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**THE EVALUATION OF FACTORS DETERMINING
THE EFFECTIVENESS OF SUPERVISION AND
MONITORING ALLERGENS IN POULTRY PLANTS**

Summary of doctoral dissertation

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1. Justification of topic selection

On the website Science in Poland, the Polish Ministry of Education and Science confirmed that the incidence of allergies is increasing. It is predicted that, in 15 years, every second European will suffer from an allergy. Currently, it is estimated that 7 million people suffer from food allergies in Europe alone. Dr. Lucyna Pachocka, Head of the National Dietetics Center of the Food and Nutrition Institute in Warsaw, confirmed that "allergic diseases are already on the 4th-5th. place in terms of prevalence, right after cardiovascular diseases, respiratory diseases and cancer. All over the world, at least 20-30% of people suffer from allergies and with the increase in the population, the number of sick people therefore doubles every 10 years. "

Based on the collected data, prof. Maciej Kaczmarek from the Medical University of Białystok confirms that 6% of children in Poland suffer from food allergies, mainly up to 5 years of age, and 3-4% of adults (Science in Poland, <https://naukawpolsce.pl/aktualnosci/news>, downloaded dnia 04/02/2022). Over the past few years, problems related to food allergies in the United Kingdom (UK) have been one of the most common causes of hospitalization in the country. The Food Standards Agency (FSA) state in their published guide "Food allergen labeling and information requirements" that 5 to 8% of children and 1 to 2% of adults in the UK have a food allergy and 1 in 100 people suffer from gluten intolerance (FSA, 2020, p. 7). The latest NHS Digital report, available as of February 4, 2022, "Food allergy admissions, by government office region, for 2013-14 to 2018-19", shows an increase of 1,830 hospital admissions due to food allergies in England between 2013 (4,091 cases) and 2018 (5,921 cases). In London alone, there were 1,585 hospital admissions for food allergies in 2018, up from 825 in 2013.

RASFF (The Rapid Alert System for Food and Feed) in its annually published report includes statistics of notifications about food, feed and food contact materials potentially hazardous to human, animal or environmental health. In the 2020 report, allergens were included as the fourth of the ten most important threats to food products from member countries (RASFF, 2020, p. 17). In Poland, just in 2021, 15 products were withdrawn from the market as a result of incorrect labelling of allergens or the lack of specification of allergens in the composition of the product, despite its presence in the product (GIS, <https://www.gov.pl/web/gis/ostrzezenia>, taken on February 4, 2022). The UK FSA recalled 88

products in 2021, of which 7 are meat products and 6 are poultry products. In January 2022, 3 product withdrawals were made from the UK market, one of which was related to the recall of a batch of several types of products, which included 6 products with the addition of meat and 3 with the addition of poultry (FSA, www.food.gov.uk-news-alerts, retrieved on February 4, 2022).

The substances and products causing allergies or intolerances are specified in the Regulation of the European Parliament and of the Council (EU) of 21 October 2011 on the provision of food information to consumers, no. 304, Annex II to the Regulation. This list contains a list of 14 substances with their derivatives. However, the current legal situation does not prescribe how to proceed to prevent cross-contamination during the production of food containing allergens. Companies are left to develop their own means of safe food production based on the principles of GMP (Good Manufacturing Practices) and GHP (Good Hygiene Practices). Over the past decade, a number of guides, articles, seminars and courses have been published in the UK and Poland, the main role of which is to help effectively supervise and monitor allergens in businesses. Plants producing under the brand name of retailers are also forced to implement complex systems for the supervision and monitoring of allergenic substances imposed by the quality management systems recognized by the retailers, the effectiveness of which is verified during unannounced inspections by specially trained auditors. Despite the enormous expenditure related to research on allergens, the number of cases of allergic reactions and product withdrawals from the market due to the lack of allergen declarations contained in products is increasing, and the aforementioned projects do not always bring the expected results. Therefore, it was justified to conduct research in the area of identification and evaluation of factors influencing the monitoring and supervision of allergens in plants. An analysis of the literature showed that all publications, regulations and guides approach the subject of allergen surveillance and monitoring as a whole without detailing specific industries in the food industry. The research conducted is intended to focus only on the poultry industry to identify and evaluate the factors influencing the effectiveness of the supervision and monitoring of allergens in a given industry. The choice of the industry is due to the continuous increase in the demand for poultry meat. In the first two quarters of 2020, an increase in Polish exports of poultry (meat, processed and live poultry) by 4.1% was observed, compared to a 15.6% increase in the same period in 2019. According to the data of the National Poultry Council, Poland is among the top producers of

