

Seminar Presented at



The
Allergy
Show

18-20 June 2004
Olympia, London

For People and
Families with Asthma,
Eczema, Hayfever
and Allergies

Food Allergy and Intolerance

Dr. Janice M. Joneja, Ph.D., RD



Examples of Allergic Conditions and Symptoms

Respiratory Tract

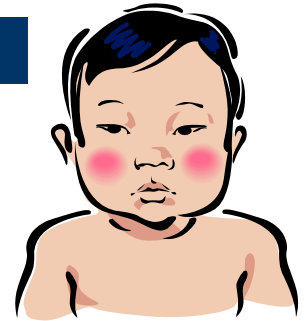
- Hayfever
- Runny nose
- Itchy, watery, reddened eyes
- Earache with fluid in the ear
- Throat tightening due to swelling of tissues
- Asthma



Examples of Allergic Conditions and Symptoms

Skin and Mucous Membranes

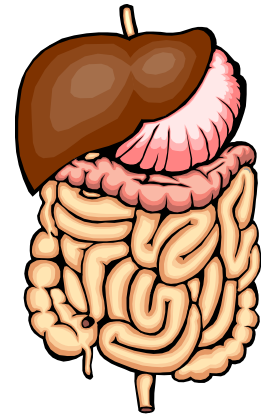
- Eczema
- Hives
- Swelling of tissues, especially mouth and face
- Itching
- Rash in contact with allergen
- Irritation and swelling of tissues around and inside the mouth (Oral allergy syndrome)



Examples of Allergic Conditions and Symptoms

Digestive Tract

- Diarrhoea
- Constipation
- Nausea and Vomiting
- Abdominal bloating and distension
- Abdominal pain
- Indigestion (heartburn)
- Belching



Examples of Allergic Conditions and Symptoms Nervous System

- Migraine
- Other headaches
- Spots in front of the eyes
- Lack of energy
- Over-active
- Lack of concentration
- Irritability
- Chilliness
- Dizziness

