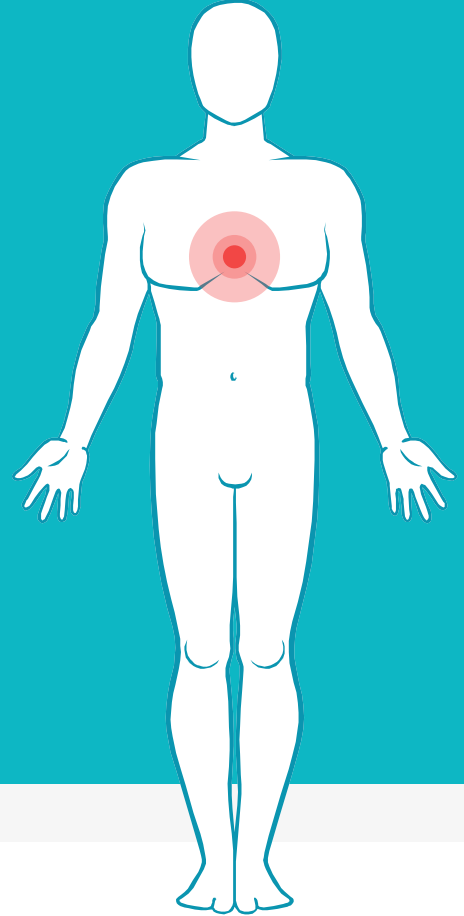


Coronavirus

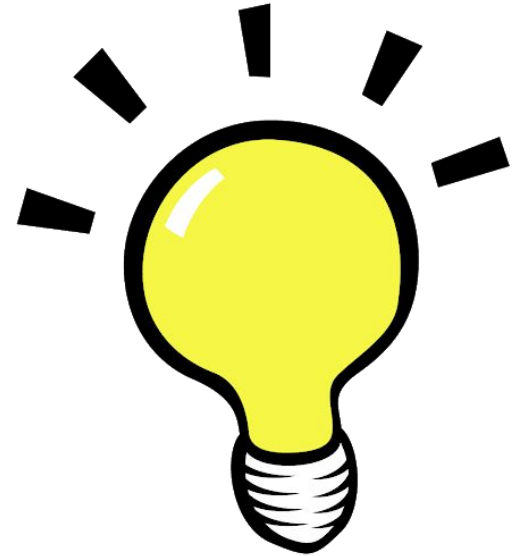
Group 5

Feb. 27, 2020



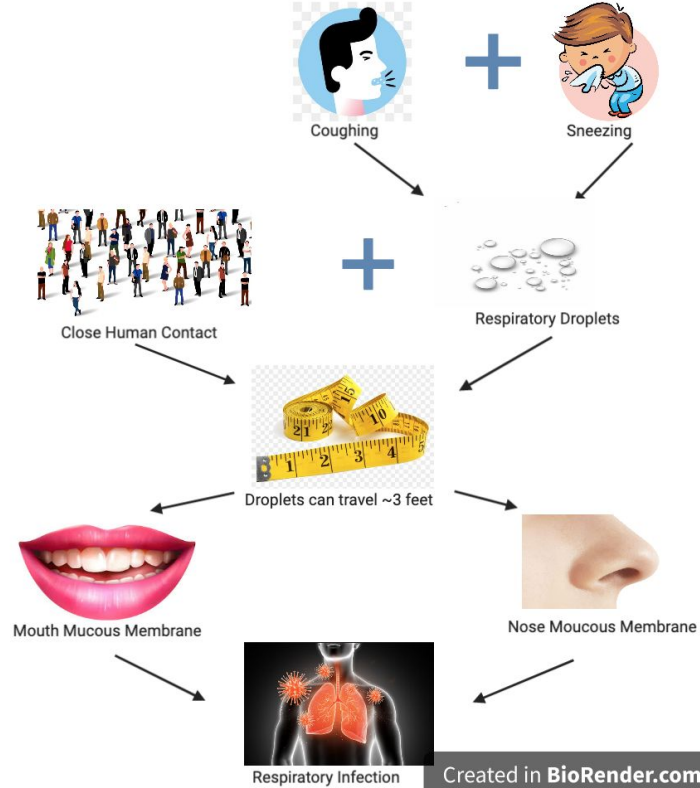
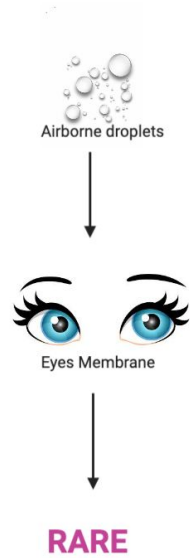
What is Coronavirus?

