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FREQUENCY AND SOURCES OF FOOD SAFETY HAZARDS IN THE INVESTIGATIONS OF THE STATE SANITARY INSPECTORATE ON THE EXAMPLE OF THE ACTIVITIES OF A SELECTED DISTRICT SANITARY AND EPIDEMIOLOGICAL STATION

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ABSTRACT

The aim of the study was to analyse the frequency and sources of food safety hazards based on the results of research performed within the framework of official food control and monitoring, by the District Sanitary and Epidemiological Station. Basing on the published references, the concept of food safety was discussed, as well as the legal regulations in this respect at EU and national level. Hazards present in food (chemical, biological, physical) were also characterized. The analytical part was based on data from 558 food samples taken as part of official food control and monitoring performed by the District Sanitary Inspectorate over three consecutive years. It was found that during the analysed period, the largest number of samples tested for food hazards came from the groups: confectionery and pastry products; poultry, offal and poultry products, eggs and eggs products; milk and milk products. Samples were mostly collected at hypermarkets, food discounters, bakeries and confectioneries and convenience stores. The directions of the analyses varied significantly between product groups, with the most common being microbiological hazards and the content of additives, including preservatives, dyes and substances other than sweeteners and dyes. Confectionery and pastry products were most frequently tested for microbiological contaminants, while additives were mainly determined in delicatessen and culinary products. During the inspections, 15 food samples were called in question, and in one case the product labeling was questionable. The reasons for questioning the quality of food were the presence of microbiological contaminants such as: thermophilic *Campylobacter* bacteria, *Salmonella* bacteria, including *S. enteritidis*, an excess of *Enterobacteriaceae*, the presence of biological contaminants and inappropriate caloricity of the meal.

Key words: food, food safety, State Sanitary Inspectorate, food monitoring, microbiological contaminants, foodborne diseases

INTRODUCTION

The food-related industry is one of the largest production sectors not only in the European Union, but worldwide. The seamless and rapid transfer of foodstuffs allows consumers to gain a constant access to a wide range of goods, giving producers almost unlimited markets [Jaroszewska and Figurska 2020]. Today, animal and plant raw materials are delivered from considerable distances and processed in different regions of the world. Therefore, proper legislation, management and cooperation between different sanitary services are necessary to ensure food safety [Kowalska and Krzewska 2019]. Today's food market consists of many components: the primary producer, food processing and storage facilities, shipping companies and wholesalers, retail and catering,

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as well as food safety control institutions. Globalization of food production means new challenges for food safety [Janasik 2020]. Trends in global food production, processing, distribution and preparation generate new challenges for food safety. New pathogens and their toxins appear, resistance to antimicrobial drugs increases, consumers demand variety and exotic products, and often eat outside their household. Food has become a pleasure on the one hand, but on the other hand it is also a carrier of risks that can cause disease and even death [Elmi 2004, Obiedzińska and Kwasek 2016].

The World Health Organisation estimates that a staggering 420,000 people die each year from consuming contaminated food. These foods can be infected with parasites, bacteria, viruses, chemicals, or toxins. Unsafe food is responsible for over 200 identified diseases. Despite ongoing efforts, food-borne illnesses remain a significant global challenge [Elmi 2008]. Unsafe food not only harms individuals but also significantly impacts global trade. The World Bank estimates that low- and medium-level economies experience a substantial US$95 billion in economic losses annually due to unsafe food. [Kowalska and Krzewska 2019].

The concept of food safety is a part of a wider issue, which is food security [Kowalczyk 2016]. Food safety is defined as the conditions that must be met and the actions that must be taken at each stage of food production or marketing, which primarily concern:

- the additives and flavourings used,
- levels of pollutants,
- pesticide residues,
- organoleptic characteristics,
- food irradiation conditions [Leskiewicz 2012].

According to Szymańska-Brałkowska [2012] and Balon et al. [2016], the modern consumer is looking for food that has desirable sensory characteristics, adequate nutritional value, does not contain substances that negatively affect the health and functioning of the organism, and at the same time is easy to use, properly packaged and has a price appropriate to the cost of its production. Wang et al. [2018] report that, frequent food safety incidents in recent years have significantly reduced consumer confidence in food products offered on the market.