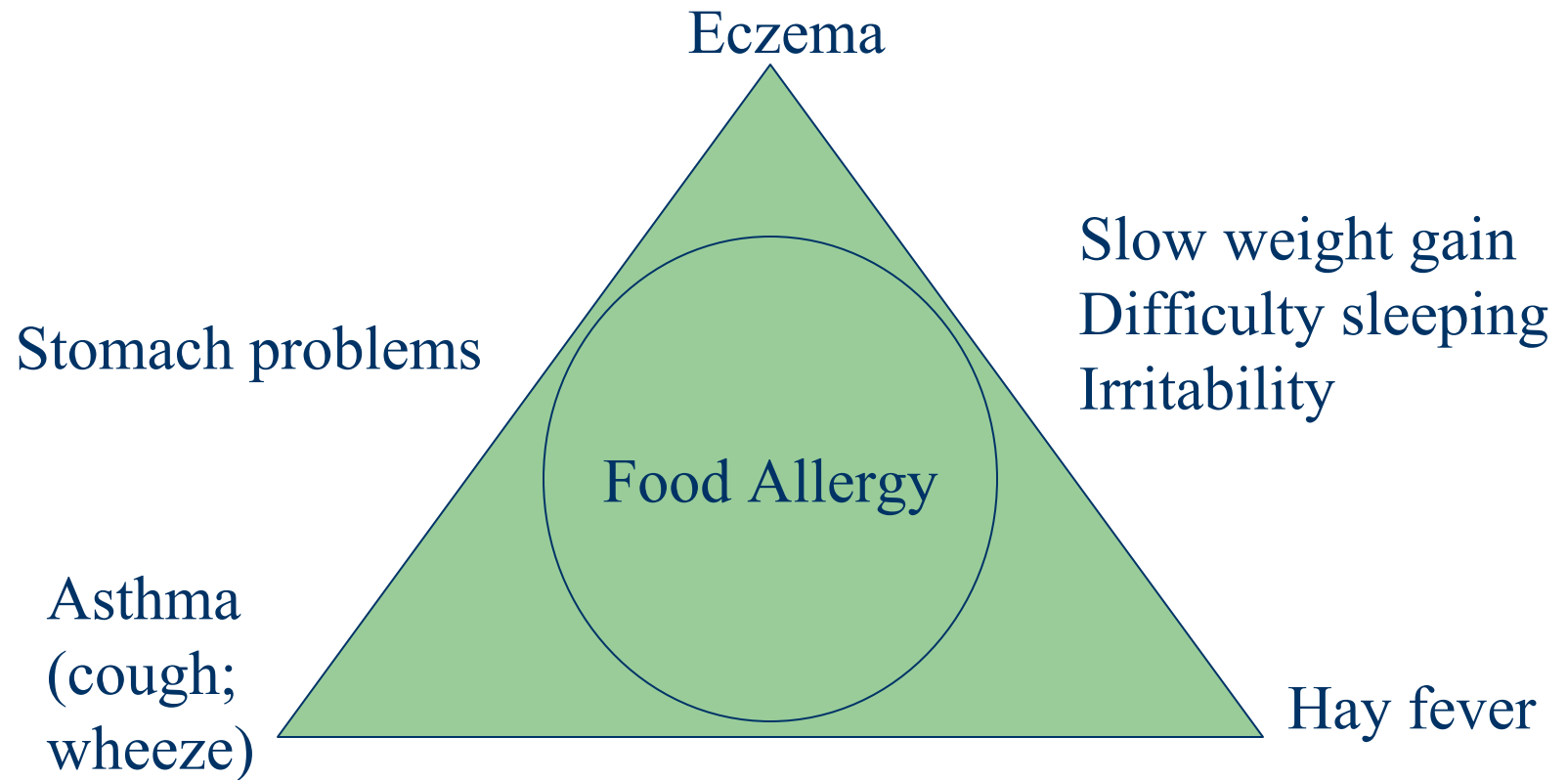


Examples of Allergic Conditions and Symptoms: Other

- Frequent urination
- Bed-wetting
- Hoarseness
- Muscle aches
- Low-grade fever
- Excessive sweating
- Paleness
- Dark circles around the eyes



The Allergic Triangle

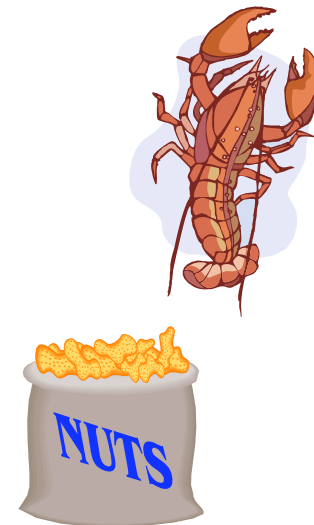


Anaphylaxis

- Severe reaction of rapid onset, involving most organ systems, which results in circulatory collapse and drop in blood pressure
- In the most extreme cases the reaction progresses to anaphylactic shock with cardiovascular collapse
- **This can be fatal**

Anaphylaxis

- Almost any food can cause anaphylactic reaction
- Some foods more common than others:
 - Peanut
 - Tree nuts
 - Shellfish
 - Fish
 - Egg
- In children under three years
 - Cow's milk
 - Egg
 - Wheat
 - Chicken



