Food Allergy and Intolerance

CPC Seminar June 2015
Clare Wall
Outline

• What is food allergy and food intolerance?
• How prevalent is it?
• How do we diagnose it?
• How do we manage it?
Adverse reactions to food: definition

Any abnormal clinical response attributed to ingestion, contact or inhalation of any food, a food derivative or a food additive

• Toxic
• Non toxic or hypersensitivity
Adverse reactions to food

Exposure → Sensitization → Genetic Predisposition → Re-exposure → Symptoms

Allergy
Prevalence of food allergy

Precise prevalence is unknown: Self report vs diagnosis

- Adults: 1.4% - 2.4%
- Children < 3 years: ~ 6%
- Atopic dermatitis (mild/severe): ~35%
- Asthmatic children: 6 - 8%
- Prevalence depends on: Genetic factors, age, dietary habits, geography and diagnostic procedures

Adapted from Sampson HA. Adverse Reactions to Foods. Allergy Principles and Practice. 2003
Increasing prevalence of allergy

Hospital admissions data from 1990/91 to 2000/01 in England.

Over 11 years total admissions for these disorders increased from 0.02% - 0.06%. (1960 to 6752 out of 49,300 admissions in total).

Gupta et al, BMJ 2003
FOOD ALLERGY VS FOOD INTOLERANCE

What is intolerance?
A food intolerance is not the same as a food allergy. A food allergy is when the body’s immune system reacts abnormally to specific foods. No allergic reaction takes place with a food intolerance.

People with a food intolerance may get digestive symptoms such as:
- Diarrhoea
- Stomach cramps
- Bloating

Symptoms
- Mouth and lips tingling
- Your face swelling
- Feeling sick
- Urticaria (nettle rash or hives)
- Colicky pains in your abdomen
- A feeling of tightness around your throat

In the UK about
1:100 people have an allergy to peanuts

& about
1:200 people have an allergy to tree nuts.

Common food allergens
- Egg
- Nut
- Sesame
- Soya
- Seafood

Anaphylaxis
Anaphylaxis is an extreme form of allergic reaction. It can cause swelling of the lips and tongue, breathing problems, collapse and loss of consciousness. Anaphylaxis can cause death and is therefore a medical emergency.

About 20 people a year die in the UK due to anaphylactic reactions. In about half of these cases, there is no known cause (idiopathic anaphylaxis).

In the UK
ONE in FIVE
thought they suffered with a food allergy

but on formal testing

THE PLACEBO-CONTROLLED FOOD CHALLENGE
showed that only
7 in every 500 of adults showed signs of allergy.

In a nutshell (well not if you’re allergic!)

Food intolerances are never life-threatening, whereas some allergies are - they can cause anaphylaxis.

Learn more about allergy from Patient.co.uk http://www.patient.co.uk/Allergy-General-Overview.htm,
For more information on allergy visit Patient.co.uk.
Why increase in Food Allergy?

- Hygiene hypothesis
- Age of introduction of allergenic foods to infants
- Methods of food processing
- Development of allergy to food by skin exposure
Food Allergy Facts

- Eight foods account for 90% of all reactions
Food Allergy Facts

- Food allergy usually proves to be restricted to 1 or 2 foods

- Young children: milk, egg, peanut, tree nuts, soy, and wheat account for about 90% of cases

- Adolescents and adults: peanut, fish, shellfish, and tree nuts account for about 85%
Food allergy in children: international

USA & UK
- Milk
- Egg
- Peanut
- Tree Nuts
- Seafood

FRANCE
- Egg
- Peanuts
- Milk
- Mustard

ITALY
- Milk
- Egg
- Seafood

ISRAEL
- Milk
- Egg
- Sesame

SINGAPORE
- Birds Nest
- Seafood
- Egg
- Milk

AUSTRALIA
- Milk
- Egg
- Peanuts
- Sesame
Food allergens

Class 1 food allergens:
- Primary sensitizers
- Sensitization may occur through the gastrointestinal tract
- Large Proteins
- Stable to heat, acid and proteases

Class 2 food allergens (cross-reactive):
- Generally plant-derived proteins
- Highly heat-labile
- Difficult to isolate
- No good, standardized, extracts are available for diagnostic purposes

