

РЕГИОНАЛНИ ЦЕНТАР ЗА ТАЛЕНТЕ ВРАЊЕ

WHAT DO WE EAT? - FOOD ADDITIVES AND HEALTH
ШТА ЈЕДЕМО? - АДТИВИ У ИСХРАНИ И ЗДРАВЉЕ

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ABSTRACT

Food additives are different natural and artificial substances which are added to foods during their production, processing, transport and storage. The additives can be divided into preservatives, antioxidants, PH control agents, thickeners, stabilizers, emulsifiers, anticaking agents, flavor enhancers, antibiotics and some other chemicals. The use of most food additives is considered to be safe. However, some additives can be toxic, and even carcinogenic. They are connected to many health problems. The manufacturers are obliged to label each product using an International Numbering System for Food additives (INS) – a letter E and a number which describes the additive used (E number). This survey will show which additives are most commonly used today, in which foods and in which quantities. The data about their harmful effects on peoples' lives will be shown, too.

Key words: food, additives, E numbers, health, diseases

РЕЗИМЕ

Прехрамбени адитиви су различите врсте природних или вештачких супстанци, које се додају намирницама у току производње, прераде, транспорта и чувања хране. Адитиве делимо на конзервансе, антиоксидансе, регулаторе киселости, згушњиваче, стабилизаторе, емулгаторе, средства против згрушавања, појачиваче укуса, антибиотике и разне друге додатне хемикалије. Примена већине адитива у исхрани се сматра сигурном, међутим, поједини адитиви могу бити токсични, па чак и канцерогени. Повезани су са низом здравствених проблема. Произвођачи су дужни да на производима тачно означе које адитиве садржи производ и то по међународној номенклатури, словом Е и одговарајућим бројем који тачно описује тај адитив (Е број). Ово истраживање показује које адитиве највише користимо у исхрани и у којим намирницама и количинама. Такође ће бити и изнети подаци о штетности коју неки адитиви могу имати по здравље човека.

Кључне речи: храна, адитиви, Е бројеви, здравље, болести

INTRODUCTION

The use of additives in the process of food preparation is nothing new. Even in the Bronze age, people used salt in order to make food tastier, smoke to preserve meat or some ferments in the production of bread, beer and cheese. The ancient Egyptians used many spices and food colours. They used sulphur, plant ash, loam, chalk, lime, algae, plant extracts, etc. Until the middle of the 20th century, only raw materials for food production were used, but later, following the industry development the production of processed foods has started. Then, the use of chemical substances in the process of food production has started, too. From its very beginning, the use of additives brought the controversy whether they were good or bad.

At the beginning of the 20th century, an international Congress was held in order to prevent the abuse of additives. The list of substances which could not be used in the food processing was made. This meant that any other substances could be used. Such 'negative lists' have been changed many times so far. So, today there is 'a positive list' of substances that can be used and any other ones are forbidden.

According to the international Codex Alimentarius, which was made by the experts from the World Health Organization and the Food and the Food and Agriculture Organization of the United Nations, food additives are chemical substances which usually do not have any nutritive value and can be added during the process of food processing in order to keep some features while transported and stored. They can not be the main food ingredients, but are only considered as something added in the process of food production for technological reasons. In addition, the quantities of additives must be regulated and must depend on the cause they are used for. They can be used only if:

- a) they do not harm health
- b) they are technologically necessary
- c) they are not used to deceive the consumers.

This international list contains more than 3,000 substances which can be added to food, but each country has its own laws which regulate the use of food additives, too. The countries which are members of the EU have their own laws which are stricter than in other countries, which have

less financial possibilities to study food additives. In Serbia, the use of food additives is regulated by the Rules on quality and other demands for food additives from 2001.

The use of food additives

1 Colours

The use of colours in food production is considered unnecessary. But, producers consider that their product will not be attractive to buyers because its natural colour is lost either during the process of its production or during its storage. Colours are used in almost all products: cakes, sweets, ice creams, chewing gums, cheese, oil, soup, butter, and many beverages.