According to Szymańska-Brałkowska [2012], in a survey of 26691 respondents in the 27 EU-member countries, consumers ranked chemicals, pesticides and toxins in food (19%), food poisoning caused by e.g. *Salmonella* and *Listeria* bacteria (12%), eating stale food (9%), and food additives including dyes and preservatives (9%) as the most important food-related risk factors. According to Brewer and Rojas [2008], the biggest concerns for consumers are pesticide residues, hormones in poultry and meat, as well as preservatives.

Food safety hazards are categorized into three main classes based on their origin: physical, biological, and chemical. These hazards can enter the food chain through various pathways, including intentional human actions and unintentional contamination [Arisseto-Bragotto et al. 2017]. These hazards can occur in food at any stage of the food chain, from animal feed to ready-to-eat food. To minimise the possibility of contamination, control and inspection services pay particular attention to the traceability of raw materials, products and batches [Ozimek et al. 2004]. According to Murray et al. [2017], there is also a need for systematic education on food hazards to raise people's awareness of food-borne diseases.

Human activities are the primary source of chemical contamination in our food supply. These chemicals pose a significant threat to human health, as they can accumulate in vital organs like the liver and kidneys. The impact of these chemicals on our bodies may not be immediately apparent, often manifesting over time [Kołożyn-Krajewska and Sikora 2010].

Microbiological hazards can arise at any stage of the food chain [Quinlan 2013]. Minimally processed foods are more vulnerable to microbial contamination than highly processed ones. Microbiologically perishable foods are vulnerable to contamination by bacteria, moulds, yeasts and viruses that are a direct threat to human health and life [Nowicka et al. 2014]. The pathogens that most commonly cause bacterial food poisoning are: *Campylobacter* spp., *Salmonella* spp., *Yersinia* spp., *Escherichia coli*, *Listeria monocytogenes*, *Shigella* spp., *Staphylococcus aureus*, *Clostridium* spp. [Maćkiw et al. 2015, Yeni et al. 2016]. Food can also be a source of health-hazardous metabolites such as aflatoxin, ochratoxin, patulin and citrinin [Yeni et al. 2016, Arisseto-Bragotto et al. 2017]. For instance, according to van Velsen et al. [2014], foodborne *Salmonella* infections are a worldwide problem, with an estimated 80,3 million cases each year. In areas of Africa, Asia and South America only, 200,000 deaths are recorded because of this.

While physical hazards are not naturally present in food, they can be introduced through various human errors and manufacturing practices. Here are some common causes:

- Poor hygiene: When staff fail to follow basic hygiene rules, hair, jewelry, pins, buttons, cigarette butts, or clothing fibers can contaminate food.
- Neglect of good manufacturing practices: Failure to adhere to proper manufacturing procedures can result in metal particles, glass, work tools, screws, or nails ending up in food.
- Ineffective technologies in the initial stages of processing: Pebbles, sand, seeds, leaves, bones, scales, fish bones, fruit, and vegetable skins can eventuallz be present in the final product.

The presence of physical hazards in food is dangerous for consumers due to the possibility of choking or mouth and gastrointestinal injury [Krejpcio and King 2014].

In Poland, food safety regulations are governed by EU and national legislation. The EU rules are as follows:

- Regulation (EC) No 178/2002 of the European Parliament and of the Council of 28 January 2002 (latest consolidated version: 27.03.2021);
- Regulation (EC) No 852/2004 of the European Parliament and of the Council of 29 April 2004 on the hygiene of foodstuffs (Last consolidated version: 20.04.2009);
- Regulation (EC) No 853/2004 of the European Parliament and of the Council of 29 April 2004 (latest consolidated version:01.01.2021);
- Regulation (EC) No 1924/2006 of the European Parliament and of the Council of 20 December 2006. (latest consolidated version: 13.12.2014);
- Commission Regulation (EC) No 2073/2005 of 15 November 2005 (latest consolidated version: 08.03.2020);
- Regulation (EC) of the European Parliament and of the Council No 1924/2006 of 20 December 2006 (latest consolidated version:13.12.2014) [Kołożyn-Krajewska and Sikora 2010];
- Regulation (EU) No 1169/2011 of the European Parliament and of the Council of 25 October 2011 (latest consolidated version: 01.01.2018);
- Regulation (EU) 2017/625 of the European Parliament and of the Council of 15 March 2017 (latest consolidated version: 14.12.2019).

