Factors Contributing to Acute and Chronic Asthma

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Learning Objectives

Describe the difference between acute and chronic asthma

Review the factors that contribute to acute asthma

Define the factors thar contribute to chronic asthma

Describe methodology to prevent these contributing factors

Introduction

Asthma is a common chronic disease that has been suffered by more than 300 million people around the world. People with asthma feel a severe inflammatory problem in their airways that causes dyspnea, wheezing and many other symptoms.

According to National Library Medicine, almost 12 million people in the United States suffer from this disease each year, and a quarter of them require hospitalization.

The exacerbations of asthma are mainly two types (acute asthma and chronic asthma) exacerbations.

Risk Factors in Developing Asthma

- Family history
- Viral respiratory infections
- Exposure to allergens, chemicals, or smoke
- Sex, age, and race and ethnicity
- Allergic conditions such as eczema and hay fever
- Obesity

Occupational Exposures

- Baking
- Grain processing or milling
- Drug and detergent manufacturing
- Farming
- Working with laboratory animals
- Working with plastics and metal
- Woodworking

Causes of Occupational Asthma

- **Isocynates**
- Platinum salts
- **Proteolytic enzymes**
- Wood dusts
- **Glutaraldehyde**
- Soya bean
- Persulphates or henna
- Crustaceans or fish products
- Grain / Flour (barley, oats, wheat, maize)
- Caster bean dust
- **Laboratory animals**
- Antibiotics
- **Latex**
- **Soldering flux (colophony)**
- Ispaghula
- Tea dust

Certain Childhood Conditions

Children who were born preterm (prematurely) have an increased risk of developing asthma, particularly if they needed breathing assistance from a mechanical ventilator.

Low birth weight also increases the risk of developing asthma.

Acute Asthma

Shortness of breath or breathlessness increasing progressively

Wheezing or coughing increasing gradually

Feeling chest pain or tightness in the chest

A huge drop in lung function (FEV_1 or PEF) that requires medical assistance and intervention

Acute Asthma Triggers

-Dry & cold air
-Upper respiratory infections
-Allergens(dust, mites, pollen, mold, etc.)
-Exercise
-Tobacco smoke or secondhand smoke
-Cats & dogs
-Gastroesophageal reflux issue

www.HealthyTimesBlog.com

ASTHMA TRIGGERS

About **80%** of children and **50%** of adults with **asthma** also have **allergies**.

An allergy is the immune system's reaction when exposed to what is otherwise a harmless substance, such as plant pollen, mold, or animal hair, skin or saliva. The immune system treats these substances, called "allergens," as if they are harmful, causing a disruption to normal body functions. Allergens are what trigger a series of reactions by the immune system during an allergic reaction. Asthma attacks can be triggered by allergies, which can temporarily increase the inflammation of the airways in a susceptible person.

2nd most cause of asthma attacks, particularly second hand smoke. Contains more harmful substances (tar, carbon monoxide, nicotine, and others) than the smoke inhaled by the smoker.

COMMON ALLERGENS

POLLENS

53.5% of asthma patients have been found allergic to pollens.

ANIMAL DANDER (SKIN, SALIVA)

For **30%** of asthma patients a cat contact can trigger an attack.

DUST MITES

May be a cause in **50% - 80%** of asthma cases.

FOOD & DRUG ALLERGIES

6% of allergy sufferers have food/drug allergies as their primary allergy. Food allergy is more common among children than adults. **90%** of all food allergy reactions are cause by milk, soy, eggs, wheat, peanuts, tree nuts, fish and shellfish.

COMMON NON-ALLERGENS

RESPIRATORY INFECTIONS

Flu, common cold and viral respiratory infections, among others, are common asthma triggers in adults and children.

10 WORST CITIES FOR ASTHMA, 2010

Twelve factors are used to formulate the list, including air pollution, pollen scores, asthma prevalence, use of "rescue inhalers," and poverty.

1. **Richmond**
2. **St. Louis**
3. **Chattanooga, Tenn.**
4. **Knoxville**
5. **Milwaukee**
6. **Memphis**
7. **Tulsa**
8. **Philadelphia**
9. **Augusta**
10. **Atlanta**

www.webmd.com

Infographic designed by www.BuzzFactory.net

What Is Chronic Asthma?

Chronic asthma refers to the intense condition of asthma symptoms.

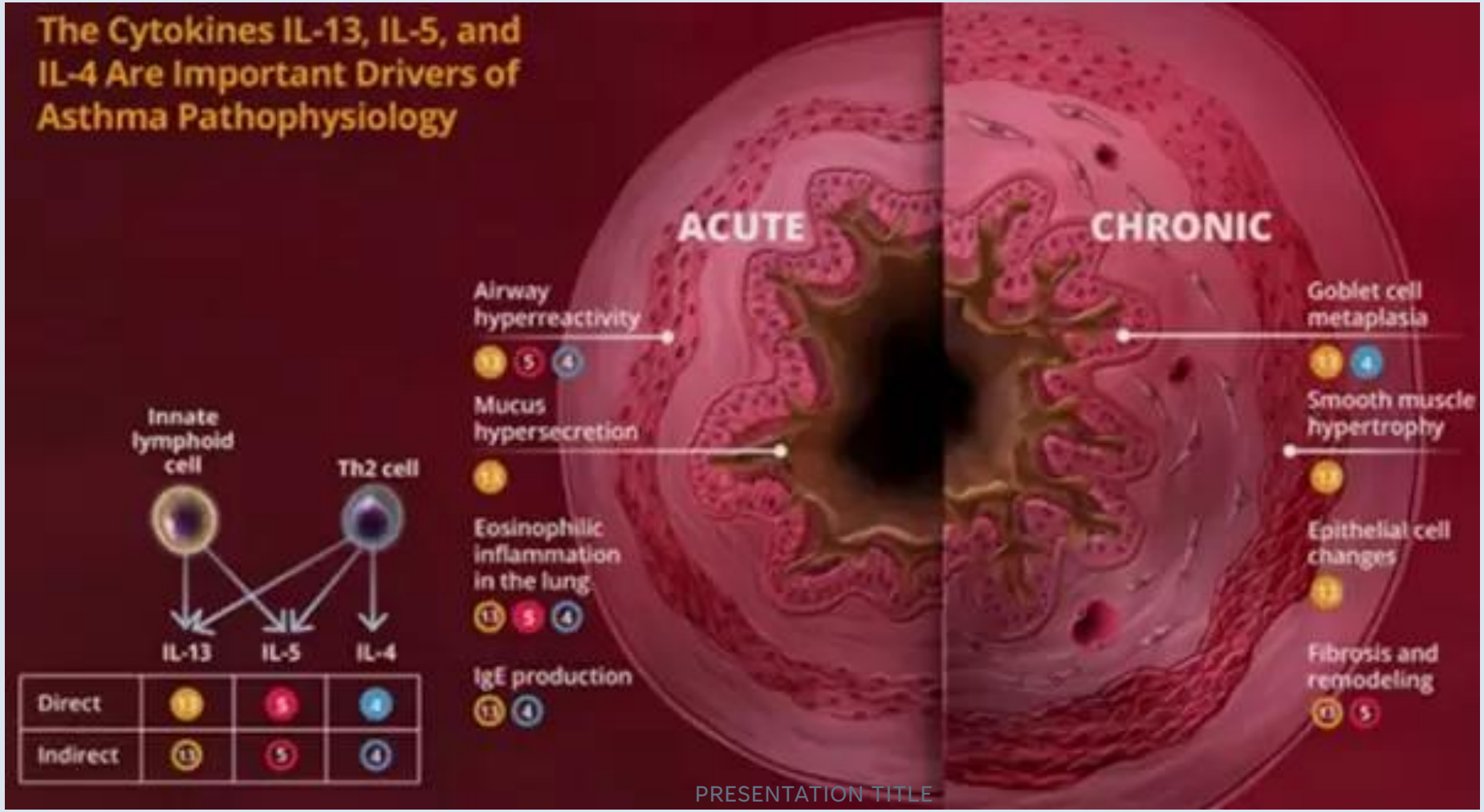
A n individual with chronic asthma suffers from inflammation and swelling in the airways due to the narrow down of the airways.

