

# Asthma Medication Refresher



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# Objectives

1. Classify asthma medications according to their mechanism of action.
2. Identify patients indicated for asthma medications or medication combinations.
3. Describe precautions and side effects of *newer* medications used to treat asthma.
4. Select appropriate asthma medication delivery devices for patients of varying ages and needs.
5. Understand the role of biologic medications in the management of asthma.
6. Identify options for helping with access to asthma medications.

No Conflicts of Interest to Disclose

# 2007

- iPhone most popular phone in U.S.
- Pirates of the Caribbean: at World's End highest grossing U.S. film
- Umbrella by Rihanna #1 song
- Indianapolis Colt's def. Chicago Bears in Superbowl
- NIH Guidelines for the Diagnosis and Management of Asthma (EPR-3) published



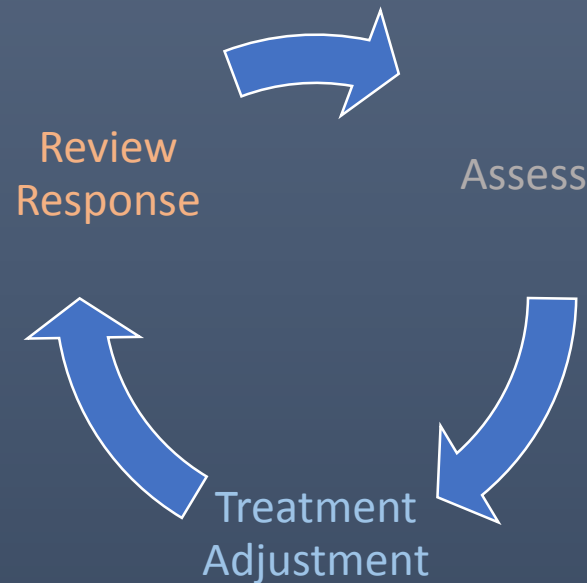
# Control-Based Asthma Management

Symptoms  
Exacerbations  
Side-Effects  
Patient-Satisfaction  
Lung Function

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Asthma Medications  
Non-pharmacologic Strategies  
Modify Risk-factors

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Symptoms  
Risk Factors  
Lung Function  
Inhaler Technique  
Medication Adherence  
Patient Preferences

# Asthma Medications

- Quick-Relief Medications (Rescue/Reliever)
  - Used as-needed for reducing current symptoms or prevention of exercise-induced bronchoconstriction
- Controller Medications (Maintenance)
  - Reduce airway inflammation and hyperreactivity to reduce future symptoms and risks such as exacerbations and decline in lung function



2

## Who Should Use Controller Medications?

Daytime Symptoms or Reliever Use > 2 days per week

Nighttime Awakening from Asthma > 2 days per month

**ASSESS CONTROL:**

**STEP UP IF NEEDED** (first, check medication adherence, inhaler technique, environmental control, and comorbidities)

**STEP DOWN IF POSSIBLE** (and asthma is well controlled for at least 3 months)

**STEP 1**

**STEP 2**

**STEP 3**

**STEP 4**

**STEP 5**

**STEP 6**

**At each step:** Patient education, environmental control, and management of comorbidities

**≥12 years of age**

**Intermittent Asthma**

**Persistent Asthma: Daily Medication**

Consult with asthma specialist if step 4 care or higher is required. Consider consultation at step 3.

Preferred Treatment<sup>†</sup>

SABA\* as needed

low-dose ICS\*

low-dose ICS\*  
+ LABA\*  
**OR**  
medium-dose ICS\*

medium-dose ICS\*  
+ LABA\*

high-dose ICS\*  
+ LABA\*  
**AND**  
consider omalizumab for patients who have allergies<sup>††</sup>

high-dose ICS\*  
+ LABA\*  
+ oral corticosteroid<sup>§§</sup>  
**AND**  
consider omalizumab for patients who have allergies<sup>††</sup>

Alternative Treatment<sup>†,‡</sup>

cromolyn, LTRA,\* or theophylline<sup>§</sup>

low-dose ICS\*  
+ either LTRA,\* theophylline,<sup>§</sup> or zileuton<sup>‡‡</sup>

medium-dose ICS\*  
+ either LTRA,\* theophylline,<sup>§</sup> or zileuton<sup>‡‡</sup>

Consider subcutaneous allergen immunotherapy for patients who have persistent, allergic asthma.\*\*

Quick-Relief Medication

- SABA\* as needed for symptoms. The intensity of treatment depends on severity of symptoms: up to 3 treatments every 20 minutes as needed. Short course of oral systemic corticosteroids may be needed.
- Caution: Use of SABA >2 days/week for symptom relief (not to prevent EIB\*) generally indicates inadequate control and the need to step up treatment.

# Standard of Care - 2007

Controller Classes	Clinical Effect	Role
Corticosteroids	Wide range of actions on multiple cell types (e.g., mast cells, eosinophils, neutrophils, macrophages, lymphocytes) and mediators (e.g., histamine, eicosanoids, leukotrienes, cytokines) involved in inflammation	Preferred Controller*
Inhaled Long-acting Beta <sub>2</sub> Agonists	Causes bronchodilation and some inhibition of release of mediators from mast cells	Preferred Add-on
Leukotriene receptor antagonists	Inhibits physiologic actions of leukotrienes (airway edema, smooth muscle contraction, and activity associated with the inflammatory process)	Alternative or add-on
Anti-immunoglobulin E monoclonal antibody (Anti-IgE)	Limits release of mediators of the allergic response from mast cells and basophils	Add-on
Methylxanthines (Theophylline)	Causes bronchodilation via phosphodiesterase III/IV inhibition and reduces airway sensitivity	Alternative or add-on
Mast Cell Stabilizer (Cromolyn)	Inhibits the release of histamine and leukotrienes from mast cells	Alternative or add-on

\*Oral steroids are reserved as add-on therapy or for short courses during exacerbations

# How does the 2007 standard of care work?

Group – By treatment in 6 months before randomization					
1	No Treatment	2	Low-Dose ICS	3	Medium/High-Dose ICS
Treatment	Treatment Group	n	Well Controlled (%)	Totally Controlled (%)	
Fluticasone	1	544	65	31	
Fluticasone-Salmeterol	1	539	71	42	
Fluticasone	2	577	52	20	
Fluticasone-Salmeterol	2	583	69	32	
<b>Fluticasone</b>	<b>3</b>	<b>567</b>	<b>33</b>	<b>8</b>	
<b>Fluticasone-Salmeterol</b>	<b>3</b>	<b>568</b>	<b>51</b>	<b>19</b>	

All patient's received *guideline-concordant* step-therapy every 12 weeks to maximum step 5 (High dose ICS/LABA) over 52 weeks



# Severe Uncontrolled Asthma

European Respiratory Society and American Thoracic Society Definition:

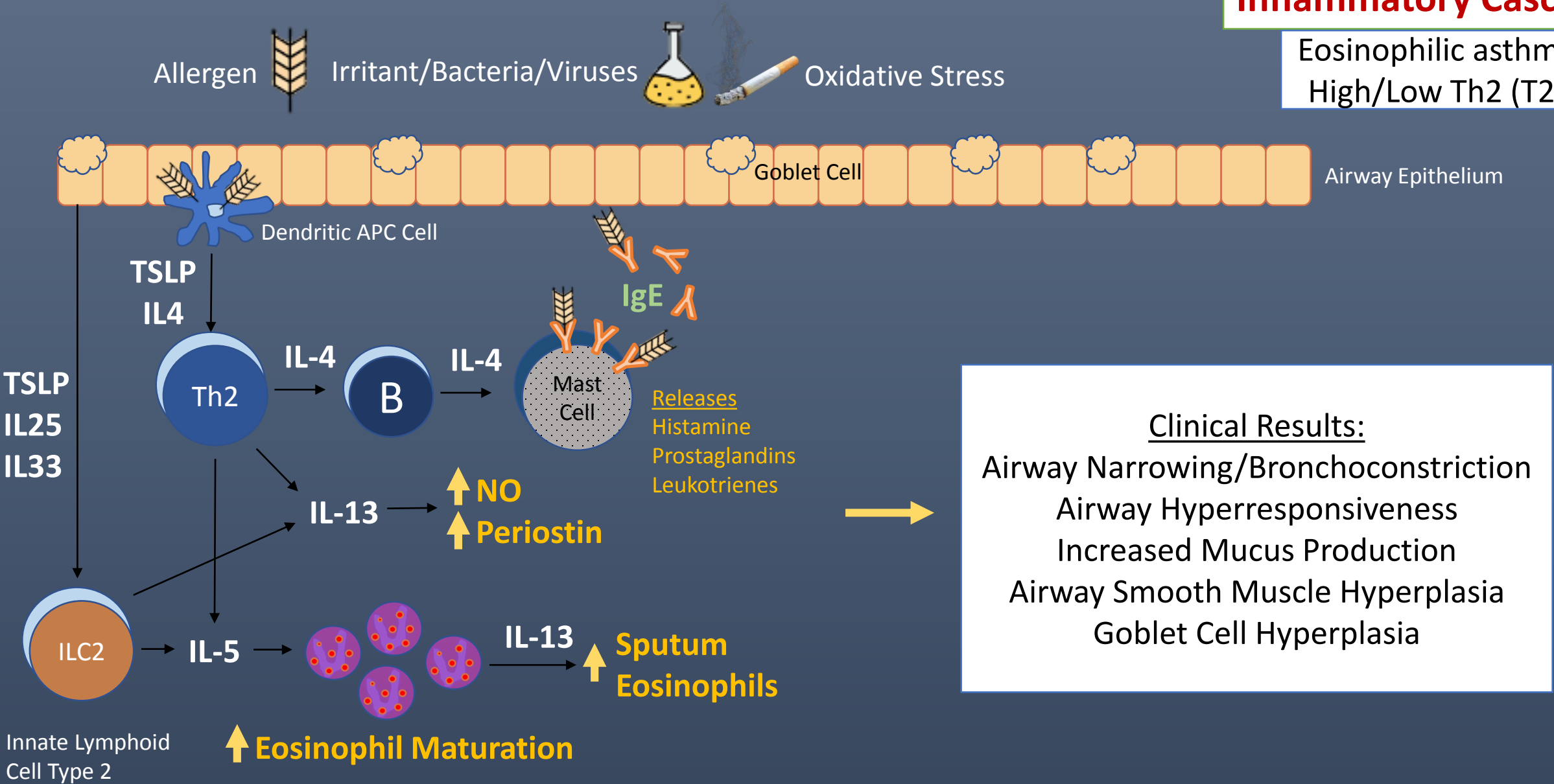
“Asthma that requires treatment with high dose inhaled corticosteroids plus a second controller and/or systemic corticosteroids to prevent it from becoming “uncontrolled” or that remains “uncontrolled” despite this therapy.”

