

Table 1 Additive codes

Type of additive	Code	Notes
1. Colorants	E 100 – E 182	Most start with 1
2. Preservatives	E 200 – E 297	Most start with 2
3. Antioxidants	E 300 – E 390	Most start with 3
4. Emulsifiers	E 400 – E 496/E 1000 – E 1001	Emulsifiers and stabilisers
5. Melting salts	E 400 – E 496	
6. Thickeners	E 400 – E 496	
7. Jellifiers	E 400 – E 496	
8. Stabilisers	E 400 – E 496	
9. Taste agents	E 600 – E 640	
10. Acidifiers	E 300 – E 390	
11. Acidity and pH correctors	E 300 – E 390	
12. Anti-clogging agents	E 200 – E 580	
13. Modified starch	E 1400 – E 1450	
14. Sweeteners	E 900 – E 999	
15. Aeration substances	E 400 – E 496	
16. Antifoaming agents	E 500 – E 580	
17. Surface and whitening agents	E 900 – E 999/E 1500 – E 1520	
18. Meal treating agents	E 500 – E 580/E 900 – E 999	
19. Strengtheners	E 500 – E 580	
20. *******	E 1200 – E 1202/E 1400 – E 1450/E 1500 – E 1520	
21. Sequestrants	E 400 – E 496	
22. Enzymes	E 1100 – E 1105	
23. Filling agents	-	
24. Propulsory gases	E 900 – E 999	
25. Other categories	-	

Source: Banu, C., Alexe, P. & Vizireanu, Camelia. (2003). *Procesarea industrială a cărnii*. Bucureşti: Ed. Tehnică.

In the spirit of the present norms, we define the following as below:

1. **Preservatives** – substances that prolong the shelf period of foods by protecting them against alteration caused by microorganisms. Examples:

- benzoic acid and its salts: E 210 – E 213;
- ascorbic acid and its salts: E 200 – E 203;
- SO_2, sulphites: E 220 – E 228;
- K and Na nitrites: E 249 – E 250;
- K and Na nitrates: E 251 – E 252;
- acetic acid and its salts: E 260 – E 261;

Food safety law stipulates that food produce labels should mention the preservatives used by either their usual name, or by the name of the ingredients. The same law stipulates that producers cannot use preservatives to deceit the consumers, i.e. making them believe a certain food looks other than in reality.

For instance, preservatives containing sulphites are forbidden in meat because they confer it a red colour, suggesting it is fresh.

Nitrates and nitrites, in combination with salt, are used as anti-microbial in meat produce, because they stop bacterium spore development.

Nitrates are used as preservatives to flavour and fix colour in red meat and in chicken and fish produce.

Sulphites are used, primarily, as antioxidants to prevent and reduce discoloration in fruits and vegetables – apples and potatoes.

It is forbidden to use sulphites in foods that are also sources of thiamine (VB1), since they destroy nutrients.

Symptoms reported by sulphite-sensitive people consist in difficult breathing and stomach aches.

2. **Antioxidants** – substances that prolong the shelf period of the foods by protecting them from oxidation (rancidising, colour changing).

Oxidative degraded fats have a negative impact on the human body through the destructive action on the vitamins A, E, C, B_1, B_2, B_6 in the foods, by affecting the gastric and intestinal mucous.

Vitamin C is one of the most efficient antioxidants. A recent study shows that vitamin C prevents the formation of cancer-inducing nitro amines, stimulating the immune system and protecting against chromosome damage.

3. **Acidifiers** – ensure food protection against microbes, increasing food produce acidity. Examples:

- citric acid - E 330;
- tartaric acid - E 334;
- lactic acid - E 270;
- acetic acid - E 260;
- malic acid - E 296.

4. **Buffer substances** – are used in the regulation and maintenance of the pH specific to different foods. Are such substances the salts of citric, tartric, and malic acids (E 331 – E 352).

5. **Anti-foaming agents** – reduce or limit foam-formation: E 465/E 900A – E 900B

6. **Emulsifiers** – substances that make possible the formation and maintenance of homogeneous mixtures. Examples:

- lecithin – E 322;
- salts of fatty acids – E 470;
- glycerids – E 471 – E 472;

Bread and similar produce contain emulsifiers that maintain freshness and allow dough to be processed in massive amounts. They are used in ice-cream, cakes, whipped cream, sauces, and feta cheese.

7. **Jellifiers** – confer consistency to foods through gel formation.

8. **Sequestrants** – make up chemical complexes with metal ions.

9. **Stabilisers** – maintain physico-chemical properties.

10. **Thickening agents** – increase viscosity.

The environmental commission of the European Parliament pleads for proper labelling of food produce containing nitric colorants (such as E107 or E110) and for authorisation of flavours and enzymes only if there are benefits for the consumers. At present, the use of food additives is regulated by a series of E.C. regulations.

The four regulation propositions are meant to simplify and update the legislation in the field, taking into account the latest scientific findings. Even if, on the whole, the common position of the Council is accepted, the members of the Commission for environment, public health and food safety have reintroduced certain amendments to clarify certain procedures and to improve consumer protection.

The first regulation establishes the common procedure at European level for the authorisation of food additives, enzymes and flavours. In the first report developed by Åsa Ingrid Gunilla Westlund (PSE, Sweden), the members of the European Parliament ask, through their amendments, a more transparent procedure of licensing. This procedure will be centralised, transparent, and it will be based on risk analyses carried out by the European Agency for Food Safety (AESA/EFSA). The European Commission will manage the list of produce acknowledged. "The new regulation will bring forth a simplification for companies and will increase consumer protection".

The Parliamentary Commission has adopted unanimously a second report concerning the following food additives: sweeteners, colorants, antioxidants, emulsifiers, gelatines, and packaging gases. According to the report, food additives should be acknowledged and used only if they meet certain criteria: to be safe when used; to be strictly necessary to be used; to bring forth benefits for the consumers, and not to deceit them.

There should, however, be no risk that a food additive induces the erroneous conviction that the food produce contains other ingredients than the real ones. According to new available scientific data, children subjected to nitric colorants are exposed to risk (e.g., E 107 or E110). In this context, European officials have introduced a new amendment that asks the labelling of food produce containing them to warn against the fact that "nitric colorants can have allergenic effects and can induce hyperactivity in children".

As is the case in other food additives, specialists underline the fact that flavours and enzymes should be used only if beneficial for the consumers and only if they do not generate the false impression that the produce is fresh. If they are produced from GMO-ed organisms, this information should be labelled. As for flavours, they should be used only if the desired effect cannot be obtained by using condiments.

CONCLUSIONS

Together with the licensing procedure for new food additives, all additives on the market (about 300) are subjected to re-evaluation.A flavour is considered natural if the flavouring element is 95% natural (the European Commission suggested only 90%). Besides food safety and the

consolidation of the domestic market, we also need to take into account other interests of the consumers such as the need for foods to be as natural as possible.

It is absolutely forbidden to introduce food additives in non processed foods, as well as sweeteners and colorants in the foods for infants and little children. The members of the European Parliament have greeted the fact that the demand of the Parliament was accepted by the Council of Europe at first lecture according to which the licensing procedure should also take into account the effects of additives on human health and on the environment.

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