CLINICAL ASPECTS OF PEDIATRIC ASTHMA

LUIS ANTONIO GONZALEZ M.D.
ALLERGY/IMMUNOLOGY
EL PASO, TEXAS

ASTHMA DEMOGRAPHICS

- Affects > 26 million Americans
- Affects 6 million children < 18 years old
- 1 in 13 people have asthma
- 1 in 12 children have asthma
- 3,615 people died from asthma in the U.S.
- 10 Americans die from asthma every day

- AAFA.org (2018) and CDC.Gov (2018)

ASTHMA DEMOGRAPHICS

- Adults die 4x more frequently than children
- Women > men and boys > girls
- African-Americans: Higher risk of death
- 2008 to 2013: $81.9 billion dollars/year
- Leading chronic disease in children
- Top reason for missed school days

- AAFA.org (2018) and CDC.Gov (2018)

MAIN QUESTION

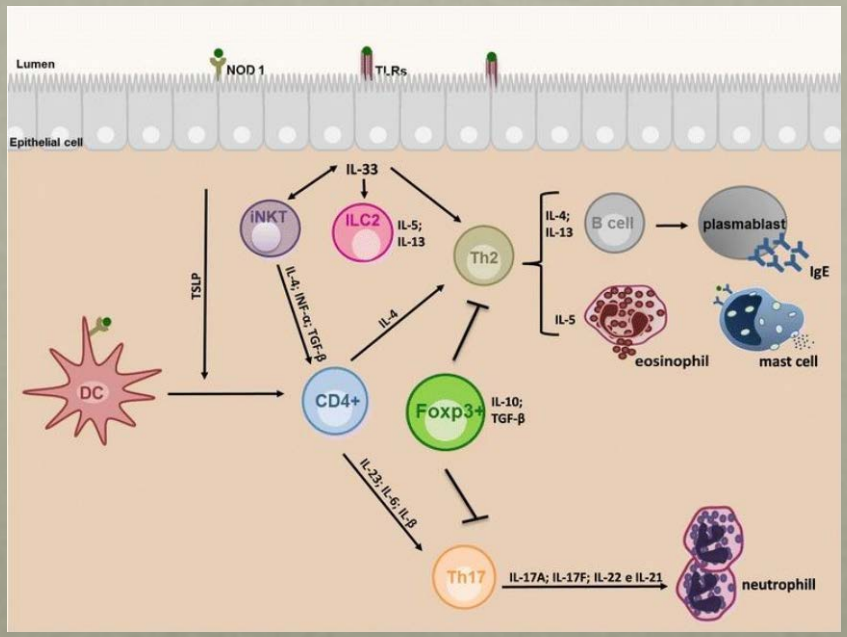
Doctor: “I want to know if my child has asthma”

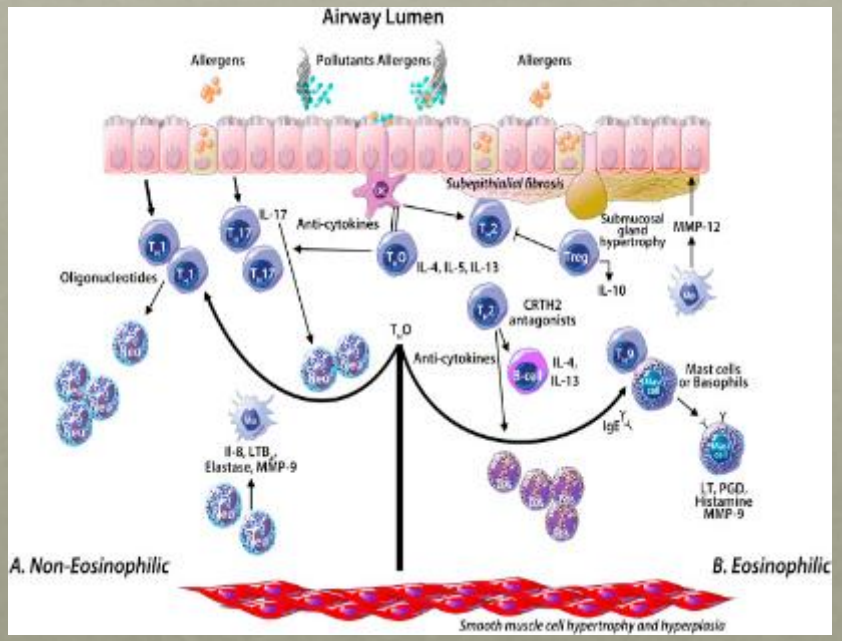
WHAT IS ASTHMA?

- Asthma is an heterogeneous disease characterized by chronic airway inflammation
- Symptoms: wheeze, shortness of breath, chest tightness and cough that vary in time and intensity
- Variable expiratory airflow limitation

Global Initiative for Asthma (2015)

