Asthma and COPD: Are They a Spectrum?
Treatment Responses

Ronald Dahl,
Aarhus University Hospital,
Denmark
Pharmacological Treatments

**Bronchodilators**
- Inhaled short-acting $\beta_2$-Agonist (rescue)
- Inhaled short-acting anticholinergic
- Inhaled long-acting $\beta_2$-agonist
- Inhaled long-acting anticholinergic

<table>
<thead>
<tr>
<th>Mild mod asthma</th>
<th>Severe asthma</th>
<th>COPD</th>
</tr>
</thead>
<tbody>
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</tbody>
</table>

**Controllers**
- Oral steroid
- Inhaled corticosteroids
- Low dose theophylline
- Anti-leukotriene
- Anti-IgE

<table>
<thead>
<tr>
<th>Mild – mod asthma</th>
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<tbody>
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<td>+</td>
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</tr>
<tr>
<td>Asthma</td>
<td>COPD</td>
<td></td>
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<tr>
<td>Allergen avoidance</td>
<td>Smoking cessation</td>
<td></td>
</tr>
</tbody>
</table>
First line treatment

**Asthma**
- Inhaled corticosteroid

**COPD**
- Inhaled long acting bronchodilators i.e. LAMA and LABA
First line treatment

- **Asthma**
  - Inhaled corticosteroid

- **COPD**
  - Inhaled long acting bronchodilators i.e. LAMA and LABA

Second line treatment

- **Asthma**
  - LABA
  - LAMA
  - antileukotrienes

- **COPD**
  - Inhaled corticosteroid
  - PDE4 inhibitor
### First line treatment

<table>
<thead>
<tr>
<th>Asthma</th>
<th>COPD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allergen avoidance</td>
<td>Smoking cessation</td>
</tr>
<tr>
<td>- Inhaled corticosteroid</td>
<td>- Inhaled long acting bronchodilators i.e. LAMA and LABA</td>
</tr>
</tbody>
</table>

### Second line treatment

<table>
<thead>
<tr>
<th>Asthma</th>
<th>COPD</th>
</tr>
</thead>
<tbody>
<tr>
<td>LABA</td>
<td>Inhaled corticosteroid</td>
</tr>
<tr>
<td>LAMA</td>
<td>PDE4 inhibitor</td>
</tr>
<tr>
<td>antileukotrienes</td>
<td></td>
</tr>
</tbody>
</table>

**Anti IgE**

**Allergen immunotherapy**

**antibiotics**
The central role of inflammation and bronchial hyperresponsiveness leading to symptoms in asthma

- Eosinophilic inflammation
- Bronchial hyperresponsiveness
- Allergens, Exercise, Irritants, endogenous
- Exacerbations Infections, allergens
- Expiratory flow limitation
- Hyperinflation
- Bronchial obstruction
  - Spasm, plugs
- Breathlessness
- Symptoms
- Quality of life
- Inactivity
- asthma

Adapted from Cooper. Respir Med 2009
The central role of inflammation and bronchial hyperresponsiveness leading to symptoms in asthma

- **Eosinophilic inflammation**
- **Bronchial hyperresponsiveness**
- **Expiratory flow limitation**
- **Hyperinflation**
- **Bronchial obstruction**
- **Spasm, plugs**
- **Breathlessness**
- **Symptoms**
- **Quality of life**
- **Inactivity**

Adapted from Cooper. Respir Med 2009
The central role of inflammation and bronchial hyperresponsiveness leading to symptoms in asthma

- Eosinophilic inflammation
- Bronchial hyperresponsiveness
- Expiratory flow limitation
- Hyperinflation
- Bronchial obstruction (Spasm, plugs)
- Symptoms
- Quality of life
- Inactivity
- Asthma

Factors leading to hyperresponsiveness:
- Allergens, Exercise, Irritants, endogenous
- Exacerbations, Infections, allergens

