

Of Epidemics and Pandemics

Major outbreaks of disease have blighted humankind ever since the establishment of sedentary villages and small towns, and by the introduction of domesticated farm and work animals. Spread of disease was enhanced by the close proximity of housing and their inhabitants and livestock, and accentuated by the establishment of national and, eventually, international trade.



Aedes albopictus mosquito, the vector for diseases including dengue, chikungunya and yellow fever (credit: CDC/James Gathany).

Pandemics and epidemics

First probable epidemic was 3000 BCE as evidenced by a number of mass graves in China.

Plague

Three pandemics: 541–747 CE (The Plague of Justinian); 1346–1844 CE (originally The Black Death); and 1894 CE (originating in the Canton Province of China).

Cholera

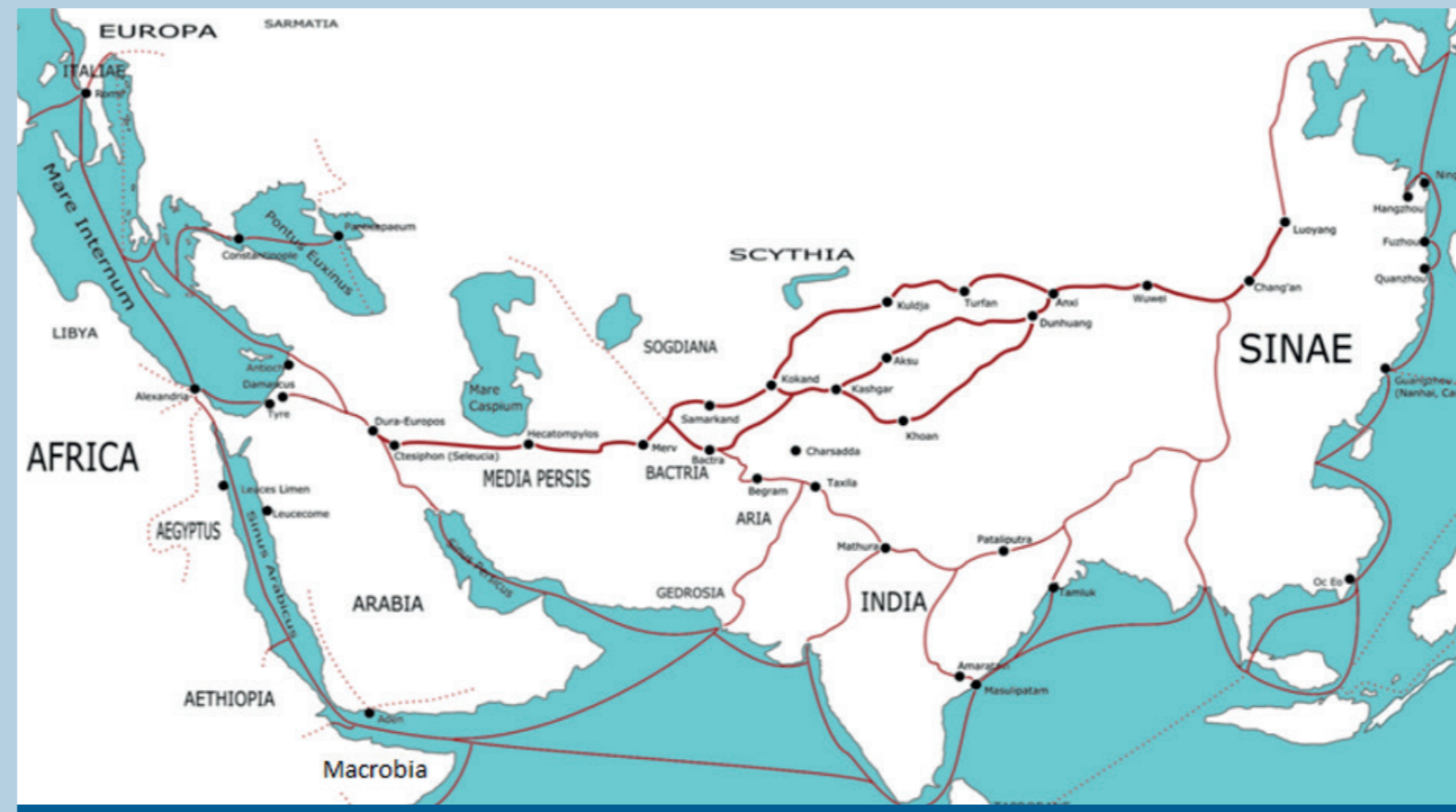
Seven pandemics: 1817–1824 CE (Asiatic cholera, originating in the Ganges delta region); 1827–1835 CE, 1839–1856 CE, 1863–1875 CE and 1881–1896 CE (originating in Bengal region, the last of which investigated by Robert Koch); 1899–1923 CE (originating in Ganges delta); and 1961–2022 CE (originating in Indonesia).