- A large family of viruses that cause illness
 - 4 subgroups:
 - Alpha, Beta, Gamma, Delta
- Zoonotic virus
- Illness ranges from common cold to severe diseases
- MERS: Camels → Humans
- SARS: Cats → Humans
- COVID-19 → Novel Virus: strain has not been previously identified



Fun Fact: Corona means crown representing crown-like spikes on the surface of this virus

Transmission Pathway



Diagnosis

Reverse Transcription-Polymerase chain reaction (RT-PCR)

- ▷ Viral RNA

CT scan

- ▷ Atypical pneumonia

Serologic Test

- ▷ Antibodies against virus

Viral Culture

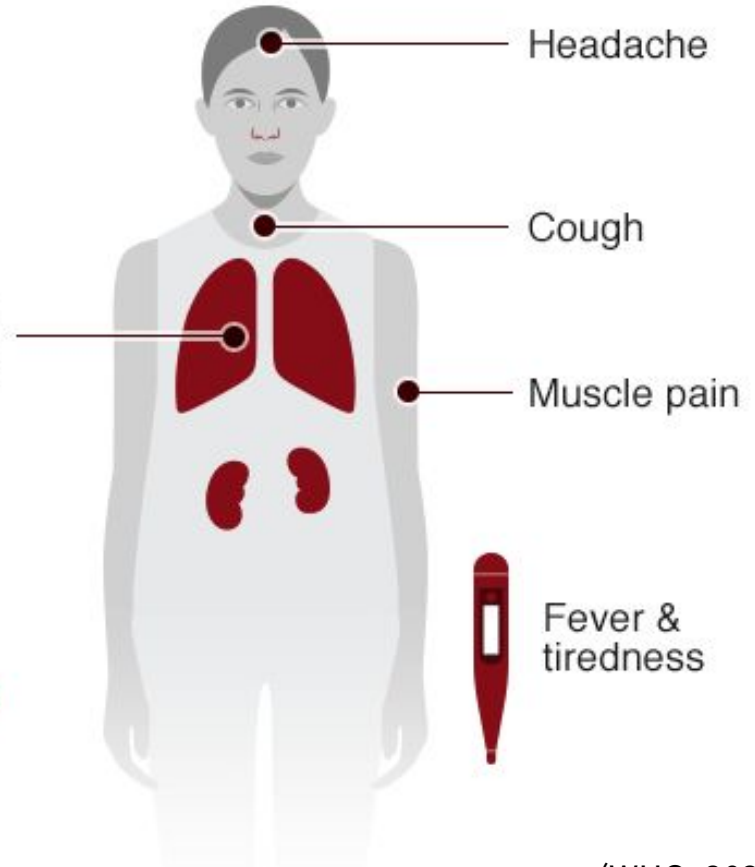
- ▷ Cell culturing
- ▷ Morphology



Symptoms

Shortness of breath
breathing difficulties

Virus seems to start with a **fever**, followed by a **dry cough** and then, after a week, leads to **shortness of breath** and some patients needing hospital treatment



Prevention & Protection



Clean hands with soap and water or alcohol-based hand rub



Cover nose and mouth with tissues or inside of elbow when coughing or sneezing



Avoid close contact with anyone with cold or flu-like symptoms



Thoroughly cook meat and eggs



Avoid unprotected contact with live wild or farm animals

(WHO, 2020)

N95 respirator

Reduces exposure to small particles

Filters out at least 95% of airborne particles

Tight fitting, allows minimal leakage



Surgical mask

Fluid resistant, protects wearer against large droplets

Does **not** protect against smaller airborne particles

Loose fitting - allows leakage around the edges



(3M & Getty, 2020)

