Prevalence of Sesame Allergy in Egyptian Atopic Children

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List of Abbreviations

Abb.	*Meaning*
ACE	*Angiotensin-converting enzyme*
AEC	*Absolute eosinophil count*
BAT	*Basophil activation test*
CBC	*Complete blood count*
CFIA	*Canadian Food Inspection Agency*
DBPCFC	*Double blind placebo-controlled food challenge*
EC	*European Commission*
ELISA	*Enzyme linked immunosorbent assay*
ENT	*Ear, nose and throat*
Fc€RI	*Fragment constant Epsilon receptor I*
FDA	*Food and Drug Administration*
FDEIA	*Food-dependent exercise-induced anaphylaxis*
Ig	*Immunoglobulin*
IL	*Interleukin*
OIT	*Oral immunotherapy*
RAST	*Radio allergosorbant test*
SFA	*Sesame food allergy*
SpIgE	*Specific immunoglobulin E*
SPT	*Skin prick test*
TH	*T helper*
TNF-α	*Tumour necrosis factor alpha*

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INTRODUCTION AND AIM OF THE WORK

Food allergy is defined as an adverse immunological response to food that is reproducible under blinded conditions. As a result of changing environmental conditions, westernized life style, air pollution, and the consumption of lots of additives and preservatives with foods, food allergy is increasing worldwide. Food allergy affects about 6-8% of children *(Wassenberg et al., 2007).*

Sesame seeds are used by various cultures for food and are available in 3 different colors (white, black & brown). Sesame oil is extracted from the seeds, just 3 ml of sesame oil is enough to induce an allergic reaction *(Kanny et al., 1996).* Interest in sesame-coated bread products has increased markedly in recent years. Burgers in sesame-sprinkled buns are eaten everywhere and often. Tahini, hummus and halvah are now popular snack foods for infants. As a consequence the consumption of sesame has soared *(Perkins, 2001).*

Prevalence of allergy to sesame (Sesamum indicum) with its major allergens Ses i 1-7 becomes more significant due to its increasing industrial importance. Sesame represents an insidious "hidden allergen" found not only in alimentary products, but also in cosmetics and medical products, especially sun-protection creams

and solvents for intramuscular injections *(Guenova, 2008).* Sesame food allergy tends to appear early in life, but unlike cow's milk and egg allergy, persists in 80% of the cases *(Cohen et al., 2007)*.

Sesame is thus considered to be a major cause of severe IgE- mediated food allergic reactions among infants and young children *(Guenova, 2008).* Severe allergic reactions to sesame are becoming increasingly frequent especially among young children and can sometimes result in anaphylaxis *(Panizzolo, 2005).*

The aim of the study is to demonstrate the frequency of sesame allergy/senstization among a group of atopic Egyptian children and its clinical correlates.

SESAME ALLERGY

Sesame seed allergy is becoming increasingly prevalent, probably because of its use in international fast-food and bakery products *(Beyer et al., 2002)*.

Sesame food allergy (SFA) tends to appear early in life, and persists to adulthood in most cases *(Cohen et al., 2007).*

Sesame is most commonly found in Middle Eastern dishes, bakery products, dips, salad dressings, and vegetarian foods. In addition, sesame oil is used extensively in the pharmaceutical and cosmetic industries. This increasing consumption of sesame might be one of the reasons for the growing frequency of reported cases of sesame-induced allergic reactions. In fact, various types of reactions have been reported, including IgE-mediated food allergy and anaphylaxis, occupational reactions, and even non-IgE mediated reactions *(Caminiti et al., 2006).*

Sesame seeds are available in 3 colours: white, brown and black. Evidence exists of the ability of protein and oil components of sesame to trigger allergic reaction *(Gangur et al., 2005).*

It has been reported that 30 mg of sesame seed and 1ml sesame oil could trigger anaphylaxis; this suggests strong allergenic potency. It was also suggested that asthma induced by sesame could be even more severe than that induced by peanut, milk or egg. There were concerns that widespread use of sesame in food may eventually cause sesame to share the same 'notoriety and fate' as the peanut – a major cause of severe food allergic reactions *(Gangur et al., 2005).*

Epidemiology

The use of sesame and thereby the risk for allergies is a matter of geography. The increased consumption of foods containing sesame seeds has been shown to be paralleled by an increase in reported sesame-induced allergic reactions *(Dalal et al., 2002)*.