# Where do we go from here?

- Sherri, 43 yo AA F with worsening asthma
- ACT 7, 2 exacerbations past year requiring OCS
- + FH of asthma
- Bus drive for CTA, two cats (has been with her “forever”), never smoker
- BMI 32 kg/m<sup>2</sup>
- Currently Taking:
  - Fluticasone/salmeterol (Airduo®) 232/14 mcg, 1 puff twice daily
  - Albuterol MDI prn
  - Omeprazole 20 mg po daily
  - Montelukast 10 mg qHS
  - Loratadine 10 mg prn

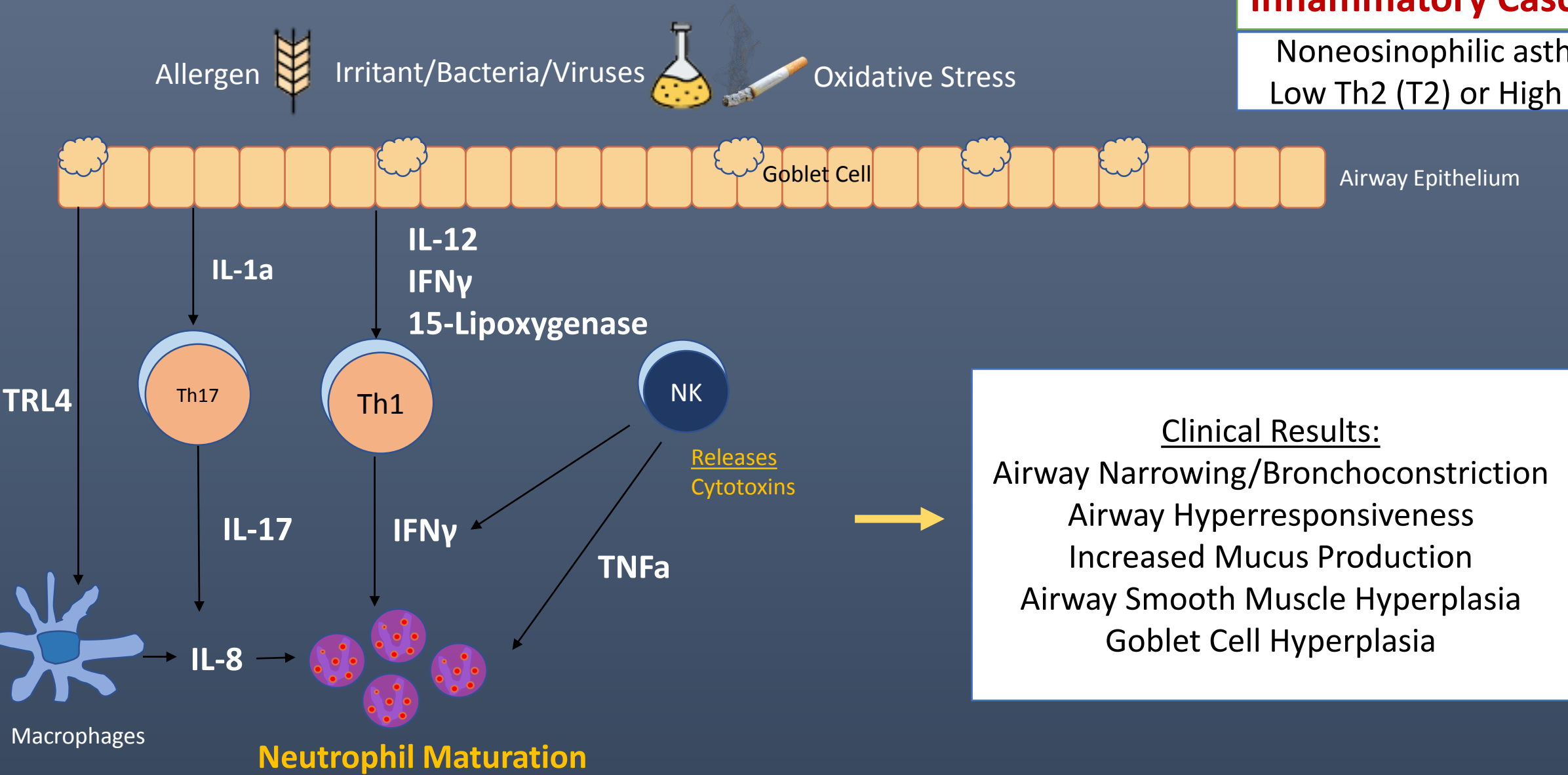
# Inflammatory Cascade

Eosinophilic asthma  
High/Low Th2 (T2)



# Inflammatory Cascade

Noneosinophilic asthma  
Low Th2 (T2) or High Th1



# Phenotype Guided Therapy

- Uses inflammatory cell biomarkers to guide therapy

Elevated Blood or Sputum Eosinophils

Elevated Serum IgE

Elevated FE<sub>NO</sub> / Periostin?

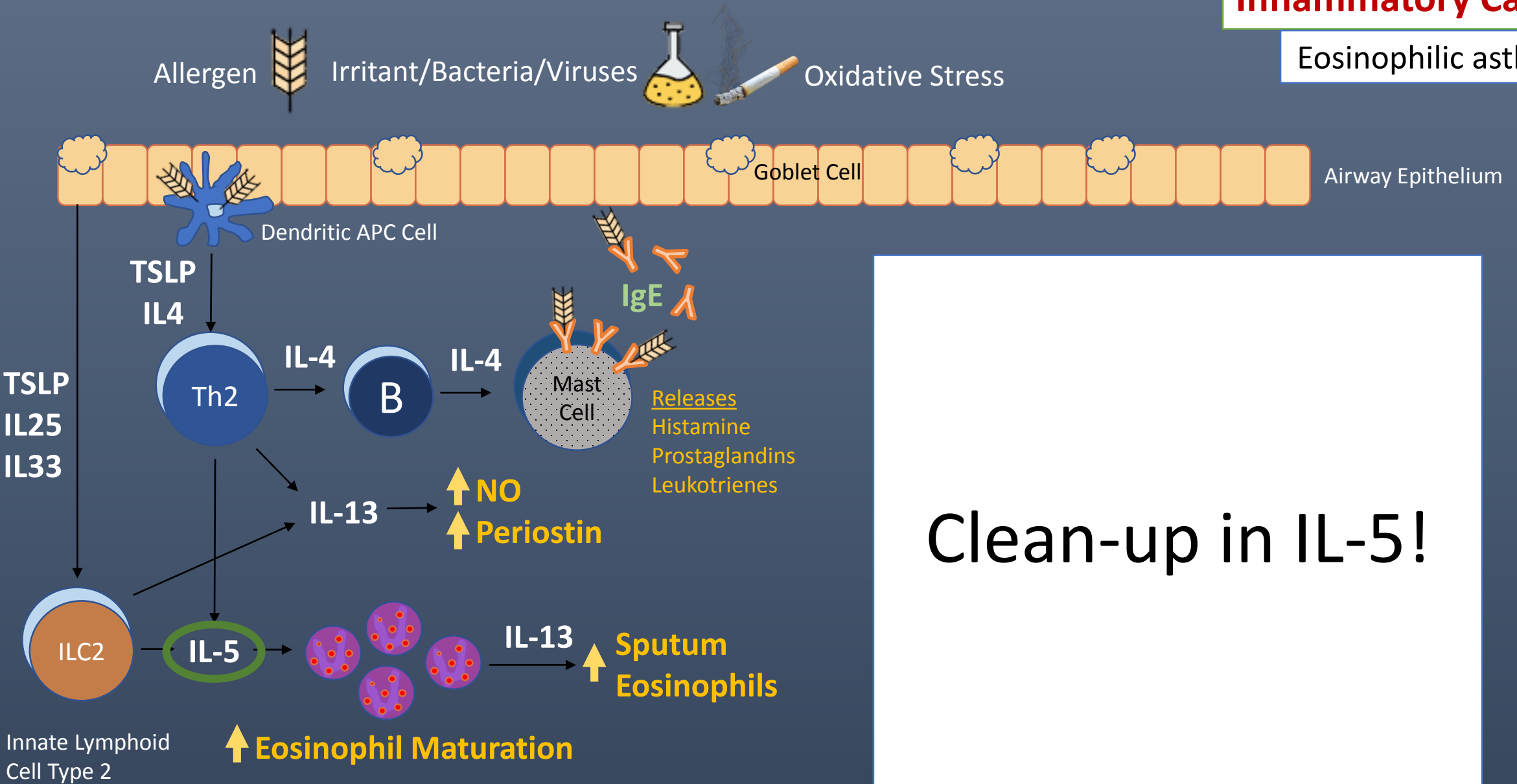
# FDA Approved Biologic Agents for Asthma

Medication	Biomarker Target	Approved Age	Indication	Dosing
Omalizumab (Xolair®), 2003	IgE	≥6 years	High IgE Levels (30-700 IU/mL)+Allergies	75-375 mg <b>SubQ</b> q2-4weeks
Mepolizumab (Nucala®), 2015	IL-5	≥12years	Blood Eos ≥150 cell/μL (90d) ≥300 cell/μL (1y)	30 mg <b>SubQ</b> q4wks
Reslizumab (Cinqair®), 2016	IL-5	≥18 years	Blood Eos ≥400 cell/μL	3 mg/kg <b>IV</b> q4wks
Benralizumab (Fasenra®), 2017	IL-5R	≥12 years	Blood Eos ≥300 cell/μL	30 mg <b>SubQ</b> q4-8weeks
Dupilumab (Dupixent®), 2018	IL-4R/(IL-4/IL-13)	≥12 years	Blood Eos ≥300 cell/μL	400 mg (200 mg x 2) <b>SubQ</b> , followed by 200 mg given every other week*

\*Start 600 mg (two 300 mg injections) **SubQ**, followed by 300 mg given every other week if using concomitant oral corticosteroids or with co-morbid moderate-to-severe atopic dermatitis for which dupilumab is indicated.

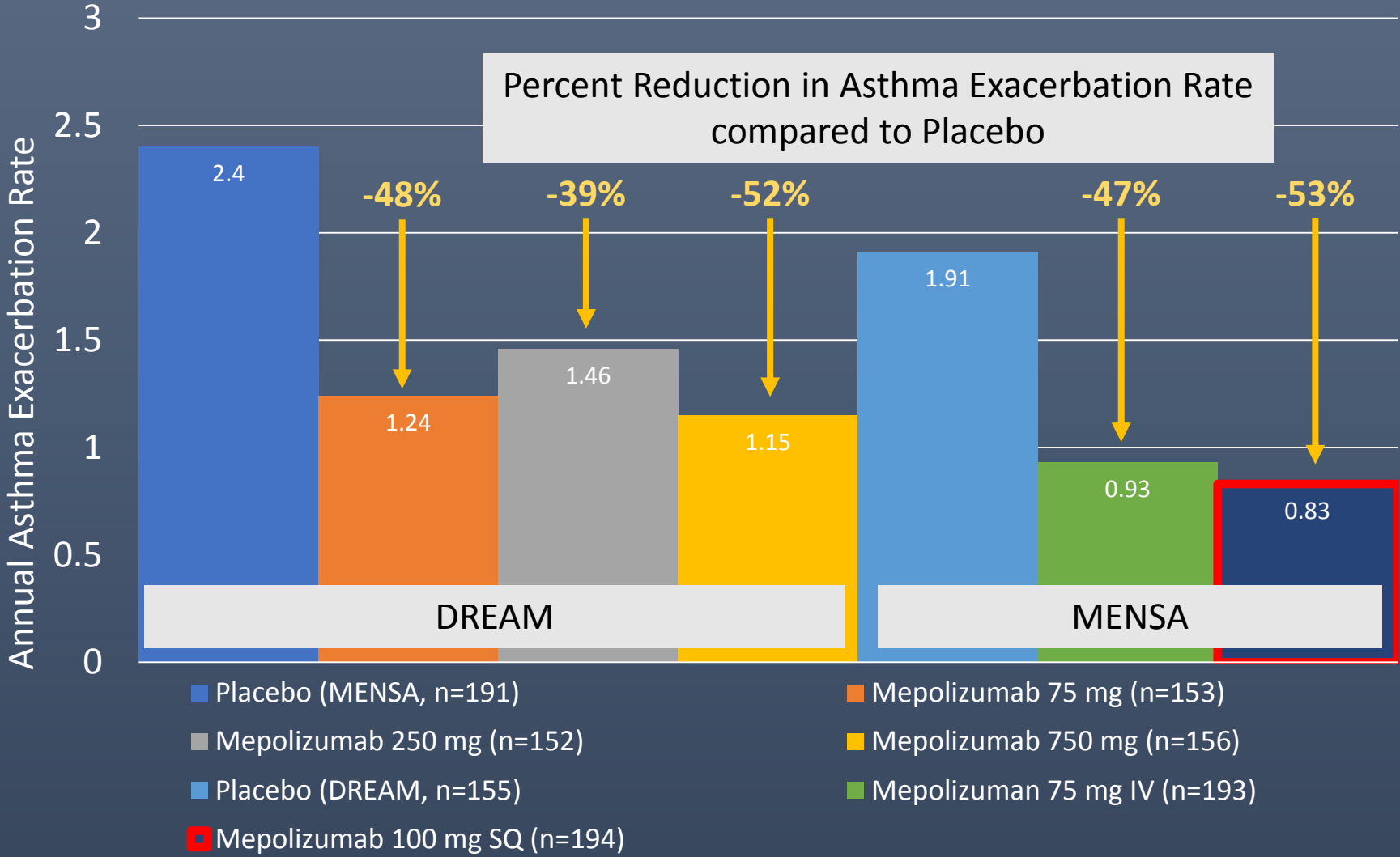
# Inflammatory Cascade

Eosinophilic asthma



Clean-up in IL-5!

