

# Food allergy

# Epidemiology of food allergy

- 15 to 30% of UK parents think their child has a food allergy
- 6-8 % of UK children
- 30 % of UK children with eczema
- Food accounts for >90% of anaphylaxis

# Impact of a food allergy diagnosis

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

Adverse reaction to food

Non toxic

Toxic  
(microbiological  
Pharmacological)

Immune mediated  
(food allergy)

Non immune mediated  
(Food intolerance)

IgE mediated

Non IgE mediated

Enzymatic

Pharmacological

Other

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Other

**Food Allergy**  
(Allergic food hypersensitivity)

```
graph TD; A["Food Allergy (Allergic food hypersensitivity)"] --> B["IgE mediated"]; A --> C["Mixed"]; A --> D["Non IgE mediated"];
```

**IgE mediated**

**Mixed**

**Non IgE mediated**

# 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)

```
graph TD; A[Food Allergy (Allergic food hypersensitivity)] --> B[IgE mediated]; A --> C[Mixed]; A --> D[Non IgE mediated];
```

IgE mediated

Mixed

Non IgE mediated

# 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




























# Common food allergens

Nuts	Peanuts, Treenuts (Hazel, Cashew, Brazil, Walnuts, pistachios, pecan)
Milk	Cows, Goats milk
Egg	Hen's
Fish	white and oily fish (less often tuna)
Shellfish	shrimp, crab, lobster, oyster, scallop
Seeds	Sesame seed, pine nuts, sunflower seed
Pulses	soybeans, green peas, lentils, chickpeas
Cereals	wheat, barley, oats, buckwheat
Fruit	Banana, Kiwi

# 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
- Cross sensitisation more common than cross reactivity

If Allergic to:	Risk of Reaction to at Least One:	Risk:
<b>A legume*</b> peanut 	<b>Other legumes</b> peas  lentils  beans 	<b>5%</b> 
<b>A tree nut</b> walnut 	<b>Other tree nuts</b> brazil  cashew  hazelnut 	<b>37%</b> 
<b>A fish*</b> salmon 	<b>Other fish</b> swordfish  sole 	<b>50%</b> 
<b>A shellfish</b> shrimp 	<b>Other shellfish</b> crab  lobster 	<b>75%</b> 
<b>A grain*</b> wheat 	<b>Other grains</b> barley  rye 	<b>20%</b> 
<b>Cow's milk*</b> 	<b>Beef</b> hamburger 	<b>10%</b> 
<b>Cow's milk*</b> 	<b>Goat's milk</b> goat 	<b>92%</b> 
<b>Cow's milk*</b> 	<b>Mare's milk</b> horse 	<b>4%</b> 

If Allergic to:	Risk of Reaction to at Least One:	Risk:
<b>Pollen</b>  birch  ragweed	<b>Fruits/vegetables</b>  apple  peach  honeydew	<b>55%</b> 
<b>Peach*</b> 	<b>Other Rosaceae</b>  apple  plum  cherry  pear	<b>55%</b> 
<b>Melon*</b>  cantaloupe	<b>Other fruits</b>  watermelon  banana  avocado	<b>92%</b> 
<b>Latex*</b>  latex glove	<b>Fruits</b>  kiwi  banana  avocado	<b>35%</b> 
<b>Fruits</b>  kiwi  avocado  banana	<b>Latex</b>  latex glove	<b>11%</b> 

<b>If Allergic to:</b>	<b>Risk of Reaction to at Least One:</b>	<b>Risk:</b>
<b>Egg</b>	<b>Peanut</b>	<b>20 – 30 %</b>
<b>Milk</b>	<b>Soy</b>	<b>10 (– 40) %</b>
<b>Peanut</b>	<b>Tree nuts</b>	<b>35 – 50 %</b>
<b>Peanut</b>	<b>Sesame</b>	<b>25 %</b>

# 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

- Method is important
- Weal size correlates with likelihood of being clinically allergic
- Weal size does NOT correlate with severity of allergic reaction