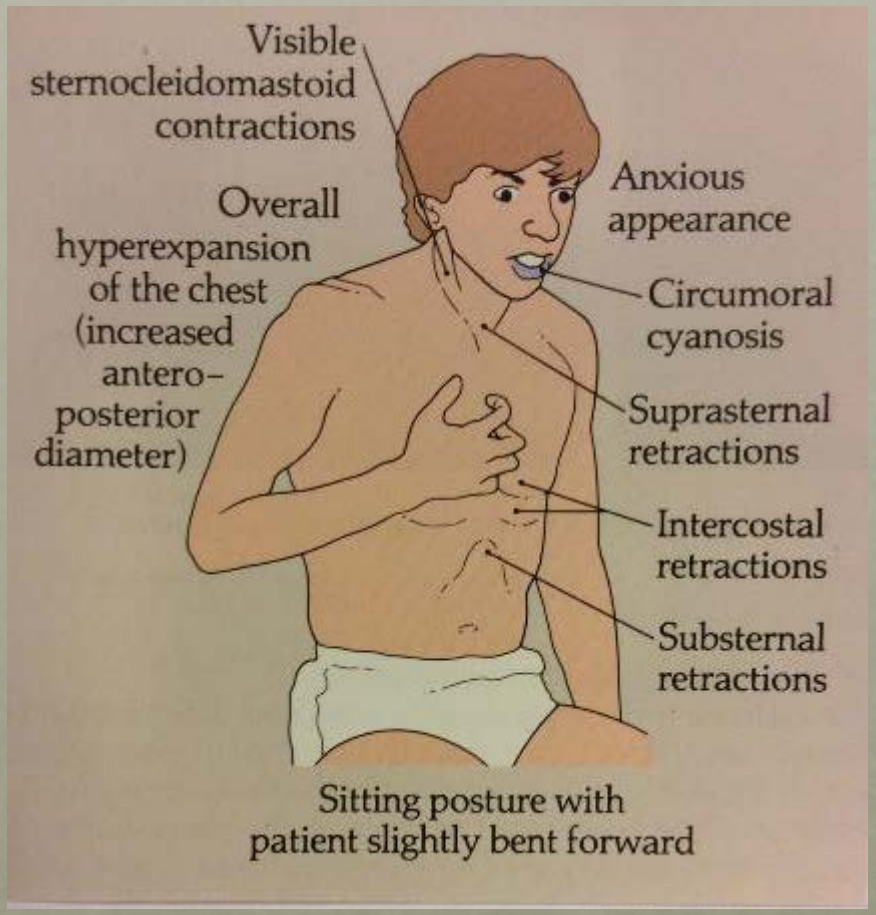
IMMUNOLOGICAL ASPECTS OF ASTHMA





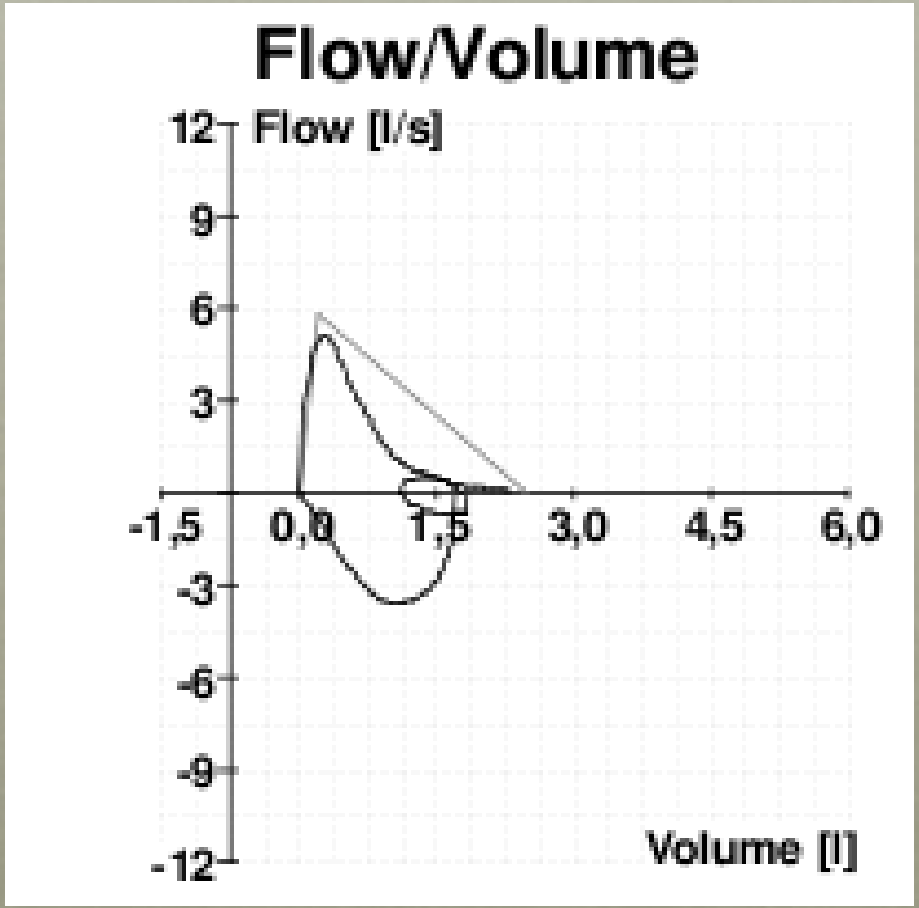
David Weldom, M.D. Texas A & M University, BSC

CLINICAL ASPECTS OF ASTHMA



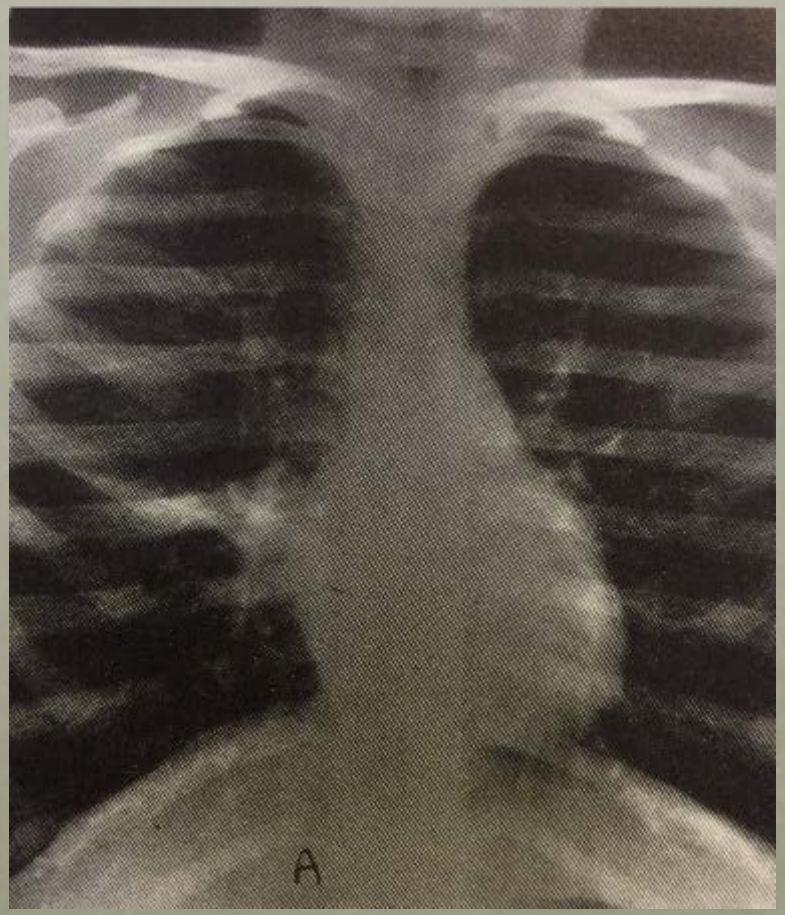
Atlas of Pediatric Physical Diagnosis, 1987

VARIABLE AIRFLOW LIMITATION



https://commons.wikimedia.org/w/index.php?title=User:Evgenios_Metaxas_MD_MSc,_Pulmonologist MD_MS

RADIOLOGICAL ASPECTS OF ASTHMA



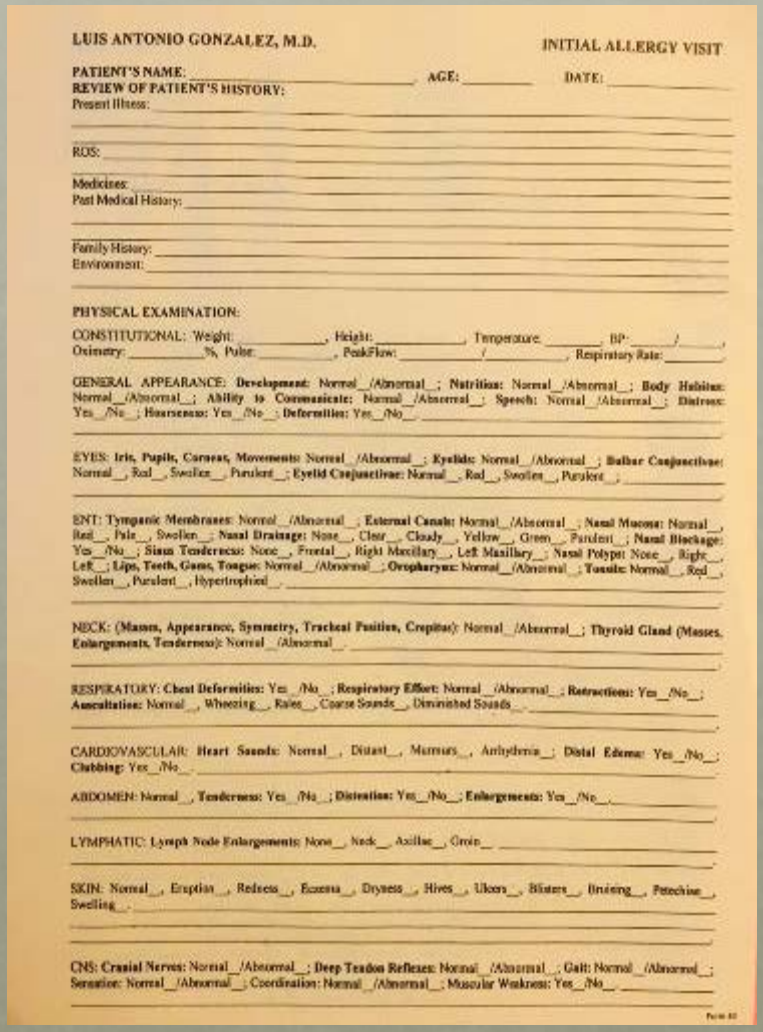
Atlas of Pediatric Physical Diagnosis, 1987

HOW DO YOU DIAGNOSE ASTHMA?

