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CHANGE IN FOOD PERCEPTION – FROM TRADITIONAL TO FUNCTIONAL FOOD

ZMIANA W POSTRZEGANIU ŻYWNOŚCI – OD ŻYWNOŚCI TRADYCYJNEJ DO FUNKCJONALNEJ

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Summary: In a changing world, the concept of food also is also undergoing numerous changes. Along with the progress of civilization, the expansion of knowledge, the industrial revolution and the novel processing and preservation techniques, the role of food in Western societies has taken on a whole new meaning. Currently, the global market for functional foods is valued at 34 billion euro, which means that for a long time yet in Western civilization the prospective earnings will shape the consumer habits. It is widely recognized that the consumption of functional foods is a remedy for the overwhelming number of cases of civilization diseases that are directly related to lifestyle. The aim of this study was to discuss changes in the methods of food processing and the impact of public awareness of the health effects of processed foods on the characteristics of food products.

Keywords: traditional food, functional food, food industry development.

Streszczenie: W zmieniającym się świecie koncepcja żywności również ulega licznym zmianom. Wraz z postępem cywilizacji, rozszerzeniem wiedzy, pojawieniem się rewolucji przemysłowej oraz nowatorskich technik przetwórczych i konserwujących rola żywności w społeczeństwach zachodnich nabrała zupełnie nowego znaczenia. Obecnie światowy rynek żywności funkcjonalnej wynosi 34 mld euro, co oznacza, że przez długi czas w cywilizacji zachodniej perspektywa zarobków będzie kształtować nawyki konsumentów. Powszechnie wiadomo, że spożycie żywności funkcjonalnej jest środkiem zaradczym dla przytłaczającej liczby przypadków chorób cywilizacyjnych, które są bezpośrednio związane z stylem życia. Celem tego artykułu było omówienie zmian w sposobie przetwarzania żywności i wpływu świadomości społecznej na zdrowie produktów spożywczych przetworzonych na cechy produktów żywnościowych.

Słowa kluczowe: tradycyjna żywność, funkcjonalna żywność, rozwój przemysłu spożywczego.

1. Food industry development

Industrial development began in the 18th century in England and Scotland due to the demographic explosion that forced food and textile production on a large scale. Then the mechanisation of industry started, which effectively marginalised the manufactory and craft production. The second major cause of rapid industrial development was agrarian reform which involved a change from feudal type agriculture to the modern one. However, the construction of the steam machine was the turning point which made significant progress in the development of industry [Diebolt, Haupert 2016].

The characteristic feature of the third phase of the industrial revolution, which is currently operating are industrial districts - technopoles. Their location to a much lesser extent depends on the availability of raw materials and energy, whilst also strongly associated with the access to qualified personnel and the proximity of universities. This is due to the continuing development of high technology in all industries. The development of methods of food production which started in the 18th century has meant that today in highly developed and developing countries the lack of availability of food does not exist. Developed methods of production are currently being upgraded or are reviewed in terms of their impact on human health. The globalization in the manufacture of food has led to the possibility of consuming products that due to geographic and environmental conditionality were not previously available locally [Diebolt, Haupert 2016; Galanakis 2016].

In order to maintain the quality of the products during transport it is necessary to apply physical and chemical means to facilitate their transport. Production on a large scale is also associated with its security preservation, in the form of plant protection products or animal vaccinations. These compounds do not remain without affecting human health. Because of this, we can observe a growing trend to return to craft and manufacture production which has been associated with a more natural and healthier food production.

A growing consumer awareness causes that eating food produced globally is changing in the direction to food produced locally. The production of this food is governed by many regulations conditioning its high quality. It is also a cause of the high prices, which not all consumers can afford. For this reason the further development of food production methods will probably be divided. On the one hand the methods ensuring the effective global output will be continued which will be followed by the development of natural, organic food production methods [Diebolt, Haupert 2016; Galanakis 2016].

2. Processing methods in food production

Currently, the production of food is one of the most important branches of industry. The development of methods of obtaining food while ensuring its security, as well as the efficiency of the process is the biggest challenges for both food manufacturers

and scientists related to food technology [Pouliot et al. 2014]. The traditional methods of food processing products can be divided into mechanical operations, heat--mass exchange operations and chemical processes, therefore it can be classified as physical, physico-chemical and chemical.

Mechanical processes are based on physical phenomena includes the following processes such as grinding, mixing and separating mixtures. Grinding is used at the beginning of the technological process and is applied in order to reduce its particles through to the stresses exceeding its strength and consistency. As a result, the material breaks down into smaller elements and increases the surface of its processing. The plant and animal material and the degree of its fragmentation divide this processing into tissue and cellular shredding. An increase of the surface of material preserving cell structures is used in the initial phase of material processing. Contrary the disintegration of cells which in the case of plant and animal material is preceded by shredding of tissue with grinding, milling and homogenization, it applies ultrasonic waves or crushing [Pouliot et al. 2014; Chemat et al. 2017].

