Asthma Inhaler Technique
Aerosol Drug Delivery Systems

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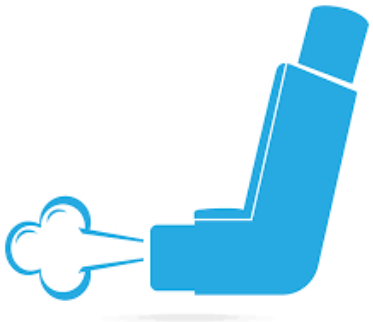
Aerosol Medications Advantages and Disadvantages in Respiratory Disease

Advantages

- Noninvasive and painless
- Direct delivery drug to site of action
- Rapid onset of action
- Lower dose than systemic administration to produce desired effects
- Minimize systemic adverse effects



Disadvantages

- Less-than-optimal technique decreases drug delivery and reduces efficacy
- Techniques differ between device categories and devices within a specific category
- The proliferation of inhalation devices has resulted in a confusing number of choices
- Inhaler devices are less convenient than oral drug administration

Inhaler device

Aim:

➢ To make an **aerosol** from the drugs solution or solid particles

An aerosol is a two-phase system defined as a dispersion or suspension of solid particles or liquid droplets in a gaseous medium (e.g., air, oxygen, heliox)

I. **Pressurized Metered-Dose Inhalers (pMDIs)**

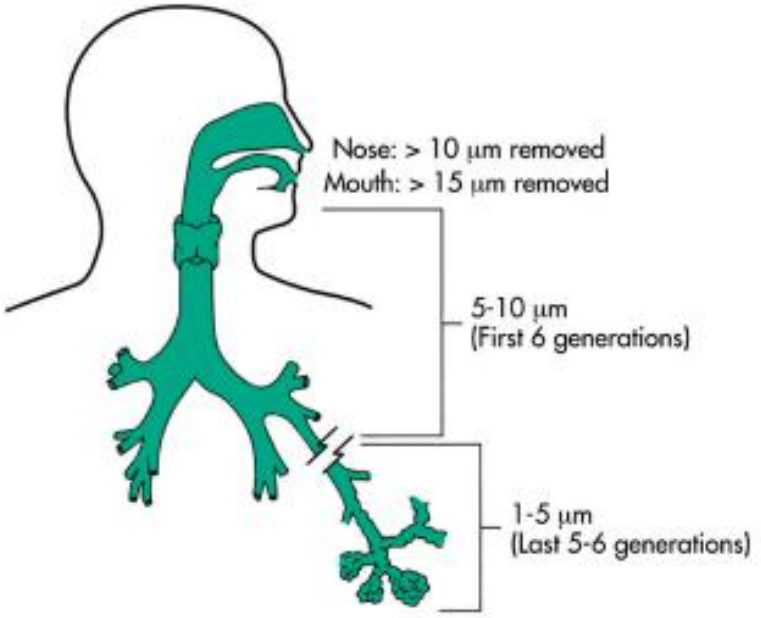
II. ***Dry powder inhalers***

III. ***Nebulizers***

Factors affecting lung deposition

- Particle size
- Speed of inspiration(inspiratory flow)
- Integrity of airway
- Proper inhaled device technique

A simplified view of the effect of aerosol particle size on the site of preferential deposition in the airways (From Reference 2, with permission)



Particles (> 10 μm) are filtered in the nose and/or oropharynx

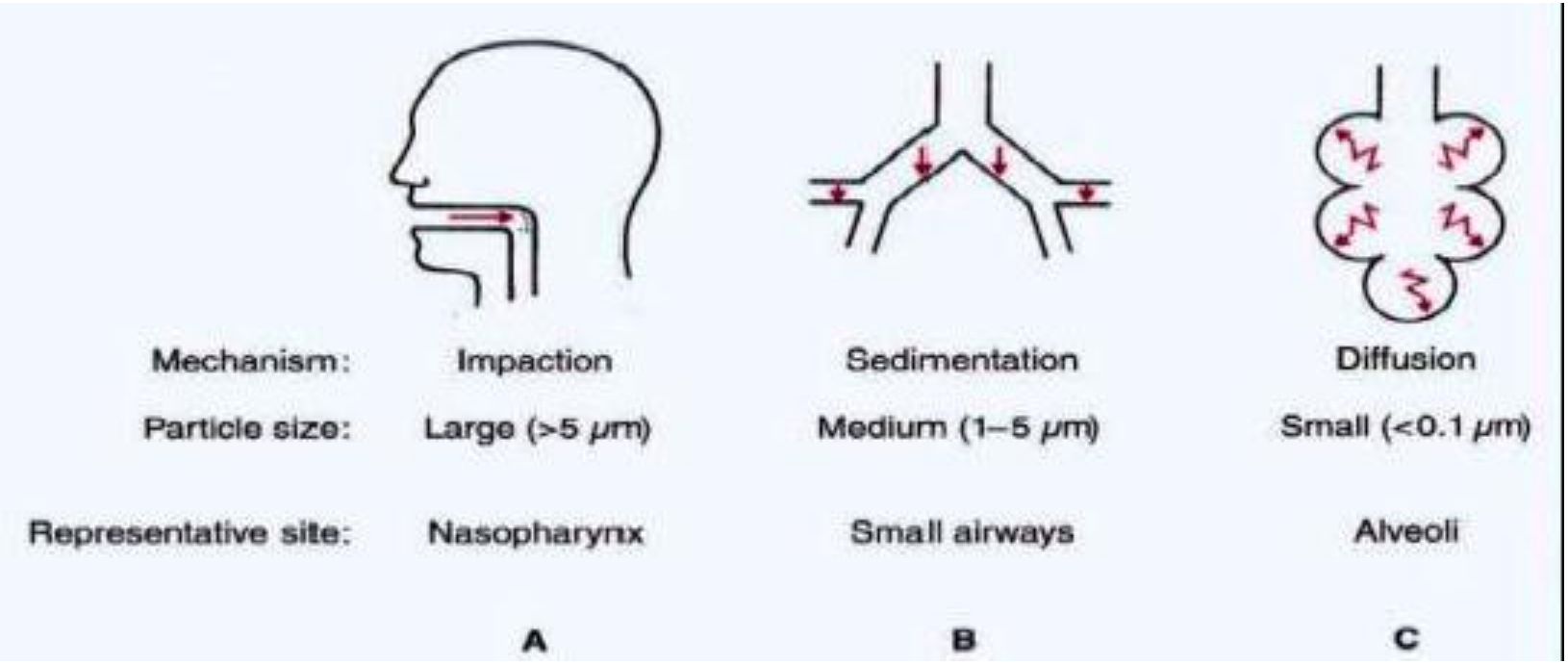
Particles of 5–10 μm generally reach the proximal generations of the lower respiratory tract

