

**Biosecurity:
A Multi-Dimensional Challenge of
Escalating Complexity and Urgency**

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**History of Biosecurity Threats:
Pandemic and Plagues**

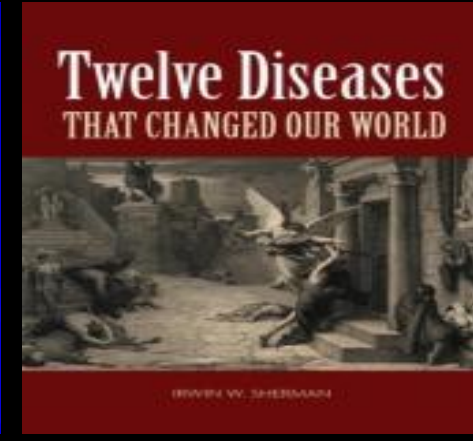
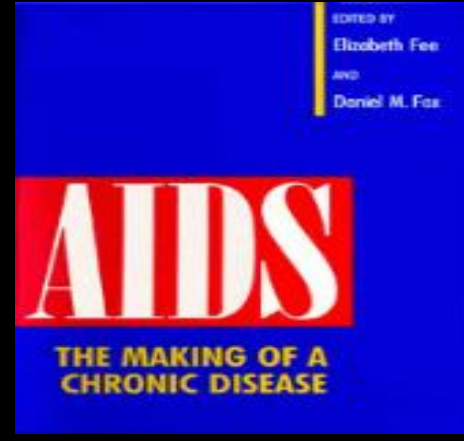
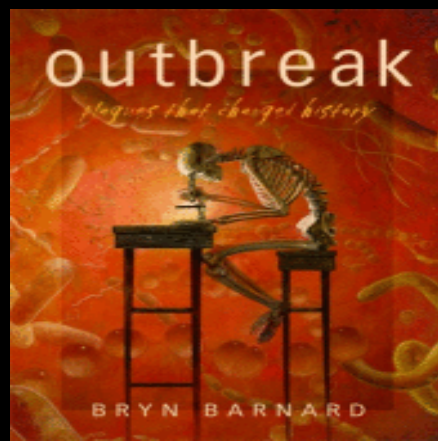
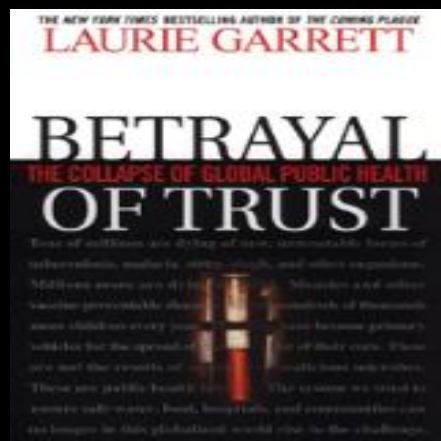
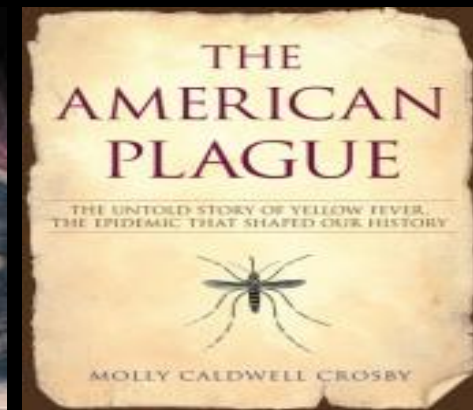
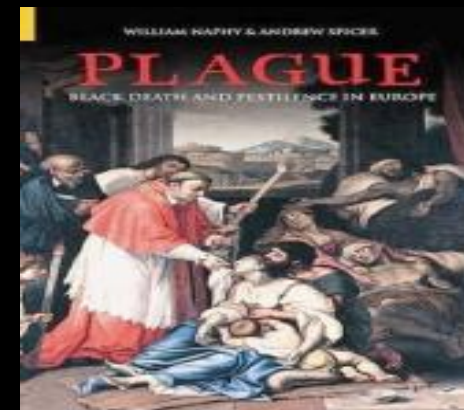
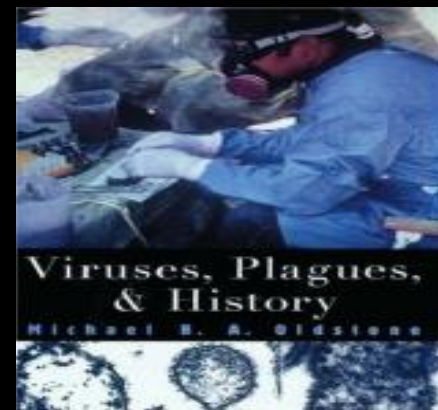
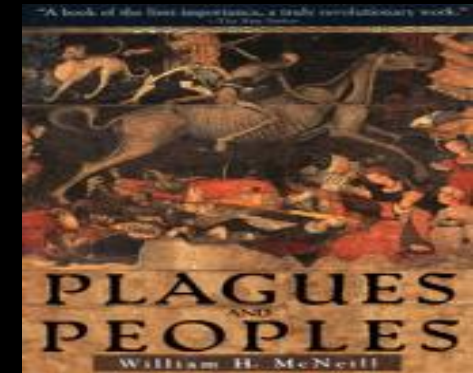
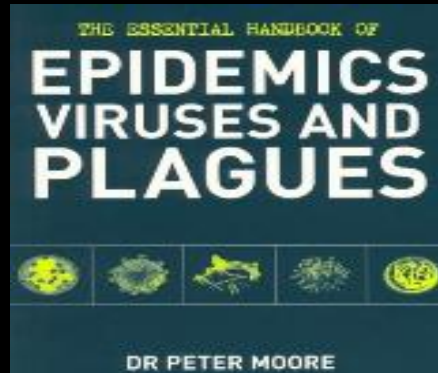
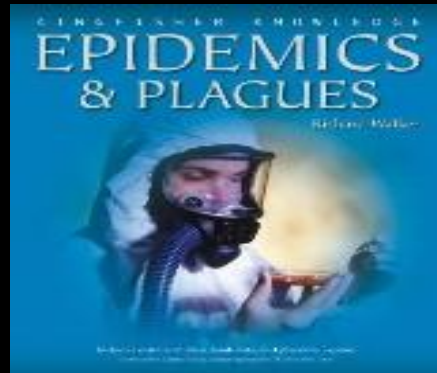
The Four Horsemen of the Apocalypse

- pestilence
- war
- famine
- death



Albrecht Dürer, 1498

Infectious Diseases: A Powerful Force in Human Evolution



History of Biosecurity Threats: Pandemics and Plagues

- **multi-millennial history of major societal dislocations**
- **large scale disruptions, often over extended periods**
- **sadly, a consistent theme of neglect and threats ignored**
 - **reactive versus proactive preparedness**
 - **proliferation of public fear, distrust, scapegoating and social divisions**
 - **triggers for major cultural change**
 - **economic/shifts in geopolitical power and political and military ascendancy**