# Mepolizumab – Anti-IL-5 Antibody



DREAM (13 months)  
 Eos > 300, 3%, or FENO > 50

MENSA (32 weeks)  
 Eos >150 90d / 300 last year

ADRs (similar rates to placebo)  
 HA, nasopharyngitis, back pain, fatigue

Inj. Site Rxn: 9% vs 3% PCB  
 Hypersensitivity 1% vs. 2% PCB  
 Anaphylaxis rare (0.2%)

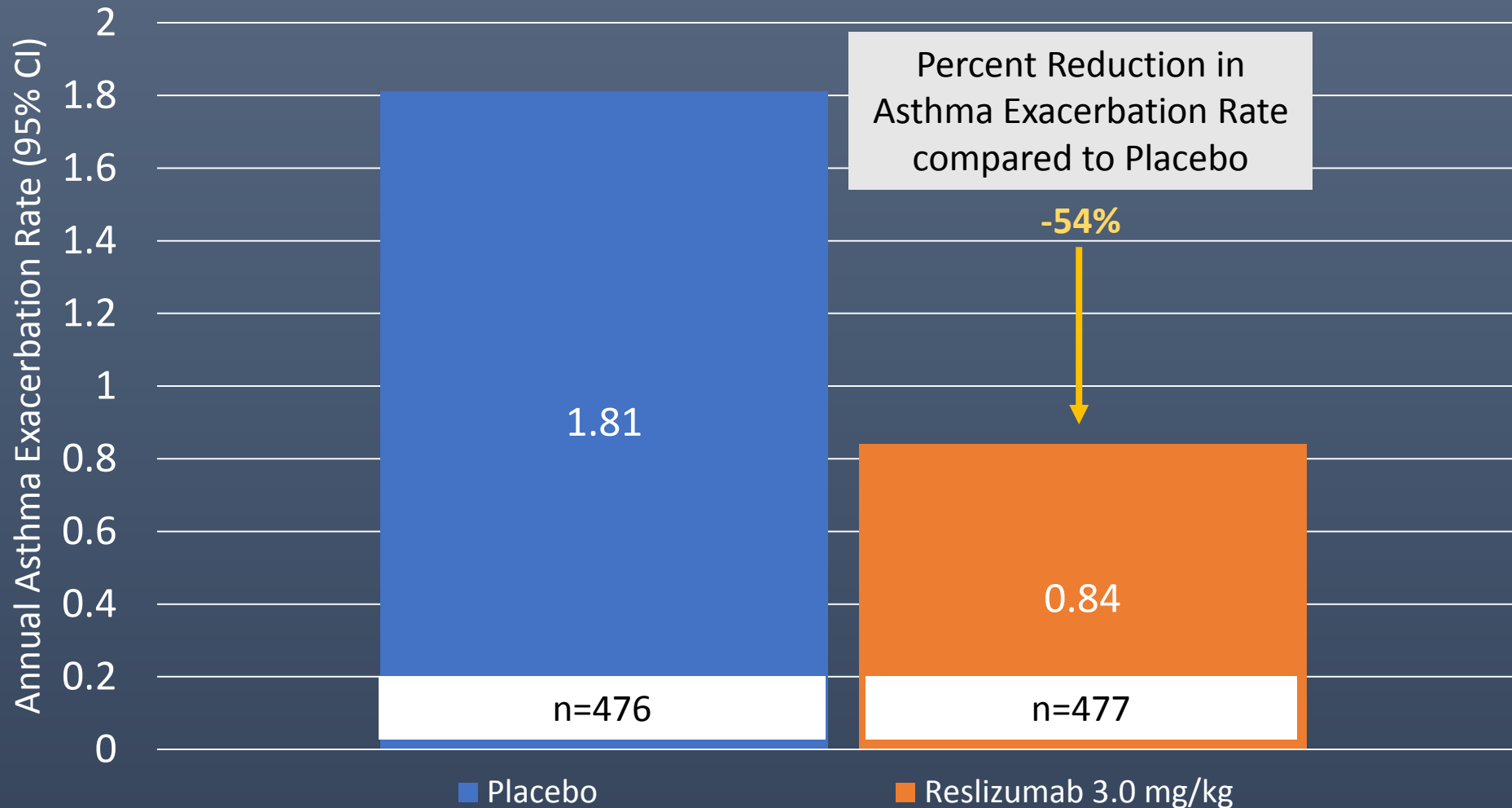
**Dosing and Administration**  
**100 mg SQ q4 wks**  
 SQ in upper arm, thigh, or abdomen  
 Administered in healthcare setting

Pavard ID, et al. *Lancet*. 2012;380:651  
 Ortega HG, et al. *N Engl J Med*. 2014;371:1198



# Reslizumab – Anti-IL-5 Antibody

— Exacerbation Rate in Patients with Elevated Eosinophils ( $\geq 400$  cell/ $\mu$ L)



ADRs (similar rates to placebo)  
Oropharyngeal pain, myalgia (1-3%)  
Anaphylaxis (0.3%)  
Transient CK elevation? (20%)

