RAD RESPIRATORY & ALLERGIC DISEASE FOUNDATION

# Bronchial Asthma

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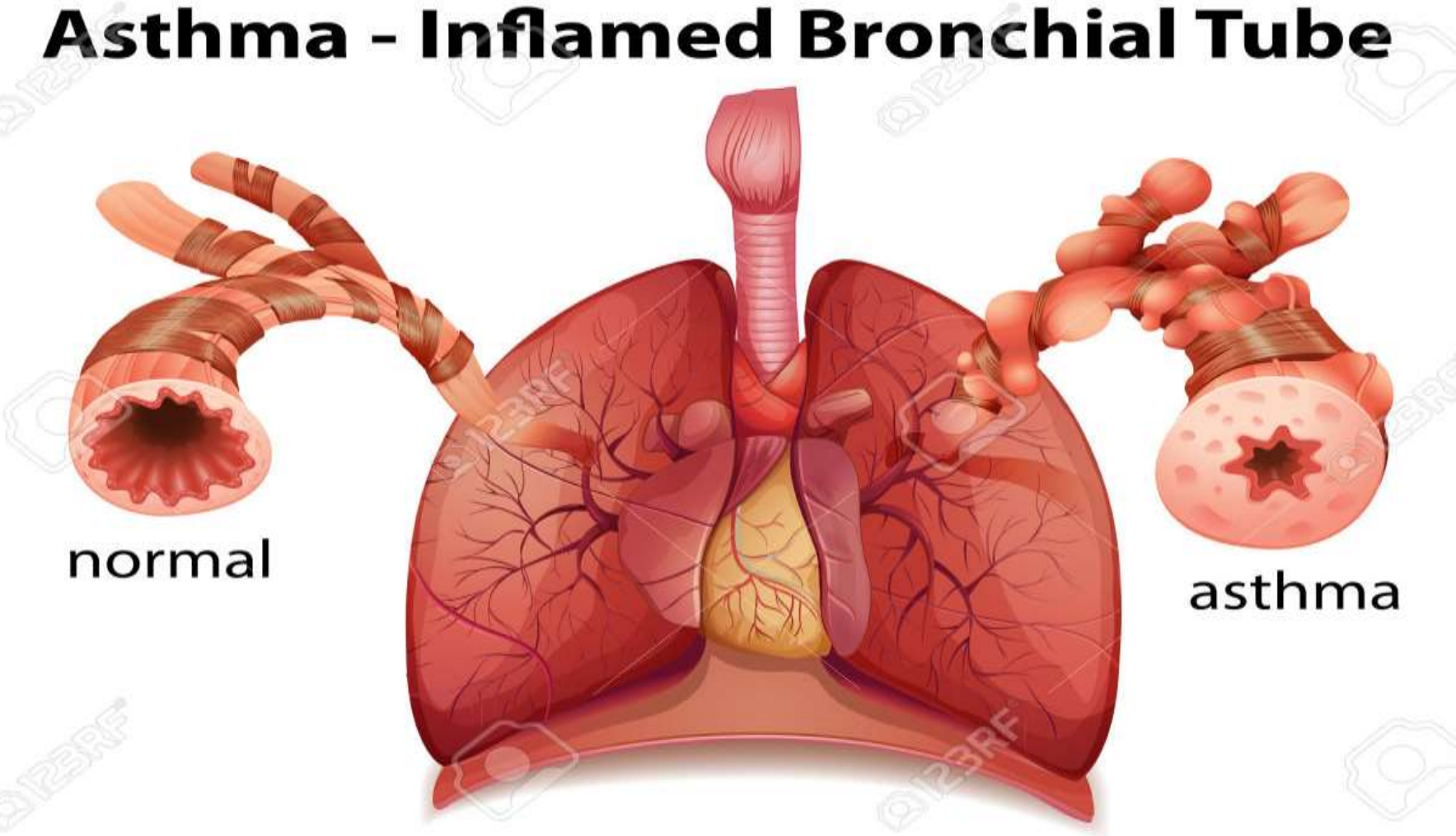
# Our Goals

- Definition of bronchial asthma
- Etiologic factors
- Immunology
- Pathophysiology
- Diagnosis
- Differential diagnosis
- Treatment guidelines

