Importance of Inhalation Therapy and Inhaler Devices

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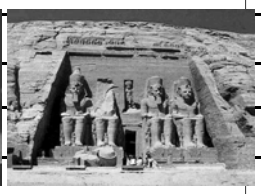
OH GOD!!!! PLEASE RELIEVE ME OF MY SYMPTOMS



5000 years ago

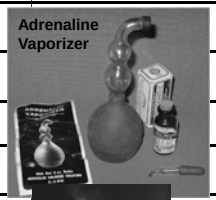
INHALATION OF FUMES FROM DATURA PLANT (Asthma Bidis / Cigarettes)

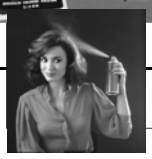
2000 BC INDIA

Datura Stramonium

THE ASTHMA CIGARETTES

DISCOVERY OF THE pMDI

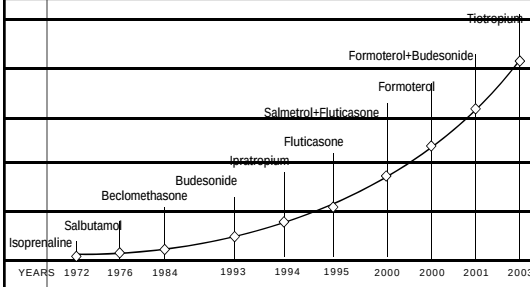




13 year old asthmatic girl, Susie Mason complained to her dad…..

1955

History of Inhaled Drugs in India



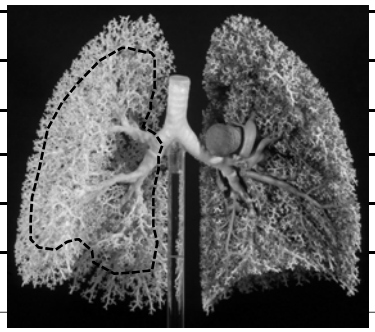
The World's Largest Range……In India

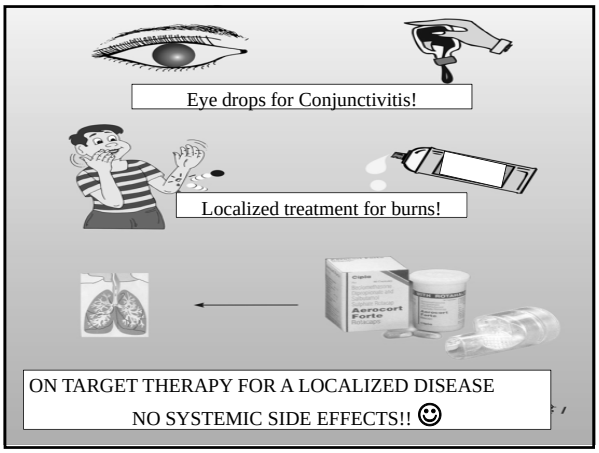
Aakriti Bhatia

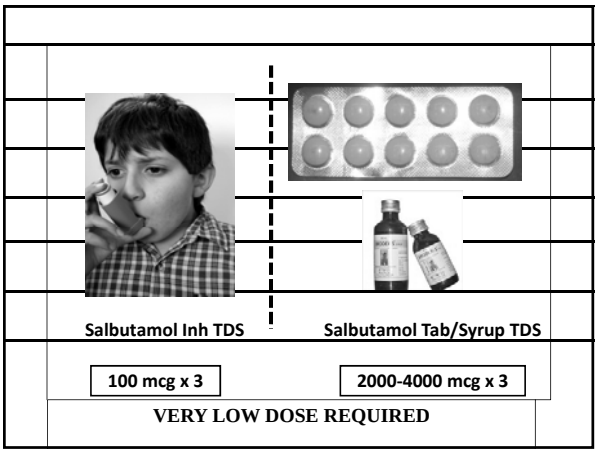
Myths about Inhalation Therapy

- Inhaled therapy is **strong**
- Inhaled therapy is **addictive**
- Inhaled therapy is a **last resort** in asthma
- It is **costly**

WHY INHALATION THERAPY?







Oral vs. inhaled bronchodilators

	Inhaled	Oral
Site of action	Direct	Indirect
Side-effects	Few	Many
Dose	Low	High
Speed of onset	Rapid	Slow
Length of action	5-6 hours	5-6 hours
Administration	Requires instruction	Easy

Factors affecting lung deposition

Physical	Patient (Ventilatory)	Anatomic
Particle size,	Tidal volume	Airways
diameter	Inspiratory flow rate, breath holding	Disease
	Inhaler technique	