- Pediatric asthma can be hard to diagnose and challenging to treat
- The diagnosis of asthma is clinical
- There is no specific test for asthma

HISTORY OF PRESENT ILLNESS

- Cough, wheezing, chest tightness and difficulty in breathing.
- Most common: cough and wheezing



LUIS ANTONIO GONZALEZ, M.D. INITIAL ALLERGY VISIT

PATIENT'S NAME: _____ AGE: _____ DATE: _____

REVIEW OF PATIENT'S HISTORY:

Present Illness: _____

ROS: _____

Medicines: _____

Past Medical History: _____

Family History: _____

Environmen: _____

PHYSICAL EXAMINATION:

CONSTITUTIONAL: Weight: _____, Height: _____, Temperature: _____, BP: _____/_____, Oximetry: _____%, Pulse: _____, PeakFlow: _____/_____, Respiratory Rate: _____

GENERAL APPEARANCE: **Development:** Normal__/Abnormal__; **Nutrition:** Normal__/Abnormal__; **Body Habitus:** Normal__/Abnormal__; **Ability to Communicate:** Normal__/Abnormal__; **Speech:** Normal__/Abnormal__; **Distress:** Yes__/No__; **Hoarseness:** Yes__/No__; **Deformities:** Yes__/No__ _____

EYES: **Iris, Pupils, Corneae, Movements:** Normal__/Abnormal__; **Eyelids:** Normal__/Abnormal__; **Bulbar Conjunctivae:** Normal__, Red__, Swollen__, Purulent__; **Eyelid Conjunctivae:** Normal__, Red__, Swollen__, Purulent__ _____

ENT: **Tympanic Membranes:** Normal__/Abnormal__; **External Canals:** Normal__/Abnormal__; **Nasal Mucosa:** Normal__, Red__, Pale__, Swollen__; **Nasal Drainage:** None__, Clear__, Cloudy__, Yellow__, Green__, Purulent__; **Nasal Blockage:** Yes__/No__; **Sinus Tenderness:** None__, Frontal__, Right Maxillary__, Left Maxillary__; **Nasal Polyps:** None__, Right__, Left__; **Lips, Teeth, Gums, Tongue:** Normal__/Abnormal__; **Oropharynx:** Normal__/Abnormal__; **Tonsils:** Normal__, Red__, Swollen__, Purulent__, Hypertrophied__ _____

NECK: **(Masses, Appearance, Symmetry, Tracheal Position, Crepitus):** Normal__/Abnormal__; **Thyroid Gland (Masses, Enlargements, Tenderness):** Normal__/Abnormal__ _____

RESPIRATORY: **Chest Deformities:** Yes__/No__; **Respiratory Effort:** Normal__/Abnormal__; **Retractions:** Yes__/No__; **Auscultation:** Normal__, Wheezing__, Rales__, Coarse Sounds__, Diminished Sounds__ _____

CARDIOVASCULAR: **Heart Sounds:** Normal__, Distant__, Murmurs__, Arrhythmia__; **Distal Edema:** Yes__/No__; **Clubbing:** Yes__/No__ _____

ABDOMEN: Normal__, **Tenderness:** Yes__/No__; **Distention:** Yes__/No__; **Enlargements:** Yes__/No__ _____

LYMPHATIC: **Lymph Node Enlargements:** None__, Neck__, Axillae__, Groin__ _____

SKIN: Normal__, Eruption__, Redness__, Eczema__, Dryness__, Hives__, Ulcers__, Blisters__, Bruising__, Petechiae__, Swelling__ _____

CNS: **Cranial Nerves:** Normal__/Abnormal__; **Deep Tendon Reflexes:** Normal__/Abnormal__; **Gait:** Normal__/Abnormal__; Sensation: Normal__/Abnormal__; Coordination: Normal__/Abnormal__; Muscular Weakness: Yes__/No__ _____

HISTORY OF PRESENT ILLNESS - COUGH

- Asthma: More common cause of chronic cough in children > 3 years old
- Asthma can present just with cough
- Investigate the patterns of cough: nocturnal, seasonal, etc.
- Asthma is frequently misdiagnosed or not suspected

HISTORY OF PRESENT ILLNESS - COUGH

- 80% of asthma children: symptomatic before age 5
- Asthma is frequently misdiagnosed

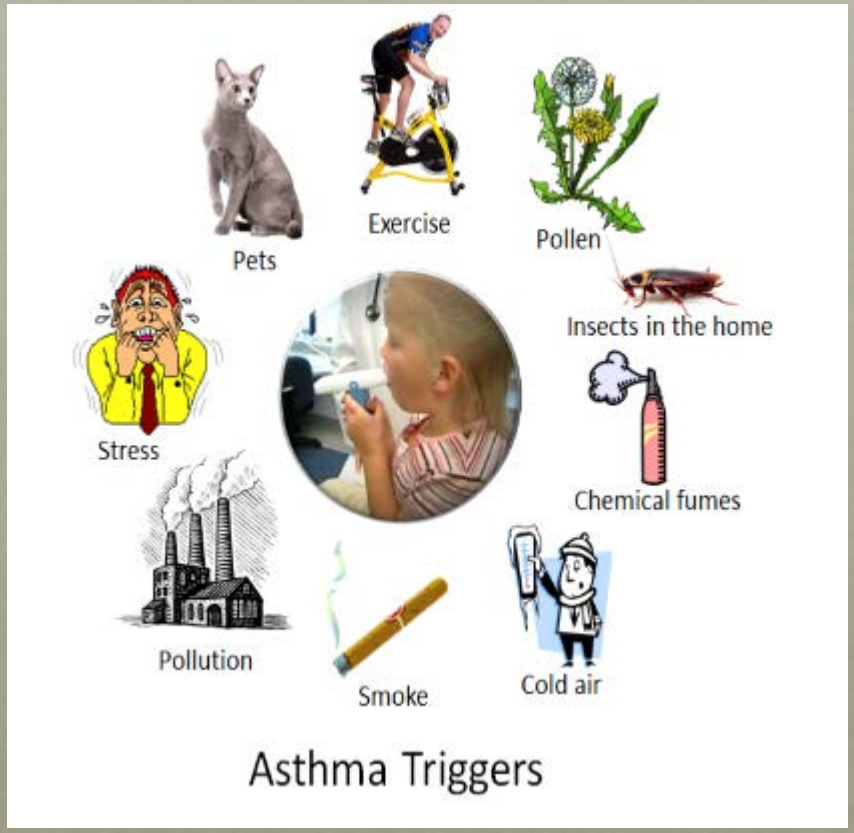
Ryanboren: Chase coughing. Flicker.com

HISTORY OF PRESENT ILLNESS - WHEEZING

- Hallmark of asthma
- Inspiratory and expiratory: polyphonic
- Central Obstruction: expiratory, monophonic: tracheomalasia
- Vocal cord dysfunction: inspiratory and monophonic (Stridor)
- Early onset: intermittent. Viruses
- Late onset: more persistant. Atopy