# What is asthma?





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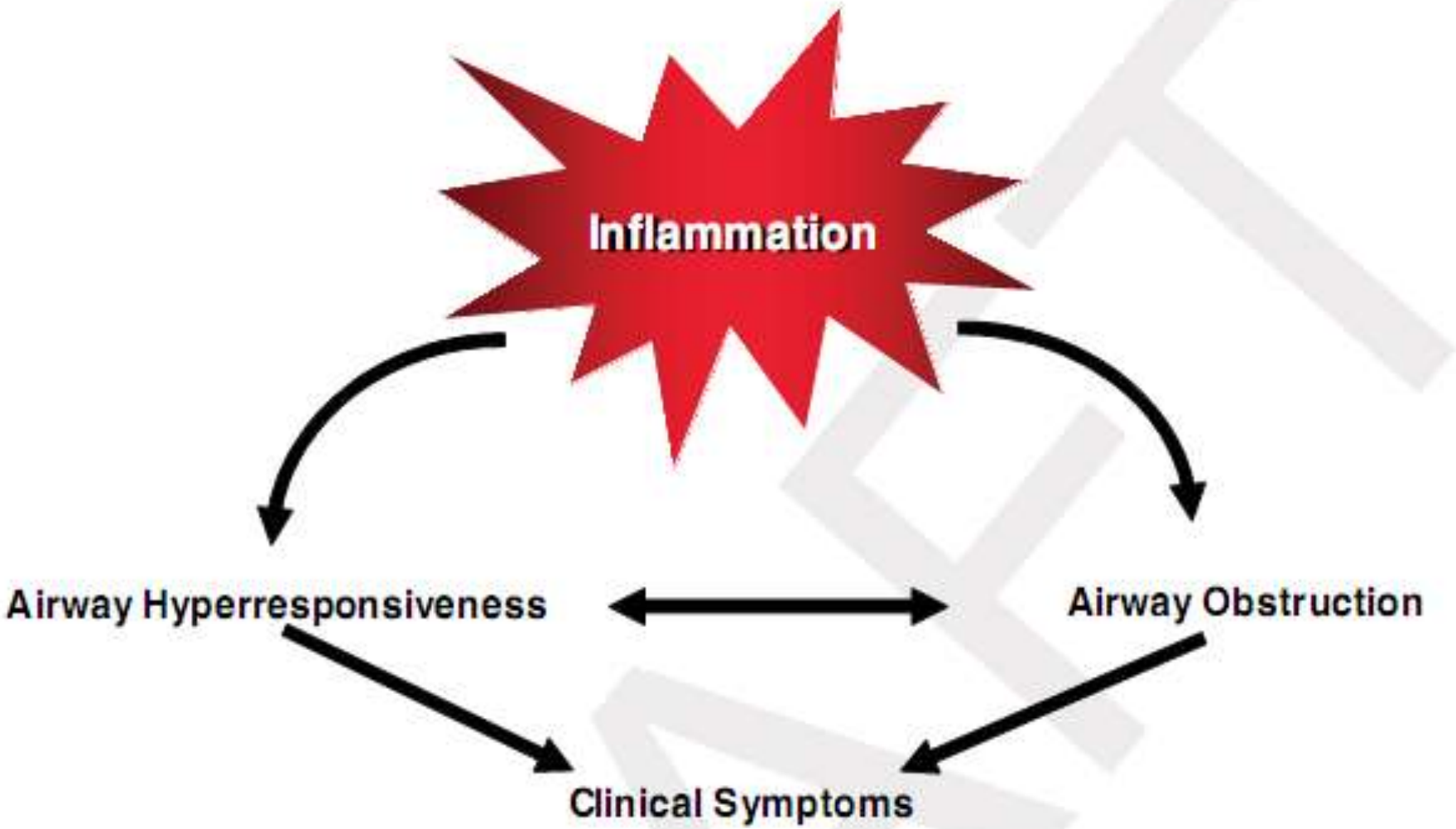
**Asthma is a heterogeneous disease, usually characterized by chronic airway inflammation. It is defined by the history of respiratory symptoms such as wheeze, shortness of breath, chest tightness and cough that vary overtime and in intensity, together with variable expiratory airflow limitation.**


Inflammation
Airway Hyperresponsiveness
Airway Obstruction
Clinical Symptoms

- **chronic inflammatory disorder of the airways in which many cells and cellular elements play a role, in particular,**

**-mast cells,**
**-eosinophils,**
**-T lymphocytes,**
**-macrophages,**
**-neutrophils, and epithelial cells**

**Airflow obstruction** is often **variable, reversible** either spontaneously or with treatment and associated with **recurrent episodes of wheezing, breathlessness, chest tightness**, and **coughing**, particularly at night or in the early morning.