Particle size and airway deposition

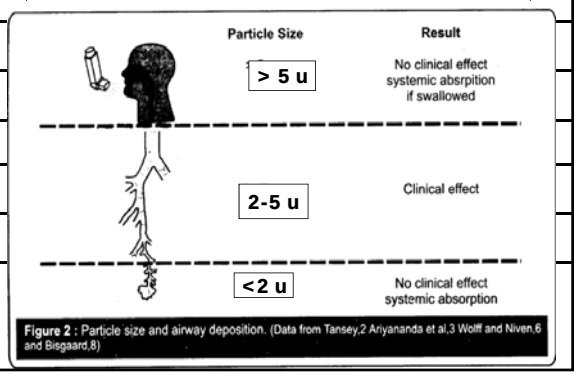
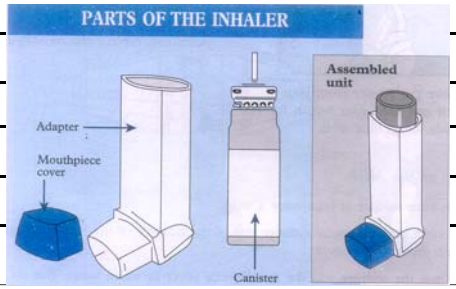


Figure 2 : Particle size and airway deposition. (Data from Tansey,2 Ariyananda et al,3 Wolff and Niven,6 and Bisgaard,8)

Devices for asthma and COPD

- pMDI (Solutions and suspensions)
- DPI -- single dose
  -- multi dose
- Spacers -- large and small volume
  -- valved / non-valved
  static / non-static
- Nebulisers (solutions and suspensions)

Metered dose inhaler



Metered-dose Inhaler

Advantages:

- Rapid onset of action
- Smaller dose of the drug is required
- Low incidence of adverse effects
- Compact and easy to carry
- Cost-effective

Disadvantages:

- Activation-inhalation co-ordination required
- Cold Freon Effect
- Deposition in the oropharynx

Deposition pattern of aerosols in the airways

Dose delivered by a metered-dose inhaler

1%	4%	5%	80%	10%
Exhaled	Alveoli	Conducting airways	Oropharynx	Actuator

Hence correct technique is important!

Common MDI "User" Errors

- Forgetting to shake canister
- Not exhaling before actuation
- Beginning to inhale after actuation
- Inhaling deeply → then actuating
- Forgetting breath-holding

MDI with Spacer

- Decreases oropharyngeal deposition due a reduction in velocity. This reduces local as well as systemic side effects
- Overcomes coordination problems
- Decreases cold freon effect
- Larger particles remain in the spacer while the smaller particles are inhaled
- Increases drug deposition in lungs
- **Recommended esp. :**
  - dose of inhaled steroids > 800 mcg/day
  - administration of high dose bronchodilators

Using a Spacer Correctly

- Should be compatible with MDI
- Minimal delay between actuation and inhalation
- Repeated **single** actuations
- Tidal breathing
- Clean monthly ; static charge
- Replace every year

When can you not use an MDI alone ?

Child below 3, or adult over 85

- MDI + Spacer
- MDI + Spacer + Baby Mask

In acute severe asthma, MDI and spacer can **equally effectively** deliver bronchodilators as a nebuliser.

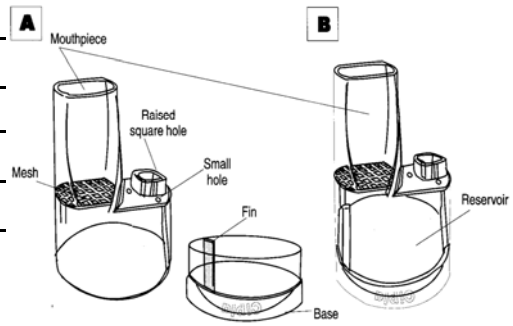
Dry Powder Inhalers

- Single dose (Rotahaler, Handihaler) and multidose – reservoir (Turbohaler) and multiple unit dose (Accuhaler)
- Lactose, an inert carrier is mixed with the active drug
- Resistance between DPIs varies and their efficiency may be different at various flow rates

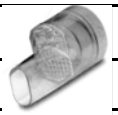
Dry powder inhalers

- Easy to use
- No coordination
- Gained wide acceptance
- Single dose ones are **economical**
- 80% of patients learnt to use a Rotahaler in the **first visit itself.** *(Vijaykumar et al)*

Rotahaler - Assembly and Use



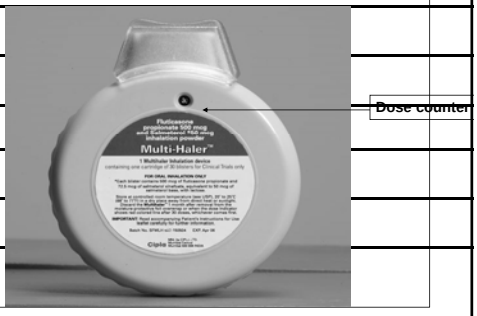
The Rotahaler

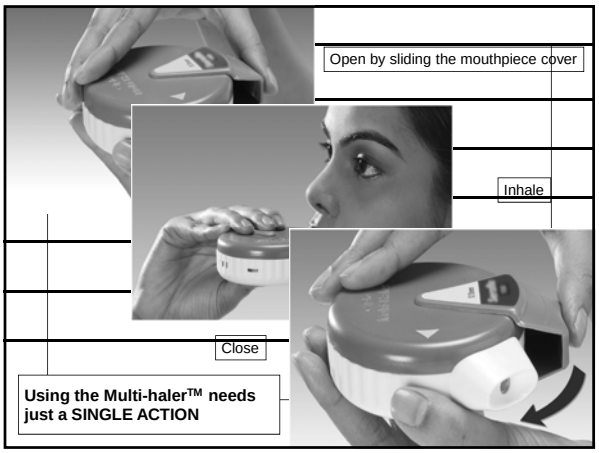


- Has transformed inhalation therapy
- Child's play (Insert - Rotate - Inhale)
- Economical
- Acceptable (v/s difficulties with MDI)
- **Every drug you need**