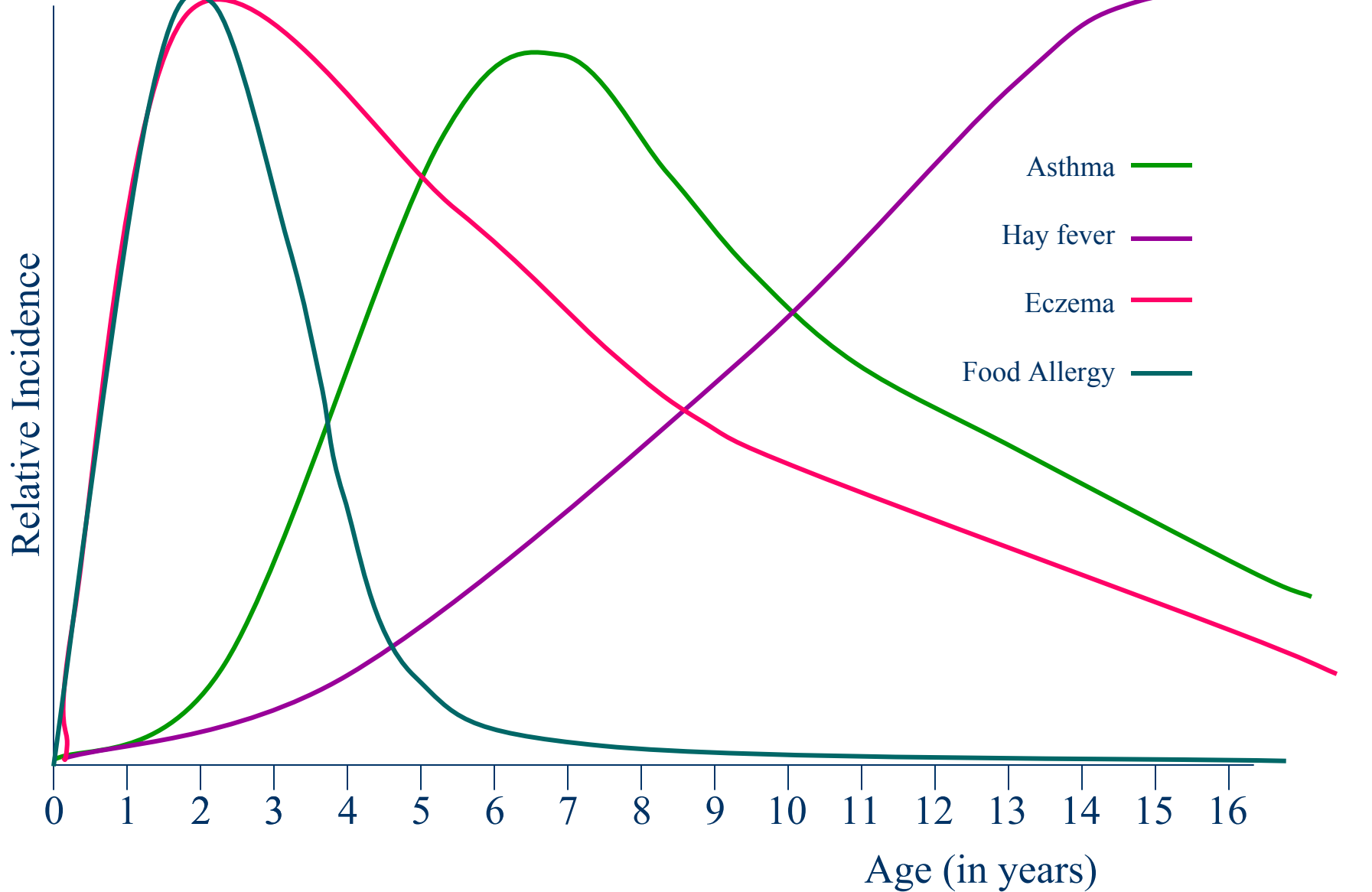
Emergency Treatment for Anaphylactic Reaction

- Injectable adrenalin (epinephrine)
- Fast-acting antihistamine (e.g. Benadryl)
- Usually in form of Anakit® or Epipen®
- Transport to hospital immediately
- Second phase of reaction is sometimes fatal, especially in an asthmatic
 - Patient may appear to be recovering, but 2-4 hours later symptoms increase in severity and reaction progresses rapidly



Age Relationship Between Food Allergy and Atopy

{Adapted from Holgate et al 2001}



Food Allergy & Food Intolerance

DEFINITIONS: American Academy of Allergy and Immunology Committee on Adverse Reactions to Foods, 1984

Food Allergy

Reaction of the **immune system** that responds to food as if it were a threat to health.