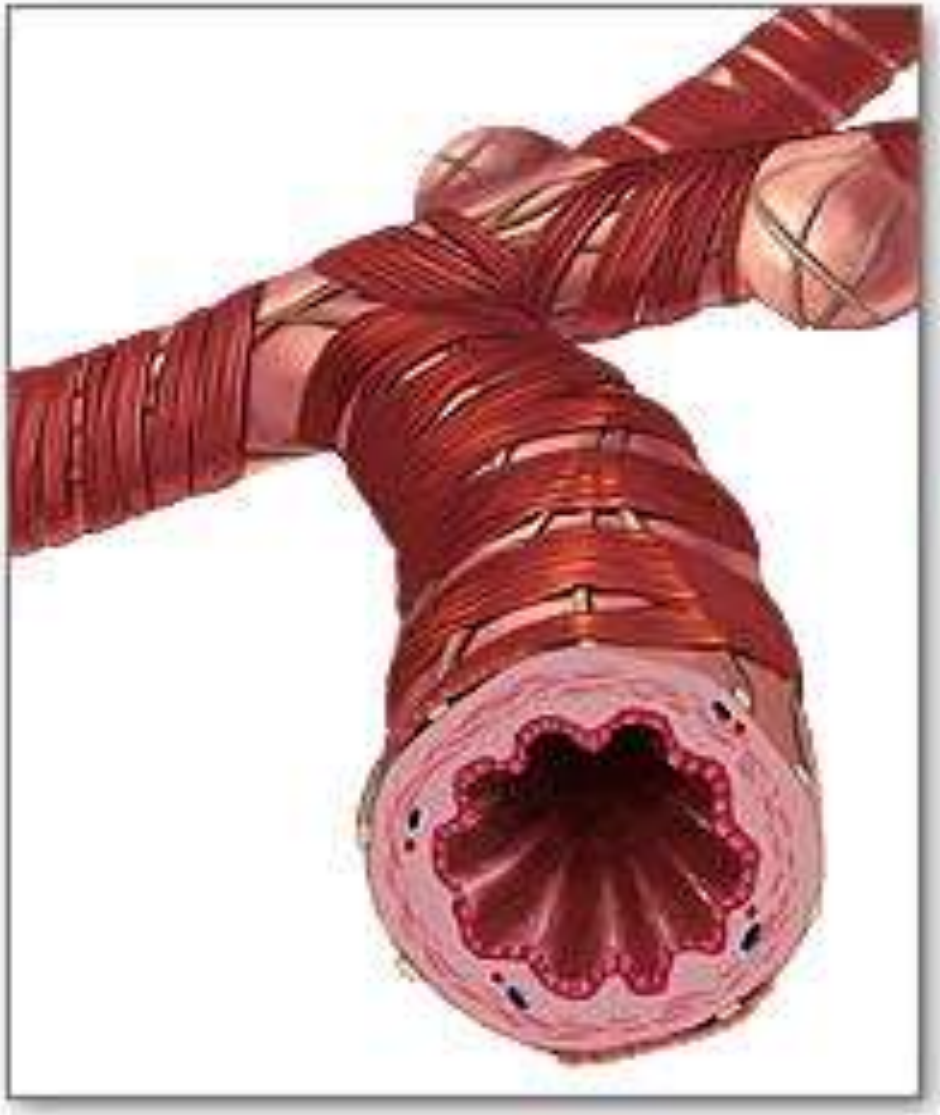
# Bronchial hyperreactivity



- exaggerated response of bronchial smooth muscle to trigger stimuli to physical, chemical, immunologic, and pharmacologic stimuli

