



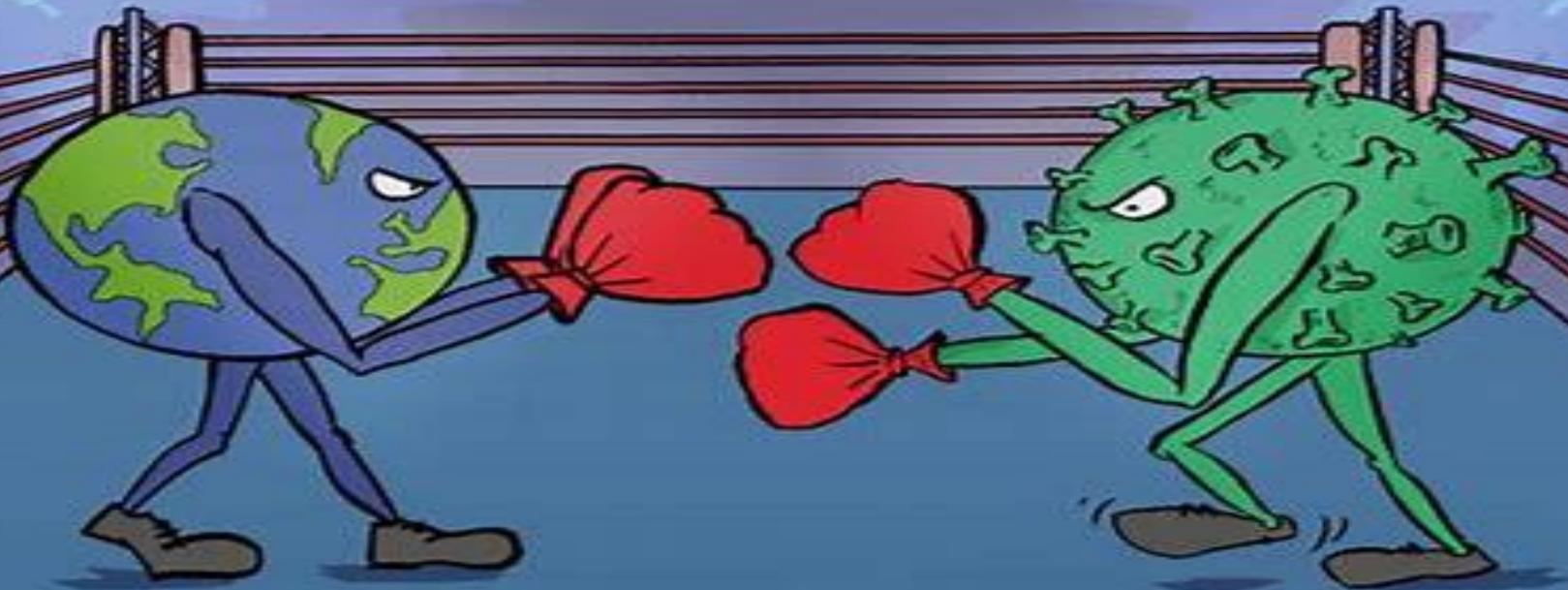
EMERGING AND RE-EMERGING INFECTIOUS MICROBES

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Objective

Overview of emerging and reemerging infectious disease microbes as the cause of pandemics,
- Including today's Coronavirus pandemic as a continuation of the never-ending war between humans and infectious microbes.

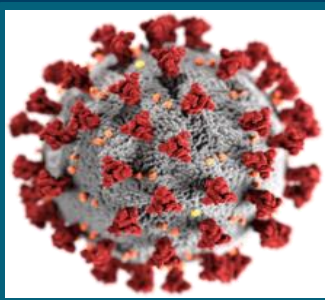
world vs. corona



Why be concerned about Infectious Microbes

- Today's SARS-CoV-2 is one of the many infectious microbes that have caused pandemics since the beginning of civilization.
- These microbes remain as one of the greatest threats to society, why?
 - they were here on earth 2 billion years before humans arrived,
 - learning every trick for survival, and likely that they will be here 2 billion years after we depart.