Chronic Asthma Triggers

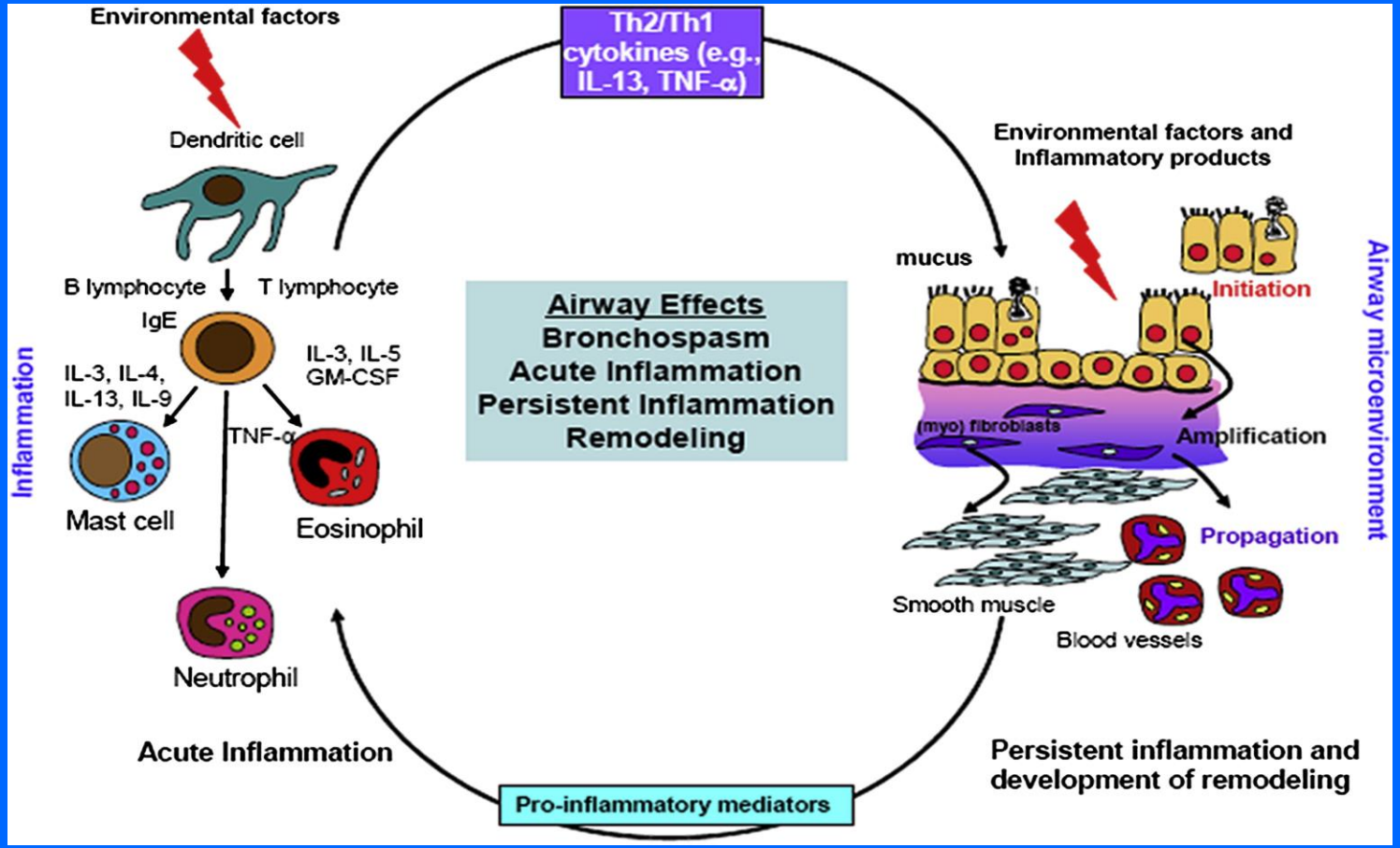
-Respiratory infection (Rhinovirus)
-Sanitizing agents
-Air pollution, strong perfumes, chemical fumes, etc.
-Allergens (pollen, weeds, animals, dust, mold, grass, etc.
-Poor daily adherence to daily asthma medications
-Stress & anxiety
-Medications like aspirin, NSAIDs, etc.
-Sinusitis, heartburn, acid reflux, etc.

Asthma Triggers

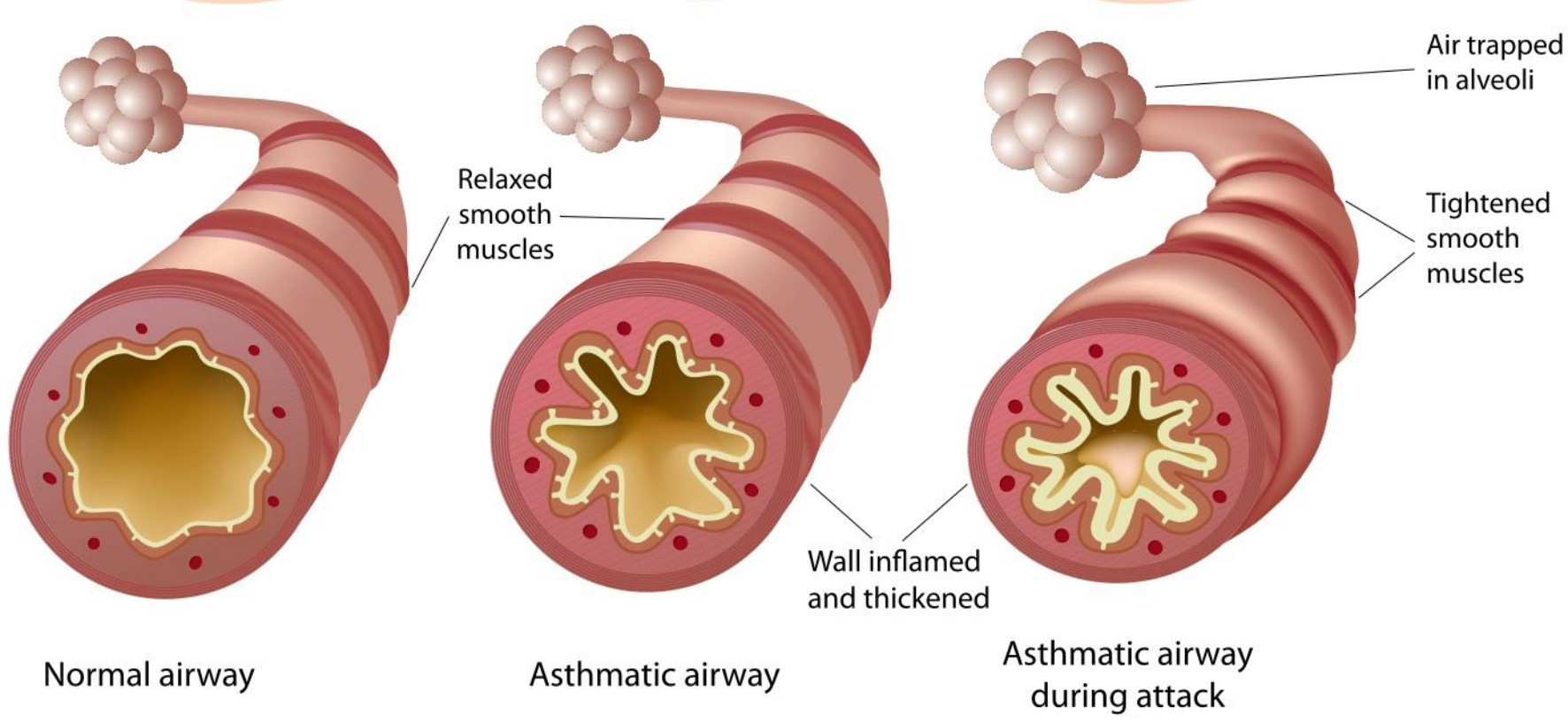
Difference Between Acute And Chronic Asthma



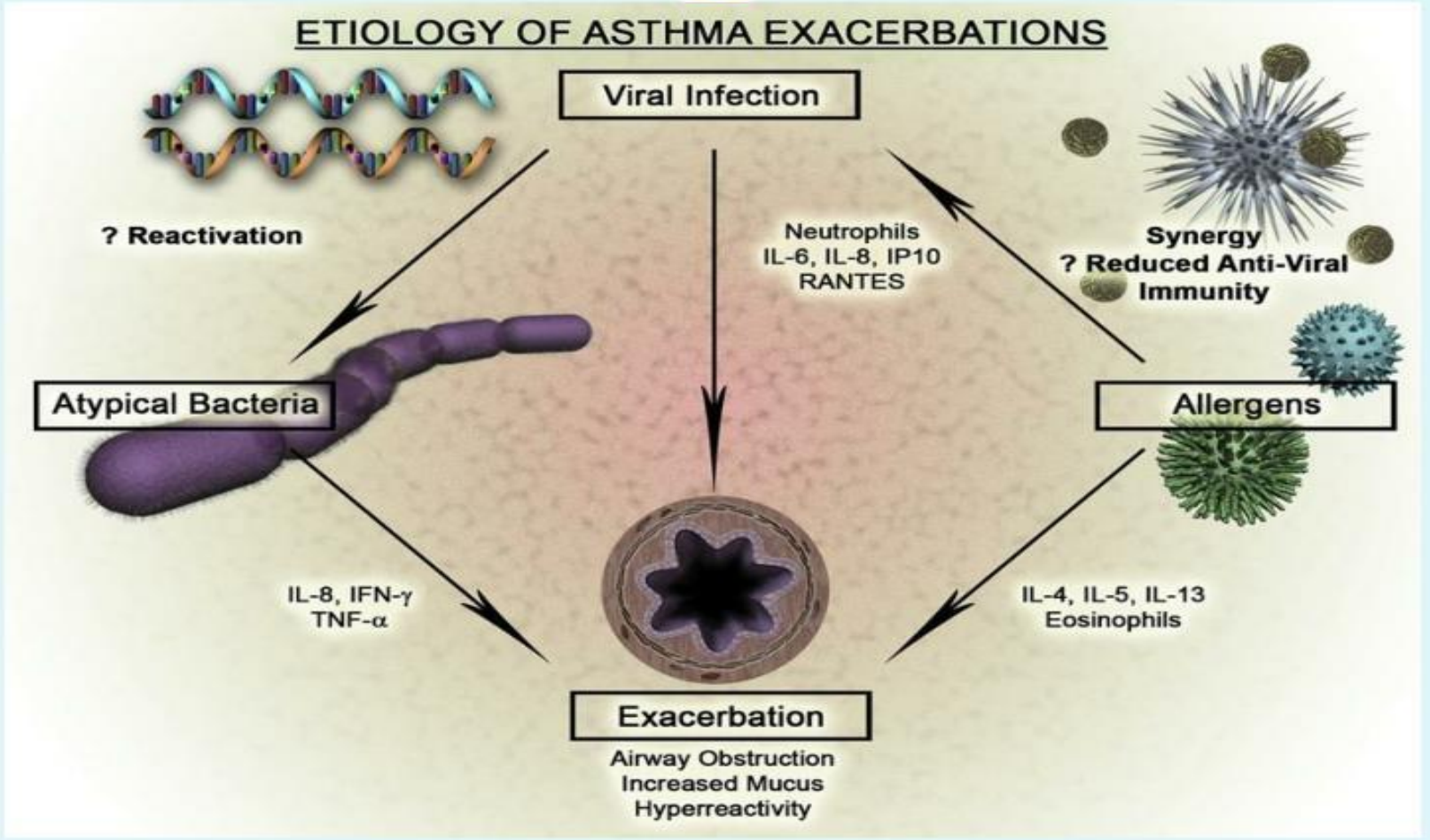
Pathophysiology of Acute and Chronic Asthma