The purpose of the mixing process is to create homogeneous mixtures and is used to intensify the heat – mass exchange processes and speed up the chemical or biochemical changes. In order to obtain homogeneous mixtures, mechanical stirring, streaming and pneumatic mixing is applied [Kutz 2013].

In turn, the process of separating mixtures can be divided into two types: concentration and separation. Concentration is the separation of the two phases in slurry that change their proportion favouring suspended body particles and include sedimentation and filtration. However, separation means removing from each the different particles of distributed phase. The following processes are used such as sifting for separation from each other fine particles, as well as hydraulic (e.g. the separation of stones from the beetroots) and pneumatic (the separation of phases in gas mixtures) processes [Pouliot et al. 2014; Chemat et al. 2017; Kutz 2013].

Also in the area of heat-mass exchange processes, intense technological development is observed. These processes are based on the phenomena of conduction, convection and radiation. In food production they are used to speed up chemical reactions in the raw materials, changing their phase state or causing mass transfer in the form of evaporation, sublimation, extraction or diffusion [Chen, Mujumdar 2008].

Heat-exchange processes are used in food preservation for the inhibition of or the slowing down the chemical and biological processes. Among the processes of thermal processing of raw material is blanching, or the short-term heating of raw materials to the temperature below 90 °C which protects the plant raw materials and semi-finished products from adverse changes. The use of much higher temperatures is associated with the process of pasteurization which achieved provides the complete inactivation of enzymes and ensures microbiological decontamination in raw materials and finished products [Chen, Mujumdar 2008]. These processes are mainly used in the dairy industry.

In the fruit and vegetable industry also steaming for softening of plant tissues is used (i.e. the potatoes before the start of the fermentation process of potato pulp in the production of alcohol). Heat-mass exchange processes include also concentration, which are used for example in the production of white sugar to obtain a crystalline form by solvent evaporation from the mother liquor [Ranganathan et al. 2016].

Another method of concentrating semi-finished food products is dry concentration, which consists of freezing water and then its mechanical removal. The development of methods of food production has also led to the development of membrane concentration based on the process of reverse osmosis using membranes and high pressure ensure the permeation of water molecules through the semi-permeable membrane, which is called ultrafiltration and mainly used in the dairy industry [Aider, de Halleux 2009].

An important element in the production of food is drying carried out in order to obtain the corresponding parameters of the processed materials and to increase the durability of the finished products. Depending on the desired degree of dryness of the material methods of mechanical, thermal, or physico-chemical processing are applied [Brennan, Grandison 2012].

Due to the flourishing market of instant products the development methods of spray drying is observed, once used mainly in the production of milk powder, and today in the production of high-calorie snacks, often replacing meals [Brennan, Grandison 2012].

Another commonly used method in obtaining food is extraction consisting of the separation of the mixture components by the use of solvents, e.g. sugar from sugar beet, oilseed fat, and colorants from plants, animals and even microorganisms [Brennan, Grandison 2012].

Sorption, physical absorbing of particular substance – sorbate – by other means absorbents, was deployed for the purification of sugar juices during the production of the white sugar, manufacturing carbonated water, cleansing and clearing solutions using activated carbon and in manufacturing aromas used in the production of food [Brennan, Grandison 2012].

In the production of alcohol the distillation and rectification were used consisting of separating a single component or several components from the liquid mixture using the evaporation parameters of volatile components [Brennan, Grandison 2012].

In food production an important role is played by water purification and demineralization. Ionisation is commonly applied based on the exchange of ions between the solution of the dissociated substances and ion-exchange resin, that is, the material that contains in its structure the active ion centres. This process is also used to reduce the colour of solutions [Chen, Mujumdar 2008; Ranganathan et al. 2016; Aider, de Halleux 2009; Brennan, Grandison 2012].

The third group of methods used in food production are chemical processes, which include hydrolysis, oxidation and hydrogenation. The process of hydrolysis is

the cleavage of chemical bonds with the linkage of water molecules in the presence of catalysts. This process is mainly used in the hydrolysis of starch and protein, in the production of amino acids, spices, and recently also in nutritional preparations for athletes. The oxidation process usually leads to adverse changes in food, but has found use in receiving gluconic acids and gluconate by the oxidation of glucose [Earle, Earle 2003; Jeantet et al. 2016].

