

FOOD SAFETY HAZARDS – REDUCTION OR ELIMINATION METHODS

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Abstract: The aim of the quality of the consumed food is to guarantee a proper functioning of the body and its development according to gender, age, physical condition and demographic and environmental circumstances. Due to the ongoing development and the migrant flows, the rules and dietary habits have changed. The quality of production, in particular the production of raw materials, partly-finished and finished products and the marketing of foods are particularly susceptible to threats of physical, chemical and biological origin. There are constantly increasing demands placed on food manufacturers to ensure foods that are safe to the human health and life. The expectations of stakeholders are constantly rising and to meet their requirements, organisations often have to implement organisational, production, social and environmental changes as part of the process management aimed at improving/increasing quality. The objective of this study is to present activities in the field of food safety. A particular attention was paid to the quality management systems and to institutions supervising food security. The study attempted to present the frequent food safety hazards and their solutions in the food chain.

Keywords: quality, food, safety, food chain.

1. Introduction

As a result of the increasing importance of food security there is a growing interest of food business operators in the issues of quality and in particular in the quality management as part of the food security. The aim of the implemented pro-quality policies in the field of food security is the safety of the consumer, realized by an appropriate legal system that regulates the production and food turnover as well as the control and by following the safety standards at every stage of the food chain. The inseparable attributes of the food quality are its safety, health and the economic security of the consumer.

In 1996, the World Food Summit adopted a declaration on global food security and formulated the concept of food safety, which was to be understood as actions undertaken at the national level and an implementation of appropriate strategy to achieve the objectives that determine food security. This applies both to individual national aims adapted to resources and to ensure food safety as a whole.

It is expressed by the capability to continuously satisfy society's food needs and to ensure access to food necessary to maintain a healthy lifestyle. It is the duty of every country to properly manage its food policy, the aim of which is to maintain food security. The scope for actions is diverse and adapted to the given country's economic capacity.

The provision of food security in the complex field of the management of food safety, is its most important element. When we add aspects regarding the supervision over the proper documentation, surveillance, responsibility of managers or audits, then it constitutes a food safety management.

In addition, the existing food law, which does not specify the requirements for the qualifications and evaluation of raw materials and service suppliers, implies the need to develop their own procedures, taking into account both the product specification and the impact which raw materials have on the quality and safety of the final product.

Actors along the food chain have standards and systems that indicate the way to manage or ensure food safety. The management standards, i.e. (Olkiewicz, 2015): GHP, GMP, HACCP, ISO 22000, IFS, GMP+, QS, BRC or National Food Quality Systems, primarily mean that through their implementation, the standardization of the implemented processes, we can achieve a satisfactory level of the food safety management.

2. Selected factors influencing the level of food safety

Food safety is affected by progressive globalization by adding unknown risks to the already existing ones. Microbiological threats are the most important hazards related to the level of food safety among other dangers. Furthermore, the use of antibiotics during animal breeding causes the transmission of antibiotic resistance from animals to humans, as well as an increase in the risk associated with the transmission of food-borne diseases (Gawęcki, and Mossor-Pietraszewska, 2006).

The European Food Safety Authority conducted studies in 2005 and 2010 (Eurobarometer, 2005; Eurobarometer, 2010) among the consumers of the European Union on modern food hazards (Table 1). The research concerned the identification of the most important factors threatening the safety of food, which adversely affect various spheres of social life (Dzwolak, 2011).

Table 1.*Food safety hazards*

Research institutions		Harmful agents
2005	Eurobarometer The European Food Safety Authority (EFSA)	<ul style="list-style-type: none"> • environmental pollution, • pesticide residues in vegetables, fruits and cereals, • unsanitary conditions used in food manufacturing and gastronomy industries, • hormone and antibiotics residues in meat products.
2010	Eurobarometer The European Food Safety Authority (EFSA)	<ul style="list-style-type: none"> • food produced from cloned animals, • nanoparticles present in food products, • adverse effects of plastic containers on food (quality and freshness), • the risk of diet-related diseases, i.e., diabetes, • unhealthy lifestyle, • failure to comply with dietary recommendations.
2011	EFSA The European Food Safety Authority	<ul style="list-style-type: none"> • mercury in fish and dioxins in pork meat, • genetically modified food, • conditions in which animals were raised, • new animal viruses, i.e., avian influenza, • Bovine Spongiform Encephalopathy (BSE), • allergies on substances found in food products.