History of Biosecurity Threats: Pandemics and Plagues

- 7 historical eras (soft boundaries and overlap)
- before 1800 AD
- 1800-1900 AD
- 1900 AD onwards
- 1950's onwards
- 1980's onwards
- 2000's onwards
- 2020: the COVID-19 reset

exploration,
war and
conflict

industrialization
urbanization

trade,
globalization
and new
connectivities

scientific
progress, new
technologies,
new risks

Major Pandemics

Athens 427 BC



Justinian Plague 541 AD



The Black Death 1350-1700



History of Biosecurity Threats: Pandemics and Plagues Before 1800 AD

- **omnipresent threat and average human life span limited to 30 years**
- **pestilence in livestock and crops drove repeated cycles of famine and civil unrest**
- **lack of understanding of disease causation**
- **little or no environmental or personal hygiene**
- **pervasive sense of helplessness against backdrop of illiteracy and misplaced faith in religious institutions for solutions**

Global Exploration and the Dissemination of Infectious Diseases

With a new introduction by Gerald N. Grob

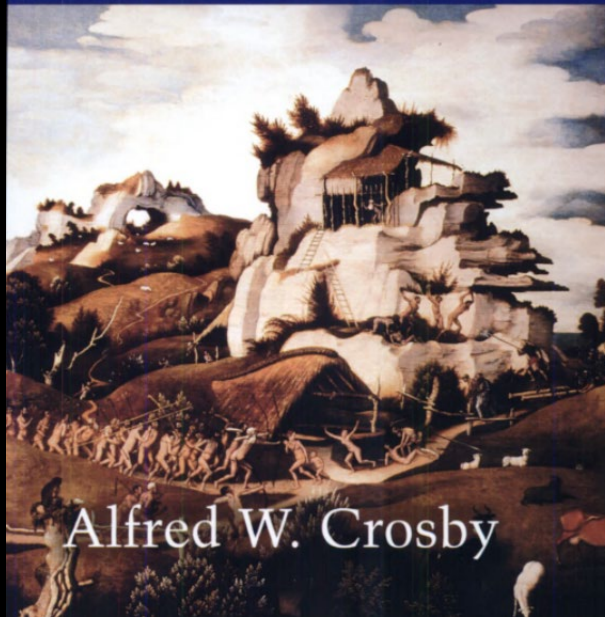
Rats, Lice and History

Hans Zinsser

ECOLOGICAL IMPERIALISM

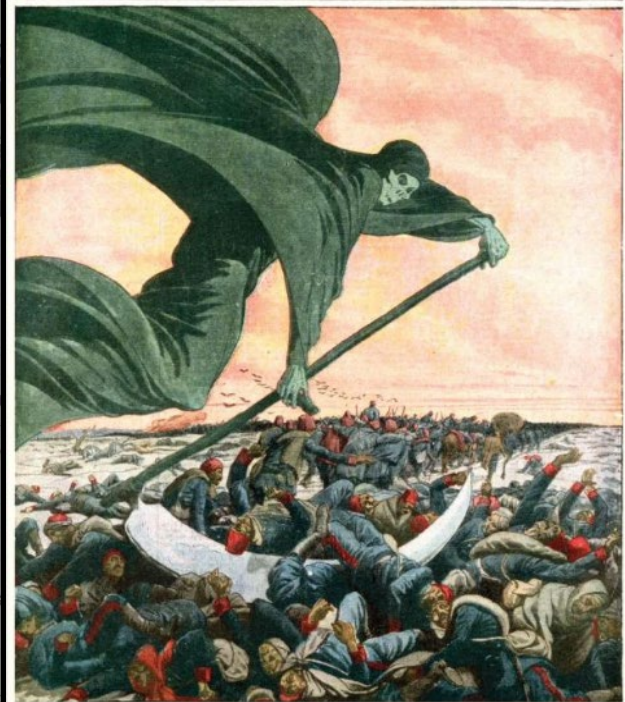
The Biological Expansion
of Europe, 900–1900

NEW EDITION



Epidemics and Society

FROM THE BLACK DEATH TO THE PRESENT



FRANK M. SNOWDEN

History of Biosecurity Threats: Pandemics and Plagues Before 1800 AD

- **global exploration by Western European nations for new land, resources and trade**
- **‘the new world’ encounters the infectious diseases of the ‘old world’**
 - **particular devastation in S. and N. America**
 - **decimation of Polynesia (measles)**
- **“payback”: syphilis comes to Europe from Amerindians**
- **expanded encounters of Europeans with insect borne infectious diseases in tropical and semitropical climates**
 - **Yellow Fever, Dengue, typhus, malaria**

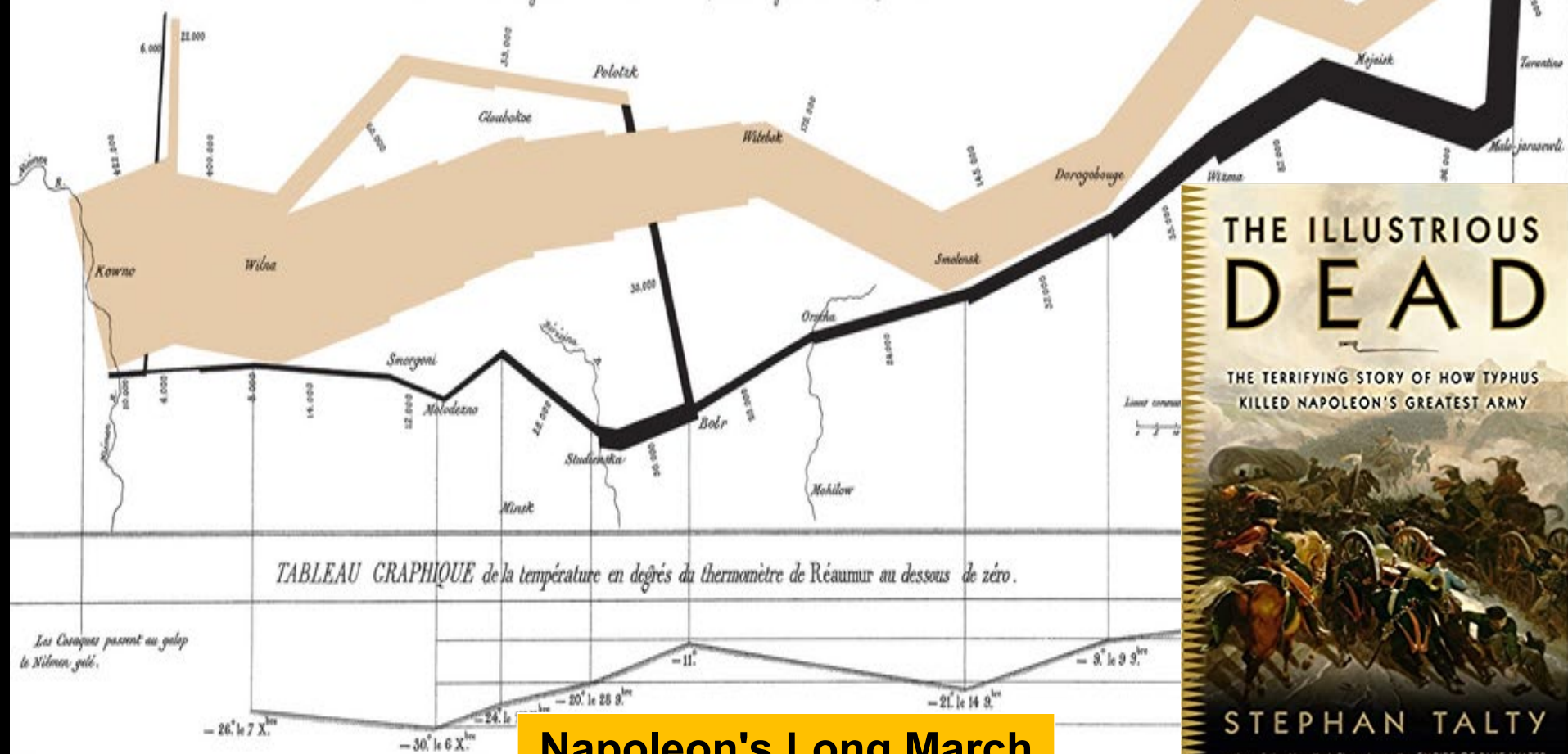
Military Medicine: The Toll From Infectious Diseases Frequently Exceeds Combat Casualties

Carte Figurative des pertes successives en hommes de l'Armée Française dans la campagne de Russie 1812-1813.

