Asthma
SMOKING GUNS

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Overview of Asthma Medications
- Daily: Long-Term Control
  - Corticosteroids (inhaled and systemic)
  - Long-acting beta₂-agonists (Serevent, Foradil)
  - Methylxanthines (SR Theophylline)
  - Leukotriene modifiers (Singulair, Accolate, Zyflo)
  - Combination Products

Inhaled Corticosteroids
- Most effective long-term-control therapy for persistent asthma
- Small risk for adverse events at recommended dosage (when inhaled)

Inhaled Corticosteroids
- Reduce potential for adverse events by:
  - Using spacer or holding chamber
  - Rinsing mouth
  - Using lowest dose possible
  - Use in combination with long-acting beta₂-agonists may reduce potential for adverse effects

Benefit of daily use:
- Fewer symptoms and exacerbations
- Reduced use of quick-relief medicine
- Improved lung function
- Reduced airway inflammation
- Not for short-term relief
- Must be used daily for full benefit
Comparative Dosages of Inhaled Corticosteroids

- Preparations are not equivalent per puff or per microgram.
- Comparative doses are estimated.
  - Few data directly compare preparations

Comparative Dosages of Inhaled Corticosteroids

- Most important determinant of dosing is clinical judgment.
  - Monitor patient's clinical response to therapy
  - Monitor peak flow or FEV1
  - Review Patient's Acceptance (compliance)
  - Adjust dose accordingly

Cromones

- Considered as mild anti-inflammatory agents
- Advantage - virtually no side effects (bad taste)
- Disadvantage - TID to QID dosing
- Used only as controller medication, not for rescue
- Used primarily in pediatric population, seasonal allergy prophylaxis and special populations (steroid intolerant)
- Cromolyn and Nedocromil

Long-Acting Beta2-Agonists

- Not a substitute for anti-inflammatory therapy
- Not appropriate for monotherapy
- Beneficial when added to inhaled corticosteroids as an adjunct (NAEPP-3)
- Not for acute symptoms or exacerbations
- Has role for EIB in endurance athletes
- More controversial with black box warnings and data

Short-Acting Beta2-Agonists

- Most effective medication for relief of acute bronchospasm (> anticholinergics)
- More than one canister per month suggests inadequate asthma control
- Consider ‘Rule of Two’
- Regularly scheduled use is not generally recommended
  - May lower effectiveness and increase side effects
  - May increase airway hyperresponsiveness

Leukotriene Modifiers

- Mechanisms
  - leukotriene receptor antagonists

- Indications
  - Long-term control therapy in mild persistent asthma
  - Improve lung function
  - Prevent need for short-acting beta2-agonists
  - Prevent exacerbations
**Clinical Pharmacology: Montelukast**

- No dosage adjustments required based on:
  - Renal or mild to moderate hepatic insufficiency
  - Gender or for the elderly

**Pharmacokinetics:**
- Rapidly and well absorbed
- Not affected by food ingestion
- Minimal accumulation with multiple dosing
- Oral contraceptives

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**Types of Delivery Systems**

- Infants and toddlers
  - Nebulizers
  - Metered Dose Inhalers with holding chamber
- Pre-School Children
  - Metered Dose Inhalers with holding chamber
  - Dry Powder Inhalers
- School Age Children
  - Dry Powder Inhalers
  - Metered Dose Inhalers (MDI) with holding chamber

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**Dosing Regimen in Adults and Children**

- Montelukast is marketed under the trade name SINGULAIR™† (montelukast sodium, MSD)
- Administered once daily at bedtime
- Available for adults and children as young as 2 years of age

**Cherry-Flavored Chewable Tablets**

- 4 mg
- 5 mg
- Ages 2–5
- Ages 6–14
- 10 mg
- Ages >15 years

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**Role of Leukotrienes in Asthma**

- **LTD₄**
- Increased Mucus Secretion
- Eosinophil Influx
- Epithelial Cell Damage
- Cationic Protein Release, Contraction & Proliferation
- Sensory Nerves (C-Fibers)
- Edema
- Blood Vessel
- Sensory Nerves
- Airway Smooth Muscle
- Inflammatory Cells (e.g., Mast Cells, Eosinophils)
- Airway Epithelium
- Decreased Mucus Transport

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**MDI-Spacer Particle Size**

- Labeled Dose
- Emittted Dose
- Fine Particle Dose
Metered Dose Inhaler (MDI)

- Most patients use inhalers incorrectly
- Many health care professionals who teach inhaler technique do not know correct technique
- Patients do not know when to change canisters

Metered Dose Inhaler Technique

- Remove cap
- Shake the inhaler
- Breathe out to end of normal breath
- Position out of mouth or with spacer (preferred to in-mouth)
- Press and breathe in SLOWLY for 5 seconds
- Breath-hold for 10 seconds
- Wait 1-2 minutes and repeat

