



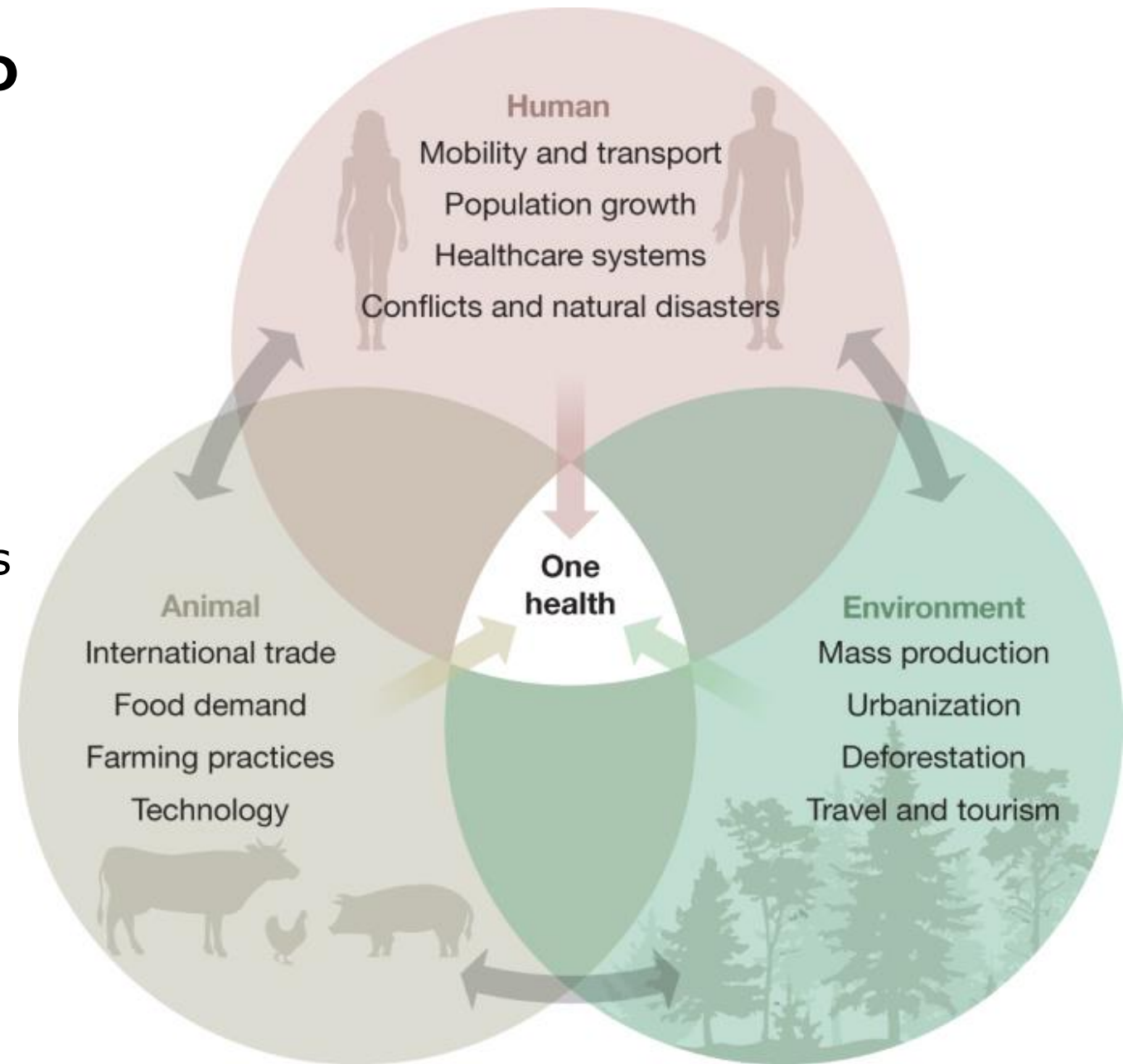
**THE GREAT  
PANDEMIC  
OF HISTORY**



COMPILED BY HOWIE BAUM

## THE REASONS THAT HAVE CAUSED AN EPIDEMIC OR PANDEMIC:

- 1) The shift from humans being hunter-gatherers to agrarian societies, which started 12,000 years ago.
- 2) Expanded trade between communities
- 3) Increased interactions between humans and animals that caused the transmission of pathogens.
- 4) Expanded cities and trade territories
- 5) Increased travel to other places that exposed people to other viruses and germs.
- 6) Increases in human population.



# THE HISTORY OF PANDEMIC

There have been 249 Pandemics throughout recorded history from 1,200 BC, up to the Covid- 19 virus today.

**This presentation is about the 24 main Pandemics.**

In early times, people didn't know how they started because they didn't have as much medical knowledge as we do today.

To see the whole list and brief details about them, go to [https://en.wikipedia.org/wiki/List\\_of\\_epidemics](https://en.wikipedia.org/wiki/List_of_epidemics)

