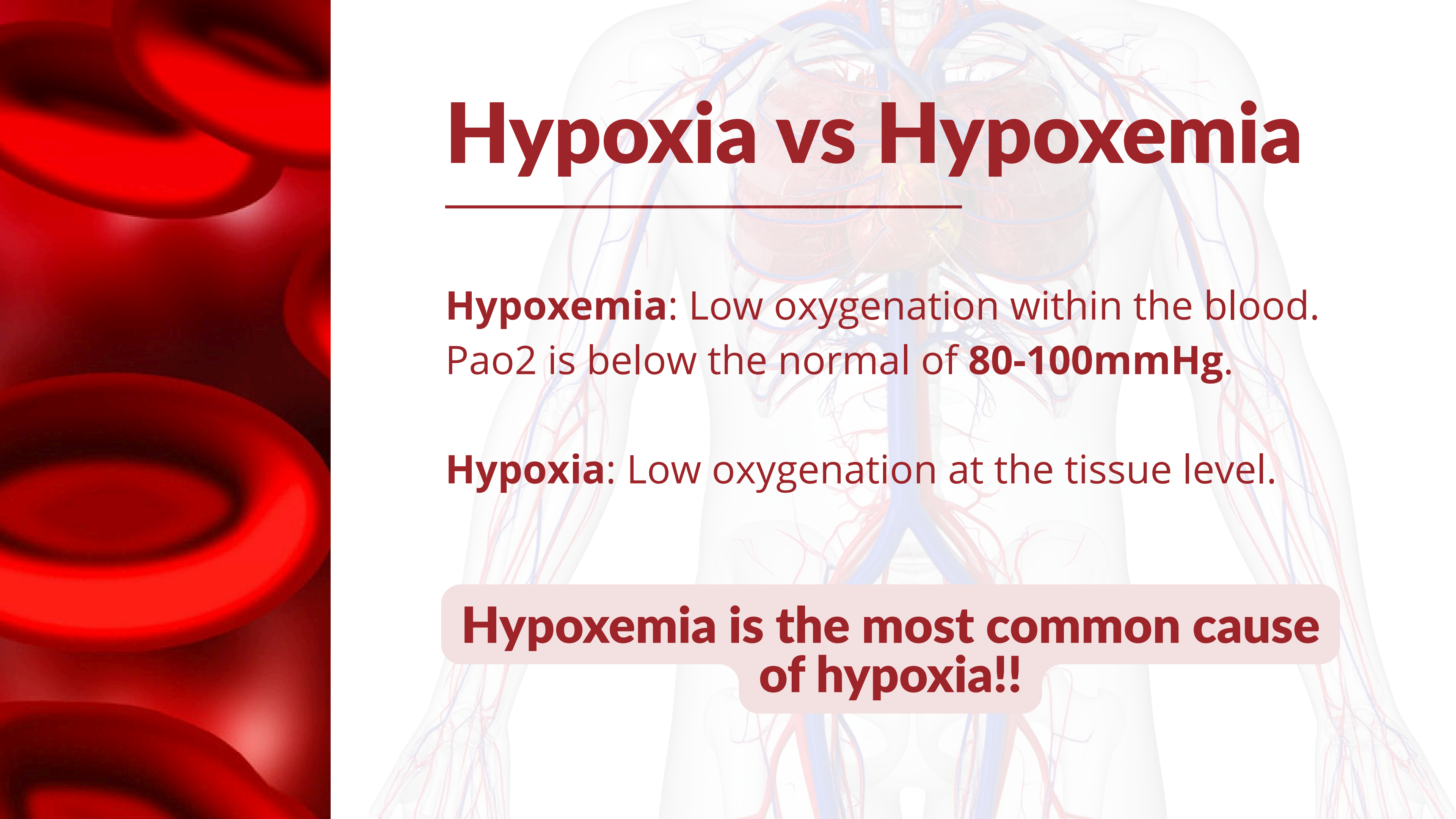


The background of the slide is a dense, artistic illustration of numerous red blood cells. These cells are depicted in various shades of red and orange, with some showing a distinct biconcave disc shape. They are scattered across the entire frame, creating a sense of depth and movement, as if they are floating in a fluid. The lighting is soft, highlighting the edges and surfaces of the cells.

