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Cow's milk allergy on children

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Abstract

Cow's milk allergy (CMA) is an abnormal response by the body's immune system to cow's milk. It is one of the most common food allergies in children, however it also affects adults in later life, however CMA results from an immunological reaction to milk proteins (caseins and whey proteins) There are different mechanisms that contribute to the pathogenesis and the main two described mechanisms at the basis of this disease refer to immunoglobulin E (IgE-) and non-IgE- reactions .

CMA cause symptoms including skin reactions, GIT upset such as stomachache, vomiting, diarrhea or constipation.

A study was done to compare the cow's milk protein specific IgE concentration between 3 groups of children, under the age of 3 years, another group over the age of 9 years and in another group of children above 11 years old. The study proved that the children above age of 11 years old lost their cow's milk allergy protein

The only way to prevent an allergic reaction is to avoid cow's milk, However there are Medications are used such as antihistamines and epinephrine (adrenaline) which administrated as injection.

Introduction

Allergy is a term used when an immune response results in exaggerated or inappropriate reactions harmful to the host. Generally speaking, allergy reactions occur in response to external stimuli (antigens) whereas autoimmune reactions occur in response to internal stimuli (antigens). The term allergy is often equated with hypersensitivity but more accurately should be limited to the IgE-mediated reactions. There are four different types of immunological hypersensitivity reactions, type I-VI. Type I is immunoglobulin (Ig)E dependent and results in acute (<1 h) symptoms due to mast cell activation upon antibody (especially IgE) receptor crosslinking. Type II, III and IV hypersensitivity reactions result in delayed or intermediate delayed symptoms, 6-92 h, upon allergen challenge. ⁽¹⁾⁽²⁾⁽³⁾

Food allergy is a growing problem in Western Europe and the USA. Clinical symptoms may involve the skin, respiratory tract and gastrointestinal tract, which can even lead to a systemic anaphylactic reaction. Cow's milk allergy (CMA) is one of the leading causes of food allergy in infants. In developed countries approximately 2 to 3% of infants exhibit CMA. It is different to lactose intolerance. While lactose intolerance is not an allergic condition as it does not involve the immune system. In people with lactose intolerance, the digestive system can't fully digest lactose. However very few adults are allergic to cow's milk. People who are allergic to cow's milk can also be allergic to milk from other animals such as goats. ⁽¹⁾⁽²⁾⁽³⁾⁽⁴⁾

CMA results from an immunological reaction to one or more milk proteins, Cows milk contains two main protein classes, the caseins (30 g/L) and whey proteins (5 g/L). The caseins consist mainly of α S1-, α S2-, κ - and β -casein, whereas whey proteins comprise of β -lactoglobulin, α -lactalbumin, bovine serum albumin, serum immunoglobulins and lactoferrin. Large population studies with cow's milk allergic infants have shown that the major allergens are β -lactoglobulin, α S1-casein and α -lactalbumin.

There are different mechanisms that contribute to the pathogenesis and the main two described mechanisms at the basis of this disease refer to immunoglobulin E (IgE-) and non- IgE-reactions. Nevertheless, even if these two pathogenic pathways are the main described, there is a third mechanism causing CMA, as a third group of symptoms attributed to cow's milk allergy are unpredictably associated with IgE antibody (IgE-associated/cell-mediated disorders). ⁽²⁾⁽³⁾⁽⁴⁾

Aim of the study: To compare the level of cow's milk protein-specific IgE among children with documented CMPA under the age of 3 years, another group over the age of 9 years (persistent allergy), and in another group of children above 11 years old.