National regulations are:

- Act of 14 March 1985 on the State Sanitary Inspectorate [Journal of Laws 2021, item 195];
- Act of 15 December 2000 on Trade Inspectorate [Journal of Laws of 2020, item 1706];
- Act of 21 December 2000 on the commercial quality of agri-foodstuffs [Journal of Laws 2021, item 630];
- Act of 25 August 2006 on food and nutrition safety [Journal of Laws of 2020, item 2021, as amended];
- Act of 15 December 2016 on counteracting unfair exploitation of contractual advantage in trade in agricultural and food products [Official Gazette of 2020, item 1213];
- Act of 29 January 2007 on Veterinary Inspection [Journal of Laws 2021, item 306].

In Poland, official food safety supervision is carried out by five inspections:

- State Sanitary Inspectorate (SSI)
- Veterinary Inspectorate (VI)
- Agricultural and Food Quality Inspection (AFQI)
- State Inspectorate for Plant Protection and Seed Production (SIPPSP)
- Trade Inspectorate (TI) [Kołożyn-Krajewska and Sikora 2010, Wojciechowski 2014].

In contrast, mandatory systems to ensure proper food quality and safety at all stages of production are:

- GMP (Good Manufacturing Practice);
- GHP (Good Hygiene Practice);
- HACCP (Hazard Analysis and Critical Control Point System) [Smith DeWaal 2003, Sikora 2017].

Non-mandatory systems to guarantee good food quality include:

- Quality Management System (QMS)
- Quality Assurance Checkpoints (QACPs);
- Food safety management according to ISO 22000;
- Total Quality Management (TQM).

The aim of this study was to analyze the frequency and sources of food safety hazards basing on the results collected within the framework of an official food control and monitoring performed by the State Sanitary Inspectorate. Empirical data came from documents held by one of the District Stations.

MATERIAL AND METHODS

The materials for this study came from the documentation and reports held by one of the District Sanitary and Epidemiological Stations (DSES) (from the Podkarpackie Voivodeship). The DSES selected for the study has 987 manufacturing facility under its supervision, including production plants, farms, retail and wholesale food trade facilities, as well as canteens and restaurants. Sampling for the tests was done according to the guidelines obtained from the Voivodeship Sanitary and Epidemiological Station (VSES). This document provides the precise guidelines on the methods and weight of samples to be taken and a schedule by month and a classification of groups by product.

This paper uses the results from surveys carried out in three consecutive years as part of monitoring, official food control, VSES supplement letters and following the consumer interventions.

The paper uses the results of the evaluation of food samples from the following groups:

- Group 01 – Meat, offal and meat preparations,
- Group 02 – Poultry, offal and poultry products, eggs and egg products,
- Group 03 – Fish, seafood and their preparations,
- Group 04 – Milk and milk products,

- Group 05 – Cereal grains and cereal products, flour,
- Group 06 – Confectionery and pastry products,
- Group 10 – Vegetables,
- Group 11 – Fruit,
- Group 12 – Mushrooms,
- Group 16 – Mineral waters and beverages,
- Group 17 – Vegetable fats,
- Group 21 – Herbs and spices,
- Group 23 – Fine foods and culinary products,
- Group 24 – Foodstuffs for particular nutritional uses,
- Group 26 – Dietary supplements,
- Unclassified lunch meals.

Each sample taken for testing was described, and a sampling protocol was drawn up, which concerned the place and date of collection, the name and weight of the sample, the group number, the collection method, the direction of testing and information on the type of control. The descriptive data of the samples and the test results were collected in a sample record document and stored at the DSES.

The study was based on the data from records compiled in three consecutive years. The data concerned 558 samples. The data were processed in Excel and then statistically analysed using the chi-square independence test in STATISTICA ver. 13.0. The analysis included:

- Food sampling frequency according to: year assessment; half-year assessment (May-October and November-April); sampling mode (monitoring, official control and official control + monitoring); reason for sampling (scheduled sampling and off-plan sampling);
- Frequency of food sampling of different groups depending on: year of assessment; location of sampling (different locations offering different types of food are listed);
- Characteristics of the directions of food sample testing in each product group;
- Number and percentage of samples that were normal and questioned by year.