Particles of 1–5 μm reach to the lung periphery

Diffusion occurs with particles smaller than 1 μm

Particle sizes of 1–5 μm are best for reaching the lung periphery

Factors affecting lung deposition
Particle size



Factors affecting lung deposition

Integrity of airway

left is a gamma camera scan of the lungs(anterior view) of a healthy subject after inhaling 0.9% saline aerosol containing technetium-99m sulfur colloid (MMAD = 1.12 µm).
The gamma camera image on the right shows deposition of the same aerosol in the lungs of a patient with asthma who had clinically severe airway obstruction at the time of inhalation (FEV1 = 36% of predicted).

Inhalr technique
Is it important?

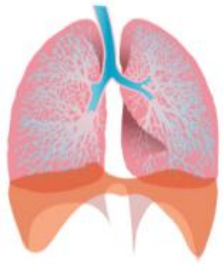
Importance of technique

- Asthma UK estimates that 2.1 million patients in the UK are suffering unnecessarily because they do not use their inhaler treatment effectively
- An estimated 75% of hospital admissions for asthma are avoidable and as many as 90% of deaths from asthma are preventable

http://www.asthma.org.uk/news_media/media_resources/for_journalists_key.html
"Living on a Knife Edge" Asthma UK, 2004
Last accessed: 25th June 2010

90%

of Australians don't use their inhalers correctly



CONFIDENCE IS USUALLY MISPLACED

75% Confident when asked

10% Correct when checked

Long-term inhaler users asked whether they were using their inhaler correctly

POOR TECHNIQUE IMPACTS HEALTH

50% Higher risk of hospitalisation for asthma or COPD

More side-effects like hoarseness & mouth infections

Overuse of medication & wasting of doses

GOOD TECHNIQUE IMPROVES HEALTH

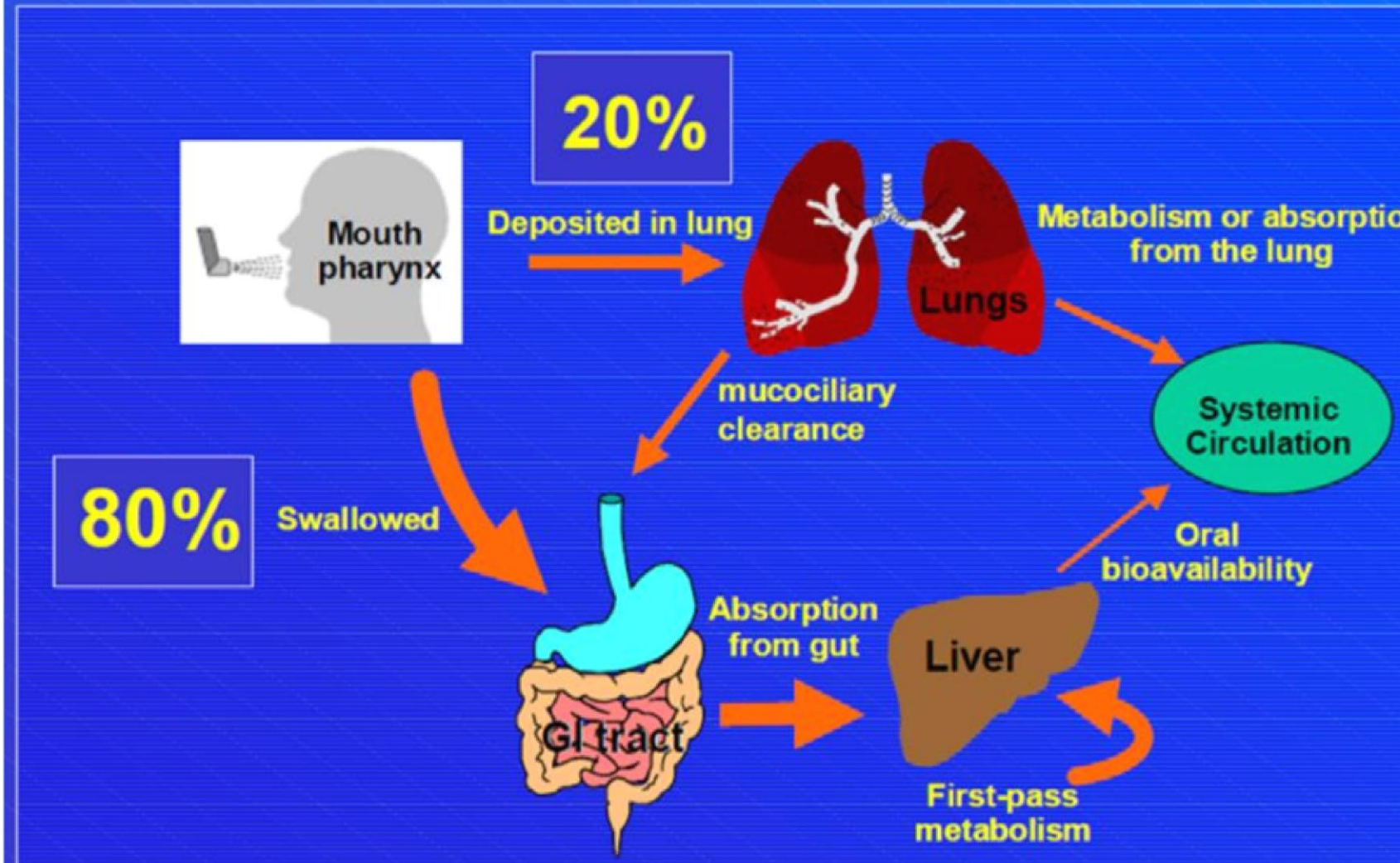
- Fewer asthma symptoms
- Increased lung function
- Better quality of life
- Lower medication costs

