### **RSPT 1410 Common Respiratory Drugs**

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Wilkins: Chapter 32

### Classifications

- Respiratory therapists administer several different class of drugs:

  - Sympathomimetics (adrenergic)
     Parasympatholytics (anticholinergic)
     Mucoactives (mucolytic)

  - Antiasthmatics (prophylactic)
  - Anti-infectives (antibiotic)

Sympathomimetics (Adrenergics)

## Sympathomimetics

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· Agents

- Albuterol (Ventolin, Proventil)
- Bitolterol (Tornalate)
- Formoterol (Foradil)
- Levalbuterol (Xopenex)
- Metaproterenol (Metaprel, Alupent)
- Pirbuterol (Maxair)
- Salmeterol (Serevent, Advair)
   Terbutaline (Brethaire)

### Sympathomimetics

- General indication is relaxation of bronchial smooth muscle in the presence of reversible airflow obstruction associated with
  - acute and chronic asthma
  - bronchitis
  - emphysema
  - bronchiectasis
- · Usually categorized as short-acting and long-acting

### Sympathomimetics

stimulate

- $\alpha$ -receptors  $\rightarrow$  vasoconstriction
- β1-receptors → cardiac stimulant
- $\,\beta\text{2-receptors} \rightarrow \text{relaxes}$  bronchial smooth muscle





### Sympathomimetics

- Short-acting agents
  - indicated for relief of acute episodes termed "rescue drugs" in the National Asthma Education and Prevention Program Expert Panel II (NAEPP

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- EPR II) guidelines
   ultra-short-acting (<3 hours duration): epinephrine, isoproterenol, isoetharine
   short-acting (4-6 hours duration): metaproterenol, terbutaline, albuterol, bitolterol, pirbuterol, levalbuterol

### Sympathomimetics

- · Long-acting agents
  - are indicated primarily for maintenance bronchodilation, control of bronchospasm and control of nocturnal symptoms; usually combined with an anti-inflammatory drug
    - long-acting (12 hours duration): salmeterol, formoterol

### Sympathomimetics

- Anti-inflammatory actions
  - both short-acting and long-acting  $\beta$  agonists show anti-inflammatory actions in vitro

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- salmeterol and formoterol inhibit human mast cell activation and degranulation
- neither drug is considered to have an effect on
- airway inflammation sufficient to replace corticosteroids

# Sympathomimetics Adverse side effects tremor nausea palpitations & tachycardia tolerance to drug effects headache loss of bronchoprotection insomnia worsening of V/Q ratio increased BP hypokalemia

bronchoconstrictor reaction

nervousness

dizziness

#### 12 Sympathomimetics SVN: 1% solution (1:100), 0.25:0.5 ml (2:5:5.0 mg) qid MDI: 0.2 mg/puff, puffs as ordered or needed SVN: 2.25% solution, 0.25:0.5 ml (5:63-11:25 mg) qid SVN: 0.5% solution (1:200), 0.25:0.5 ml (1:25:25 mg) qid MDI: 105 mg/puff, 2 puffs qid SVN: 1% solution, 0.25:0.5 Epinephrine Adrenalin Cl α, β Onset: 3-5 min Peak: 5-20 min Duration: 1-3 hr Onset: 3-5 min Peak: 5-20 min Duration: 0.5-2 hr Onset: 2-5 min Peak: 5-30 min Duration: 0.5-2 hr Micro-Nefrin, Asthma Nefrin, various α, β Racemic epinephrine Isuprel, Isuprel Mistometer Isoproterenol β Onset: 1-6 min Peak: 15-60 min Duration: 1-3 hr Onset: 5-30 min Peak: 30-60 min Duration: 3-6 hr putts qid SVN: 1% solution, 0.25-0.5 ml (2.5-5.0 mg) qid Isoetharine HCl Isoetharine β2 Im (2=350 mg) qua qd-6h The 2.5 or 5 mg, 5 mg q6h Im): 1 mg/ml. 0.25 mg q5 The 2.5 or 5 mg, 5 mg q6h Im): 1 mg/ml. 0.25 mg 8C SYN: 5% solution. 0.3 ml (15 mg) tid, qid MDI: 650 ug/ptff, 2-3 puffs tid, qid The: 10 or 20 mg, 20 mg tid, qid Symp: 10 mg/5 ml, 2 tsp tid, qid Terbutaline Brethaire $\beta_2$ Onset: 1-5 min Peak: 60 min Duration: 2-6 hr Metaproterenol Alupent β.