Acute Asthma Pathophysiology



Pathophysiology of Acute Asthma

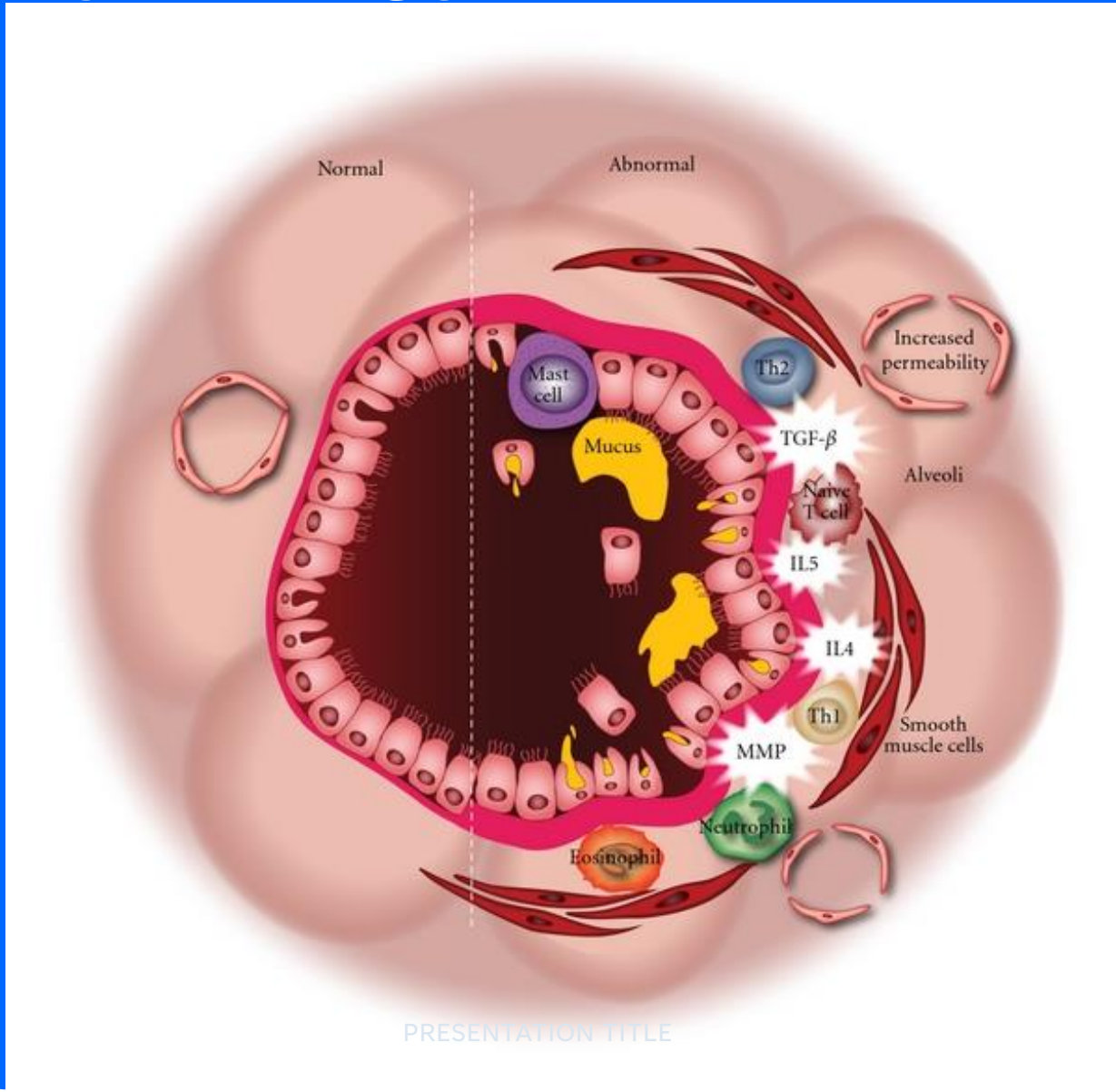


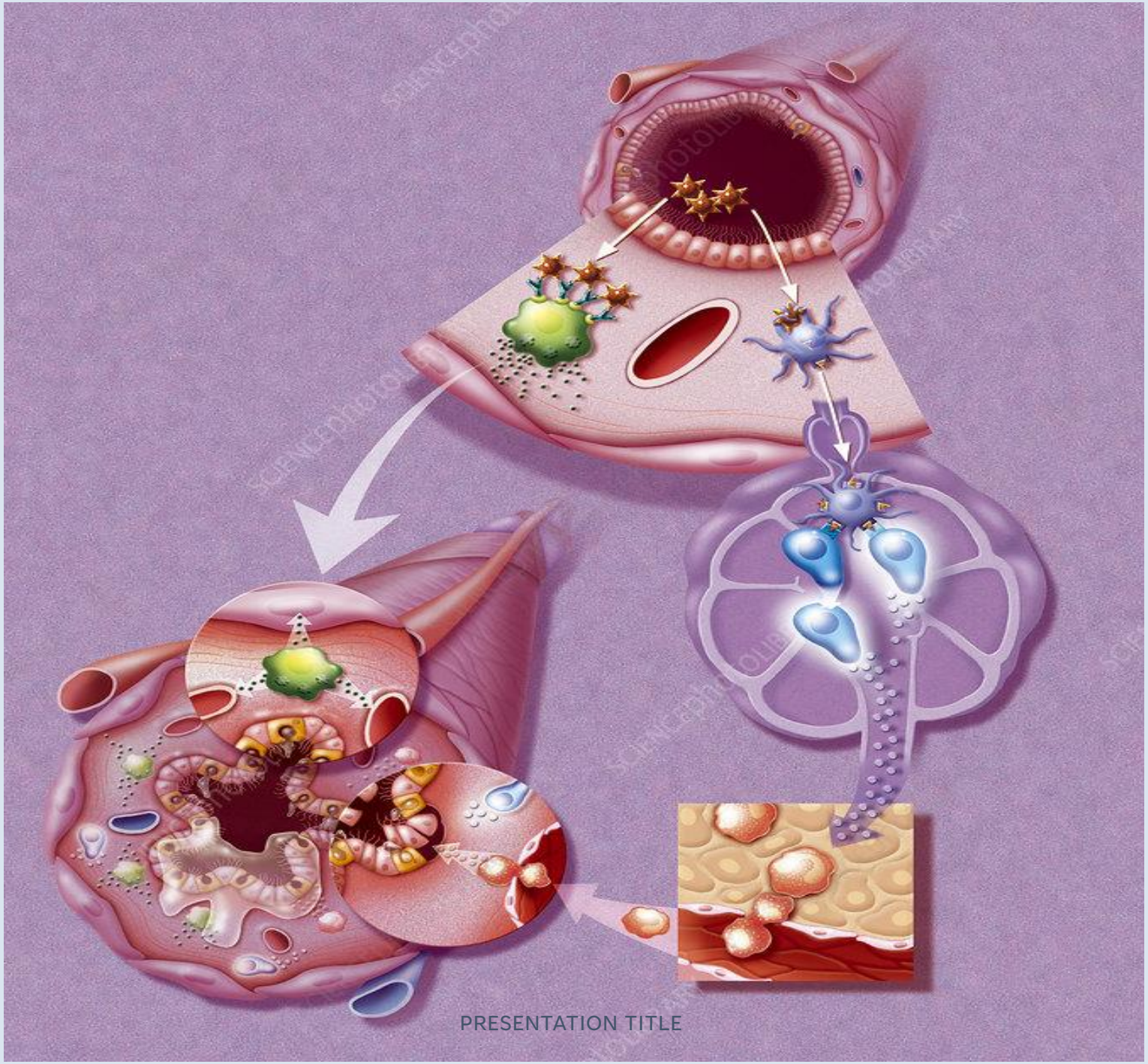
Asthma Pathology - Modern view

Effects of Chronic Asthma

- Exercise intolerance
- Recurrent infections
- Permanent narrowing of the bronchial tubes
- Signs and symptoms that interfere with sleep, work and other activities
- Sick days from work or school during asthma flare-ups
- Inability to participate in daily or social activities leading to depression
- Fragment sleep

Pathophysiology of Chronic Asthma





PRESENTATION TITLE

Core Features of Acute Asthma

-Mucus hypersecretion

-IgE production

-Airway hypersecretion

-Inflammation in the lung

Core Features of Chronic Asthma

-Goblet cell metaplasia

-Fibrosis & remodeling

-Changes in the epithelial cell configuration

-Smooth muscle hypertrophy

The Primary Symptoms of Acute Asthma

-Anxiety

-Hyperventilation

-Race in the heart rate

-Lung function get reduced

-Feeling difficulty in heart rate or breathlessness

How to Prevent Acute Asthma

-While there is no prevention for asthma, the symptoms and asthma attacks can be managed through regular monitoring and treatment.