MAKE SURE YOUR TECHNIQUE IS CORRECT

Visit our How-to video library to watch demonstrations
Ask your pharmacist or practice nurse to check your technique
Every few months, check that you are still doing it right

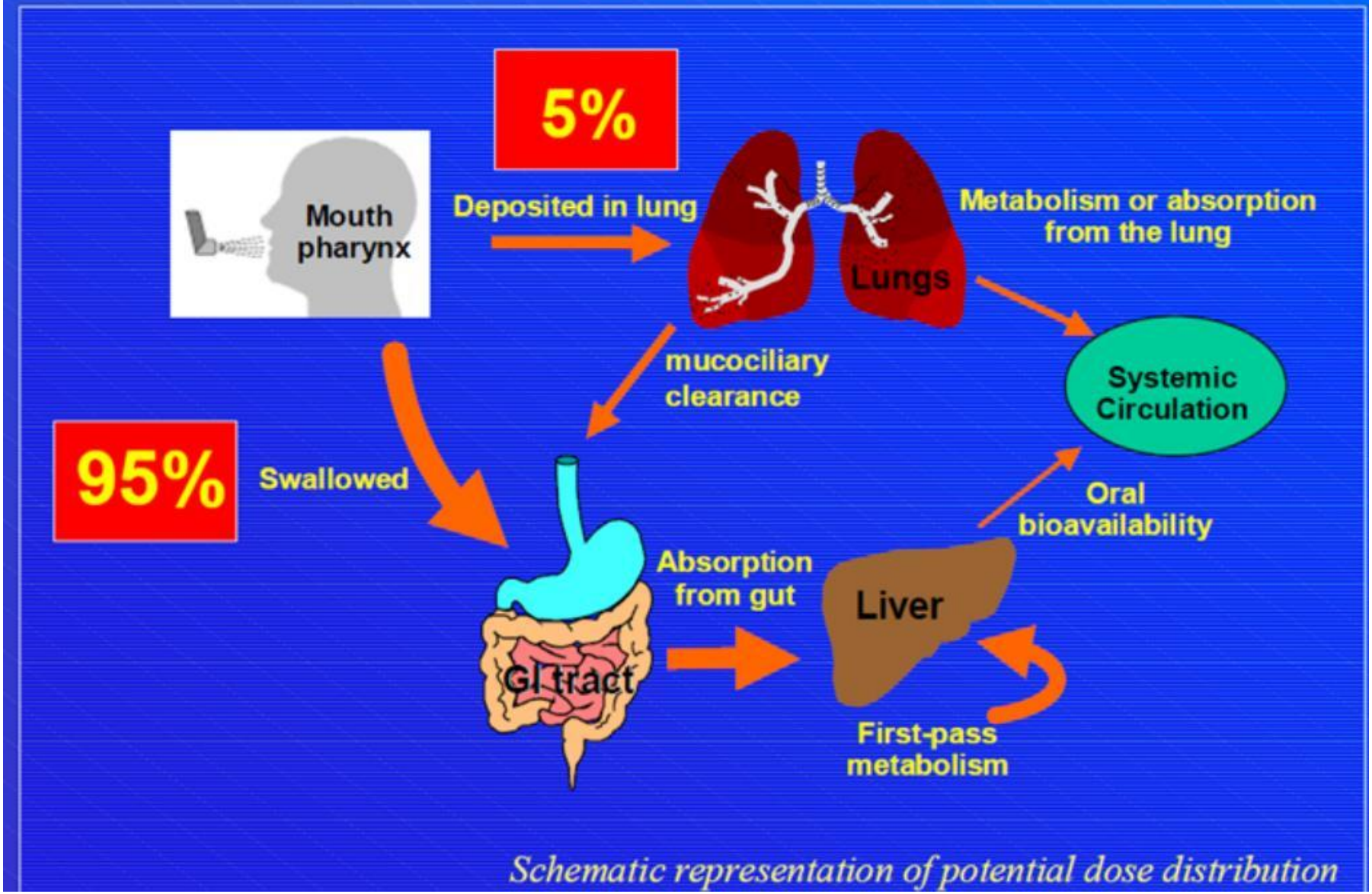
Source: National Asthma Council Australia. Inhaler Technique for People with Asthma or COPD