Another example of the application of this process is the oxidation of the starch for the production of gel desserts and other preparations [Singh et al. 2016], while the production of margarine involves the process of hydrogenation (reduction), which hardens the vegetable fats through the saturation of unsaturated double bonds in heated oil with gas hydrogen [Earle, Earle 2003; Jeantet et al. 2016; Singh et al. 2016].

Along with the progress of civilization, the access to information on the degree of processing food is increasing resulting in different reactions in society. Increasing reluctance towards high processed food creates a trend aimed at healthy living and nutrition, as indicated by the increasing demand for organic food.

Production of this food uses typical methods but the raw materials used in the process must be of a natural origin. It is not allowed to use chemicals at any stage of production. For example, animal manure in plant cultivation can be applied but only when no chemical compounds have been added [Ustawa z dnia 5 grudnia 2014 r. ...; Ustawa z dnia 25 czerwca 2009 r. ...; Rozp. Min. Zdrowia z dnia 22 listopada 2010 r. ...].

The changing lifestyle of consumers means that they are looking for an easy food preparation, widely available and with a favourable impact on their health. It is expected that the product will meet the specific function, so food technologists have another challenge related to the design of new food products. Therefore food production techniques are continually changing for custom modelling food products with healthy features [Duvnjak et al. 2016; Schulze et al. 2016].

There is also a noticeable trend of sustainable food production in terms of technological, economic and social development. It tends to develop such methods that will not be 'land-forcing' and will have a significant efficiency. This results in the development of the research on obtaining biotechnological compounds using tissue culture and microorganisms cultivations [Duvnjak et al. 2016; Schulze et al. 2016; Proctor 2011].

3. Changes on the market due to impact of rising food knowledge

Currently the development of food science and nutrition is a source of the influx of information about the mechanisms of the impact of food ingredients on the human metabolism. This knowledge is also the cause of the growth of the market of special food in respect of which consumer expectations are being built on the basis of scientifically identified activity. The scientific search focuses on reducing the risk

of lifestyle diseases – chronic and causing the loss of health, cardiovascular disease, obesity, cancer, osteoporosis and diabetes type II [Mertz 2008].

In the global research centres the potential of probiotics and prebiotics is analyzed in the prevention and treatment of cancers of the large intestine. The first defence of the organism is the environment of the stomach and intestines, which reacts to the microorganisms consumed along with food. These may be pathogens, but also those whose presence is highly desirable [Yu, Li 2016].

It has long been known that plants contain many phytochemicals compounds which have a specific impact on the human body. It is proved that the reduction of the incidence of diseases such as heart arrhythmia, coronary artery disease, stroke, hypertension, osteoporosis, cancer and gastro-intestinal disturbances is a result of the consumption of certain vegetables and fruits. A diet rich in fruit and vegetables may reduce for example the porosity of blood vessels and can increase the activity of natural antioxidant defence enzymes. In plant medicines, active ingredients have been long used. For this reason, key roles in the understanding of the mechanisms underlying the functioning of the human body are played by biology and molecular medicine [Rodriguez-Casado 2016].

Some plant substances play an extremely important role in preventing oxidative damage associated with cardiovascular diseases. Carotenoids and vitamins C and E are antioxidant and strength the human immune system. Recent studies have shown that phenolic compounds, especially anthocyanins, in addition to the vitamins and carotenoids have a beneficial effect on the body of people with chronic disease. These compounds contribute to lowering the level of LDL cholesterol, damaged by oxidation in the blood, thus preventing the formation of dangerous deposits in the blood vessels. Also tested is the role of antioxidants in preventing cancer arising as a result of damage to the genes. The loss of the ability of the cell to the normal response results in the uncontrolled proliferation and metabolism in pathological cell cancer. Antioxidants neutralize certain substances which as a result of oxidation can damage the genetic material [Zhang et al. 2015; Harasym, Olędzki 2014].

Another group of plant compounds which have a large impact on the human body are phytoestrogens. Their behaviour is similar to human hormones. A high content of these compounds is observed in pulses. It is believed that the high level of dietary intake of soy products in Asia underlies the relatively low incidence of breast cancer in those countries. Some of the most valuable compounds are isoflavones because according to scientific reports they reduce the risk of heart disease by preventing the formation of blood clots. Studies show that these compounds prevent osteoporosis and soothe symptoms of menopause by supplementing the needs of the body for oestrogen [Bičíková et al. 2012].

The development of knowledge on new compounds with a healthy impact is rapidly taking place. Not only the typical food products and consumer plants from region of Europe and North America are being examined, but the attention of world science

and hence the market is headed in the direction of other continents, rightly seeking there the varieties and species with unprecedented impacts on the human body.