RESULTS AND DISCUSSION

In the DSES where the study was performed, a total of 558 food samples were collected over the three-year period (Table 1). Comparing the years with each other, it can be concluded that the number of samples taken in each year was at a similar level. This indicates that the Station where the surveys were conducted is working and carrying out inspections according to the year-round inspection plan, and there were no emergencies requiring additional, over-planned inspections. In contrast, there are large discrepancies in each of the three years when comparing the six month periods. In all years, more than 80% of the sampling was carried out in May-October. However, this seems to be justified as the months included in this half-year period are those with higher temperatures and food during this period is more exposed to various factors (mainly microbiological) that can worsen its quality and safety.

The Chief Sanitary Inspector (CSI), together with scientific and research institutes, each year draws up a sampling plan for all voivodeships within the framework of official food control and monitoring, which is of plant origin – produced and on the market, and of animal origin – only on the retail market. Annual reports on the implementation of the above mentioned plan are drawn up by the State Voivodeship Sanitary Inspectors. The reports must be made in accordance with the detailed guidelines of the CSI (https://www.gov.pl).

Table 2, which considers the mode and reason for sampling in the specified time interval, shows that in each of the analysed years most samples were taken under official food control and monitoring (more than 50%). It is noteworthy that in successive years, the proportion of samples collected under official food control and monitoring systematically increased, while the proportion of those taken exclusively under official food control decreased. This relationship was statistically confirmed ($P \leq 0.05$). The second part of the table shows the data by reason for sampling. The majority of samples (more than 95%) were in accordance with the station's annual work plan. Sampling outside the plan (so-called intervention sampling) accounted for a negligible percentage of

Table 1. The number of food samples taken by the DSES over the three-year period, divided into two half-year periods

Year of survey	Samples taken during the half-year				Total collected samples per year	
	May – October		November – April			
	n	%	n	%	n	%
First	141	83.4	28	16.4	169	30.3
Second	183	85.1	32	14.9	215	38.5
Third	152	87.4	22	12.6	174	31.2
Total	476	85.3	82	14.7	558	100.0

Table 2. Number of food samples taken by the DSES over a three-year period by mode of sampling

Mode or reason for collection	Year						Total		Value χ^2
	First		Second		Third				
	n	%	n	%	n	%	n	%	
Monitoring	10	5.9	21	9.8	26	15.0	57	10.2	
Official supervision	70	41.4	76	35.3	50	28.7	196	35,1	11.1*
Monitoring and official supervision	89	52.7	118	54.9	98	56.3	305	54.7	
Planned	167	98.8	205	95.,3	165	94.8	537	96.2	5.1
Off-plan	2	1.2	10	4.7	9	5.2	21	3.8	

* significance level $P \leq 0.05$.

all samples taken per year, but it should be noted that there is an increasing trend of this type of sampling from year to year over the three analysed years, from 1.2% in the first year to over 5% in the third year. However, in order to determine whether this is a constant upward trend and what the cause is, a longer time frame would need to be observed.

Food law requires producers to strictly follow all stringent regulations, compliance with which is checked by state surveillance units, including the State Sanitary Inspectorate. Consumers, when choosing foodstuffs, are increasingly guided not only by their healthiness and visual appeal, but also consider their quality [Omieciuch 2016].

The main task of the state food supervisory units is to protect the population from diseases related to food consumption [Płusa and Porajski 2019]. The activities of the State Sanitary Inspectorate, as well as those of other inspectorates, are established by legal regulations. Both traders and consumers need to be assured that the activities of these institutions are carried out fairly, in accordance with food law, impartially and effectively [Szkiel and Jendza 2014].

