Dąbrowski Jan, Gąbka Ilona, Dalmata Weronika, Dębek Karolina, Lipiec Marta. Food hypersensitivity - classification, pathogenesis, diagnosis. What are food allergies? Journal of Education, Health and Sport. 2022;12(9):463-468. eISSN 2391-8306.
DOI http://dx.doi.org/10.12775/JEHS.2022.12.09.053
https://apcz.umk.pl/JEHS/article/view/39647
https://zenodo.org/record/7049424

The journal has had 40 points in Ministry of Education and Science of Poland parametric evaluation. Annex to the announcement of the Minister of Education and Science of December 21, 2021. No. 32343.
Has a Journal's Unique Identifier: 201159. Scientific disciplines assigned: Physical Culture Sciences (Field of Medical sciences and health sciences); Health Sciences (Field of Medical Sciences and Health Sciences).
Punkty Ministerialne z 2019 - aktualny rok 40 punktów. Załącznik do komunikatu Ministra Edukacji i Nauki z dnia 21 grudnia 2021 r. Lp. 32343. Posiada Unikatowy Identyfikator Czasopisma: 201159.
Przypisane dyscypliny naukowe: Nauki o kulturze fizycznej (Dziedzina nauk medycznych i nauk o zdrowiu); Nauki o zdrowiu (Dziedzina nauk medycznych i nauk o zdrowiu).

The authors declare that there is no conflict of interests regarding the publication of this paper.
Received: 21.08.2022. Revised: 02.09.2022. Accepted: 05.09.2022.

Food hypersensitivity - classification, pathogenesis, diagnosis. What are food allergies?

Jan Dąbrowski[1], Ilona Gąbka[1], Weronika Dalmata[1], Karolina Dębek[1], Marta Lipiec[2]

1. Student Scientific Circle at the Department of Epidemiology and Clinical Research Methodology of the Medical University of Lublin.
2. Student Research Group at the independent Laboratory of Functional Disorders of the Chewing Organ, Medical University of Lublin.

Abstract

Introduction: Food hypersensitivity is a pathological, increased and inadequate reaction of the body to a particular substance, the consumption of which can cause various types of body symptoms.

Purpose: The purpose of this study is to distinguish different types of hypersensitivity mechanisms, resulting in the introduction of appropriate diagnosis and treatment.

Results and conclusions: Food hypersensitivity is becoming an epidemic of the 21st century. This is due to many individual factors as well as environmental pollution. It is important to identify the type of mechanism involved in a given food hypersensitivity and to eliminate the causative factors, or incorporate appropriate treatment. Understanding this forms the basis of therapy.

Methods: Data for the article were retrieved using PubMed setting the time descriptors to 2014-2020.

Keywords: food hypersensitivity, allergic, non-allergic, diagnosis, diet, food, allergens.

Introduction

Along with food, essential nutrients are supplied to the body, which are used as building blocks, a source of energy and substrates for many chemical reactions occurring in the human body to enable proper functioning. These components include, among others, carbohydrates, proteins, lipids, vitamins and other macro and micro nutrients. Under physiological conditions, most of these substances are not harmful. Unfortunately, in some cases, adverse reactions may occur in the body after contact with a particular nutrient, which disrupt the proper functioning of the body and its homeostasis. However, they can cause a disease state and sometimes even a life-threatening condition [1,6].

Purpose: The purpose of this study is to distinguish different types of hypersensitivity mechanisms, resulting in the introduction of appropriate diagnosis and treatment.

Methods: Data for the article were retrieved using PubMed setting the time descriptors to 2014-2020

Definition

A disorder of the body resulting from an abnormal reaction to ingested food is defined differently. Over the years, the definition has changed many times due to which terms such as hypersensitivity, allergy, and food intolerance are very often used interchangeably, which is incorrect. The most correct form of classification is the division on the basis of the pathomechanism of the reaction. There are two main groups : allergic food hypersensitivity, which follows an IgE-dependent mechanism, and non-allergic food hypersensitivity, which follows an IgE-independent mechanism. Non-allergic food reactions (IgE-independent) include many reactions of different origins min:

- non-immune intolerances -> disorders of enzyme secretion such as lactose;
- pseudoallergic reactions -> foods rich in histamine or additives and preservatives in foods;
- autoimmune reactions -> celiac disease;
- IgG-mediated reactions [1,2,6].

Epidemiology

A person has to deal with disorders of allergic origin from an early age. Based on studies, IgE-mediated food allergy usually develops by the age of 2. The most likely causes include a disturbed balance of T-lymphocyte ratio, with a predominance of Th2 lymphocytes, and an incompletely developed intestinal barrier, which reduces food tolerance and disrupts the entire immune mechanism [1,5].

Influencing factors

Factors predisposing to food hypersensitivity of environmental origin include improper diet, inappropriate implementation in childhood of foods with allergic tendencies, food additives and air pollution. Under the influence of these stimuli, the expression of genes responsible for normal food tolerance reactions can be altered, leading to disorders in the absorption of nutrients contained in food. Further predisposing factors are genetic, that is, the inheritance of genes responsible for the potential development of allergies in the family. Also, dietary habits in different parts of the world affect the frequency and number of people who develop food disorders [1,2].

Pathogenesis

The basis of the pathogenesis of food allergy is the action of the immune system. The human immune system includes innate immunity and acquired immunity. Innate immunity consists of a system of physical and chemical barriers and the action of specialized cells that, together with the complement system, cytokines and acute phase proteins, form the body's nonspecific defense. Acquired immunity, on the other hand, involves the development of the immune system's ability to recognize and fight specific antigens. Cells involved in specific immunity include T lymphocytes and B lymphocytes [4].