Fate of inhaled drugs – Good Technique



Schematic representation of potential dose distribution

Fate of inhaled drugs – Poor Technique

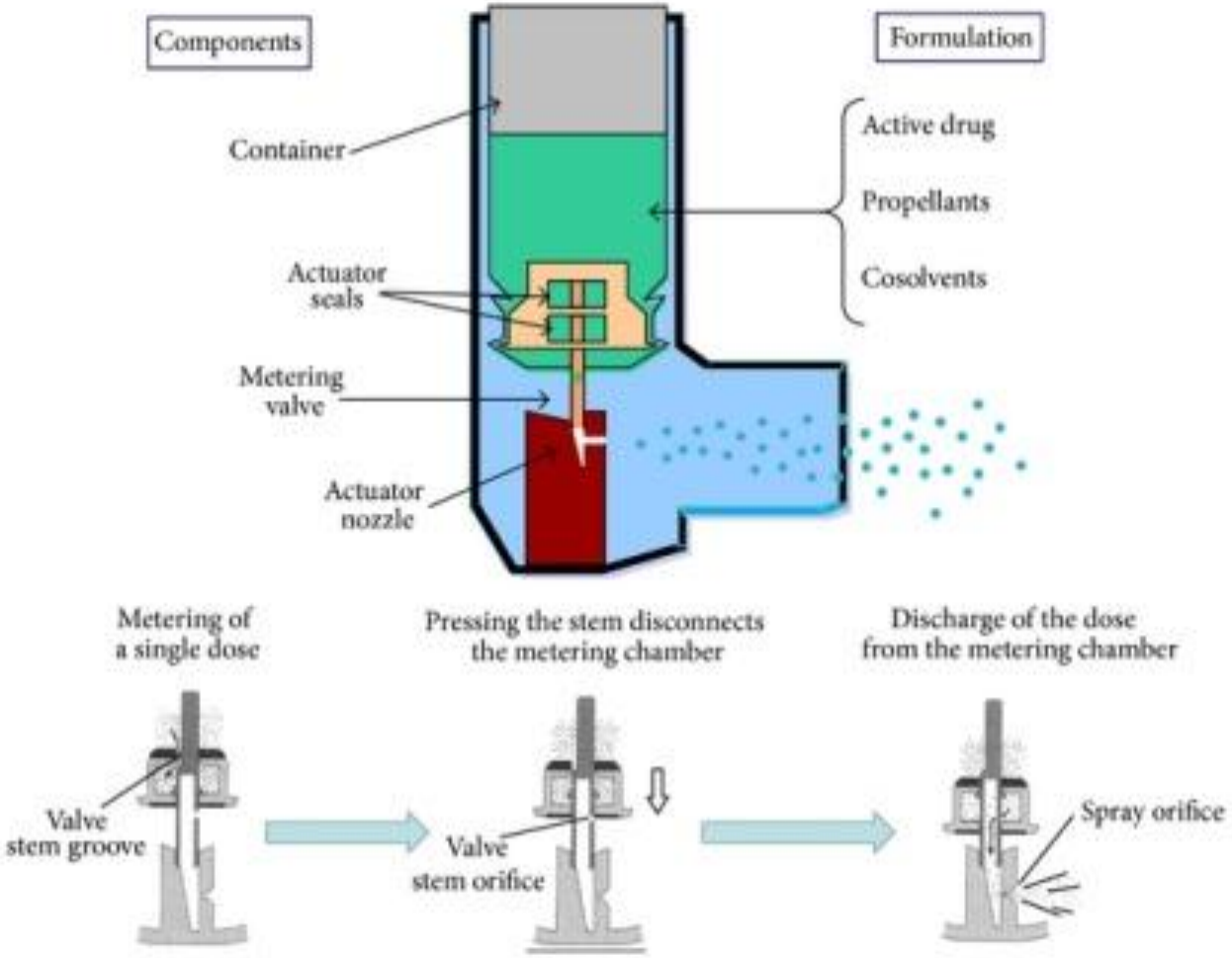


Schematic representation of potential dose distribution

Pressurized Metered-Dose Inhalers (pMDIs)

- The most commonly used aerosol delivery devices
- Used alone, or in conjunction with a spacer or valve holding chamber
- Portable, compact, and relatively easy to use
- Uniform dose of drug is released from the inhaler within a fraction of a second after actuation
- Doses are reproducible throughout the canister life