The Multihaler

Bottom View (Multihaler)





REVOLIZER

Pattern of Drug Deposition with Different Inhalers
(values are % of total drug dose)

Site of Deposition	Dry powder inhaler	Metered dose inhaler	MDI with large volume spacer
Lung	10-15%	10-15%	20%
Oropharynx	80%	80%	15%
Device (total)	5%	5%	65%
Patient (total)	95%	95%	35%

Nebulisers

Advantages
- High doses
- Tidal breath adequate for inhalation. Therefore can be given in children or breathless patients
- For aerosolised drugs which cannot be given by metered-dose inhalers

Disadvantages
- High dose - toxicity
- Expensive
- Regular maintenance
- Risk of transmission of 'air borne' infections **(TB / SARS)**

Dose Equivalence for nebulised steroid

Budesonide by MDI (400-800 mcg)	→	Budesonide by Nebulizer (1000 mcg)

Nebuliser vs **MDI with Spacer**

- Have **not** been shown to be superior to MDI and Spacer for the use of inhaled steroids.
- In acute severe asthma, MDI and spacer can **equally effectively** deliver bronchodilators as a nebuliser.

Whom would you prescribe an MDI?

- Young adults who are already using it correctly.
- Young adults who are using it incorrectly, but who would be quick to understand its correct use.

Who gets an MDI with a Spacer?

- ANY age
- Difficulty in use of MDI or DPI alone
- Disabled patients(someone else fires the actuator)
- Acute severe asthma
- COPD patients who have difficulty in inhaling deeply enough
- High-dose inhaled steroid

Who gets an MDI with Spacer and Mask?

- Children below 3 years
- Very elderly patients too, who may find it difficult to even keep a Spacer mouthpiece in their mouth

Who gets a DPI (Rotahaler) ?

- Any patient above the age of 4 years
- Patients with a 'stigma' to using MDIs
- Poor MDI technique
- Patients with any level of education

MEDICATIONS FOR ASTHMA

Asthma disease: spasm and swelling

- Spasm needs a **Reliever:** Bronchodilator
- Swelling needs a **Controller:** Anti-inflammatory

Relievers

Reliever (Quick Relief)

- Bronchodilator (beta$_2$ agonist). Eg: Salbutamol, Terbutaline
- Quickly relieves symptoms (within 2-3 minutes)
- **Not for Regular Use**

Reliever …

Inhalers>	Most of the time
Nebulised >	For severe attacks; administer at your PHC/hospital
Oral >	Rarely needed

Controllers

- Control the inflammation
- Takes time to act (1-3 hours)
- Prolonged effect (12-24 hours)
- **Should be used on a regular basis** (whether well or not well)

Inhaled Corticosteroids are the most potent and effective anti-inflammatory medication currently available for asthma

GINA Workshop Report, 2003

Controllers ..

1. Inhaled corticosteroids (ICS): Budesonide/ beclomethasone/ Fluticasone – use any
2. Combination of ICS + LABA(Long acting beta2 agonists): Salmeterol, Formoterol
3. Leukotriene modifiers
4. Sustained release theplhylline

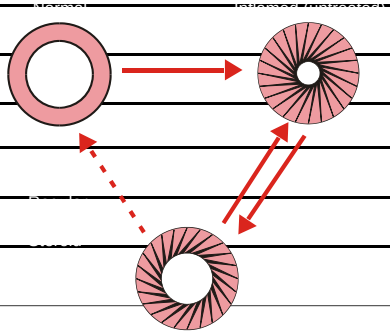
LABAs + steroids in a single inhaler

- Synergistic effect-
- Low doses of both drugs can be used, lesser side effects
- Deposition of 2 drugs at same time and same site
- Improves compliance
- Ensures that both drugs are taken
- More economical

Combination therapy

- Budesonide (100/200/400 mcg) + Formoterol (6 mcg)
- Fluticasone (125/250/500 mcg) + Salmeterol (25 mcg/50 mcg)
- Ciclesonide (80/160/200/400 mcg)+ Formoterol (4.5mcg/6mcg)

THE STORY OF ASTHMA TREATMENT



Asthma Treatment

- All asthma drugs should preferably be given by ***Inhalation***
- It is important to select the proper ***Inhalation Device***

Ideal Device ?

That which suits your patient the best