Food allergy

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Red Cross Hospital
Impact of a food allergy diagnosis

- Quality of life worse than Type 1 DM
  - 39% longer to shop
  - Significantly greater expense
  - Psychological / behavioural
  - Anxiety in family
  - Overprotection & social isolation

- Risk of malnutrition

- Risk of fatal reaction
Adverse reaction to food

Psychological (food aversion)

Organic

Toxic (microbiological pharmacological)

Non toxic
Adverse reaction to food

- Non toxic (food hypersensitivity)
- Toxic (microbiological Pharmacological)
Definitions

• Food hypersensitivity
  – A reproducible, abnormal, non-psychologically mediated reaction to food
  – Present only in susceptible individuals

• Toxic reactions
  – May be non-reproducible
  – Present in all individuals exposed to that food
Non toxic
Food hypersensitivity

Immune mediated
(food allergy)

Non immune mediated
(Food intolerance)
Definitions

• Food allergy
  – An immune-mediated food hypersensitivity reaction

• Food intolerance
  – A non-immune-mediated food hypersensitivity reaction
Adverse reaction to food

Non toxic (food hypersensitivity)

Immune mediated (food allergy)

Toxic (microbiological Pharmacological)

Non immune mediated (Food intolerance)
Adverse reaction to food

Non toxic

Immune mediated (food allergy)

Non immune mediated (Food intolerance)

Enzymatic
Pharmacological
Other
Food Intolerance
(Non allergic food hypersensitivity)

Enzymatic
- Lactase deficiency (Milk) → diarrhoea
- G6PD deficiency (Beans) → Haemolysis

Pharmacological
- Tyramine (cheese) → flushing
- Sulphites (preservatives) → Asthma
- Caffeine → palpitations

Other
- Aspirin → asthma, urticaria
- Monosodium glutamate → headache, flushing
Adverse reaction to food

Non toxic

Immune mediated (food allergy)
- IgE mediated
  - Non IgE mediated

Toxic (microbiological Pharmacological)

Non immune mediated (Food intolerance)
Food Allergy
(Allergic food hypersensitivity)

- IgE mediated
- Mixed
- Non IgE mediated
A single diagnosis?

- Multiple allergens or forms of allergies within individuals
- An individual may be allergic to multiple allergens, and each allergen may have a different mechanism of reaction and manifest differently and therefore may require different modalities of diagnosis and management.
IgE mediated vs non IgE mediated

**IgE**
- Quick onset
- Obvious link between exposure and symptoms
- Well defined mechanism
- Easy to diagnose
- Validated tests

**Non IgE**
- Delayed onset
- Unclear link between exposure and symptoms
- Mechanism unclear
- Harder to diagnose
- No validated tests
Food Allergy
(Allergic food hypersensitivity)

IgE mediated  Mixed  Non IgE mediated
IgE mediated food allergy

• Clinical result of type 1 hypersensitivity
  – Presence of IgE antibodies
  – Manifests within minutes up to 2 hours
    • Immediate
    • Immediate plus late phase

• Recur on exposure on every occasion
  – Threshold levels for a reaction vary widely
  – May be effected by exercise, alcohol, illness
  – Cooked foods may be tolerated
  – Occasionally processing increases reactivity
IgE mediated Food Allergy

Skin
- Urticaria
- Angioedema
- Erythematous rashes
- Eczema flare

GIT
- Vomiting
- Diarrhoea
- Abdominal pain
- Oral burning/itching

Resp
- Rhinitis
- Wheeze
- Cough
- Stridor
- Voice change
- Dyspnoea

CVS
- Hypotension
- Floppiness
- Collapse
- Unconsciousness
Diagnosis of IgE mediated Food allergy

• History

• Allergy testing
  – Skin prick tests
  – Specific IgE
  – Patch tests

• Food challenges
Questions in food allergy

• Does your child have any allergies?
• Is your child allergic to any food?
• Can your child eat a full helping of the following foods:
  – Milk
  – Eggs (cakes, whole egg, raw egg)
  – Nuts etc…
• Aversion may be allergy
Diagnosis for EACH allergen

- Detailed history (25 sub items!)
- Age at first exposure and all reactions
- Symptoms, duration and severity
- Timing of reaction
- Causative food, dose and form
- Reproducibility
- Co factors
- Cross reacting allergens
Allergy testing

- No one single test can be relied on
- IgE mediated reactions
  - SPTs and ImmunoCAP indicate sensitisation
  - Sensitisation does NOT confirm clinical allergy
  - Blind testing NOT recommended
  - Do NOT test for sensitisation to tolerated foods
- No tests for Non IgE mediated except exclusion and rechallenge
Allergy testing

• Skin test or specific IgE
• Suspected allergens
• Common allergens not yet encountered
• Don’t test if tolerated (but remember delayed reactions)
• Common associations
Common associations

• Co-sensitisation / co-reactivity more common than cross reactivity
  – Co-sensitisation / co-reactivity
    • independent sensitisation to more than one allergen
  – Cross-reactivity
    • reaction on exposure to a second antigen after sensitisation to the first, because of similar antibody binding epitopes
Interpreting food allergy tests

