Pandemics

In history

What is a pandemic?

The word pandemic comes from the Greek words *pan* and *demos* that mean “all” and “people”. It is an epidemic that spreads across a large territory or even the world.

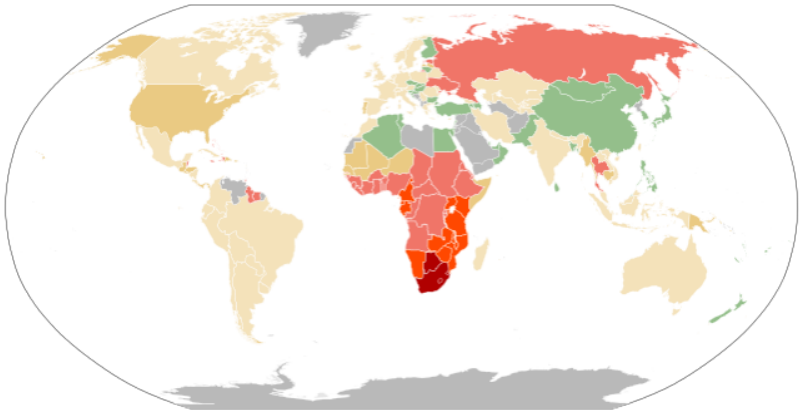
The majority of human infectious diseases and pandemics have originated through the cross-species transmission of microorganisms from animals to humans.

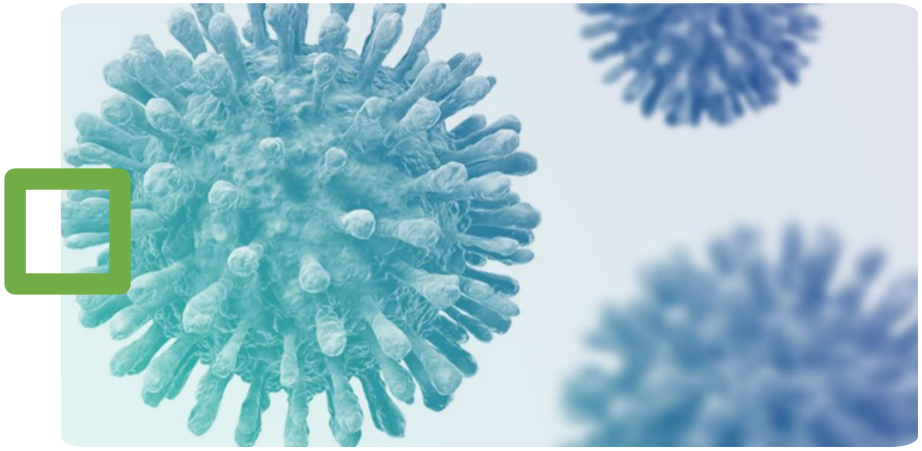
For an animal pathogen to become a successful human pathogen, it must evolve into a pathogen capable of infecting humans and maintaining long term human-to-human transmission.

The Black Death

- When: 14th century
- Where: Eurasia
- Species: bacterium Yersinia Pestis
- Deaths: 75 to 200 millions

- Not eradicated but can be cured
- Transmitted by flea bite
- Contagious when reaches the pneumonic form, through droplets