-Identify and avoid the specific triggers

-Follow medication as prescribed

-Learn proper use of rescue inhalers - including cleaning the inhalers

-Carry the inhalers and medicines to workplace/while travelling, to get an immediate relief during the attack

-Monitor breathing often. If there is an increase in breathing difficulty, wheezing or cough, it is recommended to see the doctor or visit the ER

Signs of Impeding Respiratory Failure from Acute Asthma

- Hyperinflation: Air trapping and CO_2 retention
- Loss of consciousness
- Skin and mucous membrane turning cyanotic
- Hypotension, which could lead to myocardial infarction
- Hypoxemia despite being administered supplemental oxygen


Difficulty breathing
Constricted airway
Air sacs

ASSESSING THE SEVERITY OF AN ASTHMA ATTACK

MILD

- Cough
- Soft wheeze
- Minor difficulty breathing
- No difficulty speaking in sentences

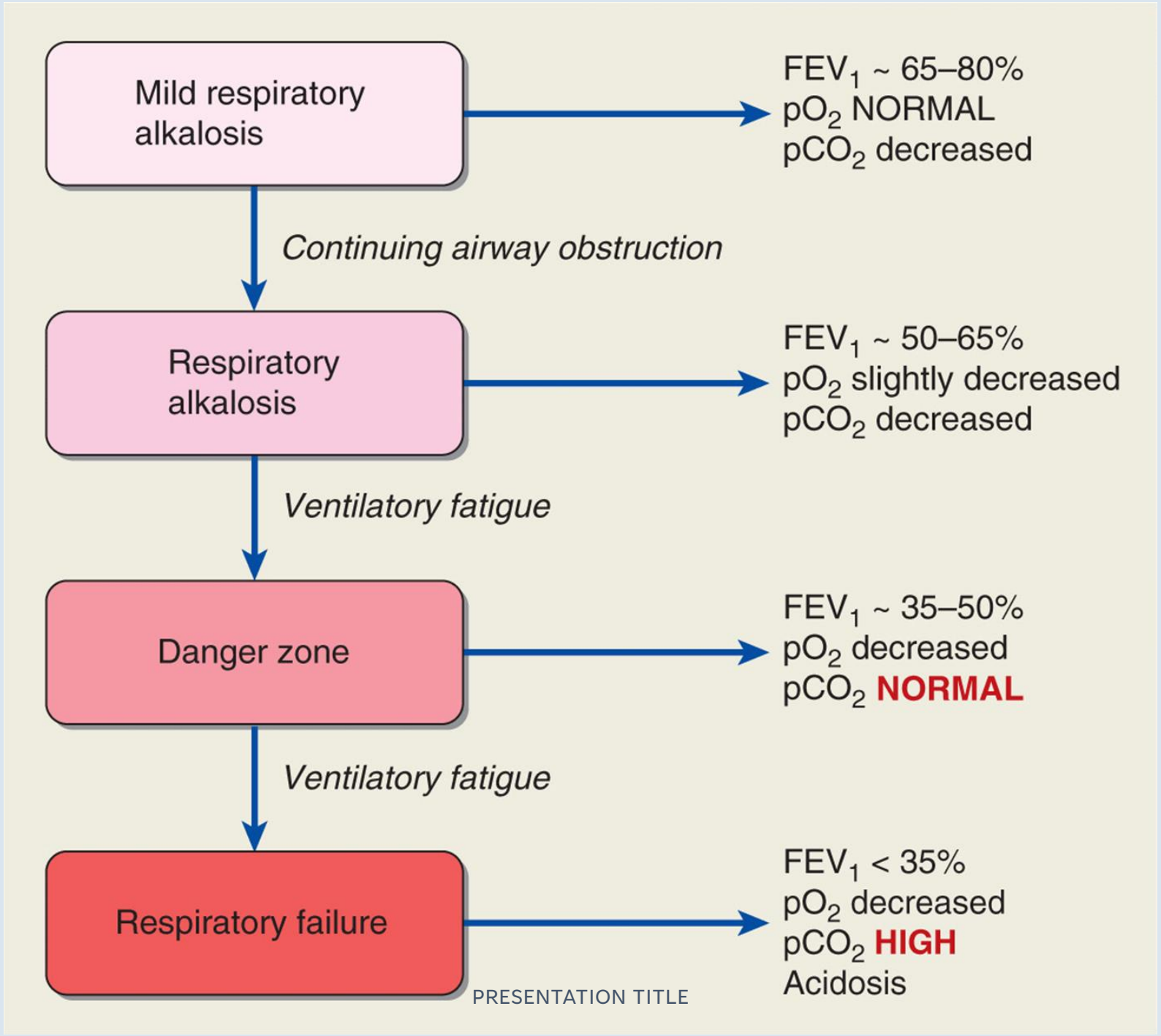
MODERATE

- Persistent cough, loud wheeze
- Obvious difficulty breathing
- Able to speak in short sentences

SEVERE

- Very distressed, anxious
- Gasping for breath
- Able to speak only a few gasping words in only one breath
- Pale and sweaty
- May have blue lips

St John


Mild respiratory alkalosis
FEV1 ~ 65–80%
pO2 NORMAL
pCO2 decreased
Continuing airway obstruction
Respiratory alkalosis
FEV1 ~ 50–65%
pO2 slightly decreased
pCO2 decreased
Ventilatory fatigue
Danger zone
FEV1 ~ 35–50%
pO2 decreased
pCO2 NORMAL
Ventilatory fatigue
Respiratory failure
FEV1 < 35%
pO2 decreased
pCO2 HIGH
Acidosis

Severity of Asthma Exacerbations

	Mild	Moderate	Severe	Respiratory arrest imminent
Breathless	Walking	Talking	At rest	
Talks in	Sentences	Phrases	Words	
Alertness	May be agitated	Usually agitated	Usually agitated	Drowsy or confused
Respiratory rate	Increased	Increased	Often > 30/min	
Accessory muscles & suprasternal retractions	Usually not	Usually	Usually	Paradoxical thoraco-abdominal movement
Wheeze	Moderate, often only end-expiratory	Loud	Usually loud	Absence of wheeze
Pulse/min	<100	100 - 120	> 120	Bradycardia
Pulsus paradoxus	Absent < 10 mmHg	May be present 10-25 mmHg	Often present > 25 mmHg	
PEF after initial BD % predicted or % personal best	Over 80 %	Approx 60 – 80 %	< 60 % predicted or personal best (<100/min or response lasts 2 hrs	
PaO_2 and/or $PaCO_2$	Normal < 42 mmHg	 < 42 mm Hg	< 60 mmHg Possible cyanosis > 42 mmHg Possible resp failure	
SaO_2	> 95 %	91 – 95 %	< 90 %	

Management of Acute Asthma

-Inhaled beta-agonists

Q2-Q4 or continuous infusion

- Oral vs. IV steroids

-Oxygen ?HFNC

-?NIPPV

-Mechanical ventilation (5%)