• History is critical
• Food challenge is only positive in 50% of children with positive history
  – Outgrowing allergy
  – Incorrect identification of food
  – Non allergic cause of reaction
• Lab tests interpreted in light of the history
Skin prick testing

• Rapid, simple, low cost, high sensitivity
• Allergens guided by history, kept to minimum
• Discontinue antihistamines for 3-5 days
• Method is important
Skin prick testing

- Weal size correlates with likelihood of being clinically allergic
- Weal size does NOT correlate with severity of allergic reaction
- Decision points for immediate type reactions in AD populations
### Sporik et al 2000

<table>
<thead>
<tr>
<th>Food allergen</th>
<th>100% PPV &lt; 2 yrs</th>
<th>100% PPV &gt; 2yrs</th>
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</thead>
<tbody>
<tr>
<td>Cow’s milk</td>
<td>6 mm</td>
<td>&gt;8 mm</td>
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<tr>
<td>Egg</td>
<td>5 mm</td>
<td>&gt; 7 mm</td>
</tr>
<tr>
<td>Peanut</td>
<td>4 mm</td>
<td>&gt; 8 mm</td>
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</table>
Specific IgE

• Total serum IgE should not be done
• ImmunoCAP valid, reliable, reproducible
• Must have quantitative values
• Result correlates with likelihood of being clinically allergic
• Result does NOT correlate with severity of allergic reaction
• FX5
Interpreting food allergy tests

• Decision points for immediate type reactions in AD populations
• Different studies give different “cut off levels” for significance
• History is critical
• Lab tests interpreted in light of the history
Sampson et al 2003

<table>
<thead>
<tr>
<th>Food</th>
<th>95 % PPV</th>
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<tbody>
<tr>
<td>Egg</td>
<td>&gt;2 7kU/L</td>
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<td></td>
<td>&lt;2 2kU/L</td>
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<tr>
<td>Milk</td>
<td>&gt;2 15kU/L</td>
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<tr>
<td></td>
<td>&lt;2 5kU/L</td>
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<tr>
<td>Peanut</td>
<td>14</td>
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<td>Fish</td>
<td>20</td>
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</table>
FS and FA vary with ethnicity

**Caucasian**  **Non-hispanic Black**  **Hispanic**

Branum Pediatrics 2009
Interpretation

• Tests give 3 possible results
  – Low
    • Skin prick test 0 to 2 mm
    • Specific IgE < 0.1 kU/L
  – Medium
    • Skin test 3 to decision point
    • Specific IgE 0.1 to decision point
  – High
    • Skin test ≥ decision point
    • Specific IgE ≥ decision point
## Interpretation

<table>
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<th>Clinical history</th>
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## Allergy test result

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Interpretation

• 3 possible outcomes
  – Not allergic
    • Eat the food, preferably immediately
  – Possible allergy
    • Food challenge needed (avoid till booked)
  – Allergic
    • Recommend avoidance
## Interpretation

### Allergy test result vs. Clinical history

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Food challenge testing

• Gold standard to diagnose clinical food allergy or to demonstrate tolerance.
• Indicated where SPT or sIgE sensitisation does not clearly correlate with clinical symptoms
• Incremental food challenge should be done by trained practitioners in centres that have experience in performing the procedure in an appropriate setting.
Therapeutic elimination diets preceded by challenge!

- No role for indiscriminate elimination diets
- Sensitisation does NOT mean allergy
- Guided by clinical history, lab results AND challenge tests
- Best done by specialised centers
Diagnosis

History

Conclusive

Exclusion

Time goes by

Prove allergy

Prove tolerance

ImmunoCap / SPT

Not conclusive

Food Challenges
Impact of challenges

• Negative challenge
  – Liberation of diet
  – Reduced anxiety

• Positive challenge
  – Confirmation of need to continue avoidance
  – Reduced uncertainty

• Parental anxiety was lower after challenge, regardless of outcome, in an observational study
Challenge Dosing Schedule

Lip doses

CM doses

Time (min)

0 15 30 45 60 75 90

Observation

48 hours
Further management

- Allergen avoidance
- Dietary adequacy
- Recognition of reactions
- Treatment of reactions
- Comorbidities
- Follow Up
Therapeutic elimination diets

- Primary therapy
- Prior assessment by dietician
- Alternative choices may differ individually
- Guided by dietician
- Education
- Regular reassessment for tolerance
- Milk, soya, egg 6/12 to 2 years
- Peanuts, tree nuts, fish, shellfish 2-4 years
Milk substitutes

- Hypoallergenic formulae are tolerated by 90% of children with proven CMPA
- AAF and EHF may be hypoallergenic
- AAF if severe, life threatening symptoms, severe growth faltering, ongoing symptoms on EHF or patients symptomatic on trace amounts via BF
- Soya in IgE mediated allergy proven not sensitised to soya and certain cases of mild-moderate non-IgE mediated allergy
Allergen avoidance

- Most important
- Most deaths occur in known allergy, with accidental ingestion in commercially prepared food
- Most reactions at home, 20 % in school
- Labelling issues
- Paediatric dietician
- Food supplementation
Food allergens in vaccines?

