

Influence of Travel and Disease: An Historical Perspective

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From time immemorial man has traveled, initially from necessity in his role as a hunter-gatherer, in later times to band together for protection, efficiency of organization, and for the benefits of extended family or tribal relationships. Further development of this theme led to early settlements, thereafter to less nomadic existence but still perhaps seasonal movement of the settlement, and finally to more permanent locations, with travel from there for the purposes of obtaining food, agriculture, trade, employment, conquest, and finally leisure. As man associated together in greater numbers the potential for the epidemic spread of infection increased, particularly in the absence of the understanding of disease and an effective public health infrastructure.

Thus history can be regarded as an account of man's traveling exploits and the ensuing consequences. However, while it is traditional to consider how history has shaped the world, it is more unusual to consider how the consequences of man's travels have shaped history. This is of particular interest for those of us involved in the discipline of travel health. The following accounts include several historical examples of outbreaks of disease occurring as a result of man's evolution and mobility, which have influenced, and perhaps shaped, the course of history.

Early History

Around 1190 BC, as described in the First Book of Samuel (Chapters 4 and 5, the New English Bible), the Israelites and Philistines battled for territorial and national supremacy. Following an initial indecisive battle, the Israelites lost the Arc of the Covenant, which to them was the earthly abode of God (Yaweh) and was fundamental to the regulation of all aspects of their lives.

Shortly after the capture of the Arc, the Philistines were afflicted by a pestilence. For 7 months the Arc was moved from place to place and further outbreaks

of disease would occur at these locations. Shrewsbury in his *Plague of the Philistines and Other Medico-Historical Essays* makes a convincing argument that this was a disease spread by person-to-person contact, specifically bacillary dysentery. The calamitous effect of this on the Philistines, coupled with the belief that this had been deliberately inflicted on them by Yaweh, induced them to return the Arc. This action, as a consequence of disease, may be considered as having a profound effect on human history, as at that time it probably prevented the disintegration and possible extinction of the defeated and demoralized Israelites. It is an early example of the spread of infection from the interaction of ancient peoples in their pursuit of territorial expansion.

I leave it to other scholars to argue the specific identity of the disease, but suffice to say that along with typhus and typhoid fever, bacillary dysentery has been a scourge of armies throughout the ages.

The Athenian Plague

Between 430 and 426 BC, there were two outbreaks of an overwhelming epidemic that decimated the civilian and military population of Athens. Vivid symptomatic description by the Athenian general Thucydides includes intense fever, tormenting thirst, restlessness, violent cough, and suffusion of the tongue and throat with blood. One of the more recent suggestions for this disease is an influenza epidemic complicated by Staphylococcal superinfection causing fulminating pneumonia.

Thucydides further described how the port inhabitants of Piraeus were the first to be affected, the disease having spread from Ethiopia, Egypt, and throughout the greater part of the Persian empire. From this account it is clear that the epidemic gained access to Athens via the port trading route.

At the same time the Athenians were besieged by the Spartans. The decimation caused by the plague is considered by many historians to have made a major contribution to the ultimate defeat of the Athenians in 404 BC, with many civilians and a large proportion of the army and navy having succumbed to the disease. This illustrates the spread of infection along the routes of trade and how a classical Greek civilization, vulnerable because of overcrowding and siege, finally succumbed to the enemy after three decades of war.

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Fortunately the influence of this great civilization persists even to this day.

Bubonic Plague

Episodes of the plague have ravaged mankind over many centuries. During 542–750 AD, the Justinian plague, named after the ruling Roman emperor of the time, swept through the Mediterranean nations and is generally accepted to have been bubonic plague. Evidence points to the spread of the disease from the trade routes extending out from the Middle East and beyond. It had a profound effect on the centers of population, and in its wake left greatly weakened Roman and Persian armies that succumbed not long afterwards to the advancing Muslim armies in the 7th century.

The spread of disease traveling along the trade routes was a major contribution to a change in the course of history, with the decline of great empires and the emerging dominance of a new culture and religion.

By far the most dramatic example of the epidemic spread of infection was the Black Death, which began around 1320 in the Gobi, Mongolia, and adjacent region. Over the next 30 years it spread inexorably along the long established trading routes of the Mongol empire, ranging across China, India, Asia, Arabia, the Middle East, northern Africa, the Mediterranean, throughout the whole of Europe, and north into Russia. It has been estimated that at least a third of the population of these areas was wiped out by the plague.

A colorful legend recounts that, when the plague caught up with the Tartar army besieging the merchant city of Caffa in the Crimea, they loaded their siege weapons with the dead bodies of their colleagues and lobbed them into the city. This would be effective in promoting the spread of infection and could perhaps be regarded as one of the earliest examples of “germ warfare.”