However, little is known about the behaviour of various phytochemicals in the human body: the bioavailability (the extent to which the substances enter the human body and have beneficial effects), metabolism and possible adverse effects depending on the dose are still undergoing intensive scientific research. The situation is not helped by the fact that some activities may be in synergy and cannot be caused by one element [Onofri et al. 2016].

Numerous scientific studies have shown that the components of plants are helpful in preventing many diseases. On the basis of this knowledge pharmaceutical products are created like herbal medicines and novel food products based on a typical food form. The increase in the diversity of food products, corresponding to the needs of different target groups, for example the elderly, pregnant women and nursing mothers, infants, small children and athletes has been observed. In this era of population ageing in Europe and North America, for many older people it is also important to consume products which can ensure a balanced diet without changing the perennial habits.

A large number of compounds contained in food affect the occurrence of coronary diseases . Most of them have been known for a long time, such as saturated fats or salt, and others have been identified over the past few decades. At the same time a wide range of active compounds is an inexhaustible source of creative approaches to formulating food products.

It has long been known that unsaturated fatty acids (UFA) of chain length less than 18 C (carbon atoms) and configuration of trans raise serum biomarkers of coronary heart diseases (CHD), i.e. total cholesterol and LDL cholesterol, thus increasing the risk of CHD occurrence. The opposite are MUFA (monounsaturated fatty acids), PUFA (polyunsaturated fatty acids) and n-6 PUFA(polyunsaturated fatty acids with omega-6), which reduce the total level of LDL cholesterol and increase the content of beneficial HDL cholesterol (by reducing the ratio of LDL to HDL cholesterol fractions) [Lee, Park 2014].

On the market there are several new types of oils, fats and margarines maintaining the balance of fatty acids, lowering the risk of affecting CHD. Similarly, a chain of n-3 polyunsaturated fatty acids as EPA (eicosapentaenoic acid C20:5) and DHA (docosahexaenoic acid C26:6), has a beneficial effect, expressed in the increase of elasticity of the walls of the arteries and may reduce the risk of CHD. Based on this knowledge the market of fish and vegetable oils has developed, for example shark liver oil or linseed oil preparations to compensate for a small intake of fish fats and vegetable oils in selected populations [Lee, Park 2014].

Olive oil was deemed to be extremely beneficial for maintaining good health. It has been proven that its consumption reduces the risk of CHD and cancer. This is the result of the presence of monounsaturated fatty acids (73%), of lowering LDL cholesterol fraction, but also the antioxidants, including phenols. The healthy effect of olive oil increased its consumption, and thereby its market price [Hernáez et al. 2016].

Plant sterols and stanols are known commonly for their ability of reducing hypercholesterolemia and CHD disease risk. The daily intake of plant sterol esters of 1.3 gram or 3.4 grams of stanols esters contributes to significantly lower cholesterol levels. The most important for the market sterols and stanols are: β-sitosterol, stigmasterol, campesterol and stanols. Products containing these deliberately added compounds form a significant part of the basic diet and these include margarine, dressings, yogurt and cheese [Gylling et al. 2014].

A hypothesis concerning the biological activity of antioxidants assumes that antioxidants taken in one's diet have the ability to prevent oxygen damage in the body. One of the most important antioxidants are classified as tocols (including tocopherols and tocotrienols as vitamin E), vitamin C, carotenoids (such as β-carotene, which is a precursor to vitamin A; lycopene and lutein), flavonoids and simple phenolic compounds. Based on epidemiological studies, it has been shown that the intake of foods rich in antioxidants increases their concentration in serum and reduces the number of deaths caused by certain chronic diseases [Harasym, Olędzki 2014].

β-glucan is a polymer of glucose, which by their functions is treated as soluble fibre. The food source of β-glucan is mainly oats and barley. It is a water soluble, complex carbohydrate that is not broken down in the small intestine. The influence of soluble dietary fibre on the digestion and health has been known for a long time. It reduces or stops the absorption in the intestine by increasing viscosity and decreasing the rate of gastric emptying, as a result lowering the content of LDL cholesterol. The impact of dietary fibre on the digestive process regulates the level of glucose consumed in meals and lowers the amount of insulin secreted. Based on the results of the studies presented in the literature, a number of food products on the market with addition of β-glucan have been elaborated like yogurt and other dairy products, breads, breakfast cereals [Zou et al. 2015].

Soy products are particularly rich in substances called isoflavones, such as daidzein, genistein and their glycosides. Numerous studies *in vivo* demonstrated their beneficial effect along with soy protein on the prevention of cardio vascular diseases by lowering the LDL cholesterol level. Scientific studies have also proven the therapeutic effects of these substances in cases of diabetes, memory problems, seizures and sudden face redness, osteoporosis and breast cancer. Isoflavones or phytoestrogens derived from soy or other plants are transformed by the microflora of the intestines and can be combined with oestrogen receptors and stimulate hormonal response [Schmidt 2008].