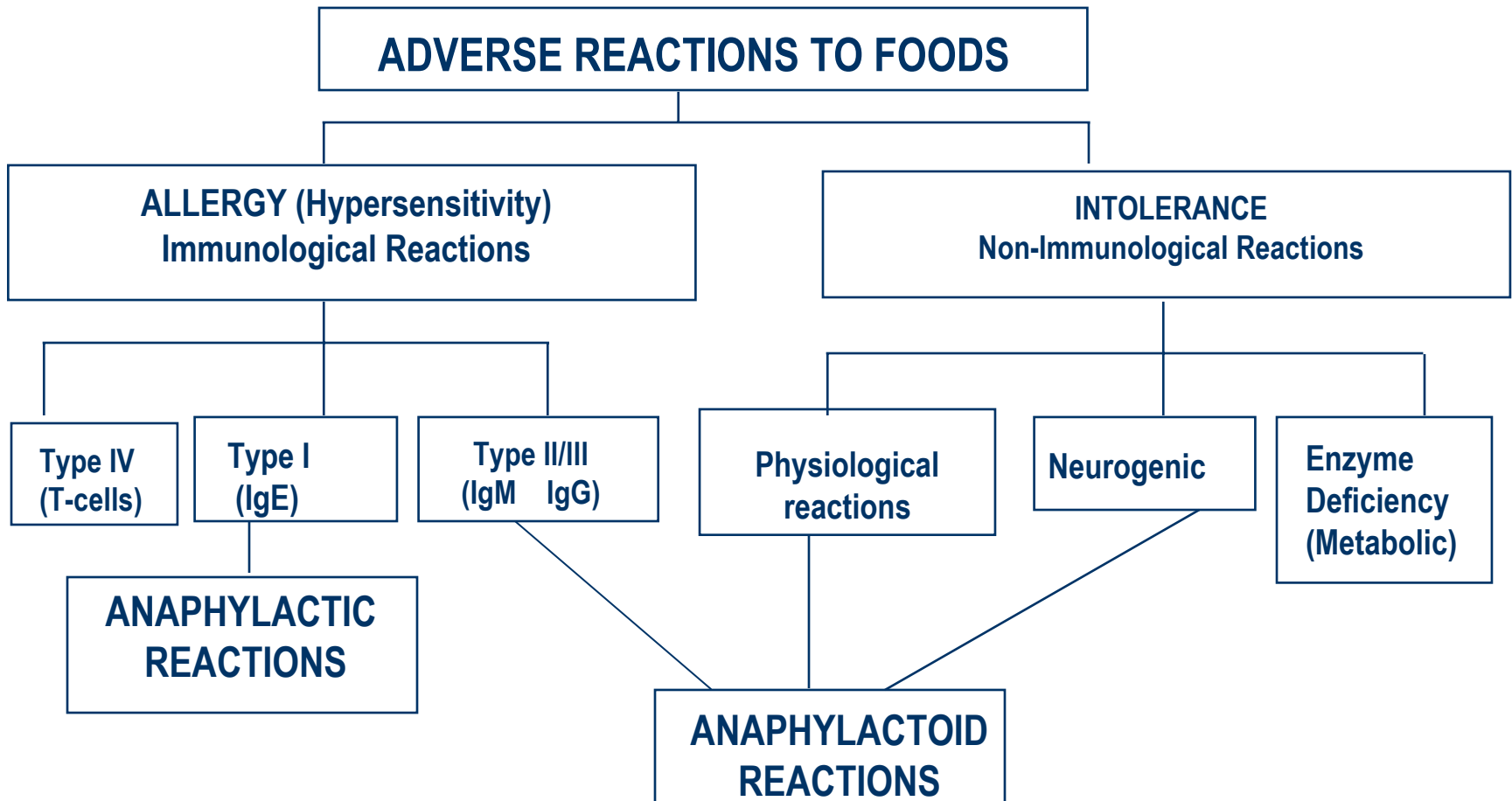
Immune system tries to protect the body from harm

Food Intolerance

Is **not** a response of the immune system.