It is difficult to conceive of a disaster of this magnitude from our contemporary viewpoint and almost impossible to assess how the advancement of man’s progress was stunted by this catastrophe—a catastrophe consequent on the increasing urbanization, overcrowding, and the interaction of travel facilitating the spread of infection along the routes of trade.

Conquests of the Americas

From about 1517 onwards, smallpox and measles ensured Spanish success against the Amerindians, Aztecs, and Incas. Smallpox was introduced by Columbus into Hispaniola with the first native case occurring in 1517/18. This led to the extermination of an estimated 2 million Amerindians by 1530. A

similar pattern occurred with the expedition of Cortez to Mexico when, from 1520 onwards, authoritative estimates attribute 3.5 million deaths to smallpox, more than half the population. A few years later Pizarro’s conquest in Peru met with equal success; the same disease, aided by war, overwhelmed the Incas.

The potent combination of invasion by an alien-appearing people with horses and weaponry not seen before, apparently immune to the devastations of frightful epidemic disease, and seemingly protected by their all-powerful God, guaranteed military victory, domination, and conversion to Christianity. Thus the course of history was shaped.

The Spanish conquerors, however, were soon affected by the loss to disease of the native population—there was an acute labor shortage. Therefore they copied from the experience of the Portuguese who had introduced negro slaves to assist with their colonization of Brazil. The long sea voyages endured by the negroes, in appalling conditions, took a heavy toll in human life. The transit time enabled the infectious processes to exhaust themselves “en route,” and thus through survival of the fittest ensured a disease-resistant, imported workforce. For example, many of them were immune to yellow fever following childhood exposure. The yellow fever virus, originating from Africa, is dependent on the mosquito for survival. This water-breeding arthropod provides a reservoir of infection with transovarial transmission of the virus. The presence of suitable water containers on board the ships helped introduce the virus to the “new world,” and by chance, the dwellings and living conditions of the colonists in the West Indies and South America provided ideal conditions for the propagation of the *Aedes aegypti* vector and its transmission of yellow fever, which rapidly took hold.

Ironically this disease, imported along with the labor force, was in the end to lead to the decimation of the colonists, almost like a “Trojan Horse” drama. Compared with the relatively immune slaves, the white colonists were ravaged by yellow fever, and during recurring epidemics it is estimated that a third to a half succumbed. This, combined with the French and British waging war against each other for supremacy of the West Indies, and the higher procreative rate of the negroes, ensured the eventual dominance of the negro population and emancipation from slavery.

History was to repeat itself in the colonization of North America a few centuries later when imported infections took a huge toll of life. This was succinctly summarized by Caitlin who wrote in 1876, “Thirty millions of white men are now struggling and scuffling for the goods and luxuries of life over the bones and ashes of twelve million of red men, six millions of

whom have fallen victim to the smallpox, the remainder to the sword, the bayonet or whisky." The further colonization by emigrants from an overcrowded Europe also helped spread tuberculosis and syphilis, but the ambient climatic conditions did not provide the same opportunity for the establishment of an exotic endemic infection like yellow fever.

Pandemic Cholera

The pandemics of cholera spreading across the continents of Asia, Africa, Europe, and America in 1817–1822 and 1826–1832 provide convincing examples of the effective dissemination of infection around the world, courtesy of traveling man.

Cholera has been endemic to India for the past two millennia, but it was only in the 19th century that it extended beyond the borders of the subcontinent assisted by the presence of a new susceptible host population, the British Army. The disease then traveled with the soldiers and traders to reach the Far East, Middle East, and Russia within 5 years.

A further outbreak in 1826 followed a similar pattern, but this time crossed the Atlantic probably in the boatloads of Irish immigrants, thereby duly reaching down to Central and South America. Consequently millions died, due to the overcrowded, post-industrial revolution, city conditions, where poverty, poor sanitation, and inadequate food were common.

This produced undoubted strains within society at that time due to the apparent "discriminatory" nature of the infection, which struck down the most disadvantaged members but appeared to spare the more affluent, who did enjoy relative protection due to less crowding and better diet and water supply. There is no evidence, however, to suggest that it caused a revolutionary political change. Nevertheless, it did seem to mark a watershed in understanding the nature of waterborne spread of infection, facilitated by travel, and can be regarded as the early beginnings of modern day public health.

The Missionary Experience

In the late 19th and early 20th centuries, the Europeans again set out in numbers to the newly explored Africa, India, China, and the Pacific. This time the all-consuming passion was to introduce Christianity to the remaining "heathen" world. Scotland, a small country that saw almost 0.5 million of its population emigrate around this time because of domestic deprivations, had the unique distinction of supplying more recruits to this cause than any other European country. Following study of information sources and analysis of the health experiences of this group, it is

possible to demonstrate the impact of disease and how acquired knowledge improved the experience of later missionaries.