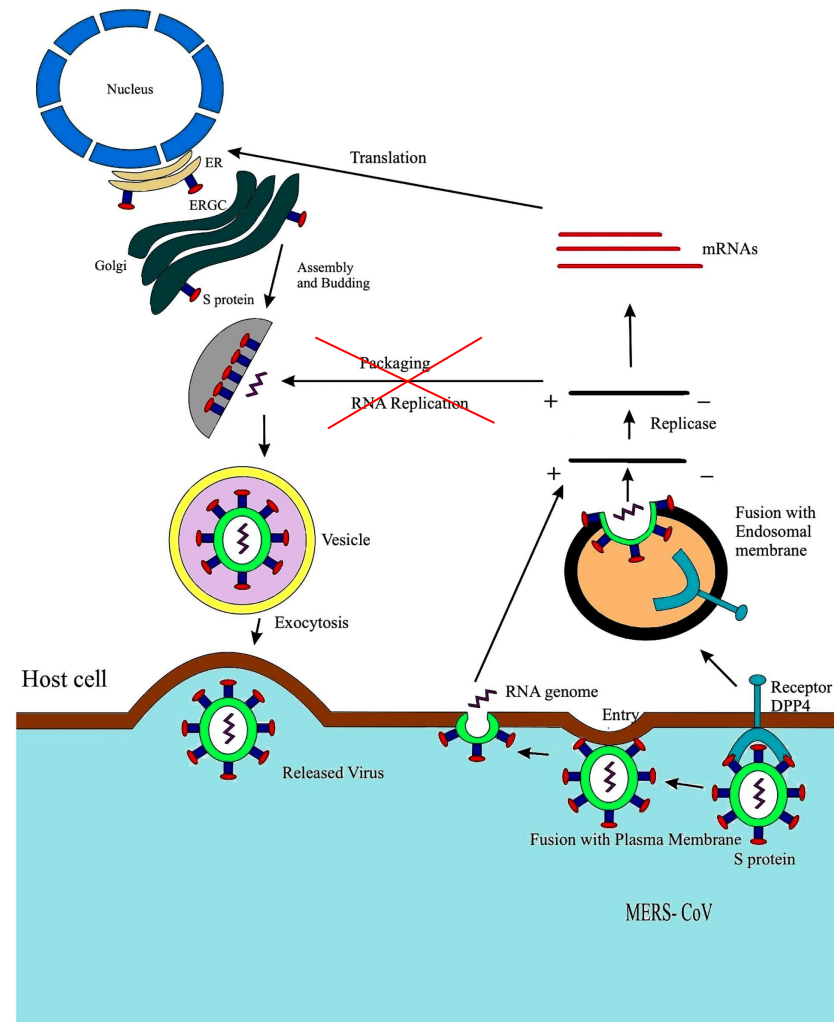
Treatment

No pharmacological cure for SARS, MERS or Covid-19

- ▶ Severe atypical pneumonia & boost immunity

Research on treating MERS

- ▶ Remdesivir
 - ▶ Reduced viral replication & lung damage
- ▶ Lopinavir and Ritonavir
 - ▶ Protease inhibitor - blocks key enzyme in viral replication

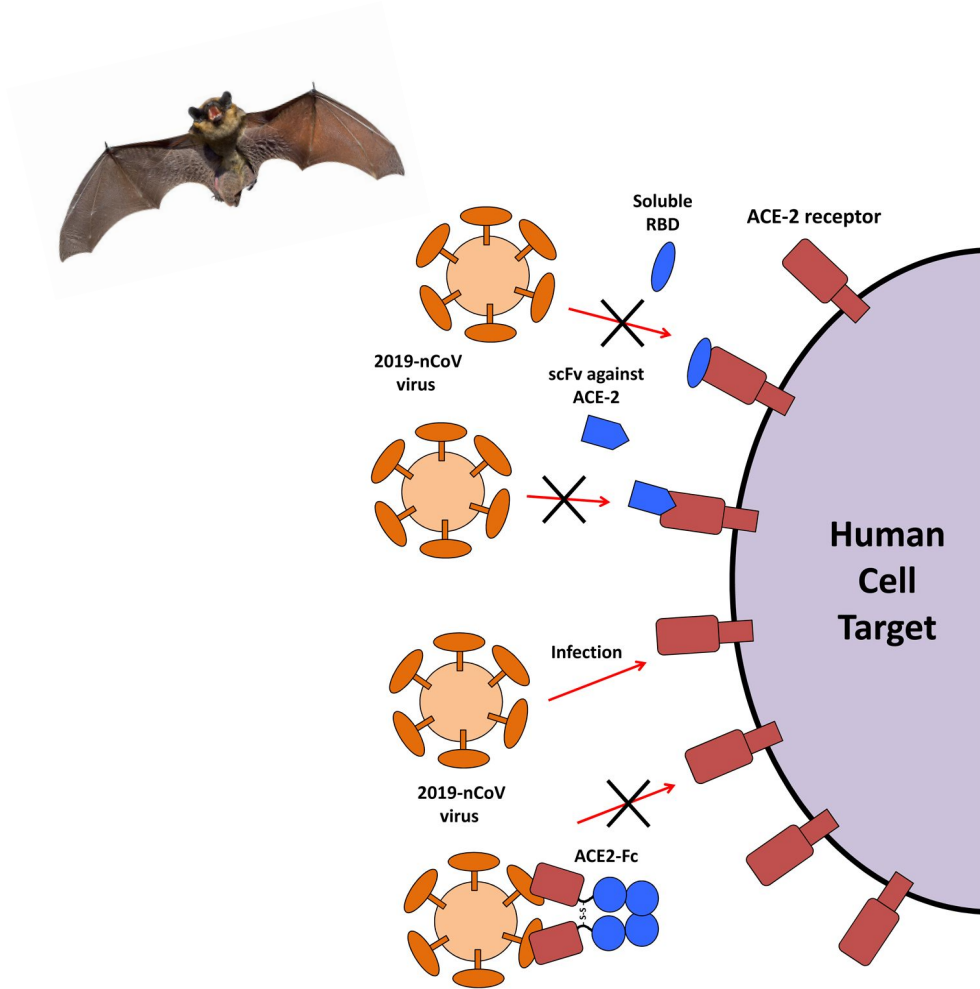


1.