Sympathomimetics						
Albuterol	Proventil, Proventil HFA, Ventolin	β2	SVN: 0.5% solution, 0.5 ml (2.5 mg) tid, qid MDI: 90 µg/puff, 2 puffs tid, qid DPI: 200 µg capsule, 1 capsule (34-6h Tab: 2 mg. 4 mg tid, qid Synup: 2 mg/5 ml, 1-2 tsp tid, qid	Onset: 15 min Peak: 30-60 min Duration: 5-8 hr		
Bitolterol	Tornalate	β2	SVN: 0.2% solution, 1.25 ml (2.5 mg) bid-qid MDI: 370 µg/puff, 2 puffs q8h	Onset: 3-4 min Peak: 30-60 min Duration: 5-8 hr		
Pirbuterol	Maxair	β2	MDI: 200 µg/puff, 2 puffs q4-6h	Onset: 5 min Peak: 30 min Duration: 5 hr		
Levalbuterol	Xopenex	β2	SVN: 0.63 mg/3 ml tid; or 1.25 mg/3 ml tid	Onset: 15 min Peak: 30-60 min Duration: 5-8 hr		
Salmeterol	Serevent	β2	MDI: 25 μg/puff, 2 puffs bid DPI: 50 μg/blister bid	Onset: 20 min Peak: 3-5 hr Duration: 12 hr		
Formoterol	Foradil	β2	DPI: 12 µg/inhalation bid	Onset: 15 min Peak: 30-60 min Duration: 12 hr		





### Parasympatholytics

### · Agents

- Atropine
  Iprotropium bromide (Atrovent)
  Iprotropium bromide & albuterol (Combivent)
  Tiotropium bromide (Spiriva)

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### Parasympatholytics

 General indication is maintenance treatment in asthma and COPD, including chronic bronchitis and emphysema

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 Combination products are indicated for patients with COPD on regular treatments who require additional bronchodilation relief of airflow obstruction





### Parasympatholytics

- · Ipratropium bromide and albuterol (Combivent) - a combination MDI product
  - product has been shown to be more effective in stable COPD than either product alone

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### • Tiotropium bromide (Spiriva)

- developed as a long-acting bronchodilator
- structurally related to ipratropium and is poorly absorbed after inhalation
- appears to maintain a higher level of baseline bronchodilation than ipratropium









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### **Mucoactive Agents**

· Agents

Acetylcysteine (Mucomyst)Dornase alpha (Pulmozyme)

### **Mucoactive Agents**

- Acetylcysteine has been used to treat conditions associated with viscous secretions (aerosol, direct instillation)
- direct instillation) – a 2° use is an an antidote (antioxidant) to reduce hepatic injury with acetaminophen overdose (oral)
- Dornase alpha is indicated in the management of cystic fibrosis to reduce the frequency of respiratory infections requiring parenteral antibiotics and to improve or preserve pulmonary function in these patients

### **Mucoactive Agents**

- · Modes of action
  - acetylcysteine disrupts the structure of mucus by substituting free thiol (sulfhydryl) groups for the disulfide bonds in the mucus
  - dornase alpha reduces the viscosity and adhesivity of infected respiratory secretions when given by aerosol this action is associated with a decrease in the size of the DNA in the sputum

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- the change in sputum viscosity is dose dependent greater reduction occurs at higher concentrations of the drug











### **Mucoactive Agents**

Dosage and administration

 dornase alpha is available as a unit dose ampoule containing 2.5 mg in 2.5 ml of solution; the solution should be refrigerated and protected from light

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- the usual dose of dornase alpha is 2.5 mg daily by aerosol, delivered through one of the approved nebulizers Hudson T Updraft II

  - Marquest Acorn II with a Pulmo-Aide compressor
     Pari LC Jet Plus with the Pari Inhaler compressor
- other nebulizers may work, but delivery of aerosol dornase alpha requires a system capable of appropriate aerosol particle size and quantity



# Corticosteroids · Indications INCICATIONS asthma – recommended for maintenance and control therapy of chronic asthma, identified in the NAEPP EPR-II as *Step 2 asthma* (greater than 2 days/week of symptoms, greater than 2 nights/month with symptoms, FEV1 or PEF 80% ± 20% or greater) COPD – not currently recommended by the American Thoracic Society for other than acute exacerbations; however, many COPD patients report lessened symptoms when taking aerosol corticosteroids active interstitial lung disease neonatal respiratory distress syndrome

- neonatal respiratory distress syndrome
- ARDS
   aspiration pneumonitis

### Corticosteroids

Beclomethasone Dipropionate

- brand names: Beclovent, Vanceril, Vanceril 84µg Double strength
- dosage
  - MDI (42 µg): adults: 2 inhalations tid or qid; children: 1-2 inhalations tid or qid

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• MDI (84 µg): adults and children > 6 yrs: 2 inhalations bid