On the basis of scientific discoveries new food products appear. Some of them are deliberately designed with the growing knowledge of the bioactivity of ingredients and form a new food group called functional foods. One of the groups created earliest in this category are – reduced-energy foods. Along with the products with reduced sugar content they are among the first and most common of the products created as functional food. The energy value of products with reduced calories must be lowered by at least 30% of the traditional food, which is achieved in industrial production by:

- reducing the amount of fat and sugar in traditional foods (e.g. low sugar jams, low fat mayonnaise, reduced fat milk);
- the use of fat substitutes and/or sugar to lower calorific value, sometimes equal to zero (for example, products sweetened with synthetic sweeteners – "light" chocolate);
- reducing the amount of flour in the carbohydrate products and replacing it with dietary fibre – a specific fraction of raw fibre;
- increasing the water contribution in the product [Świderski 2006].

One of the early dietary practices resulting from the then knowledge level and aimed at the cholesterol level reduction was the consumption of low cholesterol functional food. Production of this kind of food is based on the replacement of raw materials rich in cholesterol with substitutes [Świderski 2006]. Examples of this type of food are:

- mayonnaise without cholesterol – obtained by replacing the yolk rich in cholesterol with other emulsifiers;
- meat products with reduced cholesterol – part of the meat is replaced by vegetable proteins (e.g. soybeans, corn, oats), and also part of the fat with vegetable oils (e.g. rape, sunflower, olive oil);
- yellow fat spreads and other products with a reduced amount of cholesterol are obtained as a result of the replacement of butter parts with vegetable oils or fat substitutes;
- eggs with reduced cholesterol content in egg yolk obtained by adding to the feed of substances inhibiting the synthesis of cholesterol in the hens or genetic modifications to chickens to reduce the natural synthesis of this component [Świderski 2006].

Although the current scientific reports deny the influence of cholesterol intake in food on the increasing levels of this compound in the body, guided by responsibility towards the excessive consumption of sugar the market of low cholesterol products is well developed and is projected for further development.

4. Changes in food

The development of processing methods forced by demographic changes and the progress of civilization expressed, among others, as the industrial revolution has led to the formation of a number of food products with different levels of processing.

4.1. Unprocessed food

The unprocessed food category contains all of these food products which are suitable for human consumption without complicated food processing methods. However at this stage a significant question arises in relation to the degree of food processing because many food products are unfit for consumption without prior preparation.

Regardless of firm approach to food non-processing, its essence is to minimize processing.

The flagship examples of such foods include fruits, vegetables and seeds. The undoubted advantages of unprocessed food are its load of energy and nutrient composition. The high proportion of water, fibre, active enzymatic proteins or crude oils makes such food truly nourishing.

Also some traditional processing methods like cooking or baking extend the range of types of food with a lot of valuable products that would normally not be digestible for humans such as meal, dry beans or peas. In addition, some products in the unprocessed form may show toxic properties, such as raw potatoes.

Both the preparations of foods high in nutritional properties as well as its cultivation require a completely different approach and is time consuming. Following the fascination with the industrial revolution we can now notice the return to the time-consuming food preparation that minimizes the loss of nutritional products.

Multi-center studies have shown a significant advantage of organically grown food vs. products originating from typical crops [webpage research]. Also animal breeding conducted with conventional methods vs. ecological shows a clear difference in the nutritional value of the so derived food products.

An international team of experts led by researchers from the University of Newcastle in the UK showed that both organically produced milk and meat contain 50% more beneficial omega-3 fatty acids compared to products made conventionally [Średnicka-Tober et al. 2016].

Currently a food category called slightly processed has also appeared which means food products obtained by modern processing methods to ensure the protection of the natural properties of the raw material [Biegańska-Marecik, Czapski 2003; Czapski 2007; Martins et al. 2004; Pietrzyk 2008].

This category includes food whose production is limited to the necessary treatments, but allowing to obtain the product ready for use, with preserved natural properties [Biegańska-Marecik, Czapski 2003; Czapski 2007; Martins et al. 2004].

Regardless of the differences in the definition of the concept of "minimum processed food", we now can highlight the common properties of this product group which include [Biegańska-Marecik, Czapski 2003; Pietrzyk 2008; Kowalska 2006; Szwejda, Czapski 2007]:

- the protection of the sensory characteristics of freshness, for example turgidity, colour, smell, taste due to the gentle methods of heat treatment and preservation;
- the maintenance of nutrients sensitive to processing, mostly vitamins, provitamins, phytonutrients and minerals;
- the use of combined methods in which gentle methods of food preservation and processing are accompanied by biological or physico-chemical processes;
- the use in the process of food packaging of the modified conditions and special types of packaging individually matched to the type of product;
- cooling temperature maintenance throughout the whole chain of production and distribution of [Nowicka et al. 2014].

