

Two adolescent patients with high IgE levels and hypereosinophilia are associated with cockroach allergen

To the Editor,

Cockroach is an important indoor allergen especially in hot and moist environments. The main types of cockroaches causing the sensitivity are *Blattella germanica*, *Periplaneta americana* ve *Blattella orientalis*. Although cockroach allergens are found throughout the home, including beds, furniture, and carpets, allergen levels are highest in the kitchen. Saliva, faecal material, secretions, cast skins, debris, and dead bodies are cockroach allergens. Sensitivity to cockroach allergen has been shown to be associated with exposure levels and is more prevalent in urban than in suburban areas. For good protection, it is necessary to use insecticides and clear out the indoor environment very well.¹

IgE is a combination of two heavy and two light chain immunoglobulin in 190 kg Dalton which contains less than 1 mcg/ml in normal monomeric plasma. Serum IgE concentrations are highly age dependent. Since IgE does not cross the placental barrier in a significant amount, cord serum IgE levels are low, usually less than 2 kU/L. Progressive increases in mean serum IgE levels occur up to age 10 to 15 years. After age 14, serum IgE levels greater than 333 Ku/L (800 mcg/L) are strongly associated with atopic disorder. Although high levels of serum IgE are common in allergic disease, total serum IgE has become less frequently used as an indicator for atopy because of the wide overlap in the IgE distributions of the atopic and non-atopic population.²

Eosinophils are generated in the bone marrow and can be found in the peripheral blood, where they represent 1% to 5% of the leukocytes with an upper limit of $0.4 \times 10^9/L$. Eosinophilia and IgE production is driven by allergen-activated Th2 cells that generate large amounts of Th2 cytokines (IL-4, IL-5, IL-13).³

Here we present two adolescent patients admitted to our allergy clinic because of high IgE levels and hypereosinophilia. In evaluation of these two patients we determined cockroach allergy. We stress that cockroach allergy should always be kept in mind in cases of high IgE levels and hypereosinophilia in adolescents.

Case I

A 12-year-old male patient suffering with skin rash and intermittent abdominal pain for 4-5 years was referred to our clinic with hypereosinophilia and hyper-IgE problems. During the patient's history, it was learnt that the complaint was especially cough with effort. There were also no evidences reported about his respiratory, sore throat, and nose complaints. There was no history of having used albuterol ever before. There was no atopic disease history in his background, nor in his family's background. When we asked about the patient's house, we learned that the house is an old building, has poor hygiene and has cockroaches. The patient was not living in an environmentally safe and hygienic house,

and where they were smoking inside, and his family had financial difficulties.

Physical examination was normal. There were no findings in the system to support atopy. Laboratory results were:

Total serum IgE was 8920 IU/ml, Leukocyte count: 64600/mcgl, peripheral blood count showed eosinophilia 72%. The serum levels of complement complements C3 and C4 were within the normal range. Antinuclear antibodies, anti-DNA antibodies were negative. Serological evidence of infection generally yielded negative results (hepatitis, EBV, CMV, toxoplasmosis). Abdominal ultrasound was normal. The stool examinations revealed no parasites including *Toxocara* and *Fasciola*. No significant pathology was detected in the examination of bone marrow excluding increasing the number of eosinophils by haematologist. The results of lung function tests and echocardiography were normal. Positive skin prick test to cockroach (*blattella germanica*: 6x6/21 mm, histamine: 7x7/23 mm) was observed. Sensitivity to other aeroallergens was not found. The cockroach-specific IgE level was 3.5 IU/mL (Class 2). Fifteen percent decline in FEV1 was determined with exercise provocation test. When the patient was no the treatment during a follow-up period, the level of IgE reduced to almost 6380 IU, leukocyte count 9000/mcgl and the eosinophil ratio decreased 9%. After discharging the patient, it was advised to take montelukast due to effort symptoms. It was suggested that the patient's house be treated to exterminate pests, or home swapping. The patient's parents changed their home. One month later, it was observed that the patient has Ig E: 5320 IU/mL and peripheral blood smear did not show eosinophil, the symptoms of induction with exercise turned normal.

