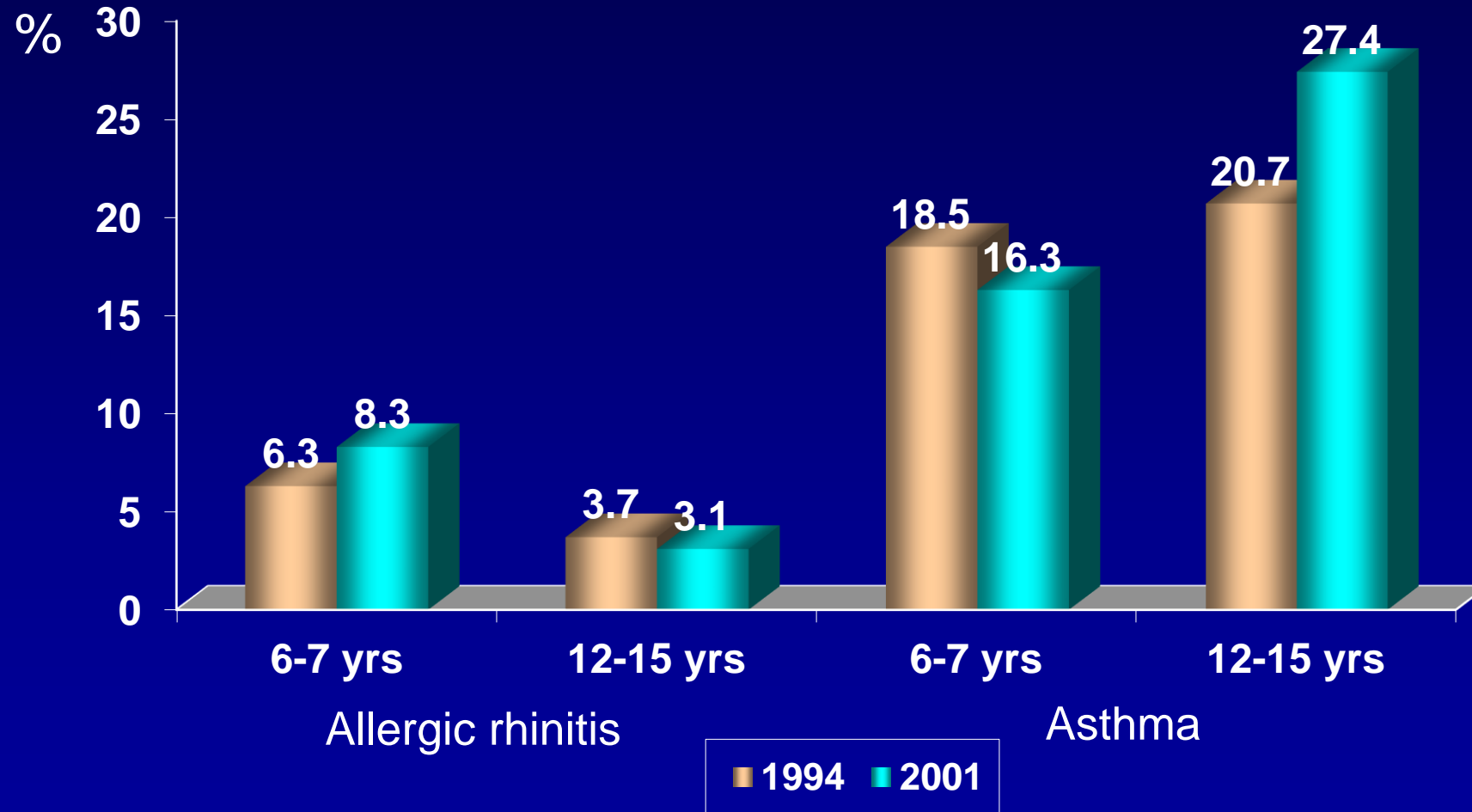


Allergy for the Pulmonologist

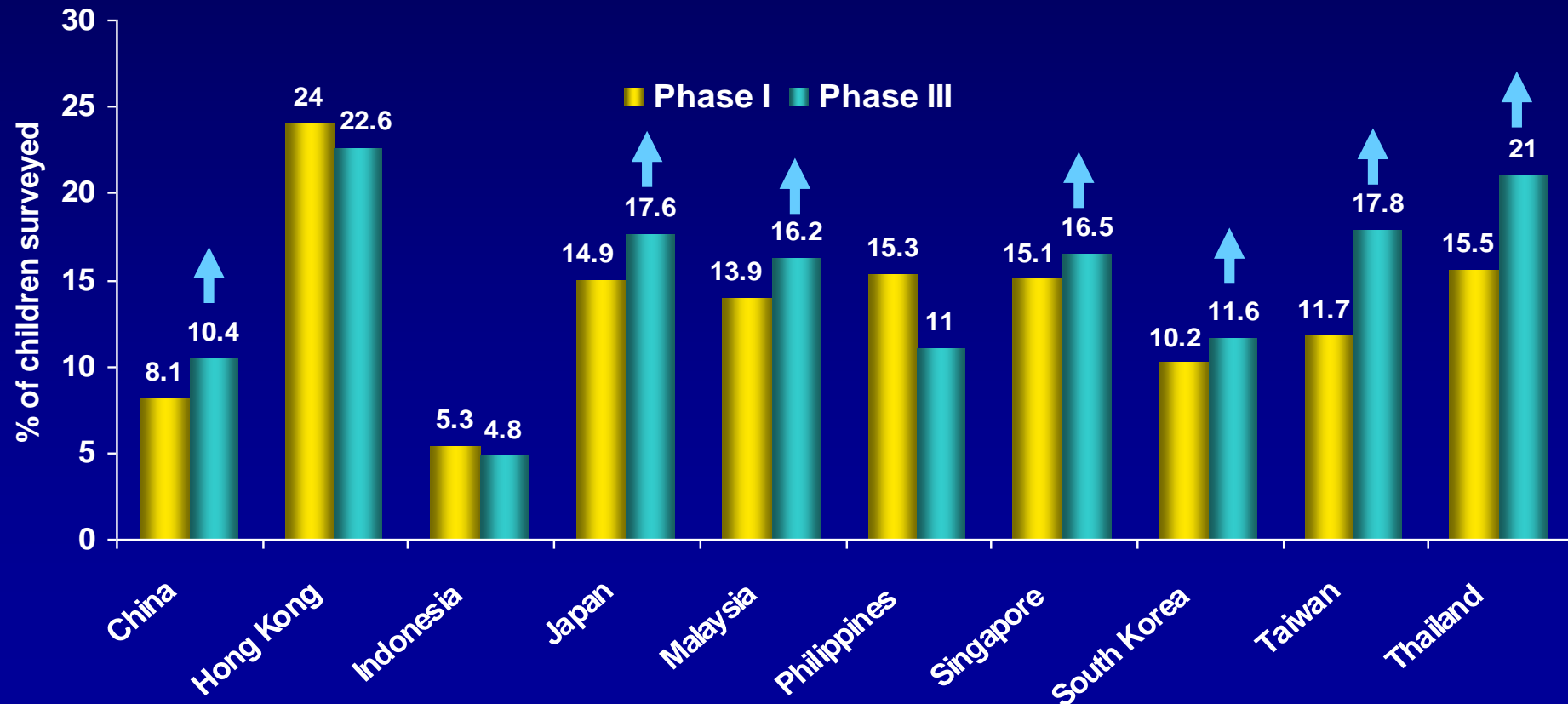
Adj A/Prof Anne Goh
Head, Allergy Service
KK Women's and Children's Hospital
Singapore