According to their origin, colours can be divided into natural and artificial. Natural colours are derived from mineral, agricultural and biological sources. However, this process is complex and expensive, so artificial colours are often used. Artificial colours are never safe enough so the terms such as suspicious, risky, dangerous and carcinogenic are used when they are discussed. Some colours that were used are forbidden now. For example, there is evidence that red colour marked E-128, which was added to minced meat before, is decomposed into the substances which are carcinogenic and can cause gene mutations.

There is a list of products to which colours must not be added, like honey, pasteurised milk, eggs and egg products, coffee, flour, etc. and most of all food for babies and children.

Colours are often added to give a product a better look. For instance, red sweets can be associated with cherries because of their colour, but they are far from any fruit.

Colours are marked from E-100 to E-199 on the products.

How do colours affect our health?

Some artificial colours, like carmoisine red, can cause allergies even in the quantity of only 1mg. There have even been the cases of anaphylactic shock. Children are mostly affected and these colours can cause allergies, asthma, headache, hyperactivity, etc.

2 Preservatives

There are just causes for the use of preservatives. The most important one is the need to preserve some agricultural products for a longer period of time. Because of the preservatives and heat

treating, it is possible to keep season products (fruit and vegetables) fresh and use them during the whole year. Preservatives prevent the growth of microorganisms, bacteria and mould, even the most toxic ones – botulinum and mycotoxin.

Preservatives are marked from E-200 to E-299 on the products.

The most commonly used preservative in meat industry is salt, that is, the mixture of sodium-chloride, sodium and potassium-nitrite. They are marked with E-200 and E-259 on the products. The quantity of nitrites that is allowed is 100-175mg/kg. The problem is the fact that nitrites are often used with some other additives, which can badly affect the organism.

3 Antioxidants are chemical substances which inhibit the oxidation of fat so they are not only used in meat products but also in butter and cream production. One of natural antioxidants is vitamin C (ascorbic acid), but the artificial one, sodium-ascorbate, is often used. The quantity allowed is 0,02%.

Antioxidants are marked from E-400 to E-499 on the products.

The use of these substances in the quantity of 2g/kg a day is considered to be safe. Animal studies showed that the larger quantities led to the weight growth, and even to death in 30% of them. There have not been any health problems with humans, except for some instances of allergies with those who are too sensitive.

4 Thickeners – the substances which are added to reach a certain viscosity, **stabilizers** – the substances added to maintain a certain texture and **emulsifiers** – the substances which stabilize a certain emulsion are marked from E-400 to E-499 on the products. The most frequently used thickeners are gelatine, carrageenan, pectin, starch, acacia gum, etc, and some of the emulsifiers are polyphosphates. The studies have shown that the high quantity of phosphates, which can be found in juices, influence the hormones which regulate the calcium in the bones. A consequence of this is fractures in the period of adolescence and osteoporosis in some later period of life.

The quantities that are allowed vary depending on a product. For instance, the quantity allowed in the meat industry is up to 5,000mg/kg.

5 PH control agents are substances which maintain or change pH (acidity or basicity). These are, for example, citric and acetic acids. There are no 'laws' for these additives, but the manufacturers use the experience and act following their conscience. Together with **anticaking**

agents, which prevent the formation of lumps, pH control agents are marked from E-500 to E-599 on the products.

6 Flavour enhancers are substances which enhance a food’s existing flavours. They themselves do not have taste, but they just activate the receptors in the mouth enhancing the existing flavor. They can be found in many products: spices, sausages and other meat products, fruit and vegetable products, mayonnaise, mustard, ketchup, etc. One of the most commonly used is glutamic acid. How does it affect the organism? According to some studies, it causes ‘the Chinese restaurant syndrome’ associated with general weakness, numbness of arms and legs, headache, palpitations.

They are marked from E-600 to E-699.

7 Antibiotics and hormones are used during the breeding of animals and plants. They enforce the growth of plants and animals and prevent the infections. A man takes them with food.

They are marked from E-700 to E-799 on the products.

