

How coronavirus will infect human in a workspace and classroom environment

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GREEN ARCHITECTURE IN THE TROPICS 14
INTERNATIONAL STUDENT WORKSHOP
"BUILDING DESIGNS DURING COVID-19 PANDEMIC"

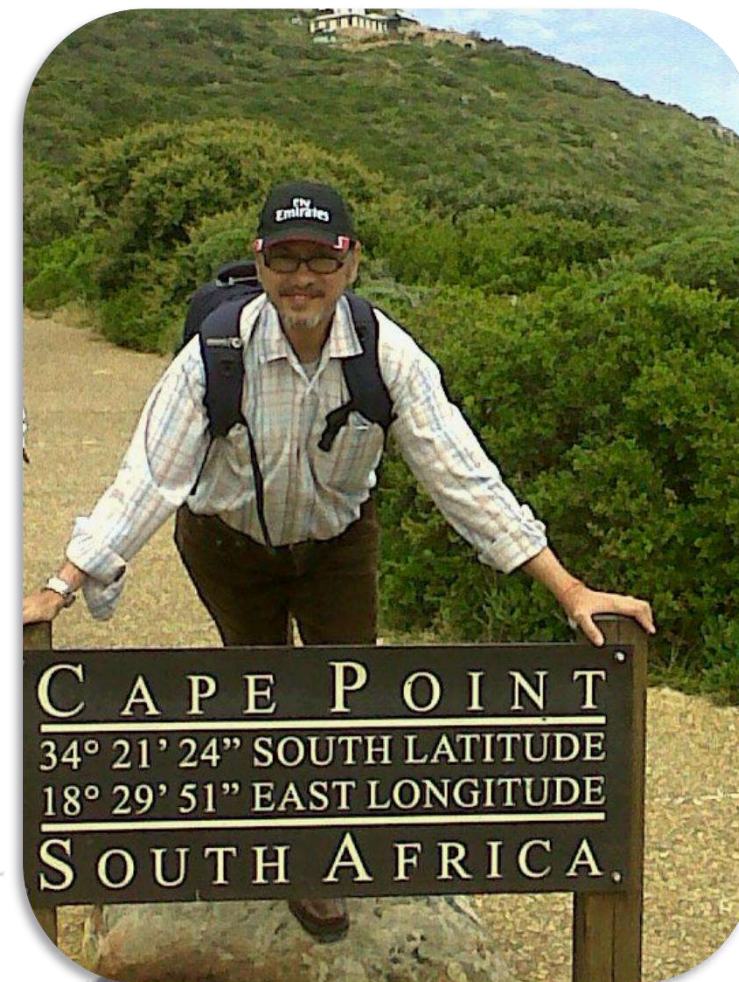
Brief Profile

Abraham Simatupang

Clinical Pharmacologist

- Dr.med. – University of Bonn, Germany (1996)
- MKes. – FK UGM (1993)
- MD – FK UKI (1986)
- Head of Dept. Pharmacology & Therapy (2004-2016; 2020-now)
- Member of Committee of Frambusia, Lepra –Ministry of Health) (2014-2016)
- Member of Drug Registration Review – FM UI & BPOM - RI
- Editorial Board of Medical Journal of Indonesia (2011-2015)
- Director – Akademi Fisioterapi UKI (2009-2012)
- General Manager of Majalah FKUKI (2010-now)
- Founder & Editor in chief (s.d. 2010): Journal of DIGM (*Deutsch-Indonesische Gesellschaft fuer Medizin*)
- Honorary editor: Cermin Dunia Kedokteran (CDK)
- Director of Task Force for HIV & AIDS (2007-2009)
- Director of Research Center (1998-2004)

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“Melayani bukan dilayani”

OUTLINE



PRE-TEST

Don't be afraid it's jus a test! 😊

TYPE OF DISEASES

NCD and CD type of disease

SHORT STORY ON EPIDEMIOLOGY

Triad of Epidemiology

MORPHOLOGY OF LIVING THINGS

*Comparison on Human Morphology and other living things
Comparison of viruses*

COURSE OF THE DISEASE

Covid-19 infection and its course

DROPLETS AND AEROSOL

Non-Communicable Disease (NCD)

(Genetic, Lifestyle)

- Hypertension, Overweight-Obesity
- Diabetes Mellitus, Dyslipidemia

Communicable Diseases

(Parasites, Bacteria, Fungi, Viruses)

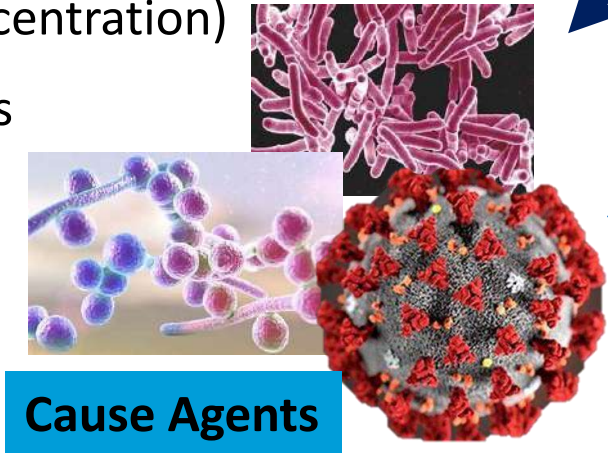
- Malaria,
- Tuberculosis, Candidiasis
- Dengue Fever, Covid-19



