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REVIEW

Position document: IgE-mediated allergy to egg protein

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Abstract Egg is the food that most often causes allergy in young Spanish children, with an incidence of 2.4–2.6% in the first 2 years of life. The prevalence of sensitisation and allergy to egg is greater in children with allergy to cow's milk and in those suffering atopic dermatitis. The protein component from egg white is the cause of the allergic response in child. The major allergens in egg white are ovomucoid and ovalbumin. Most of the allergic reactions affect the skin, followed by gastrointestinal and respiratory systems. Egg allergy is one of the most common causes of severe anaphylaxis. The diagnosis of egg allergy is based on the existence of a suggestive clinical history, a positive allergy study and the subsequent application of controlled exposure testing, which represents the gold standard for confirming the diagnosis.

The treatment of egg allergy is based on the avoidance of egg protein intake. A subgroup of egg-allergic patients are tolerant to cooked egg. In these cases, only uncooked egg must necessarily be avoided. Maintaining a diet with strict egg avoidance is difficult, and transgressions are relatively common. The patient, family, and school environment should receive education and training in the avoidance of egg and in the management of possible allergic reactions. With an avoidance diet, up to 15–20% of children will remain allergic and the severity of the reactions will increase over the years. In these more severe cases of egg-allergy, it becomes more difficult to adhere to the avoidance diet over the years, with a significant decrease in patient quality of life.

Oral tolerance induction can be regarded as a therapeutic option for IgE-mediated egg allergy. The anti-IgE, omalizumab, might become another genuine therapeutic option for food allergy, not only to prevent allergic reactions after a contact with egg, but also as a complementary treatment to oral tolerance induction for egg allergy, with the purpose of reducing adverse reactions.

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The administration of influenza vaccine to children with egg allergy is safe in children that do not manifest severe reactions after egg intake, and in children who tolerate cooked egg. The triple viral vaccine (MMR) can be given to egg-allergic children in their usual vaccination centre, with no added risk. Different medicinal products can be formulated with egg proteins, and therefore should be avoided in children with egg allergy.

Definition

According to the classification proposed by the European Academy of Allergy and Clinical Immunology (EAACI),[1] chicken egg allergy is an adverse reaction with an underlying immunological pathogenic mechanism produced by the intake or contact with egg and its proteins.

Although other possible immunological mechanisms may be implicated, in the case of egg allergy the currently only well known mechanism corresponds to an IgE-mediated type I immediate hypersensitivity reaction.

Eggs, typically represented in our setting by chicken eggs, represent an important source of proteins, and form one of the basic elements in our diet from the first year of life.

Their high protein content, introduction in the diet from the first year of life, and their widespread consumption define eggs as the food that most often causes allergy in young children in Spain.[2]

Epidemiological data

Egg is the leading cause of food allergy in children.[2–4]

Such allergy tends to manifest under 2 years of age, and 50% of the patients are able to reach tolerance by 3–4 years of age, versus 66–74% by 5 years of age.[5–7]

The literature reports a 1.6% incidence of symptomatic egg allergy in the first year of life, and a cumulative incidence of 2.4–2.6% in the first 2 years.[8,9]

In Spain, an observational study has been carried out, known as the Alergológica survey,[10] involving 4991 patients visiting the allergologist. Food allergy was diagnosed in 369 patients (7.4%). In this group, egg allergy accounted for 16% of the cases of food allergy, and egg was seen to be the fourth ranking causal food by ranking of frequency in the general population, and the leading cause in children less than 5 years of age. In this latter subgroup, egg allergy accounted for 78.9% of all cases of food allergy, and was the main sensitiser along with cow's milk. In patients with atopic dermatitis and digestive symptoms, milk and egg were the most frequent causal allergens. In individuals under 15 years of age, the frequency of egg allergy was 20%, and eggs, milk, and nuts were found to be the leading cause of food allergy in this age group.

Most sensitisations to egg protein (76%) occur before 5 years of age, 12% between 5 and 10 years of age, and 12% between 10 and 15 years of age.

In a group of 355 children diagnosed with food allergy in Spain,[2] the prevalence of allergy to egg proteins was 20.1% – this figure is similar to that recorded in the Alergológica survey. A little over one-half of the patients (56.5%) developed the symptoms between 6 and 12 months of age, and 97% of the subjects manifested in the first 2 years of life. Only 16% of children with egg allergy had other associated food allergies (three or more).

The prevalence of sensitisation and allergy to egg is greater in children with allergy to cow's milk and in those suffering atopic dermatitis.

In infants with allergy to cow's milk, sensitisation to egg has been documented in 30–67% of the cases before its introduction in the diet, and positive provocation tests have been recorded in 36%.[11–13]

In infants with atopic dermatitis, sensitisation to egg protein has been observed in 61% of patients before its introduction in the diet, and positive provocation tests have been recorded in 27–67%.[14–16]

Aetiology

Egg contains abundant proteins of high biological value, and is widely consumed throughout the world.

Egg allergy occurs when its proteins, or allergens, are recognised by the host as foreign, and the immune system consequently develops a rejection response to them.

Both components of egg, the yolk and egg white, can cause allergic sensitisation, although, particularly in children, the protein component in egg white is the cause of the allergic response. Crossed immunoelectrophoresis has identified at least 24 different proteins in egg white, but only some of them cause allergic reactions. Exceptionally, some patients can develop allergy to proteins contained in egg yolk, while preserving tolerance to the egg white proteins.

Pathogenic mechanism

Egg proteins usually come into contact with the host immune system through the digestive tract. From the first stages of life the infant can come into contact with food proteins through breast milk,[17] via the inhalatory route, or skin contact. Occasionally, first contact can occur during foetal development through the placenta.

The body has a series of physiological barriers that protect it from foreign antigens. In the digestive system, these barriers comprise two groups of elements: (1) non-immunological (gastric acid, pancreatic enzymes, intestinal enzymes, mucus, the membrane of the microvilli, the mucosal layer and intestinal peristalsis), and (2) immunological (IgA, IgE, IgM, IgG, lymphocytes and macrophages, Peyer's patches, intestinal secretory IgA and secretory IgA in breast milk).

When the composition of the diet is modified, as for example when new foods are introduced or when the infant is weaned from breastfeeding, complex physiological