Influenza

Five pandemics: 1781–1782 CE (originating in the Russian Empire); 1889–1890 CE (originating in Central Asia); 1918–1919 CE (Spanish flu, likely originated in a USA military training camp); 1957–1958 CE (originated in China and Hong Kong); and 2009–2010 CE (Swine flu, originated in the Far East).

Coronavirus

Three pandemics: 2003 CE (SARS, originating in China); 2012 CE (so-called MERS, originating in the Middle East); and 2020–2021 CE (COVID-19, originating in China).



Historical trade routes.

- 1: Pathogen in animals only
- 2: Primary infection from animal to human
- 3: Limited outbreak among humans
- 4: Prolonged human outbreak
- 5: Exclusive human outbreak; Pandemic

Five stages through which pathogens from animals evolve into pathogens in humans (from Wolfe *et al.*).

Pathogen origins

Eight of 15 temperate diseases possibly reached humans from domestic animals, three from apes or rodents, and the remaining four still unknown. Eighteen of the 25 major human pathogens originated in the Old World. Possibly one-third of all emerging diseases have originated from changes in land use.

Other notable epidemics

- Leprosy – Medieval Europe 1300–1500 CE: an example of relationships between disease, social stigmatisation and theological interpretations. Origin unknown.
- Syphilis (the French disease) – Europe 1500–1600 CE: an apparently ‘new disease’ appearing in 1495 CE among the French army of Charles VIII during the siege of Naples. Reached Asia and China by 1505 CE. Origin unknown, but debate suggests Europe or from America with Christopher Columbus.
- Yellow Fever – Yucatan 1648 CE, Hispaniola 1793–1804 CE, Philadelphia, USA 1793 CE, and Swansea, Wales 1865 CE.
- Smallpox – The Americas, Iceland, The Balkans and 18th-century Europe 1500–1800 CE, and Europe 1870–1875 CE, during which some 500,000 deaths occurred.
- Carrion’s disease – Peru 1870–1871 CE: death toll approximately 10,000. Daniel Carrión shows that verruga peruana and Oroya fever are caused by the same sandfly vector and are manifestations of the same disease. He injected himself with verruga peruana material, and subsequently died of Oroya fever.
- Poliomyelitis – USA 1916 CE and 1945–1955 CE. The 1917 epidemic resulted in 6000 deaths. Approximately 10,000 cases per year occurred between 1945 and 1955. High numbers of cases also occurred in Europe at this time.
- Contemporary malaria and tuberculosis – 20th century. Malaria currently accounts for 1–2 million deaths a year. There are approximately 20 million cases of tuberculosis per year resulting in 1.5–2 million deaths.
- HIV/AIDS – Emerges in Central Africa in the 1920s, resulting from species crossover from chimpanzee/gorilla to humans. Epidemic begins in 1970s, and spreads to all five continents by 1980.