Prevalence of Allergic rhinitis and Asthma in Singapore

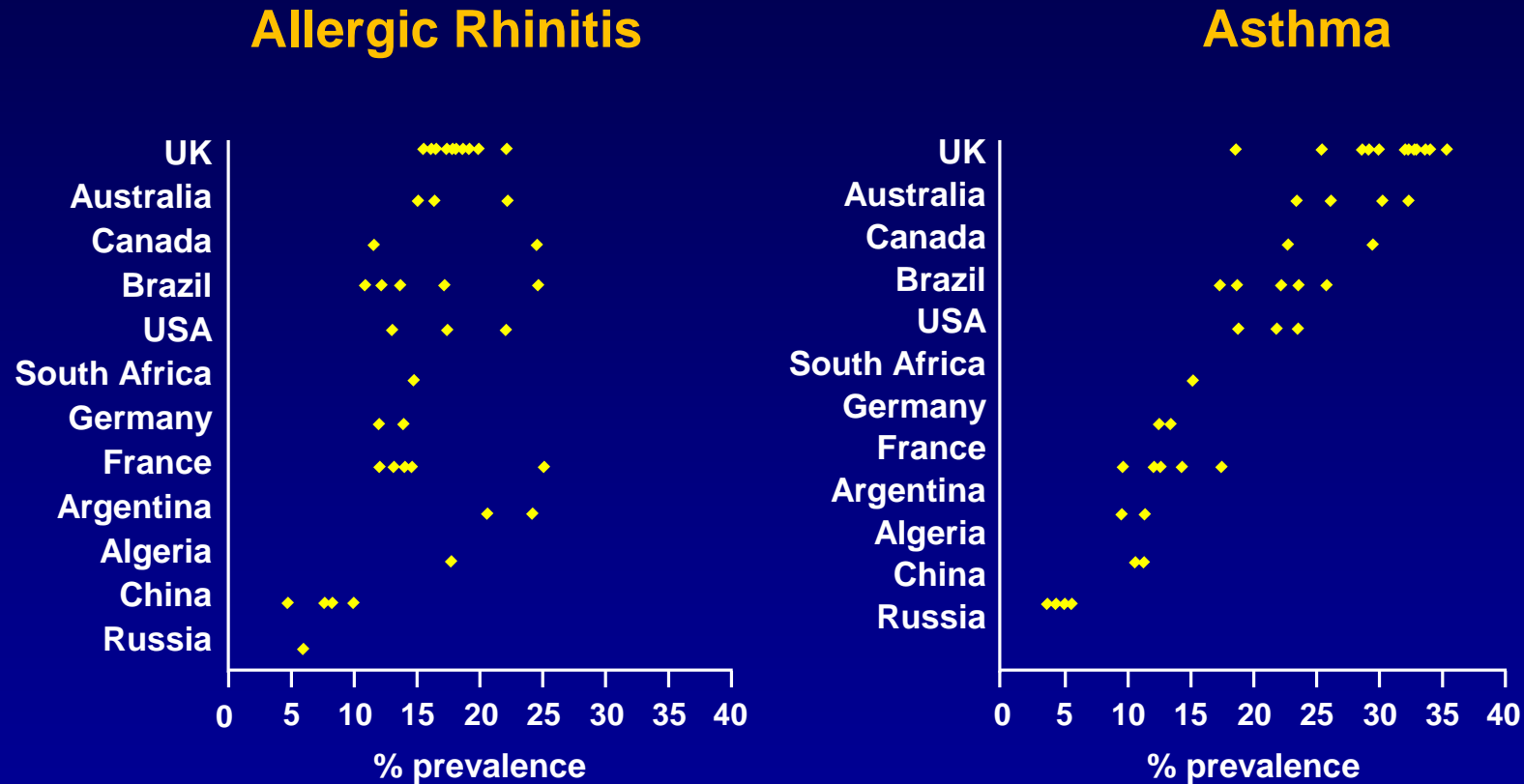


Increasing Prevalence of Rhinoconjunctivitis in Children in the Asia-Pacific Region