Sesame seed allergy is a common cause of food allergy in many countries, including Israel, Japan, the United States, and various European countries. A prevalence study of immediate hypersensitivity in Australian children found that sesame was in fourth place, following egg, milk and peanut, and was more common than that to any single tree nut studied. Among Israeli children sesame was the third most common food causing sensitization following egg and cow's milk, and it

was second only to cow's milk as a leading cause of anaphylaxis that is potentially fatal *(Gangur et al., 2005)* .

The European Commission (EC) and Canadian Food Inspection Agency (CFIA) have added sesame to the list of major food allergens for food labeling purposes *(Gangur et al., 2005).* On the other hand, the U.S. Food and Drug Administration (FDA) does not include sesame in its list of allergy-causing foods for labeling purposes *(Mayo clinic staff, 2009a).*

Types of allergens in sesame

There are differences in the extractable proteins from black and white sesame seeds and the type of extraction buffer that is used can affect the number and types of proteins that are obtained from sesame seed. These differences may be important considerations in preparation of diagnostic extracts for sesame seed and could help explain the puzzling negative skin test and negative RAST/CAP results observed in other studies on individuals who report convincing histories of sesame seed allergy *(Soylemez et al., 2002).*

Allergenic proteins of sesame seeds *(Sesamum indicum)* include seed storage proteins of sesame named Ses i 2 and Ses i 3, and recently 2 sesame seed allergens,

Ses i 6 and Ses i 7, have been identified *(Beyer et al., 2007).* Oleosins are major allergens of sesame seeds and may be relevant to severe anaphylaxis. Oleosins have been named Ses i 4 and Ses i 5 *(Leduc et al., 2006).*

Potential Cross-reactivity

Cross-reactivity between allergens in sesame and allergens in other foods, including hazelnut, rye, kiwi, peanut, black walnut, cashew, and pistachio, has been reported *(Gangur et al., 2005).*

Sesame allergies have been reported to occur at increased incidence in patients with peanut allergy. Although the coexistence may be simply due to a predisposition to food allergy in these individuals, cross-reactivity has been demonstrated between peanut and sesame seed. Demonstration of tolerance to peanut may falsely reassure patients and physicians that patients no longer need to avoid sesame as sesame allergies can exist or develop in patients despite the development of tolerance to peanut *(Beausoleil and Spergel, 2006).*

Seed storage proteins are known food allergens in peanut, walnut, Brazil nut, and soybean. Interestingly, one known IgE-binding epitope of the peanut allergen Ara h 1 has 80% homology with the corresponding area of Ses i 3. The different amino acids were previously shown

not to be critical for IgE binding in Ara h 1. In addition, sesame proteins at 78 and 34 kd were found to be homologous to the embryonic abundant protein and the seed maturation protein of soybeans, respectively. The identification of 4 sesame seed allergens was the first step toward generating recombinant allergens for use in future immunotherapeutic approaches. In addition, the detection of conserved IgE binding epitopes in common food allergens might be a useful tool for predicting cross-reactivity to certain foods *(Beyer et al., 2002).*

Pathophysiology of food allergy

Allergic reactions to food are IgE-mediated or non–IgE-mediated. Immune responses mediated by specific IgE antibodies are the most widely recognized mechanism of food hypersensitivity. Patients with atopy produce IgE antibodies to specific epitopes of the food allergen. These antibodies bind to high-affinity IgE receptors on circulating basophils and tissue mast cells present in the skin, gastrointestinal tract, and respiratory tract. Subsequent allergen exposure binds two adjacent IgE antibodies, resulting in receptor cross-linking and intracellular signaling that initiates the release of numerous mediators, including histamine, prostaglandins, leukotrienes, chemotactic factors, and cytokines (Fig. 1). The effects of these mediators on