Dressée par M. Minard, Inspecteur Général des Ponts et Chaussées en retraite Paris, le 20 Novembre 1869.

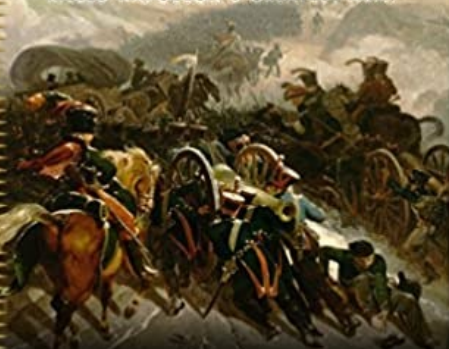
Les nombres d'hommes présents sont représentés par les largueurs des zones colorées à raison d'un millimètre pour dix mille hommes; ils sont de plus écrits en travers des zones. Le rouge désigne les hommes qui entrent en Russie, le noir ceux qui en sortent. — Les renseignements qui ont servi à dresser la carte ont été puisés dans les ouvrages de M. M. Thiers, de Ségur, de Fezensac, de Chambray et le journal inédit de Jacob, pharmacien de l'Armée depuis le 23 Octobre.

Pour mieux faire juger à l'œil la diminution de l'armée, j'ai supposé que les corps du Prince Jérôme et du Maréchal Davoust qui avaient été détachés sur Minsk et Mohilew et qui rejoignent Orescha et Witebsk, avaient toujours marché avec l'armée.



THE ILLUSTRIOUS DEAD

THE TERRIFYING STORY OF HOW TYPHUS KILLED NAPOLEON'S GREATEST ARMY



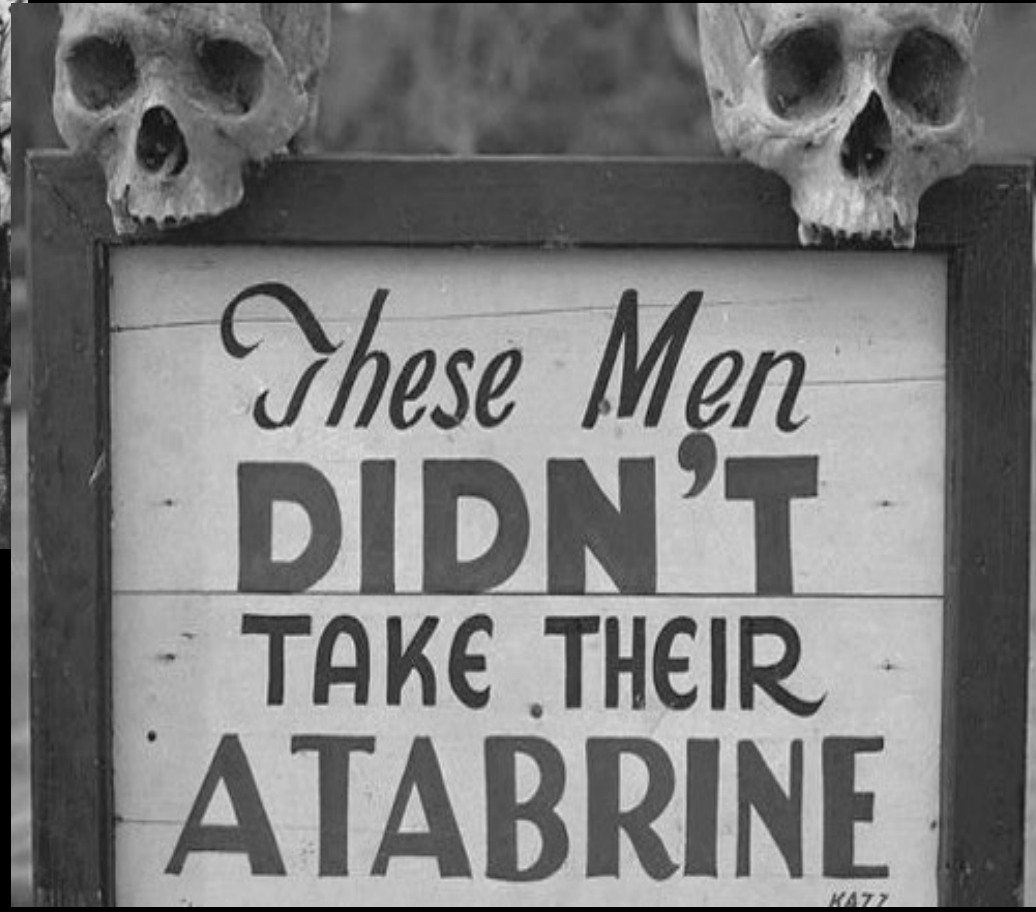
STEPHAN TALTY

author of the New York Times bestseller EMPIRE OF BLUE WATER

Military Medicine: The Toll From Infectious Diseases Frequently Exceeds Combat Casualties