12-month prevalence of rhinoconjunctivitis in 13- to 14-year-old children in the Asia-Pacific region in Phases I and III of ISAAC



Allergic Rhinitis and Asthma have similar prevalence patterns



Adapted from ISAAC Lancet 1998;351:1225–1232

Many patients with Asthma have Allergic Rhinitis

Up to 80% of all asthmatic patients have allergic rhinitis



All asthmatic patients

Bousquet J et al J Allergy Clin Immunol 2001;108(suppl 5):S147–S334

Sibbald B, Rink E Thorax 1991;46:895–901

Leynaert B et al J Allergy Clin Immunol 1999;104:301–304

Brydon MJ Asthma J 1996:29–32

Allergic Rhinitis and Asthma have common triggers

- Outdoor allergens
 - Pollens
 - Molds
- Indoor allergens
 - House-dust mites
 - Animal dander
 - Insects (e.g. cockroach allergen)



Types of mold

Indoor

Penicillium
Aspergillus
Cladosporium
Alternaria
Stachybotrys
Epicoccum

Outdoor

Cladosporium
Alternaria
Aspergillus
Candida
Botrytis
Penicillium
Helminthosporium

Epidemiology of outdoor fungi in Singapore

- Peak fungal spore counts from Feb to Mar and Oct to Nov
- Fungal spores make up 86-88.1% of total airspora
 - Cladosporium (33.5-41%)
 - Didymosphaeria (21.9-28.6%)
 - Pithomyces (10.2-14.7%)
 - Curvularia (4.1-10.6%)
 - Drechslera-like spores (1.4-2.3%)
 - Other identified or unidentified spores (<1%)

Epidemiology of indoor fungi in Singapore

- Commonest airborne bacteria and fungi in food courts - *Penicillium*, *Aspergillus* and *Cladosporium*
- Commonest fungi from 15 shopping centers in Singapore - *Aspergillus penicillioides*, *Aureobasidium pullulans*, *Wallemia sebi*, *Penicillium spinulosum* and *Aspergillus sydowii*
- Commonest fungi in childcare centres - *Penicillium*, *Aspergillus*, *Geotrichum*, *Cladosporium*
- Commonest fungi in public spaces (malls, libraries, hotels) - *Aspergillus penicillioides*, *Aureobasidium pullulans*, *Wallemia sebi*, *Eurotium* group and *Cladosporium sphaerospermum*

A Rajasekar et al Oct 2011

J Yap et al Sep 2009

MS Zuraimi et al May 2009

V Goh et al Apr 2014

Epidemiology in Singapore

SPT on 231 patients with asthma and/or allergic rhinitis and 76 healthy controls
Mold sensitization increases with age and the commonest mold is *Curvularia* spp which is the same genus as *Alternaria* locally

	Asthma and/or allergic rhinitis patients				
	Healthy controls (n=76)	All (n=231)	3-5 yrs (n=47)	6-14yrs (n=84)	>14 yrs (n=100)
	Number (Percentage skin test positive)				
House dust mite	26 (34.2)	220 (95.2)	42 (89.4) ^{***}	79 (94) ^{***}	99 (99) ^{***}
<i>Cladosporium</i>	7 (9.2)	38 (16.5)	3 (6.4)	15 (7.9)	20 (20)
<i>Didymosphaeria</i>	9 (11.8)	63 (27.3)	7 (14.9)	20 (23.8)	36 (36) ^{***}
<i>Pithomyces</i>	7 (9.2)	46 (19.9)	7 (14.9)	13 (15.5)	26 (26) ^{**}
<i>Tetraploa</i>	5 (6.6)	37 (16)	2 (4.3)	10 (11.9)	25 (25) ^{**}
<i>Curvularia</i> spp					
<i>C. inequalis</i>	0 (0)	60 (26)	9 (19.1) ^{***}	18 (21.4) ^{***}	33 (33) ^{***}
<i>C. lunata</i>	5 (6.6)	60 (26)	10 (21.3) [*]	20 (23.8) ^{**}	30 (30) ^{***}
<i>C. pallescens</i>	2 (2.6)	73 (31.6)	10 (21.3) ^{***}	22 (26.2) ^{***}	41 (41) ^{***}

*p<0.05, ** p<0.01, *** p<0.001

Classification of grasses

- Northern grasses: colder climates
 - Timothy, rye, orchard, sweet vernal, redtop and blue grass
- Southern grasses: warmer climates
 - Bermuda grass

Grasses in Singapore

- Grasses are the most common airborne pollen in SEA except in Singapore
- Grass pollen makes up 2.2-3.5% of total airspora in Singapore
- Common grasses in Singapore
 - Axonopus compressus (cow grass)
 - Zoysia matrella (Manila grass)
 - Zoysia japonica (Japanese lawn grass)
 - Stenotaphrum secundatum (St Augustine grass)