Among the obtained samples, food samples from three groups built the largest percentage: 06 (16.5%), 02 (14.9%) and 04 (13.6%) (Table 3). Mushrooms (group 12) and vegetable fats (group 17) were the least frequently assessed, both groups 0.4% each. The probable reason for the increased number of tests by the SSI of meat and poultry products, dairy products and confectionery and pastry products is the fact that the interest of Polish consumers in these types of food products is growing every year. This is related, among other things, to new trends in nutrition, but also to more attractive prices. According to a study conducted by Moskal and Michalska [2017], most respondents consume poultry meat most willingly (36.2%), while pork meat is purchased less frequently. The Chief Sanitary Inspector, by monitoring the trends in nutrition of Polish population, orders subordinate units to take samples according to current food market requirements.

The most frequently 'visited' locations by GSES staff were hypermarkets and discount stores (Table 4). This accounts for more than a third of all food sampling over the three consecutive years. This seems understandable, as it is in these retail facilities that Poles most often buy food products and, due to their popularity, the number of these types of facilities is constantly increasing. Bakeries, confectioneries and convenience stores accounted for a smaller, but also significant, proportion of locations inspected (22% of all sampling). This is also understandable, as these types of retail facilities are very popular among Polish consumers due to their close accessibility at their place of residence. The smallest number of inspections in the three-year period was recorded at market squares – just three cases (0.54). The reason for this situation seems to be that this once very popular form of trading in food (especially from individual farmers) is declining markedly from year to year. This trend has probably been accelerated by the possibility for farmers to sell their food directly.

Today, a farmer is allowed to process and sell his agricultural products directly to consumers (as a part of his farming operation). Acting alone, the farmer/producer has to take care of getting a buyer, and comply with all applicable tax and sanitary regulations for production, transport and sale. When acting with other farmers and producers, by co-founding producer groups, cooperatives or local food systems (e.g. Buying Clubs), the farmer facilitates his access to a buyer by sharing resources, costs, risks and benefits with others in production, logistics, marketing and sales. In both cases, the farmer, as producer, is individually responsible for running the business in accordance with the regulations [Mrozek 2022].

In his detailed sampling guidelines, the Chief Sanitary Inspector almost always points out in which type of facilities a particular assortment should be sampled. Thus, for example, foodstuffs such as traditional ice cream from vending machines are mainly tested dur-

Table 3. Number of food samples collected by the DSES over a three-year period by product group

Product group	Year of collection							
	First		Second		Third		Total	
	n	%	n	%	n	%	n	%
01	10	5.9	5	2.3	11	6.3	26	4.6
02	28	16.6	26	12.1	29	16.7	83	14.9
03	–	–	10	4.6	20	11.5	30	5.4
04	15	8.9	34	15.8	27	15.5	76	13.6
05	16	9.5	24	11.2	13	7.5	53	9.5
06	30	17.8	31	14.4	31	17.8	92	16.5
10	1	0.6	9	4.2	13	7.5	23	4.1
11	5	2.9	10	4.6	11	6.3	26	4.6
12	1	0.6	1	0.5	–	–	2	0.4
16	5	2.9	–	–	–	–	5	0.9
17	2	1.2	–	–	–	–	2	0.4
21	5	2.9	10	4.7	–	–	15	2.7
23	26	15.4	10	4.7	10	5.7	46	8.2
24	5	2.9	35	16.3	9	5.2	49	8.8
26	18	10.7	8	3.7	–	–	26	4.7
No category	2	1.2	2	0.9	–	–	4	0.7

$\chi 2 = 131.9^{**}$, $P \leq 0.01$.

ing the summer season, in order to check whether entrepreneurs comply with the relevant food law during this short and intensive sales time. In contrast, fresh meat and processed meats are mostly sampled at supermarkets, food discounters, wholesalers and company shops. There is a reason for this, as consumers, given the opportunity for a large selection of specific goods and a variety of products from different industries in one place, prefer to shop in large centres. In a study on shopping preferences for meat, Moskal and Michalska [2017] showed that young respondents (students) mostly (47.3%) declared that they bought fresh meat in markets and supermarkets, while 33.3% purchased in meat company shops. According to the aforementioned study, the least frequented place to buy meat was small, neighbourhood shops.