Adapted from Cooper. Respir Med 2009
# Levels of Asthma Control

(Assess patient impairment)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Controlled (All of the following)</th>
<th>Partly controlled (Any present in any week)</th>
<th>Uncontrolled</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daytime symptoms</td>
<td>Twice or less per week</td>
<td>More than twice per week</td>
<td></td>
</tr>
<tr>
<td>Limitations of activities</td>
<td>None</td>
<td>Any</td>
<td></td>
</tr>
<tr>
<td>Nocturnal symptoms (awakening)</td>
<td>None</td>
<td>Any</td>
<td></td>
</tr>
<tr>
<td>Need for rescue/“reliever” treatment</td>
<td>Twice or less per week</td>
<td>More than twice per week</td>
<td></td>
</tr>
<tr>
<td>Lung function (PEF or FEF₂₅₋₇₅)</td>
<td>Normal</td>
<td>&lt; 80% predicted or personal best (if known) on any day</td>
<td></td>
</tr>
</tbody>
</table>

Assessment of Future Risk (risk of exacerbations, instability, rapid decline in lung function, side effects)
## TREATMENT STEPS

<table>
<thead>
<tr>
<th>STEP 1</th>
<th>STEP 2</th>
<th>STEP 3</th>
<th>STEP 4</th>
<th>STEP 5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>as needed rapid-acting β&lt;sub&gt;2&lt;/sub&gt;-agonist</strong></td>
<td><strong>as needed rapid-acting β&lt;sub&gt;2&lt;/sub&gt;-agonist</strong></td>
<td><strong>medium- or high-dose ICS plus long-acting β&lt;sub&gt;2&lt;/sub&gt;-agonist</strong></td>
<td><strong>oral glucocorticosteroid (lowest dose)</strong></td>
<td></td>
</tr>
</tbody>
</table>

### SELECT ONE

- Low-dose ICS*<br>- Leukotriene modifier**
- Low-dose ICS plus long-acting β<sub>2</sub>-agonist
- Medium- or high-dose ICS
- Low-dose ICS plus leukotriene modifier
- Low-dose ICS plus sustained-release theophylline

### SELECT ONE

- Low-dose ICS plus long-acting β<sub>2</sub>-agonist
- Medium- or high-dose ICS plus long-acting β<sub>2</sub>-agonist
- Leukotriene modifier
- Sustained-release theophylline
- Tiotropium

*inhaled glucocorticosteroids  
** receptor antagonist or synthesis inhibitors

**Shaded green - preferred controller options**

Gina 2010
Clinical effects of inhaled corticosteroids in bronchial asthma

- **Certain** improve quality of life, physical, social and psychological function

- **Certain** reduce lung function
  - BHR = diurnal variation, EIA etc.
  - Symptoms day/night
  - Exacerbation/hospitalizations
  - Need for rescue medication
  - Need for oral corticosteroids

- **Probable** reduce asthma deaths
  - Acc. decline in lung function

- **Possible** long term remission/cure
Time to TOTAL CONTROL for individual criteria in the GOAL study for Seretide treated patients

- No night awakenings
- No “rescue” SABA use
- PEF am
- No daytime symptoms

Proportion of patients achieving control

Time to first week of TOTAL CONTROL (All strata)

Phase I

Phase II

GOAL Study
Continued improvements with sustained treatment

well controlled asthma

% of patients controlled each week

Week

All patients

GOAL Study
Mild to moderate asthma treatment for 8 weeks with FP

Chervinsky et al. JACI 1994, 94: 676-683
Relative increase in the number of asthmatic patients entitled to special reimbursement for their drug costs and decreases in death rate and days in hospital (index, 1981=100)
Ratio of inhaled corticosteroids and short acting β₂-agonists from 1994 to 1999
Change in mean PEF after inhaled beclomethasone (BDP) in asthma

Tomlinson et al, Thorax 2005

* p<0.01
Change in mean PEF after inhaled beclomethasone (BDP) in asthma

* p < 0.01

Tomlinson et al, Thorax 2005
Arguments for ICS in COPD

**Pro**
- Reduced rate of exacerbations
- Reduced decline in quality of life
- Reduced annual decline in spirometry

**CON**
- Local side effect in mouth and throat
- Horseness
- Pneumonia
- Suppression HPA axis
- Cost

Cochrane Database of Systematic Reviews 2007
Background
- ICS on exacerbation rate