Management of Acute Asthma

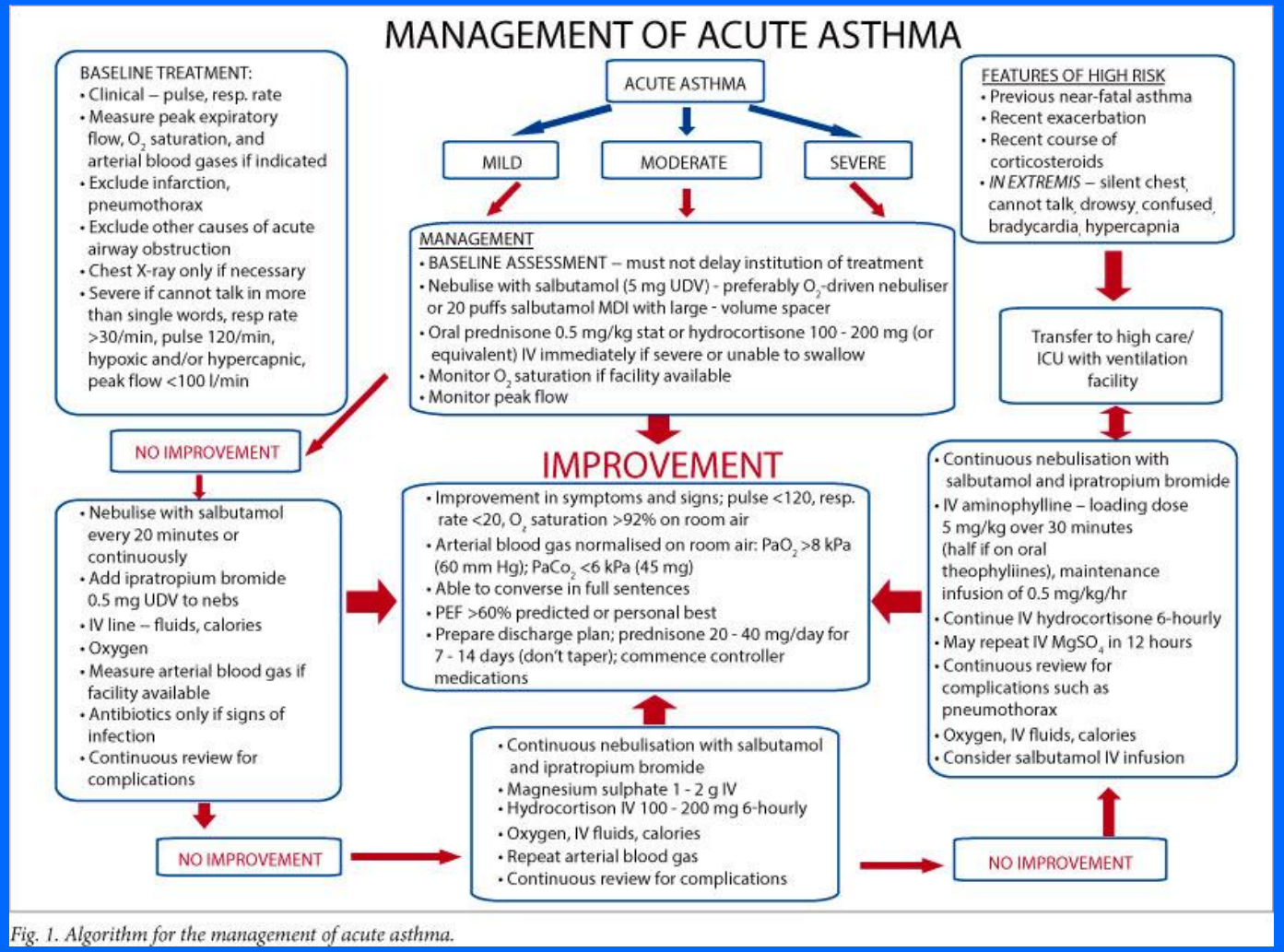


Fig. 1. Algorithm for the management of acute asthma.

The Primary Symptoms of Chronic Asthma

-Feeling tightness in the neck and chest muscles which is called retractions.

-Continuous coughing

-Feeling panic or anxiety

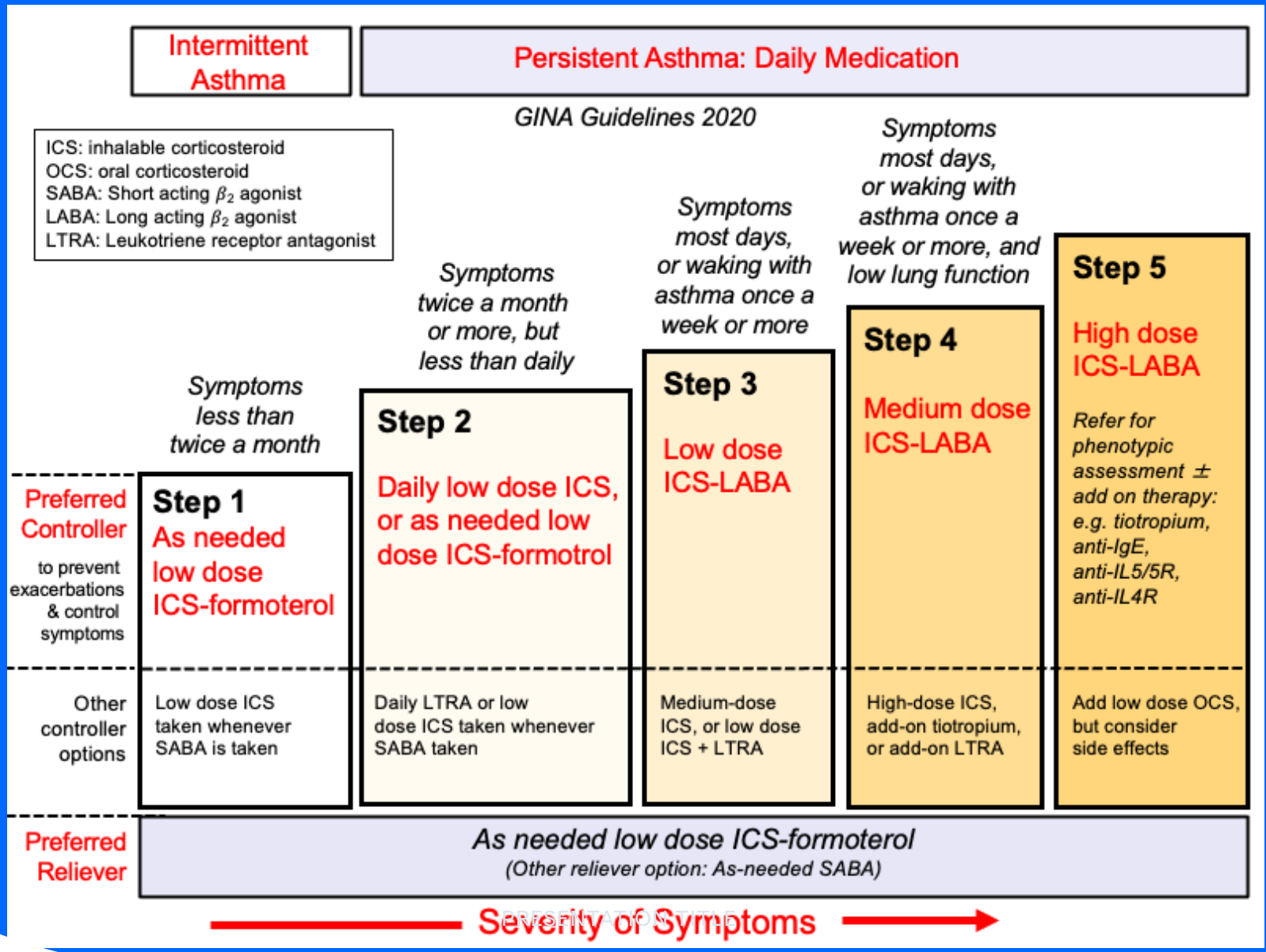
-Shortness of breath

-Severe wheezing while breathing, especially upon exertion

-Unable to have long conversations

-Interrupted nighty sleep

Classification of Chronic Asthma



Treatment of Chronic Asthma

-Daily inhaled high dose corticosteroid with LABA (500/50mcg Advair)

-Burst pack oral steroids (40-30-20-10-5mg)

-Biological therapies

-Treatment of existing comorbidities

- Development of an individualized asthma action plan

- Adherence to medication and trigger avoidance

-Thermoplasty for airway remodeling

-Frequent provider follow-up

Management and monitoring of chronic severe asthma in adults

Pharmacological interventions

British Asthma Guidelines

Step 4

Consider trials of:

- Increasing inhaled ICS up to 2000 micrograms BDP or equivalent daily in combination with a LABA
- Addition of leukotriene receptor antagonist, SR theophylline or tiotropium[a]

↓

Step 5

- Daily oral steroids in the lowest dose providing adequate control
- Maintain high–dose ICS

Biological therapies
(under specialist supervision)

- Anti-IgE (omalizumab)
- Anti-IL-5 (mepolizumab)

Additional asthma-directed pharmacotherapy
(under specialist supervision)

- Immunosuppressants
- Itraconazole
- Long-term macrolide treatment

Treatment of co-morbidities

- Nasal steroids/antihistamines for sinus disease
- Treat anxiety and depression
- Weight optimization
- Smoking cessation
- Physiotherapy for dysfunctional breathing
- Non-invasive ventilation for obstructive sleep apnoea
- Protection of bone density in patients requiring long-term or recurrent steroids

Management and follow-up of chronic severe asthma in adults

Non-pharmacological interventions

Personalized asthma action plan

- Based on asthma symptoms and/or PEF recordings
- Allows self-management of exacerbations

Facilitating adherence

- Explanation of the indications for treatment
- Discussion of real and perceived concerns of adverse effects of treatment
- Focus on benefits of good control
- Simplifying and customize drug treatment regimens
- Reinforcement