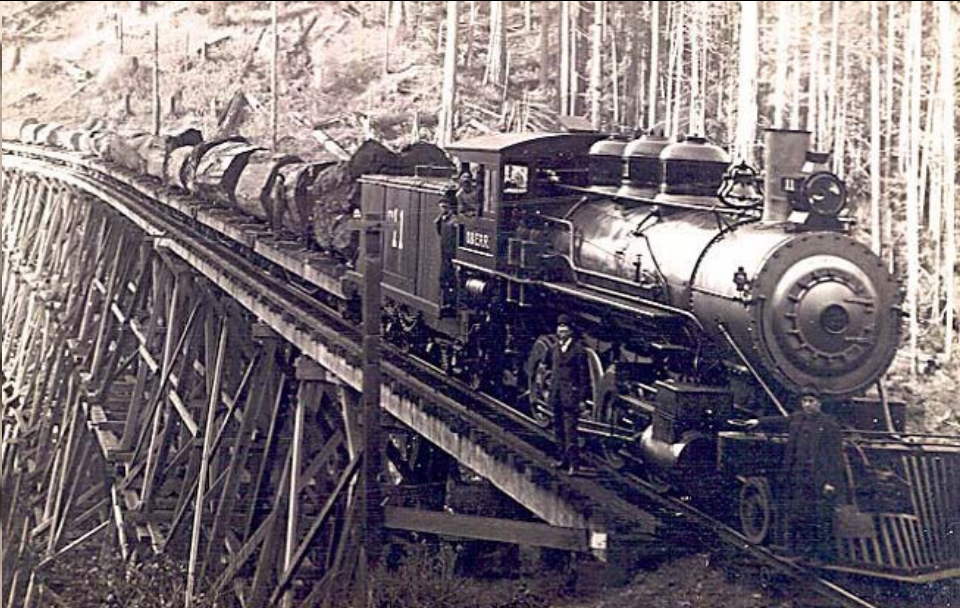
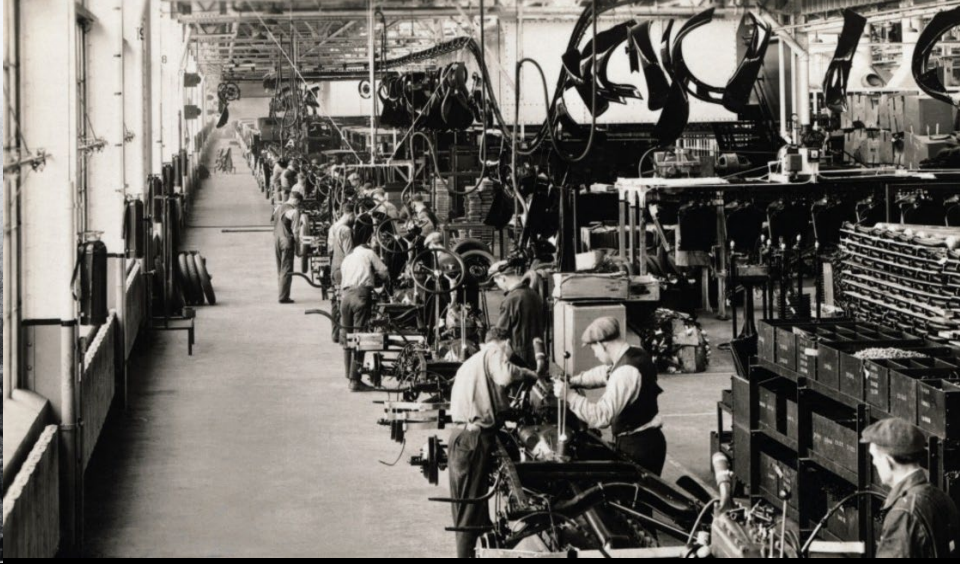
**Malaria and the
Pacific Campaigns WWII**



Military Medicine : Force Protection and Projection

- **long history of military campaigns in spreading disease**
- **expanded imperial military campaigns to capture global resources and markets for industrialization**
- **adverse impact of disease on military capabilities**
- **emergence of military medicine as a powerful intellectual resource in identification and control of infectious and parasitic diseases**
 - **Yellow Fever and construction of the Panama Canal**
 - **Malaria control programs WWII**
 - **WWII and the quest for antibiotics and vaccines**

Industrialization and the Agrarian to Urban Migration 1800 Onwards



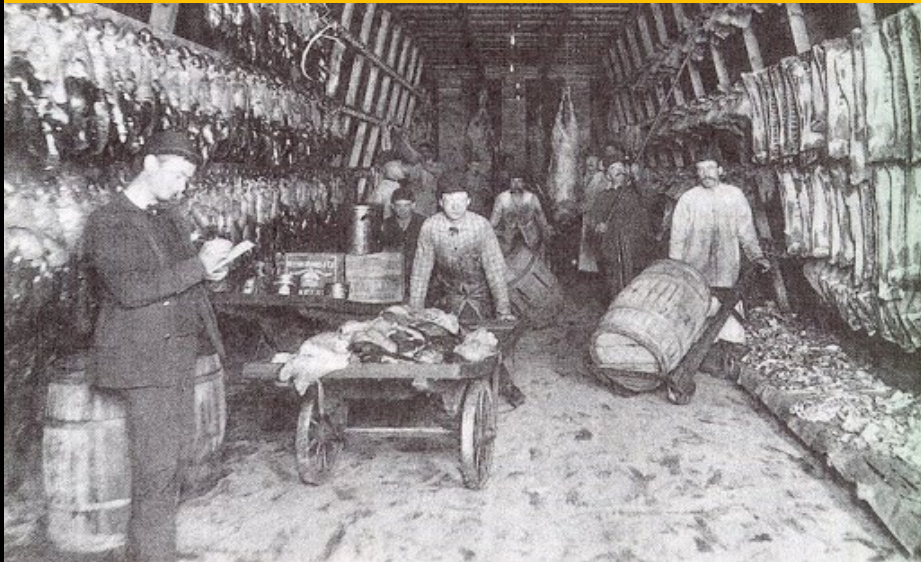
Urban Slums and Spread of Infectious Disease



Unsanitary and Unsafe Food



Unregulated Quack Therapies



ALLEN'S
COCAINE
TABLETS

For HAY FEVER,
CATARRH,
AND THROAT TROUBLES.
CURE NERVOUSNESS, HEADACHE,
and SLEEPLESSNESS.

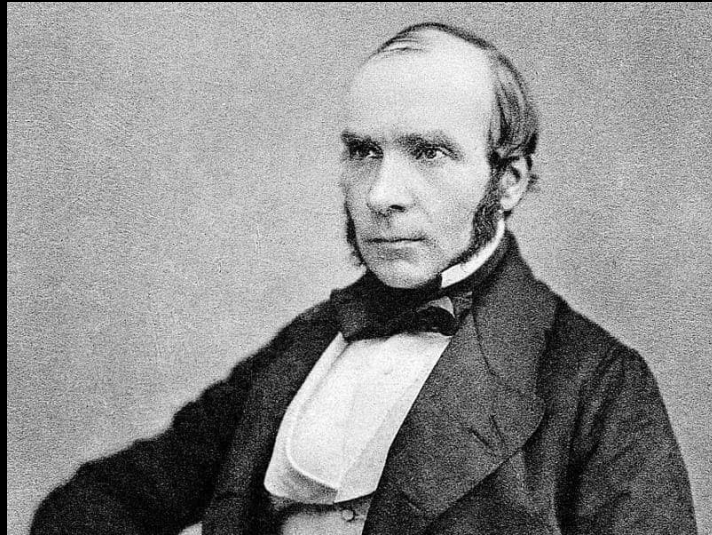
Price 50c. a box at Druggists
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ALLEN COCAINE MFG. CO.,
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History of Biosecurity Threats: Pandemics and Plagues 1800 Onwards