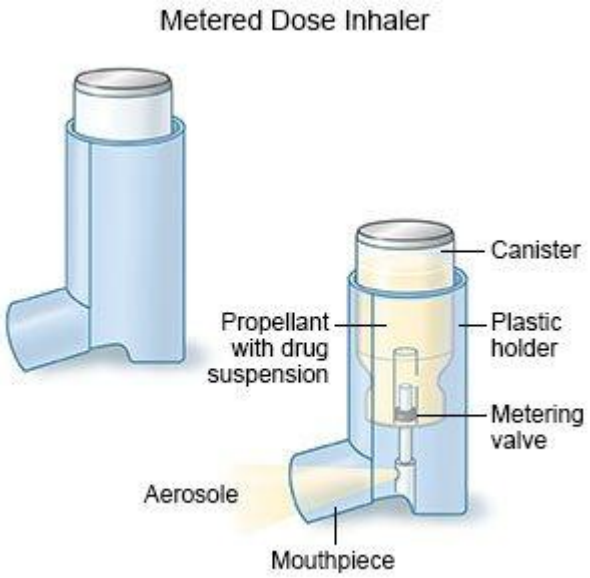
Components of a pressurized metered-dose inhaler aerosol generation

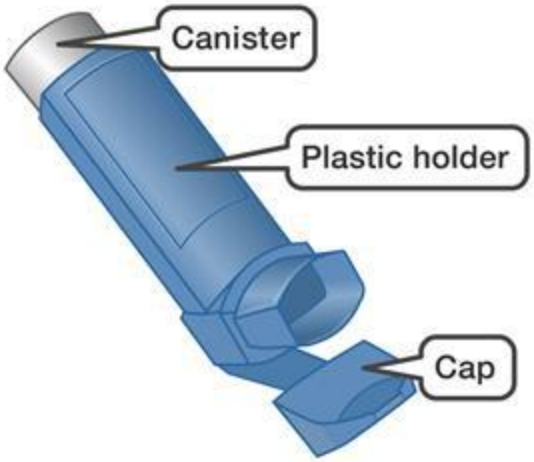


Differences between chlorofluorocarbons (CFC) Inhaler and hydrofluoroalkane (HFA)Inhaler

Component	CFC	HFA
Dose delivery from near empty container	Variable	Consistent
Variable ambient temperature	Variable	Consistent (-20C)
Force of spray	More forceful	Softer
Mist Temperature	Colder	Warmer
Mist Volume	Higher	Lower
Taste	Different	Different
Breath-holding	< important with CFC	> Important with HFA
Priming	General guidelines for all	Very specific to product
Cleaning	Periodic cleaning necessary	Stressed as REGULAR cleaning necessary

Components of a pressurized metered-dose





Differences between chlorofluorocarbons (CFC) Inhaler and hydrofluoroalkane (HFA)Inhaler

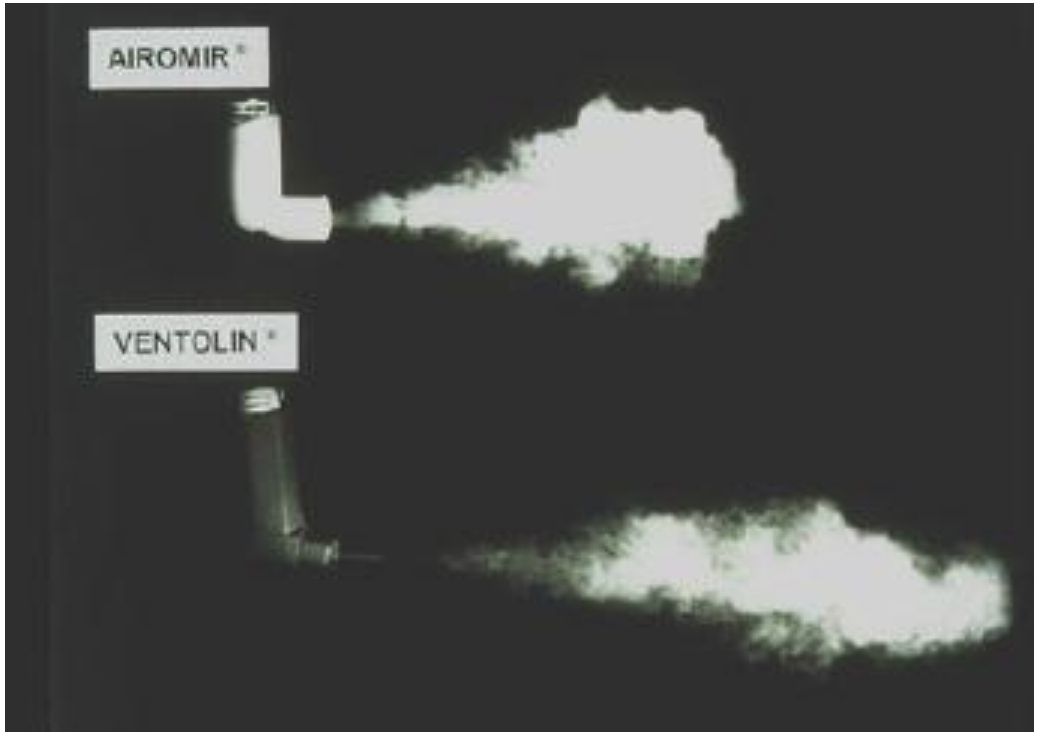


TABLE 63.4 Similarities and Differences Between HFA pMDI Albuterol Aerosols

Product (All Suspensions)	Contains Alcohol	Initial Sprays to Prime	Sprays to Prime After Days of Inactivity	Dose Counter
Proventil HFA	Yes	4	14 days: 4	Yes
Ventolin HFA	No	4	14 days: 4	Yes
Airomir HFA	Yes	4	14 days: 4	No
ProAir HFA	Yes	3	14 days: 3	Yes
Xopenex HFA	Yes	4	3 days: 4	No

HFA, Hydrofluoroalkane; *pMDI*, pressurized metered-dose inhaler.