Normal bronchiole

Asthmatic bronchiole

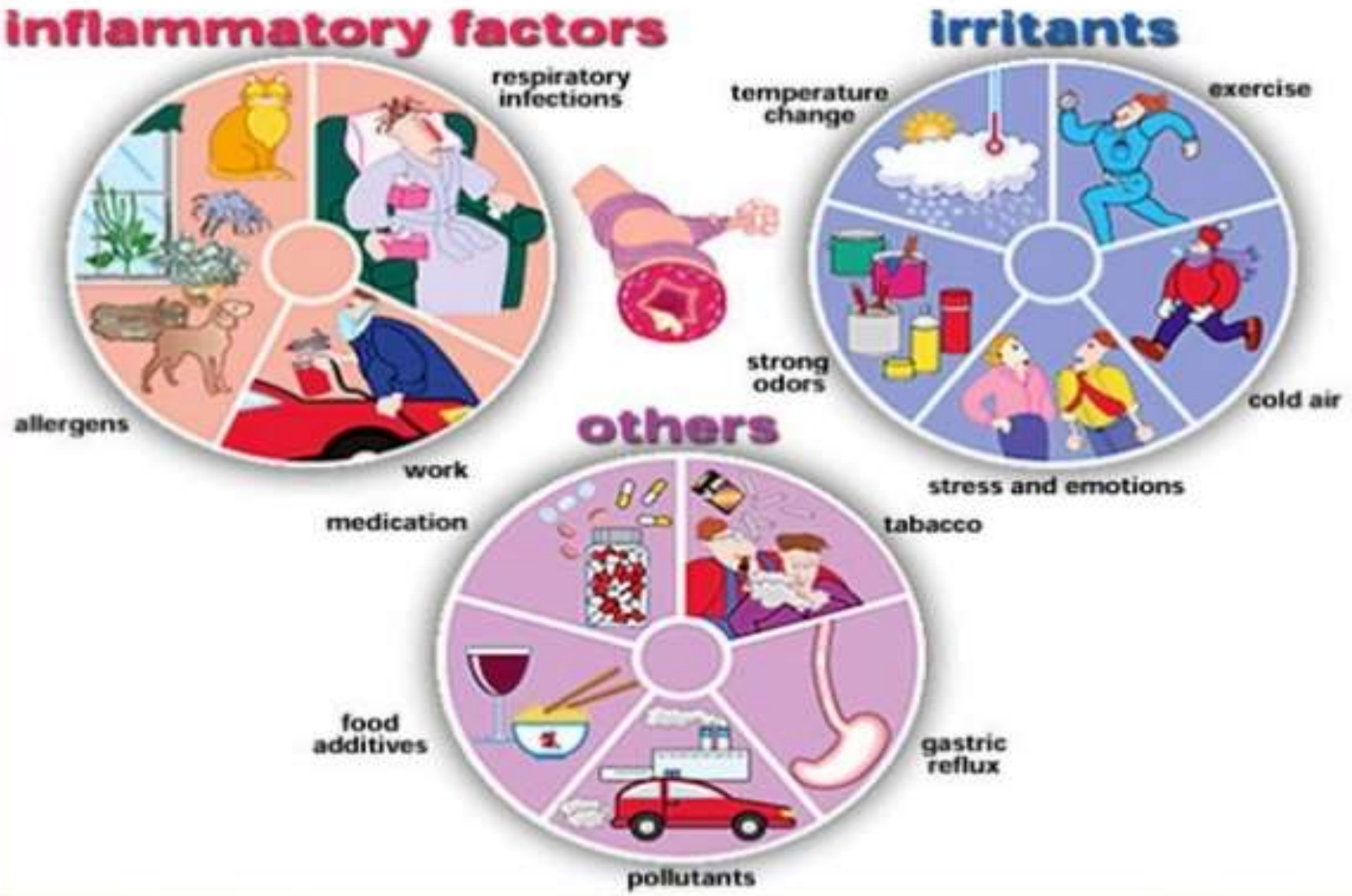


# Asthma Etiology

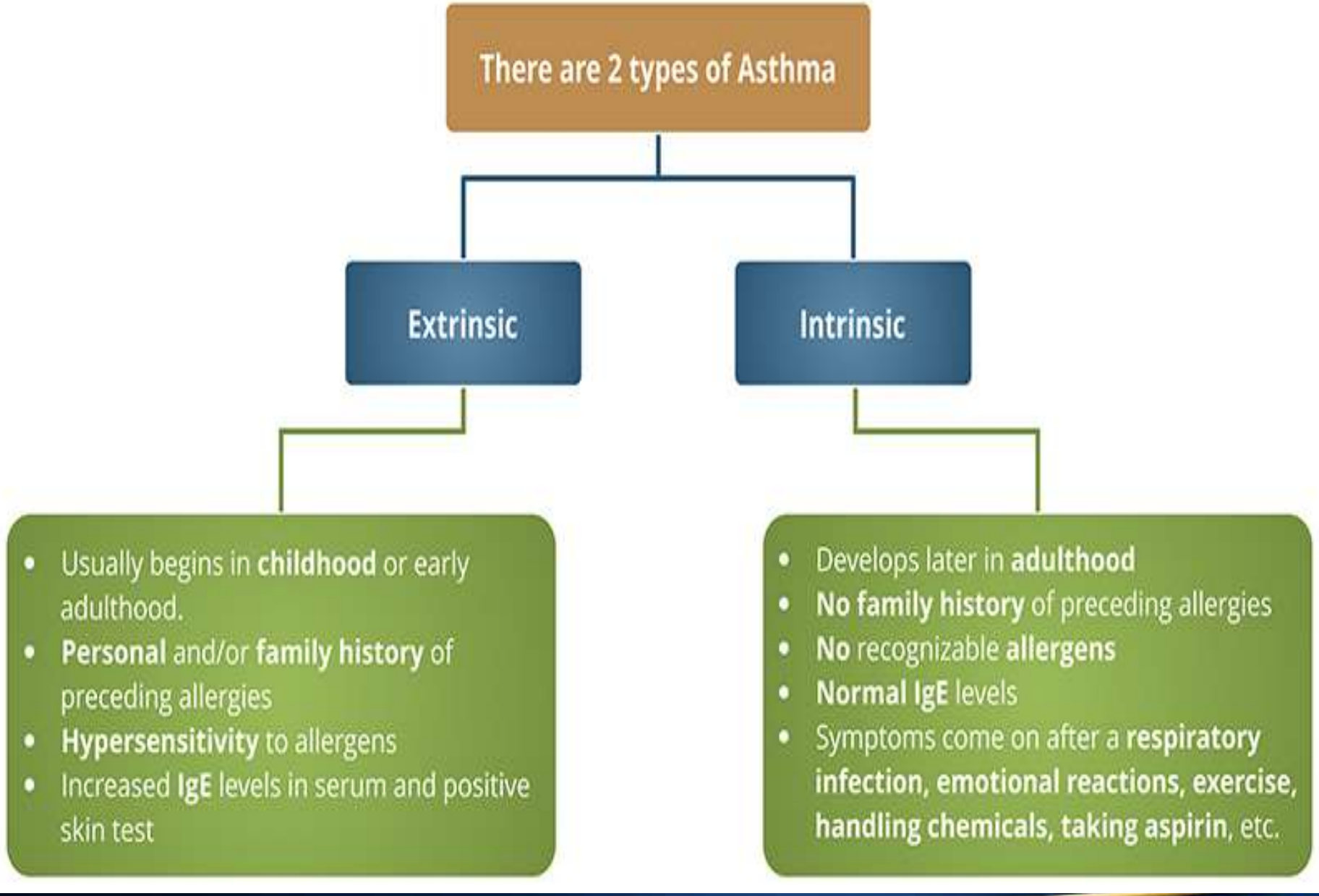
- Asthma is a complex trait
  - Heritable and environmental factors contribute to its pathogenesis