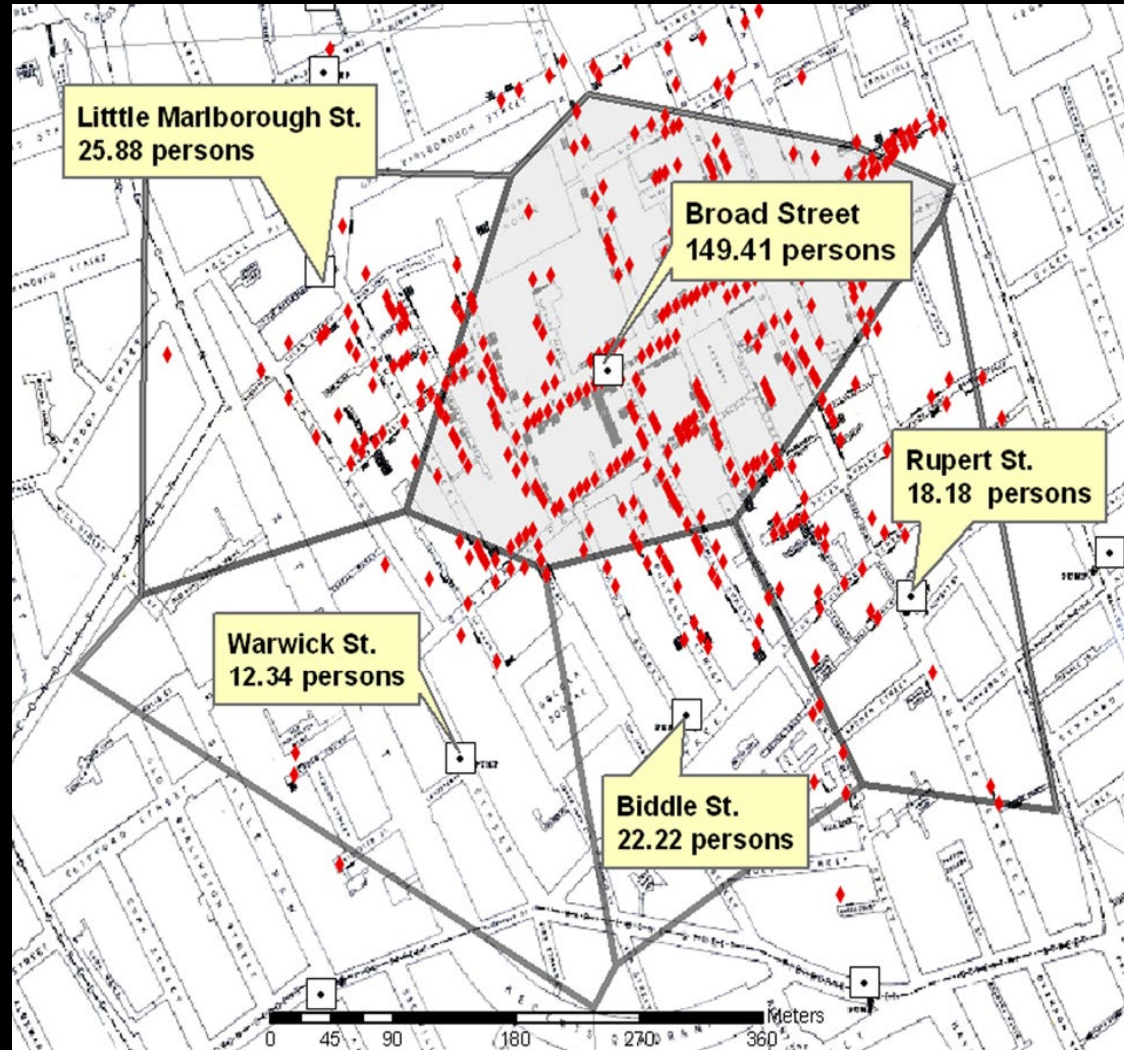
- **rapid industrialization, urbanization and urban slums**
 - **epicenters for infectious diseases**
- **birth of large-scale public health programs and sanitation engineering**
 - **workforce health to sustain the industrial economic engine**
- **creation of International Sanitary Conventions (1851-1938) as precursors to WHO/FAO**
- **validation of the ‘germ theory’ of disease (1850-1885)**
 - **R. Koch, L. Pasteur**

The Foundation of Epidemiological Testing and Contact Tracing

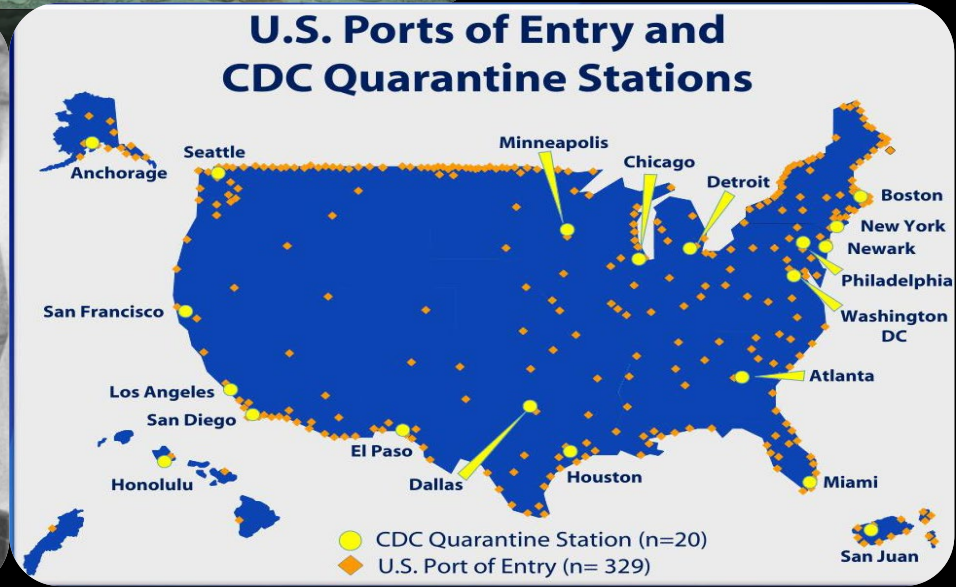
Dr. John Snow, 1855



- cholera deaths 1,000 population



Evolution of Public Health as a Key Element of National Policy and Comprehensive Legal Controls



Quarantine and Lockdowns: the Cordon Sanitaire: The Most Used Tool in Infection Control

London 1665



RULES and ORDERS

To be observed by all Justices of Peace, Mayors, Bayliffs, and other Officers, for prevention of the spreading of the Infection of the PLAGUE.

Published by His Majesties special Command.

6. That Fires in moveable Pans, or otherwise, be made in all necessary publique Meetings in Churches, &c. and convenient Furnes to convert the Air be burnt thereon.
7. That care be taken that no untowardly Beasts, stinking Fish, Flesh, musty Corn, or any other untowardly Food be exposed to sale in any Shops or Markets.
8. That no Swine, Dogs, Cats, or tame Pigeons be permitted to pass up and down in Streets, or from house to house, in places Infected.
9. That the Laws against Inn-Gates be forthwith put in strict execution, and that no more Alehouses be Licensed then are absolutely necessary in each City or place, especially during the continuance of this present Contagion.
10. That each City and Town forthwith provide some convenient place remote from the same, to have a Pest-house, Huts, or Sheds may be Erected, to be in readines in case any Infection should break out; to which if it shall happen to do, That able and faithful Searchers and Examiners be forthwith provided and Shown to Search all suspected bodie, for the usual signs of the Plague, viz. Swellings or Blisters under the Ears or Arm-pits, or upon the Groynes; Blains, Carbuncles, or little Spots, either on the Breast or back, commonly called Tokens.
11. That if any Houle be Infected, the sick person or persons be forthwith removed to the said Pest-house, Sheds, or Huts, for the preservation of the rest of the family: And that such house (though none be dead therein) be shut up for fourty days, and have a Red Crofs, and Lord have mercy upon us, in Capital Letters affixed on the doo, and Warders appointed, as well to find them necessities, as to keep them from convering with the sound.
12. That at the opening of each Infected house (after the expiration of the said fourty days) a White Crofs be affixed