Severe Acute Respiratory Syndrome (SARS)

Outbreak: Overview

- ▶ Index case in Guangdong Province, Nov. 2002
- ▶ Wild animals at local market
 - ▶ Bats ⇒ Civet cats
- ▶ Chinese New Year migration
- ▶ SARS-Cov: binds ACE2 receptor
- ▶ Worldwide: 8,098 cases
 - ▶ 774 deaths - 44 in Canada
- ▶ Mortality: 9.6% (WHO, 2004)



SARS

Transmission Rate

- ▷ $R_0 \sim 3$
- ▷ < Influenza
- ▷ < Measles
- ▷ < Zika
- ▷ < HIV
- ▷ ~ Smallpox
- ▷ > Ebola

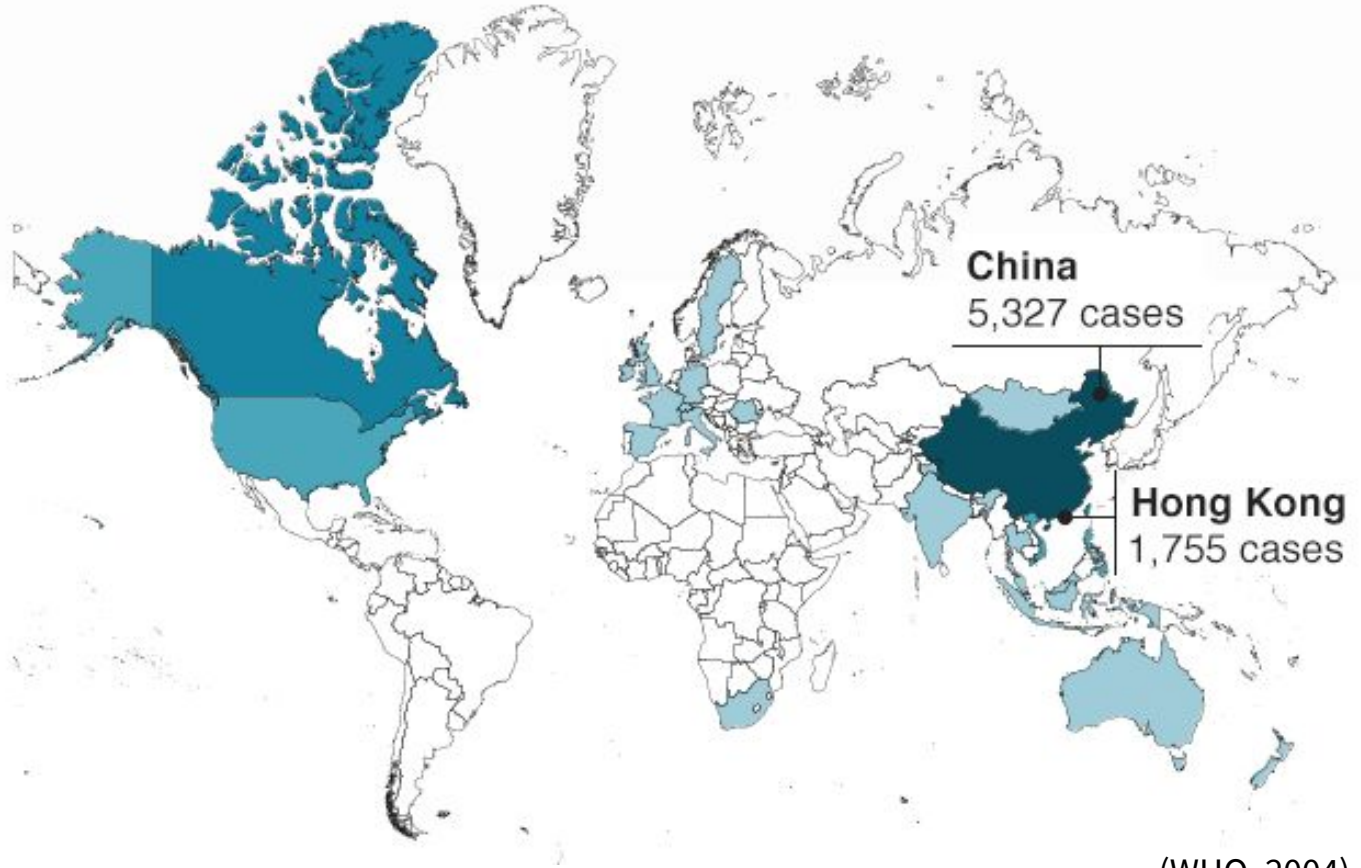
Superspreader

- ▷ HK hotel
- ▷ 12 infected
- ▷ Global travel
- ▷ 24 hrs - 5 countries
- ▷ 6 months - 30 countries on 6 continents

