HEALTH & SAFETY LABORATORY

A Review of Evidence

Passenger Exposure to Peanut and Tree Nut Allergens on Airlines

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EXECUTIVE SUMMARY

The Civil Aviation Authority (CAA) wishes to address concerns about the risk of in-flight medical emergencies caused by acute allergic reactions, such as anaphylaxis or asthma, due to exposure to peanuts and tree nuts. Anaphylactic reactions to peanuts and tree nuts during flight are rare, but they can result in severe and life threatening symptoms. The CAA also needs to consider evidence on the frequency of passengers having severe allergic reactions to peanuts and tree nuts, how these incidents occur, and what mitigating actions airlines may take to minimise these incidents and their impact on passengers.

It was anticipated that the amount of published research on this topic would be small and that a full systematic review of evidence could not be undertaken. This evidence summary was therefore based on some of the principles of a systematic review but undertaken as a scoping evidence review. The research questions addressed the reliability of evidence about severe allergic reactions to peanuts and tree nuts in airline passengers; the likelihood that peanut and tree nut allergens are present in aircraft cabins or become airborne; and whether these allergens trigger severe allergic reactions via inhalation, skin contact or ingestion. The review further considered whether other non-allergic reactions can account for the symptoms reported and whether physiological or psychological stressors play a contributory role.

Specific research questions and inclusion and exclusion criteria were agreed with the CAA. Relevant peer reviewed papers and research reports from 1980 to 2018 were identified using bibliographic search engines and using specific search words and synonyms. A total of 67 studies were identified through these searches, but after the application of inclusion and exclusion criteria, only 13 studies were relevant to the key research questions. With the support of the CAA, 20 organisations including airline authorities, airlines and patient support groups were contacted for information they collect on passengers' allergic reactions to food.

Only a few published surveys had focussed on the wider issues that the CAA wished to address, particularly the frequency and route of exposure (inhalation, contact or ingestion) that triggered anaphylactic reactions to peanuts and tree nuts in airline passengers. Other types of experimental and food challenge studies provided more evidence about the route of exposure and the threshold concentrations that illicit a response in an individual allergic to peanuts. The conclusions of the review were:

- There is evidence that a small number of airline passengers experience anaphylactic and other allergic reactions to peanuts, tree nuts and other food allergens.
- There is no compelling evidence that inhalation of peanut and tree nut allergens caused these anaphylactic reactions in airline passengers.
- Most of the evidence about food allergic reactions in airline passengers has been obtained retrospectively using surveys to collect self-reported symptoms and circumstances of exposure.
- Peanut and tree nut allergens are aerosolised when foods are handled, but concentrations that may be sufficient to provoke acute allergic reactions are restricted to within one metre of the source.
- Experimental studies demonstrated that when peanuts are handled and eaten, high concentrations of the allergens can transfer to surfaces, to clothing and to skin.
- Compared to contact and ingestion, there is insufficient evidence about the severity of allergic reactions caused by inhalation of peanut and tree nut allergens.
- Oral challenge studies in peanut allergic patients demonstrated that subjective responses (symptoms that typically resolved before the next challenge dose was applied) to peanuts occurred at doses as low as 0.1 mg and objective symptoms (e.g., urticaria, rhinitis, wheeze etc.) were observed at doses above 1.5 mg but in a small number of subjects.
- Non-allergic food intolerance reactions are associated with symptoms that may occur in passengers who suffer from mild to moderate but not severe anaphylactic reactions.
- There is evidence that stress and anxiety can affect the development and severity of food allergy. However, the available evidence does not make it clear whether anaphylactic reactions are more likely to occur in airline passengers experiencing stress and anxiety whilst flying.

Recommendations

- There is a need for standardised questions about anaphylactic and acute allergic reactions to foods to be added to the medical event report questionnaires used by airlines. These questions should record the suspected causative triggers for these reactions, whether the passenger has a history of food allergy and what medical interventions, if any, were taken to manage their symptoms.
- There is a need for hygiene surveys to assess concentrations of peanut and tree nut allergens (and other food allergens) on absorptive and non-absorptive surfaces inside airline cabins and to assess how effective current cleaning regimes are.

- There is a need to consider the use of surrogate fluorescent markers for peanut and tree nut allergens to evaluate their transfer to different surfaces during food handling and to consider risks for aerosolisation.
- There is a need for experimental studies on food handling tasks to reflect the environment in aircraft cabins.
- Immunoassays used to monitor peanut (or other food) allergen contamination in aircraft cabins need to be standardised to provide comparable data between studies.
- In association with patient support groups, there is a need to investigate how stress/anxiety caused during flights impacts on passengers and the family members of children, who suffer food allergic reactions.

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