Wuhan 2020



Epidemics Amplify Social Divisions

Fear and Scapegoating



Ethnic Tensions



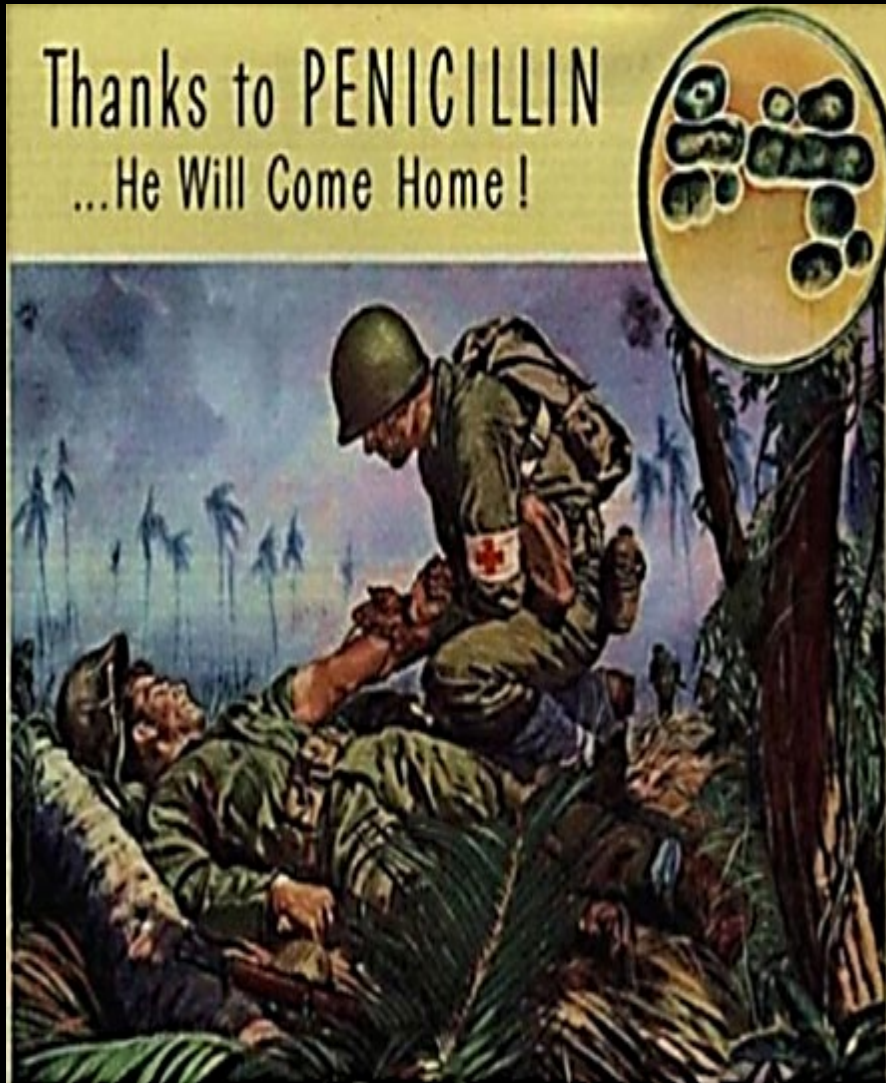
Political Tensions



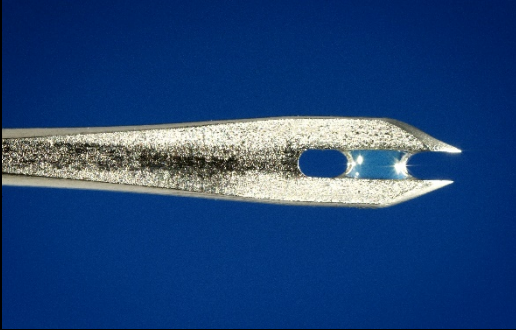
History of Biosecurity Threats: Pandemics and Plagues 1900's Onwards

- **continued national and international investment in public health programs**
 - **infection control, sanitation, housing, nutrition and education**
- **1917-1919 global influenza pandemic**
- **use of chemical and biological weapons in World Wars I and II (later lecture)**

Post-World War II : A New Era of 'Wonder Drugs'



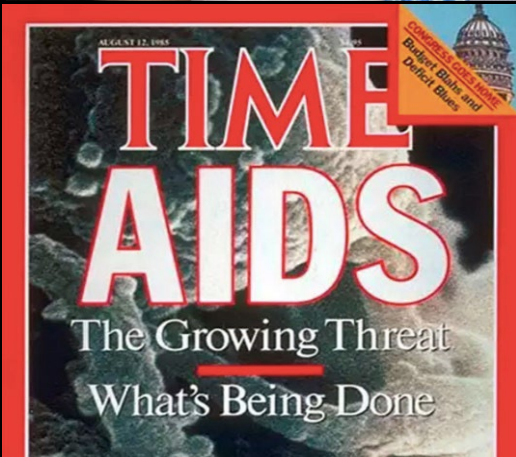
History of Biosecurity Threats: Pandemics and Plagues 1980's Onwards



- success of global vaccination campaign to eradicate smallpox



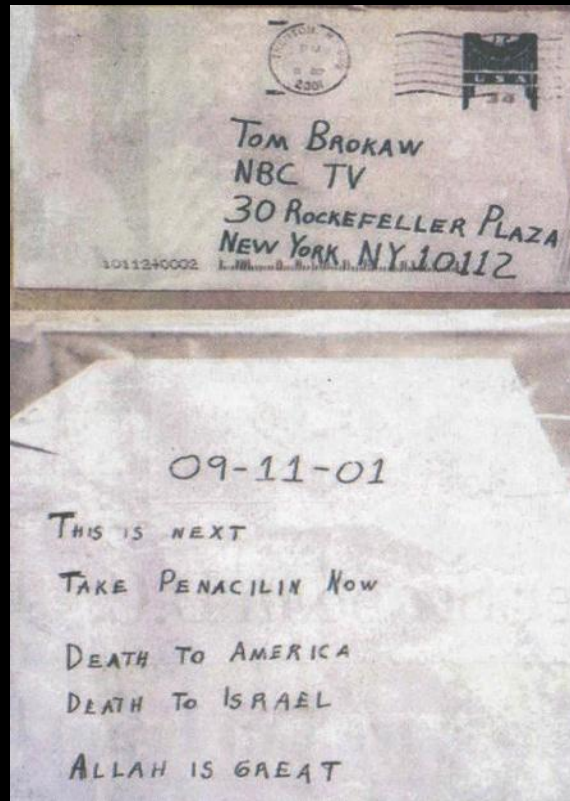
- major progress in prevention of poliovirus and multiple childhood infectious diseases (G20 countries)



- emergence of HIV/AIDS
 - extensive mortality in Africa and Asia

Amerithrax: October 2001

Assessing New Risks From Bioterrorism

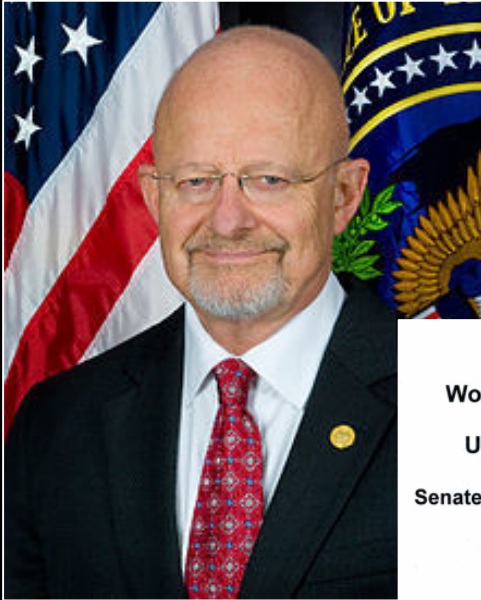


History of Biosecurity Threats: Pandemics and Plagues 2000 Onwards

- 9/11/2001 attack on USA and formation of US Department of Homeland Security
- increased concern about potential use of biological agents by terrorist groups, substate actors and nation states
- expanded 'homeland security' strategic requirements added to mission of multiple USG agencies, notably DOD and the Intelligence Community (IC)