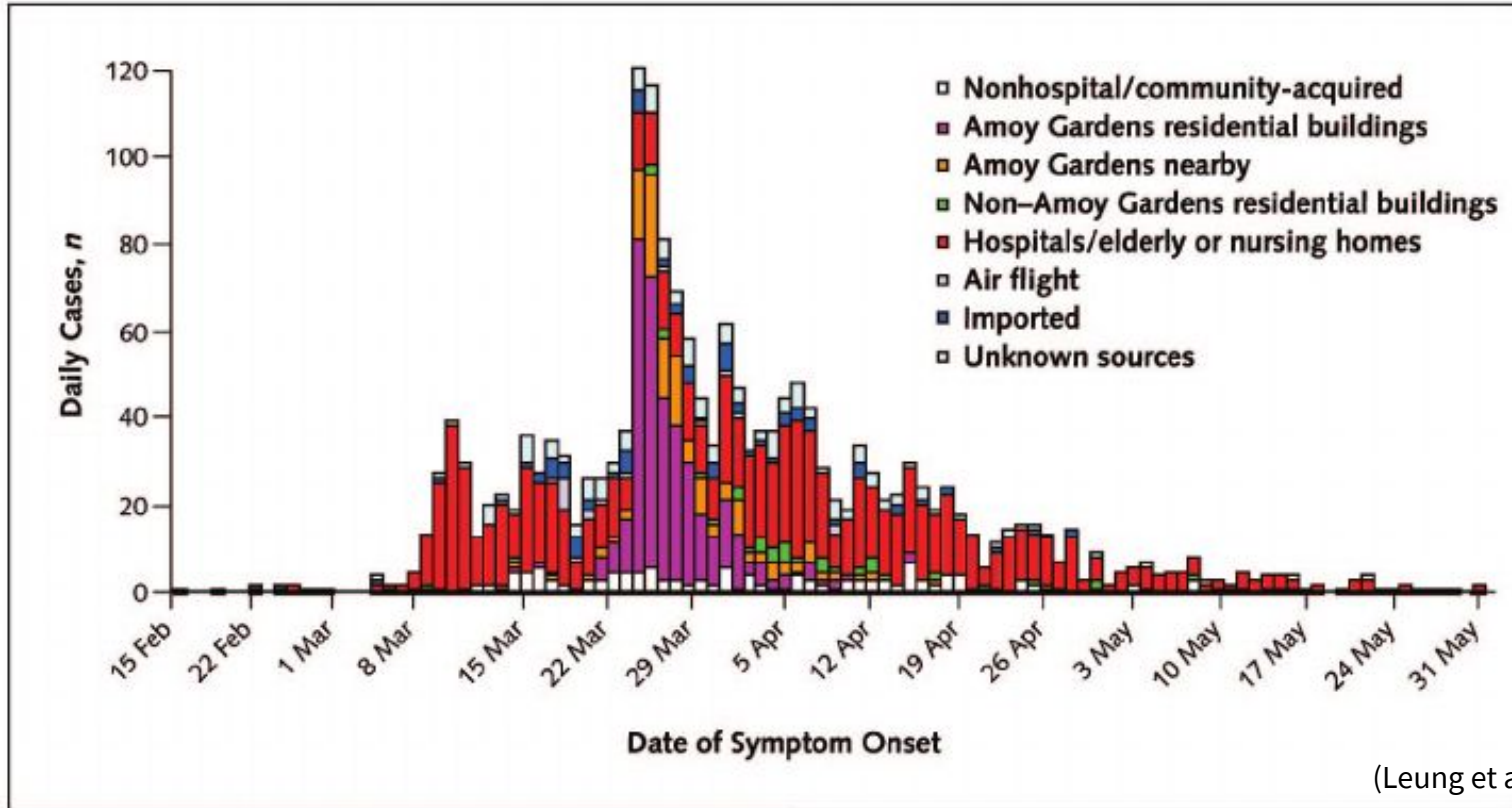


SARS Epidemic 2002-3

0-9 10-99 100-999 1,000-5,327



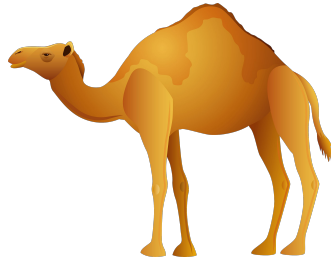
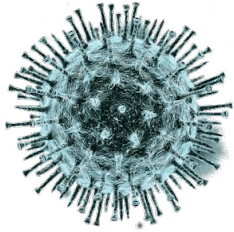
Epidemic Curve by Infection Cluster: Hong Kong



2.

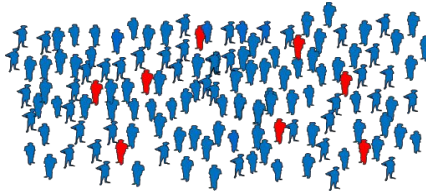
Middle East Respiratory Syndrome (MERS)

Outbreak Overview



Virus	Hosts	Who is at Risk?
Caused by coronavirus MERS-CoV	Camel: direct or indirect transmission to humans Exact mode of transmission is UNKNOWN	Patients age ranges from 14-94 Patients with diabetes, chronic kidney, lung and heart disease, obesity, smokers, steroid users