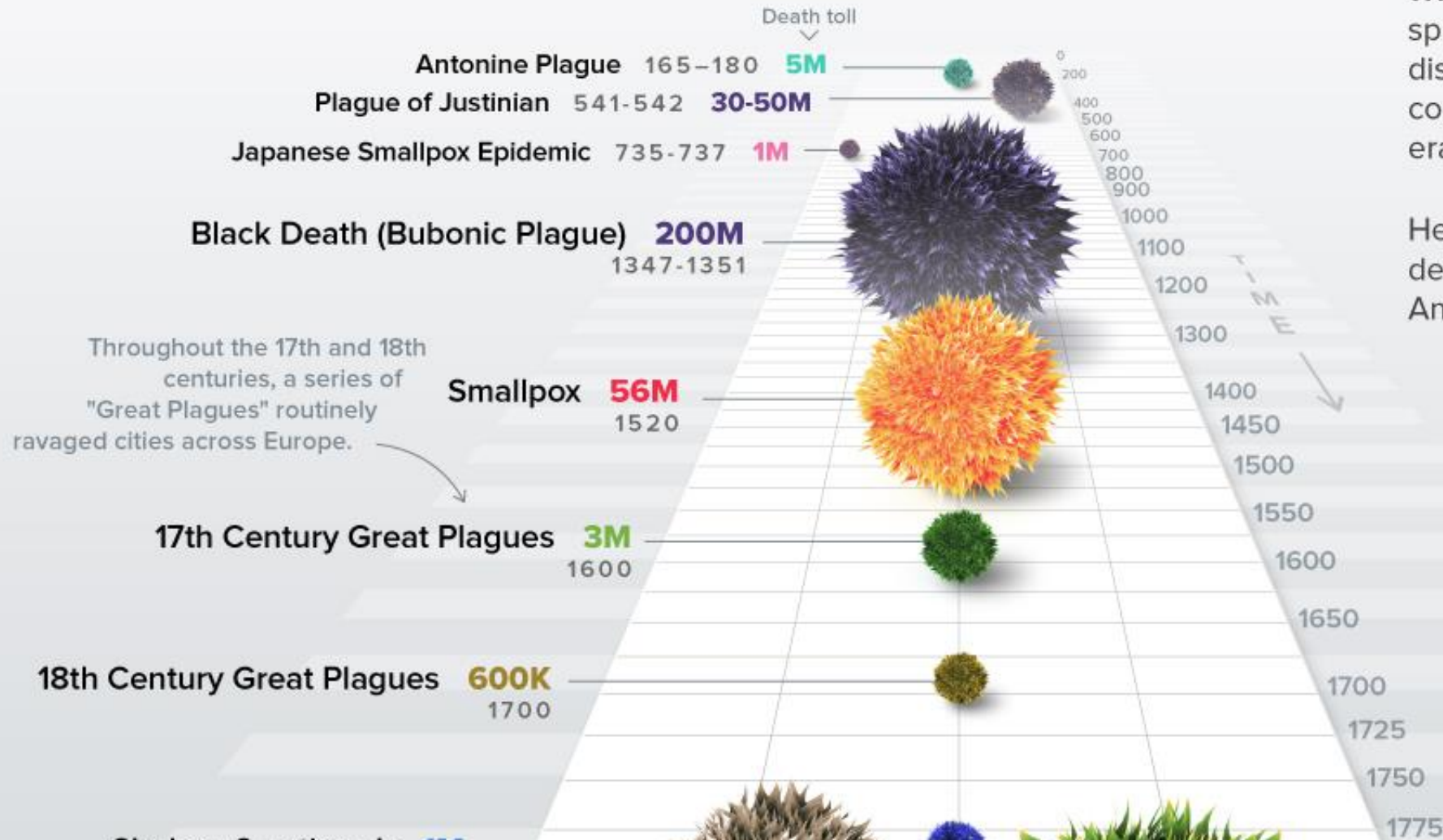


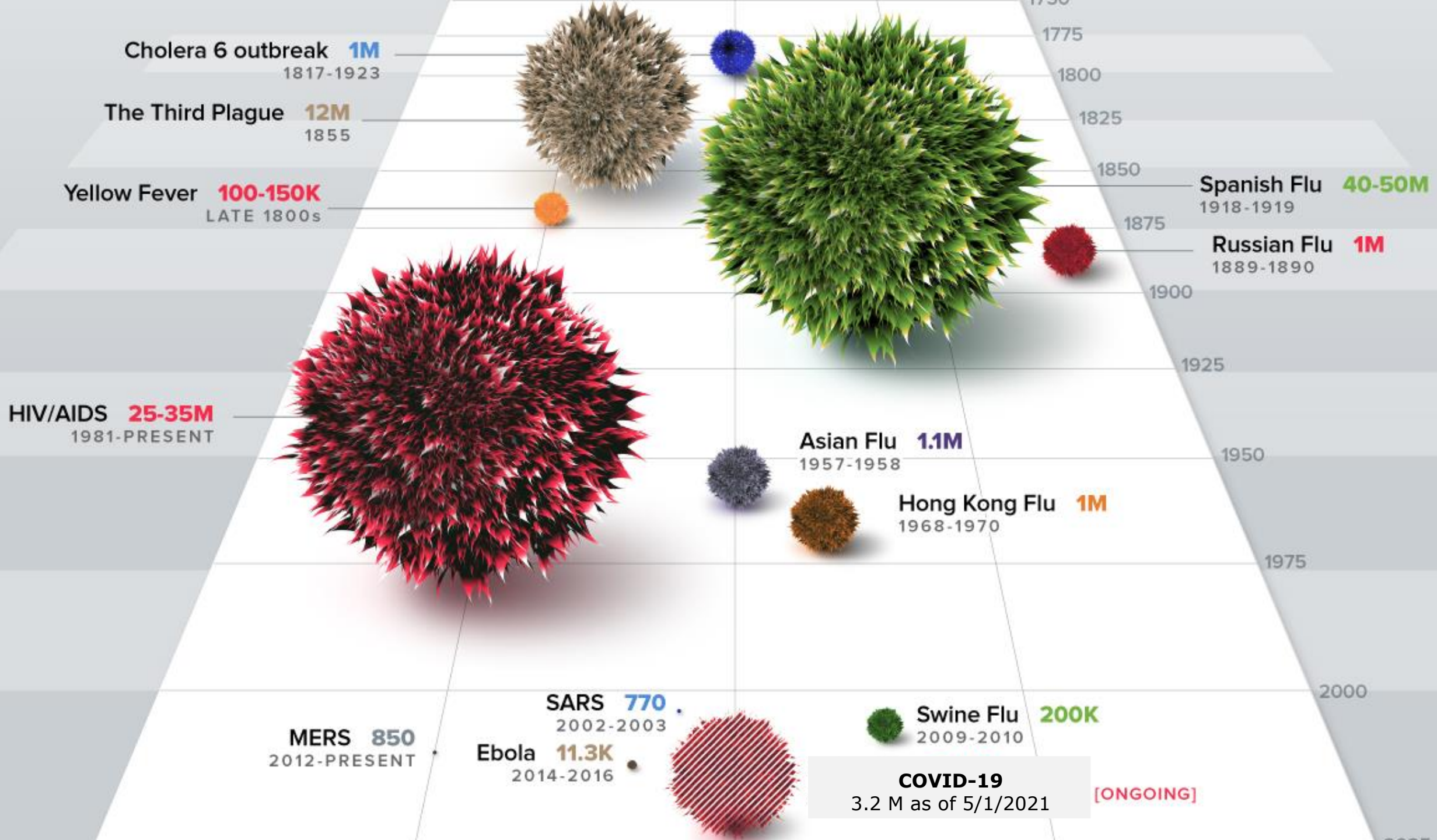
# HISTORY OF PANDEMICS

**PAN-DEM-IC** (of a disease) prevalent over a whole country or the world.

**THROUGHOUT HISTORY**, as humans spread across the world, infectious diseases have been a constant companion. Even in this modern era, outbreaks are nearly constant.

Here are some of history's most deadly pandemics, from the Antonine Plague to COVID-19.





# DEATH TOLL

[HIGHEST TO LOWEST]

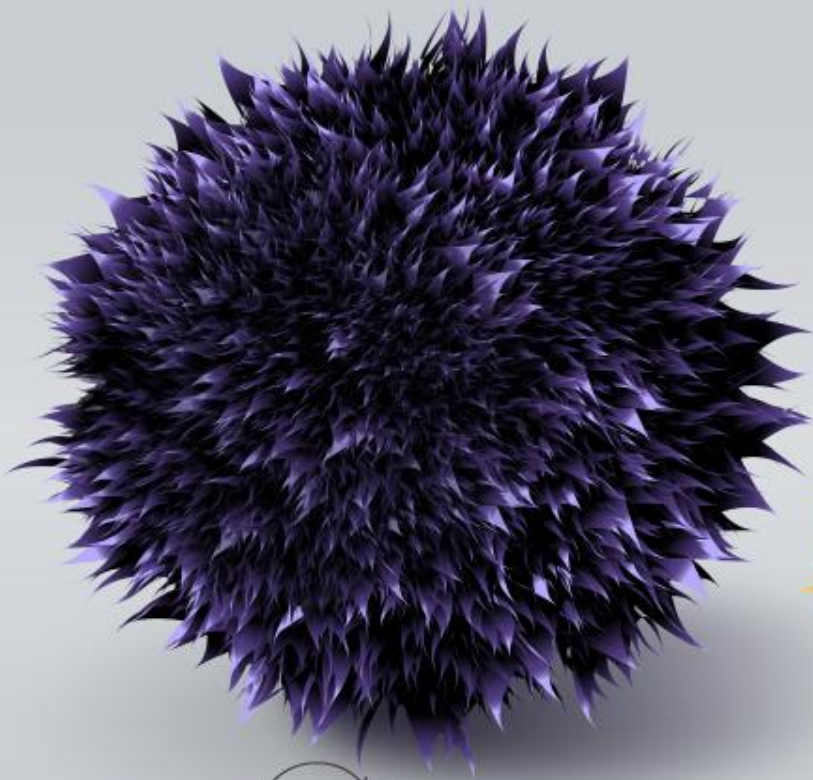
the disease is new to medicine,  
and data is still coming in.

\*Johns Hopkins University estimates

## 200M

### Black Death (Bubonic Plague)

1347-1351

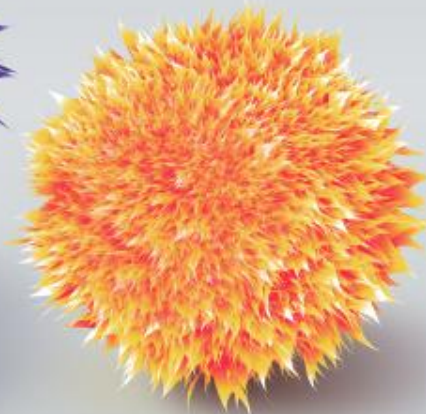


The plague originated in rats and spread to humans via infected fleas.

## 56M

### Smallpox

1520



The outbreak wiped out 30-50% of Europe's population. It took more than 200 years for the continent's population to recover.

## 40-50M

### Spanish Flu

1918-1919



## 30-50M

### Plague of Justinian

541-542



**Smallpox** killed an estimated 90% of Native Americans. In Europe during the 1800s, an estimated 400,000 people were being killed by smallpox annually. The first ever vaccine was created to ward off smallpox.

The death toll of this plague is still under debate as new evidence is uncovered, but many think it may have helped hasten the fall of the Roman Empire.



**25-35M**

**HIV/AIDS**

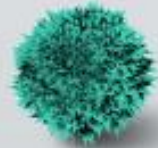
1981-PRESENT



**12M**

**The Third Plague**

1855



**5M**

**Antonine Plague**

165-180



**3M**

**17th Century Great Plagues**

1600



**COVID-19**  
3.2 M, as of  
5/1/2021

[ONGOING]



**1.1M**

**Asian Flu**

1957-1958



**1M**

**Russian Flu**

1889-1890



**1M**

**Hong Kong Flu**

1968-1970



**1M**

**Cholera 6 outbreak**

1817-1923



**1M**

**Japanese Smallpox Epidemic**

735-737



**600K**

**18th Century Great Plagues**

1700



**200K**

**Swine Flu**

2009-2010



**100-150K**

**Yellow Fever**

LATE 1800s



**11.3K**

**Ebola**

2014-2016



**850**

**MERS**

2012-PRESENT



**770**

**SARS**

2002-2003

\*Johns Hopkins University estimates.

Sources:  
CDC, WHO, BBC



# THE HISTORY OF PANDEMIC: FROM THE ATHENIAN TO COVID-19





Just as people have spread across  
the world...

...so have infectious diseases

# PANDEMIC OR EPIDEMIC?

- Epidemic
  - Affects many people at once and spreads rapidly
  - Sudden, often unexpected escalation in number of cases
  - May occur in a specific community, geographical location, or across several countries
- Pandemic
  - A type of epidemic
  - Affects an entire nation or the entire world



WE SEE OUTBREAKS CONTINUALLY, THEY  
JUST ALL DON'T REACH PANDEMIC LEVEL

# WHEN DOES AN EPIDEMIC BECOME A PANDEMIC?

When it has spread over  
a large geographical  
location

OR

When it affects a certain  
percentage of overall  
population

# PANDEMICS

- Affect larger number of people
- Often caused by new virus or disease that has not been in circulation for centuries or decades
- Most humans have little to no immunity against the disease
- Known to cause more deaths than epidemics
- Often results in social disruption and/or economic loss

# A FITTING START IN HISTORY...PLAGUE

- Stems from Greek word *plaga*, which means strike or blow
- The term “plague” used interchangeably:
  - Describe the contagious febrile disease caused by *Yersenia pestis* (Bubonic plague)
  - General term to describe any epidemic disease causing a sudden outbreak
- Some people interpret plagues as “divine punishment for sins”, others consider them the “end of days”
- Recorded pandemics have shaped our history, society, and modern medicine, and art.

# ATHENIAN PLAGUE OF 430 B.C.

# ATHENIAN PLAGUE OF 430 B.C.

- 430-26 B.C. during Peloponnesian War
- Originated in Ethiopia – spread throughout Egypt and Greece





# ATHENIAN PLAGUE OF 430 B.C.

- Initial symptoms:

- Headache
- Conjunctivitis
- Rash covering body
- Fever

(Hemoptysis is coughing up of blood from the respiratory tract)

- Followed by hemoptysis, extreme abdominal cramps, and vomiting
- Death often occurred by the 7<sup>th</sup> or 8<sup>th</sup> day
- Survivors usually suffered from partial paralysis, amnesia, or blindness



# ATHENIAN PLAGUE OF 430 B.C.

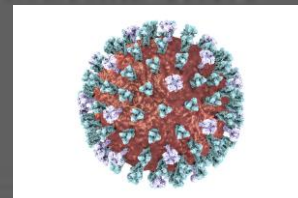
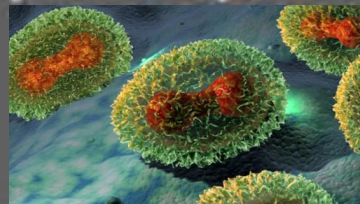


- Since this was during a war, there was substantial overcrowding in Athens
  - Plague spread quickly
  - Killed over 25% of the population
- Cause of Athenian Plague unknown:
  - Typhoid fever?
  - Ebola virus?