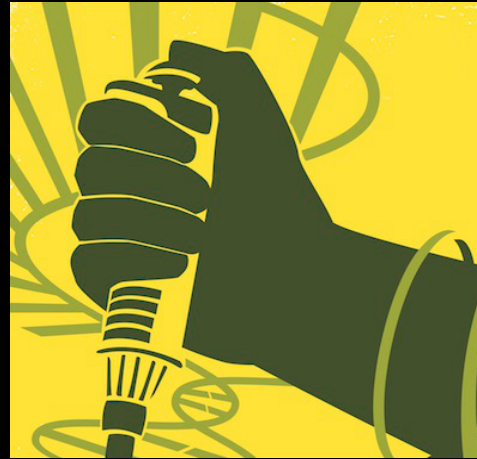
Dual-Use Applications of Synthetic Biology and the Expanded Threat Spectrum



Statement for the Record
Worldwide Threat Assessment
of the
US Intelligence Community
Senate Select Committee on Intelligence



James R. Clapper
Director of National Intelligence
February 9, 2016



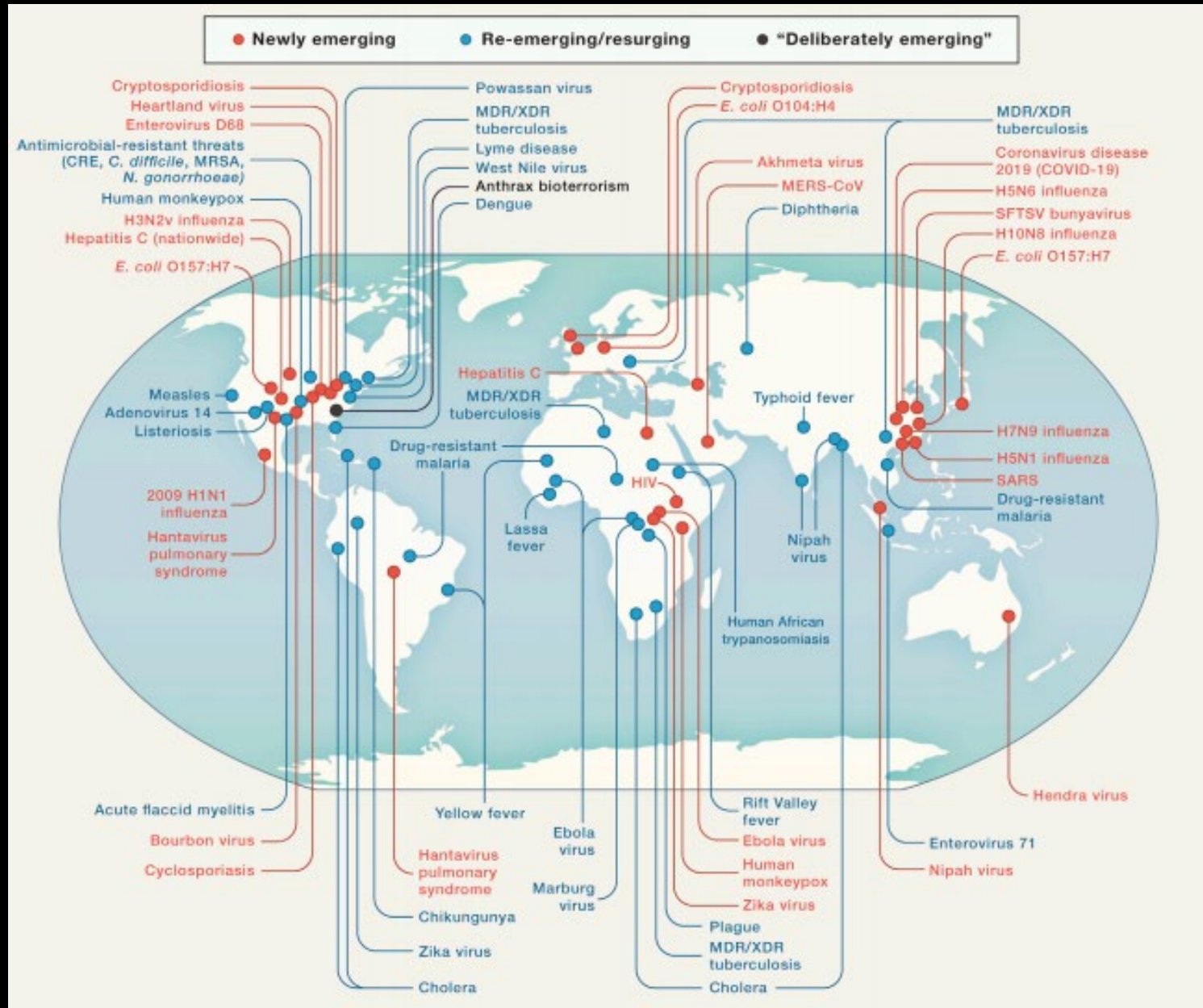
**Technology Diffusion,
Automation,
Simplification and Cost
Reduction**



**New Oversight
Mechanisms and
International
Harmonization**

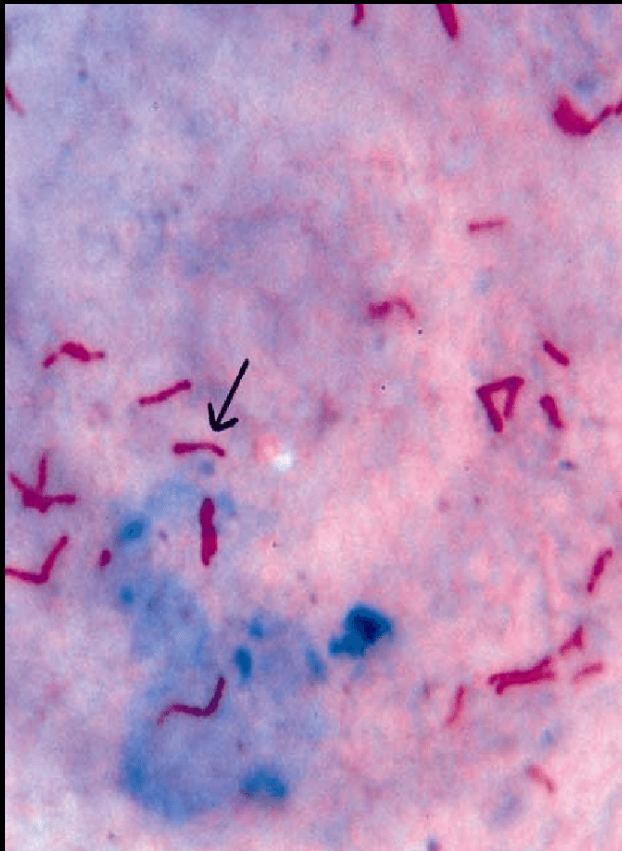
- **beneficent and maleficent applications of same knowledge**
- **potential to cause profound societal disruptions based on deliberate misuse, error or accident**

