

Coronavirus:

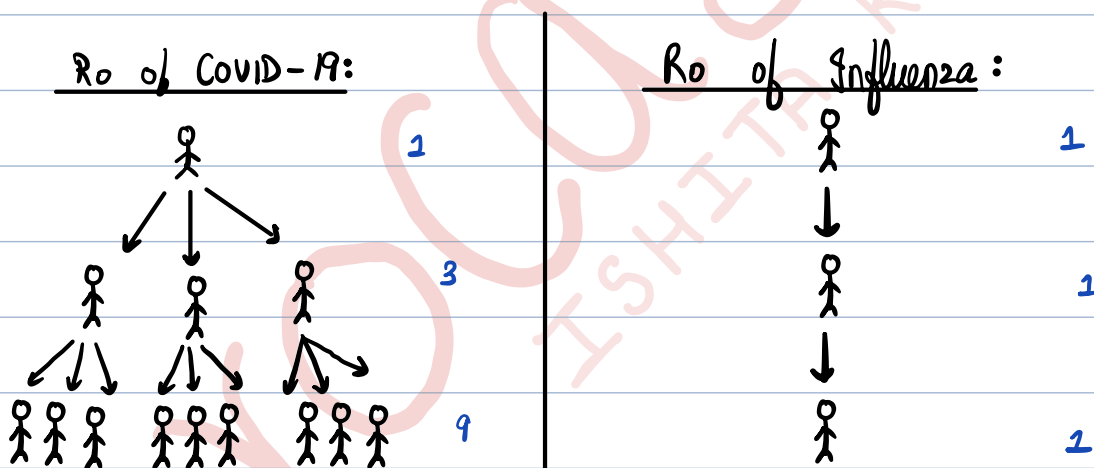
→ Coronavirus disease [COVID-19] is an infectious disease caused by the SARS-CoV-2 virus.

Symptoms of COVID-19:

- Most common symptoms:
- fever
 - difficulty in breathing
 - cough
 - loss of taste &/or smell
- Less common symptoms:
- sore throat
 - diarrhoea
 - headache
 - rash on skin, discolouration of fingers & toes
 - aches & pains
 - red/irritated eyes

How does the infection spread: mostly air borne (also known to spread through faeces)

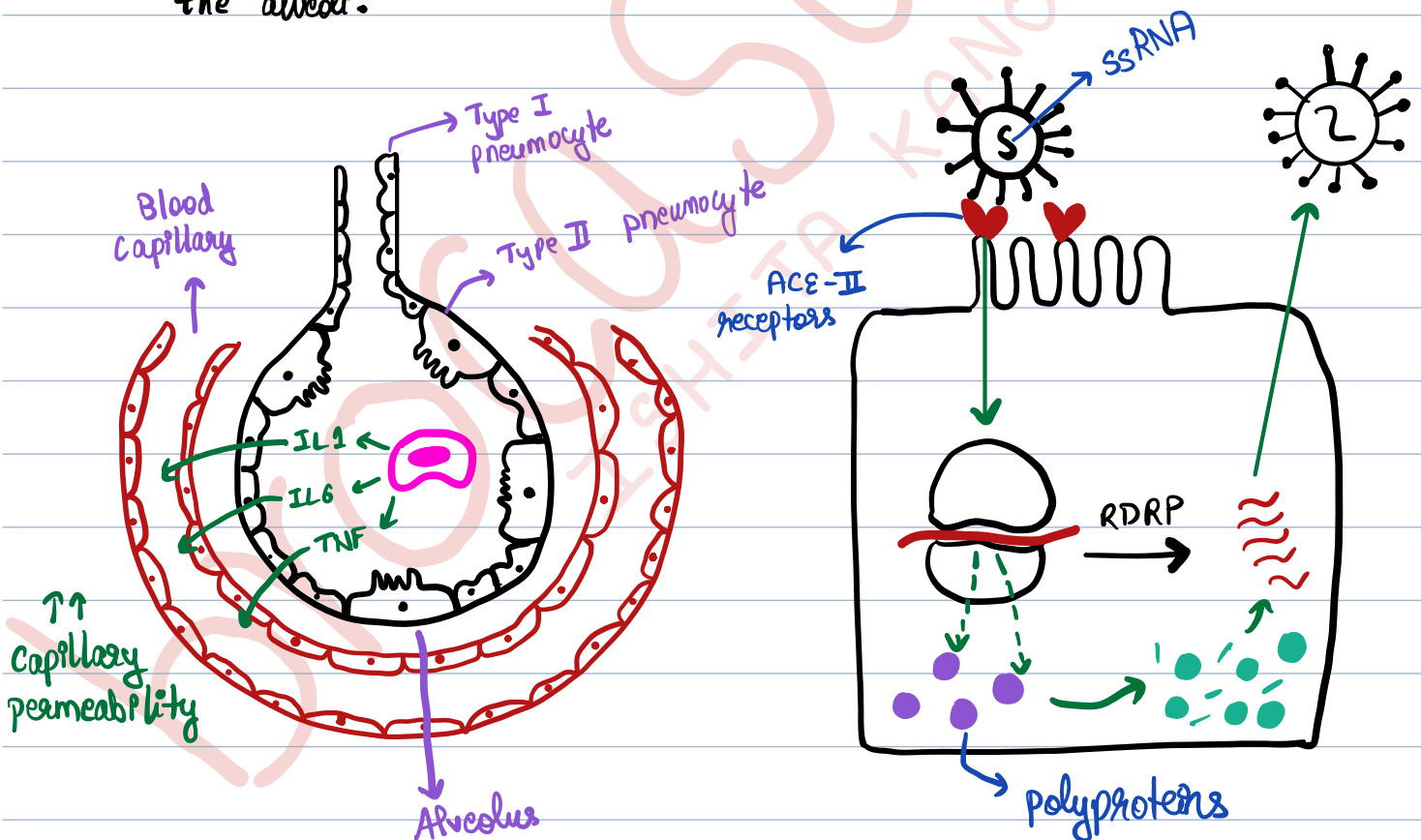
→ R_0 of coronavirus is 2-3, compared to that of influenza which is 1