Source: own study based on the EFSA Scientific Reports and The European Commission's Eurobarometer (from 2005 and 2010).

As can be seen from the analysis of Table 1, food safety hazards are also caused by toxic substances, pesticide residues, heavy metals and antibiotics present in raw materials used for food production.

Bioterrorism, an act of terrorism with the use of biological means of mass destruction is a significant and relatively new danger. Pathogenic microorganisms are used for their production, which does not require large financial outlays and complex technology and cause mass infections and mutations. Due to the odor free and invisibility nature of the biological agents, an attack with the use of such a weapon is difficult to detect.

The symptoms occur several days after the attack. Biological weapons are characterized by high efficiency and have a large range of destruction. The main targets of an attack with biological weapons of mass destruction include: population, food, livestock, agricultural crops, drinking water and natural environment. There are many research facilities in the United States involved in counteracting bioterrorism. The action against this type of danger consists primarily in undertaking research into the possibility to respond in the case of using weapons of mass destruction (Wiśniewska, and Malinowska, 2011)

Genetically modified food is increasingly being perceived as another danger. A genetically modified organism (GMO) is an organism in which the genetic material has been modified in a way that does not occur in natural conditions as a result of interbreeding or natural recombination. It involves the use of genetic engineering methods for the purpose of a specific, defined food modification.

Genetic engineering relates to plants and animals that serve as basic raw materials in the food production process. GMO products, also referred to as transgenic products, are

increasingly present among many food products available on the market. These products contain the same nutrients that can be found in the daily diet, i.e. proteins, fats, carbohydrates, nucleic acids. GMO, therefore, stands for various food products and the US is the world leader in the cultivation of transgenic plants, whereas Spain is ranked first in the EU.

Genetic modifications of plants consist in the introduction, modification or removal of specific genes, whereas, genetic modifications of animals rely on the introduction of specific genes into their organisms or modification of genes already present with the aim to obtain the desired breeding traits (Kołozyn-Krajewska, 2007; Libudzisz et al., 2008). This kind of food is subject to a more elaborate examination, checks and tests than any other type of food. The introduction of a new product to the market from a genetically modified raw material requires thorough research to determine the direct nutritional, toxicological, allegro logical and ecological consequences.

Based on the observations over a period of many years and the analysis of crops and the consumption of transgenic food, it can be stated that no negative effects have been found. Many carried out research projects in the European Union in the field of GMOs bio-safety are the basis for the statement that plants and genetically modified animals do not introduce any new threat to both the human health and the environment beyond the unknown factor, which concerns classical crop cultivation (ETC, 2009; Lisowska, and Chorąży, 2010).

3. Food safety as a good particularly at risk

Food safety is a part of a wider issue of food security. For this reason, the issue of food safety and food quality is a topic of consideration at the national, regional (i.e. the EU) and global (Codex Alimentarius) level for both the representatives of science as well as for the representatives of governmental and non-governmental institutions and organizations.

The approach to food security has undergone a permanent change. In 1974, the FAO World Food Conference defined food security as "availability at all times of adequate world food supplies of basic foodstuffs to sustain a steady expansion of food consumption and to offset fluctuations in production and prices" (Food Security, 2006). At present, the principles of food security are based on the idea of a sufficient supply, an economic access, a proper diet and a stable access to food with a strict connection to ethics, trade and humanitarian aid.

The term "food security", therefore, refers to the following conditions, which have to be met simultaneously, i.e., physical and economic access to food and health suitability of every food product (Małysz, 2009). These principles are essential to the quality.

The safety and the quality of the produced food must be provided throughout the whole agri-food cycle, i.e., from primary production to consumption. Food safety is a necessary condition relating to (Anonim, 2006):

- food additives and flavors' used in food production,
- the quantity of food contaminants,
- pesticide residues in food,
- environmental irradiation products,
- organoleptic characteristics of food products,
- undertaking actions to ensure health and life safety of people.

Codex Alimentarius (EC, 2008) defines food safety as a set of factors that ensure foods that are safe for the human health and life, provided that they are properly prepared/consumed in accordance with their intended purpose (Gawęcki, and Roszkowski, 2009).