Trigger avoidance

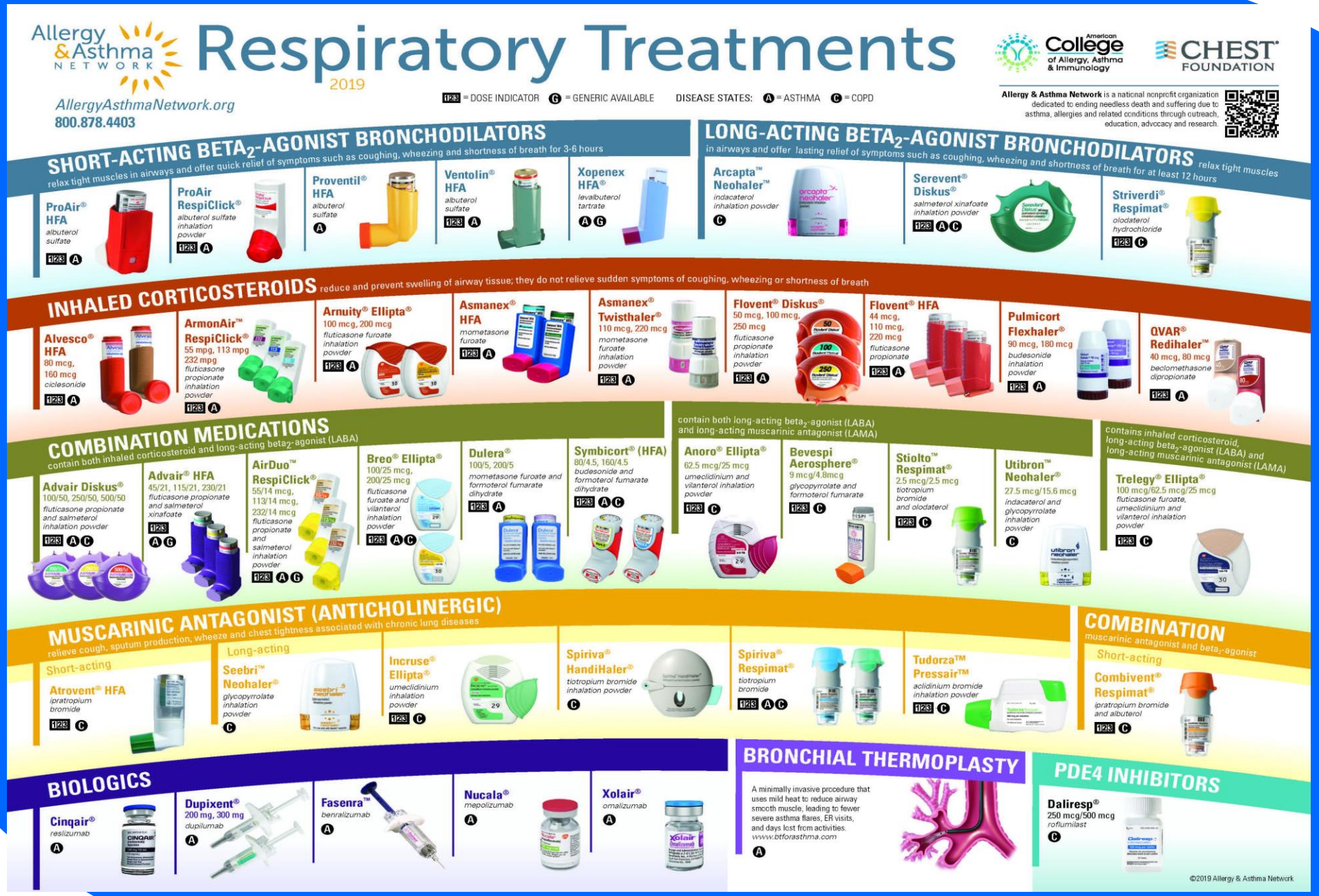
Bronchial thermoplasty
(under specialist supervision)

Follow-up and monitoring

Regular clinic review with assessment of the following:

- Asthma control (current symptom, risk of exacerbation)
- Adherence and inhaler technique
- Triggers factors and co-morbidities
- Consider non-pharmacological treatments
- Educational self-management
- Step-up or step-down in treatment intensity
- Adverse effects of treatments

ICS, inhaled steroid; BDP, beclometasone dipropionate; LABA, long acting beta-agonist; SR, sustained release; PEF, peak expiratory flow.
[a] The inhaled long-acting muscarinic antagonist tiotropium was recently licensed as add-on maintenance bronchodilator treatment for adults at step 4 of treatment who have experienced one or more severe exacerbations in the previous year.


Allergy & Asthma NETWORK
AllergyAsthmaNetwork.org
800.878.4403
Respiratory Treatments
2019
American College of Allergy, Asthma & Immunology
CHEST FOUNDATION
= DOSE INDICATOR = GENERIC AVAILABLE DISEASE STATES: = ASTHMA = COPD
Allergy & Asthma Network is a national nonprofit organization dedicated to ending needless death and suffering due to asthma, allergies and related conditions through outreach, education, advocacy and research.
SHORT-ACTING BETA2-AGONIST BRONCHODILATORS
relax tight muscles in airways and offer quick relief of symptoms such as coughing, wheezing and shortness of breath for 3-6 hours
ProAir® HFA albuterol sulfate
ProAir RespiClick® albuterol sulfate inhalation powder
Proventil® HFA albuterol sulfate
Ventolin® HFA albuterol sulfate
Xopenex HFA® levalbuterol tartrate
LONG-ACTING BETA2-AGONIST BRONCHODILATORS
in airways and offer lasting relief of symptoms such as coughing, wheezing and shortness of breath for at least 12 hours relax tight muscles
Arcapta™ Neohaler™ indacaterol inhalation powder
Serevent® Diskus® salmeterol xinafoate inhalation powder
Striverdi® Respimat® olodaterol hydrochloride
INHALED CORTICOSTEROIDS
reduce and prevent swelling of airway tissue; they do not relieve sudden symptoms of coughing, wheezing or shortness of breath
Alvesco® HFA 80 mcg, 160 mcg ciclesonide
ArmonAir™ RespiClick® 55 mpg, 113 mpg 232 mpg fluticasone propionate inhalation powder
Arnuity® Ellipta® 100 mcg, 200 mcg fluticasone furoate inhalation powder
Asmanex® HFA mometasone furoate
Asmanex® Twisthaler® 110 mcg, 220 mcg mometasone furoate inhalation powder
Flovent® Diskus® 50 mcg, 100 mcg, 250 mcg fluticasone propionate inhalation powder
Flovent® HFA 44 mcg, 110 mcg, 220 mcg fluticasone propionate
Pulmicort Flexhaler® 90 mcg, 180 mcg budesonide inhalation powder
QVAR® Redihaler™ 40 mcg, 80 mcg beclomethasone dipropionate
COMBINATION MEDICATIONS
contain both inhaled corticosteroid and long-acting beta2-agonist (LABA)
Advair Diskus® 100/50, 250/50, 500/50 fluticasone propionate and salmeterol inhalation powder
Advair® HFA 45/21, 115/21, 230/21 fluticasone propionate and salmeterol xinafoate
AirDuo™ RespiClick® 55/14 mcg, 113/14 mcg, 232/14 mcg fluticasone propionate and salmeterol inhalation powder
Breo® Ellipta® 100/25 mcg, 200/25 mcg fluticasone furoate and vilanterol inhalation powder
Dulera® 100/5, 200/5 mometasone furoate and formoterol fumarate dihydrate
Symbicort® (HFA) 80/4.5, 160/4.5 budesonide and formoterol fumarate dihydrate
contain both long-acting beta2-agonist (LABA) and long-acting muscarinic antagonist (LAMA)
Anoro® Ellipta® 62.5 mcg/25 mcg umeclidinium and vilanterol inhalation powder
Bevespi Aerosphere® 9 mcg/4.8mcg glycopyrrolate and formoterol fumarate
Stiolto™ Respimat® 2.5 mcg/2.5 mcg tiotropium bromide and olodaterol
Utibron™ Neohaler® 27.5 mcg/15.6 mcg indacaterol and glycopyrrolate inhalation powder
contains inhaled corticosteroid, long-acting beta2-agonist (LABA) and long-acting muscarinic antagonist (LAMA)
Trelegy® Ellipta® 100 mcg/62.5 mcg/25 mcg fluticasone furoate, umeclidinium and vilanterol inhalation powder
MUSCARINIC ANTAGONIST (ANTICHOLINERGIC)
relieve cough, sputum production, wheeze and chest tightness associated with chronic lung diseases
Short-acting
Atrovent® HFA ipratropium bromide
Long-acting
Seebri™ Neohaler® glycopyrrolate inhalation powder
Incruse® Ellipta® umeclidinium inhalation powder
Spiriva® HandiHaler® tiotropium bromide inhalation powder
Spiriva® Respimat® tiotropium bromide
Tudorza™ Pressair™ aclidinium bromide inhalation powder
COMBINATION
muscarinic antagonist and beta2-agonist
Short-acting
Combivent® Respimat® ipratropium bromide and albuterol
BIOLOGICS
Cinqair® reslizumab
Dupixent® 200 mg, 300 mg dupilumab
Fasenra™ benralizumab
Nucala® mepolizumab
Xolair® omalizumab
BRONCHIAL THERMOPLASTY
A minimally invasive procedure that uses mild heat to reduce airway smooth muscle, leading to fewer severe asthma flares, ER visits, and days lost from activities.
www.btforasthma.com
PDE4 INHIBITORS
Daliresp® 250 mcg/500 mcg roflumilast
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Biologicals in Asthma