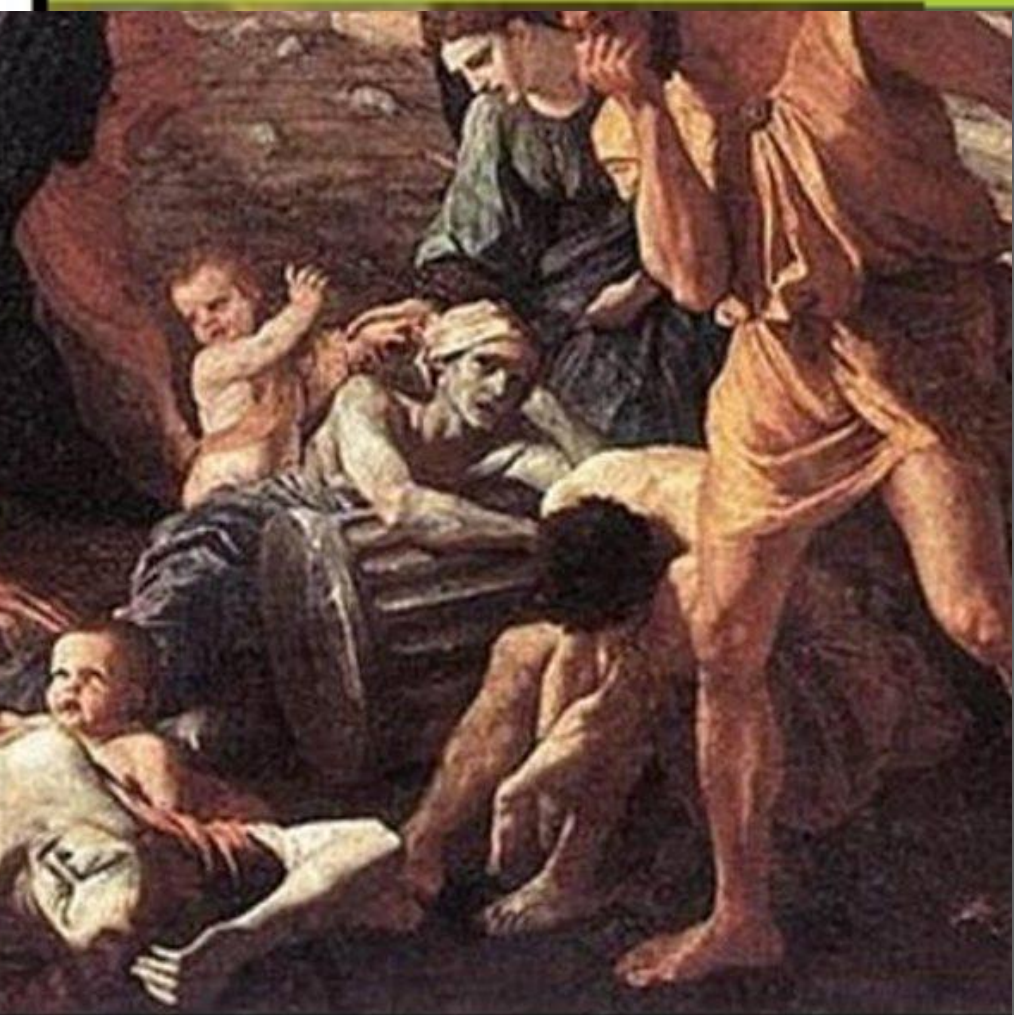
# ANTONINE PLAGUE

# THE ANTONINE PLAGUE

- 165-180 A.D.
- Also known as the Plague of Galen
- Occurred in Roman Empire
  - Brought into empire by soldiers from Selucia
  - Affected Asia Minor, Egypt, Greece, and Italy
- Killed almost 1/3 of the population (~5 million)
- Thought to be caused by smallpox or measles



# IMPACT OF THE ANTONINE PLAGUE



- Weakened the military & economic supremacy
- Affected ancient Roman traditions
- Led to the spread of new religions
- Likely started the decline of the Roman Empire

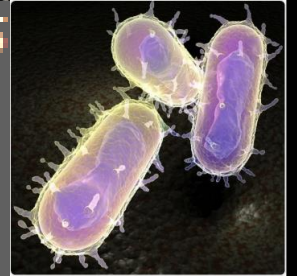
# THE JUSTINIAN PLAGUE

# THE JUSTINIAN PLAGUE

- First documentation of a “real plague” caused by *Yersenia pestis*
- 541-542 AD
- Unknown origin → Either started in Ethiopia, moving through Egypt; or started in Central Asia, traveling along caravan routes
- Spread throughout the Roman world...and beyond
- Significant in coastal cities because is followed trading routes  
“exchange of infections as well as goods”



Bacteria



# THE JUSTINIAN PLAGUE

- Hallucinations prior to outbreak of illness
- Symptoms:
  - Fever
  - Fatigue (Bubo - a swollen inflamed lymph node in the armpit or groin)
  - Buboes in groin area or armpit, occasionally besides ears
- Rapid progression after onset of early symptoms
  - Delirium, lethargic, refused to eat or drink
- Death within days





# THE JUSTINIAN PLAGUE

- ~40% population of Byzantine Empire died
  - Over 50% of population in Constantinople died
- Gravesites beyond capacity in short time
- Dug vast pits and placed bodies there
- Religion came into the picture, as Christians during this time explained the plague as “punishment for sin” or retribution for the induction of “God’s wrath”



# THE JUSTINIAN PLAGUE



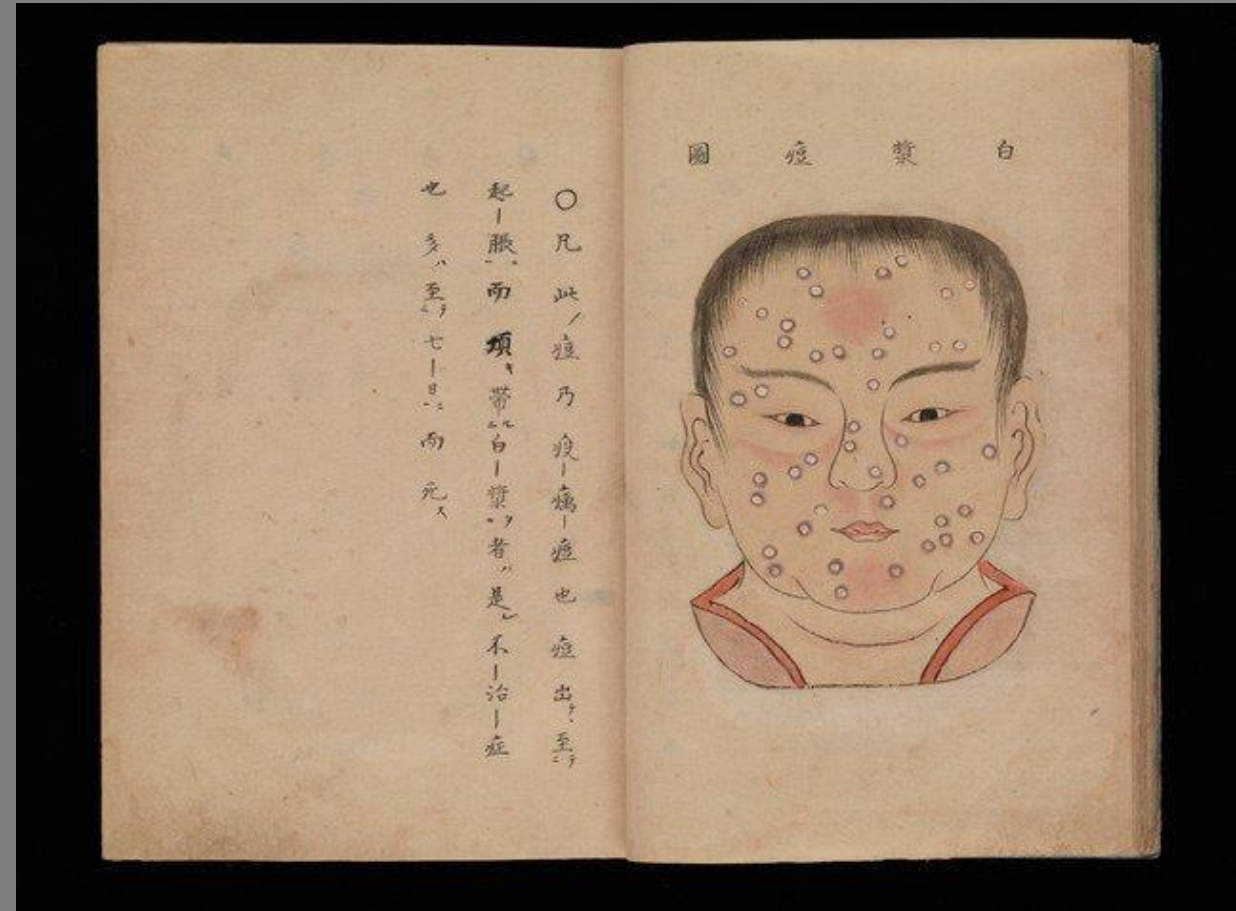
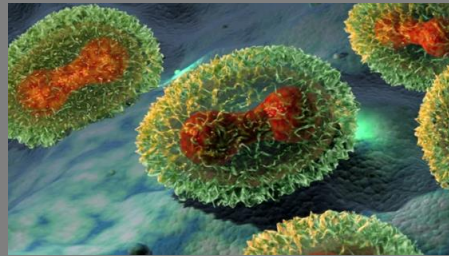
- Prior to the pandemic, the Byzantine Empire was an advanced society
- Weakened its physical, economic, and cultural infrastructure
- All trade stopped
- People either died of starvation or the disease
- Tax base gone
- No economic output
- Army suffered