Recognizing Hypoxia

Presented by:
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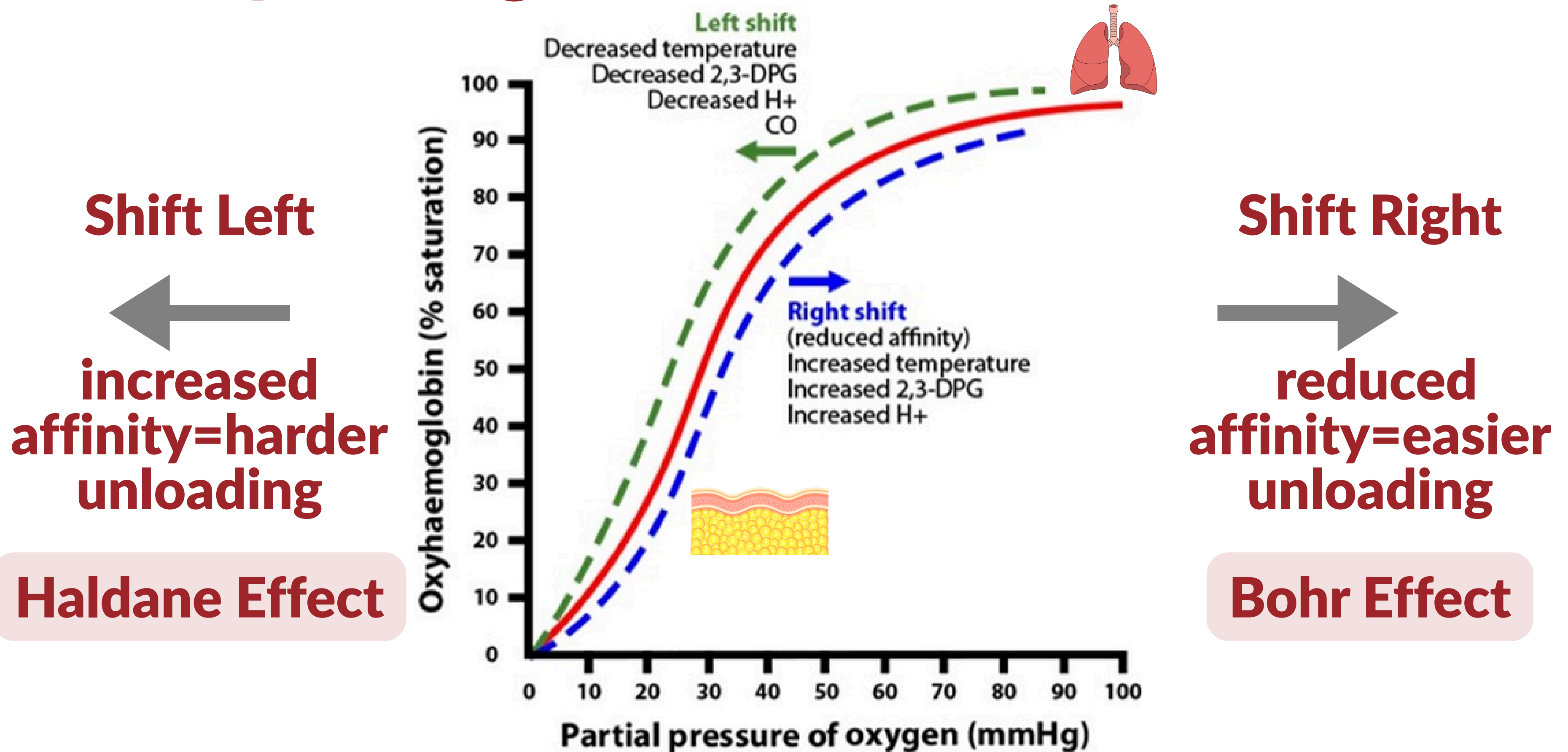
Hypoxia vs Hypoxemia

Hypoxemia: Low oxygenation within the blood.
Pao₂ is below the normal of **80-100mmHg**.

Hypoxia: Low oxygenation at the tissue level.

Hypoxemia is the most common cause of hypoxia!!