May be deficiency in an enzyme, or biochemical process. Often caused by a naturally-occurring chemical or a food additive

Classification of Adverse Reactions to Foods According to the Pathogenic Mechanisms



Food Allergy

Response of the Immune System



Foods Most Frequently Causing Allergy

1. Egg
 - » white
 - » yolk
2. Cow's milk
3. Peanut
4. Tree nuts
5. Shellfish
6. Fin fish
7. Wheat
8. Soy
9. Beef
10. Chicken
11. Citrus fruits
12. Tomato

Additional Factors Involved in Symptoms of Food Sensitivity

1. Increased permeability of the gastrointestinal tract (leaky gut)

- Inflammation:
 - Infection
 - Allergy
 - Autoimmune disease
 - Other diseases
- Immaturity (in infants)
- Alcohol ingestion

2. Physical exertion



Additional Factors Involved in Symptoms of Food Sensitivity

3. Stress



4. Eating several different allergenic foods at the same time

5. Other allergies occurring at the same time (e.g. hay fever, asthma)

Food Intolerances

Biochemical and Physiological
Responses



Symptoms of Carbohydrate Intolerance

- Watery loose stool (diarrhoea)
- Abdominal bloating and pressure
- Cramping pain in abdomen
- Flatulence
- Vomiting
- Poor weight gain

Cause of Carbohydrate Intolerance

- Lack of the enzyme that digests the carbohydrate
- Lactose intolerance is due to the lack of lactase:
 - Milk sugar (lactose) is not digested
- Sucrose intolerance is lack of the enzyme sucrase
 - Sucrose (table sugar; syrup of all types; some fruits) is not digested

Symptoms of Carbohydrate Intolerance

- Reddening and soreness of skin around the anus and on the buttocks due to acid (pH less than 6) stool in children.
 - Adults rarely develop high acid stool



- Abdominal fullness, bloating, and cramping within 5-30 minutes after eating
- Lactose intolerance is the most common condition

Management of Lactose Intolerance

- Only the milk sugar, lactose, needs to be avoided
- This is not a milk allergy:
 - **Milk proteins are tolerated**
- Lactose occurs in the whey (liquid) fraction of milk
- Milk products free from lactose and free from whey are safe
- These foods include:
 - Milk treated with lactase (Lactaid®; Lacteeze®)
 - Hard cheeses (whey is removed; casein remains and is fermented to form cheese)
 - Many people tolerate yogurt, where lactose is broken down by bacterial enzymes

Reactive Chemicals in Foods

- May act on the body in two ways:
 - chemical acts directly on body tissues rather like a drug
 - chemical reacts with a system (stops or enhances the process) that acts on the body tissue
- Symptoms occur when the body is unable to get rid of the chemical quickly enough
 - The level in the body rises and the symptoms that develop are due to the excess

Histamine

- Histamine reactions can be clinically indistinguishable from food allergy
- Sensitivity may be deficiency in the enzymes that break down excess histamine
- “Idiopathic” hives, facial swelling and headaches are examples of histamine excess
- Tests for food allergy are usually negative
- Histamine sensitivity is becoming recognized as a disease entity quite distinct from allergy

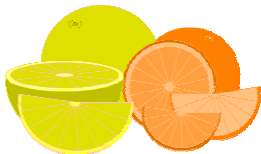
Sources of Histamine in Foods



- Fermented foods and beverages
 - Microbial activity on proteins produces histamine
- Fish and shellfish:
 - Incorrectly stored; Bacteria in the intestine of the fish break down fish protein



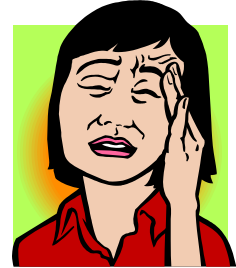
- **Some fruits and vegetables** produce histamine during ripening
- Some foods may release histamine by a mechanism which is only partially understood



Micro-organisms and Histamine

- Micro-organisms in the body:
 - Certain types of bacteria in the large bowel use undigested food material for their reproduction and growth
 - People with these micro-organisms absorb histamine from their own intestine
 - It is possible that probiotic bacteria could be used to displace these strains
 - Probiotic bacteria may be used to supply the enzyme to break down histamine in the intestine before it is absorbed

Tyramine sensitivity



- **Symptoms when tyramine-rich foods are eaten::**
 - Sharp rise in blood pressure
 - Headache
- **Caused by:**
 - **Deficiency in the enzymes that break down excess tyramine**
- **Effects**
 - Narrowing of blood vessels
 - directly because of lack of tyramine breakdown in the intestine, liver, or walls of arteries
 - indirectly via secretion of epinephrine or norepinephrine, which is normally kept at unreactive levels by the enzyme