It is hard not to notice that Poles are following the latest trends these days, also in the area of grocery shopping. The ubiquitous Internet and mobile applications installed on smartphones or tablets offered above all by large retail chains, make it possible to buy all the necessities of life and order services in a quick and hassle-free manner without leaving home or during a break at work. Mobile shopping saves time and money, as modern websites help discerning shoppers to find the best option for them [Krzepicka 2016]. Hence, it is to be expected that there will be an increase in the number of food inspections at such outlets.

Table 4. Number of food samples by commercial facility

Type of commercial facility	n	%
Hypermarkets	102	18.28
Discounters	97	17.38
Bakeries and pastry shops	63	11.29
Neighbourhood shops	62	11.11
Wholesalers	53	9.51
Restaurants and caterers	39	6.99
Company shops	29	5.20
Supermarkets	28	5.01
Drugstores	26	4.66
Pharmacies	20	3.58
Other	15	2.69
Delicatessen	11	1.97
Ice cream stalls	10	1.79
Fairgrounds	3	0.54
Total	558	100

Table 5 shows quantitatively which directions of testing of food samples were carried out by the DSES. The dominant direction of testing (360 samples – nearly 65% of all tests) was microbiological hazards. This seems understandable, since, as the previously cited publications show, these types of hazards are the most common cause of deterioration of food quality and safety, leading to serious illness and loss of health and life. Besides, microbiological hazards occur at every stage of food production and distribution.

Despite the constant efforts of sanitary services, microbiological contamination of food is still a very significant threat to human health in Poland. Pathogens such as *Salmonella, Escherichia coli, Campylobacter* or *Listeria monocytogenes* are the main cause of food poisoning. A study by Satowska et al. [2019] showed that 787 people with campylobacteriosis were reported in Poland only in 2016. Also in other countries, microbial food hazards are a huge problem. According to Schmutz et al. [2016] only in 2013, 414 Salmonella and 1168 Campylobacter outbreaks were located in EU countries.

Other important factors that make food no longer safe for human consumption include:

- the presence of metals harmful to health (nickel, lead, cadmium, mercury);
- pesticide residues (mainly in fruit, vegetables and cereals);
- the addition of flavourings, dyes and preservatives to food;
- genetic modifications;
- physical hazards getting into the food during production (glass, wood, metal, stones, sand);
- food adulteration;
- presence of mycotoxins, including aflatoxin or ochratoxin [Sitarz and Janczar-Smuga 2012].

In the three analysed years, out of a total of 558 different food samples tested, there were 15 cases (2.7% of the total) in which their quality was called into question (Table 6), with an unfortunately increasing trend of such cases in the following years. The highest number of questioned samples was recorded in the third year. At that time, 7 samples of foodstuffs of inappropriate quality were found out of 174 collected (4.0%). One less sample was questioned the year before and two years earlier, of the 2 samples questioned, only one raised health safety concerns. This increase can be explained in a number of ways. One factor may be the randomness of sampling, another the reduced attention to food quality by producers and distributors, and another, the use of more accurate and sensitive analytical methods in the assessment of food samples.

As Kowalczyk and Kwasek [2020] emphasise, food safety results in SSI inspections are quite variable from year to year. But in general, a systematic reduction in the proportion of food samples questioned due to unsatisfactory health parameters is noted. The summary of the cited authors shows that in 2001, the quality of 9.4% of tested food samples was questioned, and in 2018, this rate dropped to 3.0%. At the same time, the authors emphasise that, depending on the food assortment group, the proportion of questioned samples varied considerably. For example, the proportion of questioned batches of vegetables and fruit ranged from 1.7–1.8%, and for milk and milk products it was 7.3%.

Whenever a food sample is found not to comply with the applicable legislation, an expert meeting should be convened to qualify the product in terms of the type of notification. In case of DSES, these may be alert notifications (food or other product should be urgently withdrawn from the market because it poses an indirect or direct threat to the life or health of consumers) and information notifications (food or other product poses an indirect or direct threat to the health or life of consumers, but does not require prompt action). Next, the person responsible at Food Hygiene and Nutrition Section (FHNS) for drafting the Rapid Alert System for Food and Feed (RASFF) notification fills in a special form and sends it to the Voivodeship Sanitary and Epidemiological Station. This authority verifies if the RASFF notification is completed correctly and forwards it to the National Contact Point, which in Poland is run by the Chief Sanitary Inspector. The next steps concerning the disputed product are taken by the CSI.