MDI Facts

- Contains 60, 120 or 200 inhalations
- Four test puffs are recommended when the inhaler is first used and anytime when not used for 2 weeks

MDIs

- ProAir HFA
- Proventil HFA
- Ventolin HFA
- Xopenex HFA
- Combivent
- Atrovent
- Advair HFA 45/21, 115/21, 230/21
- Flovent HFA
- QVAR 40 or 80
- Symbicort 80/4.5 or 160/4.5
- Dulera 100/60 or 200/5
- Asmanex 110 or 220
- Alvesco 80 or 160
Problems with MDI usage

- Inhale
  - Too early
  - Too late
  - Too often
  - Too many times
- Failure to shake
- Failure to prime
- Use in cold weather
- Cold Freon effect
  - Less problematic now

Enhance deposition beyond conducting airways with slow inspiration

Dry Powder Inhalers

- Advair Diskus
  - 100/50 mcg
  - 250/50 mcg
  - 500/50 mcg
- Asmanex Twisthaler
- Pulmicort Turbuhaler
- Albuterol Rotahaler
- Foradil Aerolizer
- Serevent Diskus
- Spireva Handihaler
- Flovent Diskhaler

Reproducible dose delivery to lungs across wide range of inspiratory flows
Small particle size (2-5 microns)
Ease of use
Small size, easy to carry
Multidose capability
Cost-effectiveness
Dose counter

**Discus® Technique**

- Dose counter
- Contains 200 doses
- When red line is at the top of the window, only 20 doses left.
- When red line is at the bottom of the window, canister is empty.

**Turbuhaler® Technique**

- Dose counter
- Contains 200 doses
- When red line is at the top of the window, only 20 doses left.
- When red line is at the bottom of the window, canister is empty.

**Twisthaler®**

**Turbuhaler® Facts**

- Dose counter
- Contains 200 doses
- When red line is at the top of the window, only 20 doses left.
- When red line is at the bottom of the window, canister is empty.

**Twisthaler® Technique**

- Figure 1: Cap removal
- Figure 2: Inhalation
- Figure 3: Closing the inhaler
- Figure 4: Closed inhaler
Twisthaler® Facts

- Dose counter vertically aligned
- Discard 45 days after opening foil
- Cap locks when empty
- Contains lactose
- 30, 60 or 120 dose units
- Base unit # on daily dosing need

COPD/Asthma DPI
Spireva™ (Tiotropium)

HandiHaler®

Become familiar with the components of the HandiHaler inhaler device:
1. dust cap
2. mouthpiece
3. lise
4. piercing button
5. center chamber

Problems with DPI usage

- Inhale too slow
- Exhale into device prior to breath
- Failure to hold in proper orientation
- Failure to prime
- Failure to pierce capsule or open blister pack
- Failure to keep flow path open

How Inspiratory Flow Affects Deposition

<table>
<thead>
<tr>
<th>Inspiratory Flow</th>
<th>Drug Deposition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Too Slow</td>
<td>Mouth</td>
</tr>
<tr>
<td>Too Fast</td>
<td>Throat</td>
</tr>
<tr>
<td>Correct Speed</td>
<td>Lungs</td>
</tr>
</tbody>
</table>
Factors Influencing Efficacy

- Properties of the device
- Properties of the medication
- Characteristics of the aerosol
- Type and severity of disease
- Technique of use
- Response to treatment
- Patient acceptance/preferece
- Adherence to treatment

What Device to Select?

- Advantages
- Limitations
- Performance
- Ease of Use
- Cost
- Understanding how to use
- Understanding how to maintain

What it is

- Inspiratory peak flow meter
- Used to determine if patient is able to generate the necessary flow to properly use the prescribed medication.

Match the Device to the Patient

- Device selection is the key to adherence:
  - Some inhaled drugs have multiple device options
- Can the patient
  - Afford the device?
  - Use the device?
- Will the patient use the device?
  - Does the patient use the device?

Problems in Provider Teaching

- Lack of familiarity with specific devices
- Inadequate time to teach
- Poor training materials and techniques
- Lack of follow-up
Common Myths
- Inhalers are so simple that they do not require training
- DPIs and nebulizers require less training than MDIs
- Package inserts are sufficient

Simplicity and Repetition
- Match the device to the patient
- Use the same device whenever possible
- Take time to teach
- Use demonstration with placebo
- Observe return demonstration
- Follow-up at each patient visit
- Inquire about likes/dislikes of device/med

Other Devices to manage asthma
- Peak Flow Meters
- Peak Flow/FEV1 Meters

Bronchial Thermoplasty

Questions?