Tyramine in Foods

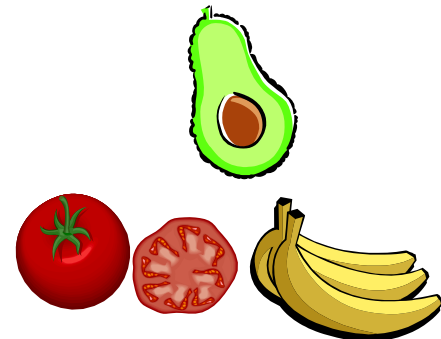
- Formed by microbial action in food preparation:

- cheese
- wine
- yeast extract
- vinegar



- Small amounts occur naturally in some foods:

- chicken liver
- avocado
- banana
- plum
- tomato
- aubergine



Sensitivity to Food Additives

- Characteristics common to persons sensitive to food additives:
 - History of asthma and hay fever
 - sometimes with hives and facial swelling
 - Aspirin sensitive

Additives Most Frequently Causing Intolerances

- Tartrazine (and other artificial food colours)
- Preservatives:
 - Sulphites
 - Benzoates
 - Sorbates
- Monosodium glutamate (MSG)
- Nitrates and nitrites



Tests for Adverse Reactions to Foods

Rationale and Limitations



Standard Allergy Tests

Skin tests



- Scratch or prick
 - Allergen extract applied to skin surface of arm or back
 - Skin is scarified (scratched) or pricked with lancet
 - Allergen encounters mast cells below skin surface
- ➔ *Rationale:* if skin (mast) cells are reactive due to allergy, allergen causes release of mediators especially histamine
 - Histamine causes reddening and swelling: “wheal and flare” reaction of the skin test
 - Size of reaction measured (usually 1+ to 4+)

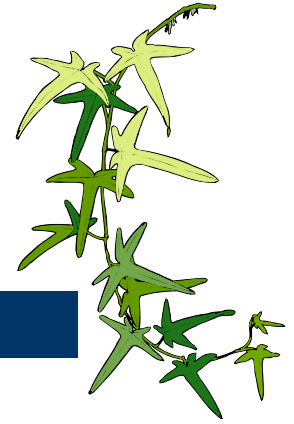
Value of Skin Tests in Practice

- Positive predictive accuracy of skin tests rarely exceeds 60%
 - Many practitioners rate them lower
- Tests for highly allergenic foods thought to have close to 100% *negative* predictive accuracy:
Such foods include:
 - egg
 - fish
 - tree nuts
 - milk
 - wheat
 - peanut

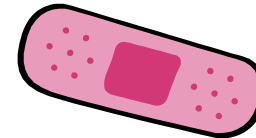
Value of Skin Tests in Practice

- Negative skin tests do not rule out food allergy
- Do not rule out food intolerance (non-immune-mediated reactions)
 - *“Skin tests for food allergy are especially unreliable because of the large number of false positive and false negative reactions”*

Other Skin Tests



- Patch Test for Contact Allergies
 - Involves reaction requiring cell-to-cell contact
 - Examples:
 - poison ivy rash
 - nickel contact dermatitis
 - preservatives, dyes and perfumes in cosmetics
 - Allergen is placed on the skin, or applied as an impregnated patch, which is kept in place by adhesive bandage for up to 72 hours
 - Local reddening, swelling, irritation, indicates positive response



Potential Danger of Skin Tests

- Many biologically active agents are efficiently absorbed through the skin:
 - Hormones (e.g. oestrogen)
 - Vaccines
 - Nicotine
 - Proteins
- Allergenic proteins are likely to be similarly absorbed
- The allergen has the potential to trigger a response of the immune system
- If the person is prone to develop allergies, allergens delivered through the skin are likely to trigger allergy
- Food allergens by-pass the filtering system of the GALT

Standard Allergy Tests

Blood Tests

- ELISA: enzyme-linked immunosorbent assay
- RAST: radioallergosorbent test
 - Designed to detect and measure levels of allergy antibodies in blood
 - Measure total allergy antibodies (IgE)
 - Measure level of antibodies formed against a specific allergen (e.g. food)
 - Some practitioners measure IgG (especially IgG4)