Zomlefer et al 1994

Ho et al 1995

Phanochyakarn et al 1989

Cua-Lim et al 1978

Grasses found in the tropics



Cow grass



Bermuda grass



Manila grass



Japanese lawn grass



St Augustine grass



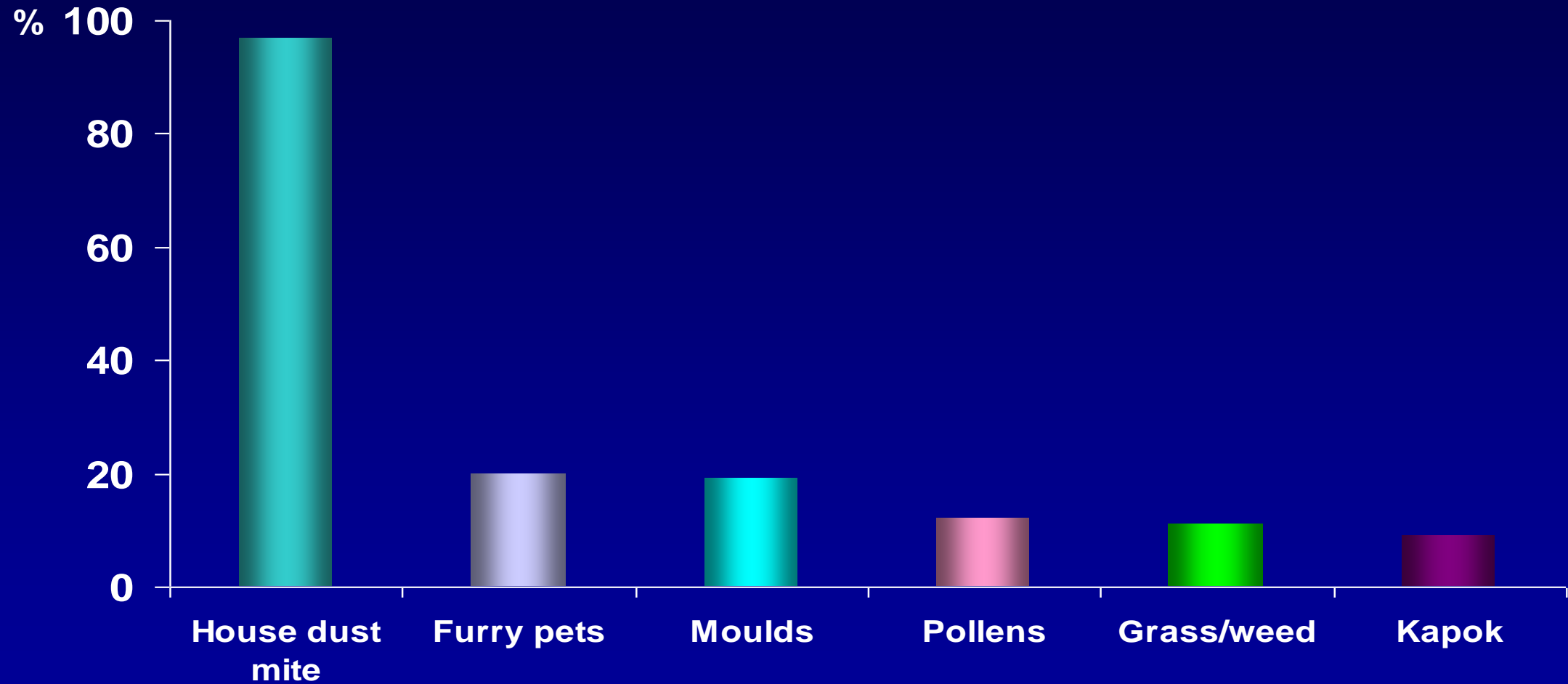
Bahia grass

Grass allergy in Singapore

- Rare
- Mainly cases of contact dermatitis seen in army boys
 - In 23 patients evaluated for grass allergy, SPT to crushed cow grass was positive in 2 patients and patch test positive in 3 patients
 - 5 out of 46 patients who had a history of grass intolerance had positive patch tests to cow grass, sea-shore centipede grass, lalang, guinea grass and elephant grass



Atopic individuals in Singapore sensitized to allergens on skin prick test



Epidemiology in Singapore

SPT on 231 patients with asthma and/or allergic rhinitis and 76 healthy controls
 House dust mite sensitization is very common with almost all patients with asthma and/or allergic rhinitis being sensitized by the age of 14 yrs old

	Asthma and/or allergic rhinitis patients				
	Healthy controls (n=76)	All (n=231)	3-5 yrs (n=47)	6-14yrs (n=84)	>14 yrs (n=100)
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*p<0.05, ** p<0.01, *** p<0.001

Environment for mite growth

- Found in dust and products with woven material or stuffing eg. mattresses, pillows, stuffed animals and bedding
- Natural food source is skin scales or fungi
- Highest mite concentrations are in mattresses
- Major factors affecting mite growth are warmth and humidity