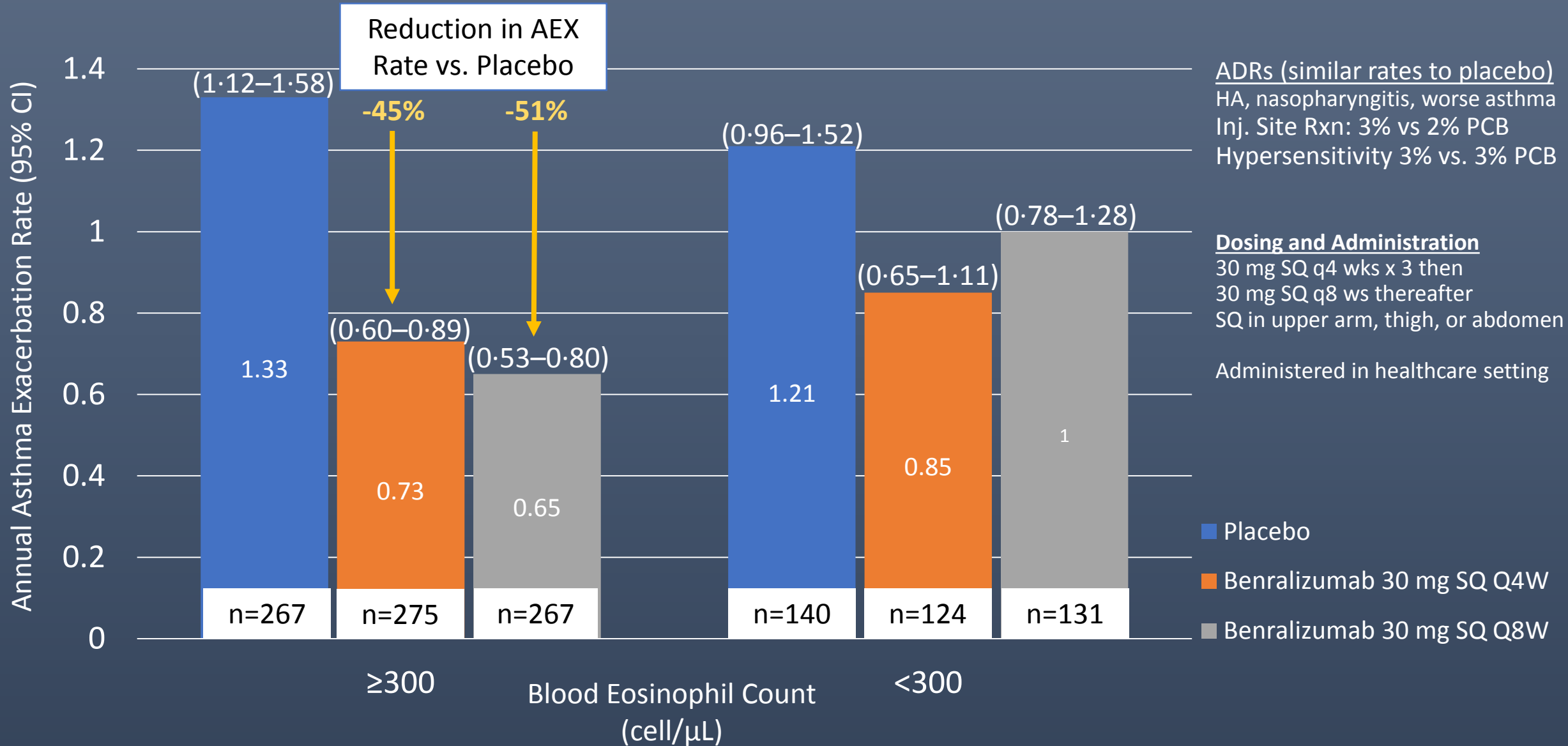
## Dosing and Administration

IV Infusion  
Administered in healthcare setting

3 mg/kg IV q4 wks  
Infusion over 20-50 minutes

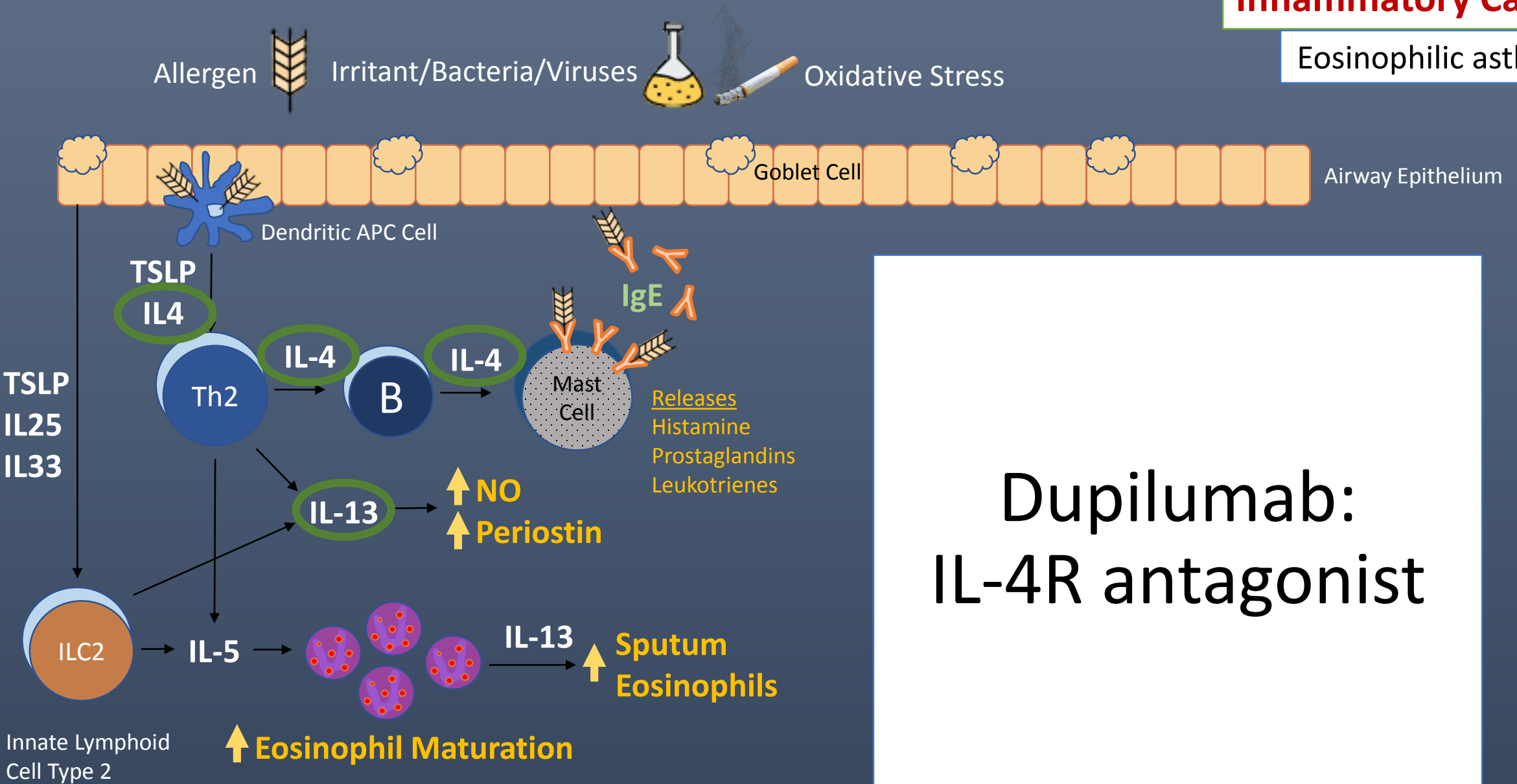
Observe for 20 minutes after infusion

# SIROCCO (Benralizumab – IL5R antagonist)










# Inflammatory Cascade








Eosinophilic asthma



Dupilumab:  
IL-4R antagonist

Effect of Dupilumab on Risk of Severe Exacerbations

Dupilumab 200 mg q 2wk	Favors Dupilumab	Favors Placebo	Relative Risk (95% CI)
Overall			<b>0.52 (0.41-0.66)</b>
Eosinophil Count			
≥ 300 cells/m <sup>3</sup>			0.34 (0.24-0.48)
≥ 150- <300 cells/m <sup>3</sup>			0.64 (0.41-1.02)
<150 cells/m <sup>3</sup>			0.93 (0.58-1.47)
FE <sub>NO</sub>			
≥ 50 ppb			0.31 (0.18-0.52)
≥ 25- <50 ppb			0.39 (0.24-0.62)
< 25 ppb			0.75 (0.54-1.05)

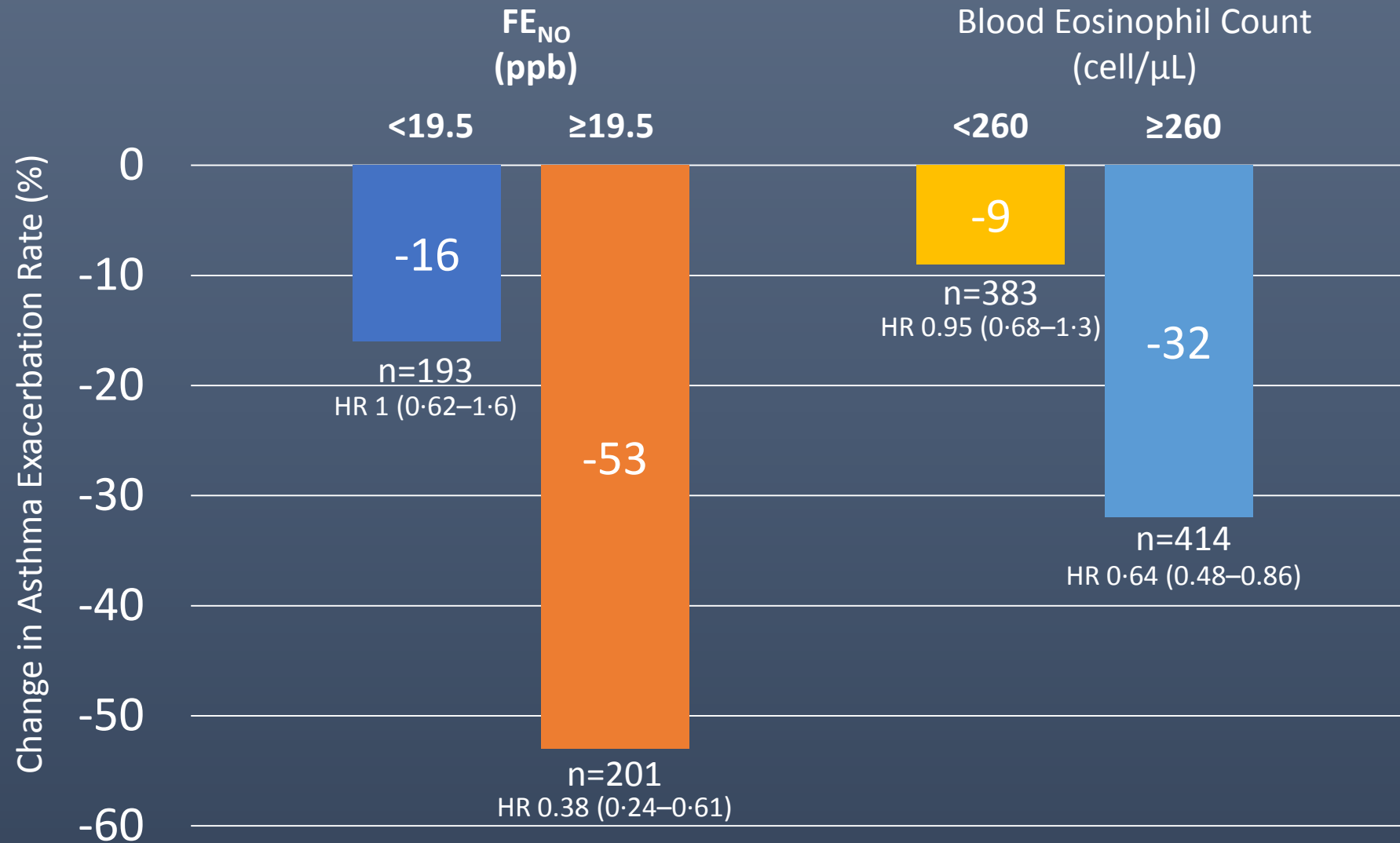
Dupilumab 300 mg q 2wk	Favors Dupilumab	Favors Placebo	Relative Risk (95% CI)
Overall			<b>0.54 (0.43-0.68)</b>
Eosinophil Count			
≥ 300 cells/m <sup>3</sup>			0.33 (0.23-0.45)
≥ 150- <300 cells/m <sup>3</sup>			0.56 (0.35-0.89)
<150 cells/m <sup>3</sup>			1.15 (0.75-1.77)
FE <sub>NO</sub>			
≥ 50 ppb			0.31 (0.19-0.49)
≥ 25- <50 ppb			0.44 (0.28-0.69)
< 25 ppb			0.79 (0.57-1.10)

# Dupilumab



- Adverse Reactions
  - Discontinuation due to adverse events: 5% (vs. 6% pcb)
  - Injection Site Reactions: 17% (vs. 6% pcb)
  - Eosinophilia: 4% (vs. 0.6% pcb)
  - Hypersensitivity <1%
- 2 pre-filled, single use syringes, for use at home
- Clear, and colorless to pale yellow solution
- Stored in refrigerator (room temperature 14 days)
- Let syringe come to room temperature (200 mg, 30m; 300 mg, 45m)
- Injected subcutaneously at 45° angle in stomach or thigh (or upper arm)

# Omalizumab



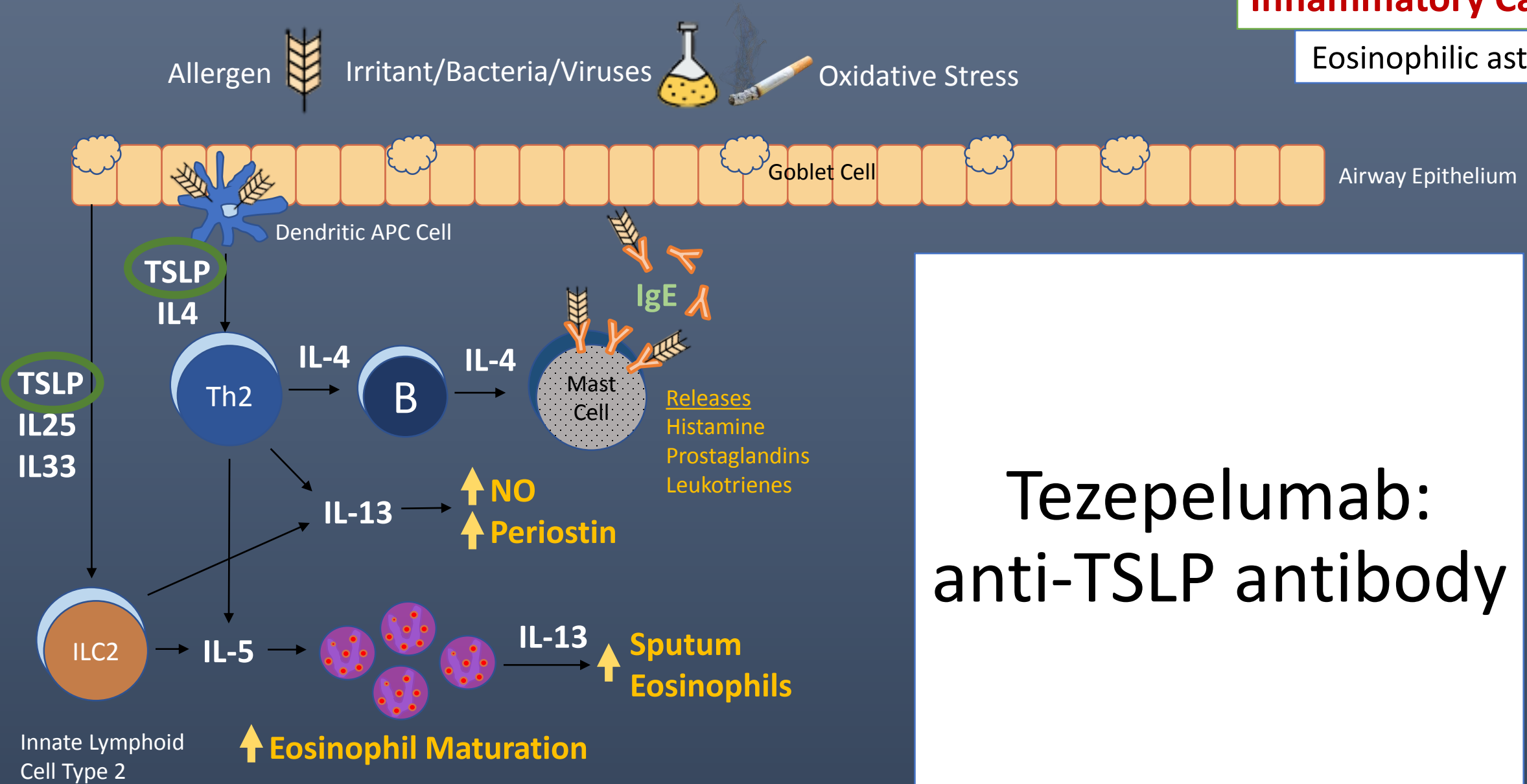
Greater reduction in exacerbations with omalizumab among patients with high Th2 biomarkers