MERS

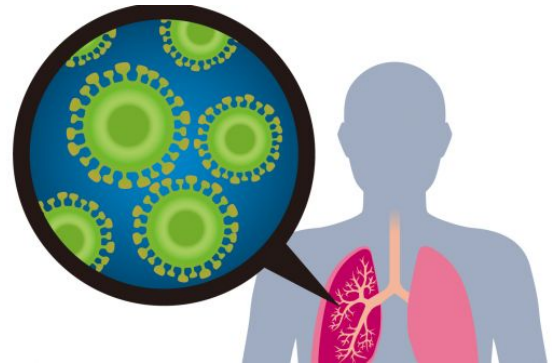


PATIENT:
ZERO

How does it get into the body?	Fatality Rate	Index Case
<ul style="list-style-type: none"> ● MERS-CoV attaches to receptor DPP4 ● Virus now transcribed into body ● Virus capsulated ● Virus spreads rapidly 	<ul style="list-style-type: none"> ● Much higher than SARS and Covid-19 ● 858 deaths/2494 cases ● 27 countries Affected 	<ul style="list-style-type: none"> ● June 2012 ● Saudi Arabian businessman who died from acute respiratory & renal failure ● South Korea heavily affected

MERS

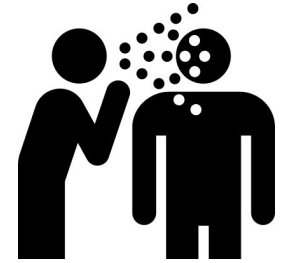
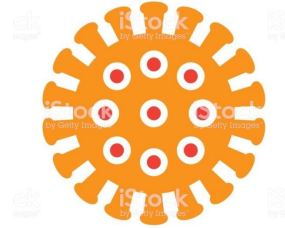
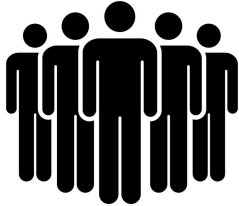
- Initially, believed MERS-CoV found in bats but never isolated it
- Camel blood analysis → only zoonotic source for human infection
- Incubation period of 2-13 days
- 3 patterns observed:
 1. Sporadic cases in communities
 2. Infection clusters in families
 3. Infection in healthcare facilities
- 75% of patients who died had an underlying condition



3.


Coronavirus Disease 2019 (Covid-19)

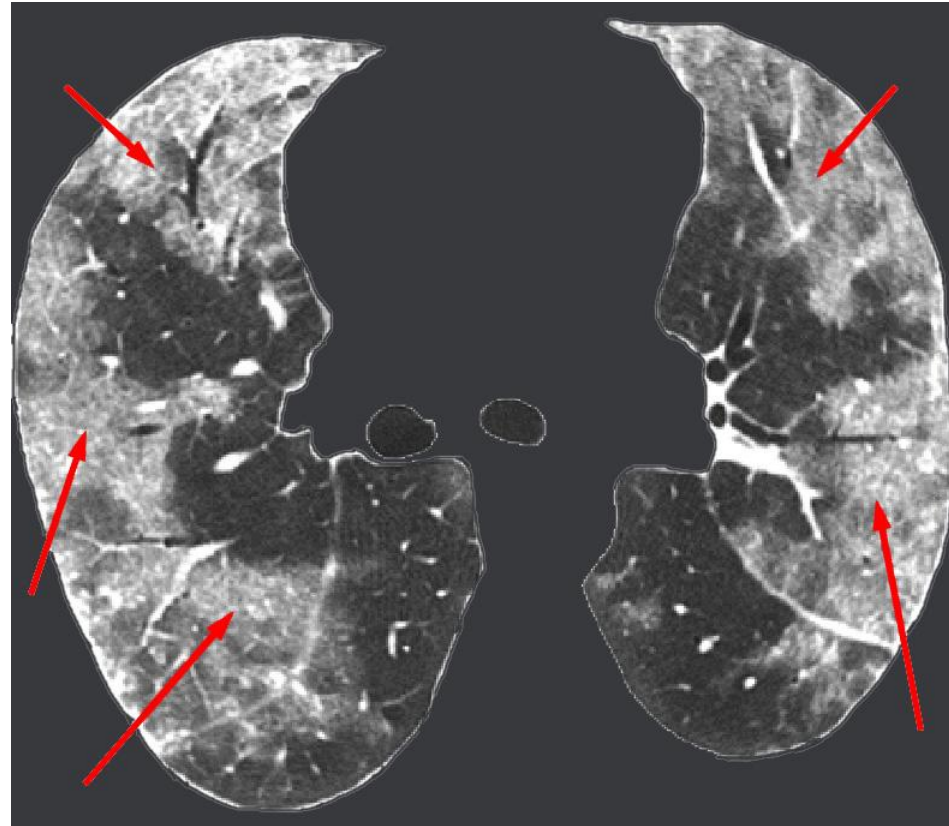
Covid-19: Overview



Origin & Cases	Virus	Clinical Manifestation
<ul style="list-style-type: none"> ● Index case in Wuhan on Dec. 31, 2019 ● China: 78,630 cases ● South Korea: largest cluster overseas at 1,595 ● UK superspreader 	<ul style="list-style-type: none"> ● Officially SARS-Cov-2 ● Evolved and mutated ● Zoonotic ● Likely bat-derived ● 79% similar to SARS ● 50% similar to MERS ● ACE2 receptor 	<ul style="list-style-type: none"> ● Similar symptoms to SARS ● Ground-glass opacity in CT scans ● Atypical pneumonia ● Lymphopenia

