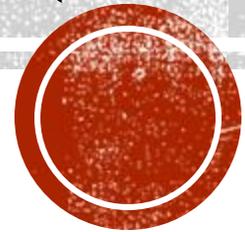


# COVID-19: EFFECTS ON ORGANS

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# OUTLINE

- Introduction
- How it invades
- Escalation of attack
- Collateral damages
- Caution
- Summary

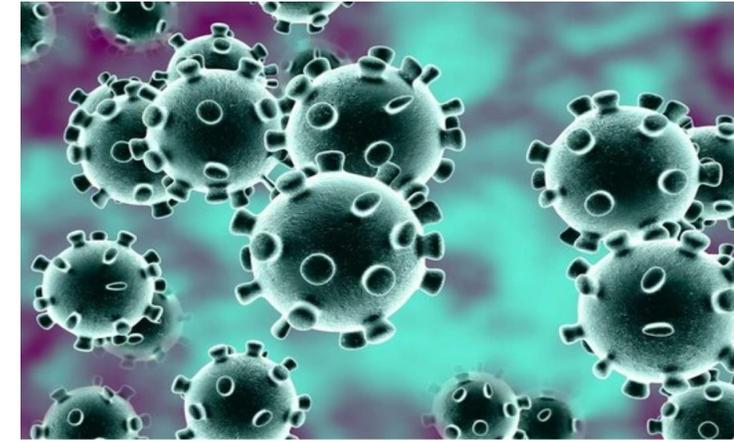
# INTRODUCTION

- COVID-19 has been underestimated, misunderstood & knowledge about it still evolving. (WHO, 2019; D. West, 2020)
- Not just a respiratory disease:
  - ✓ Cough, catarrh, cold, fever...
- Emerging facts point to other symptoms
  - ✓ GIT, ocular (pinkeye), whole-body rashes & areas of swelling and redness in just a few spots.
- In more severe cases:
  - ✓ reports of arrhythmias, heart failure, kidney damage, confusion, headaches, seizures, Guillain-Barre syndrome and fainting spells, along with new sugar control problems.
- These make it incredibly difficult to diagnose and even harder to treat.
- “This is a disease progression we have never seen for any infection that I can think of, and I’ve been doing this for a couple of decades,” says Joseph Vinetz, MD, an infectious disease specialist at Yale School of Medicine.

# HOW IT INVADES

- Viral particles gain entry through eyes, nose, or mouth
- The “spike proteins” on the coronaviruses connect with ACE<sub>2</sub> on the surface cells found throughout the body

(Li et al., 2003)



- On entry:
  - ✓ it uses multiple tools to prevent the infected cells from calling out for help
  - ✓ it also destroys antiviral commands inside the infected cell.
- These give the virus time to multiply in millions & infect surrounding areas BEFORE it is identified as an invader.
- This is part of the reason why the virus spreads before immune responses, like fever, begin.

# ESCALATION OF ATTACK

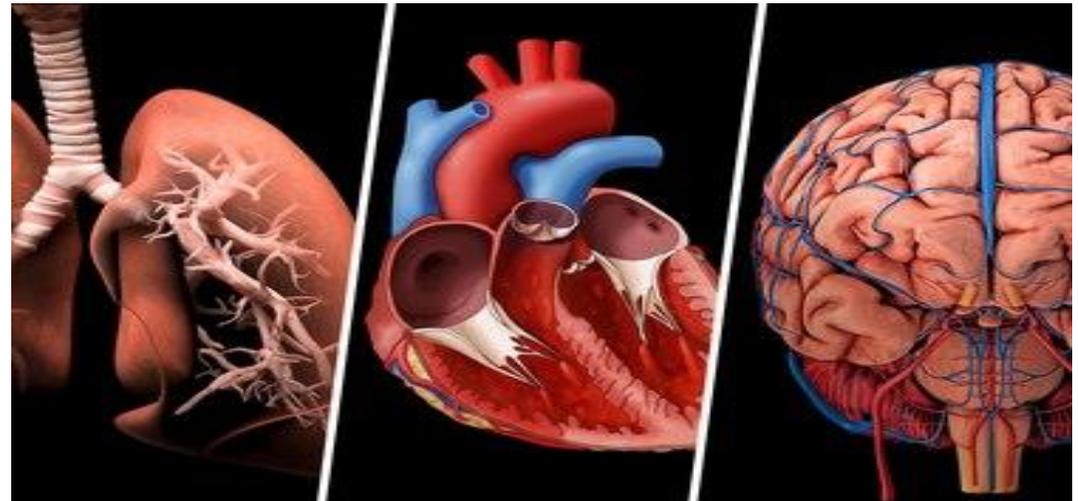
- Many people are able to fend off the virus before it gets worse. (Mayo Clinic, 2019)
- After entry:
  1. it either sets up camp in the lungs  
(respiratory syndrome leads to hospitalisation) or
  2. fights its way into the digestive tract  
(causing diarrhoea, abdominal pain, etc.)
  3. Or both
- Infection of more organs continues beyond lungs & GIT

# ESCALATION/2

- Dermatological effects now rampant in COVID-19. (Chin *et al*, 2020)
  - ✓ Some rashes are consistent with viral exanthema
  - ✓ Sometimes clots are found in toes & fingers (“COVID toes” or “pernio”), especially in paediatrics.

