Vickerstaff Health Services Inc. **Fact Sheet**

Oral Allergy Syndrome (OAS)

Recent research into food allergen structures and their function within plants has been focused especially on allergens in foods that cross-react with those in botanically unrelated trees and grasses. The reason for the interest in these particular allergens is because of increasing numbers of persons reporting the symptoms of Oral Allergy Syndrome (OAS).

Definitions:
Antigen: Protein molecule, foreign to the body, which induces the immune system to respond by producing antibodies specifically designed to neutralize the antigen. Most antigens elicit a protective response of the immune system.
Allergen: Antigen that induces the immune system to respond with an allergic rather than protective reaction.

All allergens are antigens: not all antigens are allergens
All antigens contain a protein molecule that is unique in structure and specific to the plant, animal or micro-organism that produced it.

Oral Allergy Syndrome is a complex of clinical symptoms in the mouth and throat that result from direct contact with food allergens in a sensitized individual who also exhibits respiratory allergy to inhaled allergen. The inhaled (air-borne) allergens are usually tree, weed or grass pollens that cause hay-fever symptoms in the allergic individual. It seems that after several years, oral tissues, which are closely positioned to the mucous membranes of the upper respiratory tract, also become sensitized to these antigens. However, the symptoms in the mouth do not occur in contact with the tree pollens, but after exposure to structurally identical antigens in unrelated plant foods such as fruits, vegetables, and sometimes nuts. Oral symptoms following ingestion of specific fruits, vegetables and nuts have been described in patients with co-existing allergy to trees of the birch/alder group, weeds such as mugwort and ragweed, and grasses {Table 1}.

Symptoms of OAS

Symptoms of oral allergy syndrome include itching and irritation of oral tissues, swelling of the lips and tongue, and sometimes papules or blistering of these tissues. Persons who have this allergy show immediate-type symptoms, which usually begin within a few minutes after eating the offending food. Most patients exhibit symptoms within 5 minutes, and almost all patients within 30 minutes after contact with the food. Swelling and "tightening" in the throat (glottic edema) is probably the most severe local reaction.

An interesting variation of oral allergy syndrome occurred in a patient of the Allergy Nutrition Clinic at Vancouver Hospital some years ago. She complained of watery, itchy, swollen eyes while peeling potatoes and apples. She had also recently

experienced irritation of oral tissues and throat tightening while eating a raw apple, and milder symptoms in the mouth after consuming a raw carrot. She had a twenty-year history of hay-fever to alder and birch pollens, but had only been experiencing the eye, mouth and throat symptoms for the past year. The important association here is that raw potato, apple and carrot contain structurally similar antigens to the birch and alder trees to which she is allergic. She remains free from these symptoms as long as she carefully avoids contact with raw potato, carrot and apple. The association to oral allergy syndrome is that in peeling raw potato and raw apple, the antigens become aerosolized in small droplets which spray the eyes, and can also be conveyed to the eyes on contaminated hands.

Nature of the allergens associated with OAS

All allergens are components of the living organism in which they occur. Some are part of the structure, others are regulatory factors of the plant or animal. When one considers that some components (for example cytochrome c) are present and active in many different, unrelated organisms, it is not surprising that the same factor, with the same function, even in unrelated organisms, should invoke the same antibody when it enters the animal system.

Function of some plant allergens

When an allergen has been isolated, its characteristics often suggest a probable function within the plant. For example:

The birch pollen component named Bet v 2 and the 15 kd antigen in celery have been identified as profilins, which are regulatory proteins associated with the reproductive processes in plants, hence their association with pollens.

The birch antigen Bet v 1 and the apple antigen Mal d 1 are proteins that are made by the plants when they are under conditions of environmental stress. Various stresses can stimulate the expression of these proteins, which implies that allergens increase in plants under stressful conditions like severe growing situations and exposure to some kinds of chemicals. It has been suggested that some of these proteins are made by the plants in response to environmental pollution. This might explain the apparent surge of patients exhibiting oral allergy syndrome in the past few years as pollution levels, especially in cities, increase. Furthermore, because defense-related proteins usually provide a plant with resistance to stresses, varieties that are apt to intensively induce such proteins are agriculturally valuable and are often selected for cultivation, thus increasing the number of plants that produce the potentially allergenic proteins.