poultry meat in the EU. In 2019, with a share of 24.2%, it was second in terms of poultry meat exports in intra-EU trade (KRDIG, <https://krd-ig.com.pl/rynek-drobiu>, downloaded on February 4, 2022). Based on the data provided in Statista, the production of poultry meat in the UK increased by 353 thousand tonnes between 2010 and 2020. In 2010, the production of poultry meat amounted to 1,567.7 thousand tonnes, and in 2020 it was 1921.1 thousand tons (Statista, <https://www.statista.com/statistics/298503/annual-poultry-meat-production-in-the-united-kingdom-uk/>, accessed February 4, 2022).

2. Research problem, objective of the dissertation and research hypotheses

So far, there is no legal regulation that prescribes the way allergens are dealt with in a company. The current state of knowledge does not answer the question of how allergens can be effectively monitored and controlled. The main task of the plant is to prevent the presence of an allergen in the product if the allergen is not included in the declaration on the label.

Potential sources of allergens in the food industry are:

- allergens as product ingredients resulting from recipes,
- allergens as incidental contamination - cross contamination,
- the influence of technological processes on food allergenicity.

The main purpose of the dissertation was to assess the factors determining the effectiveness of the supervision and monitoring of allergens in poultry establishments. In order to achieve the main goal, in the first place, specific goals were established, including:

- identification of factors influencing the supervision and monitoring of allergens,
- assessment of factors influencing the supervision and monitoring of allergens,
- assessment of the effectiveness of the allergen monitoring and monitoring system in the surveyed enterprises,
- development of guidelines for the effective surveillance and monitoring of allergens.

In order to organize the scope and content of the research work, three scientific hypotheses were formulated relating to the studied issues:

Hypothesis 1: The area of raw material and production controls is equally important for companies located in Poland and Great Britain in the area of allergen supervision.

Hypothesis 2: Factors determining the effectiveness of the supervision and monitoring of allergens are factors in the area of washing and disinfection of the production line.

Hypothesis 3: There is a directly proportional relationship between the duration of the allergen surveillance and monitoring system to assess its effectiveness.

3. Research methods and dissertation structure

The doctoral dissertation was written as a result of the adopted goal and confirmation of the hypotheses put forward through the analysis of secondary and empirical data. The author of this dissertation has carried out an in-depth analysis of the scientific and research literature with particular emphasis on the comparison of allergen issues in Poland and Great Britain. Research data was collected in 2015-2019. In the period 2009-2017, the author worked in the largest slaughter, cutting and packaging plants for raw turkey products in Great Britain. In 2017-2019, the author worked in the English branch of the company that has 12 meat and poultry plants in Poland. The author's own experience of being a leader in allergen management in various companies was supported by numerous meetings with a group of 10 experts using individual in-depth interviews (IDI). On this basis, a questionnaire was developed, which was used to obtain information for empirical research that was carried out in 2019. The conducted research confirmed the adopted hypotheses, as a result of which the scientific goals were achieved. The doctoral dissertation consists of four chapters.

The first chapter discusses the management of food safety and quality, and presents the types of food hazards, legal requirements and control institutions.

The second chapter discusses the standardization requirements in the area of ensuring food safety and quality, as well as the characteristics of the meat products market and the poultry industry divided into two countries, i.e. Poland and Great Britain, where the research was carried out.

The third chapter is devoted to the surveillance and monitoring of allergens in enterprises. The concept of allergens was discussed in detail, as well as the legal requirements for their supervision, the key areas were defined and explored in terms of their monitoring.