![Graph showing exacerbation rate by FEV1 categories and treatment groups with p-values.]
Asthma-related mortality and ICS sales in New Zealand: 1974–1992

Rate ratio of asthma-related deaths by number of ICS MDIs per year

Addition of inhaled long-acting beta2-agonists to inhaled steroids as first line therapy for persistent asthma in steroid-naive adults

<table>
<thead>
<tr>
<th></th>
<th>ICS + LABA better than ICS alone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asthma exacerbations</td>
<td>No</td>
</tr>
<tr>
<td>FEV-1</td>
<td>Yes - 210 ml</td>
</tr>
<tr>
<td>Symptom free days</td>
<td>Yes 11% (CI 2 – 20)</td>
</tr>
<tr>
<td>Rescue beta-2 use</td>
<td>No</td>
</tr>
<tr>
<td>Adverse events, withdrawals</td>
<td>No</td>
</tr>
</tbody>
</table>

insufficient evidence to recommend use of combination therapy rather than ICS alone as a first-line treatment

Chroin 2009 The Cochrane Collaboration
Study design

Double blind

- Seretide 50/250mcg bd

Previous therapy

- Fluticasone propionate 250mcg bd
- Salmeterol 50mcg bd

Open phase

- Therapy adjusted according to requirements

1 year

2 years

Treatment flow

Lundbäck et al. Respir med 2006
Time to first increase from randomised treatment

% patients without change in randomised treatment

FP/salmetrol 50/250mcg bd
Fluticasone 250mcg bd
Salmeterol 50mcg bd

Time to first increase from randomised treatment (years)

Lundbäck et al. Respir med 2006
Changes in treatment and dose throughout the study period

Lundback B et al, Respir Med 2006
# Treatment Steps

<table>
<thead>
<tr>
<th>REDUCE</th>
<th>INCREASE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>STEP 1</strong></td>
<td><strong>STEP 5</strong></td>
</tr>
<tr>
<td><strong>STEP 2</strong></td>
<td><strong>STEP 4</strong></td>
</tr>
<tr>
<td><strong>STEP 3</strong></td>
<td><strong>STEP 5</strong></td>
</tr>
</tbody>
</table>

**TREATMENT STEPS**

<table>
<thead>
<tr>
<th><strong>CONTROLLER OPTIONS</strong></th>
<th><strong>SELECT ONE</strong></th>
<th><strong>SELECT ONE</strong></th>
<th><strong>ADD ONE OR MORE</strong></th>
<th><strong>ADD ONE OR BOTH</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>as needed rapid-acting $\beta_2$-agonist</td>
<td>low-dose ICS*</td>
<td>low-dose ICS or high-dose ICS</td>
<td>medium- or high-dose ICS</td>
<td>oral glucocorticosteroid (lowest dose)</td>
</tr>
<tr>
<td>leukotriene modifier**</td>
<td>medium- or high-dose ICS</td>
<td>leukotriene modifier</td>
<td>anti-IgE treatment</td>
<td></td>
</tr>
<tr>
<td>low-dose ICS plus leukotriene modifier</td>
<td>sustained-release theophylline</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>low-dose ICS plus sustained-release theophylline</td>
<td>tiotropium</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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*inhaled glucocorticosteroids
**receptor antagonist or synthesis inhibitors
The central role of airflow limitation leading to symptoms in COPD

COPD

- Expiratory flow limitation
- Air trapping
- Hyperinflation

Exercise

- Deconditioning

Breathlessness

Exacerbations

- Quality of life
- Inactivity

Reduced exercise capacity

Adapted from Cooper. Respir Med 2009
The central role of airflow limitation leading to symptoms in COPD

COPD

Inhibition of these events reduce attacks and improve symptoms

Exercise

Expiratory flow limitation
Air trapping
Hyperinflation

Breathlessness

Deconditioning

Quality of life

Inactivity

Reduced exercise capacity

Exacerbations

Inhibition of these events reduce attacks and improve symptoms

Adapted from Cooper. Respir Med 2009
Outcomes are correlated with mean change from baseline in trough $\text{FEV}_1$