Recent Emerging Infection Diseases

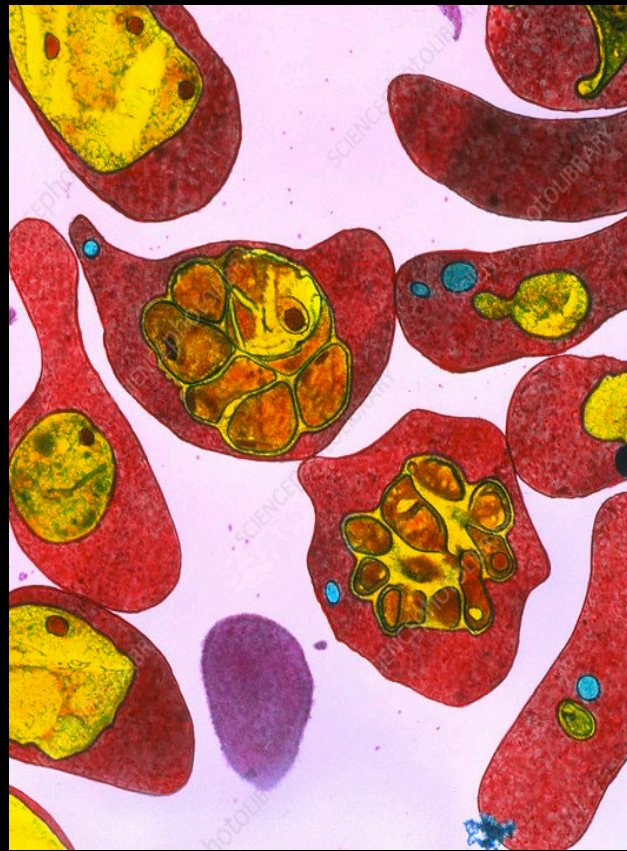


The Big Three Still Undeclared

TB



Malaria



HIV/AIDS



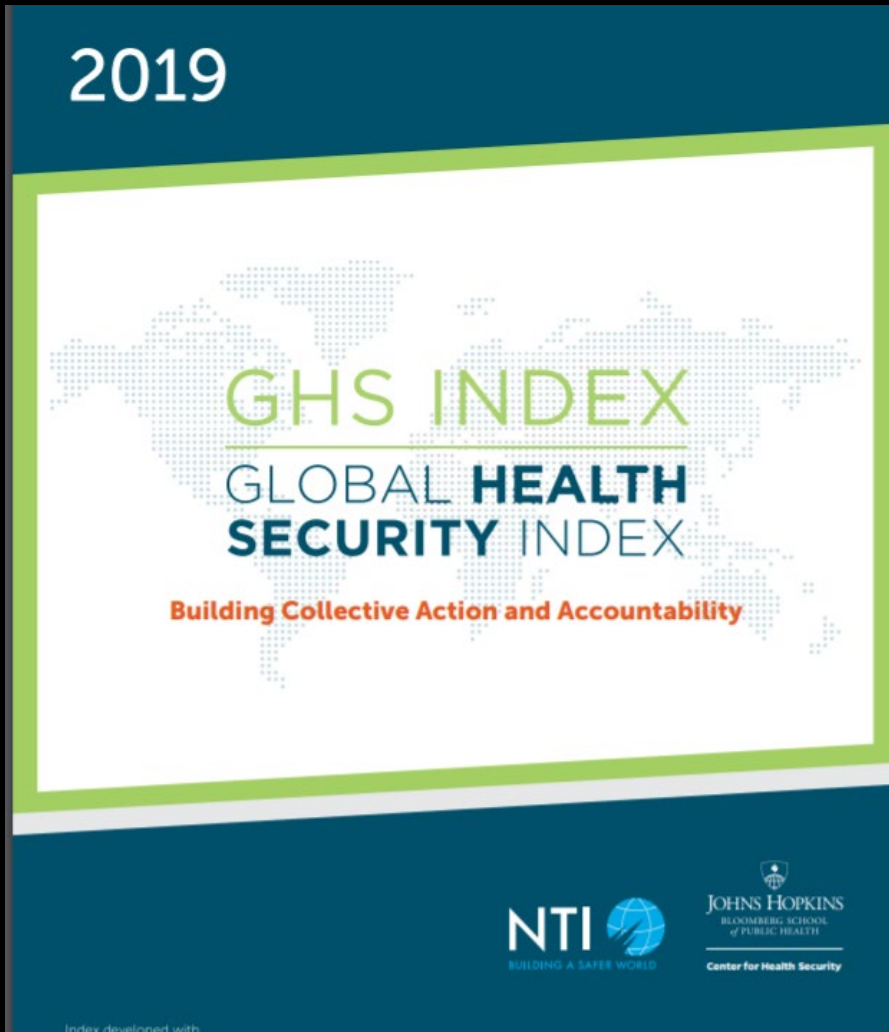
The Evolution of Global Public Health Aspirations: Alma-Ata (1978) to Astana (2018)



**Global Health
Security Agenda**

- **prevent, detect and respond to infectious disease**
- **safeguard economies**
- **end the cycle of panic and neglect**
- **need for sustained investment commitment**
- **essential public health capacities represent recurring cost**

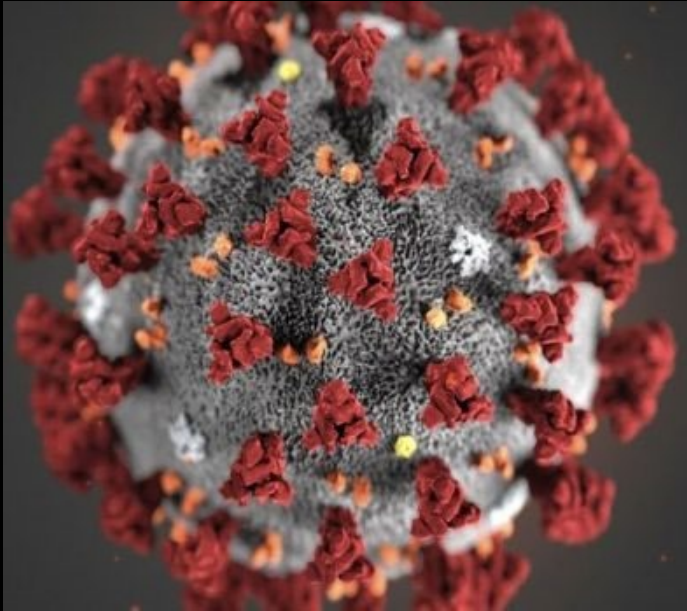
Global Public Health: A Failing Score Card : COVID-19 and Stark US Deficiencies Revealed



How Will Decades of Neglect Be Reversed?

2020

SARS-CoV-2: The Great Reset



- lessons learned?
- what will the 'new normal' look like?
- what will be the recovery time for different countries/sectors?
- new geopolitical instabilities?
- implications of a new cold war for technological/military dominance (US vs PRC)?
- discussion topics for weeks 4 to 7