WHO recommendations for House dust mite avoidance

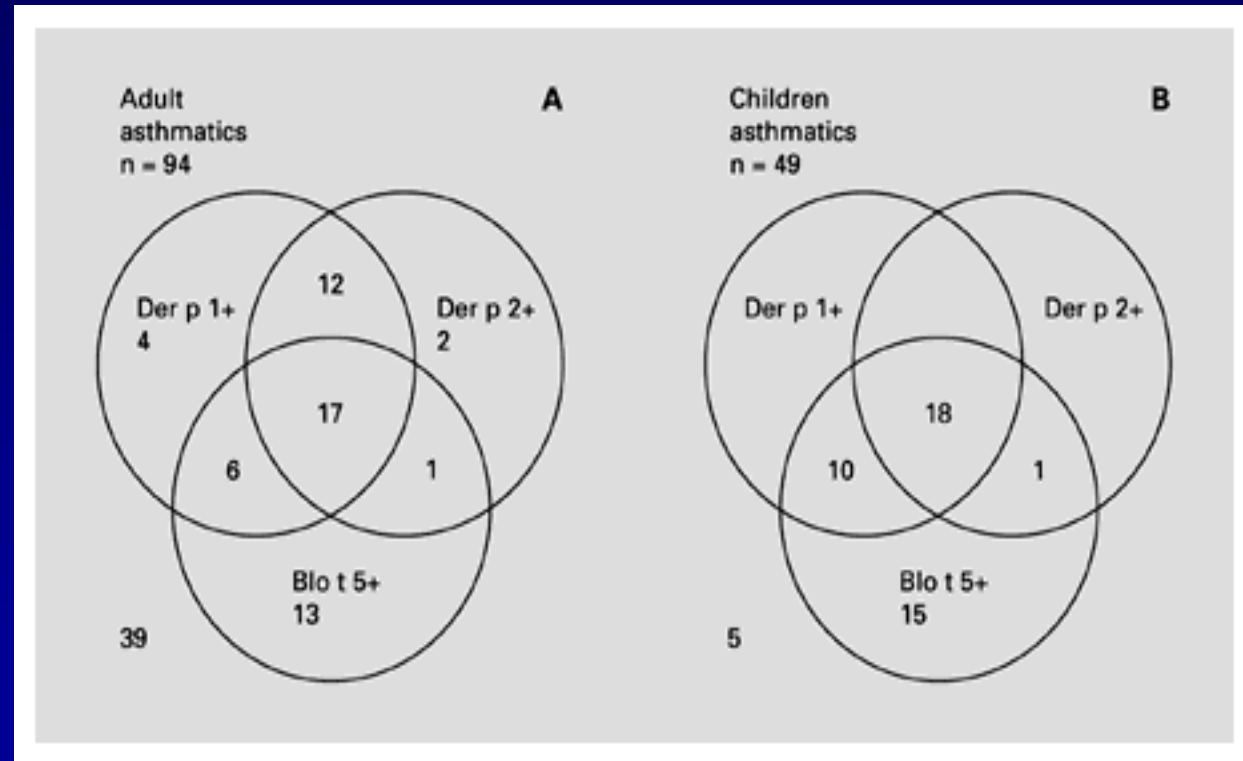
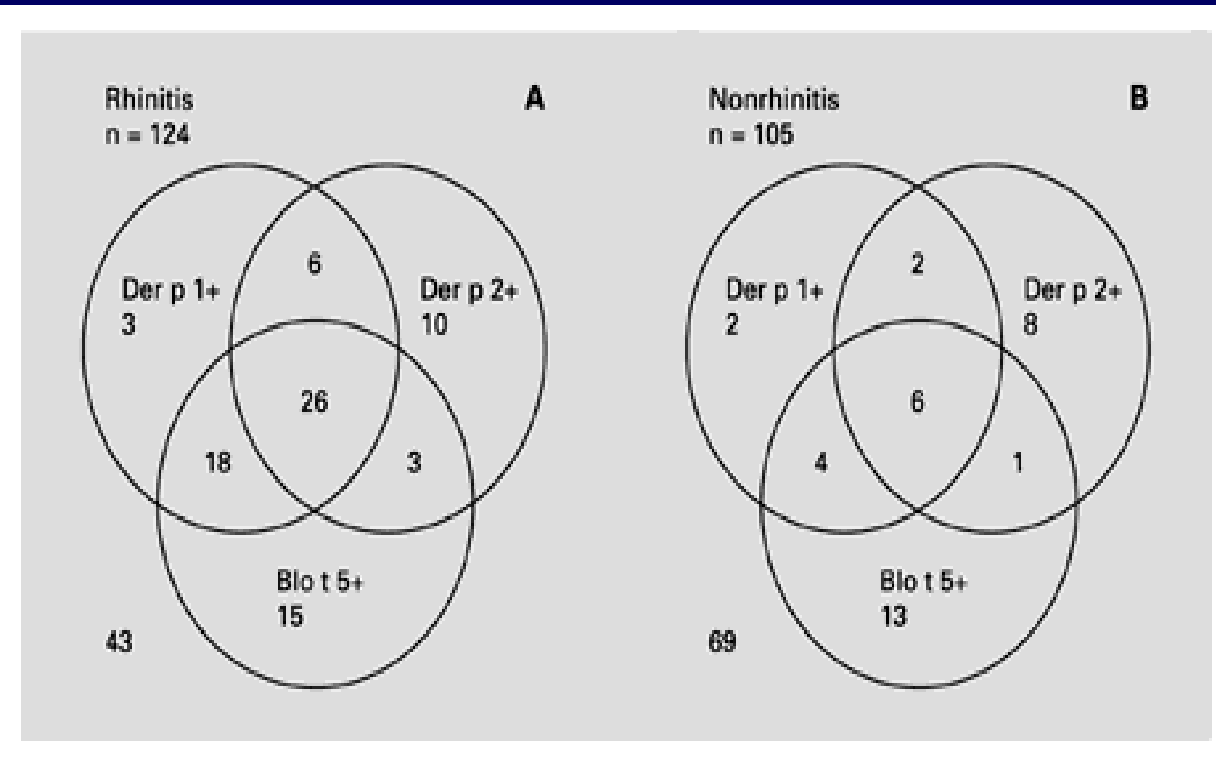
- Exposure to 2 μ g *Der p1* per g of dust increased the risk of sensitization
- Exposure to 10 μ g *Der p1* per g of dust increased the risk of symptoms
- Relative humidity of <51% has resulted in a significant reduction mite levels

House dust mite sensitization profile of Singapore and Malaysian patients with rhinitis and asthma

Patients with rhinitis and asthma are sensitized to both the storage mites *Dermatophagoides* and *Blomia tropicalis*