Food produced in EU member countries must comply with strict requirements included in food legislation. Compliance with these by the food market ensures that foodstuffs are safe for consumers. The RASFF system operating in the EU ensures that food that could pose a threat to human health and life does not reach the European market [Lendzion et al. 2010]. According to an analysis by Majewski and Dziubdziela [2018], 2032 notifications were made across the European Union in the first six months of 2017. Since 2004, (the year of Poland's accession to the EU and thus to the RASFF) a total of 42291 notifications have been created. From Poland, 1602 of them were sent during this period (this represented 3.79 % of the total). This should be regarded as a very good result and shows that the food offered on our market is safe for the consumer and any irregularities are quickly detected and removed.

SUMMARY

During the analysed three-year period, 558 food samples were taken for testing. The volumes of samples have remained at a similar level year on year, with the highest in the second year – 38.5% of the total, 30.3% in the first year and 31.2% in the third year.

Table 5. Directions of food samples by number of samples tested

Direction of research	Number of samples	% samples tested
Microbiological hazards: *Salmonella* (in 25 g), *Listeria monocytogenes* (in 1 g); presence of *Salmonella enteritidis* and *Salmonella typhimurium* (monophasic strains of *Salmonella typhimurium* only with antigenic formula 1.4 [5] 12:1); *Escherichia coli* (in 1 g); *Enterobacteriaceae* (in 1 g); presumed *Bacillus cereus* (in 1 g); *E. coli*, *Enterococci* (faecal streptococci), sulphite- reducing *Clostridia*, *Pseudomonas aeruginosa*; staphylococcal enterotoxins (presence of *E. coli*, *Enterococci* (faecal streptococci), clostridia-reducing sulphites, *Pseudomonas aeruginosa*; staphylococcal enterotoxins (presence); biological impurities; physical impurities; organoleptic; labelling	360	64.52
Contents of additives, including preservatives: sodium nitrite; dyes which are limited in food- stuffs; organoleptics; labelling	26	4.66
Metals harmful to health: nickel; lead, tin; cadmium; arsenic; mercury; organoleptic; labelling	23	4.12
Radioactive contamination	17	3.05
PAHs: benzo(a)pyrene, benzo(a)anthracene, chrysene, benzo(a)fluoranthene (sum of 4 PAHs); organoleptic; labelling	17	3.05
Mycotoxins: aflatoxin B1, aflatoxin M1, DON, ZEA, ochratoxin A, patulin, fumonisins; organoleptics; labelling	15	2.69
Caffeine; organoleptics; labelling	14	2.51
Microbiological contaminants: *Campylobacter* thermophilic bacteria	13	2.33
Commensal indicator bacteria of E. coli producing ESBL, AmpC or carbapenemases	11	1.97
Histamine	10	1.79
Moulds; organoleptics	8	1.43
Vitamin and mineral content: vitamin C; calcium; organoleptic; labelling	8	1.43
Biological contaminants; organoleptics	6	1.07
Minerals: zinc, copper; organoleptics; labelling	6	1.07
Content of omega-3 fatty acids	6	1.07
Erucic acid; organoleptics; labelling	5	0.90
Calorific value; nutrient content	5	0.90
Additives other than colours and sweeteners; organoleptics; labelling	4	0.72
GMOs – presence of genetically modified organisms and identification of genetic modification; organoleptics; labelling	4	0.72
Total	558	100.00

Table 6. Results of food samples taken over the three year period by the DSES

Year	Result				Total
	correct		questionable		
	number of samples	% of samples	number of samples	% of samples	
First	167	98.8	2	1.2	169
Second	209	97.2	6	2.8	215
Third	167	96.0	7	4.0	174
Total	543	97.3	15	2.7	558

The State Sanitary Inspectorate, primarily collected food samples as planned under monitoring, official food control or both. Only 14 samples (2.5%) were taken in response to a consumer intervention. This may indicate low consumer awareness of food monitoring and control. Over the three years, confectionery and pastry products and poultry, offal and poultry products and eggs and their products were sampled most frequently. The most common sampling location was hypermarkets and discount stores. This is correct, as both the products and locations mentioned are the most sensitive for food safety.

