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*Original Paper*

# Disease and Expansion: A Review of Medical, Ecological and Social Consequences of the Columbian Exchange

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***Abstract***

*The exploratory voyage of Christopher Columbus and his arrival in the Bahamas on October 12th, 1492 marked an innovative discovery of the New World. Since then, a series of interactions, including trade, flora, livestock, diseases, technology and ideas, have been extensively exchanged between Europe and the Americas. This massive exchange involved not only economic gains and political domination, but also profound medical, ecological and social impacts: it has transferred viruses and bacteria that carried lethal diseases from Europe to indigenous peoples who lacked immunity. Likewise, the Americas also transmitted fatal diseases through its conquistadors, which eventually resulted in numerous victims in Europe. This paper discusses several notable issues during the Columbian Exchange of diseases, including European medical settlements in the New World, the discovery of new remedies, and main diseases that spread to both the New World and the Old World. Based on the colonial context, this paper will explain the subsequent effects that ultimately changed the world. Overall, it is difficult to imagine how different the world would be without this exchange, in which diseases played an important role in contributing to European prosperity.*

***Keywords***

*Columbian Exchange, European colonization, medical sociology*

## 1. Introduction

Before 1492, most major continents remained largely unknown, and Europeans had very limited knowledge of global geography. However, the exploratory voyage of Christopher Columbus and his arrival in the Bahamas on October 12th, 1492 marked an innovative discovery of the New World – the Americas. This event enhanced connections among previously isolated regions and initiated the age of European colonization (Nunn & Qian, 2010). Since then, a series of interactions, including trade, flora,

livestock, diseases, technology and ideas, have been extensively exchanged between Europe and the Americas as a result of this monumental discovery (Domenici, 2023). This complex and remarkable movement was named the Columbian Exchange in 1972 by Alfred Crosby in his book of the same title. As an environmental historian, Crosby reinterpreted the significance of early European colonization. In his view, it involved not only economic gains and political domination, but also profound medical, ecological and social impacts (Crosby, 2003). He observes, "*if pathogens could pass freely from the Old World to the New, so, fortunately, could the life forms… that is, cultivated plants and domesticated animals*" (Crosby, 2003, p. 64). However, the negative consequences "*have been the destruction of ecological stability over enormous areas… that it amounts to a crime against posterity*" (Crosby, 2003, p. 211). This is because the Columbian Exchange was estimated to have caused a 90% mortality rate among local populations, leading it to be regarded as an American Holocaust (Stannard, 1992).

This exchange, therefore, had tremendously benefited European nations while, more importantly, transferring viruses and bacteria that carried lethal diseases from Europe to indigenous peoples who lacked immunity (Hancock, 2022). Likewise, the Americas also transmitted fatal diseases through its conquistadors, which eventually resulted in numerous victims in Europe (Crosby, 2003). As this event can be deemed as an unprecedented catastrophe in history, this paper discusses several notable issues during the Columbian Exchange of diseases, including European medical settlements in the New World, the discovery of new remedies, and main diseases that spread to both the New World and the Old World. Based on the colonial context, this paper will explain the subsequent effects that ultimately changed the world.

## 2. Early Medical Settlements

Despite their ambition for new adventures and a desire to preach Christianity, Europeans recognized the necessity of maintaining their health to continue their expansion into unfamiliar environments (Crosby, 2003). For instance, the Spanish directly exported their medical system to the colonies, establishing a robust, comprehensive and effective medical infrastructure (Guerra, 1963). Beyond their identities as conquistadors and the decline of Native American populations, the Spanish tended to be more assimilative; they built relationships with local people, which unexpectedly exacerbated the spread of diseases (Crosby, 2003). In addition, although they were perceived as culturally arrogant back then, the Spanish actively sought new remedies, conducted research on existing ones, and transferred medical knowledge from the New World to the Old (Guerra, 1963). For example, Monardes (1574) presented numerous popular herbal observations in his book, raising awareness of drugs in Western medicine. Beyond these efforts, Europeans discovered several important remedies in their new territories, contributing to advancements in medicine. As a consequence, the role of medicine for conquistadors in their colonies was not only a system of infrastructure but also a vital tool for health and settlement.

### 3. Discovery of New Medicine

Successful colonization ushered in an era of prosperity for European nations: apart from crops and animals for them to yield and rely on such as potatoes, corn and horses, there was also a more significant "gift" to facilitate colonialism – remedy. In particular, when it comes to malaria, with which colonizers encountered in the New World, the discovery of Cinchona, which dates back to the early 1500s in South America, made it possible to treat this infectious disease (Ravina, 2011). The first effective treatment found for malaria – quinine – can be extracted from the bark of the Cinchona tree in Peru, which is rich in anti-malarial compounds (King, 1992). Shortly after its discovery, quinine was brought to Europe within one year. King (1992) argued that the use of Cinchona by Europeans accelerated their colonization, especially in tropical regions where malaria became endemic. However, this perspective was controversial within mainstream European medical theory at the time, which favored treatments with generalized effects. An example of this can be found in the ancient theory of humors (from Latin "liquid", or "fluid") proposed by Galen, who suggested that patients could restore balance through methods such as bloodletting and purging (Stelmack & Stalikas, 1991). In contrast, Cinchona specifically targeted a single type of pathogen without addressing others, aligning with the concept of the "magic bullet" (Metchnikoff, 1967). Nevertheless, the abundant supply of quinine was recognized as one of the most valuable contributions to the Old World, enabling Europeans to expand their colonies more effectively. Without it, British and Dutch officers, as well as military personnel, would have faced a higher mortality rate from these deadly diseases in colonial territories.