TABLE 63.5 Similarities and Differences Between HFA pMDI ICS Aerosols

Product	Drug	Initial Sprays to Prime	Sprays to Prime After Days of Inactivity	Dose Counter
Flovent HFA (suspension)	Fluticasone propionate	4	<21 days: 1 >21 days: 4	Yes
Qvar (solution)	Beclomethasone dipropionate	2	10 days: 2	Yes
Aerospan HFA (solution)	Flunisolide	2	>14 days: 2	Yes
Alvesco HFA (solution)	Ciclesonide	3	10 days: 3	Yes

HFA, Hydrofluoroalkane; *ICS*, inhaled corticosteroid; *pMDI*, pressurized metered-dose inhaler.

Breath-actuated pMDIs
Autohaler and Easibreathe

- Minimizing patient coordination errors
- Improve lung deposition over that achievable with pMDIs alone
- The Autohaler automatically actuates at inspiratory flow rates of approximately 30 L/min, and the Easibreathe actuates at 20 L/min

Major components, advantages, and disadvantages of MDI devices

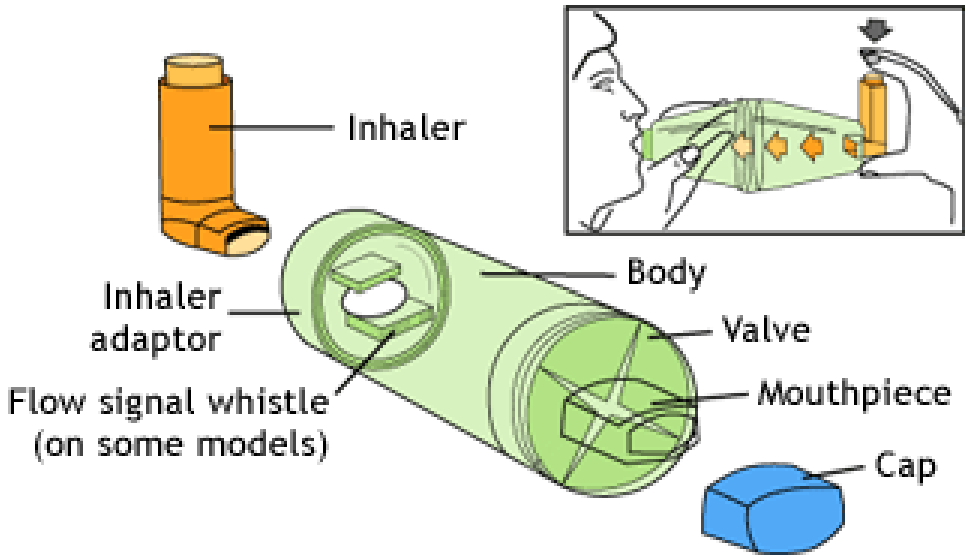
Inhaler	Formulation	Metering system	Advantages	Disadvantages
pMDI	Drug suspended or dissolved in propellant (with surfactant and cosolvent)	Metering valve and reservoir	Portable and compact Multidose device Relatively cheap Cannot contaminate contents Available for most inhaled medications	Contains propellants Not breath-actuated Many patients cannot use it correctly High oropharyngeal deposition
pMDI + spacer			Easier to coordinate Large drug doses delivered more conveniently Less oropharyngeal deposition Higher lung deposition than a pMDI	Less portable than pMDI Plastic spacers may acquire static charge Additional cost to pMDI
BA-MDI	Drug suspended in propellant	Metering valve and reservoir	Portable and compact Multidose device Breath-actuated (no coordination needed) Cannot contaminate contents	Contains propellants “Cold Freon’’ effect Requires moderate inspiratory flow to be triggered

pMDI Accessory device
Spacers and Valved Holding Chambers (VHCs)