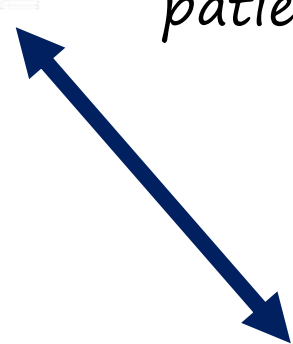
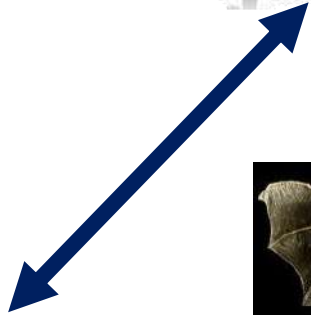
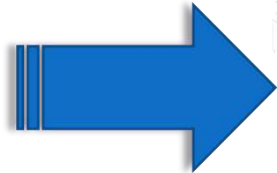
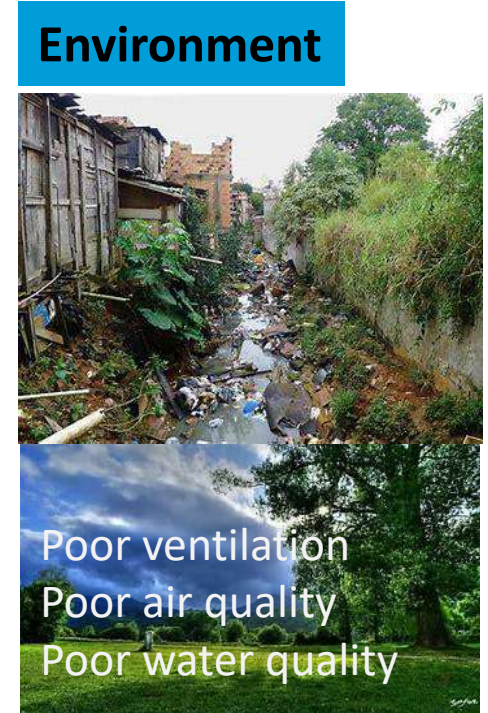
DISEASES

Triad of epidemiology

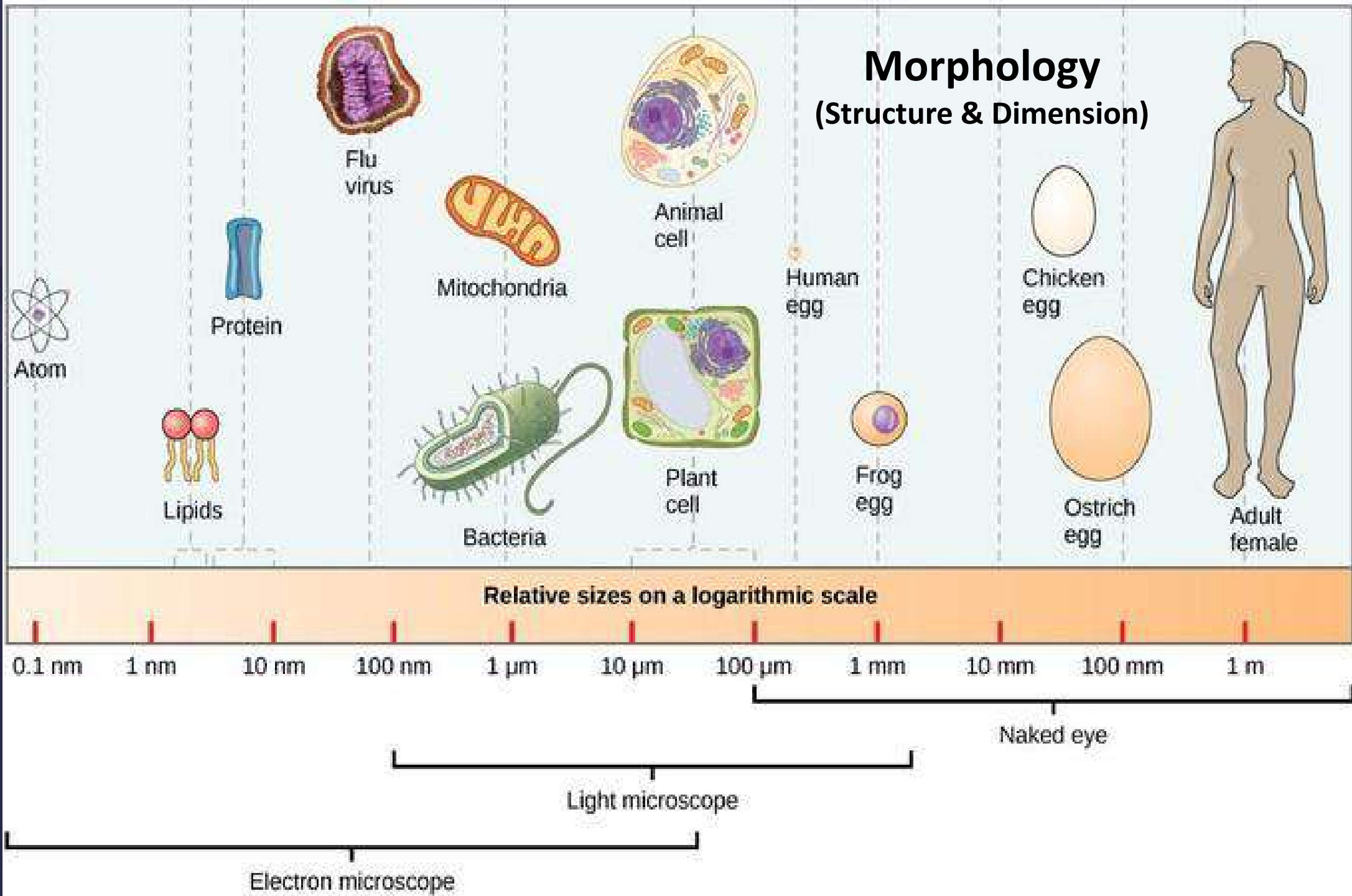
- Type of virus
- Viral load
- Titer virus (concentration)
- Viability of virus