Adapted from Sampson HA. Adverse Reactions to Foods. Allergy Principles and Practice. 2003
## Cross-reactivity

<table>
<thead>
<tr>
<th>If Allergic to:</th>
<th>Risk of Reaction to at Least One:</th>
<th>Risk:</th>
</tr>
</thead>
<tbody>
<tr>
<td>A legume*</td>
<td>Other legumes</td>
<td>5%</td>
</tr>
<tr>
<td>Walnuts</td>
<td>Peas, lentils, beans</td>
<td></td>
</tr>
<tr>
<td>A tree nut</td>
<td>Other tree nuts</td>
<td>37%</td>
</tr>
<tr>
<td>Walnut</td>
<td>Cashew, brazil, hazelnut</td>
<td></td>
</tr>
<tr>
<td>A fish*</td>
<td>Other fish</td>
<td>50%</td>
</tr>
<tr>
<td>Salmon</td>
<td>Swordfish, sole</td>
<td></td>
</tr>
<tr>
<td>A shellfish</td>
<td>Other shellfish</td>
<td>75%</td>
</tr>
<tr>
<td>Shrimp</td>
<td>Crab, lobster</td>
<td></td>
</tr>
<tr>
<td>A grain*</td>
<td>Other grains</td>
<td>20%</td>
</tr>
<tr>
<td>Wheat</td>
<td>Barley, rye</td>
<td></td>
</tr>
<tr>
<td>Cow’s milk*</td>
<td>Beef</td>
<td>10%</td>
</tr>
<tr>
<td>Wheat</td>
<td>Hamburger</td>
<td></td>
</tr>
<tr>
<td>Cow’s milk*</td>
<td>Goat’s milk</td>
<td>92%</td>
</tr>
<tr>
<td>Cow’s milk*</td>
<td>Goat</td>
<td></td>
</tr>
<tr>
<td>Cow’s milk*</td>
<td>Mare’s milk</td>
<td>4%</td>
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<tr>
<td>Horse</td>
<td>Horse</td>
<td></td>
</tr>
<tr>
<td>Pollen</td>
<td>Fruits/vegetables</td>
<td>55%</td>
</tr>
<tr>
<td>Birch, ragweed</td>
<td>Apple, peach, honeydew</td>
<td></td>
</tr>
<tr>
<td>Peach*</td>
<td>Other Rosaceae</td>
<td>55%</td>
</tr>
<tr>
<td>Cantaloupe</td>
<td>Plum, pear, cherry</td>
<td></td>
</tr>
<tr>
<td>Melon*</td>
<td>Other fruits</td>
<td>92%</td>
</tr>
<tr>
<td>Cantaloupe</td>
<td>Watermelon, banana</td>
<td></td>
</tr>
<tr>
<td>Latex*</td>
<td>Fruits</td>
<td>35%</td>
</tr>
<tr>
<td>Latex glove</td>
<td>Kiwi, avocado</td>
<td></td>
</tr>
<tr>
<td>Fruits</td>
<td>Latex</td>
<td>11%</td>
</tr>
<tr>
<td>Kiwi, avocado</td>
<td>Latex glove</td>
<td></td>
</tr>
</tbody>
</table>

*Sicherer JACI 2001*
Immune mechanisms

- IgE-Mediated
  - IgE-receptor
  - Mast cell
  - Histamine

- Protein digestion
- Antigen processing
- Some Ag enters blood

- APC
  - TNF-α
  - IL-5

- Non-IgE-Mediated
  - B cell
  - T cell
Food allergy: clinical signs

<table>
<thead>
<tr>
<th>IgE</th>
<th>IgE/Non-IgE</th>
<th>Non-IgE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urticaria/angioedema, Rhinitis /Asthma, Anaphylaxis</td>
<td>Atopic dermatitis</td>
<td>Protein-induced proctocolitis/enterocolitis</td>
</tr>
<tr>
<td>Oral allergic syndrome, Gastrointestinal symptoms (GIT)</td>
<td>Eosinophilic gastro-intestinal disorders</td>
<td>Coeliac disease, Contact dermatitis, Herpetiform dermatitis</td>
</tr>
</tbody>
</table>

Adapted from J Allergy Clin Immunol. 1999;103:717-728
Cutaneous food hypersensitivities: atopic eczema