The allergen Pru p3 in peach is a lipid transfer protein (LTP). LTPs are a family of 9kda polypeptides, widely found in the vegetable kingdom and implicated in cuticle formation and defense against pathogens. They are heat-stable and resistant to pepsin digestion, which makes them potent food allergens.

Other antigens such a the allergen named Art v 1 from mugwort, which shows antigenic relatedness to antigens in a number of pollens and food plants (birch, timothy grass, celery), is described as trypsin resistant, but its function in the plant has not been identified.

As we become more informed about the nature of the antigens that can elicit the production of IgE and induce allergy, it may be possible to predict the potential for cross-reactions between similar antigenic proteins within unrelated plant species. However, since allergy is an individual characteristic, potential allergenicity will not necessarily predict the effect of the food when consumed by any given person. Statistical methods have been utilized in an attempt to measure the probability that a person sensitized to one edible plant will demonstrate significant cross-reactivity to other, unrelated plants. However, elimination and challenge still remains the only reliable method of demonstrating individual reactivity to each suspect plant food.

Management of pollen and associated plant food allergy

Frequently, high temperatures will destroy the antigen in the plant food that is responsible for oral allergy syndrome. People demonstrating oral allergy syndrome after eating raw fruits and vegetables often can eat the same food with impunity when it is cooked.

There are reported indications that the ripeness of the fruit or vegetable may influence its allergenicity, the riper the fruit or more mature the vegetable, the greater the potential that it might incite an allergic response compared to the unripe form.

When a person has evidence of an IgE-mediated allergy (for example, rhinitis, allergic conjunctivitis, asthma) to pollens of plants usually associated with oral allergy syndrome (birch, mugwort, ragweed, timothy grass, other grasses), it is wise for them to avoid the foods known to possess identical antigens when:

- The foods have been demonstrated to cause immediate reactions in the oral cavity
- There are positive indications of allergy to the foods, based on skin tests or immunological analysis such as RAST or ELISA

When pollen-allergic individuals do not have oral symptoms and in addition, skin tests and/or immunological teats are negative for the associated foods, it is probably unnecessary to avoid the foods. However, some practitioners feel that as a precautionary measure it is wise to provide the patient who has demonstrated signs of allergy to the pollens known to share common allergens with foods in OAS with information on the types of foods likely to trigger OAS {Table 1}. The observation that the longer the duration of birch pollinosis, the higher the level of birch-specific IgE tends to become, and the greater the risk for a more severe reaction, which are predisposing factors for the onset of OAS, suggests that such precautions might be advisable.

Table 1 provides a chart of potential allergenic cross-reactivity between plant species, based on current published reports that can be used as the basis of an elimination diet for detecting the specific triggers of allergic reactions. However, hypersensitivity to these plants is an individual idiosyncrasy. Even if species are shown to have common antigens, persons who are allergic to one species in an antigenically-related group do not necessarily experience an adverse reaction to others in the same group. As in all allergy management, demonstration of triggering of the allergic response when the food is

reintroduced in a controlled fashion (challenge) is the only reliable way to identify the allergen responsible for the reaction.

TABLE 1

SUMMARY: CROSS-REACTING FOODS, POLLENS, AND OTHER ALLERGENS

Non-food allergens	Fruits and Vegetables	Legumes and grains	Nuts and seeds	Other foods
Birch pollen Mugwort pollen Grass pollens Timothy grass	Apple Apricot Carrot Celery Cherry Fennel Kiwi fruit Melon Nectarine Orange Peach Potato Tomato Watermelon	Peanut	Hazelnut "tree nuts" (unspecified)	Spice (unspecified)
Ragweed	Banana Cantaloupe Cucumber Honeydew Melon Watermelon Zucchini			