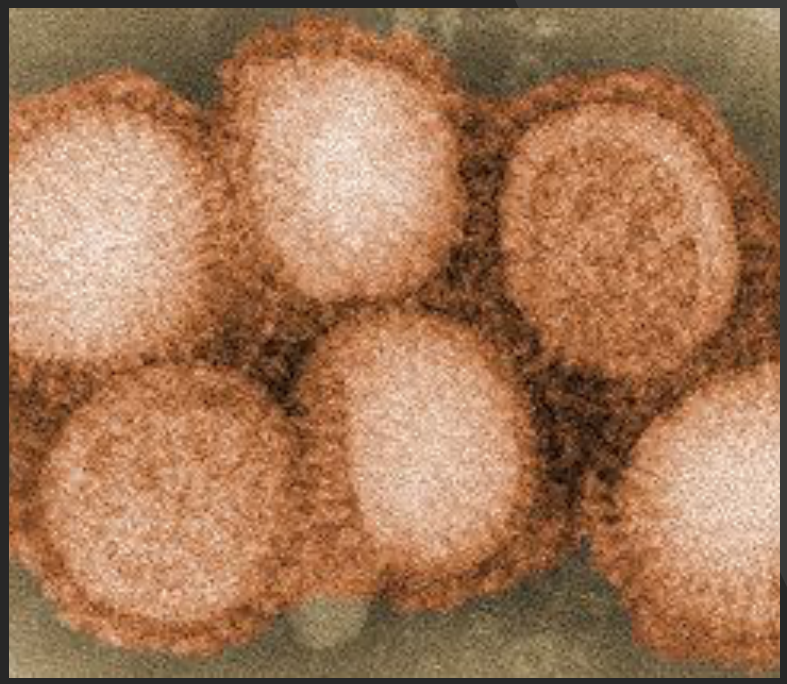
AIDS

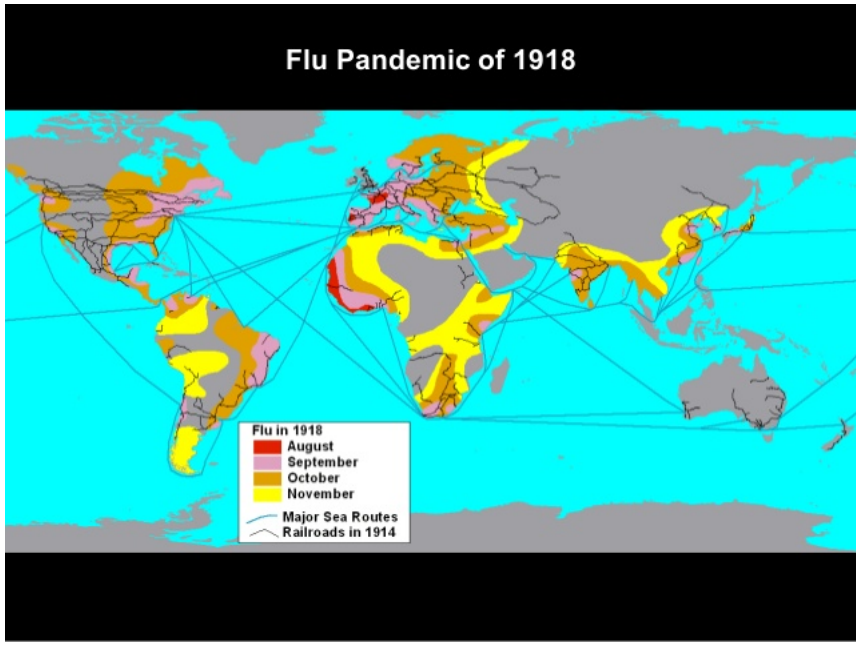
- When: 20th- 21st centuries
- Where: worldwide
- Species: Human Immunodeficiency Virus (HIV)
- Deaths: 30 millions

- Not eradicated, cannot be cured, but treatment is effective
- Transmitted through sexual contact, blood, needles, mother-infant