Food quality and safety require a careful control, which is possible by the development of quality and food safety management systems. Their introduction means focusing on the problems to ensure that the conditions are put in place for the production of food with an expected quality and safety for the consumer (Kołożyn-Krajewska, 2007). The modern consumer expects his food to be safe health-wise and not to cause infection or food poisoning.

According to this statement, the top priority for food safety is to ensure that the prepared and consumed foodstuffs will not have any harmful effects on consumer health. The assessment includes:

- normal conditions of use,
- information provided to the consumer,
- likely immediate or delayed effect on the health,
- cumulative toxic effects,
- particular health sensitivities of a specific category of consumers.

The large majority of organizations that are a part of the food chain recognize the need to establish and maintain records of conditions that have a varying influence on the safety of the food produced and placed on the market. It is important to recognize the appropriate role and position of an organization in the food chain, because it promotes interactive communication throughout the chain and the exchange of relevant data and information among its participants (Kijowski, 2008).

4. Legal requirements in terms of food safety

Food fraud is an increasingly frequent and publicized phenomenon that results in the loss of economic security of food and the consumer confidence, which consists in obtaining a value in use that is non-equivalent in relation to the cost of acquisition by purchasing adulterated food (Krysztyniak, and Obiedziński, 2012; Obiedzińska, 2015; Kowalczyk, 2016).

Furthermore, there may be a loss of food safety, i.e., as a result of an occurrence or non-declaration of an agent, inter alia, allergens in food, leading to significant health implications.

In the literature and legal documents, the term “food quality and safety” is used. Among all of the elements of quality, only food safety is subject to respective laws and is regulated by them.

Food safety means to ensure that the food is harmless to the human health and life when prepared and consumed in accordance with the intended use. Due to the requirements of the General Food Law, guidelines are established to prevent the possibility of producing unsafe food. They lay down rules for the supervision and conduct, which purpose is to reduce the occurrence of microbiological, chemical and physical hazards.

An EU Food Fraud Network (FFN) has been established to which twenty-eight EU countries and associated countries (Iceland, Norway and Switzerland) are members of. The aim of this network is to ensure security against food fraud by means of a more efficient exchange of information in cases of food adulteration between the countries (Europa, 29.07.2016). For instance, in the FFN activity report for 2015, one hundred and eight cases of food fraud were reported, especially in relation to the non-conformity of labels, suspicion of illicit export and prohibited practices for selected food products (EC, 2015).

Therefore, the degree of the implementation of legal requirements and to ensure the proper handling of the raw materials, the finished products or the process, depends on the management system used to manage organizational culture and on the awareness of the management and the remaining staff in ensuring food safety (Górna, 2012). Specialized reference laboratories have been designated where the analyses of genetically modified food and feed are carried out.

The aim of product labeling is to assist the consumer in the assessment as well as to make the right product choice. A consumer has the privilege and the right to receive information from the producer about the product and expects the product to be labeled to identify it. Proper labeling of a product is also very important for other consumer groups, i.e., proponents and opponents of GM food.

In Poland, food legislation has been harmonizing with the European Union legislation for many years. The World Codex Alimentarius Commission issues both recommendations in the so-called Codex Alimentarius and the European Union directives published in the Official Journal. The regulation on the safety of food and nutrition, adapted with the requirements of the European Union, was published in Poland in 2006. It is the main legal document relating to food legislation.

It specifies bodies entitled to issue regulations and enforce health requirements of the food products (Wiśniewska, 1997). Attention should also be drawn to the Anti-Trust and the Consumer Protection Act. It lays down the rules and conditions for the protection of competition and the interests of producers and customers. It prevents any unfair competition practices and actions that infringe on collective consumer interests.

Furthermore, in Poland there are official institutions exercising direct control over food safety, performing conformity assessment of the entity's activities with the adopted criteria. This means that they have the authority to interfere in the structure of the entity subject to control and to enforce activities.