# What are the Triggering Factors?

# TRIGGERS

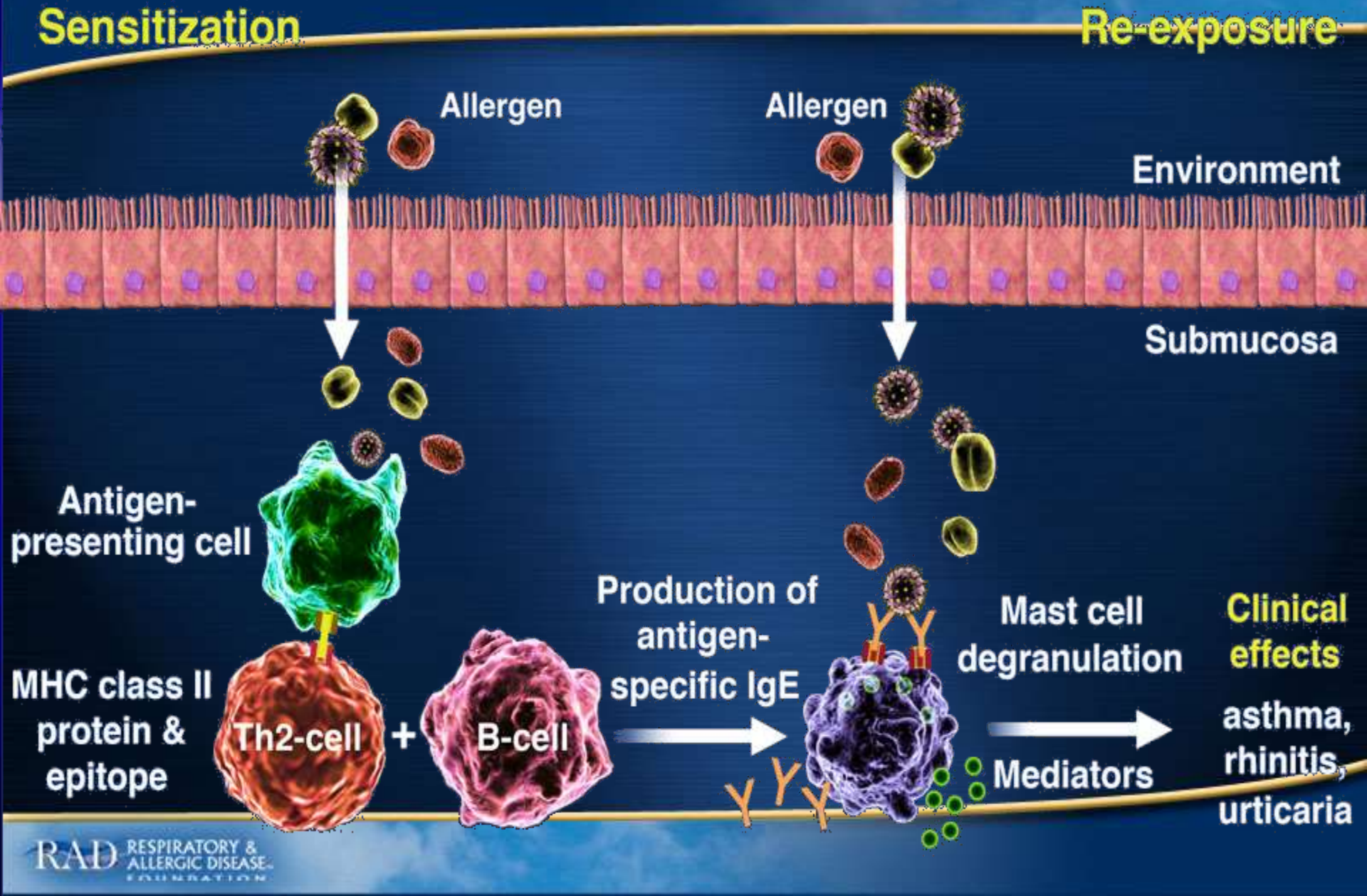

inflammatory factors
respiratory infections
allergens
work
irritants
temperature change
exercise
strong odors
cold air
stress and emotions
others
medication
tabacco
food additives
gastric reflux
pollutants

# Types of asthma


There are 2 types of Asthma
Extrinsic
Intrinsic
• Usually begins in **childhood** or early adulthood.
• **Personal** and/or **family history** of preceding allergies
• **Hypersensitivity** to allergens
• Increased **IgE** levels in serum and positive skin test
• Develops later in **adulthood**
• **No family history** of preceding allergies
• **No** recognizable **allergens**
• **Normal IgE** levels
• Symptoms come on after a **respiratory infection, emotional reactions, exercise, handling chemicals, taking aspirin**, etc.

# Immunology of bronchial asthma





# *Diagnosing Asthma*

# History



- Based on **intermittent symptoms** of wheezing, chest tightness, shortness of breath, and coughing
- May worsen seasonally-spring, fall
- May worsen with exercise
- Note any triggers
  - cats, perfume, tobacco
- **Family history**

# Symptoms

- Intermittent episodes of expiratory wheezing, coughing and dyspnea

- Severity of disease
  - occasional, mild bouts of breathlessness
  - daily wheeze in spite of multiple medications
  - may be triggered by environmental factors (e.g. seasonal allergens)

# Acute severe asthma

- Tachycardia ≥ 110 beat/min
- Tachypnea ≥ 25 breath/min
- Use of accessory muscles of respiration
- Anxiety, can not complete one sentence.
- PEF ≤ 50%
- Bilateral generalised inspiratory and expiratory rhonchi
- Pulsus paradoxus