The fourth chapter is devoted to a detailed discussion of the research results. Allergens occurring in the examined enterprises were identified. Identification and evaluation of the importance of allergen surveillance areas and factors determining the effectiveness of the allergen surveillance and monitoring system was performed. The effectiveness of the operating system was assessed and its effectiveness was verified on the basis of product

withdrawals from the market and complaints. This chapter also presents the conclusions of the conducted research relating to the set research goals and hypotheses.

The substantive part of the thesis concludes with a summary, a list of the literature used, a list of tables and figures, and a presentation of the questionnaire in Polish and English.

4. Test results and final conclusions

The literature research conducted on the basis of Polish and foreign sources, as well as empirical research carried out on the basis of the collected primary data, allowed the author to draw a number of conclusions relating to the assessment of factors determining the effectiveness of control and monitoring of allergens in poultry establishments:

1. An effective system of supervision and monitoring of allergens in poultry plants is a guarantee of producing a safe product.
2. Enterprises are fully aware of the difficulties arising from the correct implementation of allergen management procedures and instructions, as three-quarters of respondents admitted using consultants in this area. In Poland, this amount was much greater than in Great Britain. This proves the great openness of Polish enterprises and the awareness of the management staff who allocated funds from the budget to cover these costs.
3. Milk and its products (including lactose) are the most common allergen in both countries in poultry plants, which was confirmed by 93% of respondents.
4. All plants confirmed that they take into account all areas indicated in this study in the control of allergens, therefore it can be concluded that in these areas compliance with legal requirements, accepted standards and good manufacturing practices is in place.
5. Enterprises wishing to strengthen the supervision of allergens in the plant should focus on the most important areas identified on the basis of factor analysis, including: "Documenting activities", "Product development", "Supervision of raw materials and the implementation of the production process", "Identification and traceability of products and processes".
6. Most of the surveyed companies put emphasis on employee training and ensure that people visiting the plant (eg contractors, service companies, etc.) do not pose a risk of cross-contamination of products with allergens. In order to avoid the risk of cross-contamination, the vast majority of investigated plants apply the principle of segregating auxiliary equipment,

which is used in accordance with the adopted systems, e.g. with regard to colours for given raw materials / products containing allergens.

7. Establishments that slaughter laying birds or individuals sufficiently mature to develop an egg consider the activity related to the validation and verification of the post-slaughter washing process in terms of cross contamination as rather important or very important, although not all enterprises have implemented adequately effective measures for the type of activity conducted in order to avoid the risk of cross-contamination. Companies should take this aspect of allergen control into account in their risk analyzes, as not taking it into account may be a key factor in the spread of cross-contamination of allergens.

8. The most important determinants of the effectiveness of allergen surveillance are: "Cleaning and Disinfection", "Verification Activities", and "Prevention of Cross-Contamination in the Manufacturing Process".

9. Respondents from Polish plants are more optimistic about their effectiveness in controlling and monitoring allergens in virtually all areas than respondents from plants located in Great Britain. However, both Polish and UK respondents expressed concerns about the effectiveness of their actions in terms of controlling and monitoring allergens during the design of new products or the development of existing ones. When implementing new products or developing existing ones, particular attention should be paid to the risk of introducing a new allergen to the plant or ensuring that the line is kept clean after the production of a new product.

10. Almost half of the respondents came from establishments that declared gluten-free products on their labels. This means that poultry plants recognize the need to provide products to the market for a specific group of consumers and are trying to meet the modern dietary trend aimed at eliminating gluten from the diet.

11. UK plants made more product recalls than Polish plants as a result of the likelihood of cross-contamination with allergens. This may be because the UK does not make use of the possibility of labelling allergens that are not present in the product, but may be present there as a result of cross-contamination. On the other hand, in Poland such a procedure was declared by over 77% of the respondents. Enterprises should take effective measures to reduce the risk of cross-contamination with allergens and thus not abuse the possibility of declaring the occurrence of cross-contamination on the label.

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