CT: Ground-glass Opacity

- ▷ Hazy opacity 
- ▷ Thickening of alveolar walls & interstitium
- ▷ Fluid filling or collapse of alveoli
- ▷ Active disease:
 - ▶ Inflammation
 - ▶ Fibrosis
 - ▶ Edema
 - ▶ Pneumonia



*“China Sacrifices a Province To Save the World
from Coronavirus”*

- *Bloomberg News, February 5, 2020*

”

Public Health Interventions... Unrivalled in Scale



- Barricades at quarantined neighborhoods



- Temperature checks at all public venues

Source: CCTV
Wuhan, China
January 20, 2020

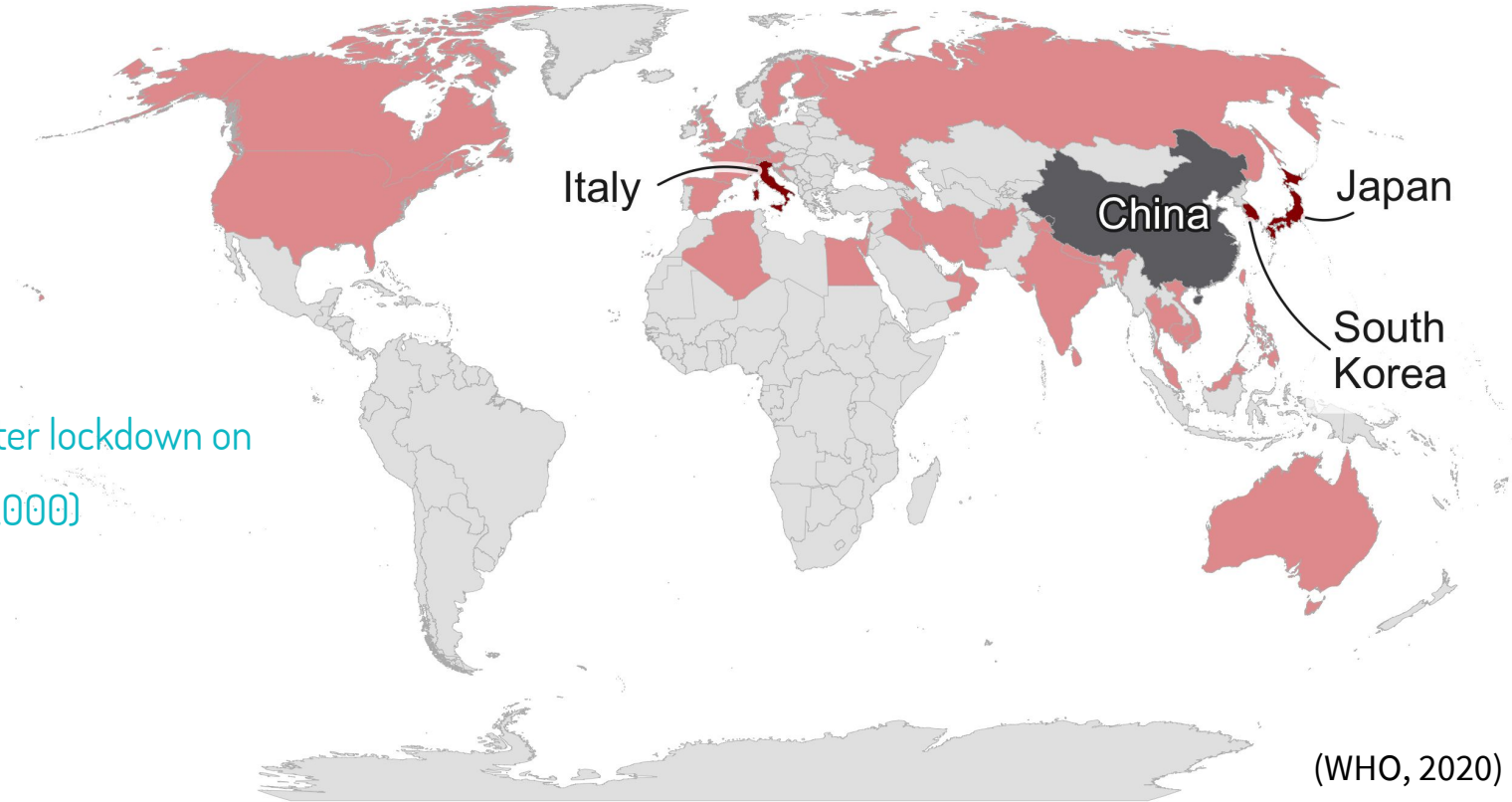
A photograph showing a crowded staircase in Wuhan, China, on January 20, 2020. Many people are wearing face masks, and the scene is busy with people moving up and down the stairs. A young man in a bright yellow jacket is prominent in the center. A woman in a white puffer jacket is looking at her phone. The overall atmosphere is one of a busy, public space during a health crisis.