Oxyhemoglobin Dissociation Curve



Symptoms

Early

- Anxiety
- Restlessness
- Tachycardia
- Tachypnea
- Headache

Late

- Confusion
- Arrhythmias
- Dizziness
- Cyanosis



Four Types of Hypoxia

Hypoxemia

- 1) V/Q Mismatch**
- 2) Diffusion Impairment**
- 3) Hypoventilation/Intracardiac shunting**
- 4) Low Inspired FiO_2**

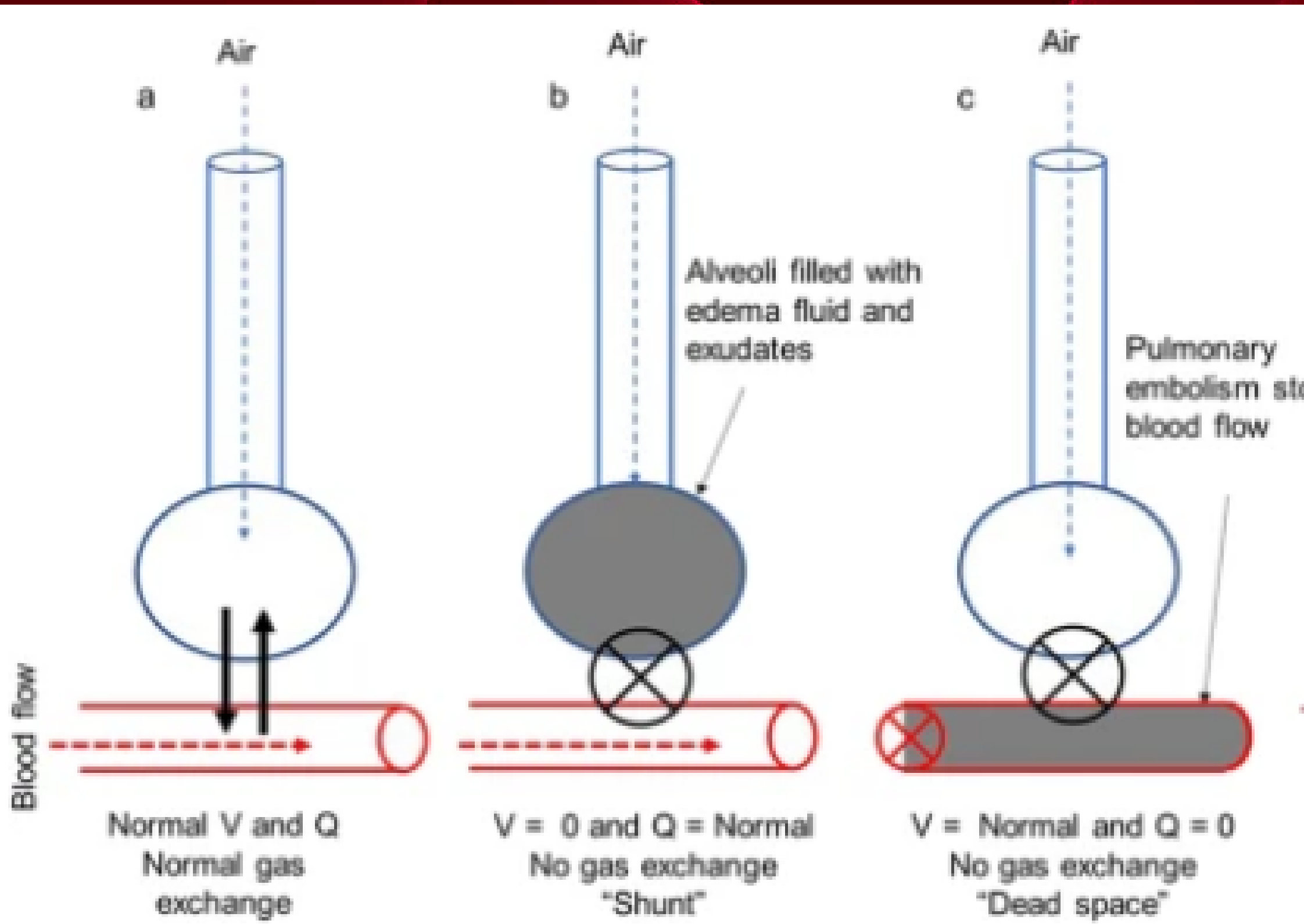
Stagnant

Anemic

- 1) Anemia**
- 2) CO poisoning**
- 3) Sickle Cell**
- 4) Methemoglobinemia**

Histotoxic

Hypoxemic Hypoxia

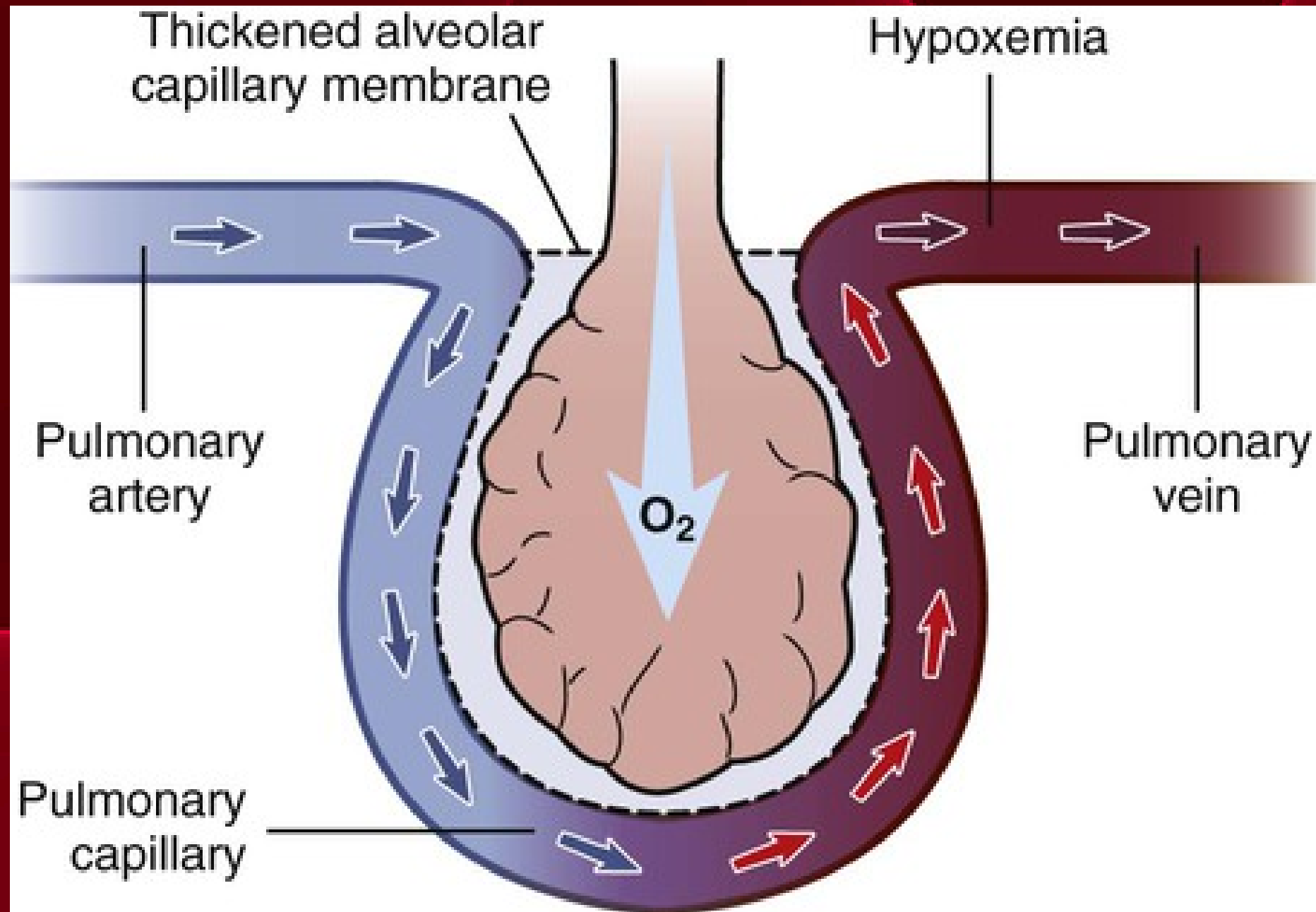


1)V/Q Mismatching

Perfusion available but no ventilation(Shunt)