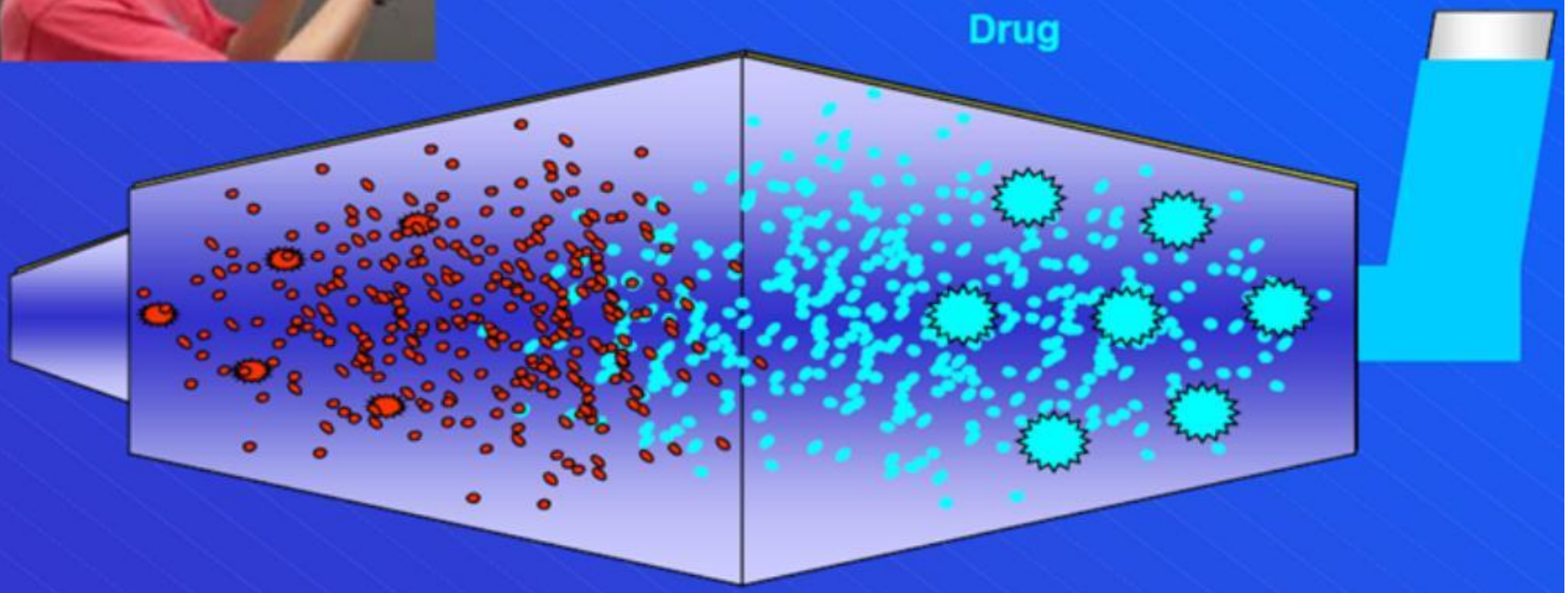
- Increases time and volume to allow aerosol particle ageing which reduces particle size
- Evaporation of propellant
- Reduced of pharyngeal particle deposition
- Removes the need hand-breath coordination
- Increasing the optimal delivery of the drug to the lung

Valved holding chambers
VHCs

Spacer with one way valve

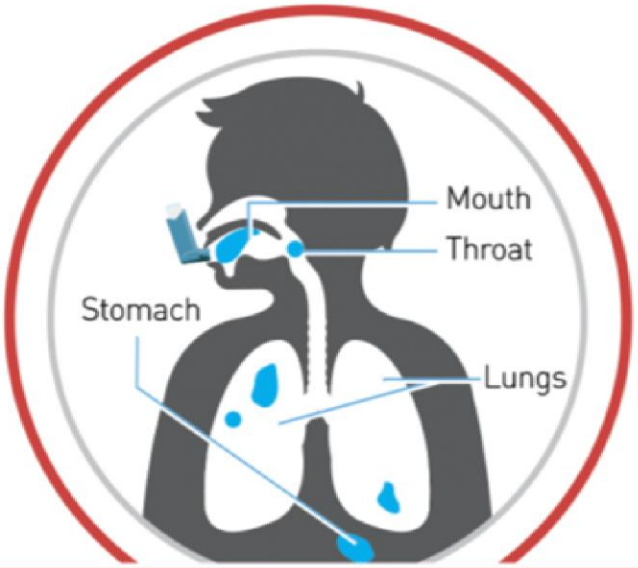


Spacer Devices – How they help



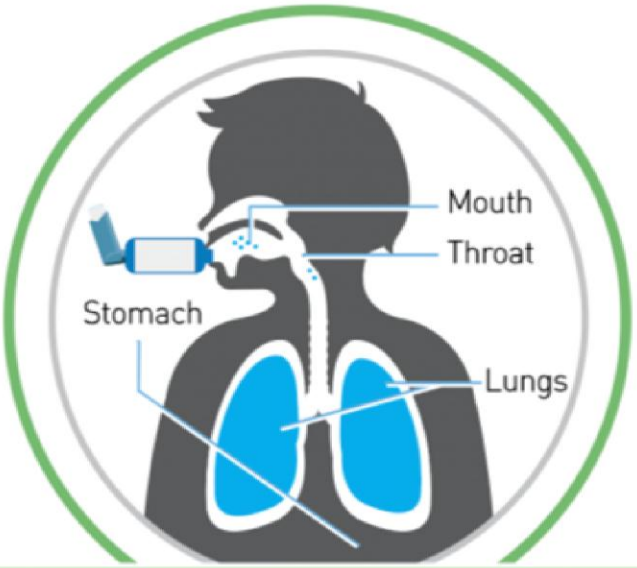
1. Capture aerosol avoiding coordination problems
2. Reduces large aerosol particles (associated with s/e)

Canday



IF PUFFER IS USED INCORRECTLY

- Most of the medication collects inside the mouth and throat
- Some medication is lost to the air
- A small proportion is actually inhaled into the lungs
- The rest is ingested into the stomach and gastrointestinal system



CORRECT USE OF A SPACER WITH A PUFFER

- More medication is delivered to the small airways deep within the lungs where it is needed
- Reduces wastage of medication
- Overcomes poor technique in coordinating inhalation and actuation of the puffer