<table>
<thead>
<tr>
<th>Average $\Delta \text{FEV}_1$ (mL)</th>
<th>Category centred value of $\Delta \text{FEV}_1$ (mL)</th>
<th>TDI (n=2,781)</th>
<th>$\Delta \text{SGRQ}$ (n=3,141)</th>
<th>Exacerbation rate/year (n=3,158)</th>
</tr>
</thead>
<tbody>
<tr>
<td>–500, –50</td>
<td>–275</td>
<td>1.44</td>
<td>–3.15</td>
<td>0.63</td>
</tr>
<tr>
<td>–50, 50</td>
<td>0</td>
<td>1.31</td>
<td>–3.17</td>
<td>0.58</td>
</tr>
<tr>
<td>50, 150</td>
<td>100</td>
<td>1.79</td>
<td>–3.84</td>
<td>0.61</td>
</tr>
<tr>
<td>150, 250</td>
<td>200</td>
<td>2.12</td>
<td>–5.84</td>
<td>0.51</td>
</tr>
<tr>
<td>250, 500</td>
<td>375</td>
<td>2.68</td>
<td>–7.38</td>
<td>0.38</td>
</tr>
</tbody>
</table>

- TDI and $\Delta \text{SGRQ}$ at 12 weeks improved with increasing positive $\Delta \text{FEV}_1$ (all $p<0.001$)
- Individual-level correlations: $r=0.06–0.18$
- Cohort-level correlations: $r=0.79–0.95$
As new bronchodilators are introduced there have been more consistent improvements in outcomes for patients with COPD

<table>
<thead>
<tr>
<th></th>
<th>Duration of action (hours)</th>
<th>Lung function</th>
<th>Breathlessness</th>
<th>Exercise endurance*</th>
<th>Quality of life</th>
<th>Exacerbations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Albuterol</td>
<td>4–6</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Ipratropium bromide</td>
<td>6–8</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Salmeterol</td>
<td>≥12</td>
<td>✓ ✓</td>
<td>✓</td>
<td>✓ (✓†)</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Formoterol</td>
<td>≥12</td>
<td>✓ ✓</td>
<td>✓ ✓</td>
<td>✓</td>
<td>✓ ✓</td>
<td>✓</td>
</tr>
<tr>
<td>Tiotropium</td>
<td>24</td>
<td>✓ ✓ ✓</td>
<td>✓ ✓ ✓</td>
<td>✓</td>
<td>✓ ✓ (✓†)</td>
<td>✓ ✓ (✓†)</td>
</tr>
</tbody>
</table>

✓ evidence of effectiveness; ✓ ✓ evidence of effectiveness over SABA or SAMA; ✓ ✓ ✓ evidence of effectiveness over LABA

*Outcome demonstrated by all bronchodilators, lack of evidence of significant differences between them
†Equivocal evidence depending on formulation; 5, 10, 11 Evidence of numerical improvements over shorter acting comparator 4, 8
NA = evidence not available

Bronchodilators remain central to the symptomatic management of COPD

- Compared with placebo, existing long-acting bronchodilators\(^1\):
  - significantly improve and sustain lung function
  - significantly improve hyperinflation and symptoms of breathlessness
  - significantly improve quality of life
  - Significantly reduce exacerbations

1. GOLD 2009
TORCH Study, COPD all cause mortality

- Placebo: 16.0% at 156 weeks
- Salm: 15.2% at 156 weeks
- FP: 13.5% at 156 weeks
- FP/Salm: 12.6% at 156 weeks

17.5% ↓ p=0.052

Calverley PA et al: NEJM  2007
TORCH Study: 2x2 Factorial analysis

<table>
<thead>
<tr>
<th></th>
<th>Yes (deaths)</th>
<th>No (deaths)</th>
<th>Crude RR</th>
<th>Adjusted RR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluticasone</td>
<td>439/3067</td>
<td>436/3045</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Salmeterol</td>
<td>398/3054</td>
<td>477/3058</td>
<td>0.83</td>
<td>0.83 (p=0.0043)</td>
</tr>
</tbody>
</table>