Alveoli ventilated but no perfusion is available (Dead Space)

Hypoxemic Hypoxia

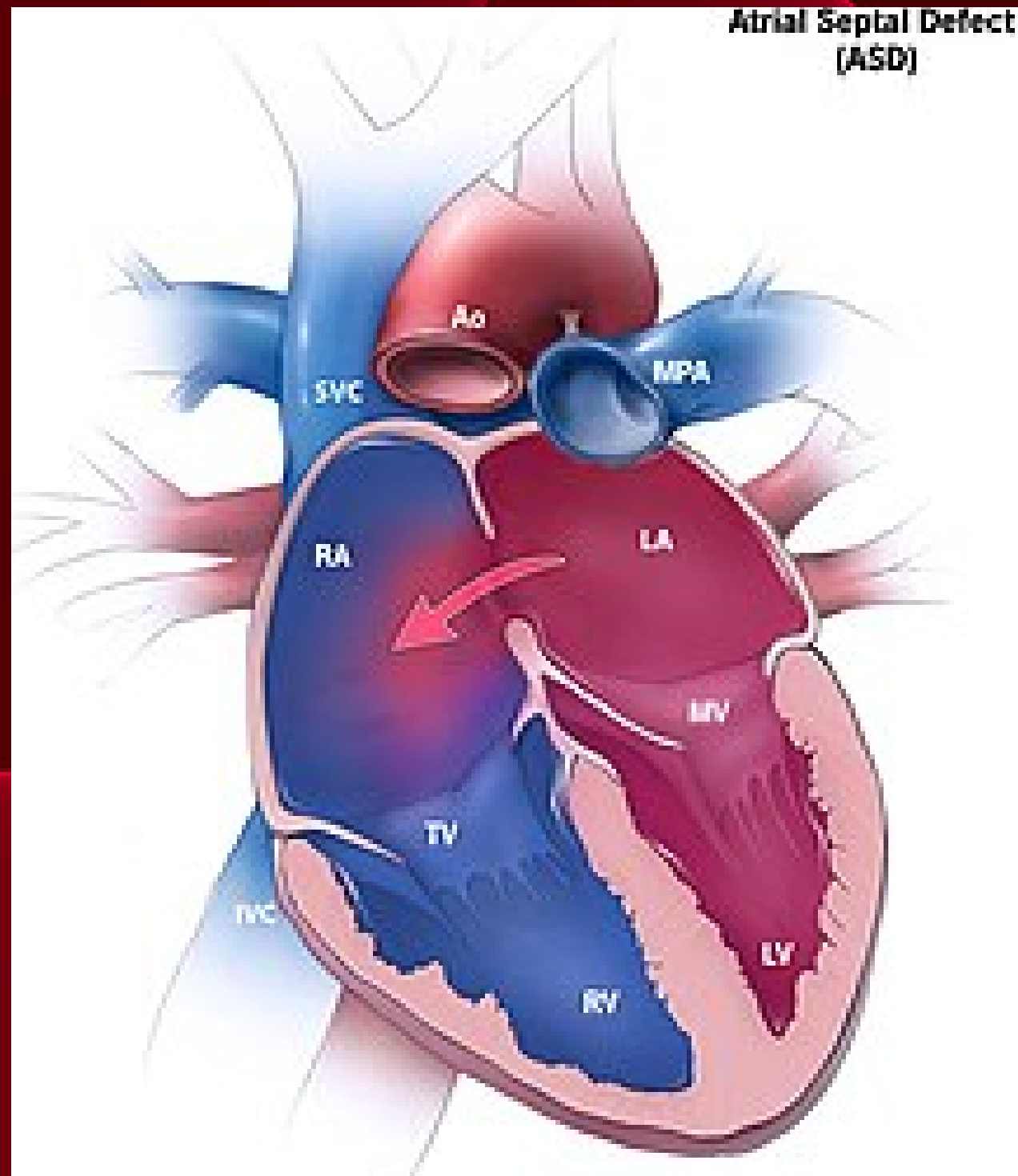


2) Diffusion Impairment:

Exchange membrane is thickened which impedes gas exchange.