- Generally begins in early infancy
- Food allergy plays in about 35% of moderate-to-severe atopic dermatitis in children
Acute Urticaria and Angioedema:

♦ The most common symptoms of food allergic reactions
♦ Acute urticaria due to contact with food is also common
Diagnosis of Food Allergy

• Detailed history
  • Food(s) suspected
  • Specific symptoms
  • Timing of symptoms
  • Reproducibility of reaction

• History may be diagnostic with some acute reactions - verified only 30 – 40% of the time
Skin prick tests – (presence of IgE)

Used for inhalants, foods, venoms and some drugs
Detect specific IgE bound to cells in the skin
The Diagnosis of Food Allergy

• Is difficult!

• High rate of false positive skin tests and RASTs (poor positive predictive value)

• Must be carefully interpreted

• Oral challenges are the only tests that are more (but still not completely) definitive
Food Allergy - Diagnosis

Detailed History

IgE-mediated
- Skin test or RAST
  - (+) Elimination Diet
  - (-) Stop

Non-IgE-mediated
- Challenge or Endoscopy
  - (+) Stop
  - (-) Done

Elimination Diet
- (-) Done
- (+) Food Challenge(s)
  - (+) Specific elimination diet
  - (-) Stop
Food allergy: Management

FSANZ Food Standards Code

- Food Standards Code 1.2.3 includes mandatory labelling of common allergens included as an ingredient, part of compound ingredient, food additive or processing aid.
- Mandatory allergens include:
  - Peanut
  - Tree nuts
  - Cow’s milk
  - Egg
  - Soy
  - Fish
  - Shellfish
  - Sesame
  - Gluten (must state grain source)
- Despite this regulation, some labels may not comply and therefore it is still important to educate about the various names for the allergens.
<table>
<thead>
<tr>
<th>Food</th>
<th>Nutrients at risk with exclusion</th>
<th>Substitute food</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cow’s milk</td>
<td>Calcium</td>
<td>Calcium: soy or specialised formula; fortified soy, rice, nut or oat beverage</td>
</tr>
<tr>
<td></td>
<td>Protein, fat</td>
<td>Protein, fat, Vit D: meat, poultry, legumes, nuts, wholegrains, soy beverage,</td>
</tr>
<tr>
<td></td>
<td>Vit A, Vit D, Vit B12, riboflavin, pantothenic acid, phosphorus</td>
<td>specialised formula</td>
</tr>
<tr>
<td>Soy</td>
<td>Thiamine, phosphorus, riboflavin, magnesium, Vit B6, iron, folate, calcium</td>
<td>Meat, wholegrains, legumes</td>
</tr>
<tr>
<td>Egg</td>
<td>Vit B12, pantothenic acid, riboflavin, selenium, folate, biotin</td>
<td>Meat, poultry, legumes, wholegrains</td>
</tr>
<tr>
<td></td>
<td>Protein, fat</td>
<td></td>
</tr>
<tr>
<td>Wheat</td>
<td>Thiamine, riboflavin, niacin, iron, selenium, folate, biotin</td>
<td>Oats, rice, quinoa, aramanth, rye, buckwheat, barley, corn, millet</td>
</tr>
<tr>
<td></td>
<td>Protein, fat</td>
<td></td>
</tr>
<tr>
<td>Nuts</td>
<td>Niacin, Vit E, magnesium, manganese, chromium</td>
<td>Meat, wholegrains, legumes, vegetable oils</td>
</tr>
<tr>
<td>Fish, shellfish</td>
<td>Niacin, Vit B6, Vit B12, Vit E, phosphorus, selenium, iodine</td>
<td>Meat, poultry, grains, legumes, vegetable oils</td>
</tr>
<tr>
<td>Meat (beef, chicken)</td>
<td>Iron, zinc, Vit B12, protein</td>
<td>Fish, shellfish, wholegrains, legumes, seeds, nuts</td>
</tr>
</tbody>
</table>

Adverse reactions to food

- TOXIC
- Nontoxic

Immune-mediated
- Allergy
  - Non-IgE-mediated
  - IgE-mediated

Non-immune mediated
- Intolerance
  - Enzymatic
  - Pharmacologic
  - Undefined

# Food Intolerance - IBS
Dietary exclusions – Irritable Bowel Syndrome

• IBS - multiple food sensitivities
  – Intolerance rather than allergy
• Exclusion diets - patients diaries etc and foods with recognized association with IBS
• 50% response rate
  – Depends on enthusiasm of patient and dietitian
• Recent interest in FODMAPs diet
  – fructose intolerance – better response in motivated patients
Fermentable

