

# Airway resistance and its measurement

## Principle

Airflow between the nose/mouth and the alveoli is driven by a pressure difference. The airways in between form a resistance

$$R = \Delta P / Q$$

where  $R$  is resistance,  $\Delta P$  is the pressure gradient and  $Q$  is airflow

Resistance itself is described by the Poiseuille law

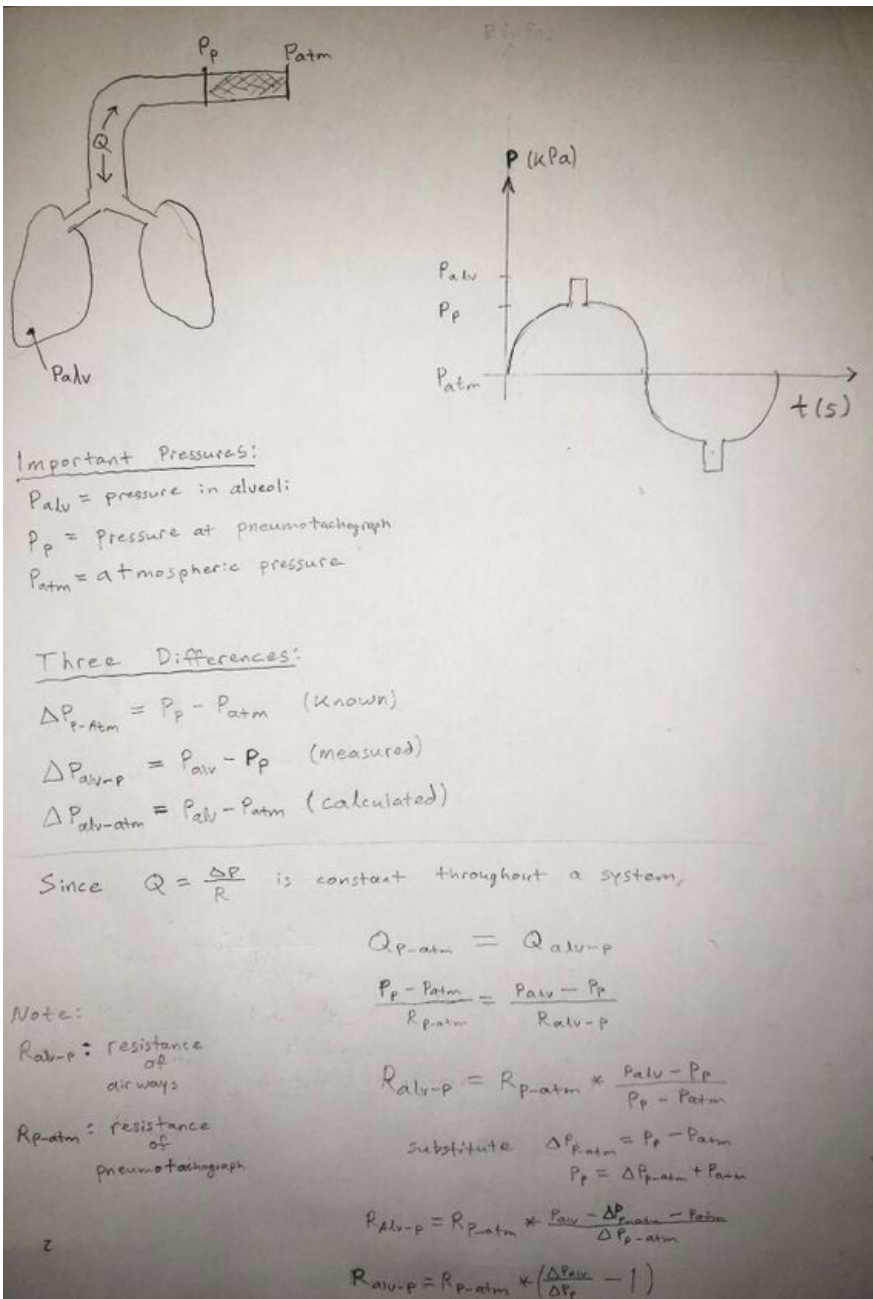
**$R = 8\eta l / (\pi r^4)$  - use to explain why during exhalation there is more resistance, because we take all the alveoli all together, compare with their radius and the tracheal radius**

Where  $\eta$  is the viscosity of the inspired gas,  $l$  and  $r$  are the length and radius of the airway

Evidently, contraction of bronchi results in decreased airflow.

## Measurement

Airway resistance is measured via **pneumotachography** (*pneumo=lung, tacho=fast, graph=write*), which compares pressure differences at two ends of a tube through which the subject breathes. Since the airflow  $Q$  is the same everywhere, one can derive an equation to find airway resistance:



Increased airway resistance indicates obstruction of the airways.

## Links

- Respiratory insufficiency

## References

Costanzo, L., 2019. *Physiology - Board Review Series*. 7th ed. Philadelphia: Wolters Kluwer, p.122.