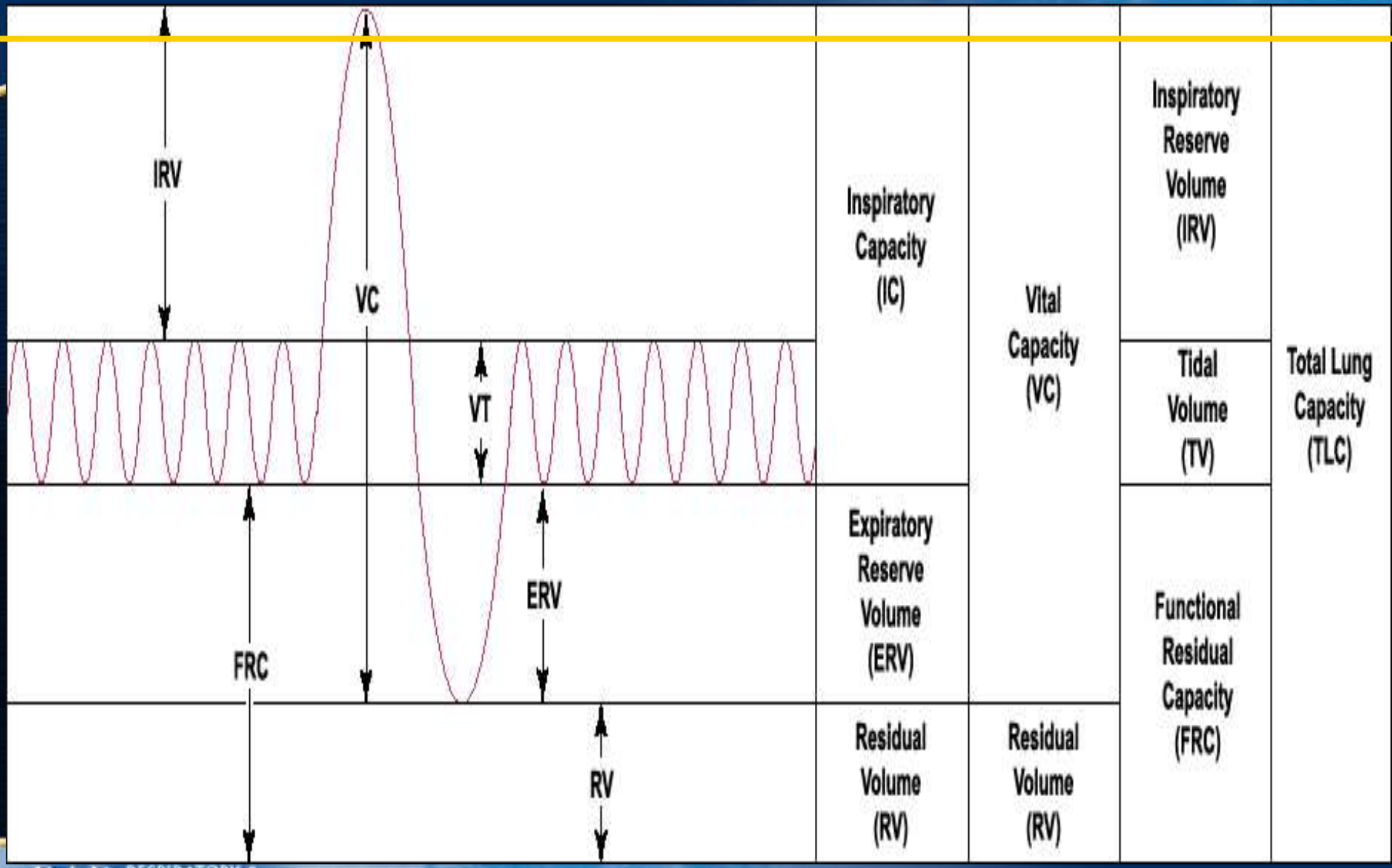
# Life-threatening asthma

- Confusion
- Silent chest,cyanosis
- Bradycardia,hypotension
- Pao2<60 ,Paco2 ≥ 50
- PEF < 33%

# Pulmonary function tests

# Lung Volumes





# Pulmonary Function Tests-Spirometry



- **FEV1**
  - –is that volume of air exhaled in 1 second
- **FVC**
  - –Forced vital capacity - volume of air exhaled with maximal forced effort

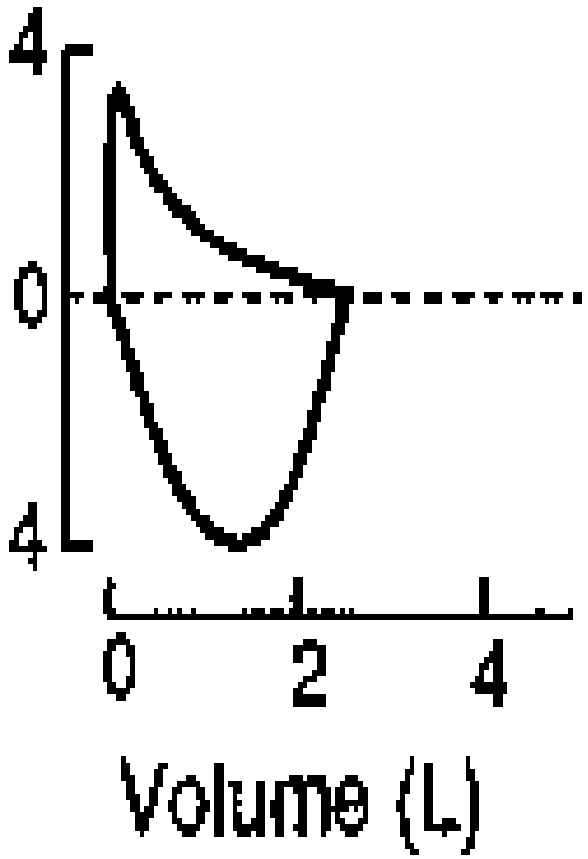
# • FEV1:FVC ratio

– Most reproducible of the PFTs

– Healthy individuals can exhale 75-80% of VC in 1 second and almost all in 3 seconds