# Sporik et al 2000

- 467 children seen in a tertiary clinic
- Skin test and food challenges on all
- Weal sizes above which all challenges were positive (100 % PPV)

Child > 2 years

Milk  $\geq$  8 mm

Egg  $\geq$  7mm

Peanut  $\geq$  8mm

Child < 2 years

$\geq$  6 mm

$\geq$  5 mm

$\geq$  4 mm

- Could have avoided about half of challenges by using these cut-offs

# Interpreting food allergy tests

- History is critical
- Lab tests interpreted in light of the history
- Lab tests reflect likelihood ratios
- Pre-test probability

# Sporik et al 2000

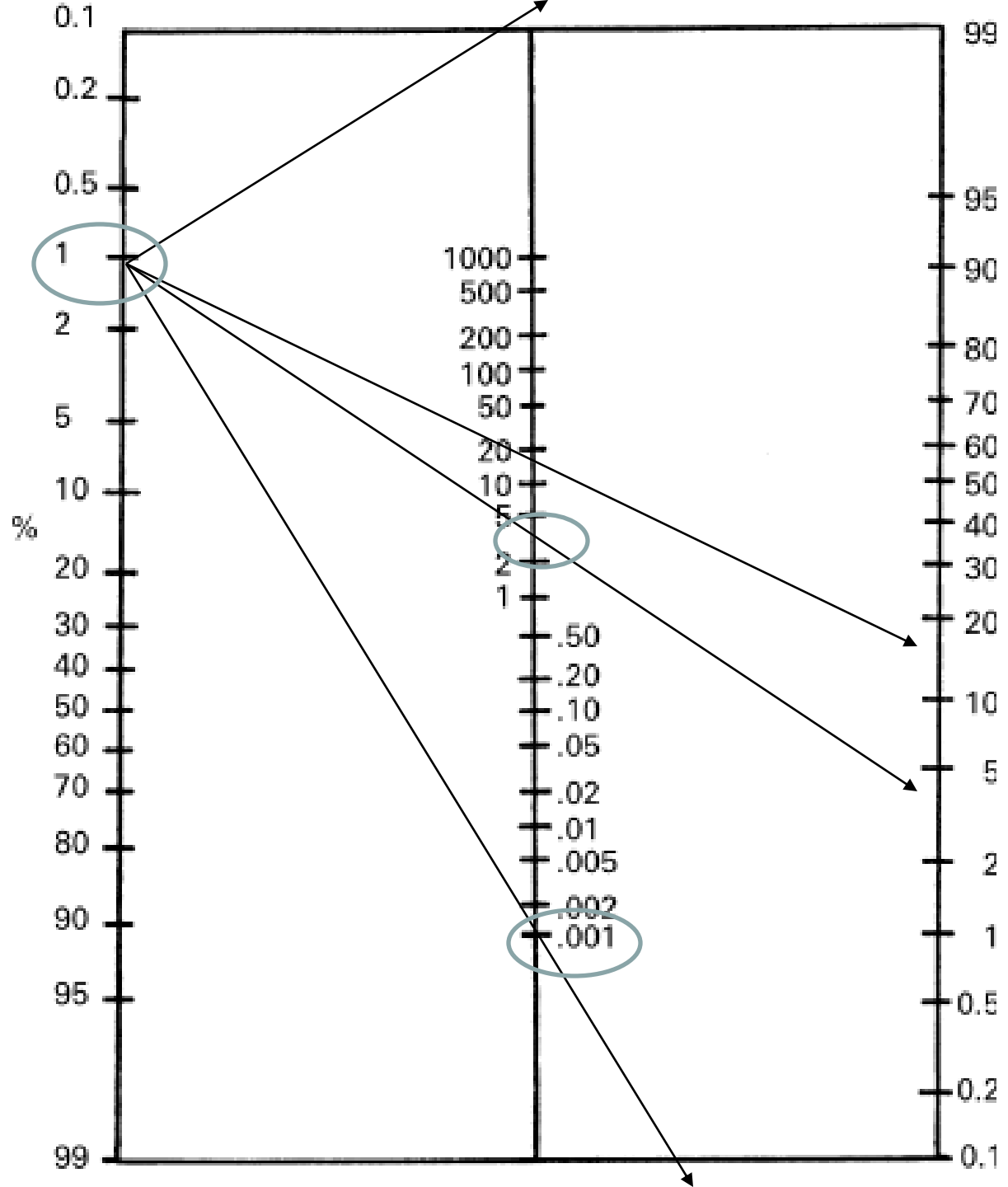
Likelihood ratios of a positive challenge			
Weal (mm)	Milk	Egg	Peanut
1	3.1	1.4	2.0
2	3.1	1.7	2.0
3	3.8	2.8	3.4
4	5.8	3.1	6.3
5	7.3	7.3	18.0
6	13.2	12.5	16.7
7	16.2	$\infty$	$\infty$
8	$\infty$	$\infty$	$\infty$