4.2. Highly processed food

The fact that food has been processed by humans for long time is indisputable [McLachlan 1975]. Doubts arise only about such processing which completely deprives the food of nutritional value, thus creating danger to human health.

White sugar is one of the examples of high processed products with no usefulness in nutrition. It is the plant substance whose gigantic spectrum of industrial applications surpasses enormously its actual nutritional value. The world's production of white sugar exceeded 100 million USD per year, and the possibility of its use in the industry continues to grow [DiNicolantonio, Lucan 2014]. The negative effects of white sugar on human health have been repeatedly confirmed [Melnik et al. 2011] but its sweetening properties and texture properties still make it a desired product on the market, now also available in the form of brown sugar and glucose-fructose syrup.

Another example is wheat flour produced from wheat repeatedly genetically modified in order to obtain varieties with a high starch content in the grain [Levrat-Verny et al. 1999]. The rheological and pasting properties of wheat flour and the consumer beliefs arising after World War II, of the superior quality of white bread over the black one has led to the spread of diet based on this processed product devoid of fibre with the low content of proteins and minerals [Amin, Gilani 2013].

White refined salt which is almost chemically pure sodium chloride is another example of the excessive heavy treatment, until it is almost totally devoid of the substances beneficial for health [Raj et al. 2016].

Hydrogenation technology of fats has contributed to the spread on the market of butter substitutes [Kummerow 2005] in which the fatty acids have configuration trans which have been shown to produce an extremely negative impact on human health [Kummerow 2009].

The desire to dominate the market, and therefore the need to extend the shelf life of many products, to distribute them to remote locations creates opportunity for adding a variety of food additives. There are, therefore, preservatives, colouring, and flavouring or taste sensation enhancers devoid of any nutritional function.

The food intake of highly processed foods is a civilization problem a symptom of which is the common and still increasing occurrence of lifestyle diseases. Poor nutritional value, incorrect balancing of the proportions of ingredients leading to an excessive surge of insulin after a meal and the presence of compounds metabolically acting in an uncontrolled and negative way, causes that consumption of such products leads to the complete deregulation of the signalling system in the human body, uncontrollable overeating, and this, in turn, to overweight and malnutrition [Juul, Hemmingsson 2015].

4.3. Functional foods

The next stage of development in the production of food in Western civilization is the direction towards the healthy impact of food. The trend started with increasing

the awareness about the properties of foods and the impact of food on health momentum, becoming an important element of the market.

In the mid1980s in Japan, and then in the United States, there began to appear on the market products referred to as functional foods [Kudełka 2011], which is not particularly surprising taking into account the approach to food in Asia and the level of development of food industry, the leader in this market is still Japan.

In the absence of a single official definition, there exists a variety of determining names, more or less reflecting the concept that food: Designer Food, Agromedical Food, Medifood, Medical Food, Fortified Food, Fitness Food, Wellness Food, VitaFood, Therapeutic Food, Performance Food, Pharma Food, Nutraceutical Food [Bogacz 2006; Karwowska, Bogacz 2007].

The lack of a specific definition of functional food has also brought a large variety of products belonging to this group. Facing the continuous development of the market for this kind of products the need to clarify this concept arises. Today there are several definitions and descriptions of functional food. The most often referred to as functional food is the food and drink showing documented beneficial effect on human health , which derives from the presence in them of the nutrients considered essential [Gawęcki 2002].

The ILSI (International Life Science Institute) specifies that: "a functional food is food, which, thanks to the physiologically active ingredients, provides health benefits, regardless of their function, i.e. proper nutrition" [Gawęcki 2002].

In the European Union is used a definition constructed under the framework of the European Functional Food Science in Europe, known by the acronym FUFOSE. In accordance with the FUFOSE, "food can be considered functional if its beneficial effect on one or more functions of the body over the nourishing effect, improve the health, well-being and/or reduce the risk of diseases. The food must resemble the form of conventional foods. However, supplements in the form of tablets or capsules are not functional foods. It is expected that this will be a component of proper diet" [Krygier, Florowska 2008; Piesiewicz 2008].

The food is also classified according to its source of origin or method of modification, due to functional groups, which include the individual products for the body's needs or based on the level of knowledge about the health effects of such food. An additional criterion for assigning the product as functional food is the exclusion of its malicious activity [Grajek 2008].

The ability to recognize a particular product as functional foods is associated with the need to carry out scientific research. This is intended to demonstrate the existence of a relationship between food intake and a specific pro-healthy effect. Preliminary studies asses the function mechanisms of the active ingredients contained in foods, and then appropriate studies are carried out on in vitro models and animals, and in the final phase the human study verifies the primary assumptions.

