
FOOD ALLERGENS - A GROWING CHALLENGE IN THE FIELD OF FOOD SAFETY

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Abstract: Allergic reactions and intolerances caused by food are considered a growing public health problem worldwide. The immune reaction of the body, or the reaction of intolerance, can be caused by the consumption of even a small quantity of food to which a person is sensitive. A wide range of risk factors directly influence the more frequent occurrence of allergic reactions and intolerances among all population groups. This article aimed to present the leading risk factors that lead to the contamination of food with nutritional allergens and consequently the occurrence of reactions in the population as well as to present the importance of the comprehensive action of all stakeholders in the food chain to prevent the occurrence of unwanted reactions. To write this review article, available scientific literature published in relevant databases was used. Numerous studies in the field of food safety confirm that the leading risk factors for the occurrence of these health conditions are: insufficient effectiveness of the food safety system within the food business operators (FBO), improper application of the principles of the HACCP system or the absence of HACCP implementation at the FBO, inadequate sanitary-technical and hygienic conditions within the facility where food is handled, non-compliance with the principles of good production and hygienic practice, complete absenteeism and insufficient education of food handlers employees about nutritional allergens, contamination possibilities, with special reference to cross contamination, prevention measures and developing awareness of the seriousness the consequences that food allergens can have on the health of consumers, inadequate food labeling, a poor monitoring system and a non-harmonized legislative framework, changing lifestyles among consumers, more frequent food consumption outside households, etc. To reduce or eliminate the risks related to food allergens, a comprehensive approach is necessary, which includes the involvement of leading authorities in the field of food safety, FBO at all levels of the food chain, as well as consumers.

Keywords: food, allergens, contamination, risks, HACCP

1. INTRODUCTION

Along with the widening of range available foods and the greater supply of food in general, in countries around the world, the number of people with symptoms attributed to adverse reactions to food is also increasing. (Akiyama et al., 2011). Food allergy is a serious, growing public health problem that affects about 10% of the total population, and the prevalence of these diseases has been increasing in recent decades worldwide (Sicherer & Sampson, 2018). Food allergy is a hypersensitivity immune reaction to food components, most often to proteins. In addition to allergic reactions to food, intolerance reactions that are not immune-mediated can also occur, and most often occur due to an enzyme deficiency (Turkalj & Mrkić 2012). The immune reaction can lead to various symptoms such as skin reactions, respiratory problems and even severe anaphylactic shock which can be fatal. In this regard, in addition to the impact on physical health, allergic reactions and food intolerance reactions represent a significant psychosocial and economic burden for individuals, their families and society in general (Patel et al., 2015; Greenhawt, 2016). Although more than 170 types of food are known to cause allergies, nine foods are now considered the main sources of allergens that cause more than 90% of all allergic reactions to food, better known as the "BIG 9". These foods include cow's milk, eggs, peanuts, tree nuts, soy, gluten-containing grains, fish, shellfish, and sesame (López-Pedrouso et al., 2023). The frequency of allergic reactions to food is associated with the way of eating, food preparation, cultural and social factors specific to individual countries and cultures (Turkalj & Mrkić 2012). Consuming food outside households as an integral part of modern lifestyles represents a significant risk for the occurrence of adverse reactions related to food in a sensitive population, with developed allergic reactions and food intolerances. The best way to prevent the occurrence of accidental situations is to avoid the consumption of food, especially within food business operators that belong to the category of risky establishments due to the specificity of their business, such as restaurants. It is estimated that between 21 and 31% of accidental situations related to the consumption of food contaminated with allergens occur in restaurants, and 13-23% occur in other places such as the workplace or school canteens (Musa et al., 2010; Barnett et al., 2018; Versluis et al., 2015). The specifics of the hospitality industry are closely related to the risks of direct or indirect contamination of food with allergens. These specificities mainly relate to inadequate sanitary and technical conditions in which food is handled, preparation of large quantities of different types of food, constant fluctuation of the workforce, absence of good hygiene and production practices, poor knowledge, attitudes and practices towards safe food handling, lack of employee education on allergens and the health consequences they can have on the health of the consumer,

ineffective system of the safe food business - HACCP in terms of identification and management of allergens, inadequate labelling of food allergens, etc (Akabanda et al., 2017; Stankovich et al., 2023; Elshoryi et al., 2020). With the increase in the prevalence of allergic reactions and food intolerances among the population, nutritional allergens, their identification and the prevention of direct or cross-contamination of food with them have become an indispensable part of the correct policy of safe food business (Gojkovi-Cvjetković et al., 2015). However, the application of recommendations and regulations in practice, despite clearly defined provisions, is often absent. The aim of this article was to show the leading risk factors that cause contamination of food with food allergens and consequently the occurrence of reactions in the population, and to show the importance of the comprehensive action of all stakeholders in the food chain in order to prevent the occurrence of unwanted reactions.