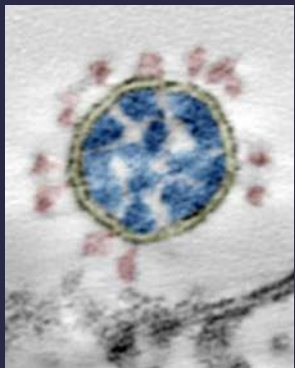
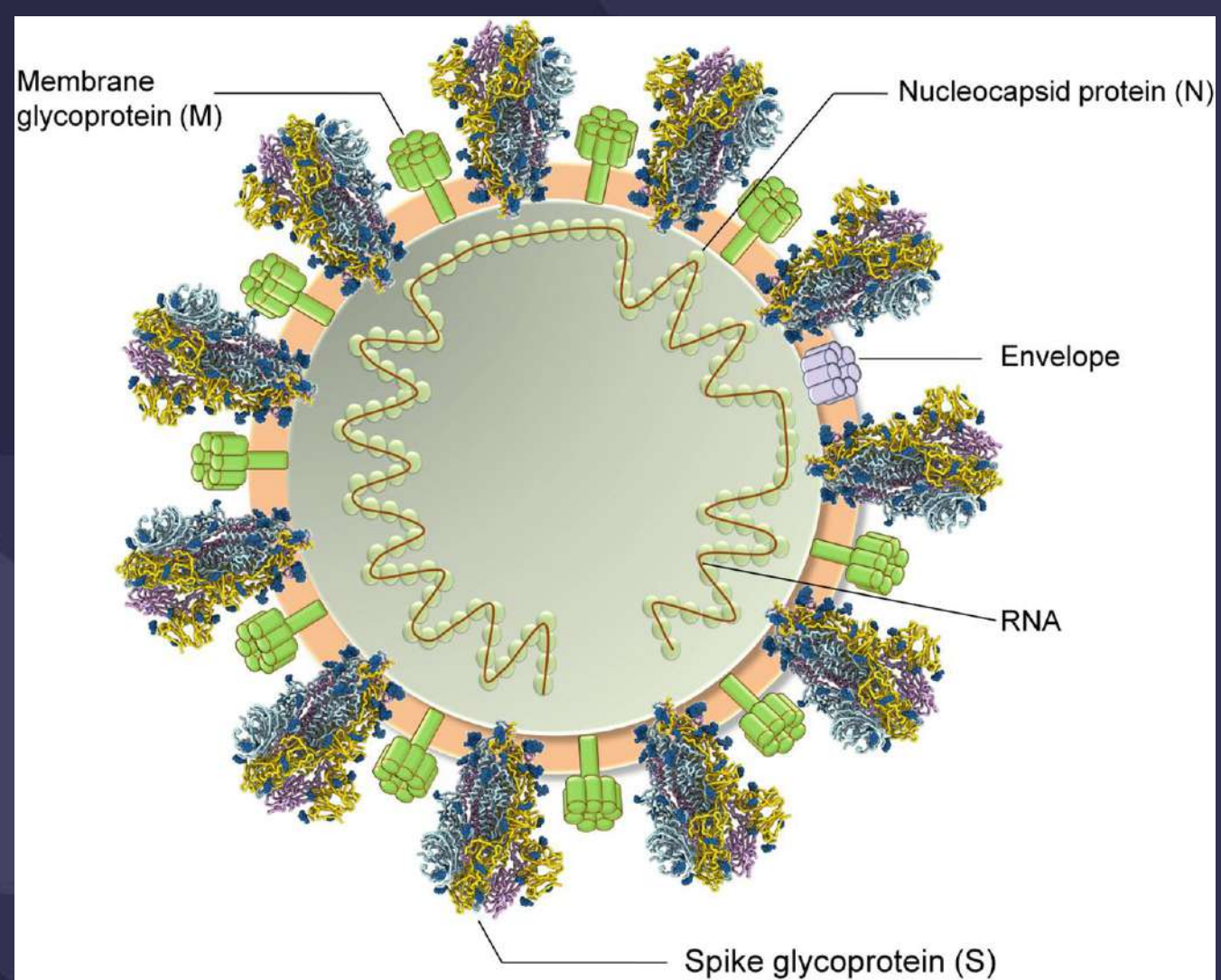
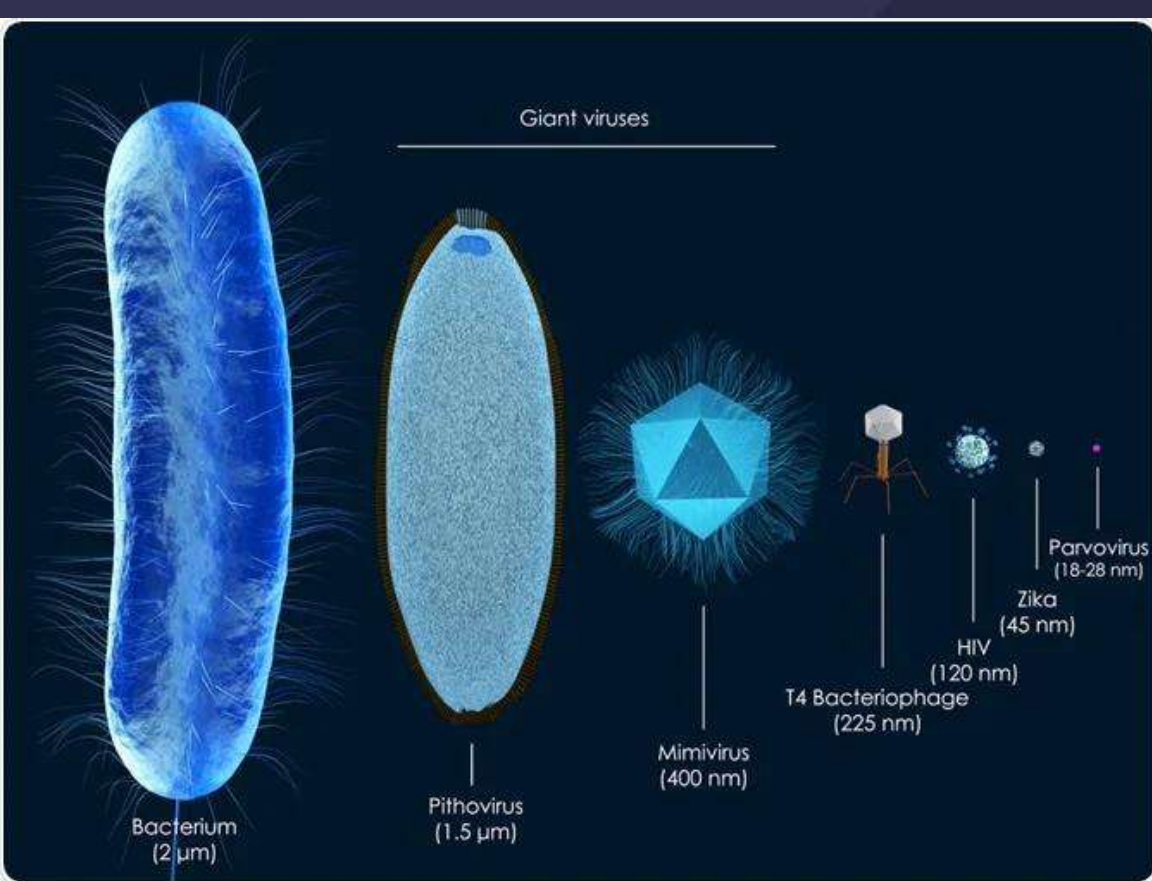