During the analysed period, the largest number of samples were taken to determine the presence of microbiological contaminants. A total of 360 samples were tested

for this purpose. The groups that were most frequently checked in this respect were: confectionery and pastry products and poultry, offal and poultry products and eggs and their processed products. This may be due to the fact that these two food groups are the most vulnerable to this type of contamination. During the three years of testing, food quality was questioned in 15 cases, including seven samples in the third year. Most of the questioned samples were from fresh poultry meat (various types of microbiological contamination). The most frequently questioned parameter was their microbiological safety. The assortment group that was characterised by an increased level of health safety risk was group 02 – poultry, offal and poultry products, eggs and their processed products.

The results of this study confirm the necessity of conducting systematic food safety control and taking actions aimed at eliminating irregularities in this area. However, in order to increase the effectiveness of food safety systems, in addition to the involvement of governmental institutions, cooperation in this area among businesses, consumer organisations, academic centres and educational and advisory organisations is needed. Only such a chain for safety can be effective in combating irregularities in food quality and safety. The most important of these are large-scale consumer education programmes and the empowerment of consumer organisations.

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CZĘSTOTLIWOŚĆ I ŹRÓDŁA ZAGROŻEŃ BEZPIECZEŃSTWA ŻYWNOŚCI W BADANIACH PAŃSTWOWEJ INSPEKCJI SANITARNEJ NA PRZYKŁADZIE DZIAŁAŃ WYBRANEJ POWIATOWEJ STACJI SANITARNO-EPIDEMIOLOGICZNEJ

STRESZCZENIE

Celem pracy była analiza częstotliwości i źródeł zagrożeń występujących w żywności na podstawie wyników badań przeprowadzonych w ramach urzędowej kontroli żywności i monitoringu, przez Powiatową Stację Sanitarno-Epidemiologiczną. Na podstawie dostępnych publikacji, omówiono pojęcie bezpieczeństwa żywności oraz obowiązujące w tym zakresie uregulowania prawne na poziomie unijnym i krajowym. Scharakteryzowano także zagrożenia występujące w żywności (chemiczne, biologiczne, fizyczne). Część analityczną oparto na danych z 558 próbek żywności pobranych w ramach urzędowej kontroli żywności i monitoringu, prowadzonych przez Powiatową Inspekcję Sanitarną w ciągu trzech kolejnych lat. Stwierdzono, że w analizowanym okresie najwięcej próbek do badań w kierunku zagrożeń żywności pochodziło z grup: wyroby cukiernicze i ciastkarskie; drób, podroby i produkty drobiarskie, jaja i ich przetwory; mleko i przetwory mleczne. Próbki pobierano najczęściej w hipermarketach, dyskontach spożywczych, piekarniach i cukierniach oraz w sklepach osiedlowych. Kierunki badań pobranych próbek były istotnie zróżnicowane w zależności od grupy produktów, a najczęstszymi były zagrożenia mikrobiologiczne oraz zawartość substancji dodatkowych, w tym konserwujących, barwników i substancji innych niż słodzące i barwniki. W kierunku zanieczyszczeń mikrobiologicznych najczęściej badano wyroby cukiernicze i ciastkarskie, a substancje dodatkowe oznaczano głównie w wyrobach garmażeryjnych i kulinarnych. W okresie prowadzonych kontroli doszło do zakwestionowania 15 próbek żywności, przy czym w jednym przypadku zastrzeżenie budziło oznakowanie produktu. Przyczyną kwestionowania jakości żywności była obecność zanieczyszczeń mikrobiologicznych w postaci termofilnych bakterii *Campylobacter*, bakterii z rodzaju *Salmonella*, w tym *S. enteritidis*, przekroczenie liczby *Enterobacteriaceae*, stwierdzenie zanieczyszczeń biologicznych oraz niewłaściwej kaloryczności posiłku.

Słowa kluczowe: żywność, bezpieczeństwo żywności, Państwowa Inspekcja Sanitarna, monitoring żywności, zanieczyszczenia mikrobiologiczne, choroby przenoszone przez żywność

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