- No interaction between FP and salmeterol: p=0.32
- All of the benefit provided by salmeterol

Suissa S et al: ERJ 2008
Annual decline in postbronchodilator FEV1 ml/year in the UPLIFT and TORCH studies

<table>
<thead>
<tr>
<th></th>
<th>UPLIFT</th>
<th>TORCH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Placebo</td>
<td>42</td>
<td>55</td>
</tr>
<tr>
<td>TIO</td>
<td>40</td>
<td>S</td>
</tr>
<tr>
<td></td>
<td></td>
<td>42</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F</td>
</tr>
<tr>
<td></td>
<td></td>
<td>42</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SFC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>39</td>
</tr>
</tbody>
</table>

NS

P<0.003

P<0.001
Probability of death (%) after 3 years observation in two large COPD trials

- **UPLIFT**
  - Control: 11.0, P=0.09
  - TIO: 10.1

- **TORCH**
  - Placebo: 15.2, SFC: 12.6, P=0.052
Exacerbation rates in two large COPD trials

**UPLIFT**
- Control: 0.85
- TIO: 0.73

**TORCH**
- Placebo: 1.13
- SFC: 0.85

-25% reduction in exacerbation rate with SFC compared to Placebo.
1 year studies - different maintenance treatments

M2-124

- 14.9%
(CI -26; -2)
p = 0.0278

M2-125

- 18.5%
(CI -29; -7)
p = 0.0035

Mean rate of exacerbations per patient per year

Calverley PM et al. Lancet 2009
6 months studies
Maintenance treatment with salmeterol

Placebo
500µg Roflumilast

Hazard ratio = 0.6
(CI 0.4; 0.9)
p = 0.0067

Fabbri LM et al. NEJM 2009
6 months studies
Maintenance treatment with tiotropium

Hazard ratio = 0.8 (CI 0.5;1.1)  
p = 0.1959

Fabbri LM et al. NEJM 2009
Roflumilast— adverse effects

- GI symptoms

- Weight loss
Combined assessment of COPD

- Assess symptoms
- Assess degree of airflow limitation using spirometry
- Assess risk of exacerbations

An opportunity to combine these assessments for the purpose of improving management of COPD
Combined assessment of COPD

(mMRC or CAT score)

Symptoms

(GOLD Classification of Airflow Limitation)

Risk

Exacerbation history

Risk

2 or more

(A) mMRC 0-1
CAT < 10

(B) mMRC 2+
CAT 10+

(C) mMRC 2+
CAT < 10

(D) mMRC 0-1
CAT 10+
# Combined assessment of COPD

Combined assessment of COPD

<table>
<thead>
<tr>
<th>Patient</th>
<th>Characteristic</th>
<th>Spirometric Classification</th>
<th>Exacerbations per year</th>
<th>mMRC</th>
<th>CAT</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Low Risk, Less Symptoms</td>
<td>GOLD1-2</td>
<td>≤ 1</td>
<td>0-1</td>
<td>&lt; 10</td>
</tr>
<tr>
<td>B</td>
<td>Low Risk, More Symptoms</td>
<td>GOLD1-2</td>
<td>≤ 1</td>
<td>2+</td>
<td>≥ 10</td>
</tr>
<tr>
<td>C</td>
<td>High Risk, Less Symptoms</td>
<td>GOLD3-4</td>
<td>2+</td>
<td>0-1</td>
<td>&lt; 10</td>
</tr>
<tr>
<td>D</td>
<td>High Risk, More Symptoms</td>
<td>GOLD3-4</td>
<td>2+</td>
<td>2+</td>
<td>≥ 10</td>
</tr>
</tbody>
</table>
Management of COPD – the aims

- Relieve symptoms
- Improve exercise tolerance
- Improve health status
- Prevent disease progression
- Prevent and treat exacerbations
- Reduce mortality
Management of COPD – the aims

- Relieve symptoms
- Improve exercise tolerance
- Improve health status
- Prevent disease progression
- Prevent and treat exacerbations
- Reduce mortality