# Investigational Pipeline

Drug	Biomarker Target	Mechanism	Eosinophilic / Neutrophilic	Phase
AZD1402	IL-4	Inhaled Anti-IL-4R Antibody	Eosinophilic	Phase I
3511294	IL-5	Anti-IL-5 Antibody	Eosinophilic	Phase I
<b>Pitrakinra</b>	IL-4/IL-13	Inhaled IL-4/IL-13 Antagonist	Eosinophilic	Phase III
REGN3500	IL-33	Anti-IL-33 Antibody	Eosinophilic	Phase II
3772847	IL-33	Anti-IL-33 Antibody	Eosinophilic	Phase II
<b>Tezepelumab</b>	TSLP	anti-TSLP antibody	Eosinophilic	Phase III
CSJ117	TSLP	anti-TSLP antibody	Eosinophilic	Phase II
Fevipiprant	PGD2/CRTH2	PGD2 antagonist	Eosinophilic	Phase III
AZD1419	TLR9	TLR9 Agonist	Neutrophilic	Phase II
2245035	TLR9	TLR9 Agonist	Neutrophilic	Phase II
Brodalumab	IL-17	Anti-IL-17R Antibody	Neutrophilic	Withdrawn
Etanercept	TNF	TNF-a receptor blocker	Neutrophilic	Withdrawn
Anakinra	IL-1	Anti-IL-1R Antibody	Neutrophilic	Phase I/II
Sirukumab	IL-6	Anti-IL-6 Antibody	Neutrophilic	Withdrawn
Navarixin	CXCR2	CXCR2 antagonist	Neutrophilic	Withdrawn

# Inflammatory Cascade

Eosinophilic asthma

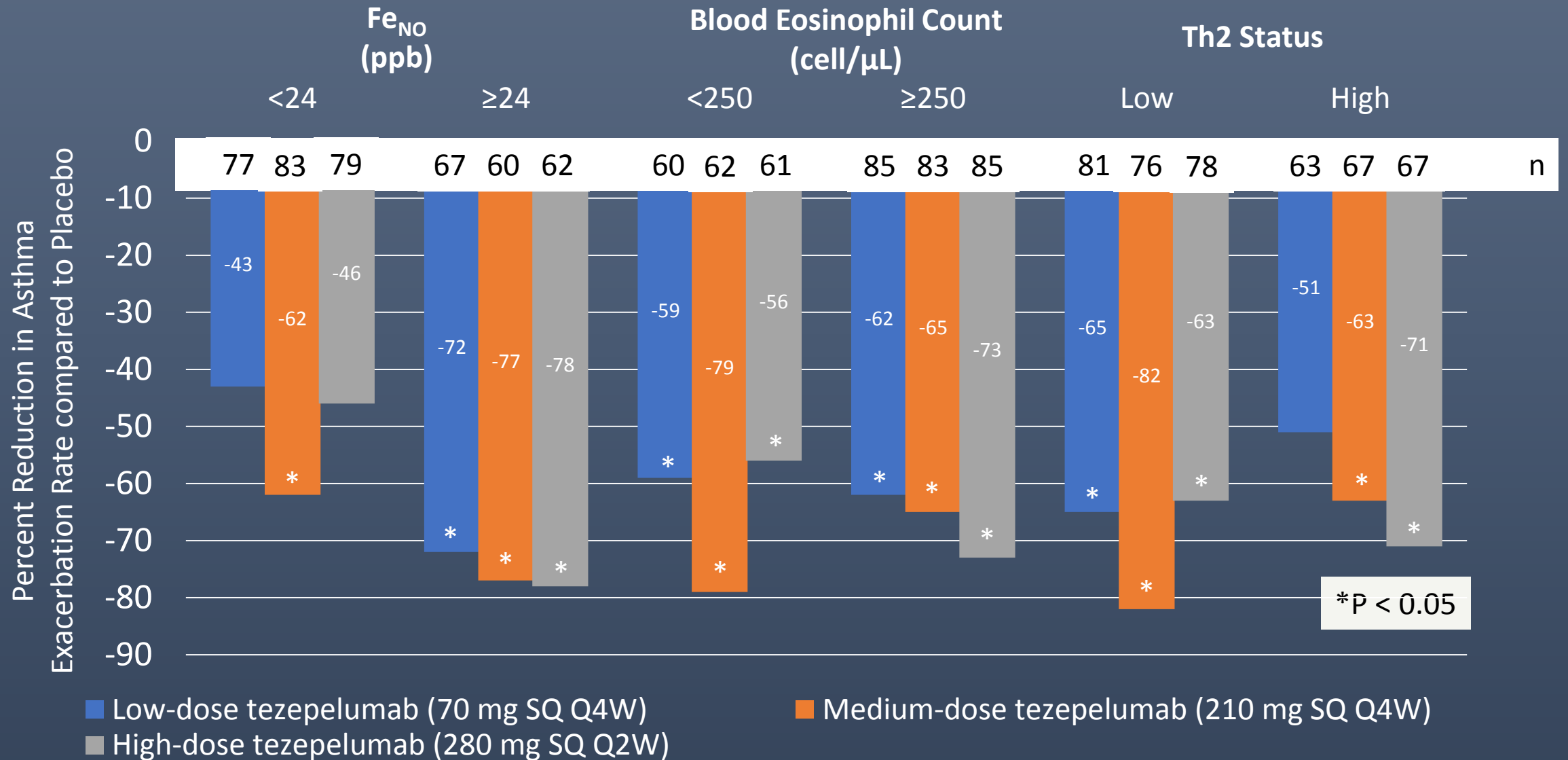


Tezepelumab:  
anti-TSLP antibody

Carr T, et al. *Am J Respir Crit Care Med*. 2018;197:22  
Pelaia G, et al. *Nat Rev Drug Discov*. 2012;11:958



# PATHWAY (Tezepelumab - Phase II)



# Tezepelumab

- Adverse Reactions

- Discontinuation due to adverse events: 1.1% (vs. 0.7% pcb) in PATHWAY
- Inj. Site Reactions (1mL): 2.5%, 2.8%, 1.4%, 3.4% in L, M, H, Placebo grps
- Inj. Site Reactions (1.5mL): 2.1%, 2.8%, 3.4%, 2.7% in L, M, H, Placebo grps
- Hypersensitivity/Anaphylaxis/Neutralizing Antibodies – None reported
- No other treatment emergent SAEs

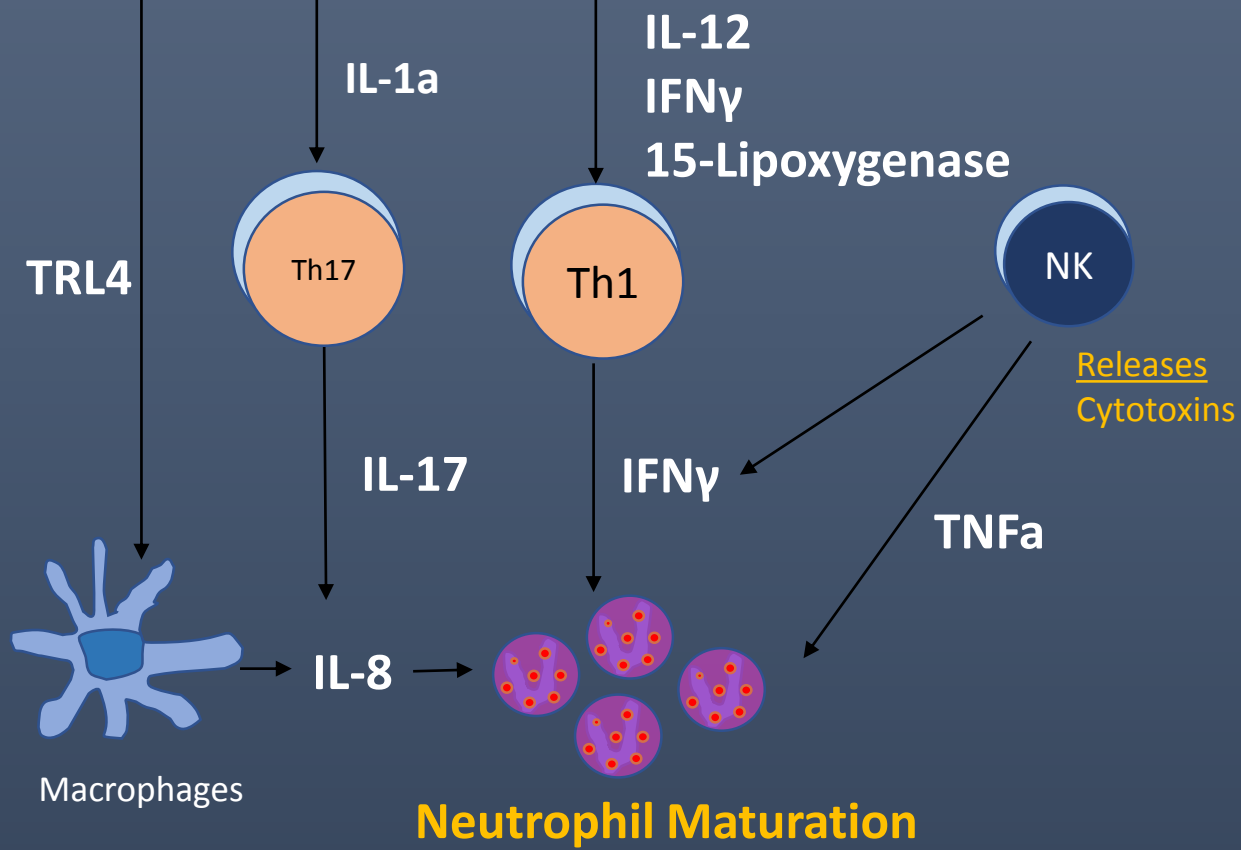
- Currently Recruiting Phase III Studies:

- NAVIGATOR (ClinicalTrials.gov Identifier: NCT03347279)
- SOURCE (ClinicalTrials.gov Identifier: NCT03406078)

# Inflammatory Cascade

Noneosinophilic asthma

Allergen  Irritant/Bacteria/Viruses  Oxidative Stress 



What about noneosinophilic asthma?