2. MATERIALS AND METHODS

This review article was the result of a search of available scientific literature from relevant databases using the keywords "*food*", "*allergens*", "*contamination*", "*risk*" and "*HACCP*". After searching and systematizing the data, a descriptive analysis was performed to obtain results for the research objectives.

3. RESULTS AND DISCUSSION

3.1. Food allergen labeling as an important public health instrument

Food allergen labelling is an internationally recognized risk management tool, and regulatory rules have been developed to reduce the risk of allergen exposure in people with food allergies (Mara et al., 2017). Considering that there is still no cure for food allergies, despite the extremely high prevalence of these diseases, the best way to prevent or control unwanted situations related to food allergens is to avoid food that contains allergens. The way in which the same can be achieved is a detailed check of the ingredients on food labels. The importance of providing clear and accurate information about the allergens contained in the product by subjects in the food business who are responsible for placing food on the market is unquestionable, considering that for people with these health problems, allergen labelling is a key instrument to reduce the risk of exposure and prevent anaphylaxis (Waserman et al., 2018; Blom et al., 2021; Elrahi et al., 2023).

With the entry into force of EU Regulation No 1169/11 on the provision of information to consumers about food, significant changes have taken place in relation to the labelling of food allergens, both in the European Union and in Bosnia and Herzegovina (B&H). Changes in the B&H legislative framework occurred in 2014, when it began to be applied Regulation No 68/13 on the provision of food information to consumers, which is substantially harmonized with European ones. The crucial change referred to the clear definition of a list of 14 substances or products that cause allergic reactions or intolerances, which must be labelled if they are used in the production or processing of food and if they are part of the product, then improving the visibility of the information (minimum font size for mandatory information), clearer presentation of allergens on the packaging of pre-packaged food (highlighting of the font style and background colour), as well as defining exceptions to labelling of food allergens. EU Regulation No 1169/11 also obliges FBOs to label food allergens on food that is offered for sale directly to the consumer or in catering establishments without pre-packaging and on food that is packed at the point of sale at the consumer's request or pre-packaged for direct sale (Regulation 1169/11/EU; Regulation 68/13/BA).

Despite the considerable harmonization of regulations regarding food allergens, unfortunately in B&H, the labelling of allergens for unpackaged products is not clearly specified by regulation, as is the case in the EU. The obligation to label allergens through official controls in B&H is defined by the Regulation on Food Hygiene of B&H, which obliges FBOs to implement and maintain the HACCP system, whereby in addition to microbiological, physical and chemical hazards, allergens should also be identified and managed in a prescribed manner, in order to accident situations are avoided or reduced to an acceptable level (Regulation 04/13/BA).

The absence of precise regulations for non-packaged products in Bosnia and Herzegovina is an aggravating circumstance, given that in practice, adequate labelling and management of allergens for this category of food on the B&H market is very often absent.

Many cases of the presence of health-improper food that were reported through the RASFF System - Rapid Alert System for Food and Feed indicate that despite the clearly and precisely defined rules for labelling and managing food allergens, problems related to allergens are still present. Many notifications related to the presence of allergens that are not indicated on food labels point to the need for significant efforts to ensure better protection of consumers health (Pádua et al., 2019; Friganović et al., 2022). A significant challenge in providing information to consumers regarding allergens is the labelling of allergens that may be the result of unintentional food contamination. Uncertainty about the risk to people who develop allergic reactions even to very small amounts of allergens has prompted many food manufacturers to provide information on potential unintentional contamination with allergens during production in the form of indicating allergens as a precautionary measure (Precautionary allergen labelling -

PAL), better known as the statement "May contain". However, stating this claim for the purpose of preventive labeling of allergens must be scientifically based and must not mislead the consumer. (Allen et al., 2014). Considering that PAL labelling is not precisely regulated by regulations, the absence of information about trace allergens is not always a guarantee for safe food consumption and represents a serious risk to the health of consumers with allergic reactions. On the other hand, providing this information with the aim of caution and avoiding possible disputes, limits the choice of food for consumers who do not want to take risks (Blom et al, 2021; Davidović et al., 2022).