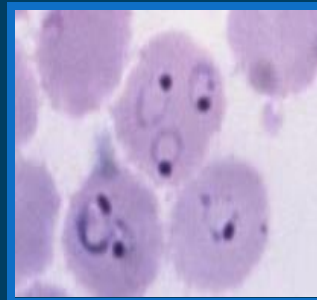
Viruses



Bacteria



Protozoa



Fungi

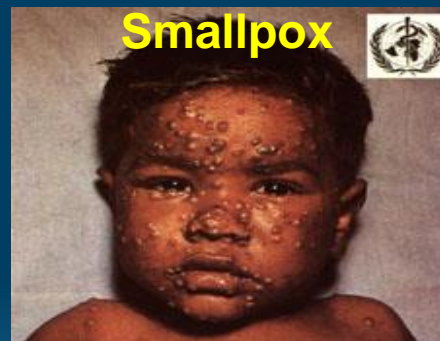
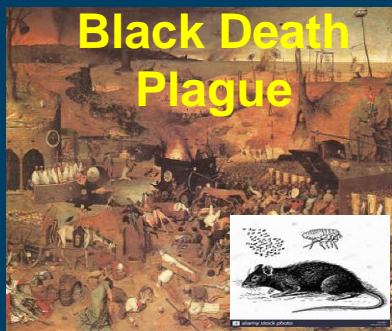


Helminths



Examples of the human disease burden caused by infectious microbes

- Black Death 14th century was the most devastating pandemic in human history killing 75 to 200 million people in Eurasia & North Africa*.
- Smallpox/measles 15th and 16th century destroyed the South American Aztec civilization.
- Spanish flu in 1918 infected 500 million, caused 50 - 100 million deaths, including 675,000 Americans.
- As of May 26, SARS-CoV-2 had caused 5.6 million cases & 346,700 deaths world wide & 1.7 million cases & 98,223 deaths in U.S.



* - killed 50% of the population in Europe

What is causing these pandemics?

- **Emerging infectious microbes** – new microbes, never recognized before.
- **Re-emerging infectious microbes** – been around for decades and have come back to cause an increase in incidence of disease.