Influenza

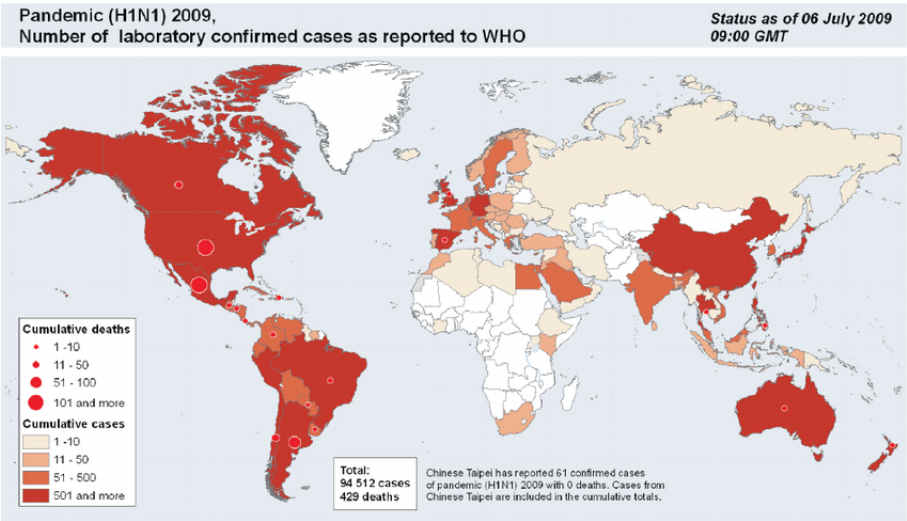
- When: 9 throughout the last 300 years
- Species: Influenza virus
- Not eradicated, vaccine.
- Transmitted from animals (pigs, chickens, ducks)
- Contagious before symptoms appear until they disappear, mostly through droplets.
- 3 main types of influenza: A and B can be serious while C is mild.
- Influenza A and B have 2 types of spikes H (haemagglutinin) and N (neuraminidase) which help infecting cells and spreading. There are different types of H and N.
- Many flu epidemics are not pandemics. The flu is seasonal.





Influenza
Spanish flu

- When: 1918-1919
- Where: worldwide
- Species: Influenza A subtype H1N1
- Origin: avian origin
- Deaths: at least 50 millions