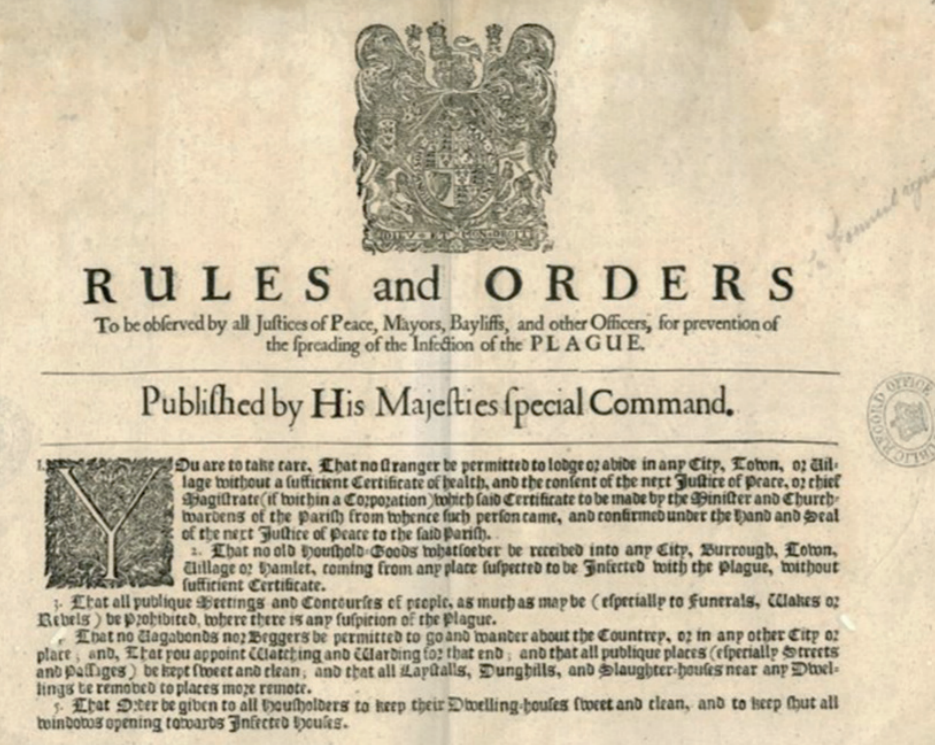


Mass grave from ancient China

Consequences of trade: some examples

Plague

- Major trade routes decided the major hotspots, with navigable rivers determining the geographical pattern of sporadic cases.
- Further studies by Yue *et al.* reveal that plague penetrated further into Europe through the local trade route network.



Rules and orders for plague under Henry VIII

Eastern Equine Encephalitis, Dengue Fever, Chikungunya Fever, Zika and Yellow Fever

- Disease vector is the *Aedes albopictus* mosquito, an invasive species spread by international trade
- Breeding ground in stagnant water especially in stored old tyres
- Now found in Europe (Albania, 1979, subsequently Italy [in tyres imported from Georgia, USA], Southern France, Belgium, Germany, The Balkans, Greece, Netherlands and England)
- Memphis, USA 1983, Texas 1985, and in 1368 counties in 40 US states since 2017
- Latin America (Brazil 1986) and subsequently in 12 Central and South American countries
- South Africa (1990) spreading to Nigeria, Cameroon, Gabon and Bioko Island of Equatorial Guinea

Yellow Fever

- Originated in Africa; transmitted to the Western hemisphere during the slave trade.
- First epidemic in Yucatan (1648).
- Subsequent epidemics in tropical America, North American coastal cities and Europe
- Swansea outbreak (1865) brought from Cuba on the barque Helca. Twenty-eight people (not crew members) contracted the disease, and 16 died. Several members of crew taken ill or died on the voyage, one dying in Swansea.

Pestilence, Plague and Pandemics: A Troubled History
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Route of Spread	Examples
Overland trade routes	The Silk Road: Far East and Asia to Middle East Overland routes between Constantinople and Western Europe Siberia and Russia to Europe (Vienna)
Oceanic and sea routes	Trade: China to India Trade: India to Africa via Indian Ocean, to Egypt and Europe via Red Sea and Mediterranean Trade: Europe to the Americas via Atlantic Ocean Cruise ships: Country to country and continent to continent
Air travel	Global air travel

Spread of pandemics through trade and travel



Daniel Carrión



Ambulance workers during the influenza pandemic of 1918