Oligosaccharides

Disaccharides

Monosaccharides

And

Polyols

Sugar Alcohols

Fructans

Galactans

Lactose

Fructose
Low FODMAP diet for Irritable Bowel Syndrome

The Low FODMAP diet was developed by researchers at Monash University. The Monash team, led by Peter Gibson, provided the first evidence that a Low FODMAP diet improves IBS symptoms. Irritable bowel syndrome (IBS) is a common functional gastrointestinal disorder affecting one in seven Australian adults and is also common in the USA, Europe and many Asian countries. IBS is characterised by chronic and relapsing symptoms; lower abdominal pain and discomfort, bloating, wind, distension and altered bowel habit (ranging from diarrhoea to constipation) but with no abnormal pathology. The diagnosis of IBS should be made by a medical practitioner.

Join the Conversation

Low FODMAP resources
- More about the Low FODMAP App
- iPhone (launch December 2012)
- Android (launch November 2013)
- Online purchase of the Monash University Low FODMAP Diet booklet (hard copy only)
- Order form for the Monash University Low FODMAP Diet booklet (hard copy only) when paying by cheque
- Participants sought for research studies
- Monash University FODMAP blog
- Monash University Seminars & Workshops

The Monash University Low FODMAP diet

The research team at Monash University have developed a diet to control gastrointestinal symptoms associated with IBS/FGID focusing on a group of carbohydrates called FODMAPs. Current research strongly suggests that this group of carbohydrates contributes to IBS/FGID symptoms.
## COMMON FOODS CONTAINING FODMAPs

<table>
<thead>
<tr>
<th>EXCESS FRUCTOSE</th>
<th>LACTOSE</th>
<th>FRUCTANS</th>
<th>GALACTANS</th>
<th>POLYOLS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fruits</td>
<td>Milk</td>
<td>Vegetables</td>
<td>Legumes</td>
<td>Fruits</td>
</tr>
<tr>
<td>apples, pears,</td>
<td>cows’,</td>
<td>artichokes,</td>
<td>chickpeas,</td>
<td>apples,</td>
</tr>
<tr>
<td>nashi, mangoes,</td>
<td>goats’</td>
<td>beetroot</td>
<td>lentils,</td>
<td>apricots,</td>
</tr>
<tr>
<td>tinned fruit</td>
<td>and</td>
<td>asparagus,</td>
<td>red kidney</td>
<td>cherries,</td>
</tr>
<tr>
<td>in natural</td>
<td>sheeps’</td>
<td>Brussel</td>
<td>beans,</td>
<td>lychees,</td>
</tr>
<tr>
<td>juice,</td>
<td>milk,</td>
<td>sprouts,</td>
<td>baked</td>
<td>nectarines,</td>
</tr>
<tr>
<td>watermelon</td>
<td>yoghurt,</td>
<td>cabbage,</td>
<td>beans,</td>
<td>pears,</td>
</tr>
<tr>
<td></td>
<td>ice</td>
<td>fennel,</td>
<td></td>
<td>peaches,</td>
</tr>
<tr>
<td></td>
<td>cream</td>
<td>garlic,</td>
<td></td>
<td>plums,</td>
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<td></td>
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<td>leeks,</td>
<td></td>
<td>prunes,</td>
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<td>okra,</td>
<td></td>
<td>watermelon</td>
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<td></td>
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<td>onions,</td>
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<td>spring</td>
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<td>onions</td>
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<td>shallots</td>
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<td></td>
</tr>
<tr>
<td>Sweeteners</td>
<td>Cheeses</td>
<td>Cereals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>fructose, high</td>
<td>soft and</td>
<td>wheat</td>
<td></td>
<td></td>
</tr>
<tr>
<td>fructose corn</td>
<td>fresh</td>
<td>and rye</td>
<td></td>
<td></td>
</tr>
<tr>
<td>syrup</td>
<td>(eg. ricotta,</td>
<td>when eaten in large amounts (eg. bread,</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>cottage)</td>
<td></td>
<td>pasta, couscous,</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>crackers,</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>biscuits)</td>
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</tr>
<tr>
<td>Large total</td>
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</tr>
<tr>
<td>fructose dose</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>concentrated fruit</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>sources, large serves of fruit, dried fruit, fruit juice</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Honey</td>
<td></td>
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</tr>
</tbody>
</table>
### Suitable on a Low-FODMAP Diet