HX OF PRESENT ILLNESS ASTHMA PATTERNS

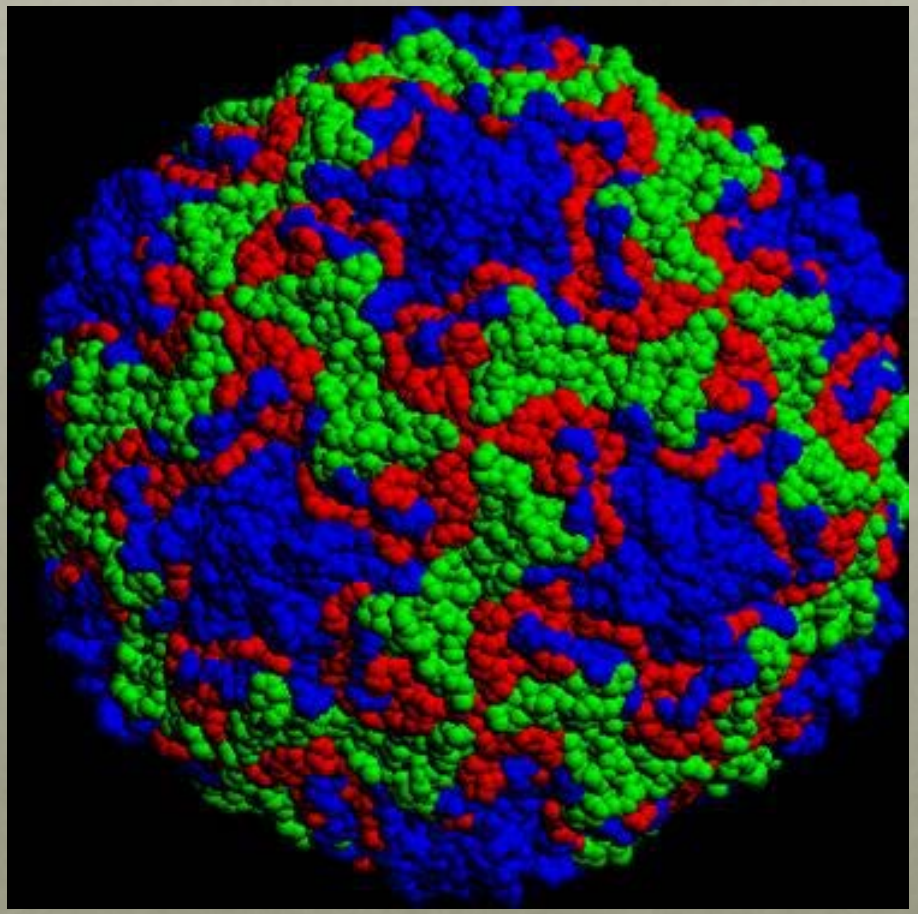
- Intermittent exacerbations
- Seasonal patterns
- Aggravating factors: smoke, construction, irritants, URIs, GERD, rhinits, medicines



Asthmatrigger.PNGwikimedia 7mike5000

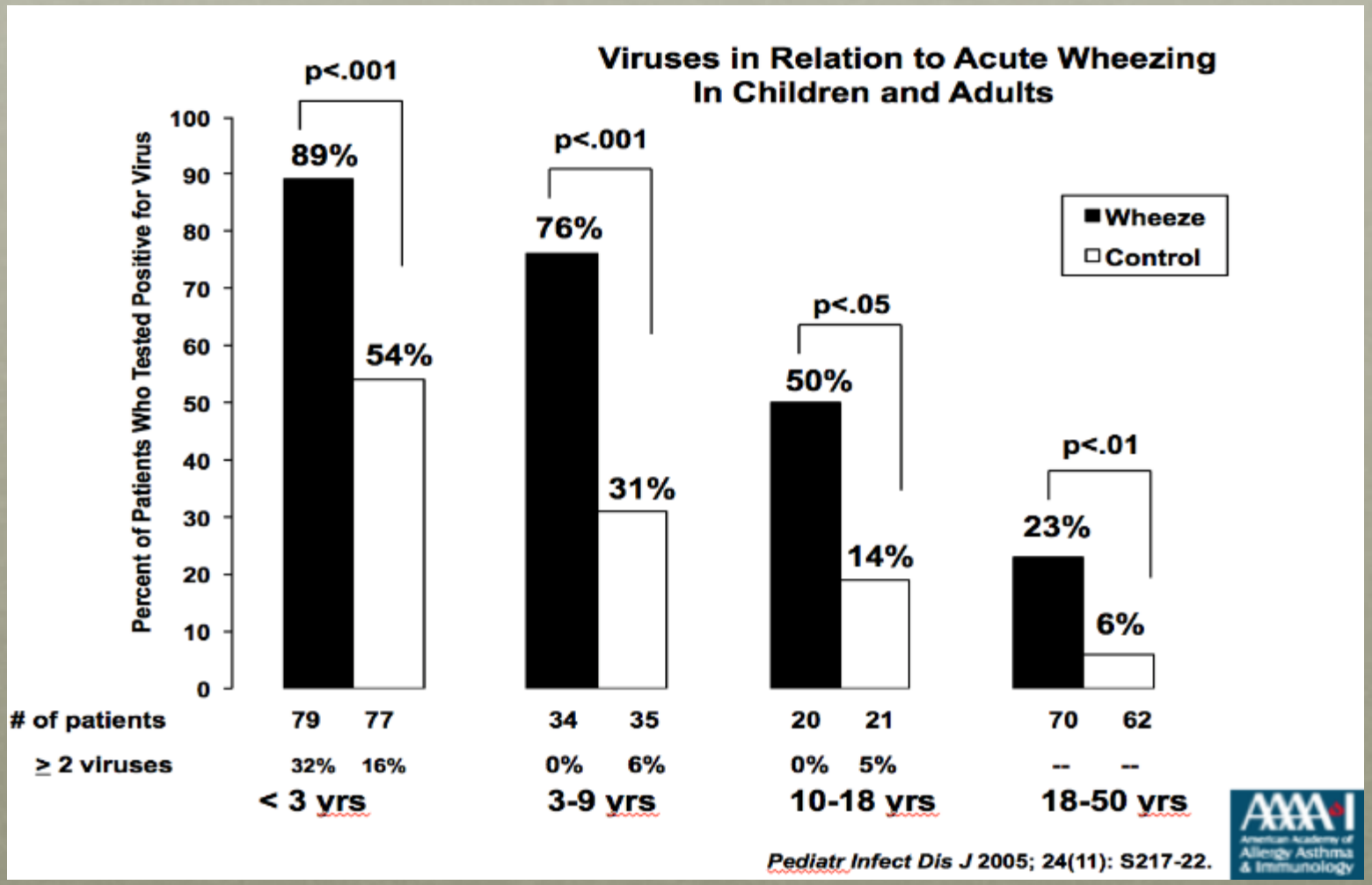
HX OF PRESENT ILLNESS VIRAL INFECTIONS

- URIs: Most important aggravating factors
- Rhinovirus, Influenza, and RSV.
- Also: Mycoplasma, Chlamydia.
- Chronic sinusitis