# JAPANESE SMALLPOX EPIDEMIC

735-737 AD

Cause: Variola major virus

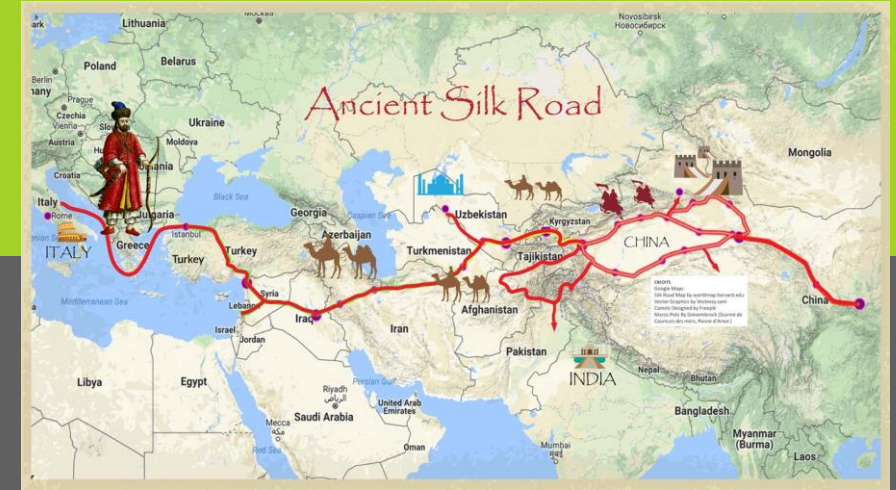
2 million people died



# THE BLACK DEATH (BUBONIC PLAGUE)

# THE BLACK DEATH

- "The Plague"
- Global outbreak of bubonic plague
- Originated in China in 1334
  - Spread through central Asia and northern India – trading route called Silk Road
  - Arrived in Europe in 1347
  - Spread through entire continent of Europe within 5 years
  - Moved into Russia and Middle East
- Within 50 years, Black Death killed ~200 million
  - 60% of European population



# THE BLACK DEATH

- Mortality (if untreated) was close to 70%
  - Most died within 8 days
- Initially Black Death was blamed on the alignment of three planets
  - Caused "great pestilence in the air"
- Later blamed on bad air
- Late 19<sup>th</sup> century – discovered that the Black Plague was due to a massive *Yersenia pestis* pandemic (rat fleas)



Bacteria



# THE BLACK DEATH



- At the time, with no reasonable explanation, people turned to religion
- General population centered on the plague as “punishment for sins”
  - Identified groups that were hit the hardest as the “gravest sinners against God”
- Frequently singled out minorities or women
- Jews in Europe accused of poisoning the wells
- Sultan in Cairo placed a law prohibiting women from making public appearances as they may tempt men into sin
- Societies were terrified

# THE BLACK DEATH



- Led to breakdown of societal structure
- Shortage of doctors → led to people selling useless cures
- Shortage of labor
  - Crops not harvested
  - Settlements abandoned
  - Trade stopped





Before the germ theory of disease, doctors believed that the plague spread was through poisoned air.

The beaked masks that doctors wore, were filled with theriac, a mixture of more than 55 herbs and other compounds including cinnamon, myrrh, and honey.

The shape of the beak was supposedly designed to give the air enough time to be cleansed by the herbs before it reached the nose.

According to the U.S. National Library of Medicine, theriac was widely used in Europe and the U.K. during the Black Death.

# QUARANTINE

The word quarantine is from the Venetian term "quarantena" meaning forty days.

- Medieval societies recognized connection between passage of time and onset of symptoms
- Noted that after a period of observation, those who had not developed symptoms of illness would likely not be affected...therefore, would not spread disease
- Started instituting mandatory isolation



# QUARANTINE

- First known quarantine in Ragusa in 1377
  - Arrivals spent 30 days (later changed to 40) isolated on nearby island before entering city
  - Effective during the Black Death
- We still use quarantining as an effective public health measure to combat outbreaks

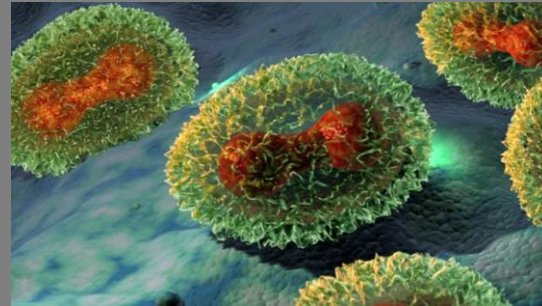


# NEW WORLD SMALLPOX OUTBREAK

1520 – onwards

Cause: Variola major virus

56 million people died



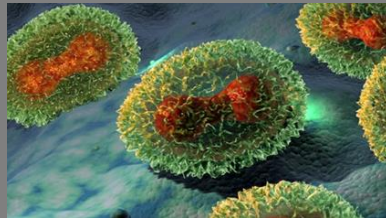
## 1520 MEXICAN SMALLPOX

500 years from the arrival of the Spanish to the official eradication in 1951

Brought to Mexico by those in Spanish ships, then spread to the center of Mexico, where it became a significant factor in the fall of Tenochtitlan.

It led to the implementation of sanitary and preventive policies.

5 – 8 Million people died



## THE COCOLIZTLI EPIDEMIC

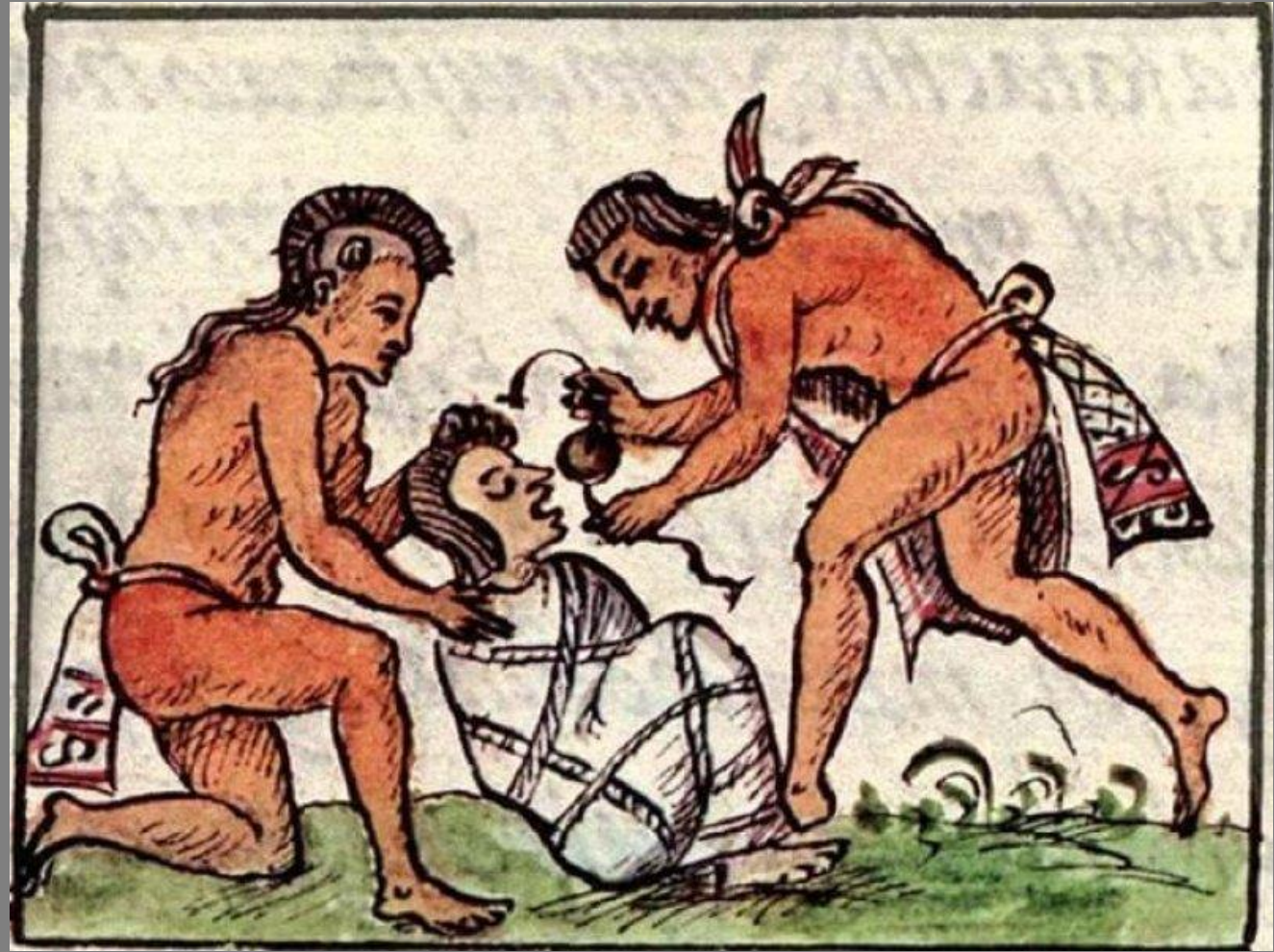
Millions of people died in the territory of New Spain in present-day Mexico in the 16th century attributed to one or more illnesses collectively called cocoliztli

1545 to 1548 and again in 1576 to 1580

A total of 17.5 million persons died.

It was a mysterious illness characterized by high fevers and bleeding.

**This outbreak is often referred to as the worst disease epidemic in the history of Mexico.**



## THE ITALIAN PLAGUE OF 1629–1631

It was a series of outbreaks of Bubonic plague that ravaged northern and central Italy.

Referred to as the Great Plague of Milan, it claimed about 1 million lives, or 25% of the population.

The plague may have contributed to the decline of Italy's economy relative to that of other Western European countries.



*Dal orto di meo bel nome hebbe gran sorte  
L'Oriente additai scorgi hor l'occaso*

*Gia fui di Vita albergo hor son di Morte  
Campidoglio funesto Ah duno Caro.*

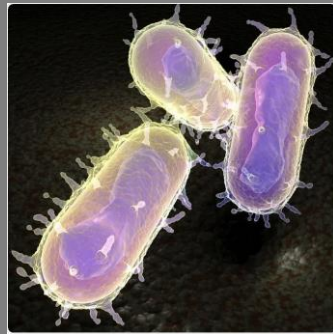


## NAPLES PLAGUE

It was a plague in Italy between 1656–1658 that nearly eradicated the population of Naples.