Common causes: Interstitial edema, pulmonary fibrosis, emphysema

Hypoxemic Hypoxia



3) Intracardiac Shunting

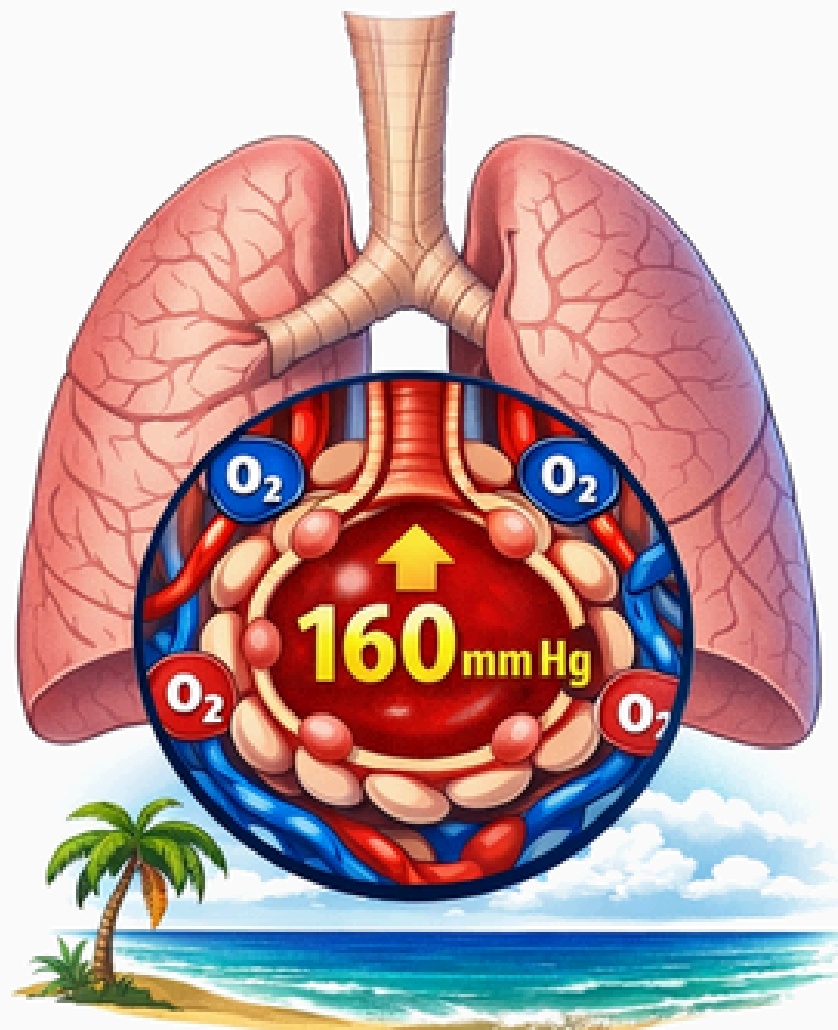
Mixing of oxygenated and deoxygenated blood in the heart.

Common causes: ASV, VSD, patent foramen ovale, congenital heart

Hypoxemic Hypoxia:

At Sea Level

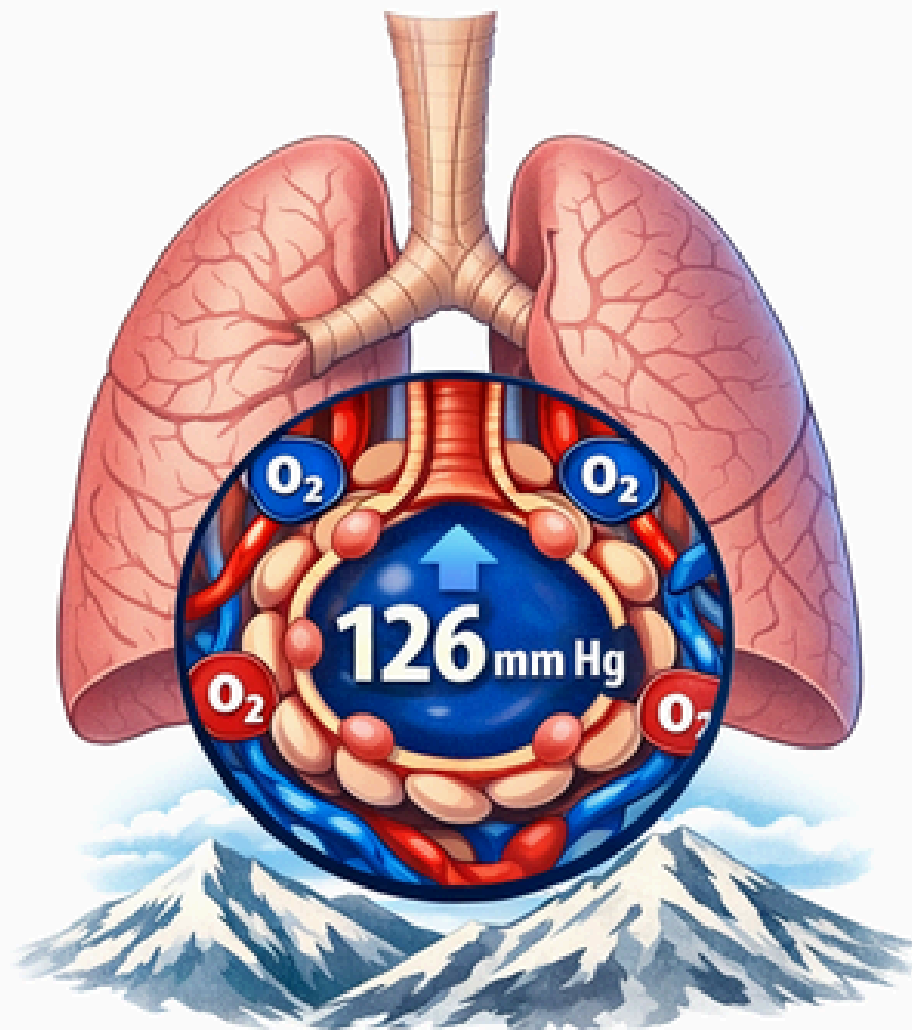
Alveolar Pressure:
~**160** mm Hg



Normal Alveolar Pressure

At High Altitude

Alveolar Pressure:
~**126** mm Hg



Low Alveolar Pressure

4) Low Inspired FiO_2

Sea Level:

$P_{atm} = 760$

$FiO_2 = .21$

$$760 \times 0.21 =$$

$P_{alv} 160$

At 7000ft:

$P_{atm} = 583$

$FiO_2 = 0.21$

$$583 \times 0.21 =$$

$P_{alv} 126$

Hypoxemic Hypoxia

How does the body compensate?

- ✓ • Increase ventilation
- ✓ • Increase heart rate
- ✓ • EPO is released to increase red blood cell production.
- ✓ • Angiogenesis- increased vascular growth into the tissues