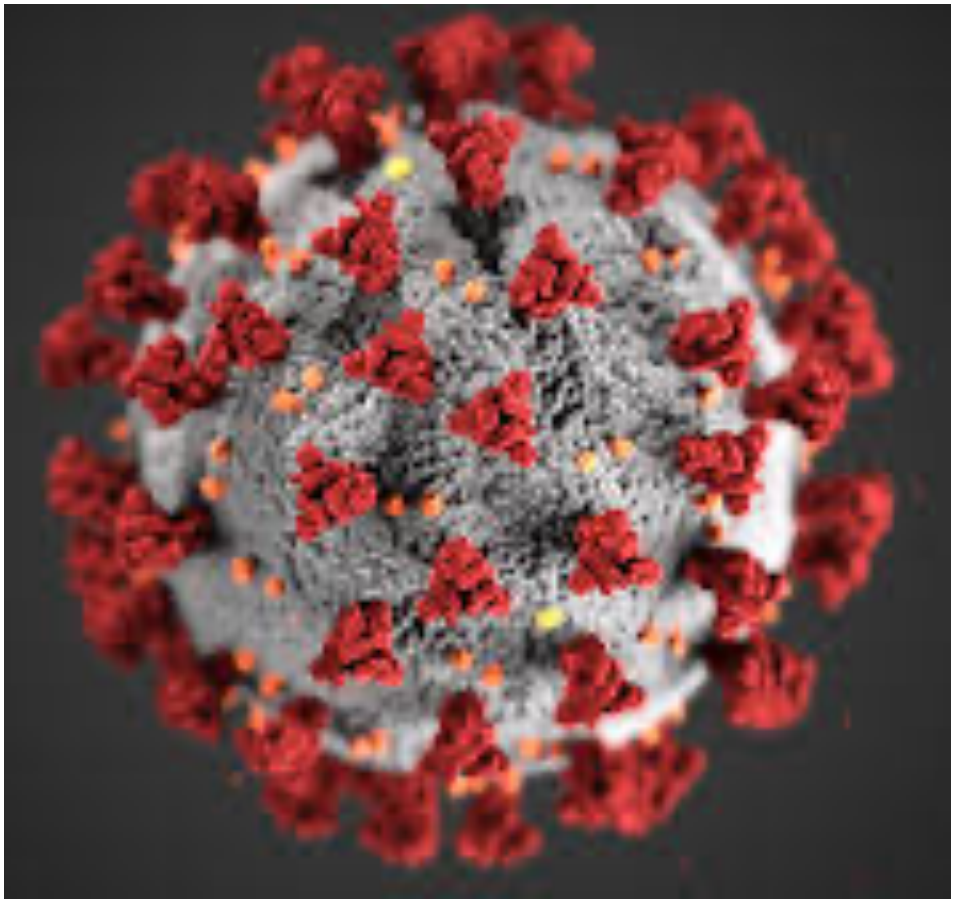


Influenza
Swine flu 2009

- When: 2009-2010
- Where: worldwide
- Species: Influenza A subtype H1N1
- Origin: swine origin
- Deaths: 151,700-575,400

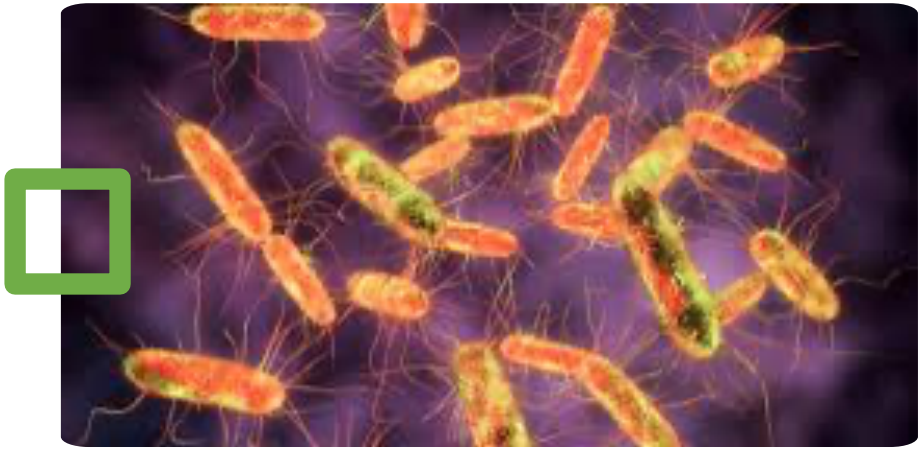
Coronavirus

- When: discovered in the late 1960s
- Species: Coronavirus (crown)
- Not eradicated, no vaccine.
- Transmitted from animals
- Contagious before symptoms appear until they disappear, mostly through droplets.
- Cause respiratory tract infections that can be mild (common cold) or lethal (SARS, MERS, COVID-19)
- Past outbreaks include SARS-CoV in 2002-2004 (China, 774 deaths), MERS-CoV (2012 in the Middle East, 2015 in Korea,2018 several locations, about 500 deaths)