It affected mostly central and southern Italy, killing up to 1,250,000 people throughout the Kingdom of Naples.

In Naples alone, approximately 150,000–200,000 people died in 1656 due to the plague, accounting for more than half of the population.



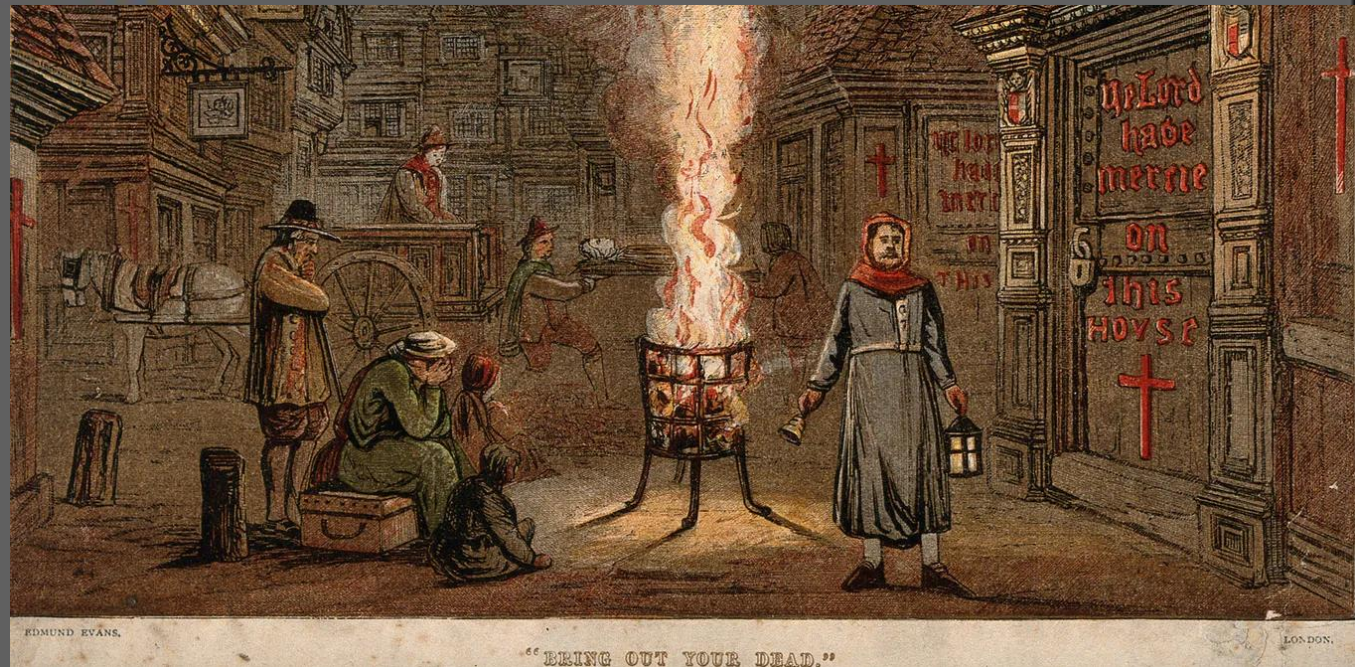


**GREAT PLAGUE OF LONDON** Just as people have spread across the world...

1665

Cause: **Yersinia pestis** bacteria from Rats and their fleas

100,000 people died



# THE PERSIAN PLAGUE EPIDEMIC

It happened during 1772–1773 and was a massive outbreak of the Bubonic plague, in the Persian Empire, which **claimed around 2 million lives.**

It was one of the most devastating Plague epidemics in recorded human history.

The outbreak resulted in the introduction of several quarantine measures for the first time in the Persian Gulf regions



# CHOLERA

The third cholera pandemic (1846–1860) started in India in the nineteenth century, that reached far beyond its border

It may have started as early as 1837 and lasted until 1863.

In Russia, more than one million people died of cholera.

In 1853–54, the epidemic in London claimed over 10,000 lives, and there were 23,000 deaths for all of Great Britain.



## MT. HEALTHY

It began in 1817, as a small settlement called Mt. Pleasant.

It was about halfway between Cincinnati in the south and Fort Hamilton in the north and there were travelers along its main street, which later became Hamilton Avenue.

When the cholera epidemic struck Cincinnati in 1849, many residents fled north to Mt. Pleasant, which had proven to be a sanctuary from the disease and its name was changed to Mt. Healthy.

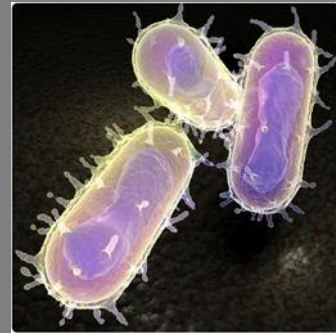


## THE THIRD PLAGUE PANDEMIC

It was a major bubonic plague pandemic that began in Yunnan, China, in 1855

It spread to all inhabited continents, and ultimately led to more than 15 million) deaths in India and China

10 million died in India alone, making it one of the deadliest pandemics in history.



# THE SPANISH FLU PANDEMIC

# THE SPANISH FLU



- 1918-1920
- First true global pandemic
- First pandemic to occur in setting of modern medicine
- Last true global pandemic with devastating consequences for societies around the world



# THE SPANISH FLU

- Caused by H1N1 strain of influenza virus
  - Outbreak of same strain again, in 2009-2010 (Swine Flu)
- True origin of pandemic is unknown
  - Possibly Spain, U.S., China, France, or Austria
- Spread all over the world
- Mortality rate of 10-20%
  - Affected over ¼ global population
  - Death toll at 40-50 million





# THE SPANISH FLU

- Higher mortality among young, previously healthy individuals
- Likely due to cytokine storm

(See next page)

- Mutated & returned to kill those who avoided infection the first time



## CYTOKINE STORMS

One of the great mysteries of the new coronavirus is why it causes only mild disease in most people but turns fatal for others. In many cases, it seems the worst damage may be driven by a deranged immune response to the infection, rather than the virus itself.

**In many of the sickest patients with COVID-19, their blood is teeming with high levels of immune system proteins called cytokines.**

**Scientists believe these cytokines are evidence of an immune response called a cytokine storm, where the body starts to attack its own cells and tissues rather than just fighting off the virus.**

Though the virus that causes COVID-19 has been circulating for over a year and research shows that like other infections, it, too, may cause this kind of catastrophic immune problem, and researchers say the size of the storm it triggers is gale-force.

# THE SPANISH FLU

- Enormous impact on society, world-wide
- First pandemic where long-lingering effects could be observed and quantified
  - Census data for 1960-1980 → “children born to women exposed to Spanish Flu had more physical ailments and lower lifetime income”
  - 2006 study found that “cohorts in utero during the pandemic displayed reduced educational attainment, increased rates of physical disability, lower income, and lower socioeconomic status”



# THE SPANISH FLU



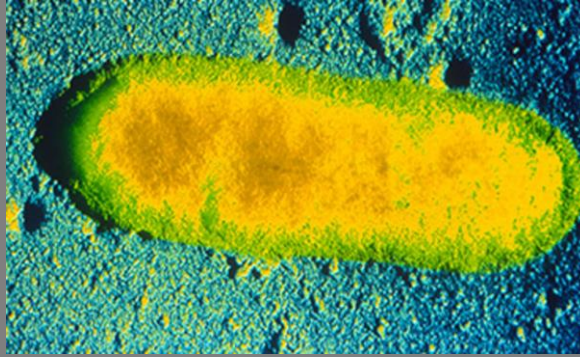
- Has been referred to as the “forgotten pandemic”
- Only lasted about 9 months
- Overshadowed by the ending of WWI
- This is just how society deals with such rapidly spreading pandemics → first with great interest → horror and panic → dispassionate interest

## EPIDEMIC TYPHUS

It happened between 1918 to 1922, in Russia.

It is also known as louse-borne typhus, is a form of typhus so named because the disease often causes epidemics following wars and natural disasters where civil life is disrupted.

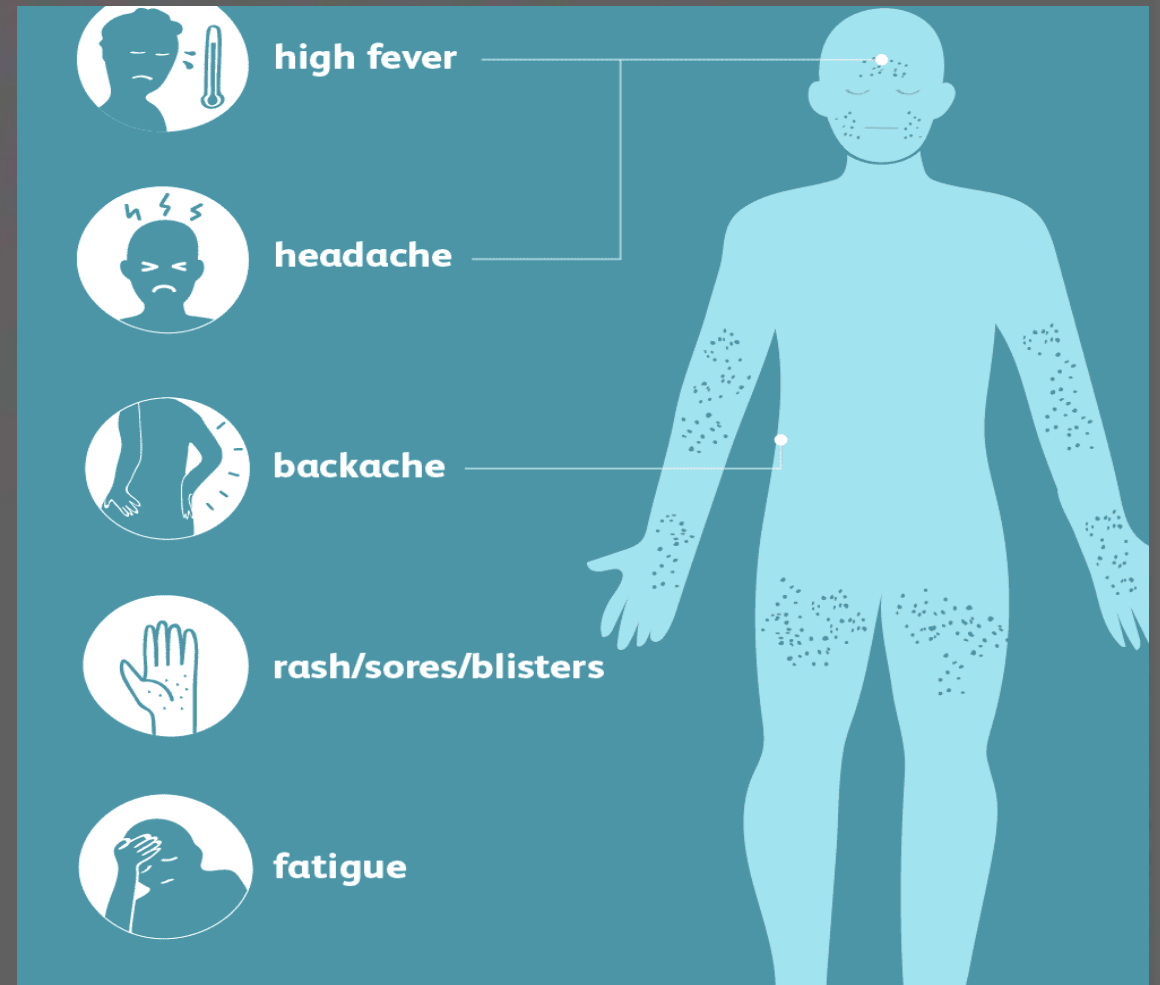
It is spread to people through contact with infected body lice, in contrast to endemic typhus which is usually transmitted by fleas