- Immunity Status
- Age, sex, nutritional status, physical status, comorbid (Diabetes mellitus, hypertension, auto-immun, cancer, HIV/AIDS, etc.), elderly people
- Immunocompromised patients: drugs → *transplantation patient, HIV/AIDS*



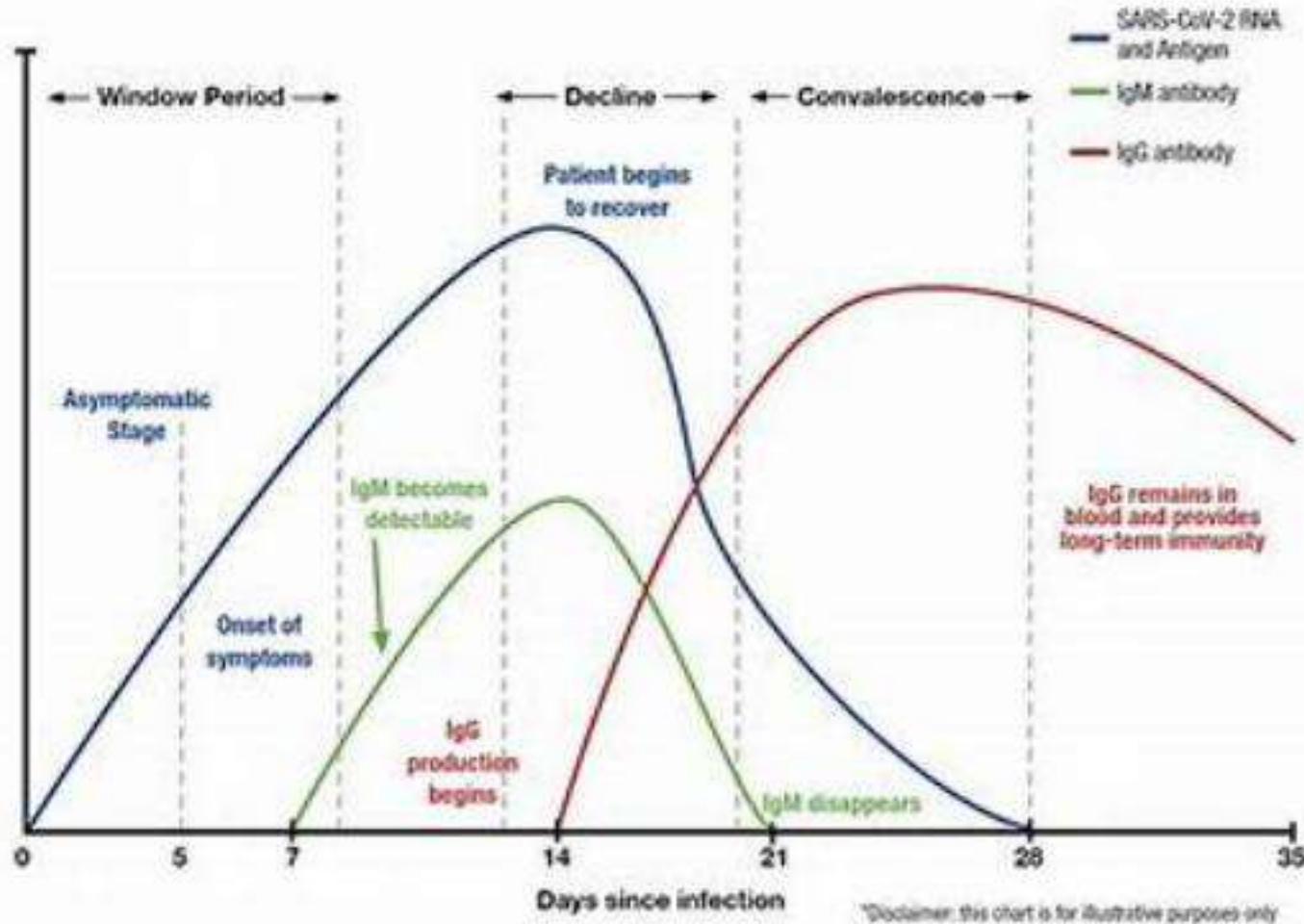
Morphology (Structure & Dimension)





Transmission EM of a single virus particle of SARS-CoV-2 at the surface of a Vero cell in an ultrathin plastic section (10 summed up digital slices of an electron tomogram)

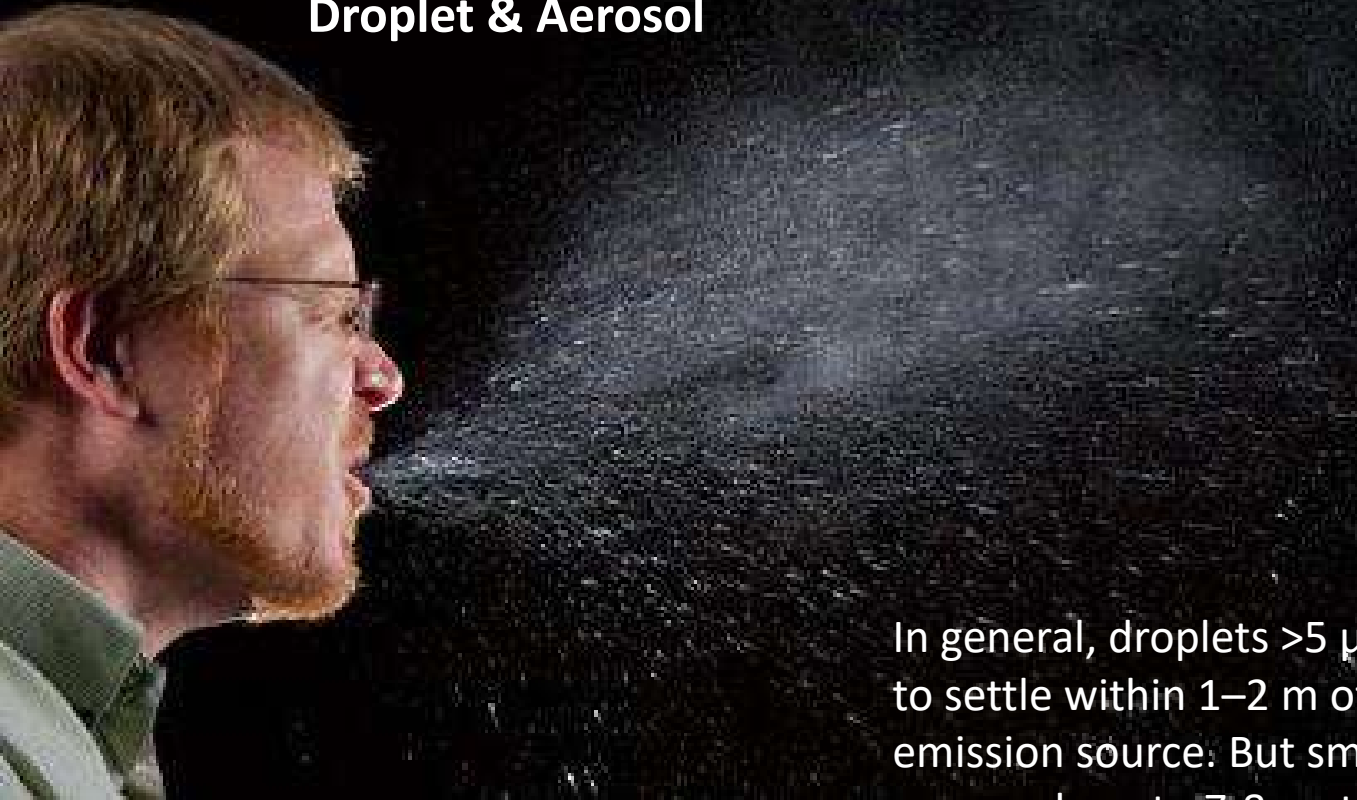
Course of the Disease (in an infected but cured person)



