

## Coronavirus:

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

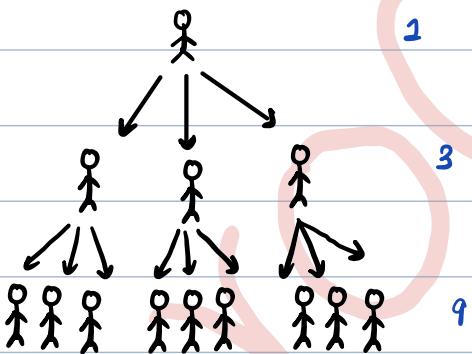
## Symptoms of COVID-19:

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

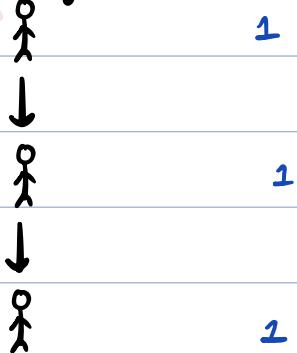
How does the infection spread : mostly air borne (also known to spread through feces)

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

## Ro of COVID-19:



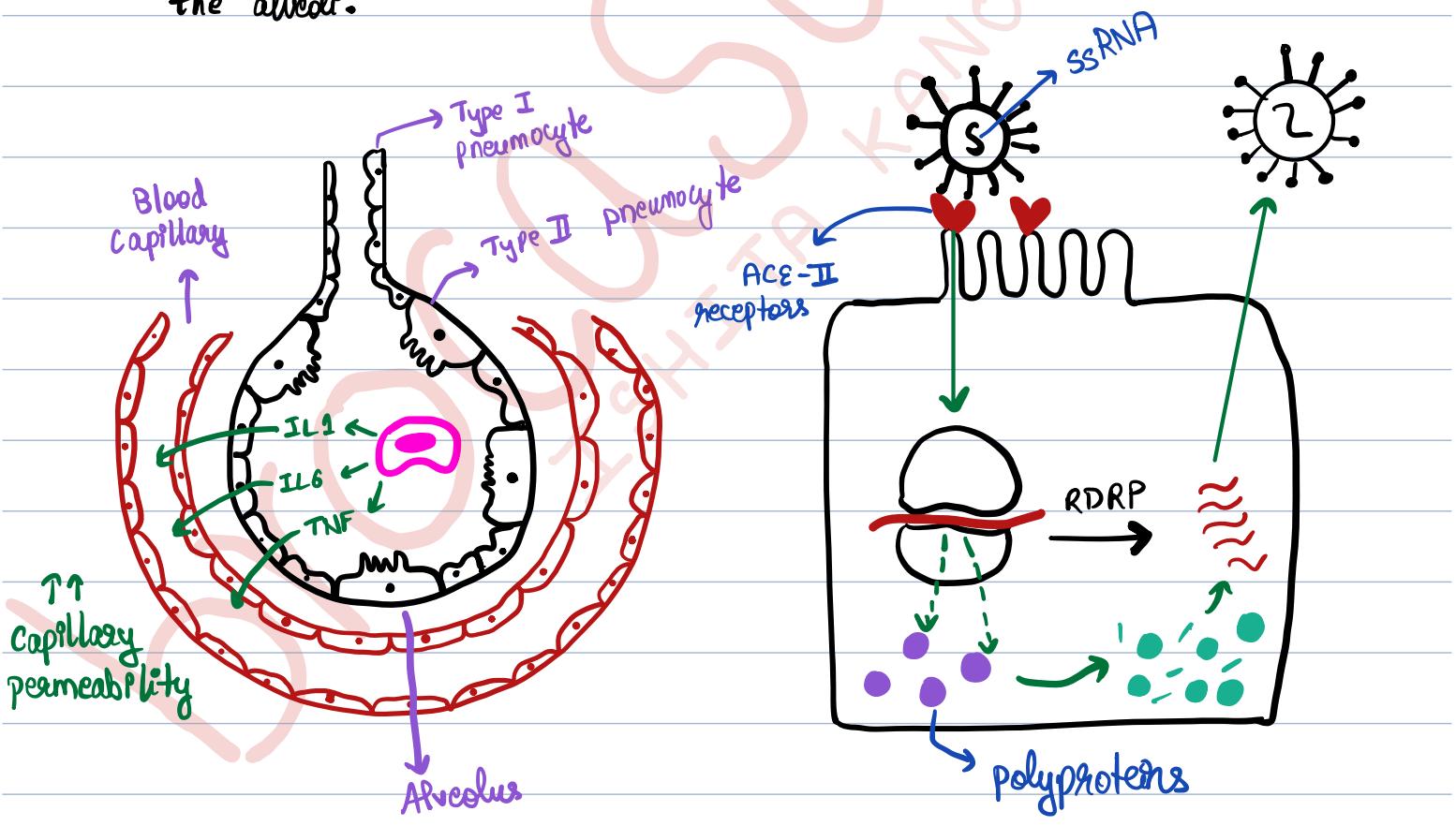
## Ro of Influenza:



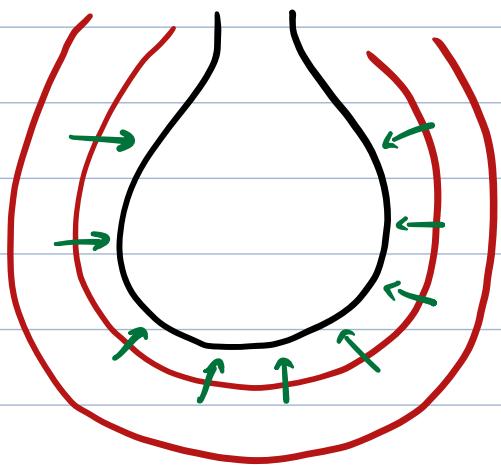
(measles has the highest  $R_0$  to date)

## What happens once the virus enters the Lungs:

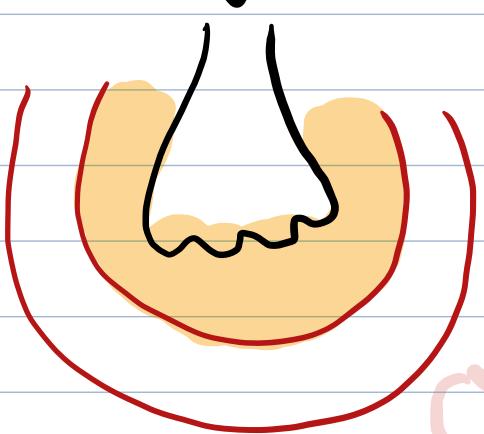
- once the virus enters the respiratory system & reaches the alveole, it attacks the alveol
- the virus will attach itself to the receptor in Type II pneumocytes with the help of S spike protein. The receptor in pneumocytes is Angiotensin converting enzyme-II [ACE-II]
- the virus, thus, enters the host 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
- ∵ plasma extravasates out into interstitial space, fluid accumulates there & compresses the alveol.



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 alveole



Diffuses to hypothalamus



Release of specific prostaglandins



Increased body temperature



FEVER

## Increased HR & RR :

Alveolar collapse



↓ gas exchange



hypoxemia



↓  $pO_2$



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 immunochemical assay) - for detection of nucleocapsid protein antigen of SARS-CoV-2
4. Viral sequencing : to monitor viral genome.
5. Viral culture