3.2. The importance of the PRP and HACCP system in the prevention of accident situations related to food allergens

As the prevalence of allergic reactions and food intolerances is on the rise in countries around the world, leading authorities in the field of food safety are increasingly focusing on allergens as hazards that can occur at any point in the food chain and can cause serious health consequences for people. The importance of allergen identification and proper allergen management within the food industry, as well as with FBOs that prepare food for direct use, is increasingly emphasized.

The importance of proper management of allergens was highlighted in the changes made by the Codex Alimentarius Commission in 2020, which related to the published their first-ever Code of Practice on Food Allergen Management for Food Business Operators. According to the code of practice, allergen management systems and their control measures should be based on risk assessment conducted by the FBO, in which they must identify the allergenic nature of the foods they handle and establish controls. Allergen management practices should be part of good hygiene practices (GHPs), and, where appropriate, HACCP systems, in manufacturing, retail and food service (Joint FAO/WHO CAC 2020).

To prevent the occurrence, minimization and elimination of allergens in food manipulation processes, it is necessary for FBOs to establish adequate sanitary-technical and hygienic conditions, i.e., prerequisite programs (PRP), which are a prerequisite for effective allergens risk management. (Tzamalís et al., 2016).

Non-specific food safety hazards are mainly controlled by applying the principles of good hygiene (GHP) and good manufacturing practice (GMP). GHP and GMP as an essential part of PRP must be the first or initial step that FBOs will take to ensure a safe environment. Good prerequisite practices ensure control over processes and represent the basis for creating a safe environment and the production of health-safe food and eliminating the risk of direct or cross-contact with allergens (Taylor Whited et al., 2019).

Generally, allergic reactions to food occur because of exposure to food proteins during ingestion of foods. However, in addition to ingestion reactions, allergic patients may have reactions from cutaneous or mucosal exposures to food proteins. In this regard, cross-contact represents one of the biggest challenges when talking about food contamination with allergens. Cross-contact occurs when food containing allergens comes into contact with food that does not, resulting in a mixture of proteins. For food allergies, cross-contact is important when an allergen is inadvertently transferred to a food/meal that is thought to not contain that specific allergen. The most common cross-contact happens due to the transfer of proteins from hands, food preparation on the same work surface, using the same appliances and utensils, improper food storage (Sheehan et al, 2018). Good hygiene practices play a critical role in the management of allergen cross-contamination. Cleaning is a key allergen control measure in many food businesses. Cross-contact of products with allergenic materials may occur due to inadequate cleaning of equipment, food contact surfaces and the operational area within a manufacturing facility as well as poor personal hygiene. The application of existing prerequisites for personal hygiene for staff, contractors and visitors should be sufficient to minimize the risk of cross-contamination. The effectiveness of the implemented hygiene and sanitation procedures must be validated to be sure that the procedure was performed correctly. It is extremely important to educate the staff regarding the proper maintenance of personal hygiene and the hygiene of the premises. Staff engaged in cleaning duties post-allergen handling should be suitably trained and aware of the potential risks of carry-over, with refresher training being provided to ensure continued compliance with the required standard. In addition to a good level of knowledge and practices related to cleaning processes, employees must be well educated and trained so that they do not lead to unintentional contamination during food manipulation processes, and they must know how to give correct information to consumers (Littleton et al., 2021). In addition to adequately established prerequisite programs, a functional HACCP team that will establish an effective and detailed HACCP plan is crucial for the prevention of food contamination with allergens.

The HACCP plan represents the core of the HACCP system, in which hazards are managed through a more comprehensive approach through 12 steps in such a way as to identify and assess their occurrence in certain process steps, then determine process steps as critical or control points, conduct monitoring, establish corrective measures in case the occurrence of danger and ultimately the verification of the previously mentioned activities (Varga, 2013; Carter et al., 2020). A properly established HACCP plan should highlight the areas of risk where allergenic

contamination is most likely and explain which control measures to follow. Incorrect or insufficiently detailed identification of allergens leads to repercussions in the further stages of HACCP system implementation, which in many cases results in aggravating circumstances or even the complete impossibility of adequately functioning (Wallace et al., 2020).

4. CONCLUSION

Cross-contact with allergens can be fatal for people with these health problems. Given that health problems related to food allergens have long been one of the leading public health problems, to reduce or eliminate the risks related to food allergens, a comprehensive approach is necessary, which includes the involvement of leading authorities in the field of food safety, FBO at all levels of the food chain, as well as consumers.

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