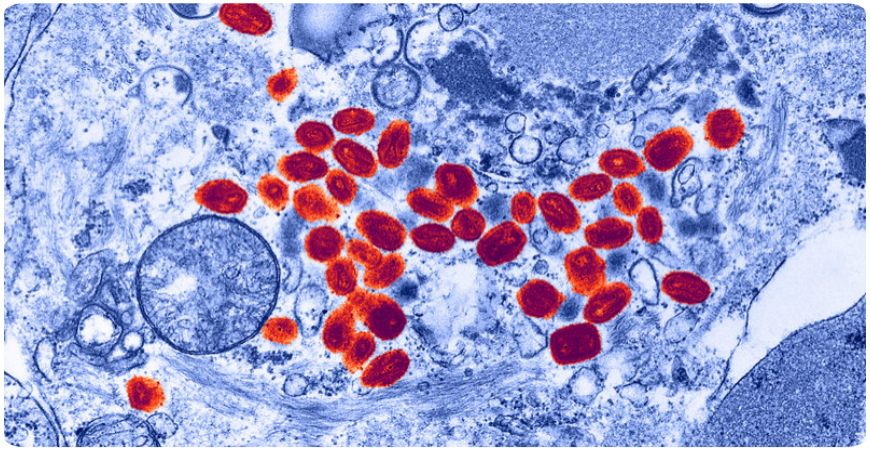
COVID-19

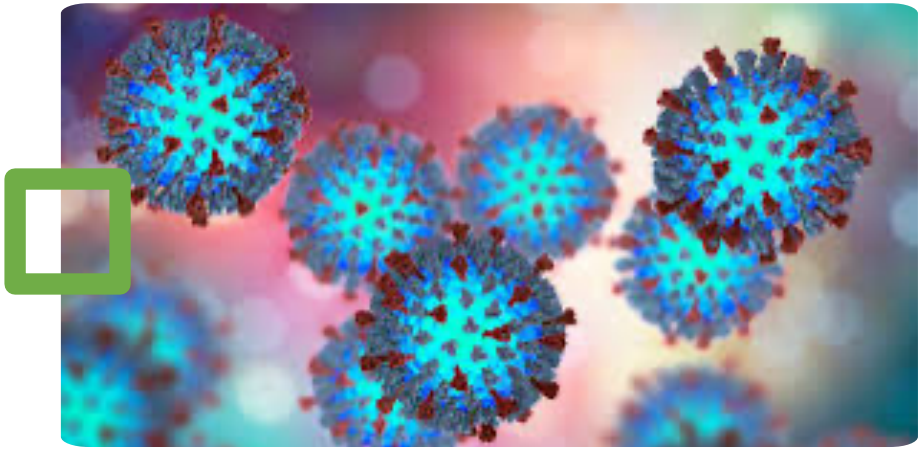
- When: 20019-2020
- Where: worldwide
- Species: SARS-CoV 2
- Origin: zoonotic, under study
- Transmission: under study
- Deaths: ongoing



Other notable outbreaks in history

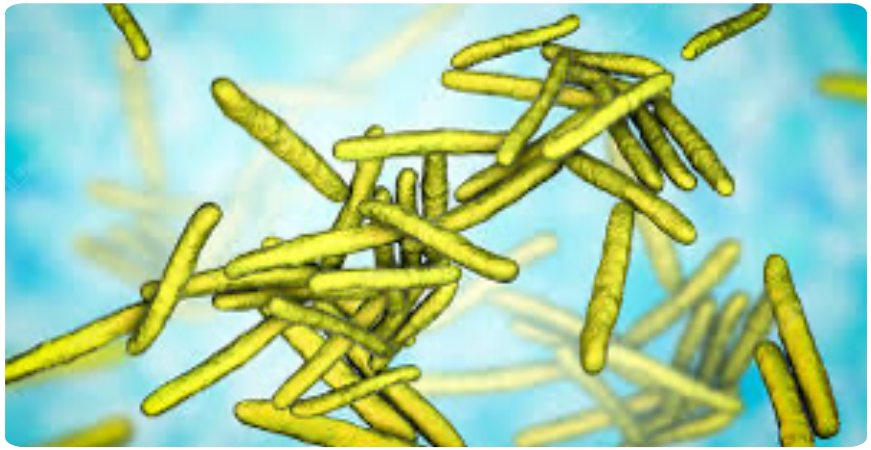
- Cholera (bacterial infection): It is an infection of the intestine. It became widespread in the 19th century killing 10 millions of people. It Is facilitated by lack of treatment of drinking water and lack of hygiene.
- Typhus (bacterial infection). It causes headache, fever and rash. It emerged during the Crusade and is now rare. It is spread by parasites (fleas, body lice)