Value of Blood Tests in Practice

- Blood tests are considered to have the same sensitivity as skin tests for identification of specific food allergies when IgE is measured
- Anti-food antibodies (especially IgG) are frequently detectable in all humans, usually without any evidence of adverse effect
- In fact, some studies suggest that IgG4 might indicate protection or recovery from IgE-mediated food allergy

Tests for Intolerance of Carbohydrates

- Lactose intolerance:
 - Hydrogen breath test
 - Blood glucose levels
 - Reducing substance in stool
 - Stool pH (in children)
- Others:
 - Enzymes activity in cells lining the intestine:
requires biopsy

Tests for Intolerance of Food Additives

- There are no reliable skin or blood tests to detect food additive intolerance
- Skin prick tests for *sulphites* are sometimes positive
- A negative skin test does not rule out sulfite sensitivity
- History and oral challenge provocation of symptoms are the only methods for the diagnosis of additive sensitivity at present
- **Caution:** *Challenge may occasionally induce anaphylaxis*

Unorthodox Tests

- Many people turn to unorthodox tests when avoidance of foods positive by conventional test methods have been unsuccessful in managing their symptoms
- Tests include:
 - Vega test (electro-acupuncture)
 - Biokinesiology (muscle strength)
 - Analysis of hair, urine, saliva
 - Radionics
 - ALCAT (lymphocyte cytotoxicity)

Drawbacks of Unreliable Tests

- Inaccurate diagnosis: the wrong cause
- Medicines or other therapies do not cure symptoms
- False diagnosis of allergy
- Creation of false ideas about disease
- Failure to recognize and treat genuine disease
- Inappropriate and unbalanced diets

Consequences of Mismanagement of Adverse Reactions to Foods

- **Malnutrition**; weight loss, due to extensive elimination diets
- Especially critical in young children where nutritional deficiency at a crucial stage in development can cause **permanent damage**
- Food phobia due to **fear** that “the wrong food” will cause permanent damage, and in extreme cases, death
- **Frustration and anger** with the “medical system” that is perceived as failing them
- **Disruption** of lifestyle, social and family relationships

Reliable Tests

Elimination and Challenge Protocols



Reliable Identification of Allergenic Foods

- Removal of the suspect foods from the diet, followed by reintroduction is the only way to:
 - Identify the culprit food components
 - Confirm the accuracy of any allergy tests
- Long-term adherence to a restricted diet *should not* be advocated without clear identification of the culprit food components

Reliable Tests



- Elimination and Challenge
 - Suspected food is removed from diet for specified period of time
 - Selective elimination
 - Foods most likely to cause reaction are eliminated
 - Foods free from these are used as substitutes
 - Nutritionally complete
 - Usually followed for 4 weeks
 - Few foods elimination
 - Only 6-8 “low allergenicity foods” allowed
 - Nutritionally incomplete
 - Diet followed for 7-14 days only

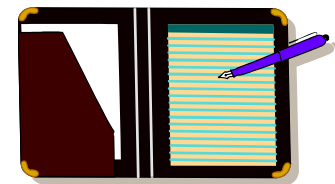
Reliable Tests

- Challenge
 - Suspect foods are reintroduced one at a time in a carefully controlled manner
 - Patient is observed for signs of adverse reaction to the food over several hours or days
 - ➔ ***Any food suspected to cause a severe or anaphylactic reaction should be challenged in suitably equipped medical facility***

Elimination and Challenge

Stage 1: Exposure Diary

- Record each day, for a minimum of 5-7 days:
 - All foods, beverages, medications, and supplements ingested
 - Composition of compound dishes and drinks, including additives in manufactured foods
 - Approximate quantities of each
 - The time of consumption
 - Symptoms and their severity
 - Time of onset and duration



Elimination Diet

Based on:

- Detailed medical history
 - Analysis of *Exposure Diary*
 - Any previous allergy tests
 - Foods suspected by the patient
-
- **Formulate diet** to exclude all suspect allergens and intolerance triggers
 - **Provide** excluded nutrients from alternative sources
 - **Duration:** Usually four weeks