5. Food preservation methods

The development of civilization and globalization has meant that food preservation has become an integral part of its manufacture. Maintenance of food is one of the elements to ensure its safety. Another reason for the use of different methods of preservation is to reduce food loss during improper storage and transport. Methods of food preservation holding up the biochemical processes, the physical and chemical changes in tissues have been developed. It should also be pointed out that the packaging and storage of food in specific chambers also provides some methods of preservation.

Its purpose is extending food suitability time for human consumption whilst maintaining certain quality characteristics. So far, many methods of foods preservation have been developed, which are classified as chemical (Figure 1), physical (Figure 2) and biological (Figure 3).

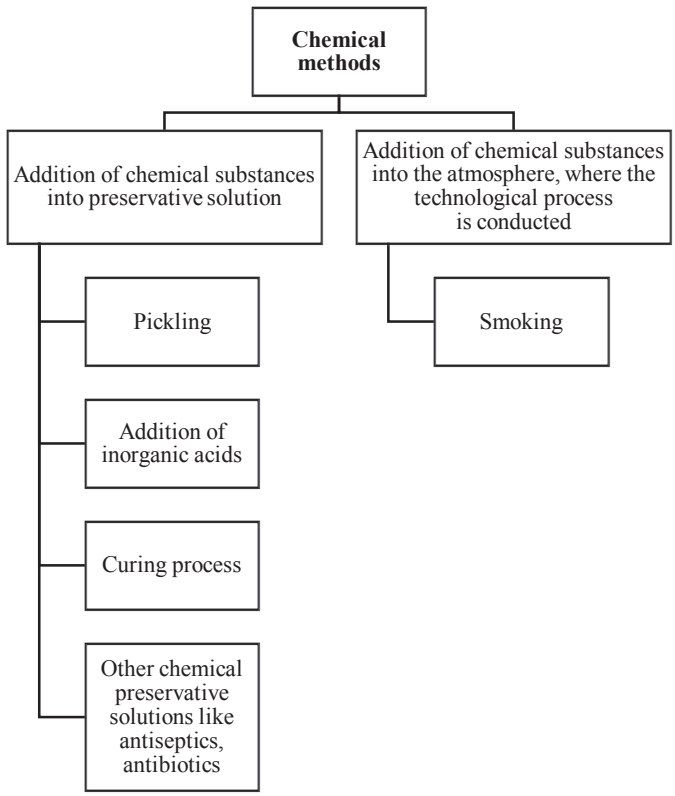

Fig. 1. Chemical methods of food preservation
Rys. 1. Chemiczne metody utrwalania żywności

Source: own study based on [Lada 2008; Huang et al. 2017; Ramesh et al. 2016; Siddiqui 2016].
Źródło: opracowanie własne na podstawie [Lada 2008; Huang et al. 2017; Ramesh et al. 2016; Siddiqui 2016].