– **Normal ratio is 70%**

# Obstructive Disorders



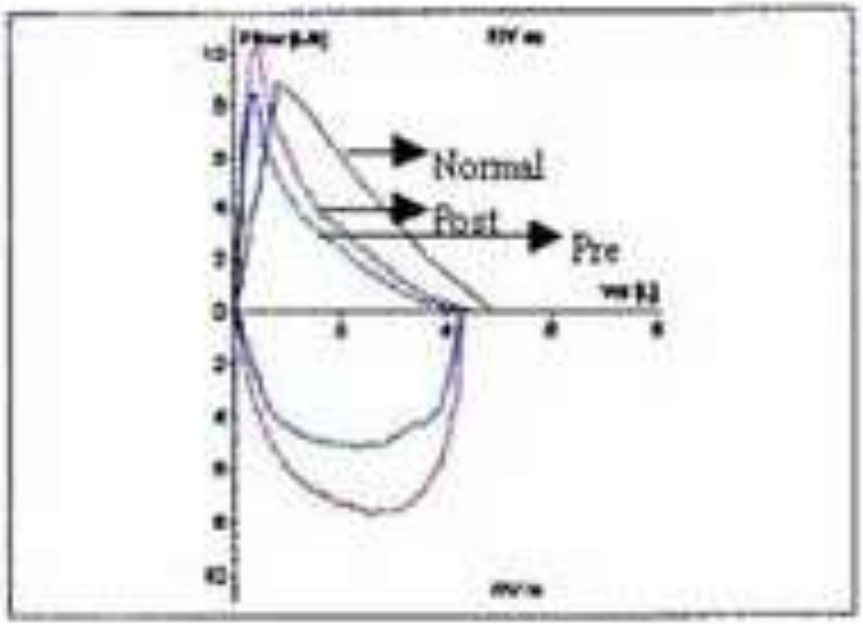

- Characterized by a limitation of expiratory airflow
  - Examples: asthma, COPD
- Decreased: $FEV_1$, $FEF_{25-75}$, $FEV_1/FVC$ ratio (<0.7)
- Increased or Normal:

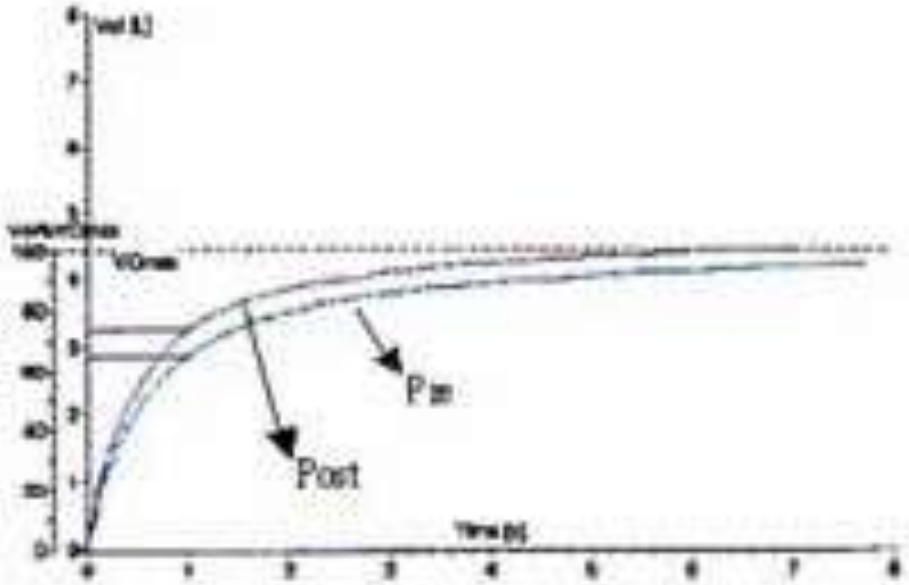
TLC

# Reversible Airway Obstruction

- FEV1 is gold standard for determining reversibility of airway disease and bronchodilator efficacy
- **Significant Clinical Reversibility More than or equal to12% improvement in FEV1 after inhaled bronchodilator**

| | Pre Bronchodilator | | | Post Bronchodilator | | |
|---|---|---|---|---|---|---|
| | Predicted | Measured | % Predicted | Measured | % Predicted | Percentage Change |
| FVC | 4.85 L | 4.19 L | 86 % | 4.43 L | 91% | 6% |
| $FEV_1$ | 4.05 L | 2.87 L | 71 % | 3.24 L | 80% | 13% |
| $FEV_1$/FVC (%) | 83.35% | 68.43% | | 73.09% | | |



# Peak Expiratory Flow (PEF)

- Maximal rate of flow that can be produced during forced expiration
- Useful in ED, at home, at clinic
- Changes in PF usually correlate with change in FEV1
  - However, PEF is less reproducible than FEV1
- **Healthy young adult has PEF - 60L/min**