# Long Acting Muscarinic Antagonist (Tiotropium)

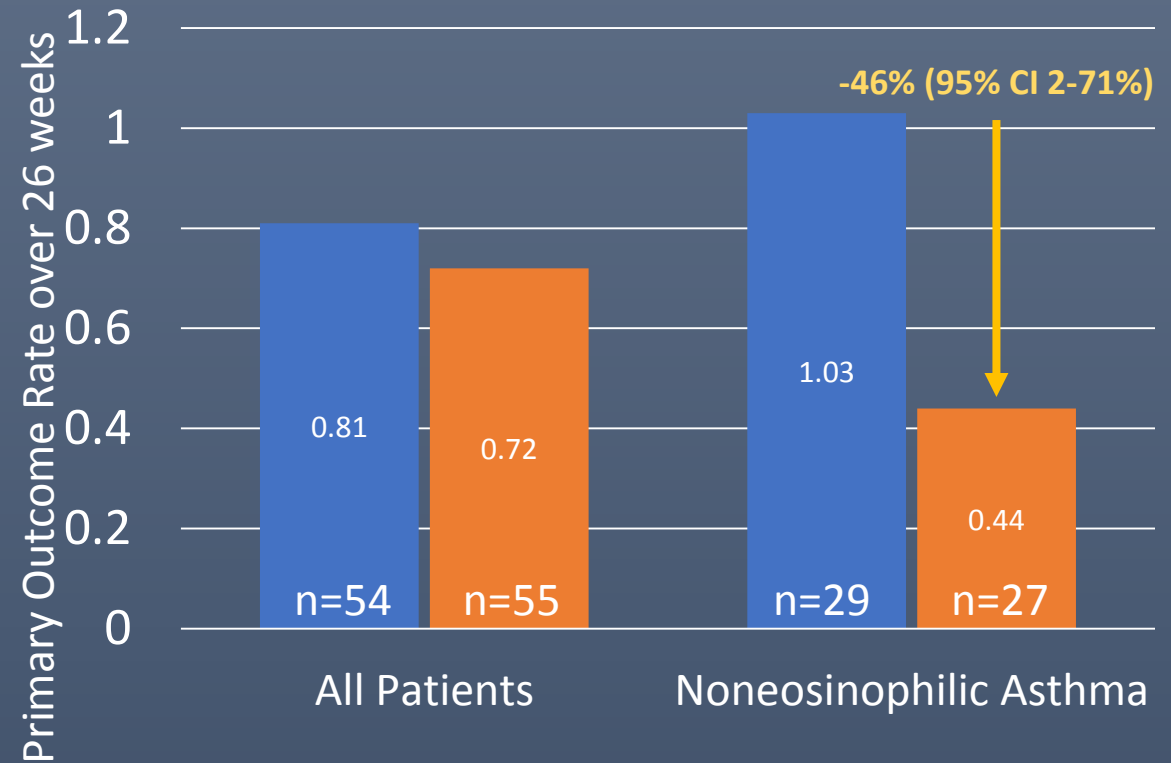
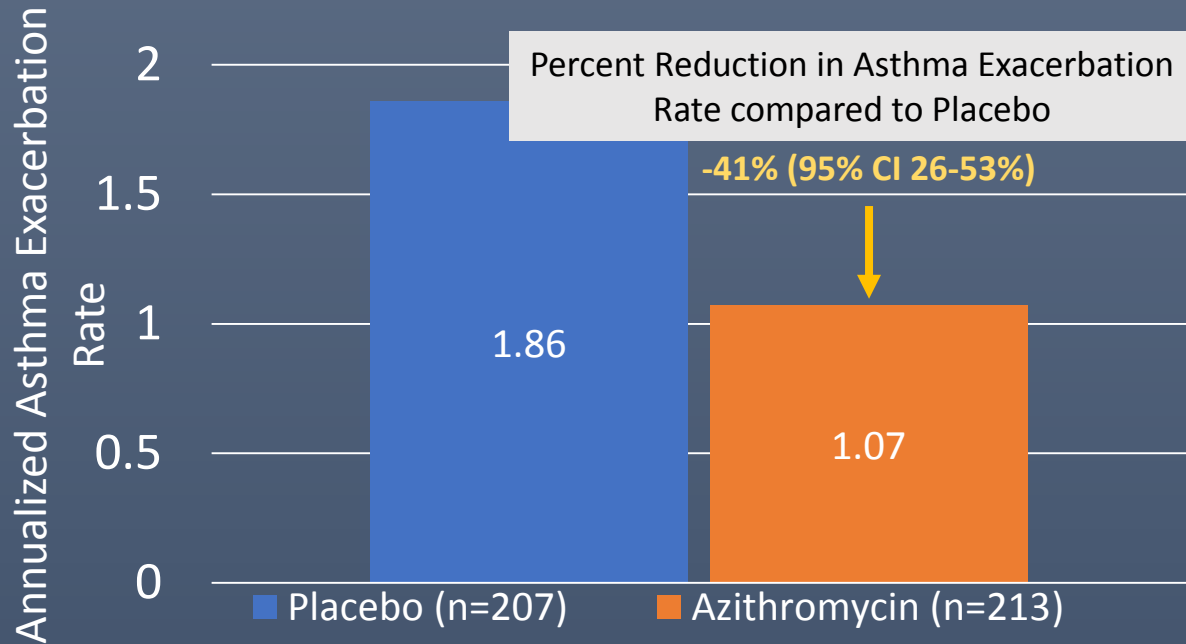
- Cause bronchodilation and reduce mucous secretion by inhibiting muscarinic cholinergic receptors on airway smooth muscle, glands, and nerves
- Dosing (Spiriva Respimat®) - Patients 12 years of age and older
  - 1.25 mcg 2 puffs daily
- Place in Therapy
  - Add-on to Med/High-Dose ICS + LABA (Step 4 or 5) therapy
- ADR: dry mouth, metallic taste, AUR
- Caution:
  - NAG, Bladder obstruction



# Antimuscarinic/Anticholinergic Medications

<b>Tiotropium Plus:</b>	<b>Low-Medium Dose ICS</b>	<b>Low-Medium Dose ICS</b>	<b>Low-Dose ICS</b>	<b>High Dose ICS/LABA</b>
Comparator	Placebo	Adjunct LABA	Medium-Dose ICS	Placebo
Number of RCTs/pts	(n=5)/2563	(n=4)/~2000	(n=1)/210	(n=3)/1197
Exacerbation requiring steroid	<b>Favors Tiotropium</b>	N/D	N/D	<b>Favors Tiotropium</b>
Exacerbation requiring Hospitalization	<b>Favors Tiotropium</b>	N/D	N/D	N/D
Asthma Control	<b>Favors Tiotropium</b>	<b>Favors LABA</b>	N/D	<b>Favors Tiotropium</b>
FEV <sub>1</sub> Change	<b>Favors Tiotropium</b>	N/D	<b>Favors Tiotropium</b>	<b>Favors Tiotropium</b>
QOL	N/D	<b>Favors LABA</b>	N/D	N/D
AEs	N/D	N/D	N/D	N/D
Cochrane Review #	CD011397	CD011438	CD011437	CD011721

# Macrolides Antibiotics?



## • AMAZES

- Azithromycin 500 mg three times per week added to ICS/LABA (n=420) x 48 weeks
- Diarrhea / **Drug resistance**
- Excluded pt with Hearing Loss / QT prolongation

## • AZISAST (AZithromycin in Severe ASThma)

- Azithromycin 250 mg daily x 5 days then 250 mg three times per week added to ICS/LABA x 26 weeks
- Primary outcome: Asthma exacerbation or LRTI
- **Beneficial for noneosinophilic asthma (blood eosinophil count < 200 cell/ $\mu$ L)**

# Vitamin D?

- Low vitamin D (25[OH]D) are associated with increased risk of asthma exacerbation in both children and adults
- Vitamin D inhibits production of IL-17 (noneosinophilic asthma)

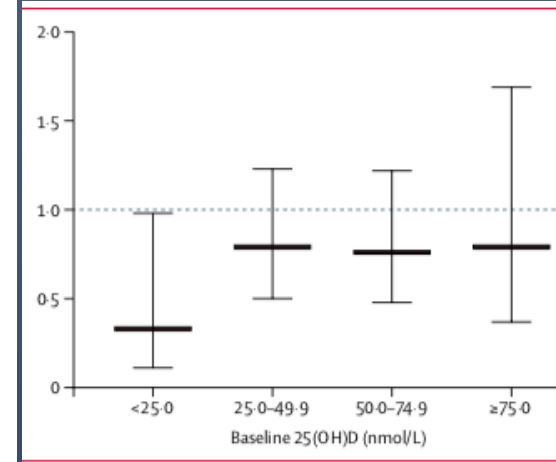
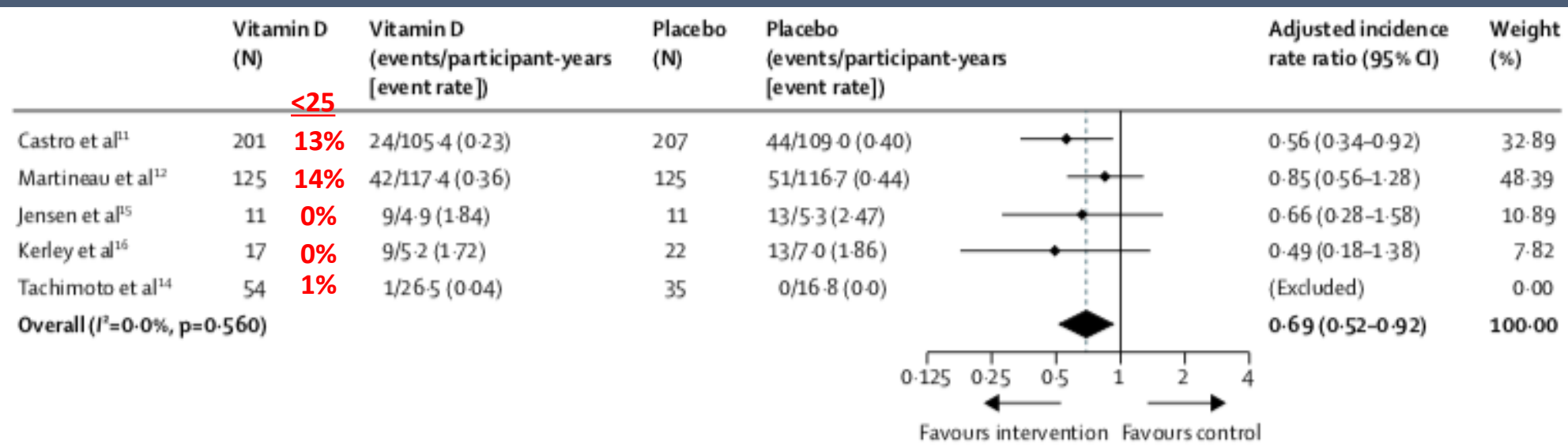


Figure 2: Two-step individual participant data meta-analysis, event rate for asthma exacerbations requiring treatment with systemic corticosteroids

