

TOPIC: PRESSURE IN THE LUNGS & PLEURAL CAVITIES

Forces That Shape the Lungs

◆ Lungs are passive and elastic, so how do they remain open?

- Inwards and outwards forces _____ to keep the lungs open.

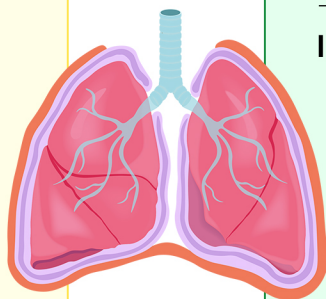
Inward forces: Lung's natural tendency is to collapse.

1. Elasticity/Recoil

- ◆ Contain collagen & _____.

2. Surface Tension

- ◆ Alveoli surface covered in fluid.
- ◆ Surface tension pulls alveoli _____. (Reduced by _____.)



Outwards force: Keeps the lungs from _____.

Intrapleural Pressure

- ◆ Pleural cavity: wet vacuum-sealed bag.
 - Visceral pleura attached to _____.
 - Parietal pleura attached to _____ wall.
 - Fluid creates _____ between visceral and parietal pleura.

◆ Intrapleural Pressure is _____: resists inward forces of elastic recoil and surface tension.

- Air cannot enter pleural cavity; negative pressure keeps the lungs from _____.

EXAMPLE

For each factor listed below, write a “C” if it would contribute to the collapse of the lung. Write an “R” if it would contribute to resisting the lungs tendency to collapse.

Surface tension in alveoli: _____

Intrapleural pressure: _____

Pleural fluid: _____

Elasticity/recoil of lungs: _____

Pulmonary surfactant: _____



TOPIC: PRESSURE IN THE LUNGS & PLEURAL CAVITIES

PRACTICE

What factor is most important in keeping the lungs from collapsing?

- | | |
|---------------------------|------------------------------|
| a) Collagen. | c) Elastin. |
| b) Intrapleural pressure. | d) Fluid lining the alveoli. |

PRACTICE

Individuals with COPD (chronic obstructive pulmonary disorder) have degraded elastin protein, causing their lungs to have less recoil. How would this affect intrapleural pressure and why?

- a) Intrapleural pressure would be more negative because less recoil would lead to less inward pull on the pleura.
- b) Intrapleural pressure would be less negative because less recoil would lead to less inward pull on the pleura.
- c) Intrapleural pressure would become positive because less recoil would lead to an outwards push on the pleura.
- d) Intrapleural pressure would become positive because less recoil would lead to less inward pull on the pleura.

TOPIC: PRESSURE IN THE LUNGS & PLEURAL CAVITIES

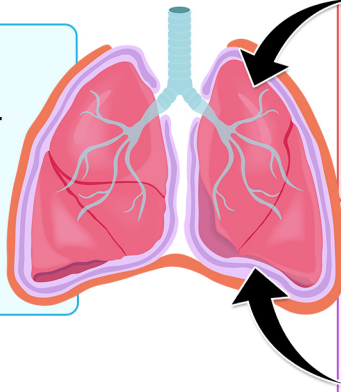
Formalizing Pressure Relationships in the Lungs

◆ ____ distinct pressures:

Atmospheric pressure (P_{atm}):

Amount of pressure in the air.

- ◆ ____: (760 mm Hg).
- ◆ Other pressures are always compared to P_{atm} .



Intrapulmonary pressure (P_{pul}): Pressure in lungs.

- ◆ P_{pul} ____ P_{atm} between inspiration & expiration because it's an ____ system.
- ◆ Difference from $P_{atm} = 0$ mmHg (+ or - ~2 mm Hg).

Intrapleural pressure (P_{ip}): Pressure in pleural cavity.

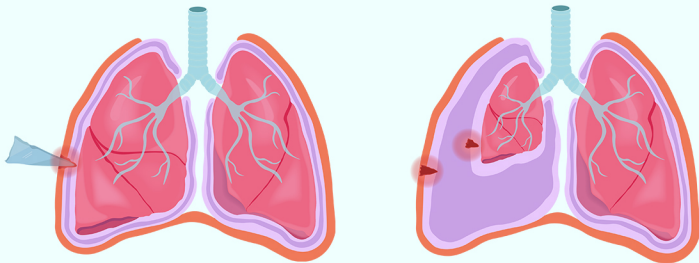
- ◆ P_{ip} ____ P_{pul} because of negative pressure created by resisting the recoil of the lungs.
- ◆ Difference from $P_{atm} \cong -4$ to -6 mm Hg.

◆ As long as P_{pul} ____ P_{ip} , lungs stay inflated with air.

EXAMPLE

Pneumothorax is a pathology caused by air entering the pleural cavity, for example, if air entered a hole in the chest wall through a stab wound. The air in the pleural cavity results in the collapse of a lung. For a patient experiencing pneumothorax, how would you expect the pressure in each location to change?

For each pressure, write “increase”, “decrease”, or “no change” on the lines below.



Atmospheric pressure: _____

Intrapulmonary pressure: _____

Intrapleural pressure: _____

In simple terms, if there is air in the pleural cavity, why does the lung collapse?

TOPIC: PRESSURE IN THE LUNGS & PLEURAL CAVITIES

PRACTICE

True or false: if false choose the answer that best corrects the statement.

In healthy lungs, the intrapulmonary pressure is always lower than the intrapleural pressure.

- a) True.
- b) False, the intrapulmonary pressure is only lower during some parts of ventilation.
- c) False, the intrapulmonary pressure is always greater than the intrapleural pressure.
- d) False, the intrapulmonary and intrapleural must be the same for ventilation to occur.

PRACTICE

Pleural effusion is a condition where fluid accumulates in the pleural cavity. Which pressure or pressures would you expect to be most directly impacted by this fluid accumulation?

- a) Intrapleural pressure.
- b) Intrapulmonary pressure.
- c) Both A & B are correct.
- d) Neither pressure would be impacted.