Stagnant/Ischemic Hypoxia

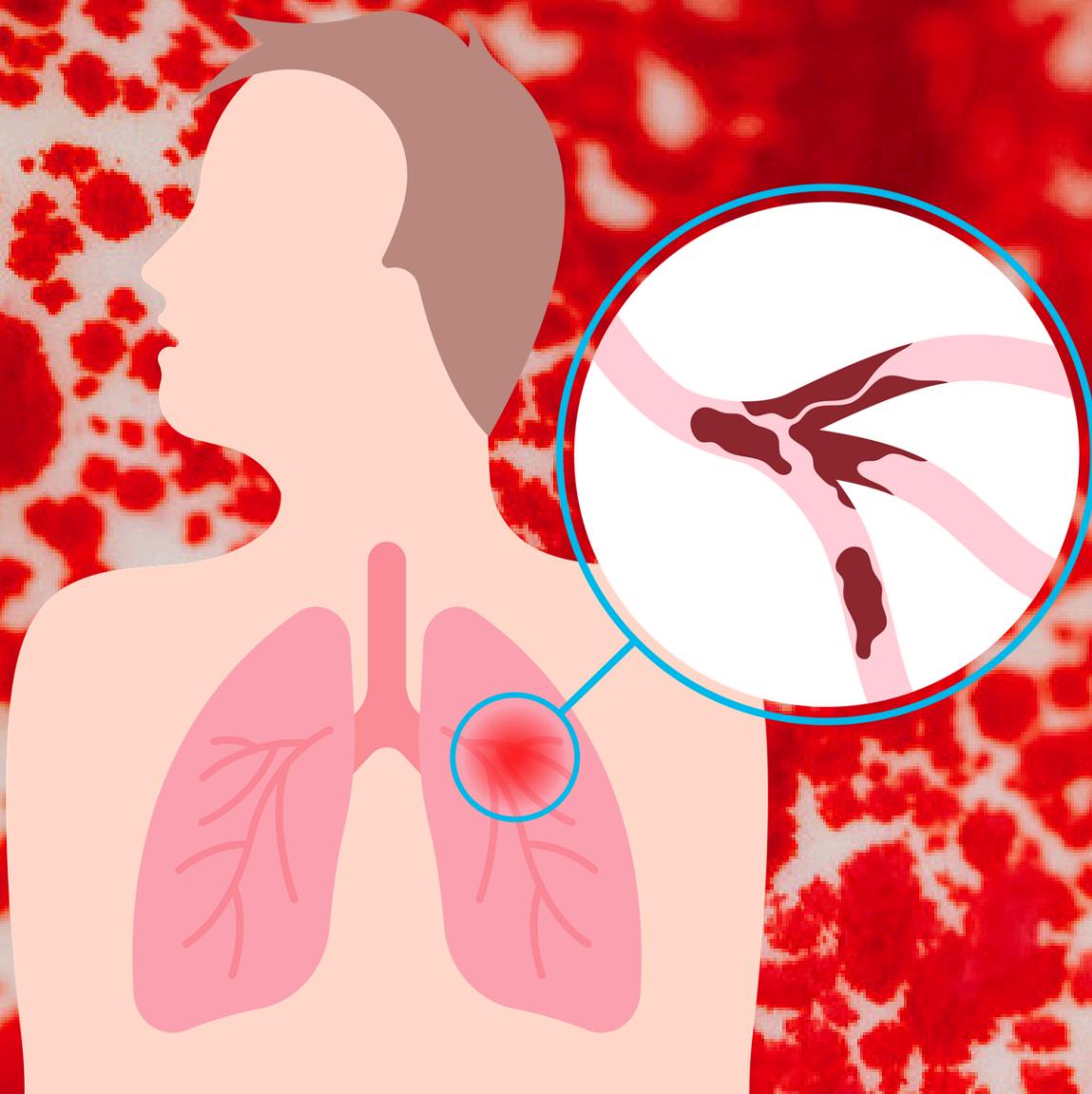
Not enough blood flow makes it into the capillary bed for oxygenation of the tissues to occur.

“Low Flow State”

Conditions:

- CHF
- Hemorrhagic Shock

*Treatment: Improve
cardiac output!*



Anemic Hypoxia

1

Anemia: Decreased RBC (Low iron levels/hypovolemia/Vitamin B12 deficiency)

2

Carbon Monoxide Poisoning: RBC have a 200X greater affinity for CO than oxygen

3

Sickle Cell: Abnormal “sickle” shaped RBC

4

Methemoglobinemia: Commonly caused by topical spray in anesthesia. Rare instances of hereditary forms.

Decreased available carrying capacity for oxygen.
The amount of hemoglobin available to carry O₂ is too low.



Familial Methemoglobinemia: Fugate Descendant

Source:

Trost, Cathy. "THE BLUE PEOPLE OF TROUBLESOME CREEK The story of an Appalachian malady, an inquisitive doctor, and a paradoxical cure."

Histotoxic Hypoxia



Cells unable to utilize oxygen due to the presence of cyanide.
Interferes with mitochondrial oxygen utilization

*Treatment: Hydroxocobalamin,
Sodium Thiosulfate*

Citations

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A microscopic view of blood cells, including red blood cells and white blood cells, floating in a dark red fluid. The cells are shown in various orientations and sizes, creating a sense of depth and movement. The background is a solid dark red color.

Thank You