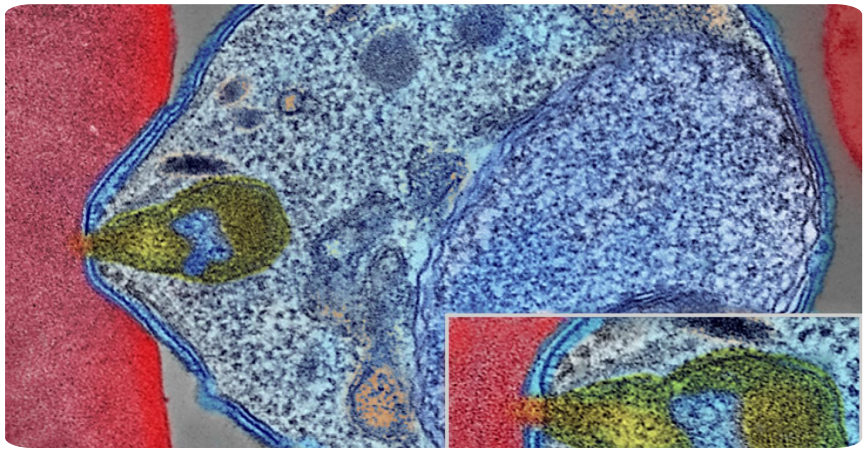
Other notable outbreaks in history

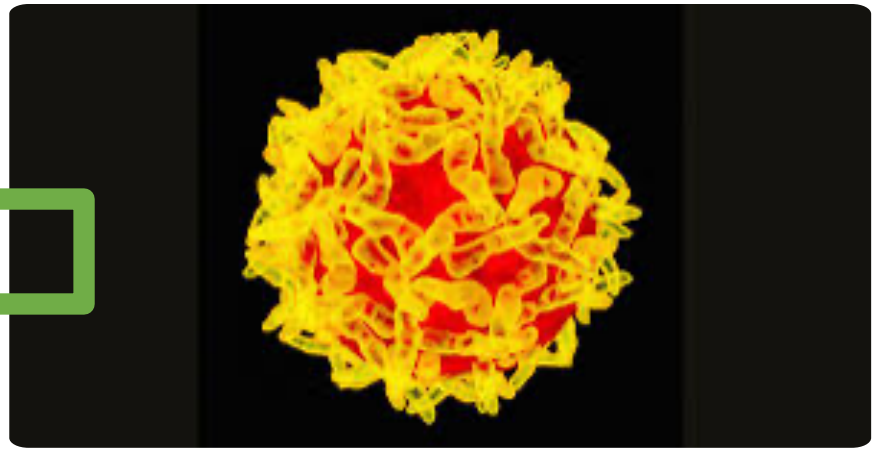
- Smallpox (variola virus). Killed millions until it was eradicated in 1979.
- Measles (measles virus). Measles killed around 200 million people worldwide over the last 150 years. It killed 777,000 worldwide in 2000



Other notable outbreaks in history

- Tuberculosis (bacterium): In the 19th century, tuberculosis killed an estimated one-quarter of the adult population of Europe. Annually, 8 million people become ill with tuberculosis, and 2 million people die from the disease worldwide. TB is still one of the most important health problems in the developing world.
- Leprosy (bacteria): It has an incubation period of up to 5 years. It damages the nerves, the lungs, the skin and the eyes. Leprosy has affected people since at least 600 BC. Worldwide, two to three million people are estimated to be permanently disabled because of leprosy.