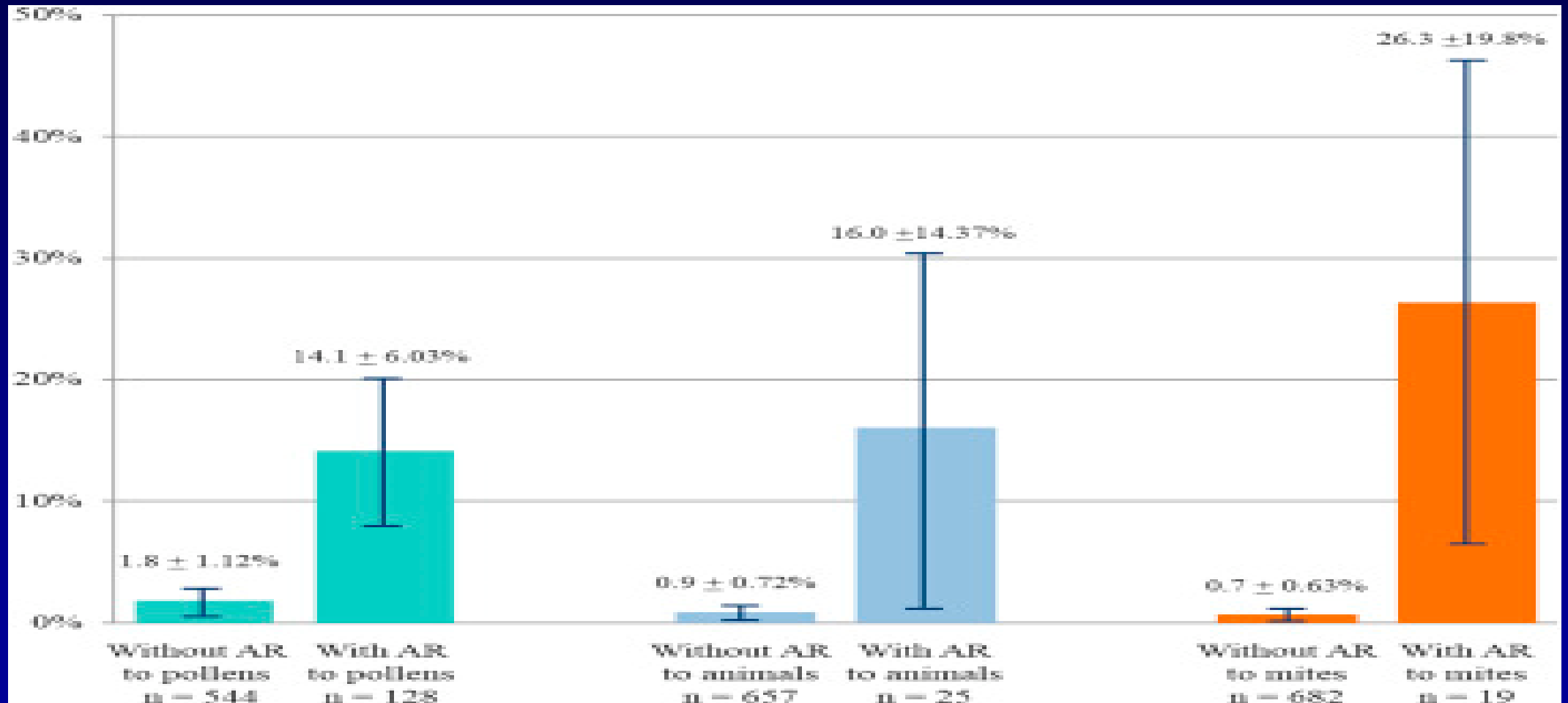
50% of patients with rhinitis are sensitized to *Blomia tropicalis*

Children with asthma were more likely to be sensitized to *Blomia tropicalis*



Sensitization to house dust in patients with allergic rhinitis increases the risk of asthma development

New asthma symptoms



Food Allergy and asthma – what is the link?

- Food allergy and asthma are allergic diseases and frequently co-exist
- The role of diet in the etiology of asthma and as a precipitant of exacerbations has been investigated and is rare
- The presence of a food allergy is a risk factor for the future development of asthma

Respiratory manifestations of food allergy

- Respiratory reactions occur as a component of anaphylaxis in about half of the cases
- Isolated rhinitis or asthma due to food allergy is rare (2-3%)
- The prevalence of food-related wheeze is highest in young children with atopic disease (asthma and eczema)
- Food allergy increases asthma morbidity and is an independent risk factor for life-threatening asthma

John M James. Pediatrics 2003;111(6) :1625-30

Simpson et al. Pediatr Pulmonol 2007;42(6):489-95

Vogel et al. J Asthma 2008;45(10):862-6

Roberts G et al. J Allergy Clin Immunol 2003;112(1):168-74

Allergy testing methods

- Skin prick tests
 - Food panel and environmental panel
- Intradermal testing
 - More commonly used in drug allergy testing
- Patch testing
 - For contact dermatitis or delayed reactions



Skin Prick Panel 2016

Patient's NRIC: [REDACTED]

Get Patient

Date:

16/10/2017

Patient's Name: [REDACTED]

Control

	Length(mm)	Width(mm)	Mean(mm)	Erythema
1. Histamine	7.0	5.0	6.0	<input checked="" type="radio"/> Yes <input type="radio"/> No
2. Diluent	0.0	0.0	0.0	<input type="radio"/> Yes <input checked="" type="radio"/> No

(I) Aerosensitization

	Length(mm)	Width(mm)	Mean(mm)	Erythema
1. House Dust Mite Mix	18.0	15.0	16.5	<input checked="" type="radio"/> Yes <input type="radio"/> No
2. Cockroach Mix	5.0	5.0	5.0	<input checked="" type="radio"/> Yes <input type="radio"/> No
3. Cat Hair (10,000 BAU/ml)	3.0	2.0	2.5	<input type="radio"/> Yes <input checked="" type="radio"/> No
4. Dog epithelia	3.0	3.0	3.0	<input type="radio"/> Yes <input checked="" type="radio"/> No
5. Blomia Tropicalis	5.0	4.0	4.5	<input checked="" type="radio"/> Yes <input type="radio"/> No
6. Kapok Seeds	0.0	0.0	0.0	<input type="radio"/> Yes <input checked="" type="radio"/> No
7. Curvilaria lunata	0.0	0.0	0.0	<input type="radio"/> Yes <input checked="" type="radio"/> No
8. GS Mold Mix #1	0.0	0.0	0.0	<input type="radio"/> Yes <input checked="" type="radio"/> No