8 Sweeteners and glazing agents are marked from E-900 to E-999 on the products.

Sweeteners are used in the food industry in order to make a product beneficial to people with some health problems (diabetes, obesity). They are used instead of sugar, and they provide sweet taste, but less food energy. They can be divided into natural sugar substitutes and artificial sugar substitutes. Natural ones are in fact ‘sugar alcohols’ which taste like sugar, and are gained from birch skin, corn seeds, plums, berries, etc. Artificial sweeteners, like saccharin or aspartame, are used in more than 600 products: soft drinks, chewing gums...

Food additive	E number range
colours	E-100 до E 199
preservatives	E-200 до E-299
antioxidants	E-300 до E -399
stabilizers emulsifiers thickeners	E-400 до E 499
PH control agents anticaking agents	E- 500 до E -599

flavour enhancers	E -600 до E -699
antibiotics	E-700 до E-799
sweeteners glazing agents	E-900 до E-999

Table 1. Food additive classification

What do we most commonly eat?

1 Minced meat - a hamburger steak

This is favourite and most commonly used fast food of both the most pupils and the adults who are forced to eat outdoors because of their work. The most important parts of this product are meat, bread and different condiments, like ketchup, mayonnaise, mustard. How much meat is there in this product? According to my study, in most recipes there are the following ingredients: for 100kg of this product, you need 50kg of beef meat, 30kg of fat, 20kg of soy or soya mince, 2% of MSG or monosodium glutamate, 3% of polyphosphate, 1% of sodium glutamate or some other flavor enhancer and 1% of pepper.



Picture 1. Favourite fast food

A common condiment is mayonnaise, an emulsion which consists of plant oils (sunflower oil in even 75-80% cases in our country), egg yolk, emulsifiers, mustard and some acids, like a citric acid.

Another condiment which is often used is ketchup. The ketchup ingredients are not considered to be bad, but apart from tomato extracts, it contains additives which are not so good. These are

modified cornstarch, stabilizers – guar gum and xanthan gum, as well as a preservative – potassium sorbate.



Picture 2. Mayonnaise and ketchup

2 Meat products

These products contain mechanically separated meat, which means that apart from meat, there are bones, ligaments, and similar things that are not meat in them. Bones contain all the substances that are used in animal feeding, especially the toxic ones, so heavy metals, hormones, antibiotics can be found there. This is a great risk for people’s health.



Picture 3. The most commonly used meat products

The ingredients of ‘a chicken salami’:

Ingredients
Proteins (separated chicken) 10%

Water 52%
Protein soy products

Cornstarch
Dextrose
Emulsifier E-450
Thickeners E-407, E-401, E-415
Flavour enhancer E-621

Antioxidant E- 315
Colour E- 120
Preservative E 250
Spices and their extracts

Table 2. The ingredients of meat products

The study of other meat products has shown the presence of similar additives, with some differences concerning spices and their extracts.

3 Snacks: smoki, crisps, etc.

These products have a great nutritive value, so their consumption should be minimal. For example, 100g of smoki snack has 520kcal or 2176kJ, which is a quarter of the energy needed for a day. In this product, there are carbohydrates (50g), fats (38g) and proteins (only 12g). Cornstarch, plant oil and the emulsifier – soy flour can be found in this snack.



Picture 4. Favourite snacks

4 Soft drinks and juices

Most people consume different kinds of soft drinks and juices. Their content can be simply described as ‘unacceptable’. For example, fruit juices contain only 1% of fruits. The components of one of them are: water, sugar, carbon-dioxide, citric acid (E-330), a stabilizer - acacia gum (E-

414), wood rosin (E-445), a colour – beta carotene (E-160), antioxidants – ascorbic acid (E-300) and alpha-tocopherol (E-307), a preservative – sodium benzoate (E-211). Depending on the manufacturer, some juices also contain sodium cyclamate and aspartame as sweeteners, potassium sorbate and sodium benzoate as preservatives and other colours and flavor enhancers.



Picture 5. Fruit juices without fruits

5 Sweets

Different kinds of chocolate creams, which we often eat, do not contain many additives. They are mostly produced from natural ingredients, dried milk, cocoa, plant oils together with the emulsifier, such as soy lecithin and some flavor enhancers. They are not recommended only because of high percentage of sugar.