- AAAAI Revised 2017

HX OF PRESENT ILLNESS
VIRAL INFECTIONS



HX OF PRESENT ILLNESS EXERCISE

- Occurs in up to 90% of children with asthma

HX OF PRESENT ILLNESS
WEATHER

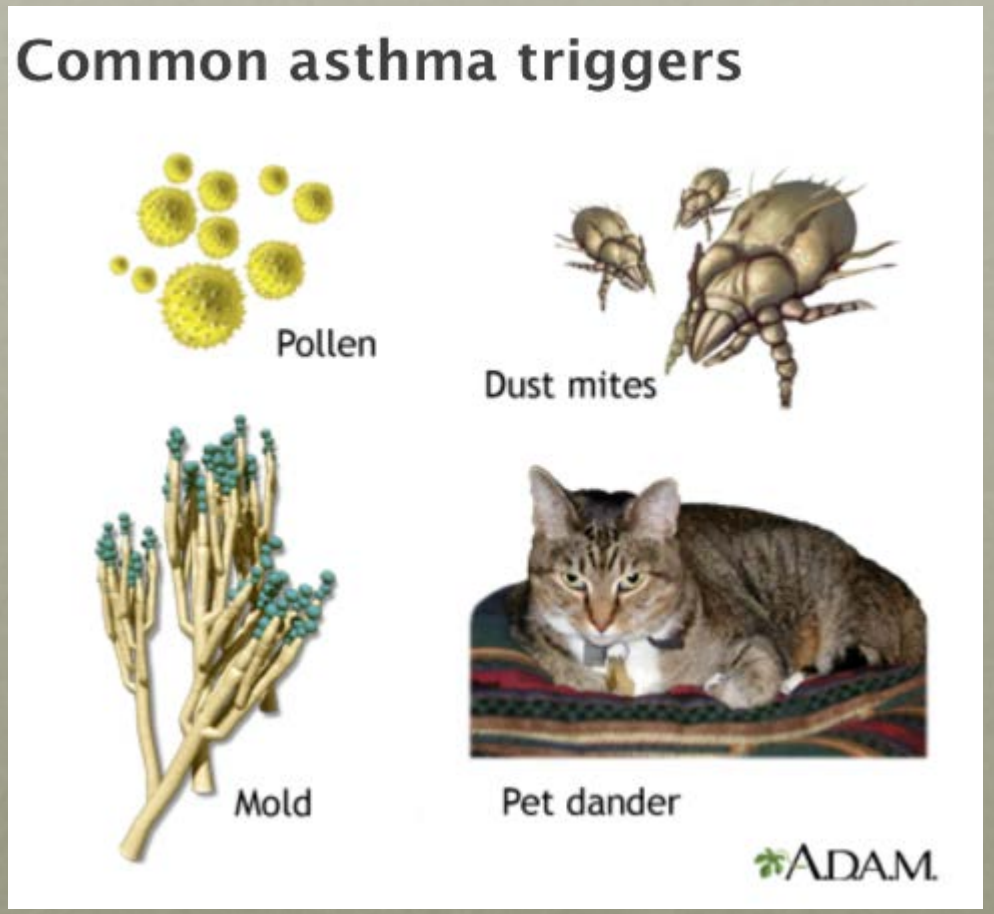
- Cold Air
- Hot, humid days
- Thunderstorms
- Winds

HX OF PRESENT ILLNESS CIGARETTE SMOKE

- Most common environmental risk factor for the development and progression of asthma in children
- Smoking outdoors is better than indoors exposure

HX OF PRESENT ILLNESS ALLERGENS

- House dust mites
- Cockroaches
- Rodents
- Pets
- Pollens
- Mold



HX OF PRESENT ILLNESS
IRRITANTS

- Nitrogen dioxide
- Perfumes
- Propellants from sprays
- Paint
- Room deodorizers
- Cleaning products
- Diesel particles

HX OF PRESENT ILLNESS STRESS

- Anxiety
- Depression
- Chronic illness

ADDITIONAL ASPECTS OF THE CLINICAL HISTORY

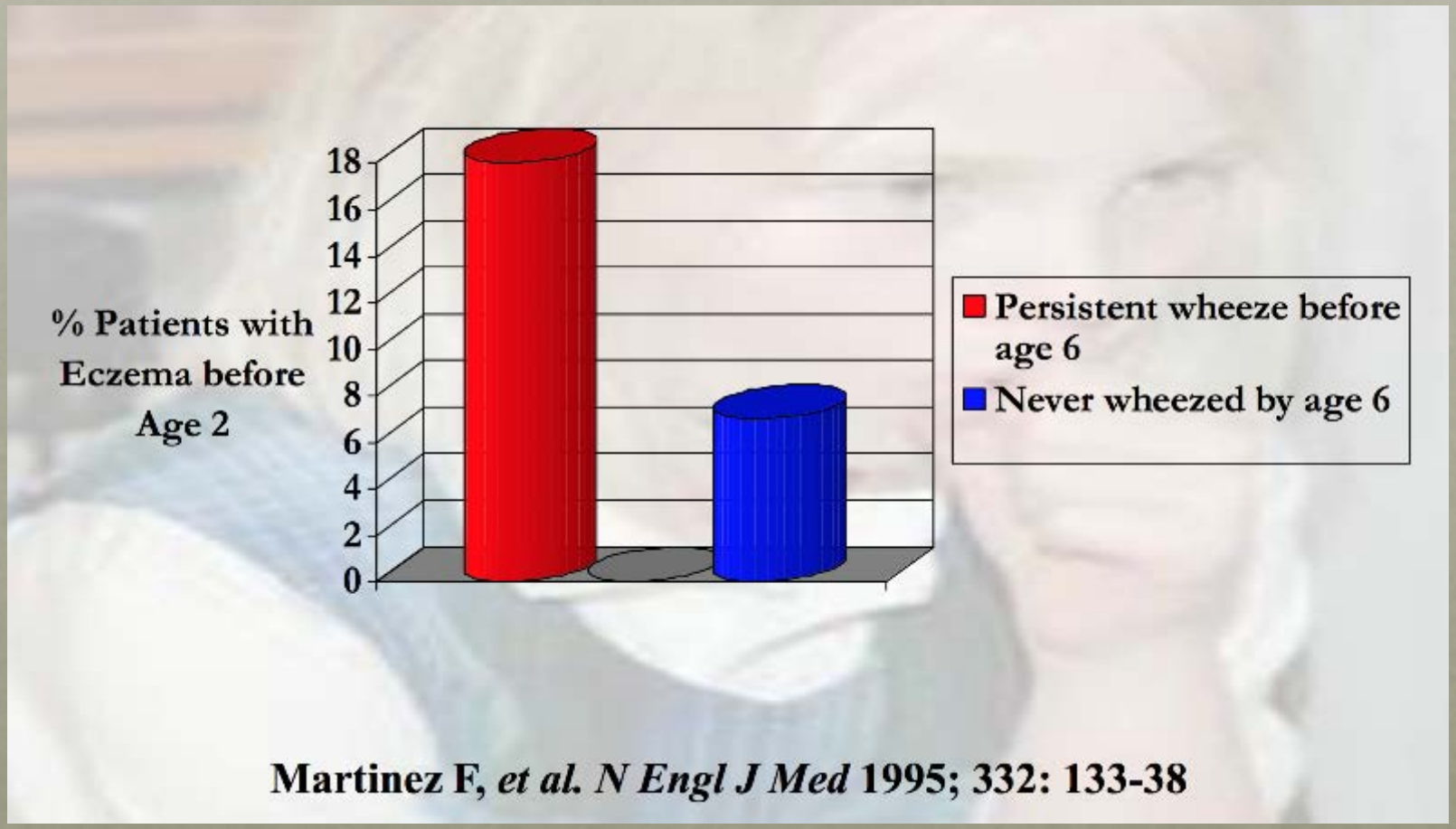
- Atopic diseases: atopic eczema, rhinitis
- Food allergy
- Nasal polyposis
- Neonatal course
- Obesity
- Medications
- Tobacco smoke
- Wood burning
- Ventilation systems
- Animals
- Bedroom
- Water leaks

ATOPIC ECZEMA

- 80% of children with atopic dermatitis develop asthma and or allergic rhinitis later on in life.