# Likelihood ratios

Child with a poor / possible history of peanut allergy

Pre test probability 1% (less than general population)

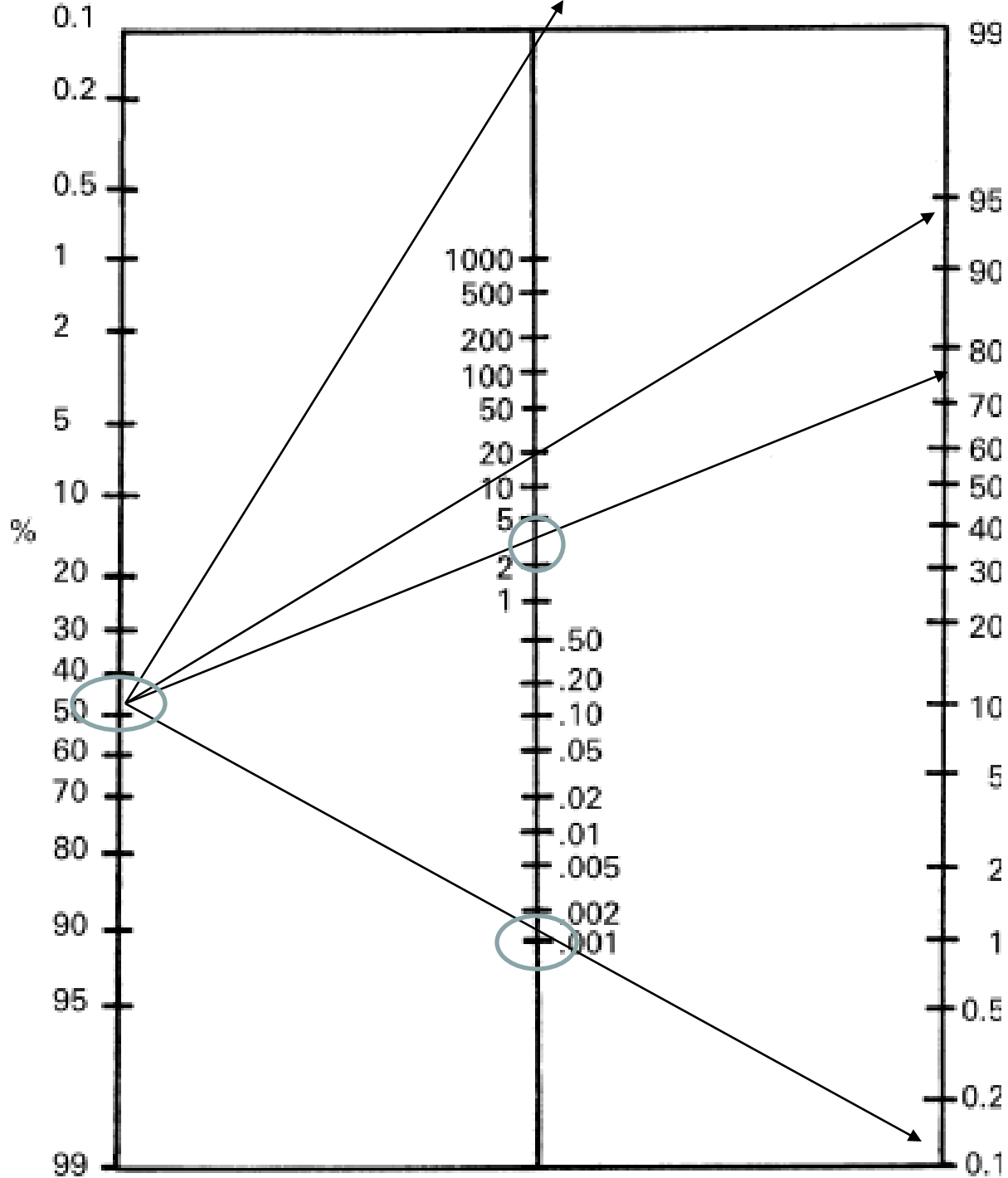
Ratios  
 0mm 0.001  
 3mm 3.4  
 5 mm 18  
 8mm  $\infty$