The external institutions supervising food safety in Poland include:

1. The National Health Inspectorate is an institution that operates on the basis of the regulation on the National Health Inspectorate. This institution holds a constant supervision over the conditions of the production processes, storage, transport, food turnover and food health quality. Its responsible authorities carry out official food control that applies to all elements and stages of the food production process that includes the raw material base, the semi-finished and final products. The official control of food also applies to genetically modified food and feed and GMOs. It is also tasked with the assessment of the effectiveness of the implementation of the HACCP system (National Health Inspectorate, 1985).
2. The General Veterinary Inspectorate is an institution that operates on the basis of the regulation on the Veterinary Inspectorate that supervises the food safety of products of animal origin to protect human health and life. It controls sanitary conditions during the acquisition, production and storage of food of animal origin. Furthermore, it supervises the trade and export of animals and food of animal origin. It has control over the compliance with the veterinary requirements relating to the manufacture of products of animal origin, placing them on the market and their direct sale (General Veterinary Inspectorate, 2004). The General Veterinary Inspectorate also carries out activities in the field of organic farming and is a part of a network of the Rapid Alert System for Food and Feed (RASFF).
3. The Trade Inspectorate is an institution subordinate to the President of the Office of Competition and Consumer Protection that operates on the basis of the regulation dated December 15, 2000. It has control over food and products that are sold or are intended for sale, also in terms of labeling and adulteration. The aim is to ensure fair practices on the food market and to protect the rights and interests of the consumers. This does not apply to the control of the health quality of food. The responsible authorities of the Trade Inspectorate supervise the so-called commercial quality of food products placed on the market, which relates to:
 - the organoleptic, chemical, physical and microbiological characteristics of food,
 - the weight and the size of a product,
 - requirements in the field of manufacturing technology, the product packaging method and the labeling of food products (Trade Inspectorate, 2000).

4. The Agricultural and Food Quality Inspection is an institution that operates on the basis of the regulation dated December 21, 2000 on the commercial quality of agri-food products and reports to the minister responsible for agricultural markets. It supervises the commercial quality of agri-food products and has control over the compliance with the requirements in their production, storage, transport and the circulation of goods, i.e., export and import. The Agricultural and Food Quality Inspection is responsible for the assessment and issues certificates concerning the commercial quality of the agri-food products. Agri-foods are the agricultural products, the freshwater and marine organisms, venison and fruits of the forest, in the form of raw materials, semi-finished and finished products. This category also includes foodstuffs. The Inspectorate also carries out a number of tasks in the field of organic farming and is a part the RASFF system network, taking decisions on dangerous food products. Within the framework of the EU, it supervises the commercial quality of eggs, poultry, bovine carcasses, pig carcasses and carcasses of other animals (Agricultural and Food Quality Inspection, 2005).
5. The National Inspection Authority for the Protection of Plants and Seed Production is an institution that carries out tasks aimed at the reduction of risks posed by harmful organisms, elimination of the negative effects that result from the exchange of goods, the use of plant protection products and supervision over the production and marketing of seeds of plants that meet all the health and quality requirements.

Furthermore, the process of food and food safety is influenced by:

- The European Food Safety Authority (EFSA), a scientific body set up by the regulation of the European Parliament and the Council of Europe in 2002, to increase the quality of health food, reduce the risk of various food poisoning and infections, and to deal with food safety hazards. The Authority aims to reduce the risk associated with food safety hazards and to improve the protection of health and human life. The EFSA lays down the rules for food safety at all stages of the production process and the processing and the circulation of food on the market.
- The basic functions of this Authority include the collection, documentation and analysis of scientific and technical information relating to:
 - food consumption and vulnerability of consumers to food safety hazards, the extent and proliferation of food-related biological threats,
 - contamination of products and feeds,
 - the assessment of risks related to food safety and nutrition,
 - food additives,
 - the state of health of plants and plant protection products,
 - the state of health of animals and their welfare,
 - genetically modified foods, agents and toxic substances throughout the food chain (Agricultural and Food Quality Inspection, 2005).

- The Rapid Alert System for Food and Feed (RASFF) is a system established in the European Union in the first decade of the 21st century and covers all Member States. In Poland, the RASFF operates on the basis of the data obtained from: The National Health Inspectorate, the Trade Inspectorate, the Veterinary Inspectorate, the Commercial Quality of Agricultural and Comestible Articles and the Customs Service (Olkiewicz, 2015). The system relates mainly to: activities aimed to restrict the placing or withdrawal of food or feed from the market that might be a threat to consumer health as well as the protection, restriction or the placing of food on the market that poses a risk to human health in relation to the batch, container or cargo of food.

