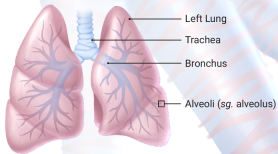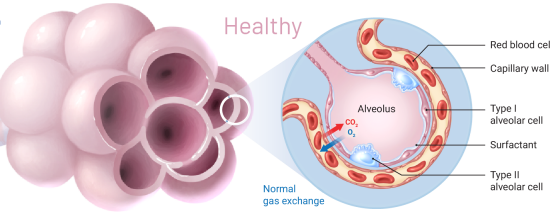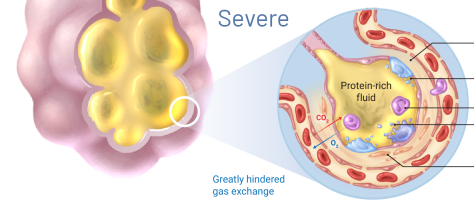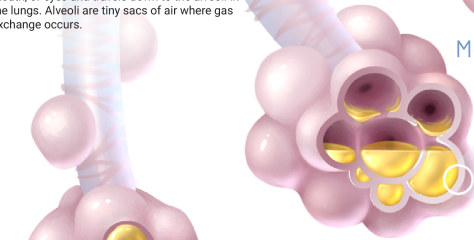# COVID-19

HOW DOES IT AFFECT YOU?

Designed by Avesta Rastan
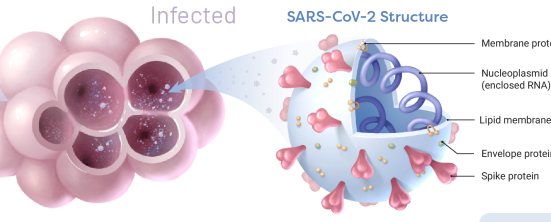www.azuravesta.com
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Coronavirus Disease 2019 (COVID-19) is a pandemic caused by Severe Acute Respiratory Syndrome Coronavirus 2, also called SARS-CoV-2. Despite the widespread awareness regarding COVID-19, many are still unaware about how it affects the human body.

Left Lung
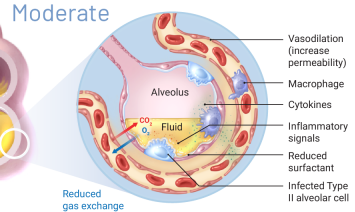Trachea
Bronchus
Alveoli (sg. alveolus)

SARS-CoV-2 starts its journey in the nose, mouth, or eyes and travels down to the alveoli in the lungs. Alveoli are tiny sacs of air where gas exchange occurs.

Healthy

Red blood cell
Capillary wall
Alveolus
Type I alveolar cell
Surfactant
Type II alveolar cell

Normal gas exchange

Gas Exchange

Each sac of air, or alveolus, is wrapped with capillaries where red blood cells release **carbon dioxide** (CO_2) and pick up **oxygen** (O_2). Two alveolar cells facilitate gas exchange; **Type I** cells are thin enough that the oxygen passes right through, and **Type II** cells secrete **surfactant** – a subtsance that lines the alveolus and prevents it from collapsing.

Infected

SARS-CoV-2 Structure

Membrane protein
Nucleoplasmid (enclosed RNA)
Lipid membrane
Envelope protein
Spike protein

Viral Infection

The spike proteins covering the coronavirus bind ACE2 receptors primarily on type II alveolar cells, allowing the virus to inject its RNA. The RNA "hijacks" the cell, telling it to assemble many more copies of the virus and release them into the alveolus. The host cell is destroyed in this process and the new coronaviruses infect neighbouring cells.

Moderate

Vasodilation (increase permeability)
Alveolus
Macrophage
CO_2 O_2 Fluid
Cytokines
Inflammatory signals
Reduced surfactant
Infected Type II alveolar cell

Reduced gas exchange

Severe

Fluid-filled interstitium
Protein-rich fluid
Loss of surfactant
CO_2 O_2
Neutrophil
Protein and cellular debris
Formation of scar tissue

Greatly hindered gas exchange

Impaired Gas Exchange

When the immune system attacks the area of infection it also kills healthy alveolar cells. This results in three things that hinder gas exchange:

1) Alveolar collapse due to loss of surfactant from Type II cells
2) Less oxygen enters the bloodstream due to lack of Type I cells
3) More fluid enters the alveolus

Immune Response

Stay Home

Symptoms may start to show (e.g. dry cough, fever, etc.)

1 After infection, Type II cells release **inflammatory signals** that recruit **macrophages** (immune cells).

Pneumonia develops

2 Macrophages release **cytokines** that cause vasodilation, which allows more immune cells to come to the site of injury and exit the capillary.

Shortness of breath

3 Fluid accumulates inside the alveolus.

Hospitalization

Dangerous for high-risk individuals; secondary infections may occur

4 The fluid dilutes the surfactant which triggers the onset of alveolar collapse, decreasing gas exchange and increasing the work of breathing.

Intensive Care (ICU)

Patients may require ventilators and life-support

5 **Neutrophils** are recruited to the site of infection and release Reactive Oxygen Species (ROS) to destroy infected cells.

6 Type I and II cells are destroyed, leading to the collapse of the alveolus and causing **Acute Respiratory Distress Syndrome** (ARDS).

Complications unrelated to COVID-19 may occur

7 If inflammation becomes severe, the protein-rich fluid can enter the bloodstream and travel elsewhere in the body, causing **Systemic Inflammatory Response Syndrome** (SIRS).

With proper care, patients may recover at any point during this process

8 SIRS may lead to **septic shock** and **multi-organ failure**, which can have fatal consequences.

Go back to:

VISUAL CAPITALIST