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U. R. S. P. Vintura Silvage

Scientific supervisor: Associated professor Ph. D A. V. Litvinchuk

Educational Establishment
"Gomel State Medical University"
Gomel, Republic of Belarus

CROSS-REACTION BETWEEN DUST ALLERGY AND SEAFOOD ALLERGY IN SOUTH ASIANS (TROPOMYOSIN SIMILARITY)

Introduction

Dust mite allergy and seafood allergy are the most common allergies worldwide. The purpose of this study is to explore the cross-reaction between dust allergy and seafood allergy in the South Asian population, specifically to determine the similarity of the cause of the allergy reaction, which is tropomyosin. Shellfish allergy is a critical food allergy and a form of anaphylaxis in Asia. Shellfish allergy prevalence is particularly noteworthy in Asian countries, which can manifest a range of symptoms from mild oral symptoms to severe and potentially life-threatening reactions [1].

The mechanisms behind such cross-reactivity can be grouped into categories based on the structural similarities of particular proteins. The major allergen associated with shellfish allergy is tropomyosin. This is a pan-allergen that is also present in-house dust mites and cockroaches. Tropomyosins, which fall under Group 10 allergens, are heat-stable muscle proteins that are associated with covariation between house dust mites and various invertebrates [2]. The tropomyosins of house dust mites have a significant homology to shellfish tropomyosins. There is also cross-reactivity between HDM and shrimp tropomyosin. Since shrimp tropomyosin has a comparable structure to house dust mite (HDM) tropomyosin, it is proposed that sensitization to tropomyosins of house dust mites is the key sensitizer that leads to cross-sensitization to crustacean shellfish [3].

If the allergy mechanism is essentially based on this common structure of the protein, then the human population that has been sensitized mainly through respiratory pathways for the allergy induced by dust mites may experience unusual allergic reactions after consuming seafood. This is in accordance with studies that have shown that a significant number of patients sensitized for HDM have specific IgE for shrimp tropomyosin [4]. However, most people are unaware of the similarity between the two types of allergy: the dust mite allergy and the seafood allergy.

Goal

The goal of this study is to investigate the link between dust mite allergies and seafood allergies in the South Asian population.We focus on examining the structure of tropomyosin, a common allergen found in dust mites and shellfish alike.Through detailed analysis of participant histories and symptoms, the study seeks to confirm if exposure to dust mites respiratory exposure can trigger seafood allergies, particularly upon consuming crustaceans.

Material and methods of research

A Google survey was used to collect live data. Questions were also included to allow participants to take part in the research to provide data regarding their history of allergic conditions. For instance, questions were included to confirm if a participant is allergic to dust and seafood. Once a participant has confirmed an allergy condition, questions are included to allow them to provide data regarding specific symptoms associated with that particular condition. The questions were created to allow participants to take part in a questionnaire to eliminate the language barrier among a wide range of participants. Once data was collected, it was analyzed to reach a final conclusion.

The results of the research and their discussion

A total of 80 participants completed the survey, and their ethnicity was South Asian (100%), the vast majority of whom were from Sri Lanka (98.8%). The demographics were mostly female (70%) and the majority were between 18 and 25 years of age (52.5%).

Dust Allergy Findings: The largest percentage of the participants, which was more than half of the sample population (55%), was the group of participants who experienced allergic reactions after exposure to dust. The most experienced allergic reaction symptoms by the participants included sneezing (65%), a runny nose (42.5%), itchy eyes (27.5%), among others. In addition, 63.7% of the participants also indicated that the allergic reaction symptoms experienced by them were exacerbated when they were cleaning dusty areas or old rooms. Notably, despite the large percentage of the participants experiencing the allergic reaction symptoms of dust mite allergy, only 13.8% of the participants had been officially diagnosed with dust mite allergy.

Seafood Allergy Findings: Seafood is a major food source for this demographic, and 97.5% of the respondents claimed to consume seafood. The main types of seafood consumed were fish (89.7%), while shrimp/prawns made up 79.5%. Of all the respondents, 28.7% claimed to have had a reaction to seafood. The main symptoms experienced for these reactions were a skin rash/itching, which made up 57.6%, swelling of lips/face, which made up 24.2%, while breathing difficulties made up 21.2%.

As would be expected, based on the established literature on tropomyosin as a pan-allergen, the main types of seafood that induced reactions were those of crustaceans. This is because 56.8% of reactions to seafood were to shrimp/prawns, while 29.7% were to crab, while 16.2% were to lobster. The reactions occurred rapidly, as more than half of these individuals had a reaction to seafood within an hour of consumption, with 32.4% having a reaction within 1 hour, while 21.6% had a reaction within minutes. In a similar manner to that of dust, formal medical diagnoses of these individuals having reactions to seafood were low, as 76.1% of these individuals had never been formally diagnosed with a seafood allergy by a doctor.

Cross-Reactivity Discussion: The survey results do support the hypothesis of a clinical cross-reaction between house dust mites and seafood, at least in the South Asian population. Of the total survey participants, 17.6% directly stated that they realized they had a reaction after eating seafood, in addition to their existing allergies to house dust. Furthermore, another 8.1% realized that their seafood allergy was only manifest after the onset of their dust allergy symptoms. As shrimp was the most common seafood allergy, causing more than 86% of the total seafood allergies, it does correlate with the structural similarities between house dust mites and shrimp tropomyosin.

Conclusions

This current research also validates a clear correlation between dust mite and seafood allergies within the South Asian population sample, particularly related to the consumption of crustacean products. Although the self-reported incidence of both types of allergies is quite high within the sample population, the rate of clinical diagnosis is surprisingly quite low for both types of allergies. The fact that both shrimp and crab are the major contributors to seafood-related allergic reactions within those individuals who also experience a dust mite allergy further supports the importance of the tropomyosin cross-reaction. A very positive aspect of the research is that 70.1% of the sample population was willing to participate in further research and/or clinical studies related to the treatment of both types of allergies, serving as a solid foundation for further research in the field.

LITERATURE

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