- Egg
  - NO problem with MMR. Even influenza now considered safe
  - Problems with yellow fever, rabies

- Gelatin
  - MMR, varicella, influenza, typhoid, yellow fever, Japanese encephalitis, shingles
Recognition and treatment

- Education of family, carers and school
- Written treatment plan
- Early treatment
- Carry medications at all times
- Medic alert
- Plan for holidays / trips
Indications for risk reduction

- Previous anaphylaxis
- Persistent asthma
- Idiopathic anaphylaxis
- FDEIA
- Peanut or tree nut allergy >5 years
- Reactions to small amounts of food
- Teenagers or young adult
- Remote from medical facility
Injectable adrenaline

- Absolute indications
  - Previous severe reaction
  - Food allergy and asthma

- Relative indications
  - Reaction to small amount of food
  - Any reaction to peanuts / tree nuts (>5 yrs)
  - Teenagers / young adults
  - Remote from medical help
Food allergy education

• Strict avoidance of allergens
• Early recognition of allergic reactions and anaphylaxis, emergency plan, medic alert
• Provision of an emergency kit containing self injectable adrenaline and liquid antihistamine
• Provision of instructions as to when to go to a medical facility
• Educate patients about long-term ongoing management
Follow up

- Allergy testing for possible tolerance with view to challenge
- Review allergen avoidance
- Review dietary sufficiency
- Review epipen technique
- Review comorbidities, especially asthma
- Interval depends on allergen, reaction and comorbidities
IgE food allergy

Eosinophilic oesophagitis / Gastro oesophageal reflux

Protein enteropathy

Protein enteropathy FPIES

Protein proctocolitis

Constipation / colic

Multiple food protein intolerance
Eczema and foods

- Test before exclusion: Severe cases, early onset, associated acute reactions
- No role for indiscriminate or long term exclusion of important foods
- Needs good history + food diary
- Avoidance guided by tests or very rarely exclusion diet with rechallenge
- Dietician in team. Supplement vitamins, calcium.
Eczema and foods

- Avoidance guided by CAP, SPT +- APT
- Removal $\rightarrow$ resolution; reintroduction $\rightarrow$ exacerbation
- May require elemental diet + slow reintroduction … always under a dietician for short periods
- Never exclude > 6 weeks without rechallenge
- Challenges may need to include responses for delayed type reactions + objective measures eg SCORAD
Eosinophilic upper GI diseases

- Eosophagitis: reflux, food refusal, dysphagia, food impaction
- Gastritis: nausea, abdominal pain, early satiety
- Weight loss or failure to thrive
- Diagnosis by endoscopy, biopsy, exclusion and reintroduction
- If no response to exclusion (elemental or targeted) diet, trial of topical swallowed steroids
Food protein / allergic / eosinophilic enteropathy ± protein loss

• Clinical manifestations depend on location and extent of the inflammation.
• The mucosal form of the disease is the most common and causes pain, nausea, poor appetite, vomiting, and diarrhea.
• Involvement of the muscular layer of the gastrointestinal wall causes strictures and dysmotility.
• Serosal inflammation may lead to ascites.
• Diagnosis by biopsy, exclusion and reintroduction.
Food protein / allergic / eosinophilic proctocolitis

• Benign disorder
• Blood-streaked stools in otherwise healthy appearing infants who are breast- or formula-fed
• Symptoms resolve within 48–72 h following elimination of dietary cow’s milk protein.
• Most infants tolerate cow’s milk by their first birthday.
Food protein induced enterocolitis syndrome

- Young formula-fed infants with severe vomiting, diarrhea, and failure to thrive.
- Lethargic, wasting and dehydration
- Cow milk and soy protein formulas
- Reintroduction of cow’s milk protein following avoidance results in symptoms within 2–3 hours
- 20% of acute exposures may be associated with hypovolemic shock
- Treatment with vigorous hydration and avoidance of triggers
- Become tolerant with age; Re-introduction of milk must be done under supervision and with i.v. access.
Coeliac disease

• Malabsorption, chronic diarrhoea, steatorrhoea, abdominal distension, flatulence, weight loss or failure to thrive
• Gliadin sensitivity (the alcohol-soluble portion of gluten found in wheat, oat, rye and barley)
• Endoscopy shows villous atrophy and extensive inflammatory cellular infiltrate
• HLA-DQ2 and DQ8 haplotype
• About 90% of patients with coeliac disease (if ingesting gliadin) have IgA anti-gliadin, antiendomysium or anti tissue transglutaminase antibodies
• Check total IgA: if low look for IgG antibodies
GI motility

- Allergy sometimes implicated in motility disturbances
- Vomiting
- Colic
- Treatment resistant GORD
- Constipation