

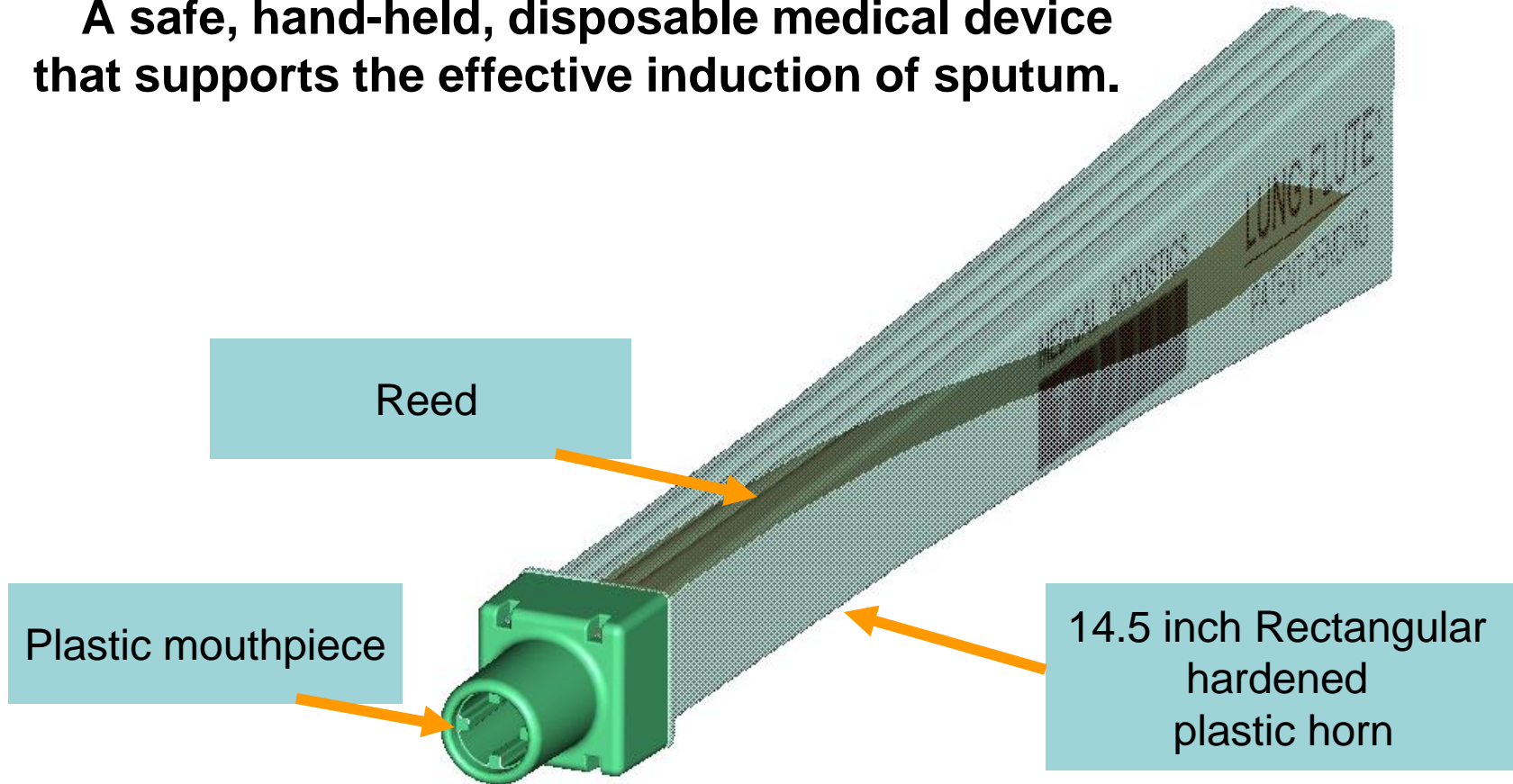
Physics and Physiology of the Lung Flute

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lungflute[®]

Physics of the Lung Flute®

A safe, hand-held, disposable medical device that supports the effective induction of sputum.

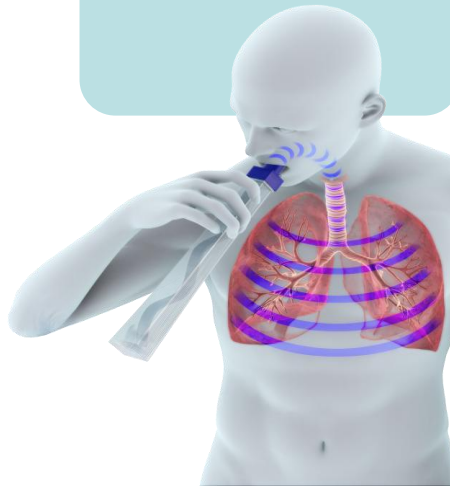


Physics of the Lung Flute®

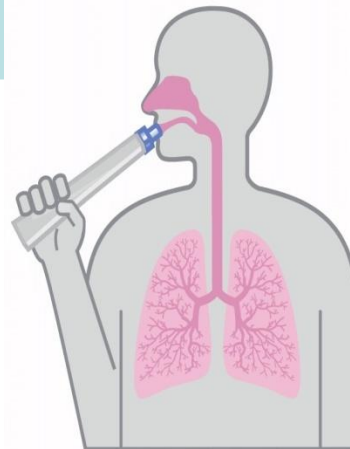
Acoustic sound waves are amorphous, and will travel deeper into the lung structure than conventional pulsed air devices