In the case of food allergy, the main role is played by IgE class antibodies, which are released by immune cells after contact with specific allergens supplied with food. B lymphocytes are responsible for the production of various classes of antibodies - IgA, IgM, IgG and IgE. In the course of an allergic reaction, B lymphocytes, through the action of cytokines, are transformed into plasma cells, which are specialized to produce IgE class antibodies against specific antigens. Due to the strong affinity of IgE class antibodies to receptors (Fc IgE complex - FceRI) during the first contact with an allergen, there is a coating of mast cells by IgE antibodies, which does not cause visible clinical symptoms and is called the induction phase. After each subsequent contact with the same allergen as a result

of the adhesion of IgE antibodies to mast cells, the cells break down and release mediators responsible for the onset of food allergy. This is type I hypersensitivity (IgE dependent)which is the main mechanism of food allergies. In addition, there are type II (cytotoxic), type III (immune complexes) and type IV (IgE-dependent). It is believed that type IV may also have some involvement in food allergy through the action of Th1 cells. The differences between the different types of reactions are related to the timing of symptoms. In type I (anaphylactic), symptoms occur within minutes to an hour after repeated contact with the allergen. Type IV reaction (delayed hypersensitivity) develops in several to 48 hours. Type II and type III being the cause of non-allergic food hypersensitivity associated with non-specific release of histamine from mast cells and basophils, resulting from certain substances contained in foods [1,3,5].

Food allergens

Food allergens are classified according to their origin, plant allergens and animal allergens are distinguished. It is important to remember that the food consumed may contain allergens from both groups, which can only exacerbate the allergic reaction. Foods that are sources of natural histamine are responsible for the food disorder of the non-allergic type. These include cheese, red wine and yeast. There is also a large group of foods that, when consumed, trigger the release of histamine from mast cells. This phenomenon is called pseudoallergic reaction is caused by : citrus, tomatoes, strawberries, chocolate and egg white [1,5,6].

Diagnosis and clinical presentation

Due to the increasing prevalence of food hypersensitivity in the population, specialists in gastroenterology, allergology, epidemiology, internal medicine and also in dietetics are looking for the causes of development, how to quickly diagnose and minimize the clinical symptoms that occur. Symptoms are very often similar to typical gastrointestinal diseases. The basic element in clinical diagnosis is a detailed interview with the patient, which should include questions about the current state and course of the disease, observations, as well as suspicions of what may be the cause of the occurrence of food hypersensitivity. It should be remembered that the course of the ailment in each case may be different, so each patient must be treated individually. Complementary to the history is the physical examination, the performance of immunological tests, in particular the determination of antibodies in the IgE

class. The procedure outlined will make it possible to detect the cause causing the symptoms of food hypersensitivity and implement medical management.

Depending on whether we are dealing with allergic food hypersensitivity or non-allergic food hypersensitivity, the initial symptoms differ.

Food allergy is characterized by a sudden onset of general symptoms (anaphylaxis) and additional symptoms in the form of skin redness and urticaria as an example of local lesions. Late symptoms may include cough, runny nose and sinus involvement.

Anaphylaxis is a life-threatening systemic reaction, it occurs within a short time of exposure to an allergen. The most common symptoms of anaphylactic reaction include swelling of the mucous membranes and difficulty breathing. In addition to food, it can occur under the influence of drugs or insect venom. The primary treatment of symptoms is to administer epinephrine intramuscularly first, to decongest the airways and stabilize basic vital signs and then implement further treatment - histamine antagonists and corticosteroids [7].

In the case of allergic hypersensitivity to food, symptoms appear within a dozen to even tens of hours. In addition, a much larger group of foods can cause reactions bypassing the immune system. It is important for patients to keep food diaries here, which makes it easier to determine the allergens contributing to this type of food disorder [1,3,5].

Summary

Food hypersensitivities are disorders that increasingly affect people in the 21st century. It is very important to skillfully classify the disorder and determine the pathomechanism of the onset, as the symptoms of the disease may be nonspecific. Not all food hypersensitivity has an immunological basis, resulting from different types of reactions, so a thorough clinical history, examination and laboratory diagnostics are essential to make a diagnosis. Treatment and appropriate diet are designed to improve the patient's quality of life.

Bibliography:

1. Nowicka-Jasztal A., Bryl E.: Food hypersensitivity – a disease of the twenty-first century? Forum Medycyny Rodzinnej 2016, tom 10, nr 1, 1-9.
2. De Martinis M., Sirufo M. M., Suppa M., Ginaldi L.: New Perspectives in Food Allergy. Int. J. Sci. 2020, 21(4), 1474. doi: 10.3390/ijms21041474.
3. Yu W., Hussey Freeland D., M.: Food allergy: immune mechanisms, diagnosis and immunotherapy. Nature Reviews Immunology 16, 2016, 751-765. doi: 10.1038/nri.2016.111.

4. Zahorska-Markiewicz B., Małecka-Tendera E. Et al.: Patofizjologia kliniczna. Podręcznik dla studentow medycyny. Wyd. Edra Urban & Partner, Wroclaw 2017, 109-119.
5. Sicherer S. H., Sampson H. A.: Food allergy: Epidemiology, pathogenesis, diagnosis, and treatment. J Allergy Clin Immunol. 2014 Feb, 133(22), 291-307. doi: 10.1016/j.jaci.2013.11.020.
6. Lin Ch., H.: Food allergy: what it is and what it is not? Curr Opin Gastroenterol. 2019, 35(2), 114-118. doi: 10.1097/MOG.0000000000000506.
7. Pfilipsen M. C., Vega Colon K. M.: Anaphylaxis: Recognition and Management. Am Fam Physician 2020, Sep 15, 102(6), 355-362.