



Medical Applications: Ohm's Law

Airways resistance

The resistance of airway to the air flow in the lungs is **analogous** to the resistance to the current in the electrical circuit, voltage **replaced** by **pressure** difference ΔP and **current** replaced by rate of flow $\Delta V/\Delta t = V$.

Air resistance $\rightarrow R_g = \frac{\Delta P}{\Delta V/\Delta t}$, Typical value for $R_g = 3.3 \text{ cm H}_2\text{O}/(\text{Litter/Sec})$



The air passages provide resistance like;

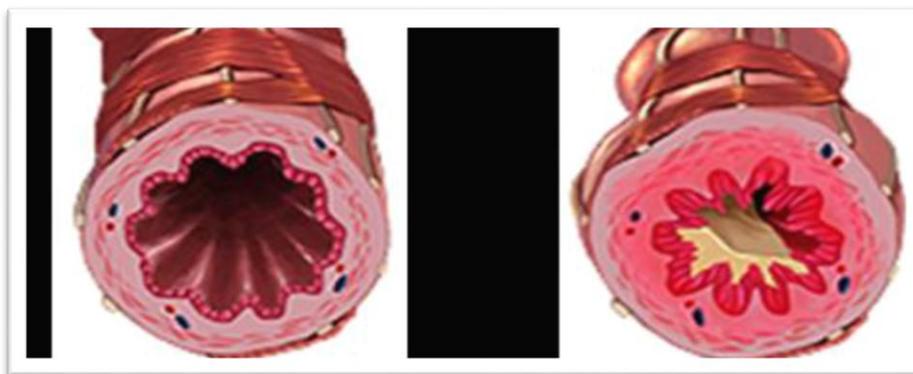
- ✓ **Mucous**
- ✓ **Diameter** of the air passage ,especially in the upper airway passages, where (**diameter** ↓ = **resistance** ↑)



Breathing with a Diseased Lung

There are a number of diseases that affect the lung and directly affect the breathing process. Lung disorders can be classified as **obstructive and constrictive disorders**.

□ **Obstructive disorders** are due to airway obstructions such as **emphysema** and **asthma** disease which related to the **lung compliance** and **airway resistance** respectively.



Asthma

The basic problem is expiratory difficulty due to increased airway resistance. This resistance is due to swelling and mucus in the smaller airways and due to contraction of the smooth muscle around the large airways.