# SMALLPOX

# SMALLPOX

- 1520-onward
- Highly contagious virus
- Fever & pustules on skin
- 30% mortality rate
  - ~56 million deaths



# SMALLPOX

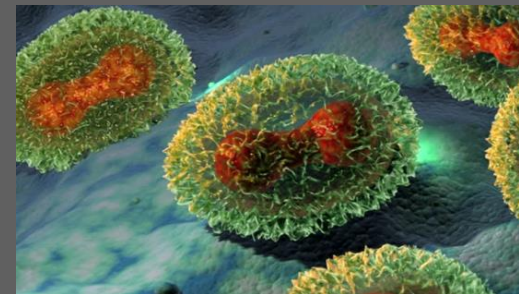


- Led to the world's first vaccine in 1798
- Well-coordinated effort in 1967 led to global eradication
  - WHO announced complete eradication in 1980



# SMALLPOX – YUGOSLAVIA 1972

- Started with pilgrim returning from Middle East with fever and skin eruptions
- Physicians had not seen this in over 30 years → Incorrectly diagnosed
- This patient infected 38 others (including healthcare workers)
- Mandatory revaccination & quarantined villages/neighborhoods
- Closed borders
- Suspended non-essential travel



# SMALLPOX – YUGOSLAVIA 1972

- Revaccinated entire population in 2 weeks
- During this outbreak:
  - 175 cases identified
  - 35 fatalities
- Due to prompt response, society returned to normal in 2 months



“This event has proven to be a useful model for working out scenarios for responses to an outbreak of a highly contagious disease, both as a natural occurrence and as an act of bioterrorism”

# HIV/AIDS PANDEMIC

# HIV/AIDS PANDEMIC

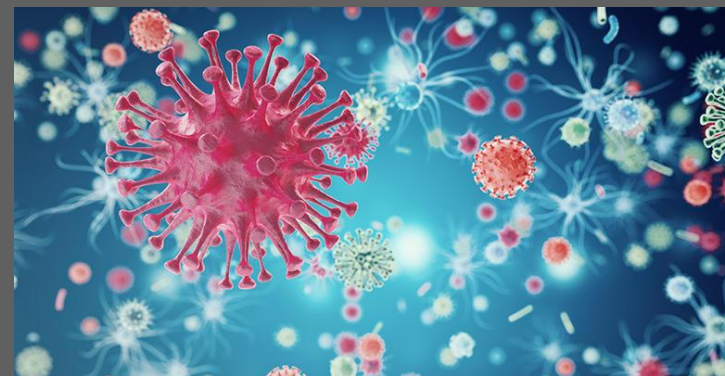


- Slowly progressing global pandemic
- Continually brings new challenges
- Started in early 1980s in U.S.
- Initially observed predominantly in gay population with high mortality
  - Led to social isolation and stigma

# HIV/AIDS PANDEMIC

*HIV prevention  
starts with ME:*  
ENDING THE HIV EPIDEMIC TOGETHER

- Global public health phenomena
- Affects ~40 million people globally
- Death toll at ~35 million people world-wide
  - ~One million deaths/year (down from nearly 2 million in 2005)
- Alarming 25% prevalence in Sub-Saharan African countries
- In U.S.:
  - ~1.2 million people live with HIV
  - 12,000 deaths/year



# HIV/AIDS PANDEMIC



- Receives great amount of public health attention – national & international administrations, plus pharmaceutical companies
- Advances in treatment have turned HIV into a chronic condition
- Attention on mental health
  - Helps us understand challenges associated with infectious disease

# SARS

(SEVERE ACUTE RESPIRATORY SYNDROME)

# SARS - NOVEMBER 16, 2002 TO APRIL, 2004

- First outbreak in 21<sup>st</sup> century to get public attention
- Caused by SARS Corona virus (SARS-CoV)
  - Started in China
  - Affected < 10,000 people
- Global health concern
  - Severe respiratory symptoms
  - 10% mortality rate





# SARS



- Intense public health response
  - Quarantining in affected areas
  - Isolating infected individuals
  - Regular sanitation of surfaces
  - Facemasks a common sight
- Studied mental health effects

# SWINE FLU (H1N1)

# WHAT IS H1N1 (SWINE FLU)?

It's a type A influenza virus that affects pigs (swine).



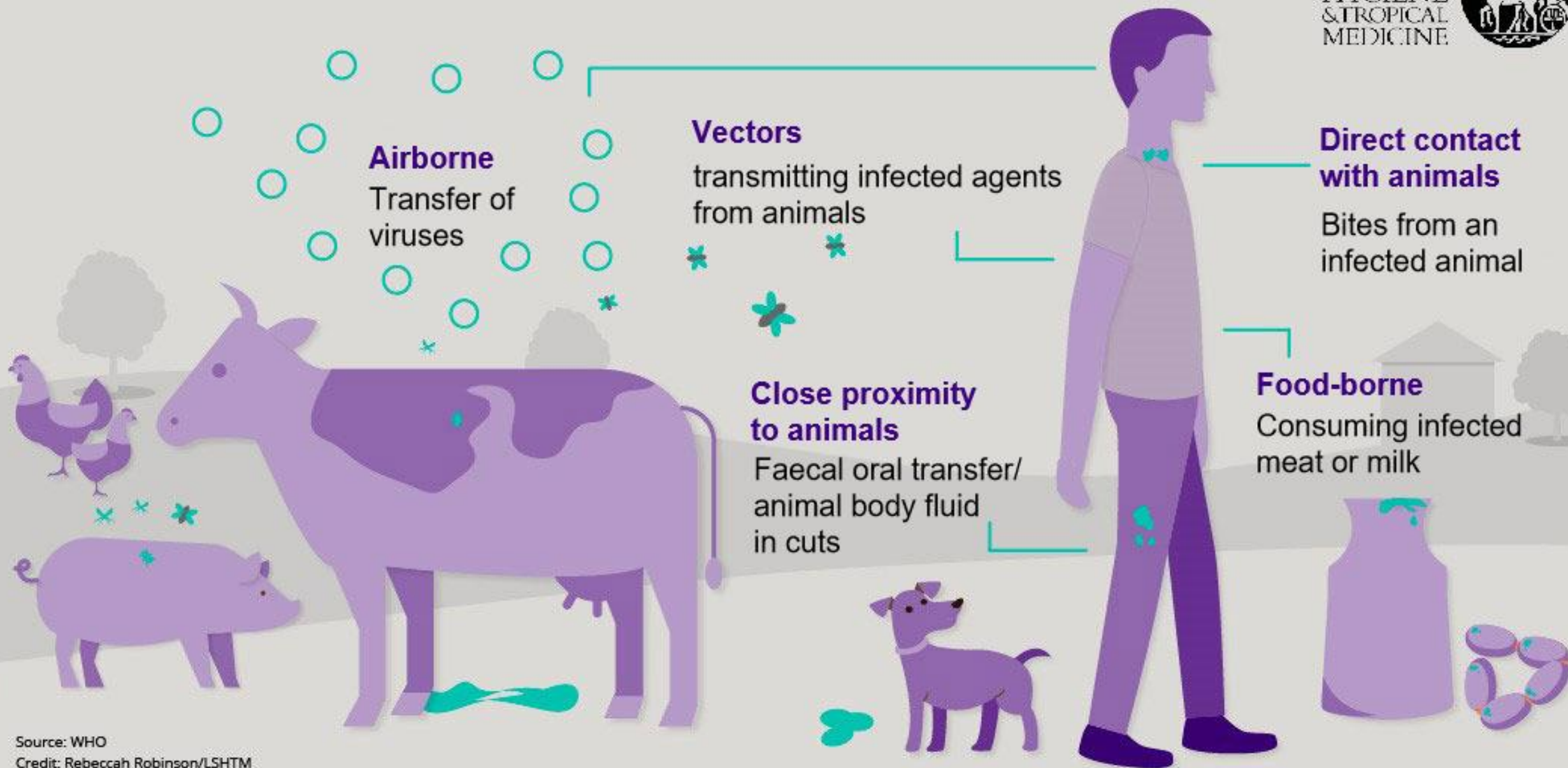
It can pass to humans through contact or air contamination.

Human swine flu symptoms include fever, nausea, and sore throat.