# Asthma Phenotype/Endotype

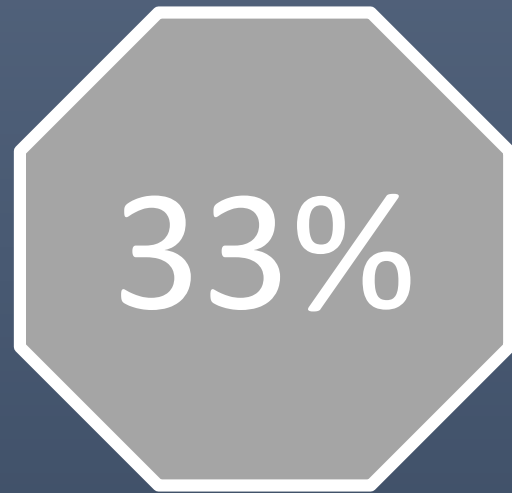
	Th2-High/Type 2 (e.g. eosinophilic asthma)	Th2-Low/Non-Type 2 (e.g. non-eosinophilic asthma)	Phenotype
Biomarkers	Eosinophils, IgE, FeNO	Neutrophils, Mixed granulocytes, Paucigranulocytosis	
Cellular	Epithelium, airway barrier dysfunction, eosinophils, airway smooth muscle cells, mast cells, NKT, Th2 vs. ILC	Epithelium, airway barrier dysfunction, airway smooth muscle cells, neutrophils, NK/NKT, Th1, Th17, ILC1/3, impaired macrophage efferocytosis, CD8+ cells	Endotype
Key Cytokines	IL-4, IL-5, IL-9, IL-13, IL-25, IL-33, TSLP, GM-CSF	IL-8, IL-17, IL-22, IL-23, IFN $\gamma$ , TNF $\alpha$ , CXCR2, IL-10 deficiency, IL-6	
Approved	Anti-IL-4/13, Anti-IL-5, Anti IL-5r, Anti-IgE	None	Treatments
Studied	Anti-IL-13, Anti-IL-4R $\alpha$ , CRTH2/PGD2, Anti-TSLP, Anti-IL-33	Macrolide antibiotics, TLR9, anti-IL-17RA, TNF $\alpha$ antagonist, anti-IL-23, anti-IL-1, Vitamin D, statins, PPAR $\gamma$ agonists, anti-CXCR2	



# Example Phenotype- Endotype Pairs

Phenotype	Clinical Characteristic	Biomarkers	Endotype
Early onset, mild-moderate, allergic	Mild asthma, good lung function, early onset, low inflammation, ICS responsive	IgE, FeNO, IL-4, 5	Th2/T2 inflammation, IgE-mediated Eosinophilia
Early onset, severe, allergic	Severe uncontrolled, poor lung function	Mixed	Th2 and Th1 inflammation Neutrophilia
Late onset, allergic	Severe uncontrolled, poor lung function, nasal polyps/sinusitis, chronic rhinosinusitis, ICS responsive	IgE, FeNO, IL-4, 5	Th2/T2 inflammation Eosinophilia Leukotrienes if ASA induced
Late onset, nonallergic	Mixed severity, obstruction, reversibility Female, Obese, GERD require high ICS doses	IL-8, IL-17, TNF $\alpha$ , IFN $\gamma$ or lack of biomarkers	Non-Th2 inflammation Neutrophilia Paucigranulocitic Oxidative stress pathways

# Comorbidities / Underlying Disorder



33%

- Atopy / Allergic Rhinitis
- Rhinosinusitis
- GERD
- Aspirin / NSAIDS / Nasal Polyps
- ACE inhibitor
- COPD
- CHF
- Anxiety / Panic Disorder / Vocal cord dysfunction
- Foreign Body
- Infection / ABPA

# Sublingual Immunotherapy (SLIT)

	Grasitek	Oralair	Ragwitek	Odactra
Allergy Covered	Timothy Grass Orchard Kentucky Blue Perennial Rye Sweet Vernal Fescue Redtop	Timothy Grass Orchard Kentucky Blue Perennial Rye Sweet Vernal	Ragweed pollen	House dust-mite
Duration	Start 12 weeks prior Continue during season	Start 16 weeks prior Continue during season	Year-round	Start 12 weeks prior Continue during season
Approved Ages	5-65	10-65	18-65	18-65
<b>Studied in patients with asthma?</b>	<b>Excluded</b>	<b>Excluded</b>	<b>Low-dose ICS FEV1&gt;70% predicted</b>	<b>At most Medium-dose ICS</b>

All SLIT products contraindicated in patients with severe uncontrolled asthma

# Sherri visited the asthma/allergy specialist

- PFTs: FEV<sub>1</sub> 75% predicted, post-bd FEV<sub>1</sub> 90% predicted
- Biomarkers
  - FeNO: 43 ppb
  - WBC 7.1 cells/mm<sup>3</sup>; Eos 2.9% (210 cells/μL)
  - Total IgE: 50 IU/mL
  - Allergen-specific IgE +: dust mites, cat dander

# Shared Decision Making for Severe Asthma

- American College of Chest Physicians/American College of Asthma and Immunology
- Interactive shared decision making tool for severe asthma treatments
- Informative handouts for patients
  - Anti-IgE
  - Anti-IL5
  - LAMA Therapy
  - Macrolides
  - Oral Steroids
  - Bronchial Thermoplasty



<http://severeasthmatusings.chestnet.org/>

# Delivery Devices

## Devices (2007):

- Metered-Dose Inhaler (MDI)
  - Metered-dose
  - Autohaler
- Dry Powder Inhalers (DPI)
  - Diskus
  - Twisthaler
  - Flexhaler
  - Turbohaler
  - Aerolizer
- Nebulized solutions

## Devices (NOW):

- Metered-Dose Inhaler (MDI)
  - Metered-dose
  - ~~Autohaler (pirbuterol dsc 2014)~~
  - **Redihaler – NEW DEVICE!**
- Dry Powder Inhalers (DPI)
  - Diskus
  - Twisthaler
  - Flexhaler
  - Turbohaler
  - ~~Aerolizer (formoterol dsc 2015)~~
  - **Neohaler (COPD)**
  - **Ellipta – NEW DEVICE!**
  - **Respiclick – NEW DEVICE!**
  - **Pressair (COPD) – NEW DEVICE!**
- Soft Mist Inhaler
  - **Respimat – NEW DEVICE!**
- Nebulized solutions



# MDI Misuse and Asthma Control

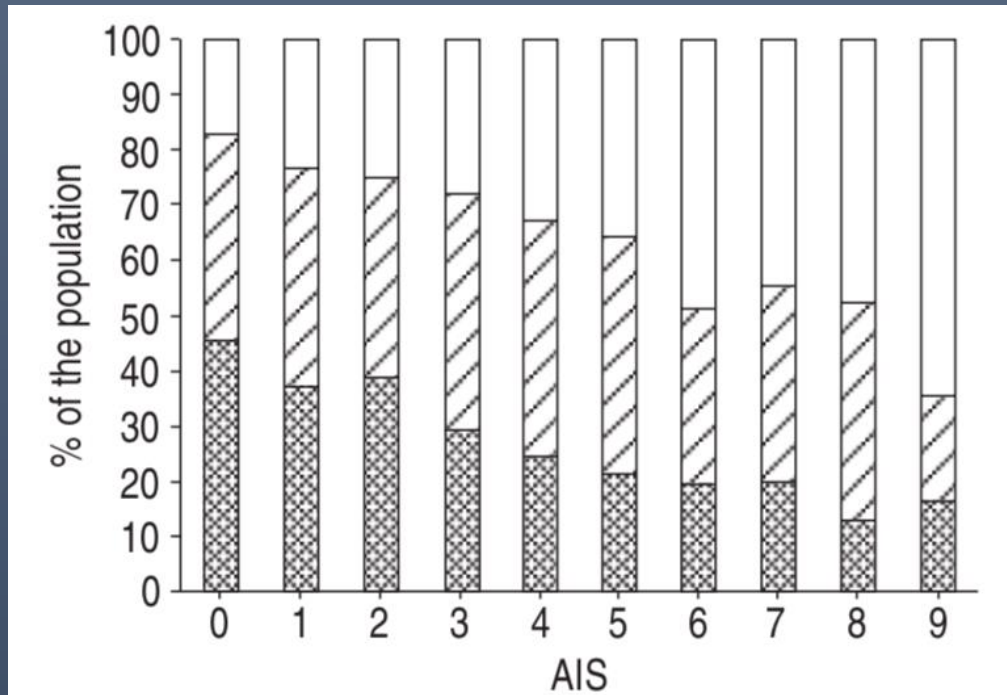






Fig. 1.—Distribution of asthma instability score (AIS) according to inhalation technique and coordination. □: misusers, poor coordinators; ▨: misusers, good coordinators; ▩: good users. n=3709 (91% of the eligible population). Analysis of variance:  $p < 0.0001$ .

Patients with less stable asthma are more likely to misuse MDIs and have poor hand-lung coordination



Device	Essential Step	Make $\geq 1$ errors (n, %)	
	MDI	Remove the mouthpiece cover	6 (3.1)
		Shake the device vigorously before use	82 (42.5)
		Trigger and simultaneously breathe in	130 (67.4)
	Aerolizer	Open the dust cap and the mouthpiece	2 (2.4)
		Insert the capsule in the well and close	5 (6)
		Push the buttons to pierce the capsule	12 (14.5)
		Breathe in rapidly and deeply	4 (4.8)
	Diskus	Slide the lever until it clicks	7 (6.8)
		Breathe in rapidly and deeply	4 (3.9)
	Turbohaler	Hold the inhaler upright	37 (25.3)
		Turn the grip until it clicks	35 (24)
		Breathe in rapidly and deeply	20 (13.7)

Less dependence on hand-lung coordination = less errors



# Spacers and Valved Holding Chambers

One year outcomes	Favors MDI + Spacer	Favors MDI + No Spacer	Odds Ratio (95% CI)
Severe Exacerbations			0.93 (0.76-1.13) 0.87 (0.53-1.42)
Overall Asthma Control			0.83 (0.73-0.96) 0.63 (0.47-0.83)
Oral Candidiasis			0.88 (0.60-1.29) 0.60 (0.28-1.29)

Beclomethasone (n=2090)  
 Fluticasone (n=444)



Love Them?

Wash them monthly?

Do not use them?

## Critical Steps

MDI

9

Diskus

8

Turbo/Twisthaler

9-10

Handihaler

10

39– 67% of nurses, doctors, and respiratory therapists are unable to adequately describe or perform critical steps of inhaler use.

Clinicians' ability to use inhalers is typically \_\_\_ years behind the introduction of new devices.

## What Clinicians Need to Know About Each Inhaler

1. How to select an inhaler
2. Advantages and Limitations
3. How to use / Ease of use
4. Cost
5. How to maintain

## Questions Clinicians Should Answer for Their Patients

1. What should the drug do?
2. Why is it being prescribed?
3. How do I know the drug is working?
4. How do I know if the drug is not working?
5. What are expected adverse effects?
6. What are unexpected or less common adverse effects?
7. How do I take it?
8. How will it taste, feel, etc?
9. When do I take it?
10. How much do I take?
11. How often do I take it?
12. When should dose or frequency change?
13. When should I call for help?