Materials and Methods:

Stored sera from children with CMPA were analysed for IgE antibodies specific for whole cow's milk, casein, whey, alpha-lactalbumin (ALA), beta-lactoglobulin (BLG), and bovine serum albumin (BSA) using the Pharmacia CAP System

Fluorescent enzyme immunoassay.⁽⁴⁾⁽⁵⁾

Results:

Within each group of CMPA children, the concentration of specific IgE antibody to casein proteins was not significantly different from that to whey proteins. However, children in the group with CMPA over 9 years of age had significantly greater concentrations of whole milk ($P = 0.02$) and casein-specific ($P = 0.04$) IgE antibodies compared with the group of children with CMPA under age 3 years. Children under the age of 3 years had a higher median concentration of casein specific IgE ($P = 0.04$) than another group of 11 children who later lost their milk allergy.⁽⁴⁾⁽⁵⁾

Discussion:

IgE-mediated reactions are based on simply immunological mechanisms that are better identified than not-IgE-mediated ones.

Since the onset of symptoms rapidly evolves (from several minutes to several hours after the contact with the allergen), this kind of mechanism is referred as “type 1 hypersensitivity”.

IgE-mediated CMA is characterized by two stages: the first, of “sensibilization”, develops when the immune system is programmed in a sudden way, so that IgE antibodies against cow milk

proteins are secreted. These antibodies bind the surface of mast cells and basophiles, and the following exposure to milk proteins triggers the “activation” phase, when IgE associated to mast cells bind allergenic epitopes sited on milk proteins and unleash a rapid release of inflammatory mediators responsible for the allergic reaction. The allergens are ingested, processed and expressed by antigens presenting cells (APC) .The interaction between APC and T lymphocytes promotes the modulation and the activation of B lymphocytes. These latter produce IgE antibodies that interact by their Fc portion with the allergen sited on mast-cells surface. ⁽²⁾⁽⁵⁾⁽⁶⁾

The pathogenesis of non-IgE mediated reactions is supported by different theories: reactions mediated by Th1 cells, interactions between T lymphocytes, mast cells and neurons that alters the function of the smooth muscle and the intestinal motility

It seems that there are discrepancies between the high number of natural resolution of manifestations linked to a not-IgE-mediated reaction during childhood and the predominance of these reactions in adulthood. This theory explains as these kinds of reactions can appear later in life. On this regard, Zuberbier et al. observed patients of different age and they found a direct relationship between the incidence of not-IgE -mediated reactions and age. Nevertheless, other studies are needed to confirm this hypothesis. ⁽⁵⁾⁽⁶⁾

CMA cause a wide range of symptoms including skin reactions, such as a red itchy rash or swelling of the lips, face and around the eyes. GIT upset such as stomach ache, vomiting, diarrhea or constipation. Occasionally CMA can cause severe allergic symptoms for example: shortness of breath, wheezing and noisy breathing. ⁽³⁾ However, CMA diagnosis is based on skin test known as skin prick test (SPT) it is expose to small amounts of the proteins found in milk, however this type of test is not completely accurate for detecting milk allergy. And blood sample also required to measure the amount of immunoglobulin E (IgE) antibodies in blood.

CMA typically presents in the first year of life.The majority of children outgrow CMA by the age of ten years ⁽⁴⁾. According to the study it proved that allergy of cow’s milk protein disappear once the child reach the age of 9 to11 years. ⁽⁵⁾⁽⁶⁾

Conclusion: Cow’s milk allergy (CMA) is characterized by hypersensitivity against casein or whey, affecting 2.5% of young infants. The pathogenesis of CMA involves IgE as well as non-

IgE-mediated reactions and clinical symptoms are found in the skin, lungs and gastrointestinal tract. however CMA results from an immunological reaction to milk proteins (caseins and whey proteins) There are different mechanisms that contribute to the pathogenesis and the main two described mechanisms at the basis of this disease refer to immunoglobulin E (IgE-) and non-IgE- reactions . regarding the study it proved that allergy of cow's milk protein disappear once the child reach the age of 9 to11 years.

Future work :

The only way to prevent an allergic reaction is to avoid cow's milk . This can be difficult because cow's milk is a common ingredient in many foods. However there are Medications are used such as antihistamines may reduce a mild allergic reaction. In a severe allergic reaction epinephrine (adrenaline) administrated as injection.

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