# Peak Expiratory Flow (PEF) Meters



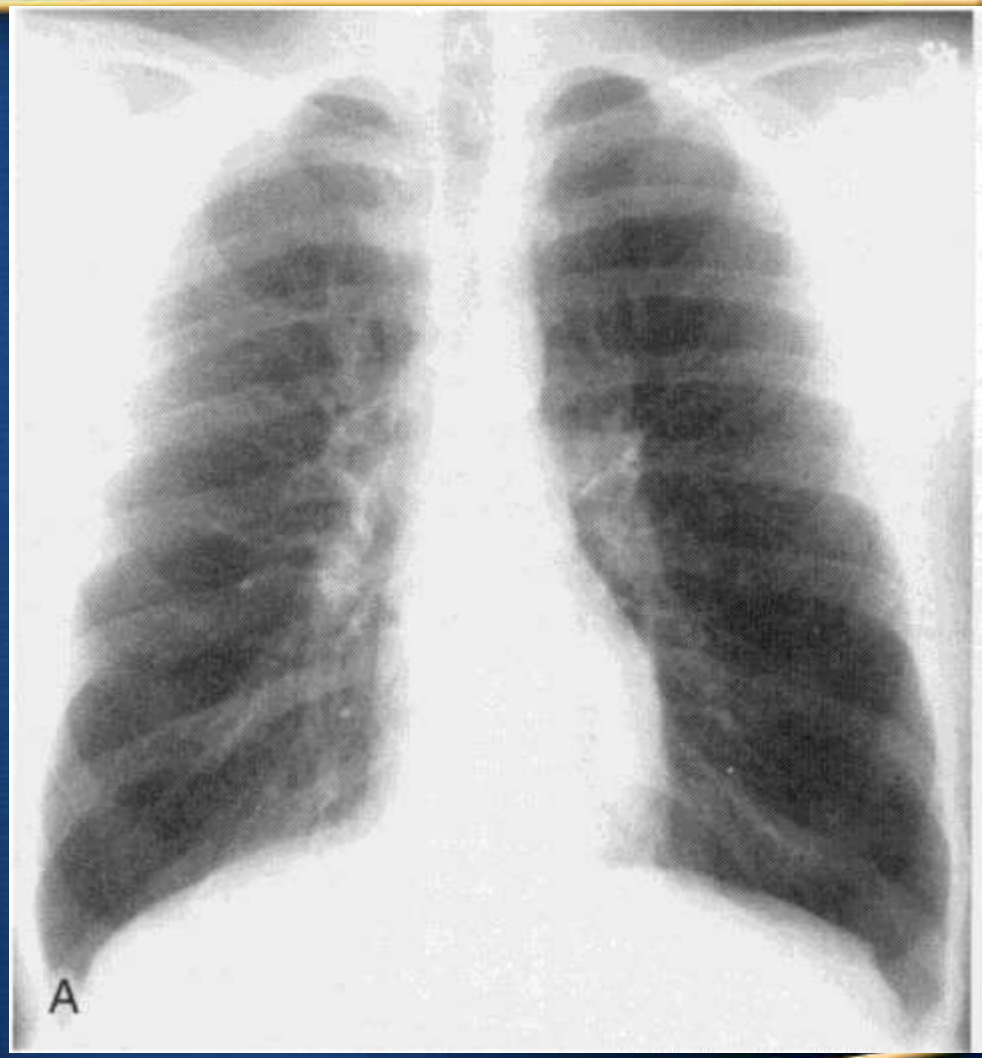
- Allows patient to assess status of his/her asthma
- Persons who use peak flow meters should do so frequently
- Many physicians require for all severe patients

# CXR

- Most patients with asthma have **normal x-rays.**
- Signs of **acute severe asthma:**

1. Hyperinflation(Diaphragm is down to the 8th rib anteriorly,MCL-ribbon-shaped heart…)
2. **Complications**:

- Pneumonia
- Pneumothorax



# Blood Gas Measurments

- Best indicators of overall lung function are arterial blood gases
  - PaO2, PaCO2, pH)

- Oxygen saturation (O2 sat)
  - Quantity of O2 bound to Hb/
  - Normal O2 sat 97.5%

# Conditions Mimicking Asthma

- Obstruction of small airways
  - COPD
  - Aspiration
  - Bronchiolitis
  - Cystic Fibrosis
- Obstruction of large airways
  - Foreign body
  - Congenital malformations
  - Cardiac disease
  - Endobronchial tumors
  - Extrabronchial obstruction
  - Psychogenic

# Management of Acute exacerbation of Bronchial Asthma

## Oxygen Therapy:

By nasal cannula or mask to achieve saturation > 90%,Controlled O2 therapy in patients with elevated CO2

## Bronchdilators:

- Nebulized **B2 agonists** Combined with **nebulised ipratropium bromide**
- given continuously for one hour, then every 60 min, after that regularly every 4-6 hours, Reduced according to response.

**Corticosteroids:**

hydrocortisone 100 mg every 6-8 hours to be reduced to dexamethasone or oral preparation later ,then inhaled preparations started.

**Antibiotics** : when signs of bacterial infection

**Intravenous magnesium**

**Aminophylline:**

intravenous infusion every 8 hours to be transformed into oral long acting preparation after improvement of acute attack.


Thanks!