OTG = Orang Tanpa Gejala/Men without symptoms (MWS)

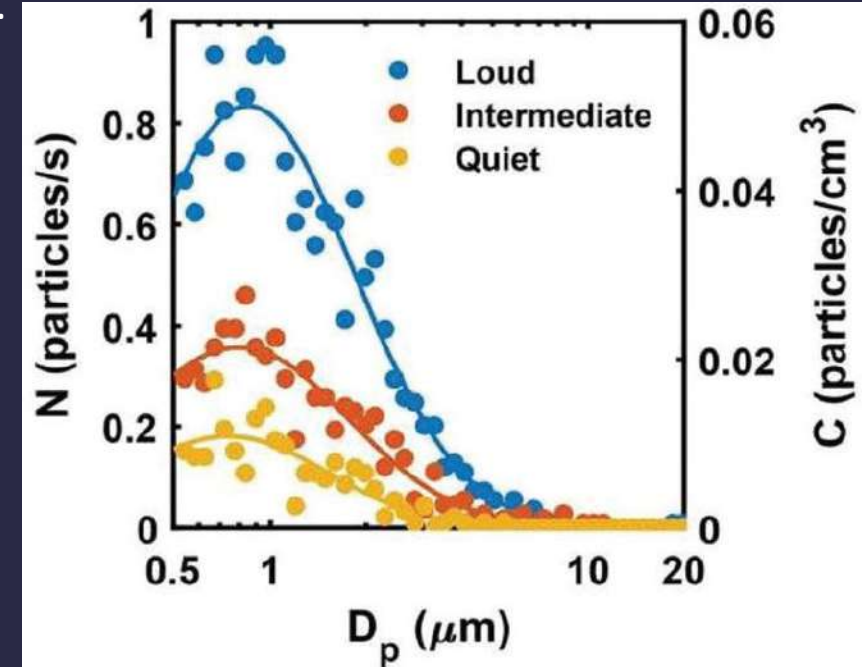
- Days 5-7 begin to appear symptoms, depending on viral-load (amount and “virulency”), endurance. The body's reaction can be MwS, mild symptoms, moderate to severe and death.
- At the beginning of the infection (up to day 7) antibodies don't appear yet, after that IgM begins to appear and disappears on the 21st day. On the 14th day IgG began to appear IgG lasted more than 35 days. If the person cured → she/he can be a donor of Convalescent Plasma Therapy.
- On the 10th day the patient begins to recover (recovery).