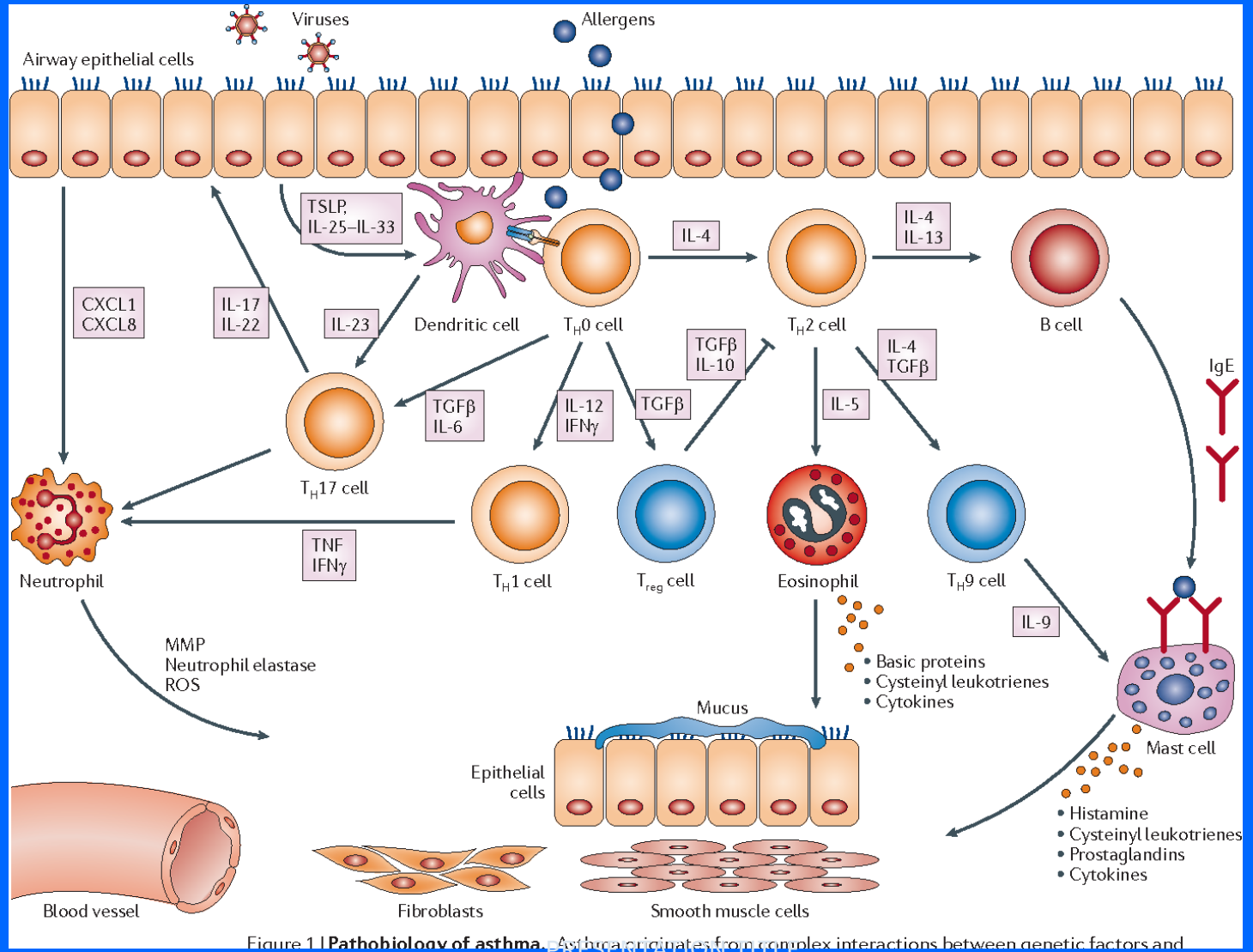


Figure 1 | **Pathobiology of asthma.** Asthma originates from complex interactions between genetic factors and

Different Biologicals Available for Asthma

Immunomodulators used in the treatment of asthma						
Generic Name	Trade Name	Binds to	Age	Route	Dosing	Administered
Omalizumab	Xolair	IgE	> 6 yrs	SC	Based on IgE level and body weight	In clinic or home
Mepolizumab	Nucala	IL-5	> 6 yrs	SC	Every 4 weeks	At home
Reslizumab	Cinquair	IL-5	> 18 yrs	IV	Based on weight Every 4 weeks	In clinic
Benralizumab	Fasenra	IL –5R	> 12 yrs	SC	Every 4 weeks for the first three doses then once every 8 weeks	At home
Dupilumab	Duplixent	IL-4Rα IL-4, IL-13	> 12 yrs	SC	Every other week	At home

SC = subcutaneous IV = intravenous

Bronchial Thermoplasty

-Thermal energy is delivered using the Alair System

-BT is performed in a series of three bronchoscopies.

-The first two sessions target the right lower lobe and left lower lobe separately while the final procedure targets the bilateral upper lobes.

-Each bronchoscopy takes approximately 30–60 minutes

-Dividing the treatment into three procedures allows shorter procedure times and obviates the risks associated with widespread irritation of the airways in patients with severe asthma.

-The Alair System consists of an RF controller and a single-use catheter.

-The catheter is connected to the RF controller and a grounding pad is placed on the patient to complete the electrical circuit.

-The RF controller delivers thermal energy at a temperature of 65°C for 10 seconds, resulting in a maximum of 18 Watts of power delivered with each activation.

-A footswitch is used to deliver the activation at the appropriate time.

-The catheter contains a four-electrode basket on the distal tip and is marked at 5 mm increments.

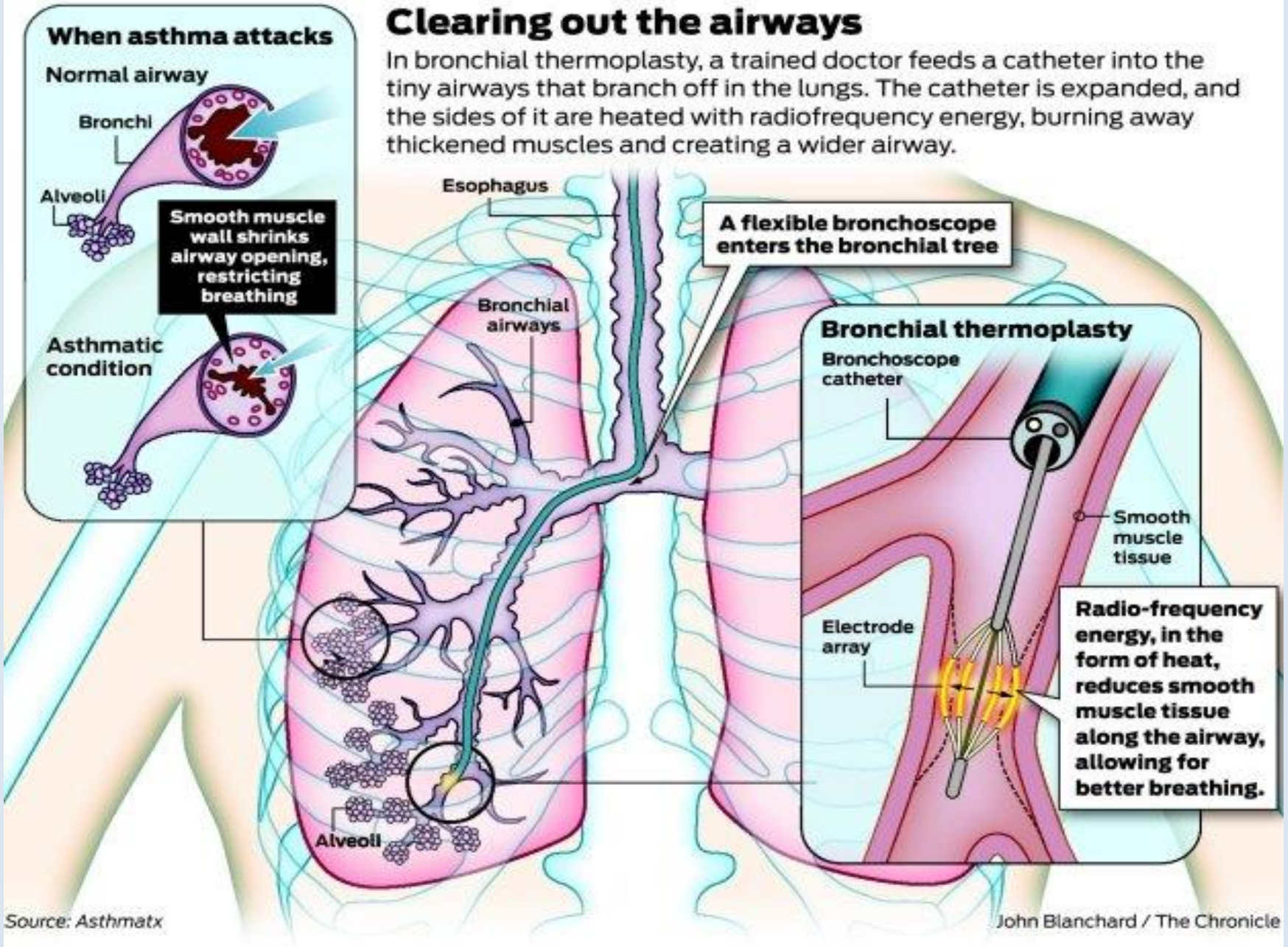
-In this manner, the entire airway wall is treated from the distal to proximal direction without overlap.