(II) Food Panel

	Length(mm)	Width(mm)	Mean(mm)	Erythema
1. Milk, Cow				<input type="radio"/> Yes <input type="radio"/> No
2. Soybean				<input type="radio"/> Yes <input type="radio"/> No
3. Egg, Whole				<input type="radio"/> Yes <input type="radio"/> No
4. Egg, White				<input type="radio"/> Yes <input type="radio"/> No
5. Peanut				<input type="radio"/> Yes <input type="radio"/> No
6. Sesame Seed				<input type="radio"/> Yes <input type="radio"/> No
7. Wheat Whole				<input type="radio"/> Yes <input type="radio"/> No
8. Fish Mix				<input type="radio"/> Yes <input type="radio"/> No
9. Shellfish Mix				<input type="radio"/> Yes <input type="radio"/> No

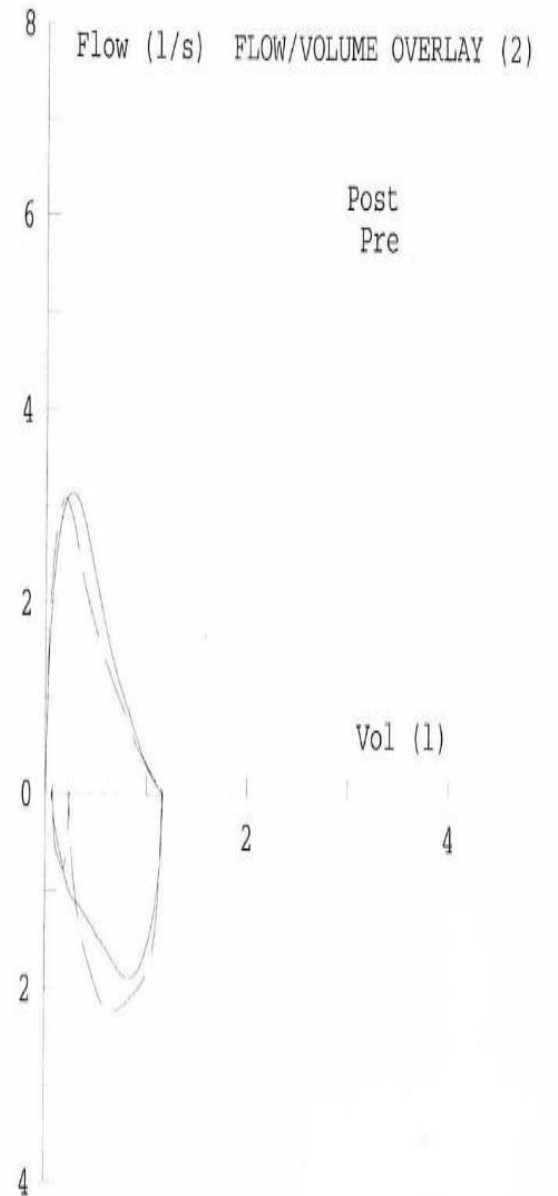
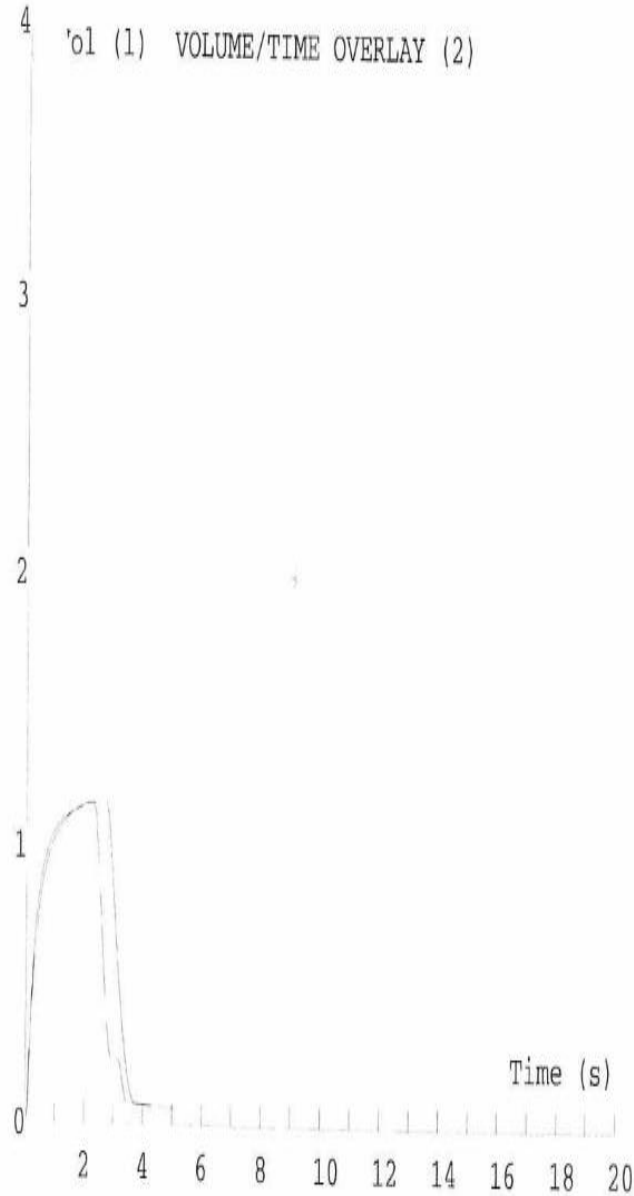
Allergy testing methods

- In-vitro testing
 - Measurement of specific IgE
 - More useful in for food allergy
 - Useful when considering immunotherapy
- Lung functions tests
 - Spirometry
 - Exhaled nitric oxide