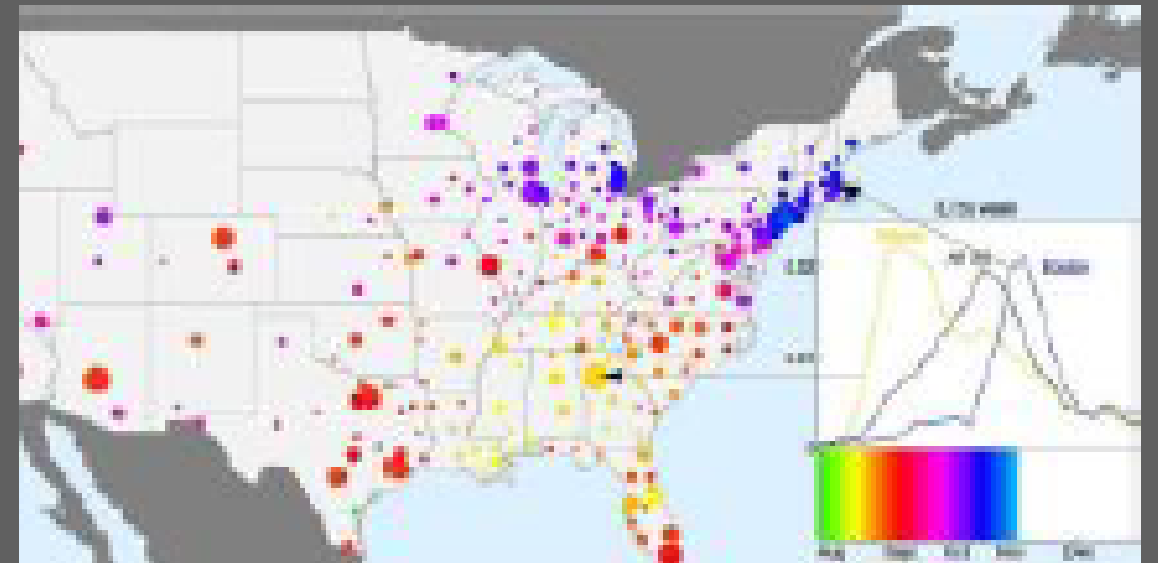
# How zoonotic diseases are transmitted

LONDON  
SCHOOL of  
HYGIENE  
& TROPICAL  
MEDICINE



# SWINE FLU (H1N1)

- Reprise of the 1918 Spanish flu
  - Far less devastating consequences
- Started in Mexico → infected over 10% of global population quickly
  - Affected ~60 million in U.S.
  - Death toll estimated to be up to 500,000 world-wide



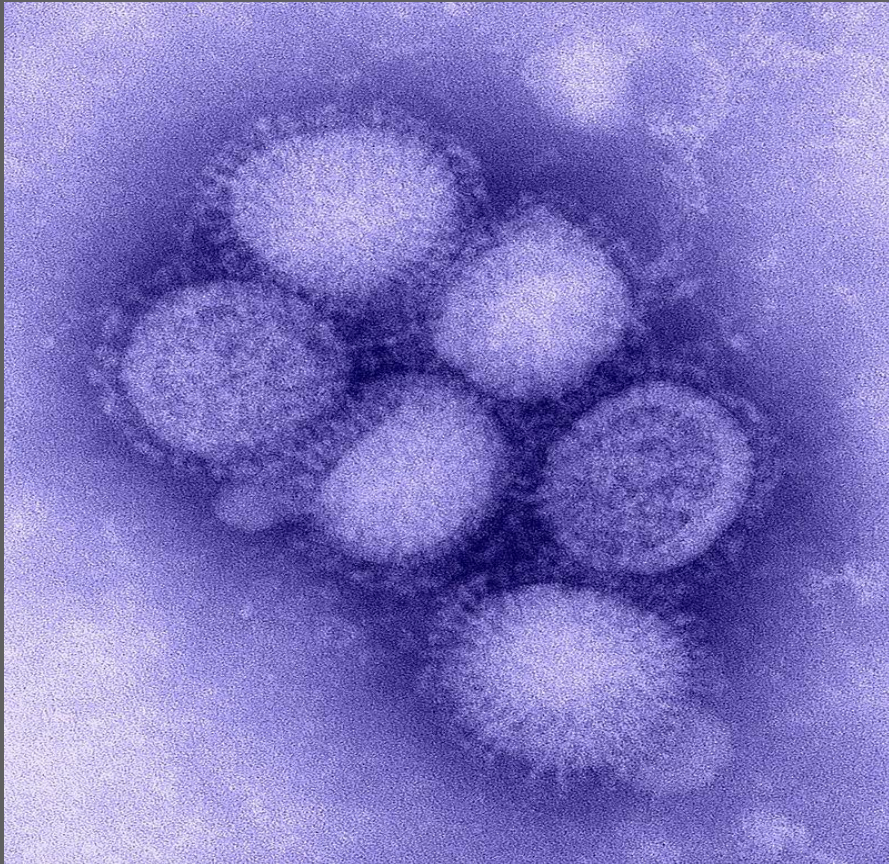
# SWINE FLU (H1N1)

- Death rate lower than typical influenza death rates
  - Disproportionately affected previously healthy, young adults
    - Older adults had immunity due to similar H1N1 outbreak in 1970's
  - Quickly led to severe respiratory compromise
- Demonstrated how quickly a viral pandemic can spread in 21<sup>st</sup> century



“A major legacy of the swine flu may have been how it exposed the persistent vulnerability of many countries with advanced healthcare systems to a fast-moving, flulike illness”

# SWINE FLU (H1N1)



- Studied mental health aspects
- Dissonance between public sentiment and steps taken by public health, as recommended by WHO and national health institutions
- General sentiment was WHO could not be trusted because the outbreak did not materialize
  - Health agencies accused of creating panic
  - Unproven vaccines to boost pharmaceutical companies

# EBOLA



# EBOLA

- Endemic to Central and West Africa
- Began in small village in Guinea in 2014
  - Quickly spread to Sierra Leone and Liberia
  - Largest infection to date
- 28,000 cases
- 11,000 deaths



# EBOLA

- Ravages countries least equipped to defend against it
- Person from Liberia, fell ill and died in Texas in 2014
  - Infected two nurses
  - Significant public concern of possible outbreak in U.S.
- Significant public health and military effort to address the outbreak

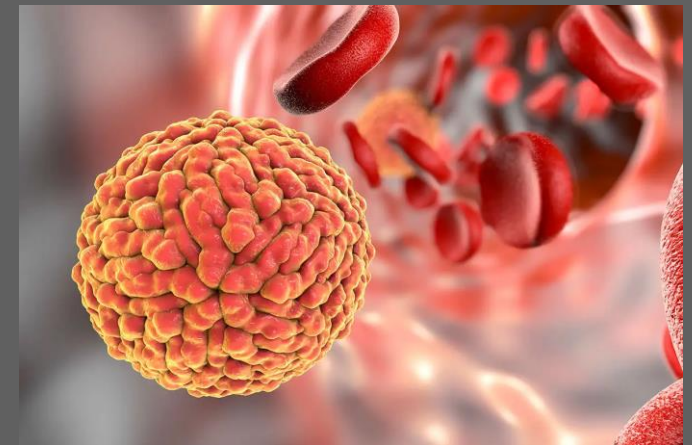


ZIKA

# ZIKA



- Little known virus found in rhesus monkeys in Uganda
- Prior to 2015, only known outbreak in Micronesia (2007)
- 2015 - outbreak identified in Brazil
- Mild illness:
  - Flat, pinkish rash
  - Bloodshot eyes
  - Fever
  - Joint pain
  - Headaches
- Mosquito-borne & sexually transmitted

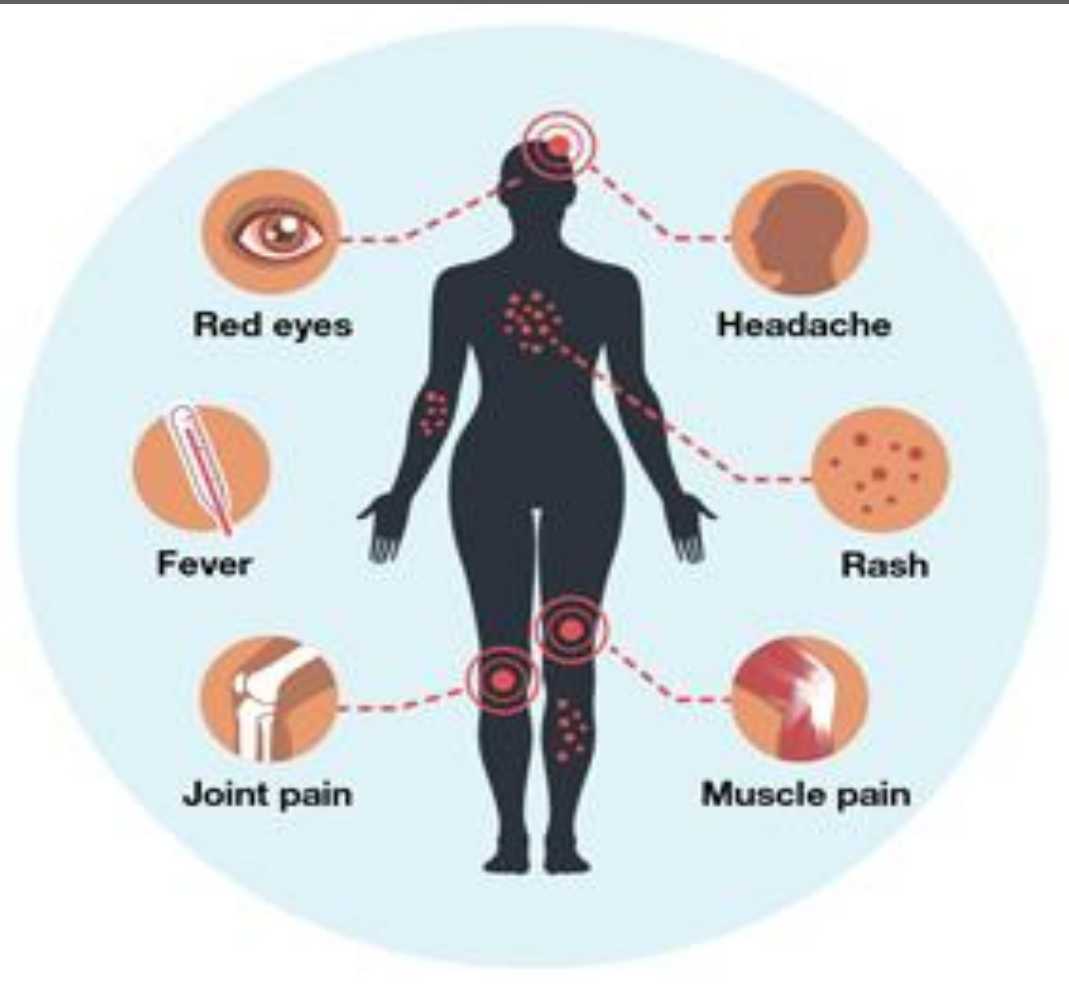


# ZIKA

- May cause Guillain-Barre syndrome
- May cause severe microcephalia in unborn children of infected mothers
- In Brazil (2015), Zika linked to:
  - 2400 birth defects
  - 29 infant deaths
- Continued to spread
- Remains a significant public health concern



