

Watermelon Contains 92% Water but It Also Contains Allergens!

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Food allergy is a health problem of public concern. It is estimated that 2–4% of the adult population and 6–8% of children suffer from allergic symptoms when eating food of either animal or plant origin [1–3]. Although it is generally assumed that food allergies are on the rise, current prevalence data are still missing.

Some foods, such as egg, milk and tree nuts, cause food-allergic symptoms in patient groups from certain countries. For example rice is a relevant allergen source in Japan, while it is rather uncommon in Europe [4]. Mustard allergy is mainly restricted to Spain and France (Southern European countries) [5, 6]. Sesame seeds cause severe food-allergic symptoms in areas where it is recommended as a supplement, especially for children [7].

Allergy to various fresh fruits has been acknowledged to be an increasing problem, and a range of fruit allergens have been characterized in the recent past. Two different allergen recognition patterns were identified. In the case of pollen-related fruit allergies, predominant IgE reactivity to pollen allergens such as Bet v 1 homologues and Bet v 2 (profilins) homologues was identified usually eliciting symptoms of the oral allergy syndrome [8, 9]. It is accepted that the primary sensitization occurs via the inhaled pollen allergens. In contrast IgE reactivity to true food allergens such as nonspecific lipid transfer proteins is observed in fruit allergies where no preceding pollen allergy is known. This type of fruit allergy is usually linked to severe allergic symptoms [9].

The frequency of reported fruit allergies also depends on the predominant fruits that are eaten in the respective region. For example allergy to citrus fruits has been reported to represent a problem in southern countries

where fresh fruits are readily available. Melon allergy has been reported for Italian and Spanish patient collectives [10, 11]. Yet, little has been reported about watermelon causing food-allergic symptoms.

In vitro diagnosis of food allergy is frequently hampered by the use of total food extracts which lack standardized quality and comparable concentrations of identified allergens. Therefore, the component-resolved approach that replaces total extracts by individual purified allergens has the potential to significantly improve the diagnosis of food allergy.

While in the last 25 years hundreds of allergens were identified, it became evident that these proteins are not randomly distributed over all known protein families but can only be found in a limited number [12–14]. There is also a strikingly high number of identified allergens that possess certain biochemical functions such as hydrolysis of proteins, polysaccharides and lipids, binding of metal ions and lipids and cytoskeleton association [14]. Likewise only 5% of all structural protein families contain allergens. The triosephosphate isomerase (TIM) β/α barrel fold represents the fold with the highest number of allergen families ($n = 9$) and comprises protein families such as β -glucanase, type II chitinase, enolase and bee venom hyaluronidase [14].

Profilins are ubiquitous proteins, essential for all organisms. They are actin-binding proteins but also crucial for a number of molecular interactions [15]. Profilins are identified as relevant pollen allergens in virtually all seasonal airborne pollen sources and related plant food allergies. IgE-binding plant food profilins have been identified from Apiaceae (carrot, celery) Rosaceae (apple,

cherry, peach, apricot, pear, strawberry, almond), Solana-ceae (tomato, bell pepper), legumes (soybean, peanut), ce-reals (wheat, corn), pumpkin seed, rapeseed, saffron cro-cus, hazelnut, grape, mango, litchi, orange, pineapple, ba-nana, coconut, persimmon and melon (musk melon and watermelon; see www.allergome.org). Profilins are read-ily digested upon addition of pepsin and therefore regard-ed as allergens predominantly eliciting mild symptoms of the oral allergy syndrome [16, 17]. Due to the high cross-reactivity of antiprofilin IgE antibodies, the clinical rel-evance has been under investigation especially for plant food. It seems that especially for citrus fruits and melon the presence of specific IgE antibodies to profilin is linked with food-allergic symptoms [18].

TIM is a glycolytic enzyme that catalyzes the revers-ible interconversion of glyceraldehyde 3-phosphate into

dihydroxyacetone phosphate and thus plays a crucial role in several metabolic pathways. Although it contains the protein fold which is most frequently found in allergenic protein families, only little is known about the TIM itself as an allergen. It has been described as an allergen for wheat and litchi [19, 20].

As mentioned above many allergens have an enzymat-ic function. For example malate dehydrogenase is an en-zyme that reversibly catalyzes the conversion of malate into oxaloacetate. So far malate dehydrogenase has only been described as an allergen from fungus [21].

In the present issue 3 allergens from watermelon are presented, profilin, TIM and malate dehydrogenase (see Pastor et al.). It represents another example of allergens which can be related to a small number of protein fami-lies as in silico analysis has previously shown.

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