Droplet & Aerosol



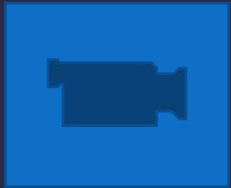
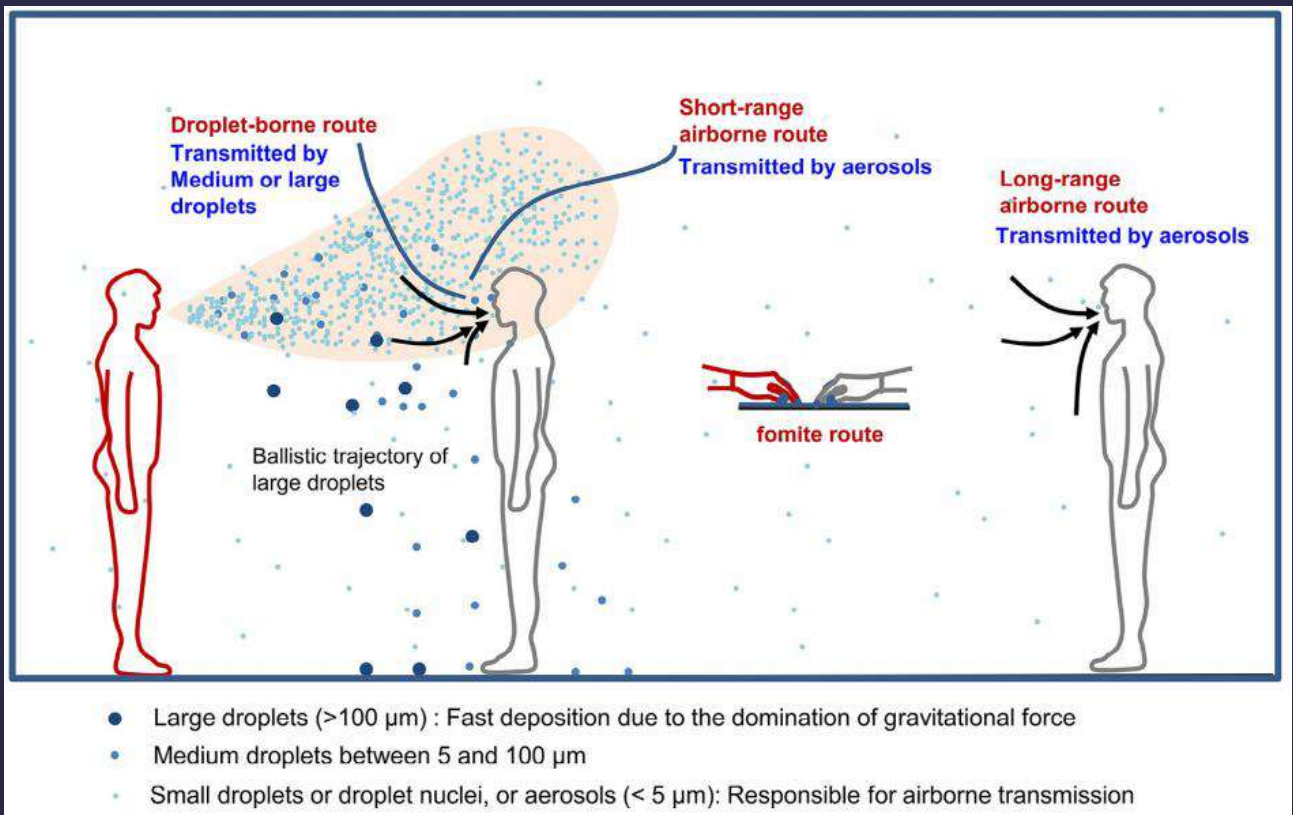
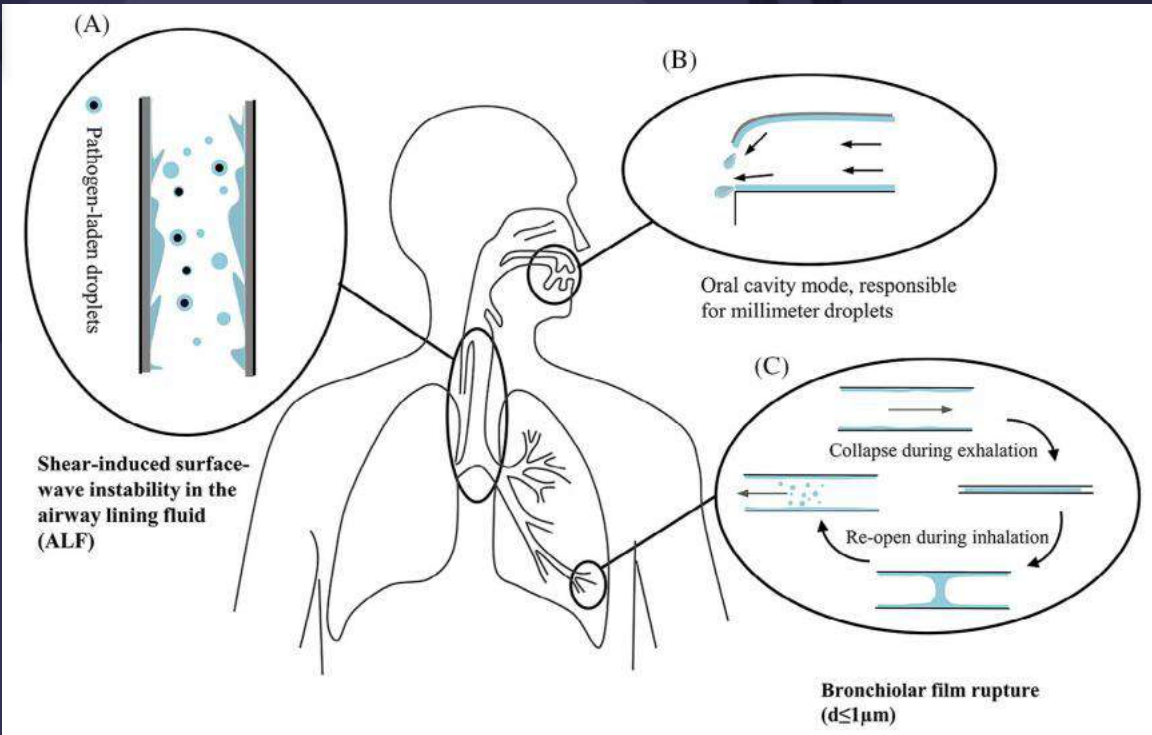
The COVID-19 virus spreads mainly via droplets of saliva or nasal discharge ('mucosalivary droplets') emitted when an infected person coughs, sneezes, talks or breathes.

In general, droplets $>5 \mu$ are expected to settle within 1–2 m of the emission source. But smaller droplets can reach up to 7-8 meters



Detailed information of droplets and aerosols generated from human expiratory activities (Source: [Duguid, 1945](#)).

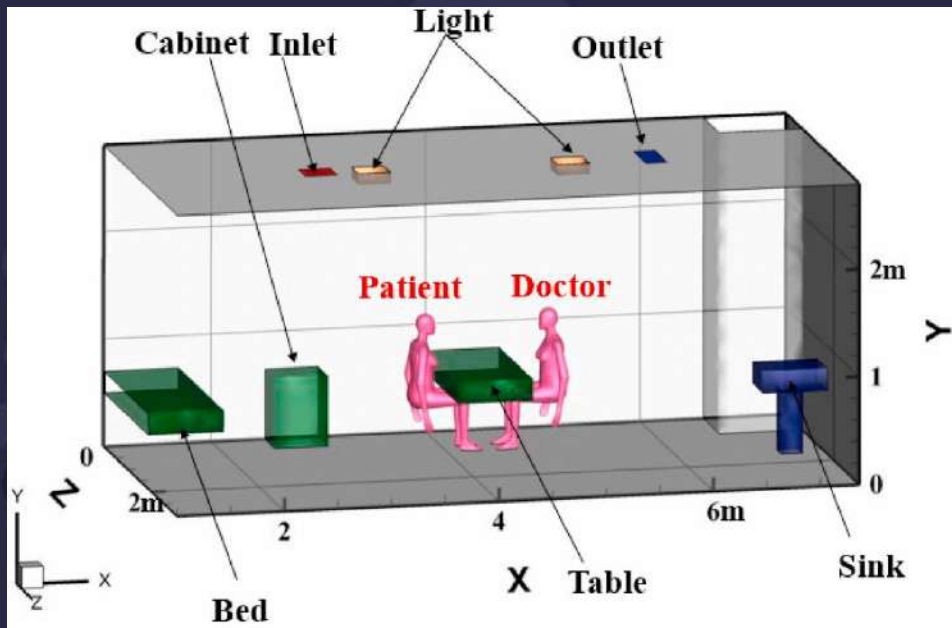
Activity	Number of droplets and aerosols generated (1–100 μm)	Presence of aerosols (1–2 μm)	Region of origin
Normal breathing (for 5 min)	None – few	Some	Nose
Single strong nasal expiration	Few – few hundred	Some	Nose
Counting loudly - talking	Few dozen – few hundred	Mostly	Front of the mouth
A single cough (mouth open)	None – few hundred	Some	Faucial region
A single cough (mouth initially closed)	Few hundred – many thousand	Mostly	Front of the mouth
Single sneeze	Few hundred thousand – few million	Mostly	Front of the mouth
	Few – few thousand	Some	Both from the nose and the faucial region