# #ZIKA



- Modern media pandemic
- In early 2016, Zika mentioned 50 times/minute on Twitter
- Social media used to disseminate information, educate, and communicate concerns
  - Public health institutions tried to promote educational aspect
  - General public voiced their concerns

# #ZIKA

- 4 out of 5 Zika posts were accurate
- "Trending" posts were inaccurate



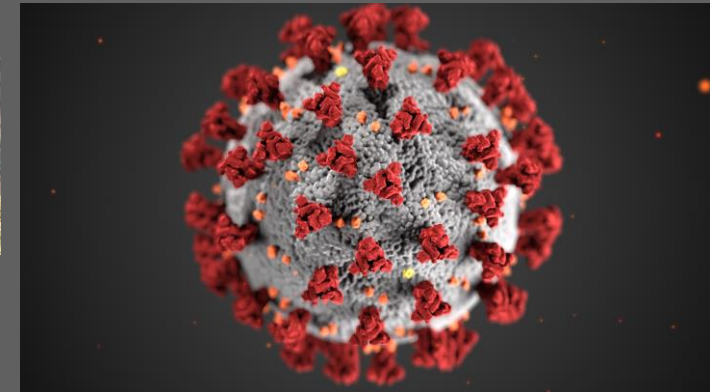
“requires significant attention in preparing for future outbreaks because it may hold a key not only to preparedness, but also to execution of public health plans that may involve quarantine and immunization”

# COVID-19



# COVID-19

- Outbreak of novel coronavirus
- Outbreak of 3 known diseases caused by coronavirus:
  - MERS-CoV
  - SARS-CoV
  - COVID-19
- All *may* be traced to bats or Pangolins
- Revealed vulnerabilities in the global response to outbreaks



# GLOBAL CASES OF COVID-19

**3,200,000 deaths  
as of 5-1-2021**



# Threat Levels

Variant of Interest

Variant of Concern

Variant of High Consequence

## VARIANTS OF THE CORONA VIRUS

Viruses constantly change through mutation, and the other types are called **variants**.

Multiple variants of the virus that causes COVID-19 are circulating globally and within the U. S.

The Center for Disease Control (CDC) has established 3 classifications for the variants being monitored and watched closely:

- 1) Variant of Interest**
- 2) Variant of Concern**
- 3) Variant of High Consequence**

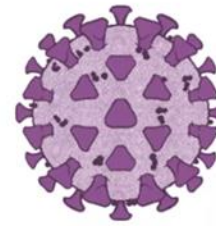
## There are currently 5 variants of Concern, in the United States:

**B.1.1.7:** This variant was first identified in the US in December 2020. It was initially detected in the UK.

**B.1.351:** This variant was first identified in the US at the end of January 2021. It was initially detected in South Africa in December 2020.

**P.1:** This variant was first detected in the US in January 2021. It was initially identified in travelers from Brazil, who were tested during routine screening at an airport in Japan, in early January.

## Variants of Concern

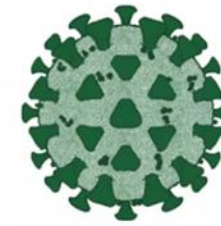
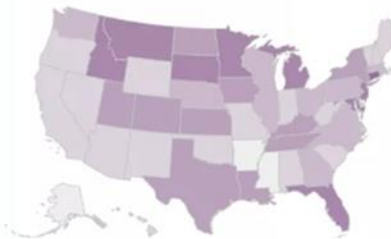


'The U.K. Variant,' B.1.1.7

50% more transmissible

Likely causes more severe disease

Vaccines are still effective

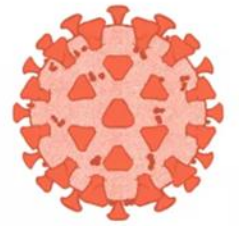


'The South Africa Variant,' B.1.351

50% more transmissible

Unknown if it causes more severe disease

Vaccines are less effective



'The Brazil Variant,' P.1

Believed to be more transmissible, but more research needed

Unknown if it causes more severe disease

Vaccine efficacy is unknown





**'The California Variant,'  
B.1.427/B.1.429**



20% more  
transmissible



May cause more severe  
disease, but more  
research needed



Vaccines are likely still  
effective



**B.1.427 and B.1.429:** These two variants were first identified in California in February 2021 and were classified as a Variant of Concern (VOC) in March 2021.

These variants seem to spread more easily and quickly than other variants, which may lead to more cases of COVID-19.

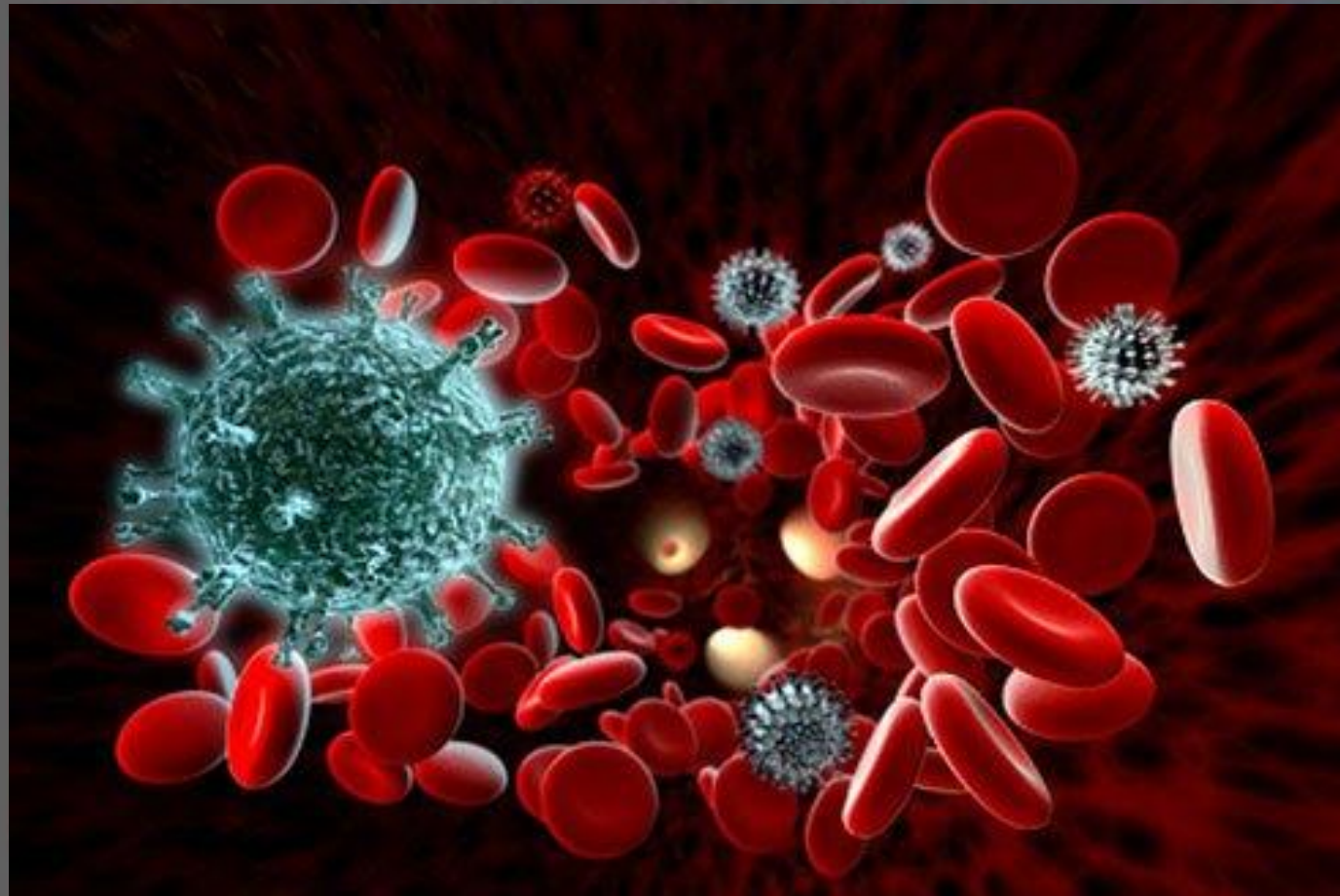
**So far, studies suggest that antibodies generated through vaccination with currently authorized vaccines, recognize these variants.**

## WHAT HAVE WE LEARNED?



- Massive improvement in sanitation, hygiene, nutrition
- Human population less vulnerable to illness
- Still face challenges:
  - HIV/AIDS remains a pandemic
  - COVID-19

“Pandemics are more likely to occur if the threat has not been seen before and is easily transmissible”



NM = BILLIONTH OF  
A METER

<https://www.youtube.com/watch?v=JBQ2ZiH9tgU> END AT 2.20

# CONCLUSION

- We are continually learning and adapting
- Current adaptations:
  - Social distancing
  - Wearing masks
  - Quarantining
  - New vaccines
- Geographical and statistical analyses to limit the spread



## CONCLUSION

- Despite the persistence of current and potential pandemics, humanity continues to move forward
- Need to be aware of factors that nurture pandemics
- Improvement in healthcare is a powerful tool
- Public health plays an enormous role in communication

**THE END**

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