## Redihaler: Breath-Activated MDI

Beclomethasone HFA (QVAR Redihaler)

1. **OPEN CAP – HOLD UPRIGHT**
2. **BREATH OUT FULLY**
3. **PLACE MOUTHPIECE IN MOUTH**
4. **FORM GOOD SEAL WITH LIPS**
5. **INHALE DEEPLY**
6. **REMOVE INHALER WHILE HOLDING BREATH 5-10 SECONDS**
7. **BREATH OUT SLOWLY AWAY FROM INHALER**
8. **CLOSE CAP**

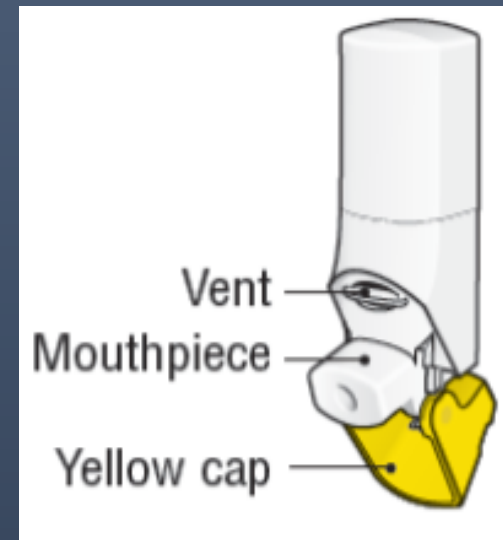
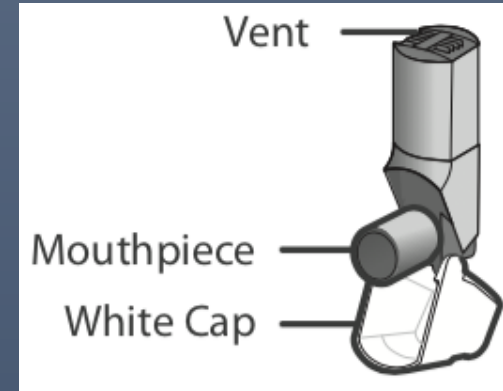
- **Do not shake**
- **Do not use with spacer**
- **Do not clean with water**

## Respiclick: Breath-Activated DPI

Fluticasone propionate (ArmonAir Respiclick)

Fluticasone/Salmeterol (Airduo Respiclick)\*\*\*

Albuterol sulfate (Proair Respiclick)



## Ellipta: Breath-Actuated DPI

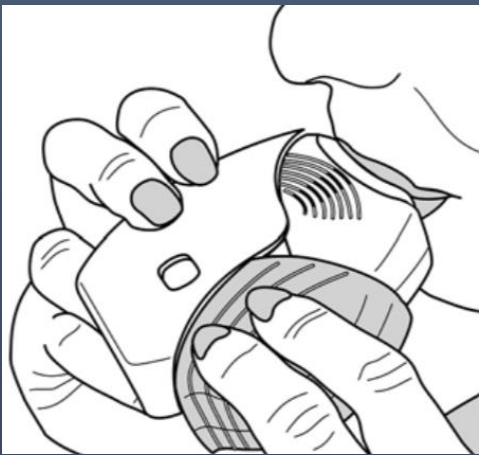
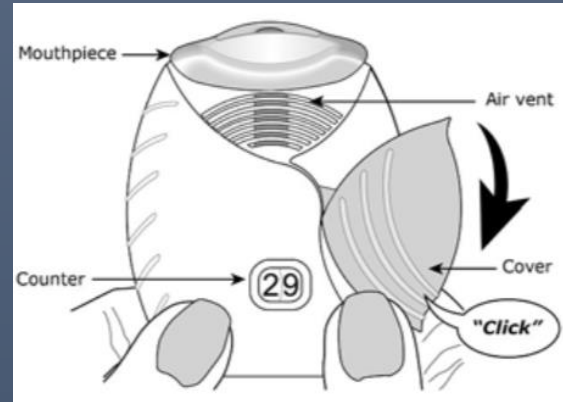
Fluticasone furoate (Arnuity Ellipta®)

Fluticasone furoate/Vilanterol (Breo Ellipta®)

Umeclidinium (Incruse Ellipta®) - COPD

Umeclidinium/Vilanterol (Anoro Ellipta®) – COPD

Fluticasone furoate/Umeclidinium/Vilanterol (Trelegy Ellipta®) - COPD



- 1. Slide the cover down until you hear a click**
  - 2. Hold the Ellipta level and away from your mouth**
  - 3. Gently breathe out. Never exhale into the Ellipta**
  - 4. Seal lips around the mouthpiece**
  - 5. Inhale rapidly and deeply. Continue to take a full, deep breath.**
  - 6. Do not block the air vent with your fingers**
  - 7. Hold your breath for up to ten seconds**
  - 8. Resume normal breathing**
  - 9. Close the Ellipta**
- Do not shake**
  - Do not use with spacer**
  - Do not clean with water**

# Respimat: Soft-Mist Inhaler

Ipratropium/Albuterol (Combivent Respimat)

Tiotropium (Spiriva Respimat 1.25 mcg and 2.5 mcg)

Tiotropium/Olodaterol (Stiolto Respimat – COPD)

Olodaterol (Striverdi Respimat – COPD)

## Preparing New Respimat

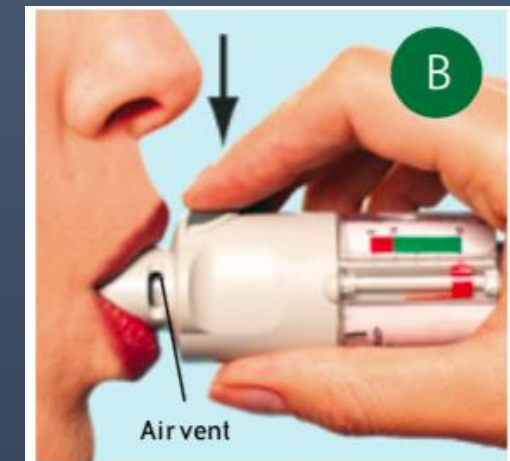
1. Hold the cap in one hand and press the safety catch on the side of the inhaler. With the other hand pull off the clear base
2. Write the discard date on the inhaler. The discard date is 3 months from the date you prepare the new Respimat
3. Take the Respimat cartridge out of the box
4. Push the narrow part of the cartridge into the inhaler
5. Push the cartridge on a firm surface to make sure it is correctly inserted

## Priming New Respimat

1. Hold the Respimat inhaler upright
2. Turn the clear base in the direction of the white arrows until it clicks
3. Flip the cap until it snaps fully open
4. Point the inhaler towards the ground
5. Press the dose release button
6. Close the orange cap
7. Repeat steps 1-6 three more times
8. Re-prime once if inhaler not used for more than 3 days; Re-prime 4 times if inhaler not used for more than 21 days

## Using Respimat

1. Hold the Respimat upright
2. Turn the clear base in the direction of the white arrows until it clicks
3. Flip the cap until it snaps fully open
4. Hold the Respimat away from your mouth and gently breathe out
5. Seal your lips around the end of the mouthpiece w/ covering vents
6. Point the Respimat inhaler to the back of your throat
7. While inhaling slowly and deeply through your mouth press the dose release button
8. Continue to breathe in slowly and deeply.
9. Hold your breath for up to ten seconds
10. Close the cap until you use the inhaler again



# Neohaler – Dry Powder Inhaler

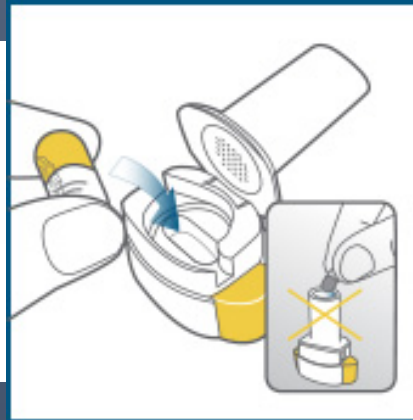
Indacaterol (Arcapta Neohaler®) - COPD

Glycopyrrolate (Seebri Neohaler®) - COPD

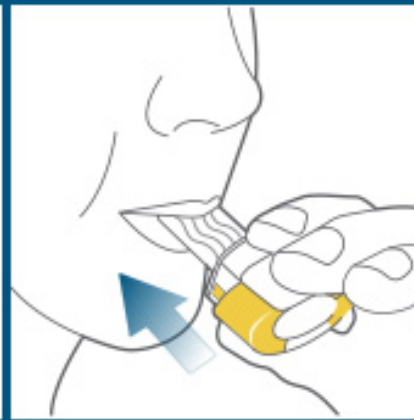
Indacaterol and glycopyrrolate (Utibron Neohaler®) - COPD



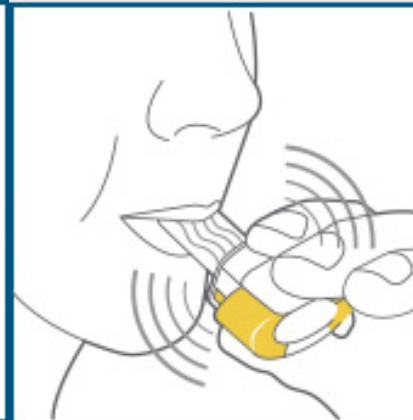
**INSERT**



**PIERCE**

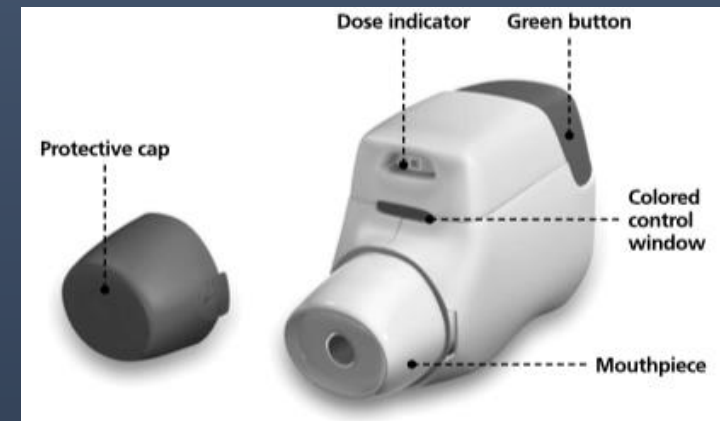


**INHALE**



**INSPECT**

# Pressair – Dry Powder Inhaler



# Overcoming Cost Barriers

## Insurance Issues

- Check formulary (preferred drug, quantity limits)
- Consider copay cards
- Consider requesting tiering exception

## NeedyMeds <https://www.needymeds.org/>

- Resources to help locate assistance programs to afford medications
- Links to Medication Assistance Programs and medications with copay programs

## Rx Outreach <https://rxoutreach.org/>

- Non-profit online pharmacy, discounts on many common medications
- Proair Resplick (\$35), Airduo (\$90)

## Online drug discount programs (e.g. GoodRx)

## Patient Advocate Foundation <https://www.copays.org/> (Asthma program currently closed)

- Financial assistance with prescription drug co-payments

## Patient Access Network <https://panfoundation.org> (Asthma program currently closed)

- Financial assistance programs for Co-pays, Premiums and Travel for Medical Care

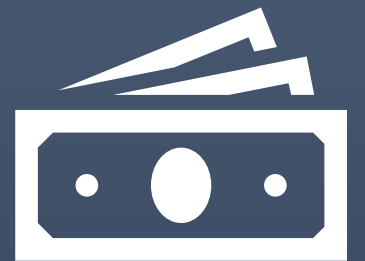
## Good Days <https://www.mygooddays.org/> (Asthma program currently closed)

- Financial assistance with prescription drug co-payments

## National Heart Lung and Blood Institute <https://www.nhlbi.nih.gov/>

- Provides free treatment, evaluation, and transportation to individuals eligible for NIH clinical trials

Clinicaltrials.gov





# Other Resources (organizations)

Chicago Asthma Consortium <http://chicagoasthma.org/>

Respiratory Health Association <https://resphealth.org/>

American Lung Association <http://www.lung.org/>

The American Academy of Allergy, Asthma & Immunology (AAAAI)  
<https://www.aaaai.org/>

Asthma and Allergy Foundation of America <http://www.aafa.org/>

Centers for Disease Control and Prevention  
<https://www.cdc.gov/asthma/default.htm>

# Asthma Medication Refresher



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11/7/2018