5. Selected determinants to ensure safety in the Food Quality Management process

The implementation of quality management and food safety systems guarantees the consistency of products in accordance to health requirements. They became the structure for the ISO 22000 family of standards:

- GMP– The Good Manufacturing Practice,
- GHP– The Good Hygienic Practice,
- GAP– The Good Agricultural Practice,
- the Hazard Analysis and Critical Control Point (HACCP),
- the ISO 9001 norm,
- BRC– The British Retail Consortium,
- IFS – The International Food Standard (Kijowski, and Sikora, 2003).

The Good Manufacturing Practice (GMP) are the principles and actions described in relevant documents that define the requirements for environmental, hygienic and technical conditions necessary for the production and the distribution of food with appropriate health quality. The objective of the GMP is to shape the nutritional quality, health safety and organoleptic characteristics of food.

The main activities of the GMP undertaken by companies that produce food include: maintaining the required hygiene in the environment; ensuring proper conditions during the storage of technical equipment, chemical agents and food products; ensuring good technical condition of the entire manufacturing plant; taking protective measures against insects and rodents infestation in a plant; ensuring optimal arrangement, lighting and ventilation of production units and warehouses; maintaining water and sewage management; the surveillance of workers' state of health (Kołożyn-Krajewska, 2007).

The Good Hygienic Practice (GHP) are procedures and activities based on legal provisions that aim to ensure safety and a proper health quality of food products. They directly concern the hygiene of production and overall control of the plant's infrastructure in relation to hygiene. The GHP collects and analyses information on the risks that may arise during the production process, takes actions aimed at controlling hazards and takes appropriate preventive measures. The GHP is a narrower category than GMP and is a very important element of food safety in relation to meeting hygiene conditions and principles.

The GMP and the GHP very often permeate each other and are interdependent, and therefore they relate to the number of links of the food chain. Various good practices in the field of agricultural production have been developed in the recent years. Their objective is to prevent against the occurrence and the spread of chemical, physical and microbiological risks. This includes:

- Good Agricultural Practice (GAP),
- Good Veterinary Practice (GVP),
- Good Breeding Practice (GHP).

Before the implementation of the HACCP system it is strongly recommended to implement the GHP or/and the GMP (Skrabka-Błotnicka, and Masłowski, 2010).

The Good Agricultural Practice (GAP) is a set of regulations and standards relating to the protection of the environment under the Common Agricultural Policy of rural areas in the European Union. It takes into account the idea of a sustainable agriculture, while taking cognizance of the care for the natural environment and the preservation of natural and landscape values. These standards comprise the following requirements:

- use and storage of fertilizers,
- agricultural use of sewage on the farm,
- use of plant protection products,
- protection of soils, water resources and natural areas,
- grassland farming (Dzwolak, 2013).

The development of this standard is confirmed by the number of entities subject to certification as presented in Table 2.

Table 2.

Number of entities certified under the Global GAP

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Total	13000	18000	35000	57000	81000	85000	89000	105000	113000	117000	126000	135000
Poland	2	28	79	288	351	396	754	1073	Lack of data	Lack of data	Lack of data	Lack of data

Source: Olkiewicz, 2015.

The HACCP system is a system used to ensure food safety in the European Union. It is a very important element of the ISO 22000 standard. The aim of its use in the production plant is the ongoing analysis of risks and critical control points in relation to food safety.

It allows to control all links of the food chain (from producer to consumer) in terms of possible hazards caused by chemical, physical and microbiological factors. The main focus of the HACCP system is the analysis of hazards of microbial origin as they are considered to be the most serious ones from the health point of view. The hazard analysis should be done through the collection and verification of information on the causes of risks, their sources and seriousness in regard to food safety. The critical control points are areas where control measures are used to reduce or eliminate the risk. A control point might be a raw material destined for production, a production line worker, a technical equipment of a plant or a specific procedure. There are two critical control points in the system:

- CCP1 – concerns point where risks can be eliminated,
- CCP2 – concern points in which risks reduction is permitted.

The implementation of the HACCP system is a lengthy and costly procedure and requires a number of crew trainings in the production plant. Each plant has the opportunity to develop its own system tailored to the nature of its operations. It may include the production, the environment of the production process, the company's personnel as well as the conditions for the storage and distribution of products (EC, 2004).