Atopic dermatitis child.JPGwikimediacommons

ATOPIC ECZEMA



David Weldom, M.D. Texas A & M University, BSC

ALLERGIC RHINITIS

- 50% of people with AR have asthma
- Most patient with asthma, have rhinitis
- Risk factor for asthma

Atlas of Pediatric Physical Diagnosis, 1987

OBESITY

- Prevalence of obesity and asthma is increasing in the world
- Early Onset: Atopic
- Late Onset: Non-atopic
- Asthma is severe
- Less responsive to inhaled steroids
- Depression & sleep/apnea

MEDICATIONS

- Aadherence: < 60% in some studies
- Drug efficacy
- Drug delivery systems
- Response to treatment

PAST MEDICAL HISTORY

- Prematurity
- Developmental delay
- Failure to thrive
- Recurrent infections
- GERD
- Hospitalizations
- Emergency room visits

DISEASES THAT MIMICK ASTHMA

- Sinusitis
- Bronchiolitis
- Foreing Body
- Vocal cord dysfunction
- Vascular ring
- Laryngotracheo-malacia
- Cytic fibrosis
- BPD
- Heart disease
- Bronchiectasis
- T-E Fistula
- Habitual cough
- GERD/aspiration

FAMILY HISTORY

- Over 100 genes associated with asthma
- 1 Parent: risk is 25%
- 2 Parents: risk is 50%

Thomsen SF. Eur Clin Respir J. 2015; 2: 10.3402/ecrj.v2.24643

ENVIRONMENT

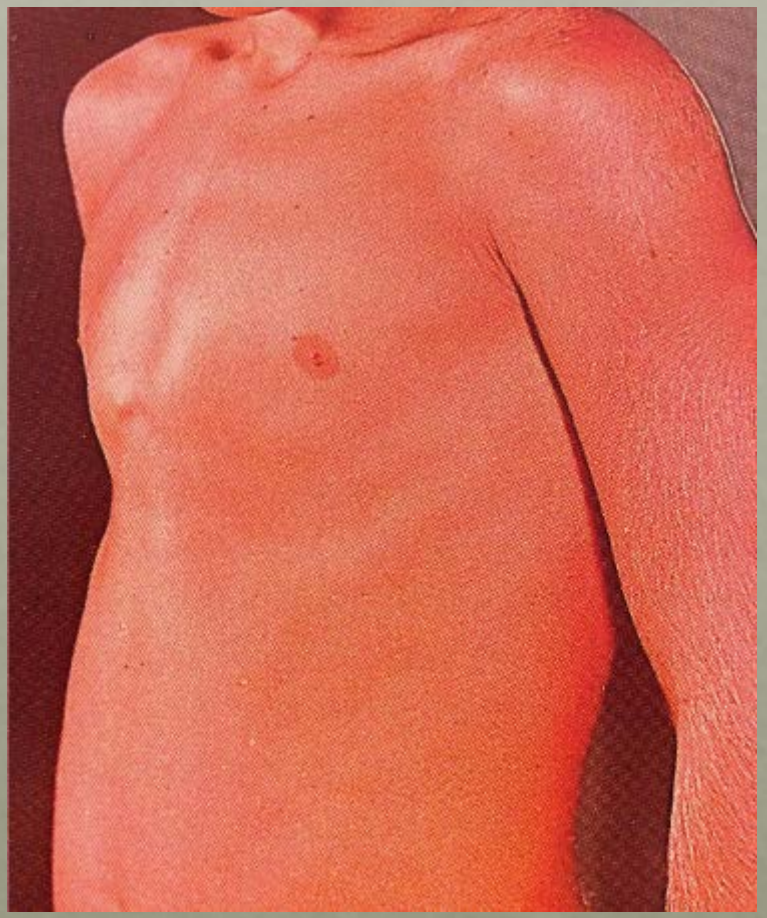
- Wood burning
- Stoves
- Ventilation systems
- Animals, leaks & mold
- Patient's bedroom
- Smoke exposure

PHYSICAL ACTIVITIES

- Most children with asthma can have symptoms brought on haveby intensive activity

PHYSICAL EXAM

- Betweend episodes, exam is usually normal
- Barrel chest
- Wheezing, rales, ronchi
- Decrease inspiratory phase
- Use of accesory muscles



Dr. Meyer B.Marks: Atlas of Pediatric Physical Diagnosis, 1987

PHYSICAL EXAM

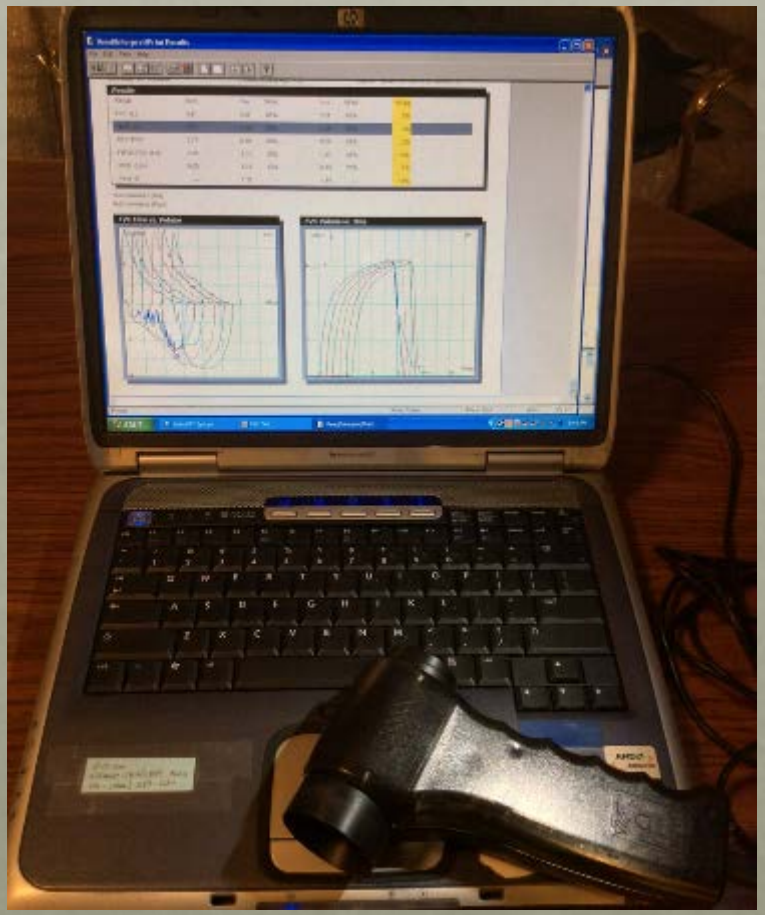
- Signs of rhinitis
- Nasal Crease
- Eczema
- Clubbing
- Cyanosis
- Signs of developmental delay
- Malnutrition
- Cough
- Fever
- Lethargy
- Fatigue
- Angioedema
- Conjunctivitis