Since the **outbreak** was discovered
in **December 2019**...

0-100 cases More than 100

Outside China

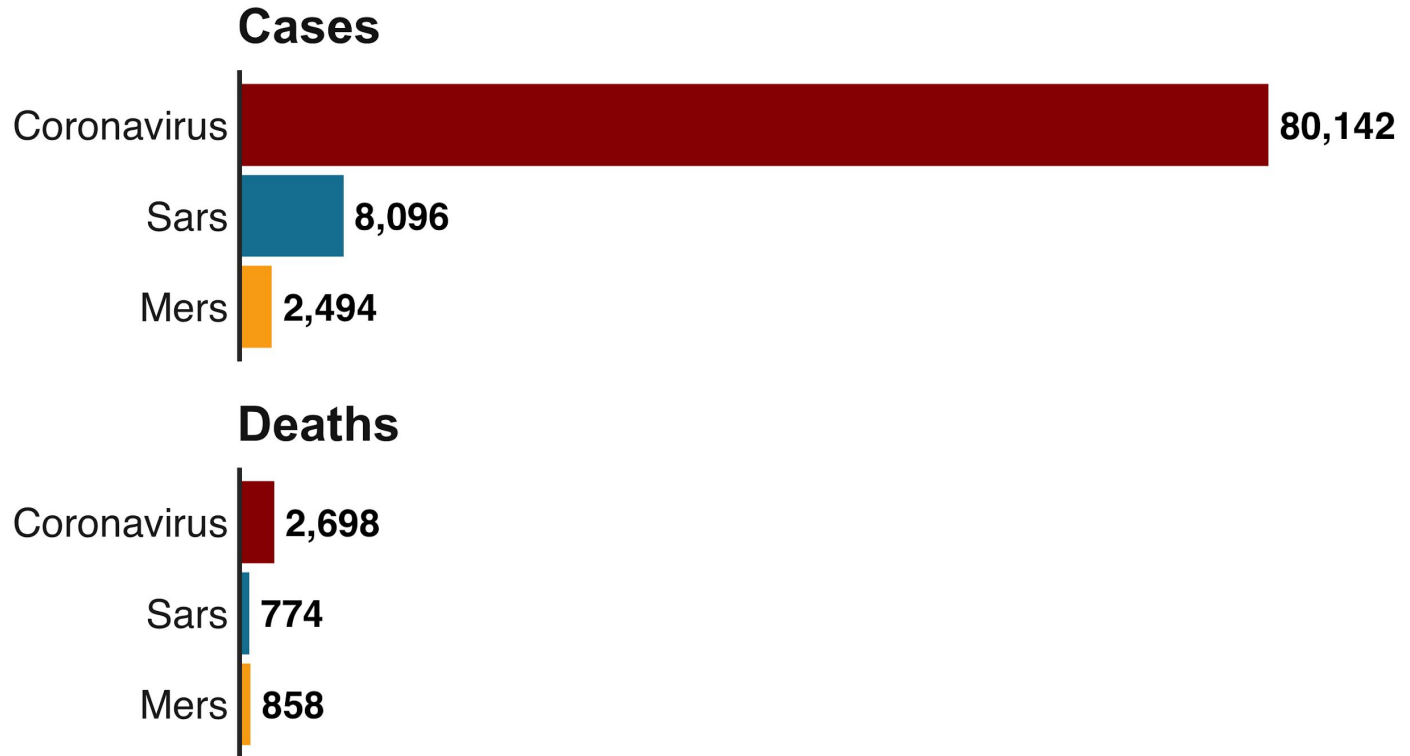
- 3,748 cases
- > 1 month after lockdown on Wuhan (~48,000)



SARS vs. MERS vs. Covid-19

Type of Coronavirus/ Variables	SARS -CoV (2003)	MERS-CoV (2012)	Covid-19 (2019)
Origin of the Virus	Bat/ Cat	Bat/ Camel	Bat/ Pangolin
Case Fatality Rate	9.6%	34.4%	3.4.% (in China) 1.4% (World) as of Feb. 25
Age range	1- 91 years old Avg. 34	14-94 years old Avg. 56	Older male with comorbidities
Reproduction Rate (R0)	3	< 0.7	4.08
Incubation Period	1- 5 days	2- 13 days	Up to 14 days (Longest: 27 days)
Transmission	Through Airborne droplets Human to Human	Through Airborne droplets Human to Human	Through Airborne droplets Human to Human

Worldwide cases



Conclusion

- Overall, coronavirus is an ongoing concern
- There are treatments being researched
- Precautions and prevention methods should be taken whenever possible
- Get treated early for symptoms for immediate medical care
- Wash your hands, and keep sanitized! Do not cough on other people



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