Reduce symptoms

Reduce risk

APSR 2011

GOLD 2011 Revision
Management of COPD

Pharmacological  First choice

- mMRC 0-1
- CAT < 10
- GOLD 1

- mMRC 2+
- CAT 10+
- GOLD 2

- 2 or more Exacerbations per year
- GOLD 3

- 1
- GOLD 4

- 0
Management of COPD
Pharmacological First choice

<table>
<thead>
<tr>
<th>GOLD 4</th>
<th>mMRC 0-1</th>
<th>CAT &lt; 10</th>
<th>SABA or SAMA prn.</th>
</tr>
</thead>
<tbody>
<tr>
<td>GOLD 3</td>
<td>mMRC 2+</td>
<td>CAT 10+</td>
<td></td>
</tr>
<tr>
<td>GOLD 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GOLD 1</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Management of COPD
Pharmacological First choice

- GOLD 4
- GOLD 3
- GOLD 2
- GOLD 1

- mMRC 0-1 CAT < 10
- mMRC 2+ CAT 10+

- SABA or SAMA prn.
- LABA or LAMA

Exacerbations per year
- 0
- 1
- 2 or more
Management of COPD
Pharmacological First choice

<table>
<thead>
<tr>
<th>GOLD 4</th>
<th>LABA and ICS or LAMA</th>
</tr>
</thead>
<tbody>
<tr>
<td>GOLD 3</td>
<td>SABA or SAMA prn.</td>
</tr>
<tr>
<td>GOLD 2</td>
<td>LABA or LAMA</td>
</tr>
<tr>
<td>GOLD 1</td>
<td>mMRC 0-1 CAT &lt; 10</td>
</tr>
</tbody>
</table>

mMRC 2+ CAT 10+

Exacerbations per year
2 or more
1
0
Management of COPD

Pharmacological First choice

GOLD 4
LABA and ICS or LAMA

GOLD 3
SABA or SAMA prn.

GOLD 2
LABA or LAMA

GOLD 1
mMRC 0-1 CAT < 10

Exacerbations per year
2 or more

Laba and ICS and LAMA

mMRC 2+ CAT 10+

0
# Management of COPD

## Pharmacological

<table>
<thead>
<tr>
<th>Patient</th>
<th>First choice</th>
<th>First alternatives</th>
<th>Other alternatives</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>SABA or SAMA prn.</td>
<td>SABA and SAMA LABA or LAMA</td>
<td>Theophylline</td>
</tr>
<tr>
<td>B</td>
<td>LABA or LAMA</td>
<td>LABA and LAMA</td>
<td>Theophylline SABA or SAMA SABA and SAMA</td>
</tr>
<tr>
<td>C</td>
<td>LABA and ICS or LAMA</td>
<td>LABA and LAMA</td>
<td>Theophylline SABA and/or SAMA Consider PDE4-inh. LAMA and ICS</td>
</tr>
<tr>
<td>D</td>
<td>LABA and ICS and LAMA</td>
<td>ICS/LABA and LAMA LAMA and PDE4-inh.</td>
<td>Theophylline SABA and/or SAMA LAMA and ICS Carbocysteine</td>
</tr>
</tbody>
</table>
### First line treatment

<table>
<thead>
<tr>
<th>Asthma</th>
<th>COPD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Allergen avoidance</strong></td>
<td><strong>Smoking cessation</strong></td>
</tr>
<tr>
<td>• Inhaled corticosteroid</td>
<td>• Inhaled long acting bronchodilators i.e. LAMA and LABA</td>
</tr>
</tbody>
</table>

### Second line treatment

<table>
<thead>
<tr>
<th>Asthma</th>
<th>COPD</th>
</tr>
</thead>
<tbody>
<tr>
<td>• LABA</td>
<td>• Inhaled corticosteroid</td>
</tr>
<tr>
<td>• LAMA</td>
<td>• PDE4 inhibitor</td>
</tr>
<tr>
<td>• antileukotrienes</td>
<td></td>
</tr>
</tbody>
</table>
Thank you for your attention