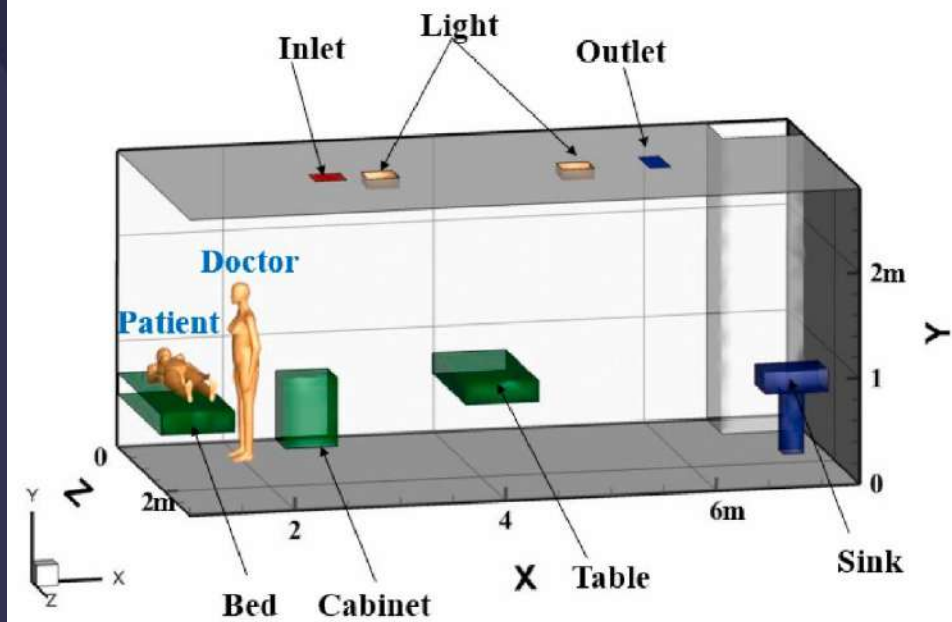
How long does Covid-19 live on surfaces?

EVIDENCE of DROPLET & AEROSOL TRANSMISSION





(a)



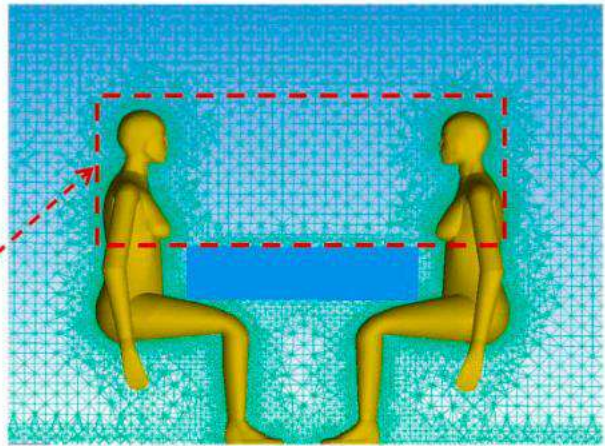
(b)

Experimental and numerical study on the transmission of droplet aerosols generated by occupants in a fever clinic

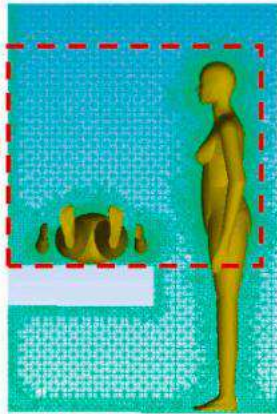
Yu Zhou, Shen Ji. *Building and Environment* 187 (2021) 107402

Name	Number	Size (m)	Temperature (K)	Boundary condition
Fever clinic	1	6.53 x 3.07 x 2.8	-	-
Indoor occupant	2	0.3 x 0.4 x 1.7	304	Trap
Inlet	1	0.3 x 0.3	291	Escape
Outlet	1	0.5 x 0.25	-	Escape
Table	1	0.7 x 1.4 x 0.2	-	Reflect
Cabinet	1	0.5 x 0.41 x 0.65	-	Reflect
Light	2	0.25 x 0.25 x 0.1	338	Reflect
Wall	-	-	-	Trap

Breathing zone



(a)



(b)



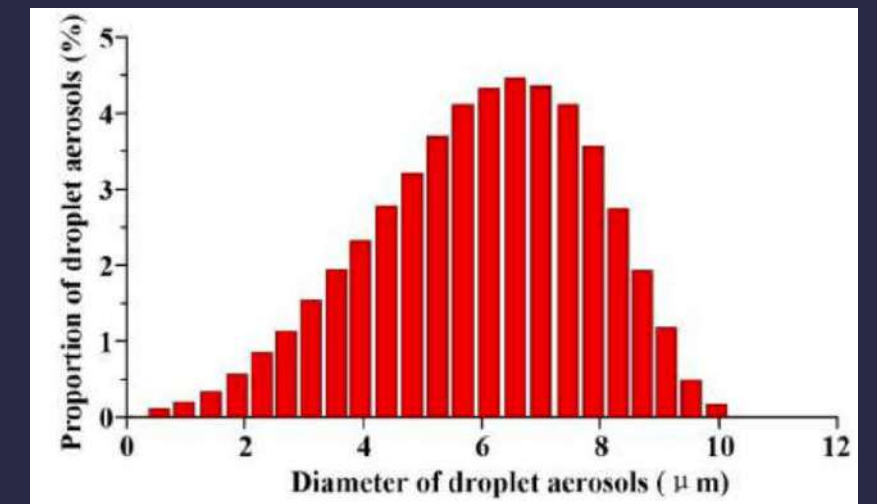
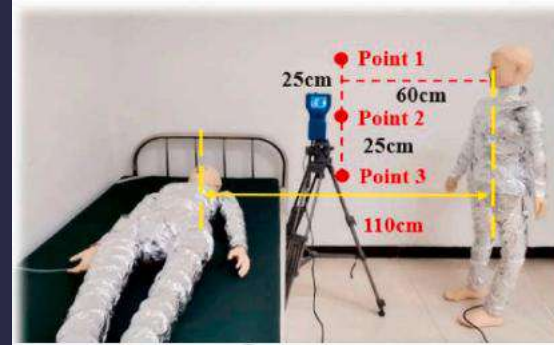
(c)