The details of this study show that while infections accounted for the majority of deaths, later appointment, coupled with improvements in the understanding of disease, is associated with fewer retirements due to ill health, lower mortality rates in service, and with missionary longevity.

This historical insight shows the effect of disease on a transient, immigrant host, exposed to unfamiliar infectious agents, stressed by altered climate, environment, and culture, but particularly vulnerable due to lack of such exposure during childhood immunologic development.

The 20th Century and the Contemporary Traveler

In the early part of the 20th century, 1918–1919, a huge influenza pandemic emerged during which the U.S. epidemiologist Edwin Oakes Jordan calculated that 21 million died, more than from the effects of military action in World War I. Such widespread infection, reckoned to have affected over 1 billion people in one way or another, was only possible because of improved transport capabilities that had been developed and the consequent, more speedy movements of larger numbers of people.

Sir Patrick Laidlaw of the U.K. National Institute for Medical Research attributed this outbreak to the swine fever influenza virus, and, although the source of the virus has not been identified, both major influenza epidemics since 1957 have emanated from the Chinese mainland. The same disease in 1969 cost the U.K. economy in the order of £150 million.

The potential for the emergence of a "new" antigenic subtype of type A influenza remains, and with China but a jet flight away via the staging stop of Hong Kong, a fresh epidemic strain can be imported to New York in 16 hours or to London in 14 hours. Thus the forgotten history of 70 years ago may come to life at any time, thanks to "jet age" travel.

The 7th cholera pandemic started in 1961, continues to spread, and in May 1993, the WHO reported a total of 461,783 cases, with 8072 deaths (5291 from Africa alone). A current example of an infection that is potentially preventable by simple basic hygiene and effective sanitation, cholera is again proving to be a scourge on a global scale, with confirmed reports during 1992 from 20 African, 19 Central and South American, 15 Asian, and 7 European countries. Despite the knowledge from 150+ years ago on the waterborne spread of infection, the overwhelming ubiquity of traveling man in the 1990s is ensuring a continuing plague. Short memories easily "forget" that

only smallpox has been eradicated, and when the public health infrastructure and health education are inadequate, “old” diseases can readily re-emerge. Similarly, when the impetus of immunization programs cannot be sustained, herd immunity falls and epidemic outbreaks return. In February 1993, the *BMJ* carried a report of 4000 cases of diphtheria reported from Russia. This is a worrying example of the difficulties faced by a country during a period of social upheaval, when a competent preventive program is thrown into disarray from the combined effects of loss of public health direction/control and consumer resistance due to anxieties about vaccine efficacy and infection transmission from contaminated needles.

The newest “recruit,” in terms of global infection spread by travel, is AIDS. Already the course of history is being charted with the economies of some developing countries under threat of collapse due to decimation of the workforce and the escalating costs of medical care. Furthermore, the impact on developed countries has raised complex social, medical, and economic issues that have led to fundamental political changes. These problems are a consequence of the social interaction of people when traveling, which is as old as history itself.

Arguably, it has never been more important for the traveler to accept responsibility for his own health welfare. At best, immunization can offer protection against exposure to only 5 to 10% of the problems likely to be encountered, and, because of the numbers of travelers, it is becoming an almost impossible logistic and economic task. This leaves a daunting responsibility for health educators to ensure that travelers accept that personal behavior modification is the biggest single contribution that he can make in reducing the risk of preventable infection/accident and the further spread of infection.

When studying travel and infection, it is tempting to look for historical analogies (e.g., today’s VSO/Peace Corps worker is perhaps yesterday’s missionary traveler and today’s package holiday hordes the armies of yesteryear). The refugee, as ever, remains the most vulnerable group in world society, crossing boundaries to flee from deprivation, discrimination, and abuse, all at the mercy of epidemic disease.

Conclusion

Man has traveled since the beginning of time. The development of settlements, then urbanization, initially with no insight on infectious diseases or public health precautions, allied to ever larger movements of people from place to place, inevitably led to outbreaks of epidemic infection. Some of these outbreaks have proved to be near catastrophic to continuing civiliza-

tion, and there are examples from biblical times right up to the present. It is of interest to consider how some of these major episodes have shaped the course of history, the lessons that can be learned from studying such episodes, and the continuing relevance for the present time when unparalleled numbers are traversing the globe faster than ever before, while the potential for the return of “old” (e.g., cholera) and “new” (e.g., AIDS) epidemics has never been greater.

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