Case II

An 11-year-old boy was admitted into our hospital with complaints of lack of appetite and fatigue. Physical examination was normal without any family history and personal background. The patient was a child of a low income family. When we asked about the patient's house, we learned that the house is an old building, has poor hygiene and has cockroaches.

Laboratory results were: Total serum IgE was 2170 IU/ml, leukocyte count 17630/mm, peripheral blood count showed eosinophilia, 4%. The serum levels of complement complements C3 and C4 were within the normal range. Antinuclear antibodies, anti-DNA antibodies were negative. Serological evidence of infection generally yielded negative results (hepatitis, EBV, CMV, toxoplasmosis). The bone marrow was normocellular and indicated an increase in myeloid and plasma series. No significant pathology was detected in the examination of bone marrow. Abdominal ultrasound was normal. The stool examinations revealed no parasites including *Toxocara* and *Fasciola*. The results of lung function tests were normal. Positive skin prick test to cockroach (*blattella germanica*: 3x3/6, histamine: 10x6/30 mm) was observed. The cockroach-specific IgE level was 17.5 IU/mL (Class 3). When the patient was in hospital, total serum IgE level had decreased to 1180 IU and peripheral blood eosinophilia was 4%. It was suggested that the patient's house be treated to

exterminate pests, or home swapping. The parents disinfected the home with pesticide, at control examination one month later there was no eosinophil in patient's peripheral blood smear.

Cockroach allergen is the predominant allergen in the inner city. In inner city populations, 30–40% of children with asthma are sensitised to cockroach and in the suburban population this rate is 21%.⁴ Cockroaches are important indoor allergens in our country with 20.2–25.7% in adult asthma patients and 16.3% in atopic children.^{5–7} In addition to the allergic diseases, high levels of IgE are frequently increased in parasitic infestations; hyper-IgE syndrome; IgE myeloma; drug-induced interstitial nephritis; graft-versus-host disease; and allergic bronchopulmonary aspergillosis. Patients with cockroach allergy also had particularly high levels of serum IgE antibodies as compared to asthmatics.¹ In one study,⁸ 28 patients with cockroach allergy had an average IgE of 1901ng/l and peripheral blood eosinophil counts were higher. Misirlioglu et al.⁷ found an average IgE of 559 IU/ml in their study.

Different aetiological factors, including allergic; autoimmune; infective; endocrine; and haematological diseases, can cause hypereosinophilia. Little is known regarding the functional capacity of cockroach antigen to activate eosinophils.³ In one study German cockroach extract induces activation of human eosinophils to release cytotoxic inflammatory mediators.⁹ There was no sign of differential diagnosis of elevated IgE concentrations and hypereosinophilia.

Cockroach allergens are associated with morbidity and mortality of asthmatics especially in the inner city. In one study 56.6% of the houses had above 2 U/g levels and one third of the houses had >8 U/g levels of cockroach allergen (Bla g 1) in asthmatic patients.¹⁰ A correlation has been observed between the prevalence of asthma and level of cockroach allergen.¹ Exposure to cockroach allergen in early life is a risk factor for the development of asthma in early childhood.¹¹ Our first patient was diagnosed asthma after exercise provocation test.

Substantial reduction in cockroach allergen can be achieved with an integrated pest management approach. It is not known whether this degree of allergen reduction will have clinical impact.⁴ However, the strong evidence that cockroach allergen exposure is linked with asthma morbidity supports recommending an integrated pest management approach to reduce exposure in cockroach-sensitised patients with asthma. In both cases, the level of serum IgE and hypereosinophilia was significantly reduced when the patient was in the hospital during the period of suspension environment. It was advised that the families' houses be exterminated before they went back to their houses. When both patients visited back in one month IgE levels were decreased and eosinophil counts were within the normal range.

The examinations for differential diagnosis of high level IgE and hypereosinophilia are difficult and expensive. We emphasize that cockroach allergy should always be kept in mind in cases of high IgE levels and hypereosinophilia. If we take a detailed history, such as the living conditions in the patient's home, we could diagnose our patients quickly.

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