DIAGNOSIS OF ASTHMA

- History of intermittent chronic symptoms of asthma: cough and wheezing
- >10% increase of predicted FEV1 after inhalation of SABA
- Presence of other atopic diseases or family history of atopy
- Absence of other diseases

USEFUL TESTS FOR ASTHMA - SPIROMETRY

- Demonstration of reversible airflow obstruction establishes the diagnosis of asthma
- FEV1 <80%; FEV1/FVC <85%; FEF25-75% <65%



USEFUL TESTS FOR ASTHMA - PEAKFLOW

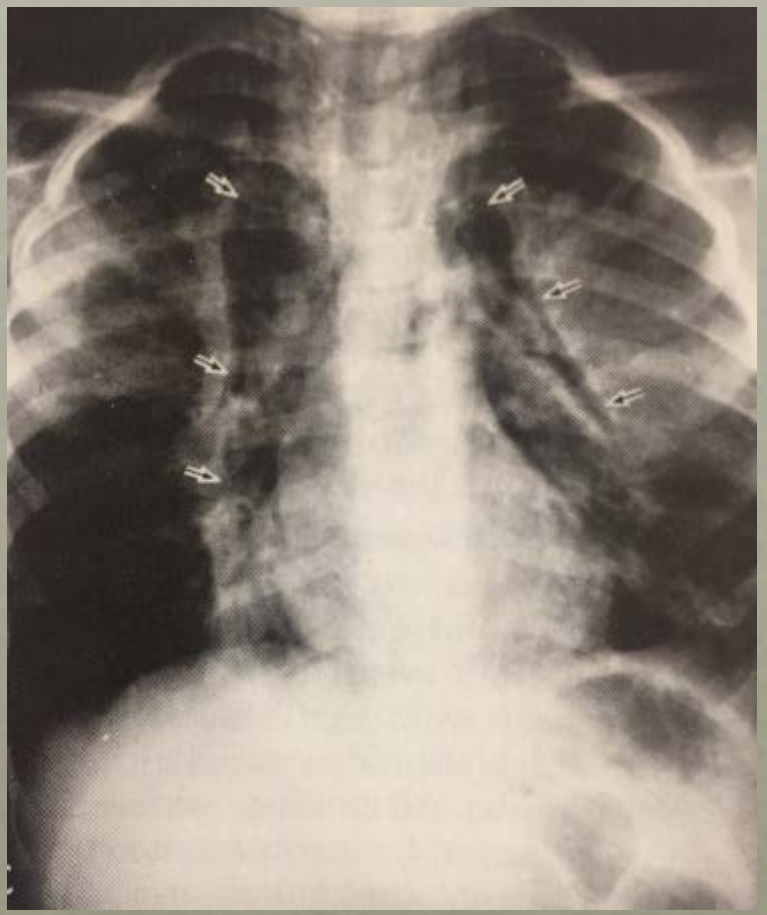
- Measurements are variable
- Effort dependent
- Variability in reference values
- Variability in values from brand to brand

USEFUL TESTS FOR ASTHMA – ALLERGY TESTS

- Demonstrates the presence of atopy
- Must be supported by clinical history
- Food allergy test is not helpful unless there is GI symptoms, eczema or urticaria

USEFUL TESTS FOR ASTHMA – IMAGING

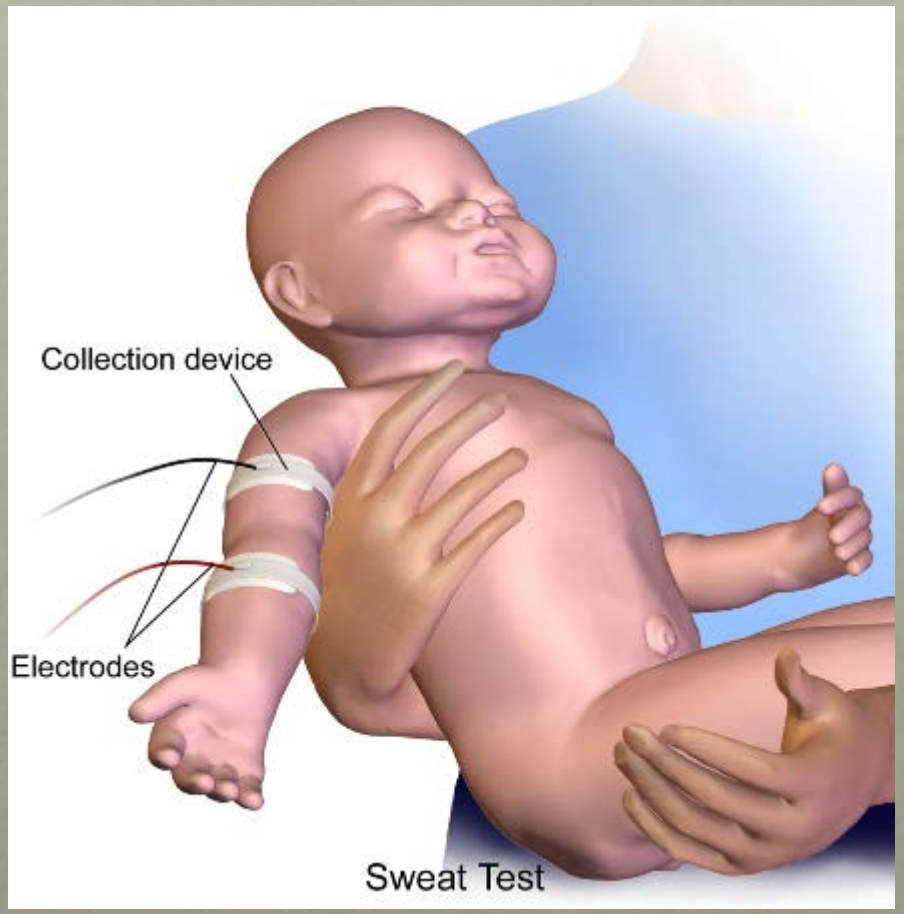
- Useful in children who do not respond to initial therapy
- Can help with other causes of wheezing: aortic arch, pneumonia, atelectasis, cystic fibrosis, etc.