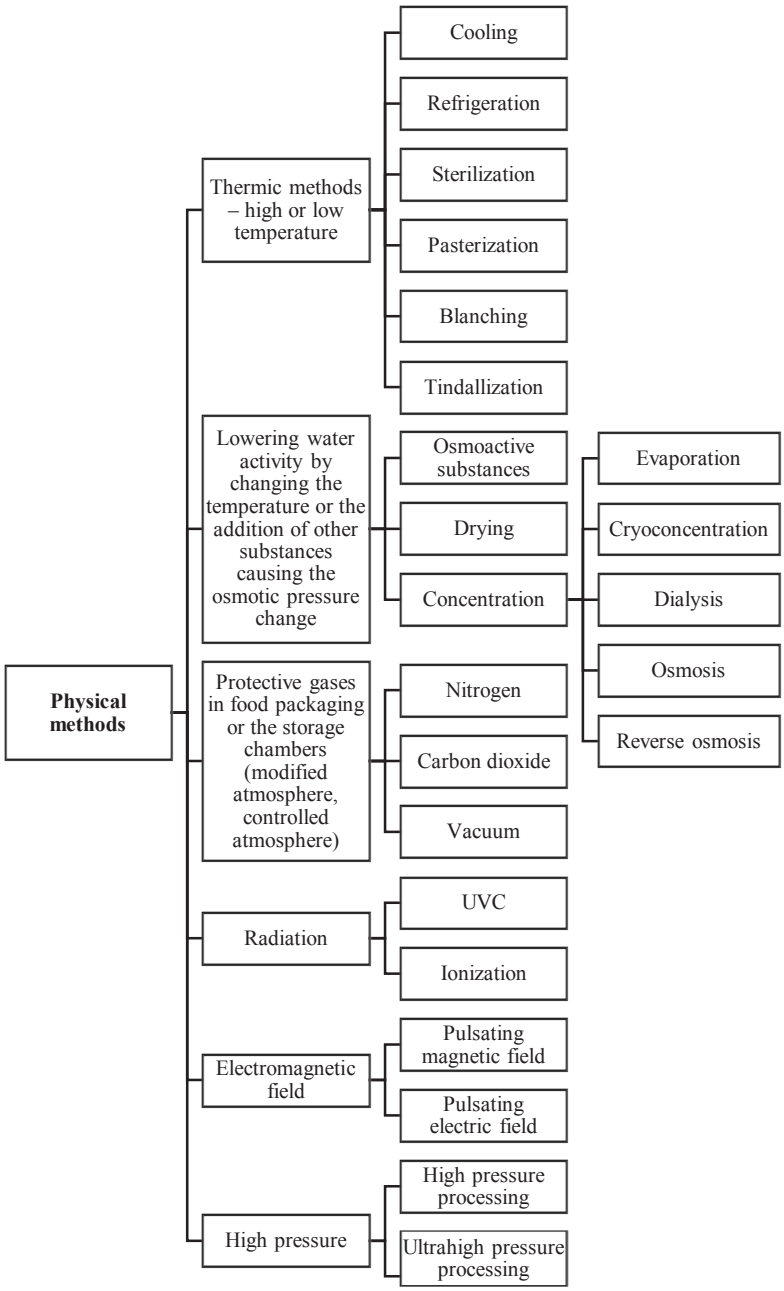

Fig. 2. Physical methods of food preservation
Rys. 2. Fizyczne metody utrwalania żywności

Source: own study based on [Lada 2008; Huang et al. 2017; Ramesh et al. 2016; Siddiqui 2016].
Źródło: opracowanie własne na podstawie [Lada 2008; Huang et al. 2017; Ramesh et al. 2016; Siddiqui 2016].

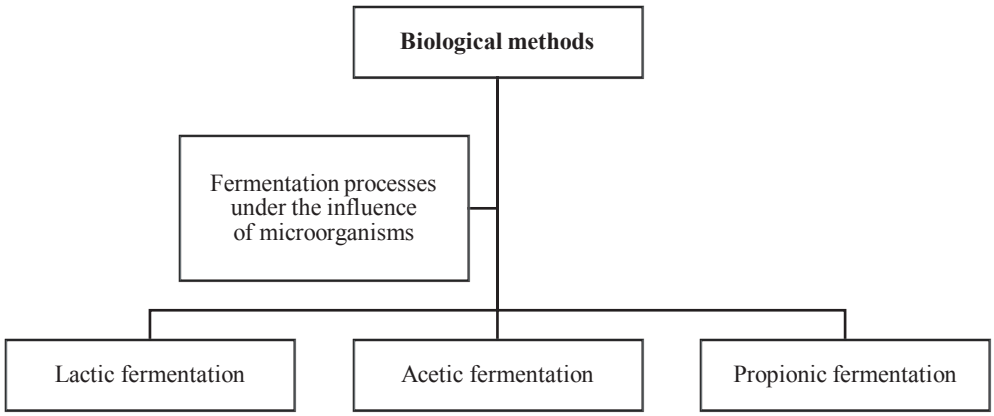

Fig. 3. Biological methods of food preservation
Rys. 3. Biologiczne metody utrwalania żywności

Source: own study based on [Lada 2008; Huang et al. 2017; Ramesh et al. 2016; Siddiqui 2016].
Źródło: opracowanie własne na podstawie [Lada 2008; Huang et al. 2017; Ramesh et al. 2016; Siddiqui 2016].

Thanks to the development of science in recent years innovative methods of preserving food have been developed. It showed that ionizing radiation and UVC affects biotic which was further applied to ensure sterile conditions in places of food trade. Food sterilization is also provided with electromagnetic fields and high pressures. The application of the methods of foods preservation is also governed by the relevant laws, limiting the addition of chemical compounds. Meanwhile, most of the chemical and biological methods outlined in Table 1 have been used in food production and preservation for centuries.

6. Summary

The application of different processing methods affect the quality of food, and thus on its bioavailability and health properties. Built on specific food functions the trend of functional products market is growing fast. The progress of civilization has led to the rapid exchange of information as well as to the global food trade. This situation has also affected the development of methods of food preservation to ensure its safety and longer shelf life.

The development of knowledge in the field of the real impact of food is tangible proof of the progress of human civilization. The currently observed “back to nature” in the production of food is nothing more than just the more aware use of the potential hidden in ordinary and yet extraordinary food.

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