With advancements in medicine, various remedies were discovered in the New World, including emetine, which can be extracted from the root of ipecacuanha. This plant, native to Brazil, serves as an effective treatment for dysentery, a digestive infectious disease. Dutch physician William Piso was a pioneer who spent many years in tropical colonies studying the effects of ipecac (Gilbert, 2004). Furthermore, after Columbus was introduced to tobacco by Native Americans upon his arrival in the New World in 1492, Europe developed a strong craving for it by the seventeenth century. Charlton (2004) declared that during this period, nicotine was widely utilized as a medicinal treatment for different ailments, significantly impressing European royalty.

### 4. Diseases Spread to New World

Spain and Portugal spearheaded their invasion and occupation of vast territories in the Americas. While they were pleased with the favorable conditions, their colonial successes would not have been possible without the spread of communicable diseases during the Columbian Exchange. American historian David Stannard described this as the largest holocaust in history, referring to it as "*the worst human holocaust the world had ever witnessed, roaring across two continents non-stop for four centuries and consuming the lives of countless tens of millions of people*" (Stannard, 1992, p. 146). The high death rate during this unforeseen disaster was partly due to the interactions between the Spanish and the indigenous populations, but primarily because the locals had not developed an immune system capable

of protecting them from being attacked by diseases. In contrast, Europeans, who had strong immunity to these pathogens, could easily resist illness that had existed in Europe for many years (Mann, 2012). Besides, critics have asserted that this amounted to biological warfare; once the Europeans recognized this situation, they intentionally infected the local populations with a new weapon – germs – that could weaken the native communities and facilitate their domination of the new land (Fenn, 2000). Although a few individuals were aware of this, the prevailing ideology of racial superiority led them to continue and justify their actions by claiming it was aligned with God's will, which "supported" their colonization efforts (Fenn, 2000).

As one of the deadliest unseen diseases, smallpox first struck the Aztecs in Mexico in 1518, resulting in the deaths of more than one-third of the local population within one month (Mann, 2011). The disease then spread rapidly in Massachusetts during the 1630s, ultimately causing the deaths of half the native population (Crosby, 2003). Both Britain and Spain implemented specific responses to this epidemic. The Spanish government promoted smallpox inoculation among white people, while British physician Edward Jenner demonstrated the efficacy of the smallpox vaccine in 1796 (Ravina, 2011). Influenza, which could be easily transmitted to natives through respiratory droplets from European colonizers, also emerged as a deadly disease. Lacking the means to sterilize goods, the disease continued to spread throughout the colonies. When Christopher Columbus's crew returned to the New World in 1493, they were afflicted with a fever that was later identified as influenza (Guerra, 1988). Pigs, birds and other livestock transported by ship likely served as major vectors for the disease, bringing about an estimated mortality rate of over 90% among the native population (Guerra, 1998).

Similarly, malaria did not appear in the New World until the Age of Discovery. It is a parasitic disease spread by the bites of tropical and subtropical mosquitoes, rather than disseminating directly from person to person. In South America, malaria was one of the contributing factors to the establishment of slave plantations, as few enslaved individuals were brought from Africa before this period (Mann, 2012). "*Hundreds of thousands of humans fell sick and about 20,000 died before these immigrant insects were eliminated*" (Crosby, 2003, p. 208). Malaria was brought to Central America, where it not only devastated the local population, but also caused substantial losses among colonial personnel (Cooper, 1973). Alongside yellow fever, which was referred to as the "black vomit", these diseases ravaged the island of St. Martin in 1648 (Cook, 1998). Yellow fever resulted in five years of famine there and in Havana, infecting over one-third of the military population (Cook, 1998).

Other major diseases, such as tuberculosis (TB), measles, and particularly typhus, were introduced by the British colonizer Francis Drake in 1585 when he brought them from Cape Verde to the Caribbean and Florida. These diseases ultimately proved to be highly contagious, "*the wilde people died verie fast and said amongst themselves, it was the Inglisshe God that made them die so faste*" (Crosby, 2003, p. 40). The spread of these diseases was exacerbated by malnutrition and poor sanitation, conditions that the native populations widely faced because of European colonization. Stannard (1992) noted that the indigenous population of California decreased from 85,000 to 35,000 – a collapse of nearly 60% in one

decade. He also argued that in Jamaica and other areas of the Caribbean, "*within a matter of months 50,000 Indians were dead*" (Stannard, 1992, p. 204). It is worth noting that the Caribbean witnessed a staggering number of deaths – amounting to millions – between 1492 and 1518 (Cook, 1998). Even more alarming, in the lower Mississippi, the native population plummeted from 20,000 to only 265 over the course of 200 years, generating a catastrophic death rate of 99% (Stannard, 1992). Cook (1998) described this horrific mortality due to diseases but contended that the Black Legend – the accusation that Spanish conquistadors employed cruel and unjust methods to conquer the New World – requires reevaluation. In fact, there is evidence indicating that germs were carried by Europeans, but their dissemination to the Americas occurred unwittingly.