Lung Flute® Operation

Patient exhales through the Lung Flute® - operating pressure of 2.0-2.5cm H₂O



Reed oscillation, tube design and lung cavity act in parallel to produce sound frequency between 16-25Hz



Lung Flute® supplements the natural mucus clearing system by artificially vibrating the airways and cilia at a frequency between 16-25Hz

Resonance frequency makes the secretions thinner and more easily expelled by coughing

Physiology of the Lungs

Human lungs possess a natural means for clearing lung secretions

Natural rhythmic 'beating' motion of cilia creates vibration between 16-25Hz



Frequency of oscillation includes mucus phase change from viscous to fluid

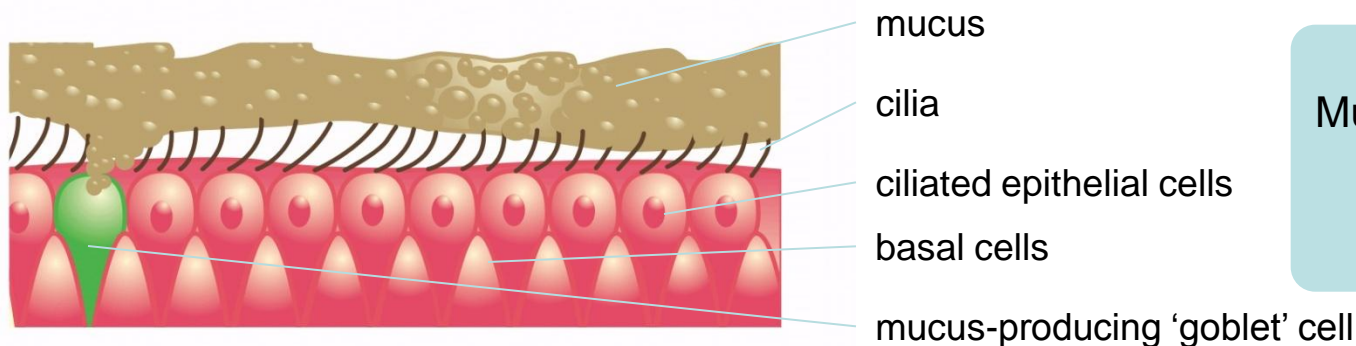


Mucus fluid can now be more easily moved by natural motion of cilia



Mucus fluid expelled by coughing or swallowing

→ → mucus movement → →



Physiology of the Lungs

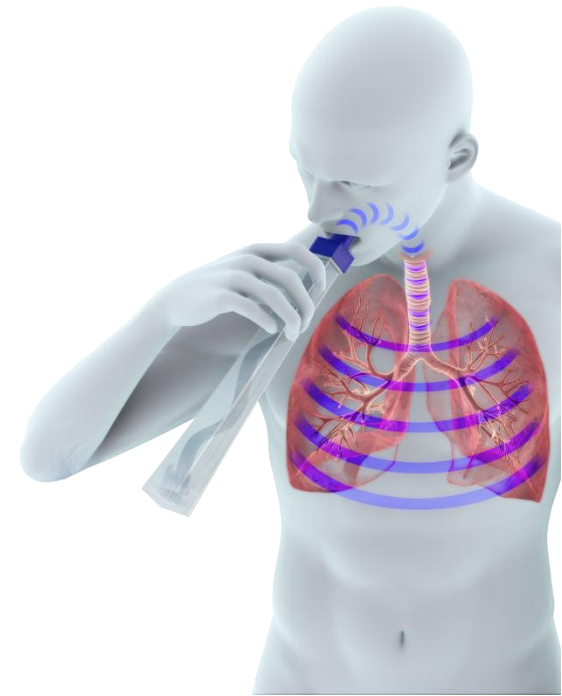
• Patients with lung disease cannot create sufficient mucus clearance as a result of:

- Reduced mucociliary activity
- Excessive mucus production
- Excessive mucus thickness

• Results:

- Lung congestion
- Discomfort
- Difficulty in breathing
- Reduced oxygenation
- Potential infection

• COPD or other lung congestion patients often can only generate pressure of 2.0 - 2.5cm H₂O



Sound Moving through Matter



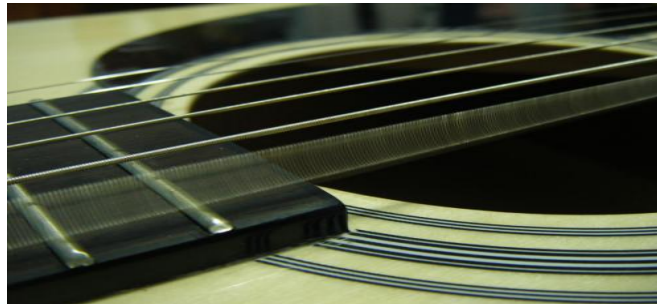
Changing the
viscosity of
secretions

Sound vs. Pressure

The combination of the string and the guitar body or the woofer and the enclosure (box) makes the sound. The string or woofer on its own makes little sound. The parts are designed to complement each other.

- The Lung Flute[®] is designed to couple with the lungs.
- The impedance (performance) of the Lung Flute[®] matches the lungs.
- They work synergistically.

Simply put, it's like plucking a guitar string.



Sound vs. Pressure

- Lung Flute[®] is designed to couple with the lungs in order to create the resonance chamber necessary to capture the sound energy
- Sound is amorphous and will travel deeper into the lungs, including constricted bronchial airways, than back pressure devices
- Lung Flute's[®] low frequency matches the natural oscillation frequency of the cilia