Mass autopsies of rats were crucial to ending San Francisco’s bubonic-plague epidemic.

**Rats and racism: a tale of US plague**

Tilli Tansey extols a history of California’s chaotic early-twentieth-century epidemic and its lessons for today.

An urban outbreak of a deadly infectious disease with no known cause is a disaster planner’s worst nightmare. In his rousing book *Black Death at the Golden Gate*, journalist David Randall describes just that: the bubonic-plague epidemic that struck San Francisco, California, in 1900. The race to identify, isolate and halt the disease is set against a rich background of official complacency, financial malfeasance, political intrigues and scientific disputes.

Not least, the story shows how such outbreaks often become sociopolitical crises, triggering official anti-science rhetoric and fear of the ‘other’ — from the ‘Spanish’ influenza pandemic in 1918 (see T. Tansey Nature 546, 207–208; 2017) to the US AIDS crisis of the 1980s, and the current Ebola outbreak in the Democratic Republic of the Congo.

After ravaging Europe and Asia in the fourteenth century, bubonic plague reappeared sporadically. In the late 1870s it emerged in south central China. An outbreak in 1893 killed thousands in Canton, spreading along rivers and steamer routes. At the end of the nineteenth century, plague was identified in a recent Chinese immigrant to the then-independent Hawaiian islands. The pathogen probably crossed from there to San Francisco, on a regular trade route.

The city was notoriously corrupt, dirty and overcrowded. California’s 1848–55 gold rush had swelled the population more than 25-fold. By 1867, Chinese immigrants made up 90% of the workforce building the transcontinental railway.

By 1880, some 16% of the population of San Francisco were Chinese. Yet they faced animosity and segregation: the 1882 Chinese Exclusion Act, for instance, cracked down heavily on immigration. Chinatown became San Francisco’s most congested and impoverished district, with ramshackle wooden buildings carved up into tiny, packed spaces. In March 1900, the first suspected plague victim died in one of them.

The bacterium that causes plague, *Yersinia pestis*, had been identified in 1894, but little was known about transmission, treatment or prevention. As Randall shows, plague was often egregiously framed as a “racial disease” to which people of European ancestry were immune. (This racist fallacy arose in part because European expatriates in colonial India and Hong Kong rarely caught diseases that ravaged the deprived, crowded communities outside their compounds.)

That first case panicked San Francisco’s authorities. They quarantined Chinatown, preventing any movement of food in, or of its inhabitants — many of them cleaners, cooks and labourers — out. Civil unrest ensued, and people began to hide the dead and dying from “wolf doctors” — the city’s health inspectors. Outside Chinatown, the middle-class white population was outraged by the disruption. A definitive diagnosis was needed.

One of the few public-health officials able to provide that diagnosis had arrived in San Francisco not long beforehand. Joseph Kinyoun was a veteran of the federal Marine Hospital Service (MHS) in Washington DC, the Bellevue Hospital in New York City (see D. Dobbs Nature 539, 354–355; 2016) and the European labs of Louis Pasteur and Robert Koch. His growing reputation had irked his boss, surgeon-general Walter Wyman, who exiled him to California.

Kinyoun’s tests on samples from the first suspected victim confirmed the presence of plague. Yet political and popular pressure had already led the local Board of Health to lift the quarantine. From that point, Kinyoun was at war with more than a bacillus. As Randall shows, medical authorities, politicians, the press and the quarantine-averse public resisted his efforts. Kinyoun was hampered, too, by intellectual arrogance and a dearth of local contacts (he was based at an isolation hospital on Angel Island in San Francisco Bay).

Most city health officials refused to implement Kinyoun’s suggestions for inspection, selective quarantine and inoculation with a still-experimental vaccine developed by Russian bacteriologist Waldemar Haffkine. City officials went to extraordinary lengths to avoid admitting the plague’s presence. A court case against the MHS, brought by the Chinese Six Companies (a benevolent society protecting Chinese interests) questioned Kinyoun’s medical qualifications: a real doctor practised with patients, not microscopes.
The company’s rise and fall features in a new documentary. Heidi Ledford sums up.

It is hard to imagine a Silicon Valley story more riveting than the tale of Theranos, the US$9-billion company founded by a 19-year-old wunderkind who promised to revolutionize medical testing and instead was charged with fraud last year. There is fear and betrayal, money and deception, and perhaps a few lessons about the extension of the technology hype cycle to medicine.

The latest take on this drama — The Inventor: Out for Blood in Silicon Valley — is a documentary directed by Alex Gibney.

Released in March, it enters a crowded field of analyses centred on the Theranos phenomenon and its founder, Elizabeth Holmes. In January, US television network ABC News and the programme Nightline released a compelling six-episode podcast documentary called The Dropout, then quickly followed with a video documentary of the same name. Last year, Wall Street Journal investigative reporter John Carreyrou, a key player in Theranos’s downfall (he broke the story in 2015), published his definitive book, Bad Blood. Plans are afoot for a film starring Jennifer Lawrence as Holmes.

Each treatment so far is a gripping account of how Holmes dropped out of Stanford University in California, and persuaded the glitterati of Silicon Valley and Washington DC to pour money into her vision: technology that could perform hundreds of tests on drops of blood taken from a finger prick.

Rupert Blue led much of the campaign to eradicate plague in San Francisco.