# Likelihood ratios

Child with a good history of peanut allergy  
Pre test probability 50%

Ratios  
0mm 0.001  
3mm 3.4  
5 mm 18  
8mm  $\infty$

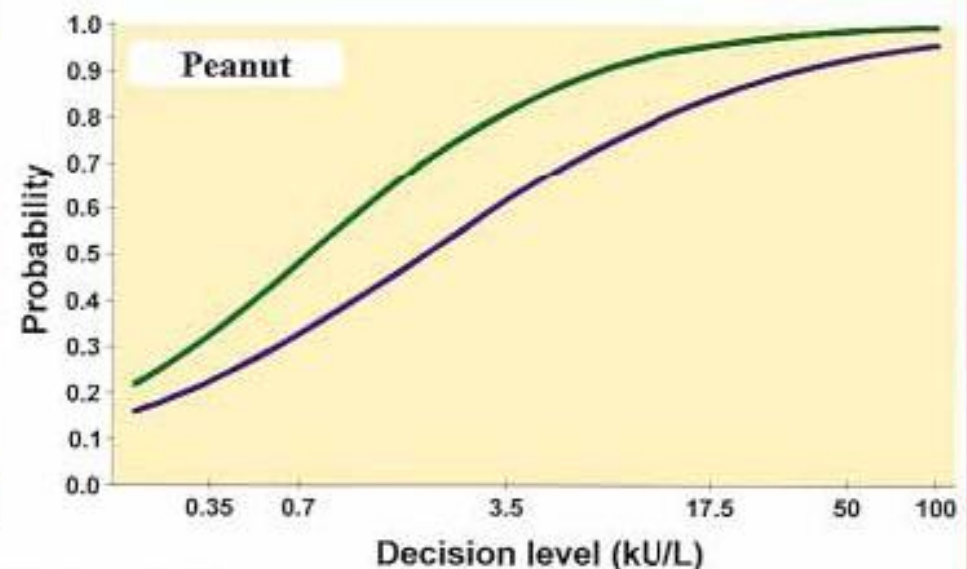
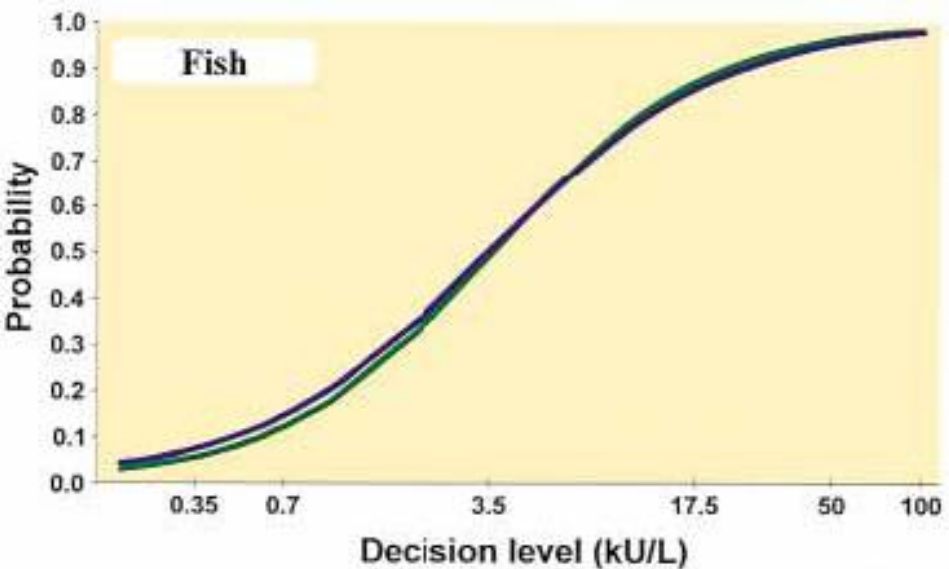
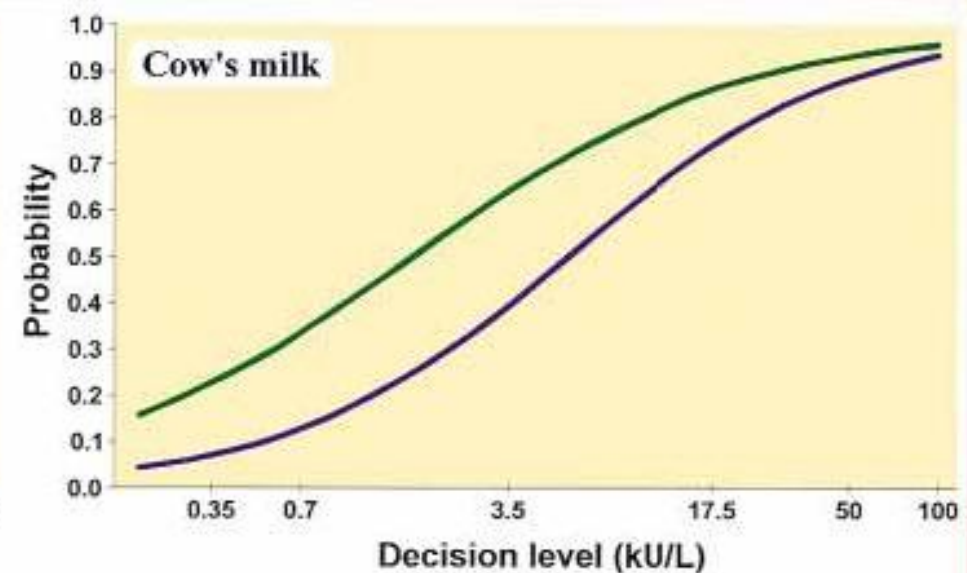
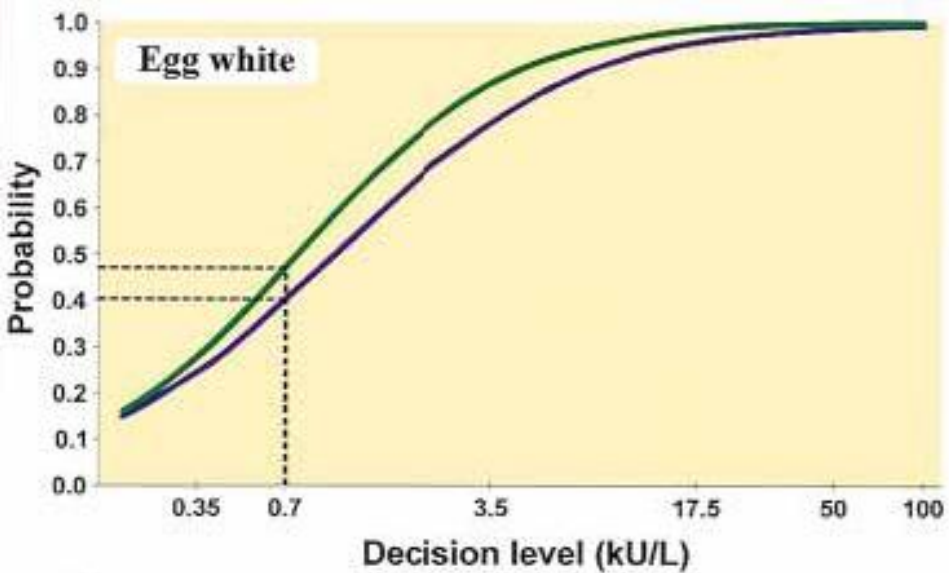