On the other hand, ice creams can not be produced and kept for a longer period of time without ‘chemistry’. So, apart from some natural ingredients, most ice creams contain stabilizers: agar-agar, guar gum, sodium alginate, sodium kazeinat (marked with E-406, E-410, E-412), then emulsifiers E-477, different colours and flavor enhancers. Fruit ice creams contain water, sugar, aromas, colours and stabilizers. Why are they called fruit ice creams?

Commonly used sweet products, like jaffa cakes, contain some other additives, too. Apart from the basic ingredients, like flour, eggs, butter, cocoa, there are also pectin, acidity regulators, emulsifiers, thickeners, citric acid, as well as some natural flavours.



Picture 6. Ice cream – a favourite dessert



The abuse of food additives

The use of food additives is mainly justified. However, food additives are often used even if they are not necessary. The studies done at the Institute for Meat Technology showed that the amount of the used substances in all meat products is bigger than it is allowed, that is, regulated by the law. Meat products often contain more phosphate and sodium nitrite than recommended. The use of some additives, like carrageenans in meat products, can cause digestive system disorders and a large intestine cancer.

In order to avoid conflicts with laws, manufacturers often add two or more similar additives instead of one, so that none of them is over the maximum quantity allowed. The greatest problem is adding phosphate and nitrite, precisely potassium nitrite E-246 and sodium nitrite E-250. The latest regulation of The Ministry of Agriculture forbids adding phosphate to meat products if they themselves already have it more than 5gr/kg.

According to some studies, a classification of food additives is made concerning their harmful effect on people's health:

Cause cancer	Cause gastro-intestinal diseases	Allergens	Cause liver and kidney diseases
E 105, E 121, E 123, E 125, E 126, E 130, E 142, E 152, E 210, E 213-217, E 240, E 330, E 477.	E 221-226, E 320-322, E 338-341, E 407, E 450, E 461-466.	E 230-232, E 239, E 311-313	E 171-173, E 320, E 322.

Table 3. Food additives and health 1

According to some other studies, food additives can be classified in this way concerning their harmful effect on people's lives, too:

Health hazard	Food additives
Carcinogenic	E131, E210, E211, E212, E213, E215 E216, E217, E142, E330
Very dangerous	E123
Dangerous	E110, E120, E124, E127
Forbidden	E102, E105, E111, E121, E125, E126, E130
Suspicious	E104, E122, E141, E171, E173, E180, E241
Intestinal disorder	E221, E222, E223, E224, E226, E407
Skin damage	E 230, E 231, E 232
Blood pressure disorder	E250, E251
Rash	E311, E312
Cholesterol disorder	E320, E321
Stomach disturbances	E322, E338, E339, E340, E341, E450, E461, E462, E463, E465, E466

Table 4. Food additives and health 2

CONCLUSION

Due to the way of life in the modern society, there is a need to consume processed and unhealthy food. In order to make this food more attractive and tastier, many additives are used. They mostly have a negative influence on health because they are not only harmful themselves, but also combined with other food ingredients, they can have even more serious consequences. There are many laws that regulate the quality and quantity of the additive used. Every day, we take a large number of additives: preservatives eating meat, emulsifiers and stabilizers eating sweets, many flavour enhancers, artificial colours and flavours, antibiotics and hormones. There are many food additives which do not have harmful effect on our health and can be used safely, but there are those which are suspicious. The consequences of some food additives can not be seen only in one generation, so they are observed and further studied, and then, if necessary, they are forbidden. The use of some food additives can cause different health problems : rash, allergies, digestive system disorders, some are carcinogenic, and some can cause gene mutations.

Taking everything into consideration, it is important to know what we eat – which additives can be found in the food we eat and what the risks are. The advice which everyone should follow is that fresh food must be used as much as possible and the processed, preserved and coloured food must be avoided as much as possible. Also, the artificial products must be replaced by the natural ones, for example, the artificial colours must be replaced by the natural ones from the plants. We should not take everything that is offered no matter how beautiful, colourful or cheap it is.

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