The European Parliament and Council Regulation of 2004 set out the principles behind the HACCP system:

- list of any food hazards that should be eliminated or reduced,
- list of all critical control points in which a risk should be eliminated or reduced, the setting of limits for critical control points to separate the level that is acceptable or unacceptable in the elimination or reduction of a risks.
- implementation of effective surveillance of critical control points,
- establishing corrective actions when a critical control point is out of control,
- establishing procedures for regular verification and evaluation of the effectiveness of the previous rules, establishing documents and archiving them in order to assess the application of the previous principles.

The British Retail Consortium (BRC) is a standard established in 1998 by a British organisation that associates producers and is used in both the food and the commercial industry. It specifies requirements for producers and suppliers to ensure the food's safety and quality of health and the appropriate hygiene, sanitation and production conditions in food plants. It is currently the leading standard in the European Union. The standard is responsible for the selection of suppliers for international retail chains. Obtaining the BRC certificate proves the safety of products and their high quality and allows to limit the number of audits from retail chains. Through the use of systematic preventive actions, production costs can be reduced and customers and suppliers trust can increase. This standard combines the requirements included in the ISO standards, the HACCP system and the GMP/GHP principles (Olkiewicz, 2015).

The International Food Standard (IFS) is a system developed by the German and French retail chains in 2002. Its purpose is to assess the guarantee of health safety of the food products that are sold mainly under own brand. The brand is owned either by a commercial network or a wholesale distributor. To obtain the IFS certificate one must meet the following requirements:

- the implementation and documentation of the HACCP system and the quality management system,
- the responsibility of the company's management in the implementation, supervision and development of the system,
- human resources management,
- staff training, hygiene and health requirements,
- the control and improvement of the parameters of the production process,
- complaint handling and surveillance of products not in compliance with the standard (Skrabka et al., 2010).

The ISO 22000 is a standard published by the International Organisation for Standardisation in 2005. It is the most integrated set of requirements related to the food safety management system and, as presented in Table 3, is increasingly used in practice. It applies to all links in the food chain (from producer to direct consumer). Due to the fact that food safety hazards may appear in every link of the food chain, a proper control and supervision at all stages of the food production process and processing over raw materials and the natural environment, is very important. The established conditions in relation to hygiene have to be met during the transport, storage and food distribution.

Table 3.

Number of certified entities within the ISO 22000 standard

Years	2010	2011	2012	2013	2014	2015	2016
Total	18580	19351	23278	24215	27690	32061	32139
Europe	7083	7361	8307	9357	10181	11181	11083
<i>Poland</i>	629	573	659	640	626	677	701

Source: ISO, 2017.

The set of the ISO 22000 standards (Table 4) provides opportunity to manage food safety by the use of supervisory measures, i.e. Good Practices (GMP, GHP), the ISO 9001 and the HACCP system. It is addressed to all economic entities that intend to implement a harmonised food safety management system.

It complies with the currently binding legal regulations, industry guides, standards and norms of individual Member States through the integration at an international scale (Wiśniewska, and Malinowska, 2011).

Table 4.
Family of the ISO 22000 standards – food safety

ISO 22000	ISO/TS 22003 – contains a technical specification regarding the requirements for Authorities conducting audits and certification of the food safety management systems.
	ISO/TS 22004 – contains a technical specification regarding guidelines for the application of the ISO 22000: 2005 norms.
	ISO/TS 22005 – concerns the traceability of the food chain, i.e., the rules and the requirements related to the implementation of the system.

Source: Kijowski, and Sikora, 2003.

Another distinct approach to the quality and the food safety management system is the PN-EN 15593: 2010 norm, which concerns the hygiene management in a production of packaging of foodstuffs. The requirements of the quality management systems, from the point of view of the packaging-production control, were defined in this norm by supplementing the following processes in relation to the requirements of the ISO 22000 standard: specifications for the constituent materials, traceability, approval and surveillance of the suppliers, subcontracting and human resources.

Responsible management is a crucial aspect in the safety of the food chain and the social responsibility of the food industry becomes particularly important. The ISO 26000 is the international standard that regulates the area of the social responsibility. The process approach in relation to the ISO 26000 standard assumes that in the output an entity should maximise its contribution to the sustainable development. On the input, however, it should rely on an understanding of the principles of social responsibility.