After being deeply embedded in the body, more severe disease begins.

- Direct attacks on other organs: **heart muscle, kidneys, blood vessels, liver, nerves, brain, etc.**
- This is a reason for the vast array of symptoms of COVID-19



# COLLATERAL DAMAGES

- Cytokines mediate against infections & trigger inflammation (*The Lancet*, 2020)
- Sickest patients with COVID-19 have high levels cytokines in the blood => “**Cytokine storm**”
- Cytokines storm results in the body attacking its own cells instead of just fighting off the virus (*WebMD*, 2020).
- Some researches link cytokine storms to sudden decompensation, leading to:
  - ✓ critical illness in COVID-19 patients and
  - ✓ low BP, heart failure, more killer immune and inflammatory cells & even more injury within the lungs, heart, kidneys & brain.

# COLLATERAL DAMAGES/2

- New finding: thrombosis is playing a major role in lethal COVID-19
  - ✓ Deep vein thrombosis (DVT) in the legs & pulmonary emboli (PE) in the lungs. (*Claire et al, 2020*)
  - ✓ Clots in arteries, causing strokes; & in tiny blood vessels in organs throughout the body
- One study in Holland: 31% of patients hospitalised with COVID-19 got clots while on anticoagulants. (*WebMD, 2020*)
- Other damages to the body are caused by:
  - ✓ low O<sub>2</sub> levels
  - ✓ ventilator use
  - ✓ drug treatments

# CAUTION

- The body always maintains a delicate physiological balance
- Diseases & drugs may destroy the delicate balance.
- COVID-19 blocking of ACE<sub>2</sub> receptor can result in heart failure, kidney injury & inflammation. (Drug-disease interaction.)
  - ✓ ACE<sub>2</sub> receptor is used by the virus to enter cells
  - ✓ ACE<sub>2</sub> receptor is important in regulating BP & inflammation.
- Timing is key in treatment strategies:
  - ✓ **Boosting** the immune system before & early on in the disease
  - ✓ Then **weakening** it as cytokine markers begin to rise.
- Drugs that may lower cytokine storm risks may also weaken the immune response, making it hard to stop virus replication.
- Using anticoagulants may end up causing severe bleeding.
- Which way to go?

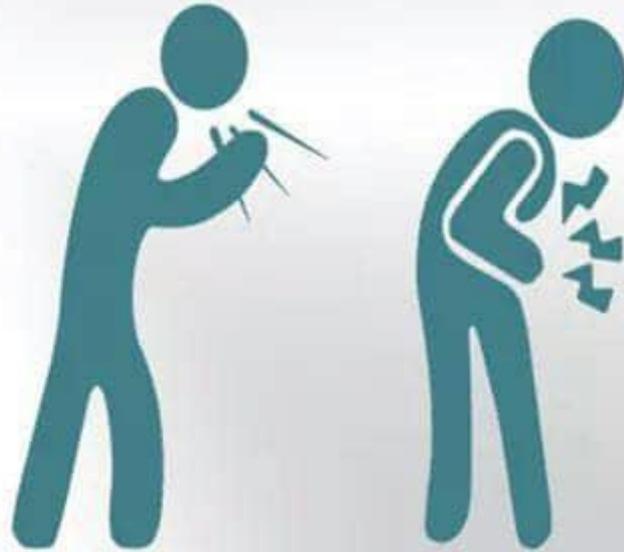
# SUMMARY

- COVID-19 is still a great mystery:
  - ✓ Not enough is known about it
  - ✓ It causes only mild disease in most people, but turns fatal for others.
- The worst damage may be driven by a cytokine storm, & not the virus.
- COVID-19 patients die from other puzzling problems, like heart arrhythmias, stroke & other cardiovascular & neurological problems
- All these make clinical trials of old & new drugs inevitable, to determine their efficacy & safety (effects on organs).
- Researchers aren't sure:
  - ✓ what percentage of severely ill patients will die from a cytokine storm
  - ✓ why some infected people will have this reaction, while others won't.
  - ✓ if antibody from the infection will protect survivors in future exposures

# Today's Reality



Advanced  
Medicine



Poor Health

# THE END

Thank you  
for listening

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