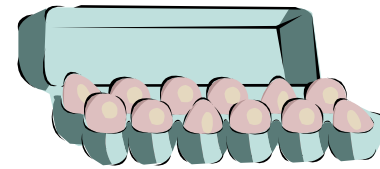
Selective Elimination Diets:

Examples of Foods Most Frequently Associated with Specific Conditions

- Eczema:

Highly allergenic foods:

- Cow's milk proteins
- Soy and soy products
- Egg
- Wheat
- Corn
- Certain legumes (peanut, soy and green pea)



Examples of Foods Most Frequently Associated with Specific Conditions (Continued)

- Asthma
 - Cow's milk proteins
 - Egg
 - Sulphites
 - Benzoates
 - Tartrazine and other food dyes

Examples of Foods Most Frequently Associated with Specific Conditions (Continued)

- Migraine
 - Histamine and tyramine containing foods:
 - Fermented foods and beverages
 - Fish and shellfish improperly stored
 - Processed meats and sausages
 - Alcoholic beverages
 - Chocolate (phenylethylamine and octopamine)

Examples of Foods Most Frequently Associated with Specific Conditions (Continued)

- **Hives and Facial Swelling: Histamine**
 - Fermented foods and beverages
 - Improperly stored fish and shellfish
 - Alcoholic beverages
 - Foods containing benzoates
 - Foods with artificial colours, especially tartrazine
 - Fruits and vegetables with high histamine:
 - Citrus fruits
 - Tomatoes
 - Berries
 - Olives
 - Pumpkin
 - Soy
 - Red beans
 - Pickles

Examples of Foods Most Frequently Associated with Specific Conditions (Continued)

- Chronic Diarrhoea; Carbohydrates
 - Foods with high starch content:
 - White rice
 - Potatoes
 - Pasta
 - Banana
 - Foods with high sugar content
 - Milk (lactose)
 - Table sugar and syrups of all types (sucrose)

Examples of Foods Most Frequently Associated with Specific Conditions (Continued)

- Oral Allergy Syndrome (OAS)
 - Foods with the same allergen as pollen to which person is allergic, e.g.:
 - Apple
 - Apricot
 - Carrot
 - Celery
 - Cherry
 - Fennel
 - Kiwi fruit
 - Melons
 - Nectarine
 - Orange
 - Peach
 - Potato
 - Tomato
 - Cucumber
 - Banana
 - Courgette
 - Peanut
 - Hazelnut

Examples of Foods Most Frequently Associated with Specific Conditions (Continued)

- Latex Allergy
 - Foods with the same allergens as latex, e.g.:
 - Peanut
 - Soy beans
 - Tree nuts
 - Avocado
 - Banana
 - Celery
 - Citrus fruits
 - Kiwi fruit
 - Mango
 - Papaya
 - Figs
 - Grapes
 - Passion fruit
 - Peach
 - Pineapple
 - Tomato

Challenge

- Double-blind Placebo-controlled Food Challenge (DBPCFC)
 - Freeze-dried food is disguised in gelatin capsules
 - Identical gelatin capsules contain a placebo (glucose powder)
 - Neither the patient nor the supervisor knows the identity of the contents of the capsules
 - Positive test is when the food triggers symptoms when the placebo does not

Challenge continued

- Drawback of DBPCFC
 - Expensive in time and personnel
 - Capsule may not provide enough food to elicit a positive reaction
 - May be other factors involved in eliciting symptoms, e.g. taste and smell

Challenge continued

- Single Blind Food Challenge
 - Supervisor knows the identity of the food
 - Food is disguised in strong-flavoured food e.g. apple sauce; lentil soup
- Open Food Challenge
 - Sequential incremental dose challenge (SIDC)
 - Determines sensitivity and dose tolerated for each eliminated food in its purest form

Final Diet

- Must exclude all foods and additives to which a positive reaction has been recorded
- Must be **nutritionally complete**, providing nutrients from non-allergenic sources
- If dose-related intolerances are a problem a four-day rotation diet may be beneficial
 - there is no clear consensus on the benefits of rotation diets at present