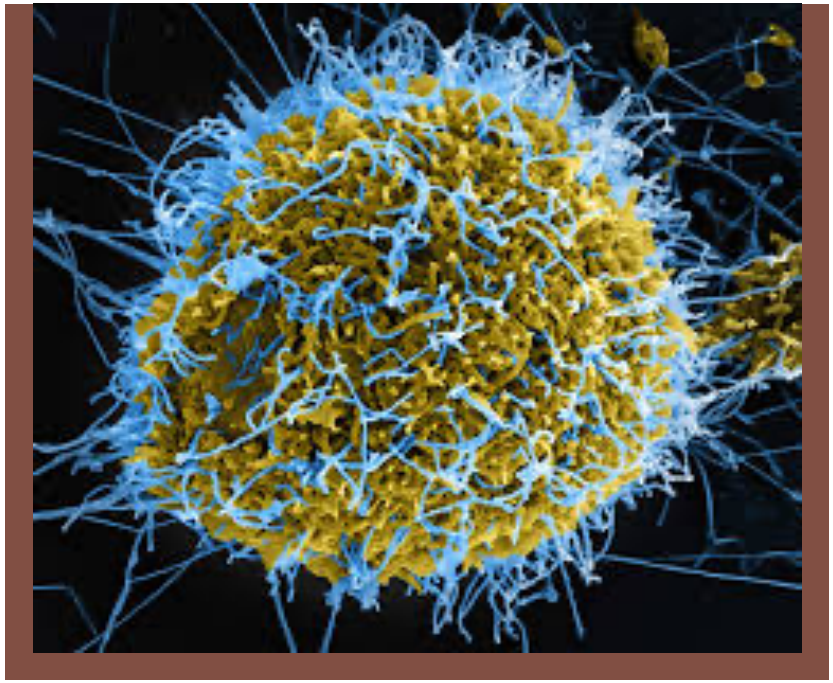


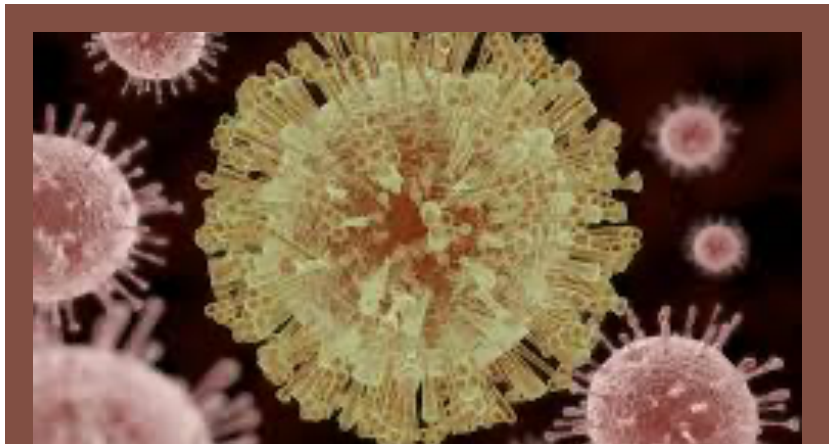


Other notable outbreaks in history

- Malaria (mosquito born disease caused by parasites): It causes fever, vomiting and headaches. In severe cases, it causes seizure, coma and death. The WHO estimates that in 2018 there were 228 million new cases of malaria resulting in 405,000 deaths. The majority of cases (65%) occur in children under 15 years old.

- Yellow Fever (viral disease): It causes fever, chills, nausea and headaches. In severe cases, it causes liver failure. It is spread by mosquitos. It is common in tropical and subtropical areas of South America and Africa. The WHO estimates 200,000 cases of disease and 30,000 deaths a year occur.





Other notable outbreaks in history

- Ebola (virus): it is rare but deadly, it causes fever, diarrhea, and sometimes hemorrhage. It kills about 50% of those infected.
- Zika (virus). It is a mosquito borne disease. It is a mild infection, but it can cause birth defects and should be avoided by pregnant women.

The future of pandemics

- Some organisms become resistant to antibiotics. An example is currently tuberculosis.
- Some diseases are very contagious and deadly. This is the case of Ebola.
- Some known organisms that have the potential to cause pandemics are
  - Coronaviruses, for which there is no vaccine.
  - Influenza
  - Zika

To go further

- World Health Organization is your source of information on epidemics and health topics in general: https://www.who.int
- How 5 of History's Worst Pandemics Finally Ended
- Social Distancing and Quarantine Were Used in Medieval Times to Fight the Black Death
- How some cities ‘flattened the curve’ during the 1918 flu pandemic