# Specific IgE

- Variety of systems available
- Phadia UNICAP
- Must have quantitative values
- Result correlates with likelihood of being clinically allergic
- Result does NOT correlate with severity of allergic reaction
- FX5

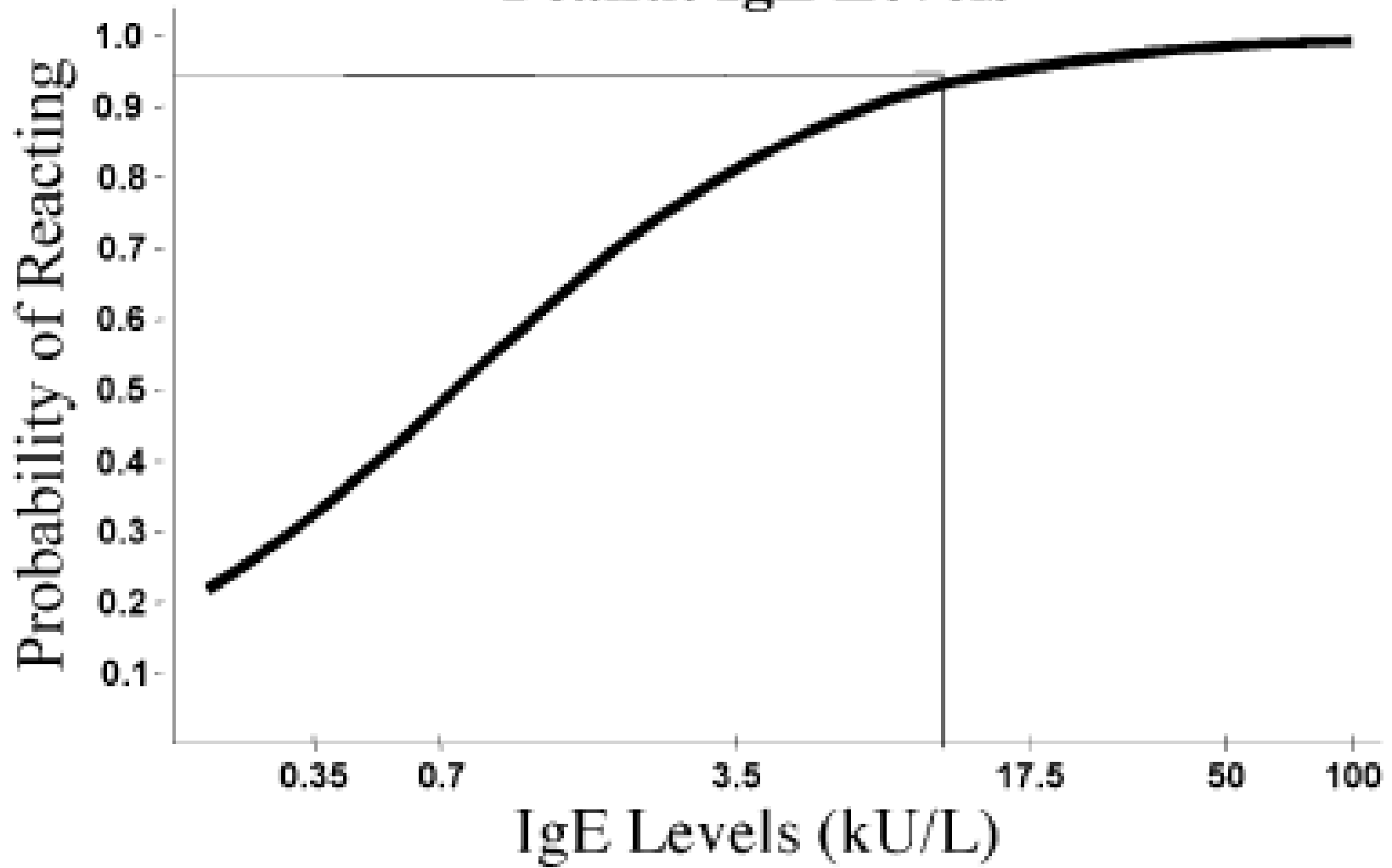
# Sampson et al 1997

- 196 children
- All with atopic dermatitis
- 50 % with asthma and PAR
- 494 DBPCFC performed
- Blood analysed for specific IgE to foods



— Retrospective study  
 — Prospective study  
*Logit model using  $\log(kU_A/L)$*

# Peanut IgE Levels



# Sampson et al 1997

Food	95 % PPV	Likelihood ratio
Egg	6	
Milk		
Peanut		
Fish		

# Sampson et al 1997

Food	95 % PPV	Likelihood ratio
Egg	6	7.2
Milk		
Peanut		
Fish		

# Sampson et al 1997

Food	95 % PPV	Likelihood ratio
Egg	6	
Milk	32	
Peanut	15	
Fish	20	

# Sampson et al 1997

Food	95 % PPV	Likelihood ratio
Egg	6	7.2
Milk	32	25
Peanut	15	9.1
Fish	20	40

# Sampson et al 2003

Food	95 % PPV
Egg	>2 7kU/L
	<2 2kU/L
Milk	>2 15kU/L
	<2 5kU/L
Peanut	14
Fish	20

# Interpretation

- Tests give 3 possible results
  - Low
    - Skin prick test 0-2 mm
    - Specific IgE < 0.7 kU/L
  - Medium
    - Skin test 3-7 mm
    - Specific IgE > 0.7 to 95 % PPV
  - High
    - Skin test  $\geq 8$  mm
    - Specific IgE  $\geq 95$  % PPV

# Interpretation

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

# Interpretation

Clinical history

Allergy test result


# Interpretation

Clinical history

Allergy test result

Low		
Medium		
High		

# Interpretation

Clinical history

Allergy test result

	Poor	Good

# Interpretation

Clinical history