<table>
<thead>
<tr>
<th>FRUIT</th>
<th>VEGETABLES</th>
<th>MILK PRODUCTS</th>
<th>GRAIN FOODS</th>
<th>OTHERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; Fruit bananas, grapefruit,</td>
<td>&gt; Vegetables bamboo shoots,</td>
<td>&gt; Milk lactose-free,</td>
<td>&gt; Cereals gluten-free bread/</td>
<td>&gt; Sweeteners sugar (sucrose),</td>
</tr>
<tr>
<td>blueberries, grapes,</td>
<td>bok choy, carrots, celery,</td>
<td>rice milk</td>
<td>cereal products</td>
<td>glucose, artificial</td>
</tr>
<tr>
<td>kiwifruit, lemons, limes,</td>
<td>capsicums, chokos, choy sum,</td>
<td>&gt; Cheeses ‘hard’ cheeses,</td>
<td>&gt; Bread 100% spelt bread</td>
<td>sweeteners not ending in</td>
</tr>
<tr>
<td>mandarin, oranges, pawpaw,</td>
<td>corn, eggplant, green beans,</td>
<td>and brie and camembert</td>
<td>&gt; Rice</td>
<td>’-ol’</td>
</tr>
<tr>
<td>passionfruit, tangelos,</td>
<td>lettuce, chives, parsnips,</td>
<td>&gt; Yoghurt lactose-free</td>
<td>&gt; Corn</td>
<td>&gt; Honey substitutes</td>
</tr>
<tr>
<td>raspberries, rock-melons,</td>
<td>pumpkins, silver beet, spring</td>
<td>&gt; Ice-cream substitutes</td>
<td>&gt; Oats</td>
<td>maple syrup, golden syrup</td>
</tr>
<tr>
<td>strawberries, tangelos</td>
<td>onions (green part only),</td>
<td>gelati, sorbet</td>
<td>&gt; Polenta</td>
<td></td>
</tr>
<tr>
<td></td>
<td>tomatoes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; Onion/garlic substituted</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>garlic-infused oil</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
KEEP CALM IT'S GLUTEN FREE

© 2013 KeepCalmStudio.com
Grain

WHEAT

BARLEY

RYE

OATS

Prolamines

GLIADINS

HORDEINS

SECALINS

AVENIN
Sources of Gluten

• **OBVIOUS**
  - Bread
  - Bagels
  - Cakes
  - Cereal
  - Biscuits
  - Pasta / noodles
  - Pastries / pies
  - Rolls

• **Not so OBVIOUS**
  - Sauces
  - Gravy
  - Cornflakes
  - Deli Meats
  - Meat products
  - Seasonings
  - Lipsticks
  - Medication
  - Stamp glue
  - Play dough
• Amaranth
• Arrowroot
• Buckwheat
• Corn
• Flax
• Millet
• Montina
• Oats?

• Potato
• Quinoa
• Rice
• Sorghum
• Tapioca
• Flours made from nuts, beans and seeds
Gluten Free
Food Standards

FSANZ

Gluten Free

No Detectable Gluten

CODEX

< 20 ppm Gluten
Gluten Free Healthy—Yeah Right!

low carb gluten free SALAD!!!
"I really hope coconuts are gluten free"
Main foods causing food allergy are milk, eggs, peanuts, wheat, soy, tree-nuts, fish and shell-fish.
Rates of food allergy have risen significantly.
Up to 5% of the population overall are likely to have food allergy.
Important to have correct diagnosis.
Dietitian should be involved with management.
Important to ensure nutrient intake is adequate.
Food intolerances are difficult to diagnose.
Dietary management of food intolerance is complex.
Going gluten free isn't always the answer!
Allergy New Zealand website:
http://www.allergy.org.nz/

Coeliac New Zealand website:
http://www.coeliac.org.nz/

Food Standards Australia New Zealand website:
http://www.foodstandards.govt.nz/