It must, however, be recognised that it is the family of the ISO 9000 standards that constitute the basis for the process-oriented quality management and introduced elements of management to food security. The result is an even more efficient management of food safety. The ISO 9001 indicates requirements for:

- establishing a policy on food security,
- planning and defining the authority and responsibilities of the security system and the safe products; authority and responsibilities at the management level,
- the management of the company's infrastructure and human resources,
- the flow of information that ensures security,
- archiving the documents of the system - systematic control of the safety management process,
- the current validation, improvement and updating of the system (Skrabka-Błotnicka, and Masłowski, 2010).

The subject literature and practice indicate (Table 5) that the ISO 9001 standard is the basic pro-quality management system that allows the implementation and maintenance of an international standard of products and/or services provided.

Table 5.*Number of certified entities within the ISO 9001 standard*

	2010	2011	2012	2013	2014	2015	2016
Total	1076525	1009845	1017279	1022877	1036321	1034180	1105937
Europe	530039	459367	469739	458814	453628	439477	451415
Poland	12195	10984	10105	10527	9574	10681	12152

Source: ISO, 2017.

Standardised management systems allow the organisations, by using the RASFF system – The Rapid Alert System for Food and Feed (Buczowska et al., 2014), to develop in a process way and to guarantee and meet the needs and the expectations of stakeholders. The objective of the system is to ensure a high level of consumer satisfaction thus becoming a food safety standard.

Authors' own surveys and the public opinion polls (as a direct interview in 2017) conducted on a group of 376 entities, demonstrate knowledge on:

- the identification and the ability to use the standardised international management systems to guarantee security of the food chain (Table 6),
- the determinants of the use of the standardised international management systems in an organisation to guarantee the security of the food chain (Table 7).

Table 6.*Level of knowledge of individual standards of the quality and the food safety management system among the analysed entities (%)*

Norms (standards)	Management
The ISO of series 9000	34%
PN-N 18000	19%
The ISO of series 14000	29%
The ISO of series 22000	23%
The ISO of series 26000	16%
HACCP	55%
GMP/GHP	39%/43%

Source: own study.

The most well-known standard is the HACCP standard with 55% of comprehension, while social responsibility encloses within 16%. This is a dangerous phenomenon for the food industry. The next factor is the ISO 18000 standard with only 19% of understanding.

Table 7.*Motivation for the implementation of the food safety management standards (%)*

Factors	Percentage of the received answers
Financial factor	71%
Achieving subsidy	66%
Improvement of the management	45%
Legal requirements	33%
External aid (advisory and consulting companies)	44%

Source: own study.

According to nearly 71% of the respondents, the financial factor is a significant obstacle in the implementation of standards of the food safety managements system. The second important factor, confirmed by as much as 44% of the respondents, are fees for the consultancy and advisory companies. Furthermore, 66% of the respondents expected to obtain subsidies for the implementation of the required standards, 45% declared improvement in the quality of the management and 33% believed that legal requirements allow to achieve the expected level of security and increase the quality of the processed food.

The conducted research suggests that *managers of the entities, which are a part of a complex food chain, are in need of additional education in the field of food safety as the implementation of the required norms and obligatory standards requires from them full awareness*. This is also due to the fact that the use of the pro-quality management systems and food safety is the main objective (direction) to increase customer safety, while ensuring a stable development of the entire agro-food industry (Radlińska, Lisowska, 2008).

6. Summary

To ensure food safety is the primary aim of all the links of the food chain, where an effective fight against the food safety hazards consists in the education of individual entities – the links of the food chain.

The main sources of hazards, which pose a significant problem, are factors of physical, chemical and microbial origin. An effective method to reduce this threat may be the safety of the entire food chain based on the HACCP system. Systematic control allows to provide food of appropriate quality and to ensure health safety, which determines a tangible improvement in the quality of life of the consumers.

Furthermore, the process of shaping food safety requires the harmonization of the EU legislation regarding food requirements and methods of their enforcement. The aim is to ensure an improvement in the appreciable level of quality of a human life and protection against harmful physical, chemical and biological factors.

In short, food safety and quality are becoming the strategic focus areas for both practice and study. It is a consequence of the globalization of economic processes, including food chain.

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