Kendig's Disorders of the Respiratory Tract in Children. Chernick 1990

USEFUL TESTS FOR ASTHMA
SWEAT CHLORIDE TEST

- When cystic fibrosis is suspected:
- Foul smelling stools
- Recurrent pneumonia
- Evidence of malabsorption
- Failure to thrive

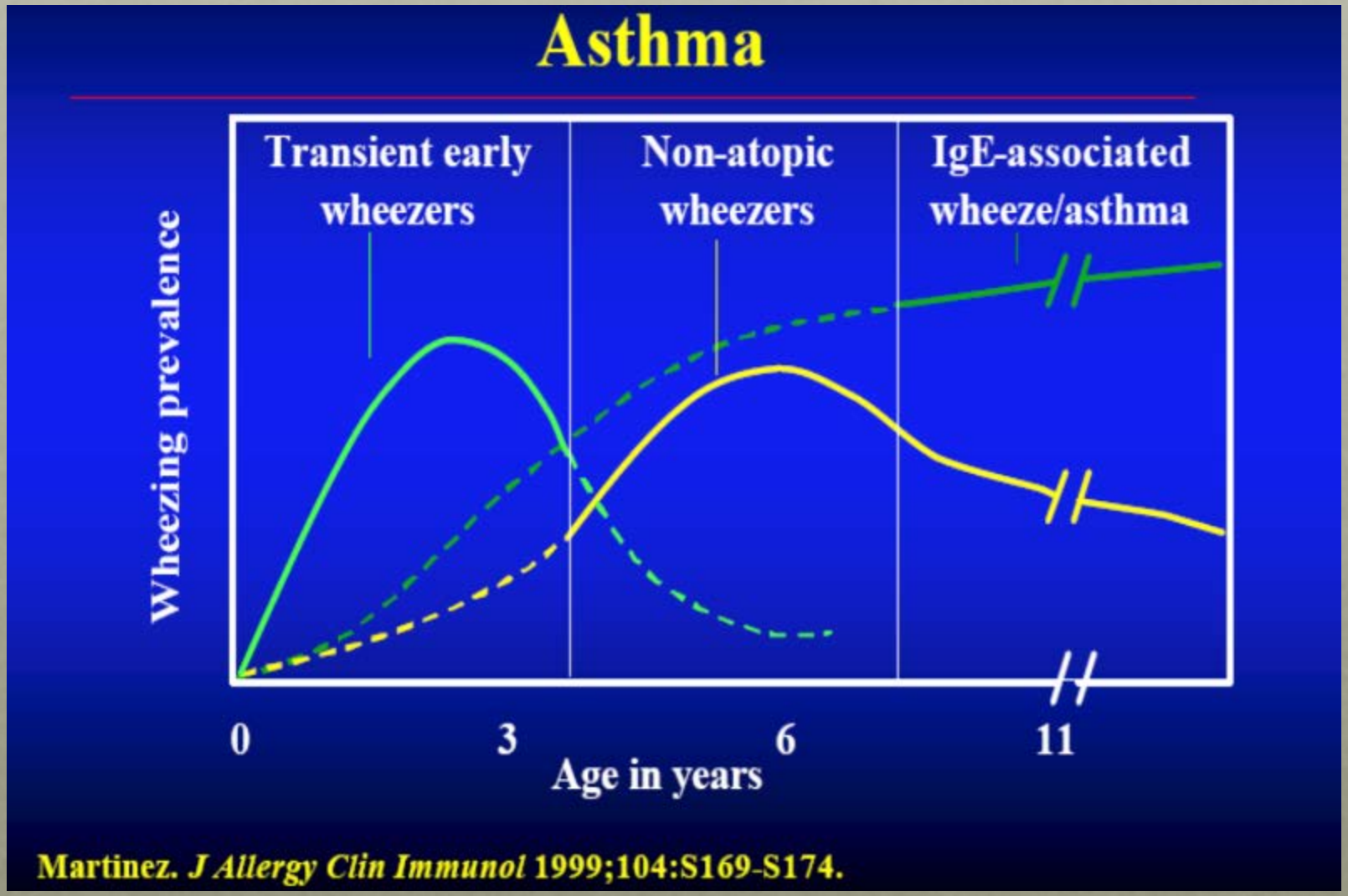


Bruce Blaus. Blausen.com staff (2014)

ADDITIONAL TESTS FOR ASTHMA

- Sputum analysis
- Barium Swallow
- CBC with differential
- Total Immunoglobulins
- ABPA panel
- Methacholine Test.
- Nitric Oxide

DIAGNOSIS OF ASTHMA IN CHILDREN



DIAGNOSIS OF ASTHMA IN CHILDREN

Asthma Predictive Index

History of greater than 4 wheezing episodes in one year (one - physician documented) PLUS

- **One major criteria:**
  - **Parent with asthma**
  - **Atopic dermatitis**
  - **Aeroallergen sensitivity > 1 aeroallergen**

OR

- **Two minor criteria:**
  - **Food sensitivity (milk, egg or peanuts)**
  - **Peripheral eosinophilia > 4%**
  - **Wheezing not related to viral URIs**

If +, then 65% likelihood of developing asthma

If -, then 95% likelihood of NOT developing asthma

Guilbert TW *et al J Allergy Clin Immunol* 2004; 114: 1282-7

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CASE # 1, Maria, a 3.5 y.o. girl

History

- Maria had onset recurrent cough and labored respirations at about 7 months of age
- Typical course: rhinorrhea →cough →respiratory distress & wheezing primarily September to March
- 5 acute care visits past year for respiratory symptoms; 1 hospitalization
- Dx pneumonia 3 times
- Rx: IM & oral antibiotics repeatedly, budesonide aerosol 2 times daily, montelukast given daily, 3 four day courses of prednisolone
- Asymptomatic between episodes

CASE # 1, Maria, PB, 3.5 y.o.girl

Evaluation

- You are seeing Maria for the first time during the summer when she's been well with no symptoms for the past month
- Normal PE and oximetry
- Review of outside chest x-rays from 3 episodes including hospitalization – peribronchial thickening, no parenchymal infiltrates
- Allergy skin testing: no specific IgE to common inhalant allergens.

Audience Evaluation

- What's the diagnosis?
- What treatment should be considered?

Take Home Points about Maria

- Symptoms are consistent with an asthma phenotype characterized by recurrent VRI induced lower airway inflammation *(cough, wheezing, dyspnea)* without chronicity
- Treatment with maintenance inhaled corticosteroids of little or no benefit *(McKean M, Ducharme F. Inhaled steroids for episodic viral wheeze of childhood. Cochrane Database Syst. Rev. 2000;(2):CD001107)*
- Oral corticosteroids effective for acute episodes; if given early, emergency care and hospitalizations potentially avoided
- “Pneumonia” a common misdiagnosis

CASE # 2, Lucy, 4.3 y.o. girl

History

- Lucy had atopic eczema beginning at 3 months of age
- Onset recurrent cough and labored respirations at 1.9 years of age in May
- 6 acute care visits the past year, about every 2 months
- Chronic rhinorrhea, worse seasonally with sneezing and conjunctivitis
- Episodic coughing at night
- Daily labored breathing with exertion
- Lucy wants to play sports but activity is limited by cough & dyspnea
- Improves with albuterol & prednisolone

CASE # 2, Lucy, 4.3 y.o. girl

Evaluation

- Lucy's PE Normal except for:
  - Nasal stuffiness
  - Eczematous lesions in flexural creases and crusted areas on malar surfaces
- Oximetry 93%
- Outside x-ray reports reviewed: 10/17/06 "interstitial infiltrates"; 7/2/07 "interstitial prominence"
- Allergy skin testing: Allergen specific IgE for molds, including Alternaria, and multiple pollens

Audience Evaluation

- **What's the diagnosis?**
- **What treatment should be considered?**

Take Home Points about Lucy

- Classic atopic triad (atopic eczema, allergic rhinitis, allergic asthma)
- Allergic asthma causing persistent symptoms
- Inhaled corticosteroid for maintenance
- Inhaled albuterol/salbutamol for acute symptom relief
- Oral corticosteroid for acute exacerbation
- Allergen identification and environmental amelioration if possible

MERRY CHRISTMAS