How to use a Standard MDI (puffer) and Spacer
Checklist of steps:
Single breath method

1. Assemble spacer (if necessary)
2. Remove inhaler cap
3. Check dose counter (if device has one)
4. Hold inhaler upright and shake well
5. Insert inhaler upright into spacer
6. Put mouthpiece between teeth (without biting) and close lips to form good seal
7. Breathe out gently, into the spacer
8. Keep spacer horizontal and press down firmly on inhaler canister once
9. Breathe **in slowly and deeply**
10. Hold breath for about 5 seconds or as long as comfortable
11. While holding breath, remove spacer from mouth
12. Breathe out gently
13. Remove inhaler from spacer
14. If more than one dose is needed, repeat all steps starting from step 4
15. Replace inhaler cap

How to use a Standard MDI (puffer) and Spacer

Checklist of steps:

Multiple breath method

1.Assemble spacer. (if necessary)
2. Remove inhaler cap
3. Check dose counter (if device has one)
4. Hold inhaler upright and shake well
5. upright into spacer
6. Put mouthpiece between teeth (without biting) and close lips to form good seal
7. Breathe out gently, into the spacer
8. Keep spacer horizontal and press down firmly on inhaler canister one
9. Breathe in and out normally for 3 or 4 breaths
10. Remove spacer from mouth
11. Breathe out gently
12. Remove inhaler from spacer
13. If more than one dose is needed, repeat all steps starting from step 4
14. Replace inhaler cap

For young children and/or during asthma attack several breaths method may be easier

How to use a Standard MDI (puffer) and Spacer
Common problems

- Not breathing in quickly enough after pressing the canister so the medication falls to the bottom of the spacer
- Not breathing in deeply enough
- Not holding breath for long enough
- Taking several puffs without waiting or shaking the inhaler in between

How to use pMDIs without spacer

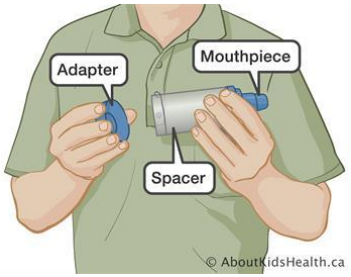
1. Remove the cap.
2. Shake the canister.
3. Breathe out gently.
4. Put the mouthpiece in the mouth and at the start of inspiration, which should be **slow and deep** press the canister down and **continue to inhale deeply.**
5. Hold the breath for 10 seconds or as long as possible, then breathe out slowly.
6. Wait a few(30-60sc) seconds before repeating steps 2-5.
7. Replace cap

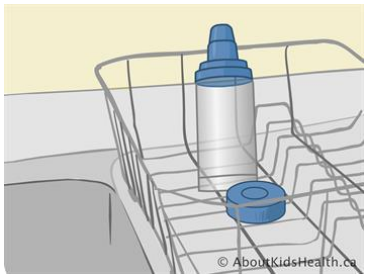
Tips

- Face mask should be used in children<3 years old or those who are unable hold the mouthpiece of the VHC tightly between the lips and teeth
- Face mask should be omitted as soon as possible
- If use ICS inhaler, with or without a spacer, rinse mouth with water and spit after inhaling the last dose
- If you use more than one inhaled medicine at a time, use the bronchodilator(“reliever”) first
- Inhaled steroids may be have their greatest effect when taken evening(between 3 pm and 5:30 pm)

Spacer care

- Clean the spacer before use it for the first time and then about once a month
- It's not unusual for your spacer to look a bit cloudy
- Wash the spacer in warm water with kitchen detergent and allow to air dry without rinsing
- Drying with a cloth or paper towel can result in electrostatic charge (‘static') on the inside of the spacer
- Wipe the mouthpiece clean of detergent before use
- Checked the spacer every 6-12 months to check the structure is intact(e.g. no cracks) and the valve is working



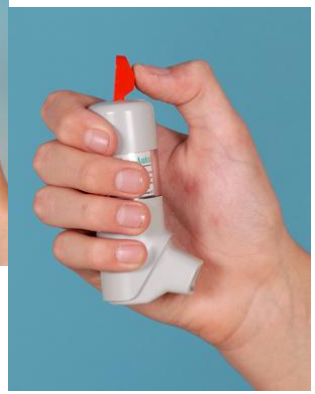


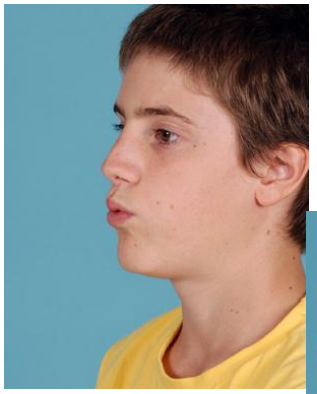
breath-actuated pMDI
How to use

1. Shake the inhaler
2. Hold the inhaler upright. Open the cap (Autohaler-push the lever up)
3. Breathe out gently. Keep the inhaler upright and put the mouthpiece in the mouth and close the lips around it
4. Breathe in steadily through the mouth. DONT stop breathing when the inhaler clicks and continue taking a really deep breath
5. Hold the breath for up to 10 seconds
6. Wait several seconds before repeating steps 1-5 for a second dose
7. NOTE Autohaler The lever must be pushed up(on) before each dose, and pushed down(off) afterwards, otherwise it will not operate

How to use an auto haler








Thanks for your attention and time!