Allergy test result

	Poor	Good
Low	Not allergy	
Medium		
High		

# Interpretation

Clinical history

Allergy test result

	Poor	Good
Low	Not allergy	
Medium	(Not allergy) Food challenge	
High		

# Interpretation

Clinical history

Allergy test result

	Poor	Good
Low	Not allergy	
Medium	(Not allergy) Food challenge	
High		Allergy

# Interpretation

## Clinical history

Allergy test result

	Poor	Good
Low	Not allergy	
Medium	(Not allergy) Food challenge	Food challenge (Allergy)
High	Food challenge (Allergy)	Allergy

# Interpretation

## Clinical history

Allergy test result

	Poor	Good
Low	Not allergy	Food challenge
Medium	(Not allergy) Food challenge	Food challenge (Allergy)
High	Food challenge (Allergy)	Allergy

# Further management

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

# 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

# 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

# Injectable adrenaline

- Absolute indications (? 2 epipens)
  - Cardiovascular or respiratory reaction
  - Food allergy and asthma
- Relative indications (? 1 epipen)
  - Reaction to small amount of food
  - Any reaction to peanuts / tree nuts (>5 yrs)
  - Teenagers / young adults
- Not strong indications (? 0 epipen)
  - Remote from medical help

# Comorbidities

- Asthma a risk for severe reactions
- Food allergy a risk for severe asthma
- Explain risk to parents and child
- Eczema
- Pollen allergy
- Immunisations

# 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

# Research

- Record of all allergic food reactions
- Record of epipen prescriptions