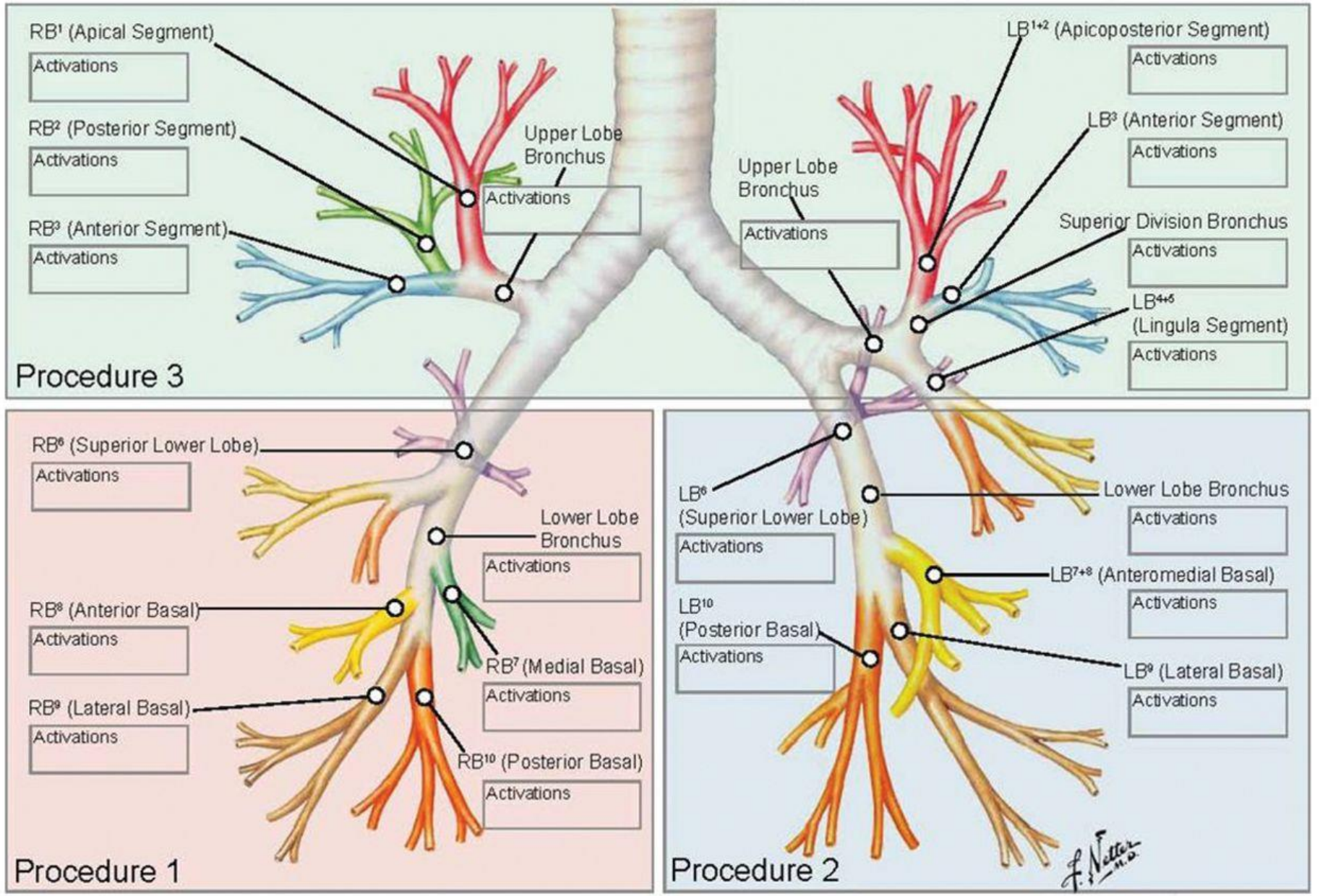
Side Effects of Thermoplasty Therapy

-The most common complications during the procedure include bronchoconstriction, mucous hypersecretion, and minor bleeding related to superficial trauma.

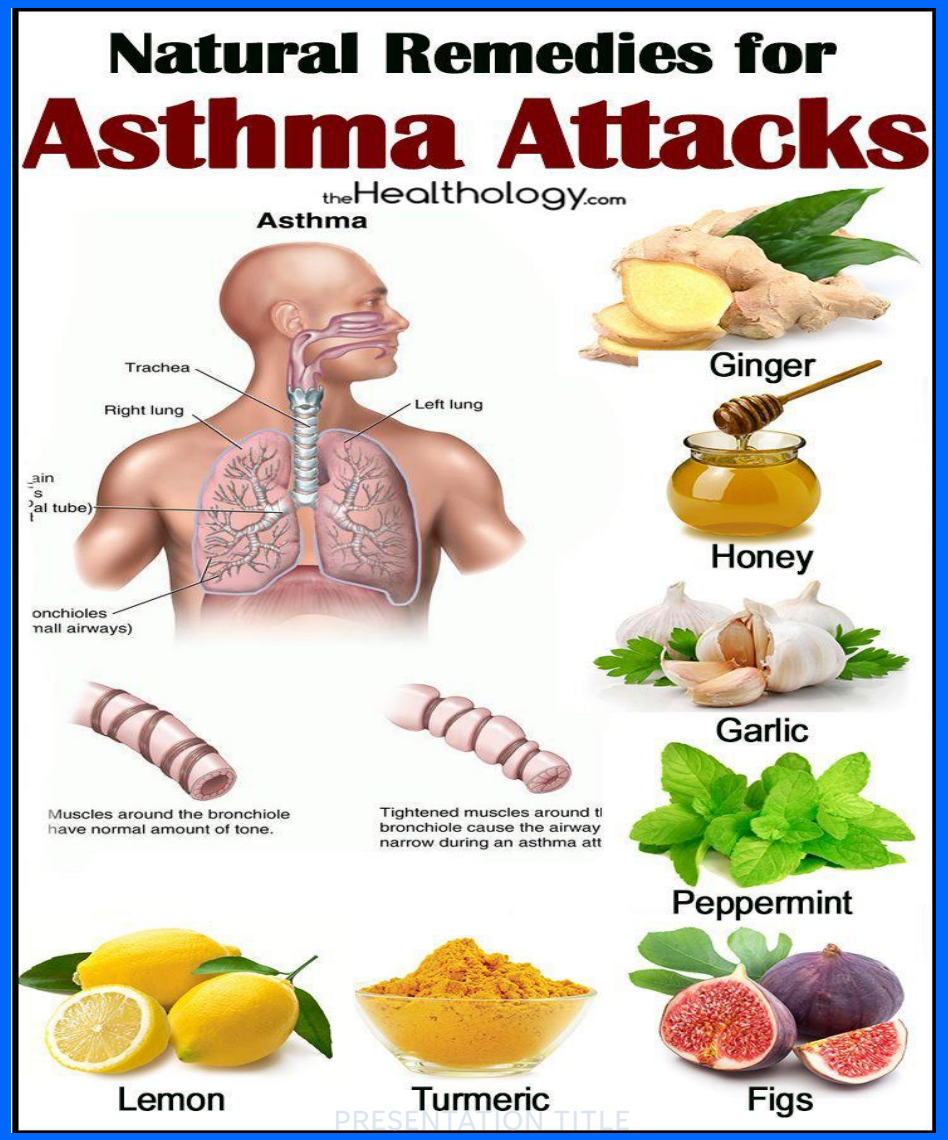
-Patients should be monitored following the procedure, and treatment with bronchodilators in the immediate post procedure setting is often needed.

-Spirometry and/or peak flow may be performed to ensure the patient is near the preprocedural baseline.


When asthma attacks
Normal airway
Bronchi
Alveoli
Smooth muscle wall shrinks airway opening, restricting breathing
Asthmatic condition
Clearing out the airways
In bronchial thermoplasty, a trained doctor feeds a catheter into the tiny airways that branch off in the lungs. The catheter is expanded, and the sides of it are heated with radiofrequency energy, burning away thickened muscles and creating a wider airway.
Esophagus
A flexible bronchoscope enters the bronchial tree
Bronchial airways
Alveoli
Bronchial thermoplasty
Bronchoscope catheter
Smooth muscle tissue
Electrode array
Radio-frequency energy, in the form of heat, reduces smooth muscle tissue along the airway, allowing for better breathing.
Source: Asthmatx
John Blanchard / The Chronicle


Patient ID: _____
Procedure 1: Right Lower Lobe
Treatment Date: _____
Procedure 2: Left Lower Lobe
Treatment Date: _____
Procedure 3: Right & Left Upper Lobes
Treatment Date: _____
RB¹ (Apical Segment)
Activations
RB² (Posterior Segment)
Activations
RB³ (Anterior Segment)
Activations
Upper Lobe Bronchus
Activations
Procedure 3
LB¹⁺² (Apicoposterior Segment)
Activations
LB³ (Anterior Segment)
Activations
Upper Lobe Bronchus
Activations
Superior Division Bronchus
Activations
LB⁴⁺⁵ (Lingula Segment)
Activations
RB⁶ (Superior Lower Lobe)
Activations
Lower Lobe Bronchus
Activations
RB⁸ (Anterior Basal)
Activations
RB⁷ (Medial Basal)
Activations
RB⁹ (Lateral Basal)
Activations
RB¹⁰ (Posterior Basal)
Activations
Procedure 1
LB⁶ (Superior Lower Lobe)
Activations
Lower Lobe Bronchus
Activations
LB⁷⁺⁸ (Anteromedial Basal)
Activations
LB¹⁰ (Posterior Basal)
Activations
LB⁹ (Lateral Basal)
Activations
Procedure 2

Natural Remedies in Chronic Asthma



Summary

-There are many contributing factors that are responsible for acute and chronic asthma

-Acute asthma by be life-threatening

-Chronic asthma is debilitating and emotionally exhausting

-There is an arsenal of options when treating both acute and chronic asthma

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