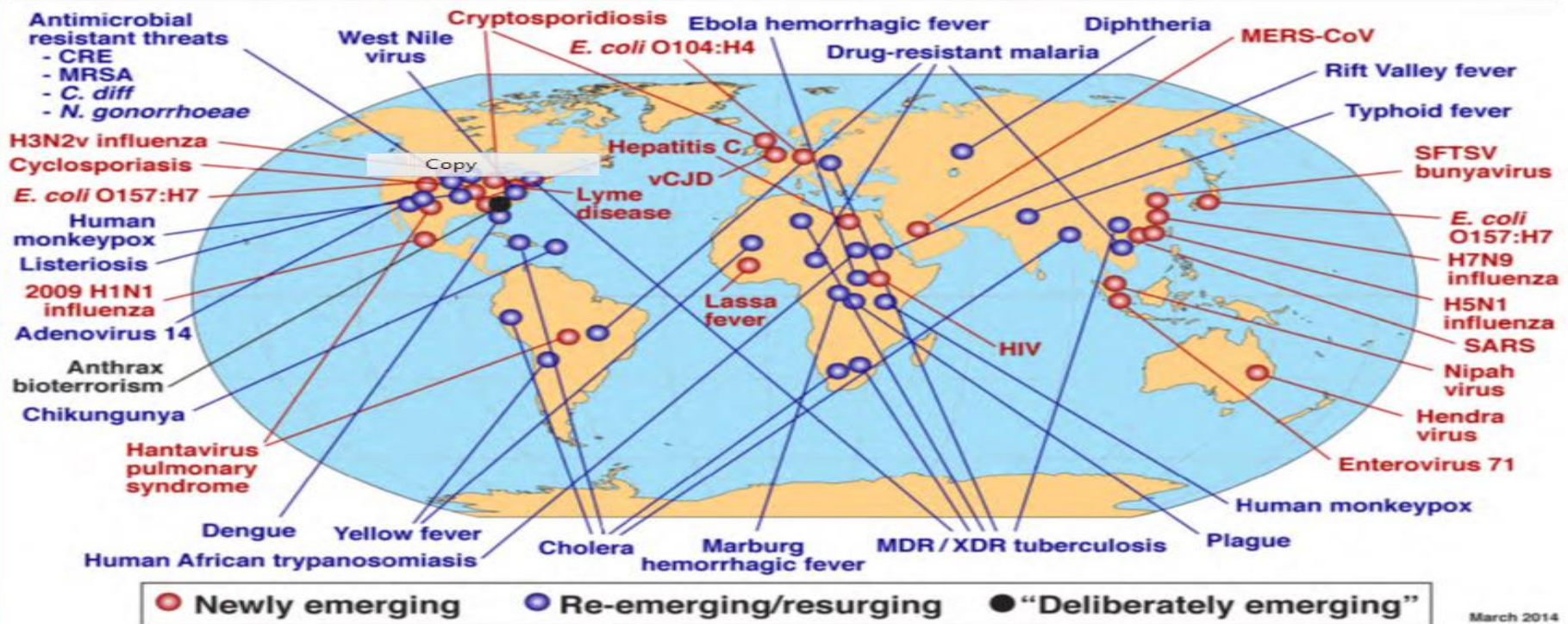
Examples of Emerging Microbes

- **SARS-Corona virus - 2**
- **SARS-Corona-virus - 1**
- **SARS – MERS Corona virus**
- **Swine Influenza H1N1**
- **Nipah virus**
- **Ebola virus**
- **Human Immunodeficiency virus (HIV)**

Examples of Re-emerging Microbes

- **Dengue viruses**
- **Zika fever virus**
- **Drug resistant Malaria**
- **Trypanasoma cruzi (Chagas)**
- **Mycobacterium tuberculosis**
- **Bordetella pertussis**
- **Measles virus**

Examples of the Global Distribution of these Infectious Microbes



Microbes found through-out the world, constantly mutating & adapting to new hosts, and spreading to all regions of the planet, and for most, there are no prevention and treatment measures

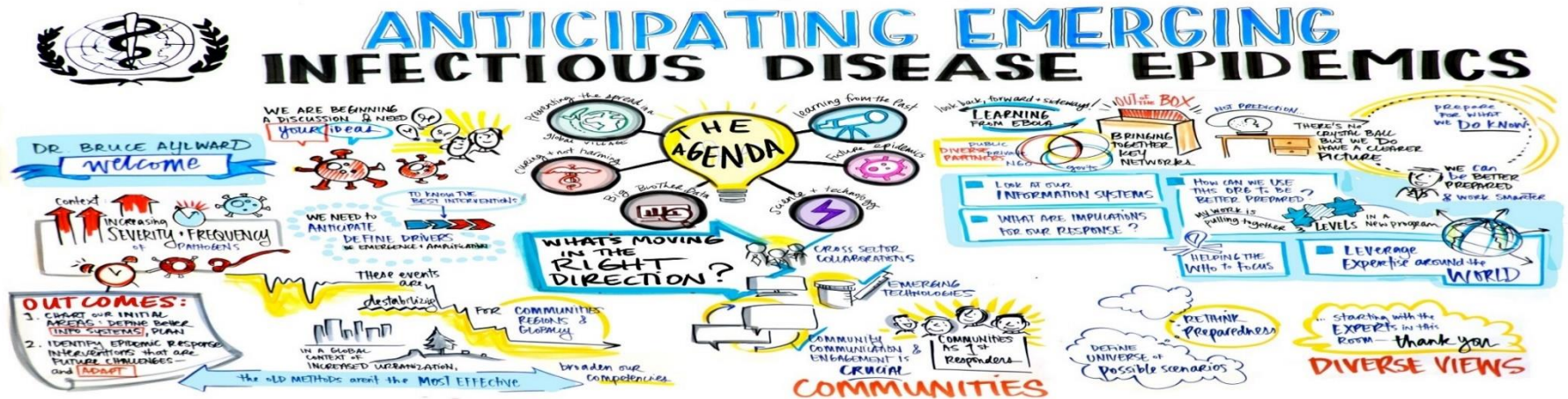
- as we are now experiencing for this Coronavirus pandemic.

Just how many unknown microbes are there and where are they coming from?

- In addition to the known microbes, estimates suggest that there are about one million unknown microbes, mainly viruses that exist among vertebrates.

WITH MORE TO COME!