KK Women's & Children's Hospital
Respiratory Function Laboratory
Pulmonary Function Report

Parameter		Pred	Pre	%Pred	Post	%Pred	Change	%Change
FVC	L	1.12	1.16	102.9	1.16	103.3	0.00	0.4
FEV 1	L	1.01	1.04	102.7	1.06	104.9	0.02	2.1
FEV 1/FVC	%	91.50	90.04	98.4	91.57	100.1	1.53	1.5
PEF	L/M	81.00	184.80	228.1	188.70	233.0	3.90	2.1
FEF 25-75	L/S	1.40	1.29	92.2	1.55	111.2	0.27	20.6
FEF 75	L/S	0.87	0.62	71.9	0.71	82.3	0.09	14.4
FIVC	L	1.16	1.09	94.3	1.10	95.2	0.01	1.0
FIVC/FVC	%	102.83	94.20	91.6	94.75	92.1	0.54	0.5
FIF50/FEF50	%	75.00	153.26	204.3	88.07	117.4	-65.19	-65.2

Test Date	31/05/2006	31/05/2006
Test Time	11:20	11:39

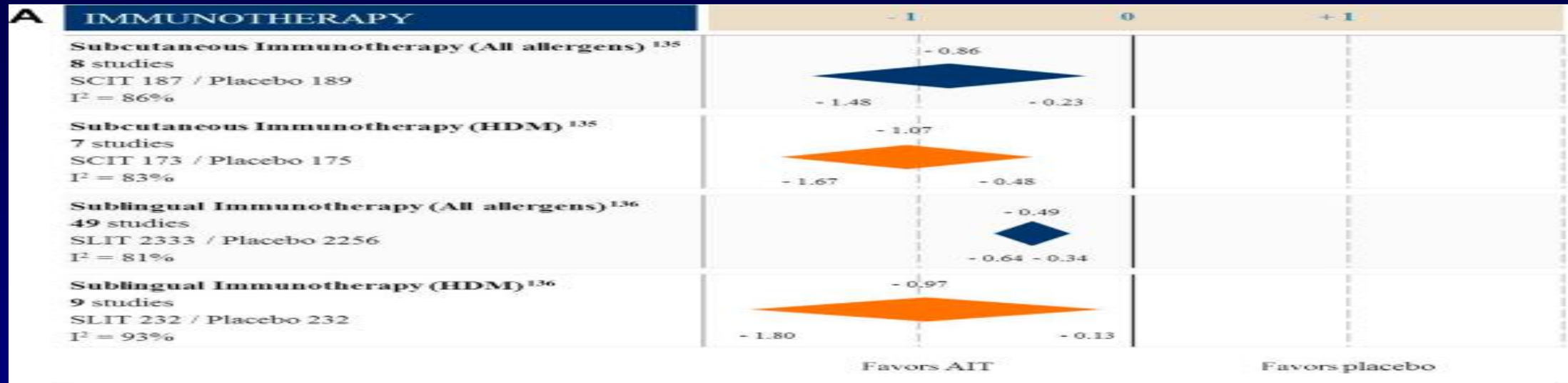


Immunotherapy

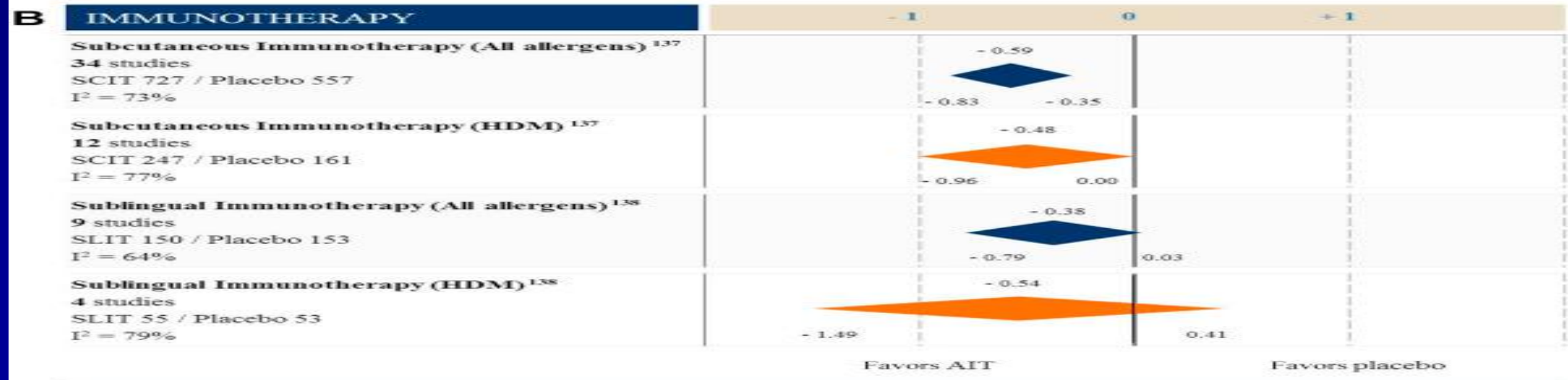
- Sublingual immunotherapy
 - Safe with few severe reactions
 - Can be delivered at home
 - Currently available for HDM, grass and ragweed allergy
- Subcutaneous immunotherapy
 - Has more adverse reactions
 - Requires to be delivered in the clinic setting
 - Can deliver multiple allergens for those who have multiple sensitization

Efficacy of Immunotherapy

Allergic rhinitis



Allergic asthma



Summary

- The prevalence of Allergic rhinitis has increased though asthma may have stabilized
- The commonest allergen is house dust mite
- The easiest test to perform to look for allergic sensitization is the skin prick test
- Immunotherapy can be considered when medical treatment does not adequately control the symptoms



Thank You