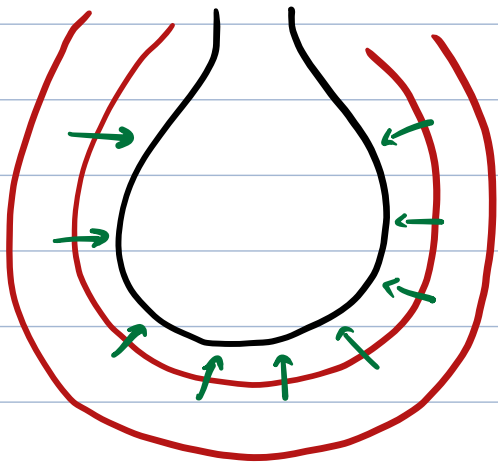
(measles has the highest R_0 to date)

What happens once the virus enters the Lungs:

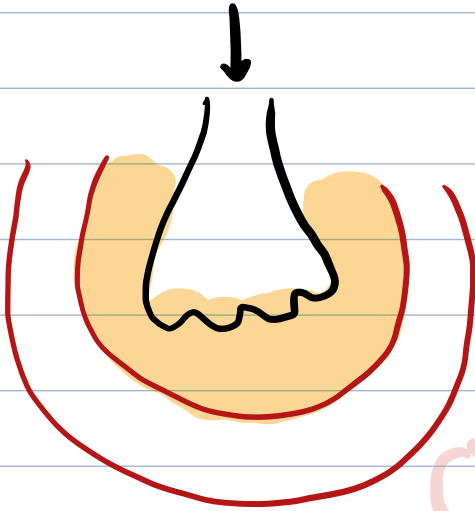
- once the virus enters the respiratory system & reaches the alveoli, it attacks the alveoli
- the virus will attach itself to the receptor in Type II pneumocytes with the help of S spike protein. The receptor in pneumocytes is Angiotensin converting enzyme-II [ACE-II]
- the virus, thus, enters the host cell & releases ssRNA which uses the ribosomes to express (translate) & form polyproteins which are structural component proteins of the virus
- ssRNA is then replicated with help of ssRNA dependent RNA polymerase
- the virus replicates & damages the pneumocytes, thus, releasing inflammatory products
- these inflammatory products act on alveolar macrophages which release IL-1, IL-6, TNF.
- these cytokines act on capillaries & increase capillary permeability
- \therefore plasma extravasates out into interstitial space, fluid accumulates there & compresses the alveoli.



Type II pneumocytes



Blood leaking out of
capillaries



Fluid collection &
alveolar collapse

Why does COVID-19 cause breathlessness:

Type II pneumocyte damage

↓ ↓ surfactant production

↑ ↑ surface tension

Alveolar collapse

↓ ↓ Gas exchange

↑ ↑ work of breathing

DIFFICULTY IN BREATHING

Cough in COVID-19:

Increased inflammatory cytokines

Attracts neutrophils

Release of ROS & proteases

Destroy Type I & II pneumocytes
along with viruses

Cough
↑
Mechanical irritation

↑
consolidation of
alveoli

↑
Collection of cellular
debris in alveoli

Fever :

IL-1, IL-6 released in alveoli

↓
Diffuses to hypothalamus

↓
Release of specific prostaglandins

↓
Increased body temperature

↓
FEVER

Increased HR & RR :

Alveolar collapse

↓
↓↓ gas exchange

↓
hypoxemia

↓
↓ pO₂

↓
stimulation of chemoreceptors

↓
(+) sympathetic system

↓
↑↑ HR

↓
↑↑ RR

When inflammatory reactions become severe:

- it affects the entire systemic circulation \Rightarrow System Inflammatory Response Syndrome (SIRS)
- this eventually leads to septic shock
- this increases capillary permeability throughout the body \Rightarrow extravasation of blood
- this decreases total blood volume & peripheral resistance \Rightarrow hypotension
- hence, there is decreased organ perfusion leading to multiple organ failure.
- kidney failure can be recognised by increased BUN level & creatinine level due to decreased blood flow to kidney
- Liver damage can be recognised by increased level of serum AST, ALT.

Laboratory Diagnosis of COVID-19:

- Swabs
 - nasopharyngeal
 - oropharyngeal
 - anterior nasal

Laboratory Testing

1. RT PCR
2. Serological testing \rightarrow based on IgM / IgG antibodies
3. Antigen detection (lateral flow immunoassay) - for detection of nucleocapsid protein antigen of SARS-CoV-2
4. Viral sequencing: to monitor viral genome.
5. Viral culture