- Most are viruses from wildlife and livestock.
 - SARS - CoV-1 - **Civet cats** → humans
 - SARS - CoV-2 - **Bats** → **ant-eaters?** → Humans
 - SARS - Middle East Respiratory Syndrome (MERS) → **camels** → humans



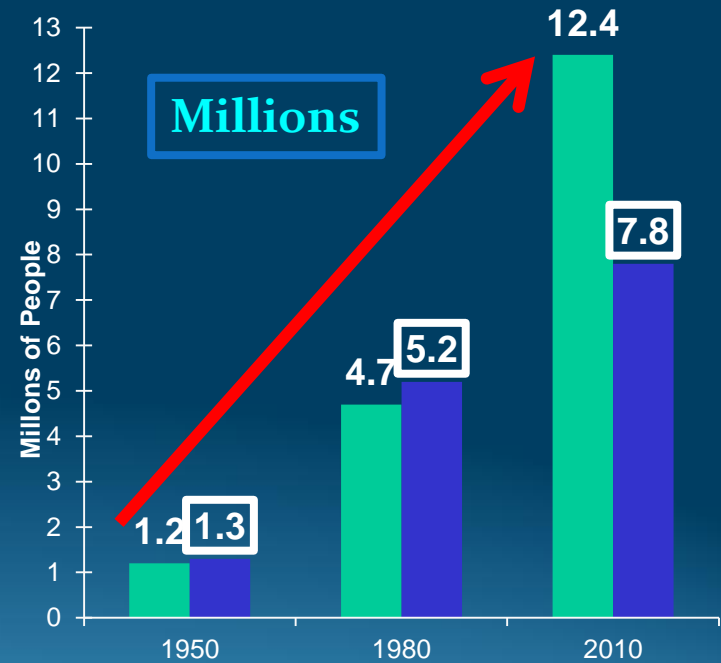
What is contributing to the emergence & spread of microbes

- Frequent travel of humans and animals by rapid modes of transportation.
- Globalization and urbanization – increases international interactions & more people are living closer together to enables the global spread of microbes.
- Agricultural, land & water use practices – increases breeding habitat to produce more mosquitoes, ticks and other vectors.
- Wildlife habitat destruction and trafficking of wildlife for food and pets.

Air Traffic Over 24 hours



Urban growth Asian & American cities



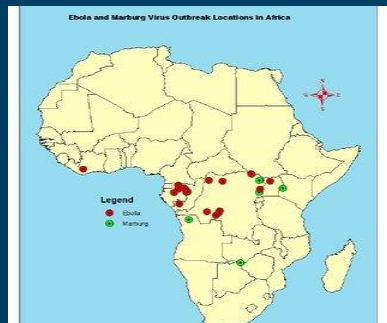
Examples of microbes that are **impacting** or **threatening** the health of the El Paso community

| Microbes impacting human health | Threat Microbes Not endemic, but could emerge anytime |
|---|---|
| • SARS-Corona virus - 2 | • Dengue viruses |
| • Human Immunodeficiency (HIV) | • Chikungunya virus |
| • Mycobacteria tuberculosis (TB) | • Zika Fever virus |
| • Swine Flu H1N1 virus | • Novel Avian Influenza A H7N9 |
| • West Nile virus (encephalitis) | • Novel Avian Influenza A H5N1 |
| • Trypanosoma cruzi (Chagas) | • St. Louis encephalitis virus |
| • Chlamydia trachomatis (STD) | • Western equine encephalitis virus |

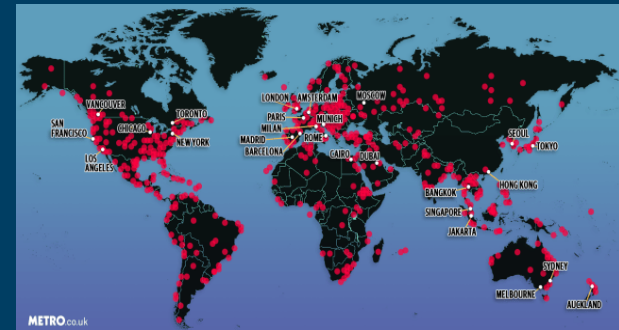
Conclusion

- Yesterday's threats of pandemics were by infectious microbes that seldom spread from the continent in which they existed,
- Today's threat is any microbes, regardless of their original existence, because they can be microbes of any country or region inhabited by humans, animals and plants.

YESTERDAY'S THREAT



TODAY'S THREAT



- As we anticipate the next pandemic to come, complacency is not an option, the world must be better prepared as never before in history,
 - with novel & improved diagnostics, therapeutics & vaccines to prevent the devastating health impact of emerging and re-emerging infectious microbes.

END