### Corticosteroids

- Beclomethasone Dipropionate HFA
  - brand name: QVAR
  - dosage form
    - MDI: 40 µg/actuation, 80 µg/actuation
  - dosage
    - adults ≥ 12 yr.: 40-80 µg bid\*, 40-160 µg bid\*\*
      - \* recommended starting dose if on bronchodilators alone
         \*\* recommended starting dose if on inhaled corticosteroids previously

### Corticosteroids

• Flunisolide

- brand names: AeroBid, AeroBid-M
- dosage form
  - MDI: 250 µg/actuation
- dosage
  - adults and children ≥ 6 yrs.: 2 inhalations bid (am and pm)

### Corticosteroids

- Fluticasone Propionate
  - brand names: Flovent, Flovent Rotadisk, Advair
  - dosage form
    - MDI: 44, 110 or 220 µg/actuation
    - DPI (Rotadisk): 50, 100, 250 µg/inhalation
    - DPI (Advair): 100, 250 or 500 µg/inhalation (with 50 µg salmeterol)

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### Corticosteroids

- Triamcinolone Acetonide
  - brand names: Azmacort
  - dosage form
    - MDI: 100 µg/actuation
  - dosage
    - · adults: 2 inhalations tid or qid
    - children: 1-2 inhalations tid or qid

### Corticosteroids

- Budesonide
  - brand names: Pulmicort Turbuhaler (DPI), Pulmicort Resputes (nebulizer solution)
    - DPI: 200 µg/actuation
    - SVN: 0.25 mg/2ml; 0.5 mg/2ml unit dose resputes

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### Corticosteroids • Budesonide - dosage DPI: adults: 200-400 μg bid\*, 200-400 μg bid\*\*, 400-800 μg bid\*\*\*, children 6-12 yrs.: 200 μg bid

- SVN: adults: 1 respule daily, children 6-12 yrs.: 0.5 mg or 1 mg once daily or twice daily in divided doses
  - \* recommended starting dose if on bronchodilators alone

  - "" recommended starting dose if on inhaled corticosteroids
     previously
     "" recommended starting dose if on oral corticosteroids previously

### Corticosteroids

- · Adverse reactions (aerosol administration)
  - local throat irritation, hoarseness, dry mouth, coughing, oropharyngeal fungal infection (Candida albicans or Aspergillus niger); rinsing and gargling after administration may prevent this infection
  - systemic suppression of HPA mechanism
  - other bronchospasm, rashes



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### Nonsteroidal Antiasthmatics

· Agents

- Cromolyn sodium (Intal) - Nedocromil sodium (Tilade)

### Nonsteroidal Antiasthmatics

Cromolyn sodium

- Indications

- to decrease the frequency and intensity of asthma attacks in both allergic and nonallergic asthma
   prevention of exercise induced asthma
   treatment and prevention of allergic rhinitis and allergic conjunctivitis

### Nonsteroidal Antiasthmatics

- · Cromolyn sodium
  - Mode of action
    - · inhibits the degranulation of mast cells by directly blocking the influx of calcium ions entering the mast cell, preventing the release of chemical mediators of inflammation

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- · action is prophylactic and pretreatment is required
- effective in blocking the late-phase reaction in asthma (more severe airway obstruction 6-8 hours after initial bronchoconstriction)

### Nonsteroidal Antiasthmatics

- Cromolyn sodium
  - Adverse reactions CNS: dizziness, headache
    - · pulmonary: bronchospasm, wheezing, cough, laryngeal
    - edema
    - miscellaneous: dermatitis, joint swelling, abdominal pain, sneezing, nasal congestion, epistaxis, urinary frequency, throat irritation or dryness
    - · allergic: urticaria, rash, angioedema, anaphylaxis
  - Clinical application
    - · complete prophylactic activity may require 4-6 weeks

### Nonsteroidal Antiasthmatics

### Cromolyn sodium

- Dosage forms
  - nebulizer solution: 20 mg/2 ml liquid ampule
  - MDI: 800 µg/actuation
- Dosage
  - nebulizer solution: adults and children ≥ 2 yrs.: 1 liquid
  - ampule by SVN qid at regular intervals
  - MDI: adults and children ≥ 5 yrs.: 2 inhalations qid at regular intervals

### Nonsteroidal Antiasthmatics

- · Nedocromil sodium
  - Indications
  - to decrease the frequency and intensity of asthma attacks in both allergic and nonallergic asthma - Mode of action

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- · inhibits mediator release from mast cells
- · inhibits eosinophil chemotaxis
- · does not have bronchodilator properties
- optimum control of asthma symptoms depends on regular use, even if symptoms are not present