**5. Diseases Spread to Old World**

The Columbian Exchange involved the prosperity of Europeans and the decline of Native American populations. However, the inhabitants of the New World were not the only victims; they also gave the Old World lethal diseases, among which the most typical one was the syphilis (often referred to as the pox). The origin of syphilis has been a subject of considerable controversy, but the Columbian theory is the most widely accepted among various debates. This theory posits that syphilis was a venereal disease that spread through sexual relations between Columbus's crew and Native American women in 1493, and then became highly contagious throughout Europe, Russia and Africa (Crosby, 2003). An alternative theory suggests that syphilis was one of many epidemic syndromes that had always existed in Europe but went unrecognized until after Columbus's discovery. However, even though syphilis has become less lethal in modern times and can be effectively treated with contemporary medicine, it was once highly fatal and spread much more rapidly in the past. Over time, its symptoms became increasingly severe, including ulcers, rashes, tumors and ultimately, death (Nunn & Qian, 2010). The first recorded epidemic of syphilis broke out in Italy during the mid-1490s, at a time when no traditional remedies were available until the discovery of the effectiveness of mercury and guaiacum in the sixteenth century (Crosby, 2003). Furthermore, European explorers suffered from other distinct illnesses that did not exist in the Old World prior to 1492, such as Chagas disease, which originates from parasites in Central and South America, as well as pinta and bejel from Central America. Nevertheless, the impacts of these diseases were not as severe, especially when compared to the scale of the disasters that befell the New World.

**6. Additional Impacts**

Despite the significant loss of life that the New World experienced due to European conquest, there were additional factors contributing to the decline of the local population. Firstly, Native Americans were often subjected to poor medical and physical conditions, which hindered their ability to sustain their lives while fulfilling essential tasks and securing resources. Secondly, residing in communities where many individuals were infected made it challenging for indigenous people to maintain a sense of

security regarding their own survival, thereby increasing the likelihood of disease transmission. As noted, "*the psychological effect of endemic disease is enormous, especially of an unknown disfiguring disease which strikes swiftly*" (Crosby, 2003, p. 56). Thirdly, young natives, as the most vulnerable group to diseases, encountered difficulties in reproducing future generations once they became victims of illness. This gave rise to the ongoing decline of the native population. Moreover, due to their compromised health, Native Americans were often subjected to severe abuse and mistreatment as a result of their unsuccessful resistance.

With the exchange of goods and increased migration throughout Europe, Asia and Africa, societies began to stratify into social classes, with manual labor increasingly performed by Native Americans (Crosby, 2003). Unexpectedly, after the fifteenth century, the high mortality rate among indigenous populations has created a labor shortage. To address this issue, a large number of enslaved individuals were forcibly transported from Africa to the Americas, enduring immense suffering (Cooper, 1973). These events also gradually led to the emergence of a diverse array of mixed-race populations that exist today. Furthermore, a long-lasting effect of the Columbian Exchange is the acceleration of biodiversity exchange. In addition to human genes, explorers introduced varied species that interacted with those in the new environment, posing challenges to existing ecosystems (Perrings, 2014). Driven by the common needs for food, fuel and materials for survival, these changes brought about environmental degradation, including increased exploitation and pollution, which rendered their settlements more precarious.

## 7. Conclusion

To conclude, once the Europeans set foot on the land of the Americas, the course of history was irrevocably altered. The age of exploration that followed Columbus's discovery initiated extensive exchanges between Europe and the American continent. During the Columbian Exchange, diseases played a particularly influential role in the colonization efforts of the Europeans. By observing the new environment and integrating with local populations, Britain and Spain established medical infrastructure in the New World and discovered effective remedies, which they subsequently introduced to the Old World. However, the most significant consequence of this exchange was the introduction of catastrophic diseases to the indigenous peoples of the Americas. Due to the fragile immunity of the local populations, these new diseases resulted in millions of deaths across various regions. Consequently, not only did their physical conditions deteriorate, but their medical treatment became increasingly inadequate, vastly reducing their survival rates. With successful expansion, Europeans were also exposed to new diseases brought back to the Old World, creating serious social disruption. This paper has provided a historical overview of the medical, ecological and social consequences of the Columbian Exchange and emphasizes the need to consider the impacts on both continents. Overall, it is difficult to imagine how different the world would be without this exchange, in which diseases played an important role in contributing to European prosperity.

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