(a)



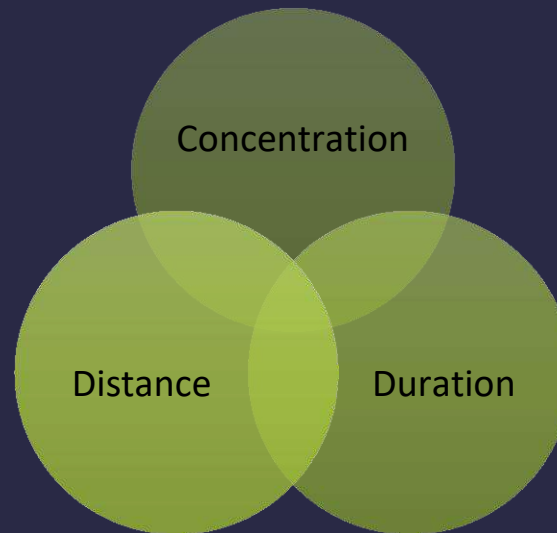
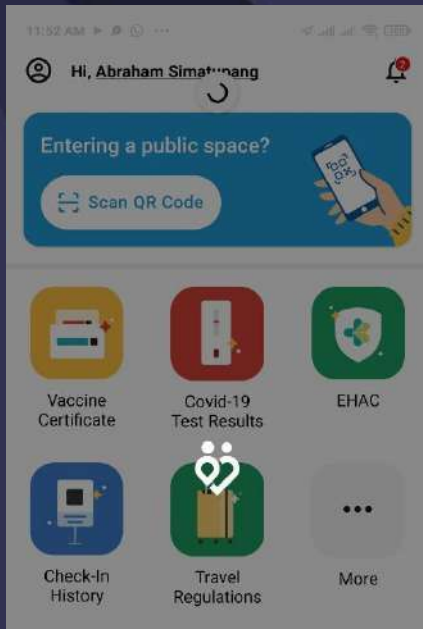
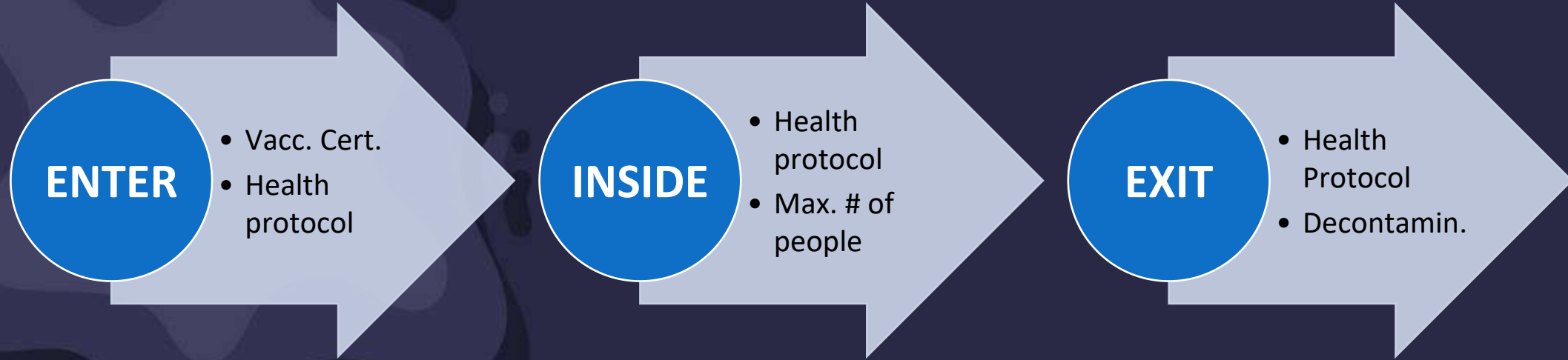
(b)



Modes of infections

- Inhale droplets or aerosols which contain the virus from patient nearby – especially when she/he sneezes, coughing, shouting, singing
- Holding the mouth or nose without washing hands first after touching objects that might be affected by spit splashes of COVID-19 sufferers
- Too close (less than 1 m apart) with patients or people who are infectious
- People who have comorbid, elderly, immunocompromised people, pregnant women, are more prone to be infected

SAFETY & PREVENTION of INFECTIOUS DISEASES TRANSMISSION in PREMISES



New Normal

TAKE HOME MESSAGES

- The appearance and development or decline or disappearance of disease depends on the interactions between human, agent and environmental factors.
- Communicable diseases, such as Covid-19, can be transmitted/transferred with many modes of transmissions
- Public building, including schools, universities should comply technical issues for a decrease in the transmission rate of covid-19
- Certain threshold such as levels of humidity, temperature, sunlight, and ventilation will speed up the virus-laden droplet and aerosol transmission, and aggravating the spread of the Covid-19.
- Although Covid-19 has been studied extensively, but there are still a lot of things remain unknown.
- Vaccines and following the health protocols are the best methods for prevention

REFERENCES

- *Int. J. Environ. Res. Public Health* 2020, 17, 6960;
[doi:10.3390/ijerph17196960](https://doi.org/10.3390/ijerph17196960)
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- *Environmental Research* 188 (2020) 109819
- *American Journal of Infection Control* 44 (2016) S102–S108
- *Building and Environment* 187 (2021) 107402.
<https://doi.org/10.1016/j.buildenv.2020.107402>
- *Scientific Reports* 2021; 11:3515
<https://doi.org/10.1038/s41598-021-82852-7>



THANK YOU

International Student Workshop

CERTIFICATE

Building Designs During
Covid -19 Pandemic

Presented To :

Dr. med , dr. Abraham Simatupang, M.Kes.

As :

SPEAKER

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Ir. Sahala Simatupang, M.T