	Gardens & Landscapes
	The Ailing Gardens in India
	Suryyia Manzoor and Taniya Iqbal
	DOI 10.2478/glp-2019-0005
	Gardens and Landscapes, De Gruyter Open, nr 5 (2018), pp. 56-68. URL: https://content.sciendo.com/view/journals/glp/glp-overview.xml

ABSTRACT

Gardens are generally associated with places that are aesthetically pleasing and perceived as promoters of social engagement within the community. Furthermore, gardens are believed to improve both the individuals' physical and psychological state of mind. However, and contrary to the previous statements, gardens may also sometimes turn into a site of agony. One such example has been explored in this article- the tea gardens of India during the nineteenth century, where their inhabitants faced a cholera pandemic. The gardens infected with cholera led to a high mortality rate in the region. This article discusses the causes that led to the cholera outbreak in India and how it spread throughout the region, causing tea gardens to turn into ailing gardens. Moreover, emphasis has also been laid on the role of tea gardens as laboratories where vaccine administration against cholera was performed.

Keywords: India, Cholera, Tea Gardens, Vaccines.

ARTICLE

Introduction

Usually gardens are looked upon as a source of aesthetic pleasure, peace, health and therapy. Their purpose is to enhance social interactions and embed visitors with aesthetic perceptions resorting to cultural artifacts (BRITTON 1896: 331). The idea of gardens as a source of therapeutics has existed since the ancient world and has been strongly endorsed in modern times. Gardens are considered as a place for therapy due to the fact that they promote socialization among people, provide a place to engage in various healthy activities including physical exercise and strolling along textured walkways, and offer positive psychological sensory experiences (ADEVI 2013: 230; JIANG 2014: 141). With rich colors and detailed architecture, gardens play an active role in reducing stress and are often essential parts in both houses and hospitals (CONAN 2007:19).

However, under certain circumstances, and if gardens are mismanaged, they can suffer the attack of precarious diseases (RICHARDSON 1998:54). Focusing on tea gardens in India, this paper argues that gardens can thus also

Suryyia Manzoor is Assistant Professor at Institute of Chemical Sciences, Bahauddin Zakariya University, Multan, Pakistan.

Taniya Iqbal is a Master Student of Chemistry at Institute of Chemical Sciences, Bahauddin Zakariya University, Multan, Pakistan.

be a place for disease if they are not well maintained. One such example is the cholera pandemic in the region's tea gardens. Most works on tea gardens cover the process of tea production. On the contrary, I argue for a change of perspective and in this article, I focus on their role as disease gardens. Cholera was a widespread disease in the nineteenth century and it proved to be one of the most fatal diseases that affected tea gardens. It most probably originated in India, escalating then to a vast area, engulfing gardens and cities as a pandemic. The disease quickly spread to cities, villages and gardens. This paper focuses on the cholera outbreak in India's tea gardens throughout the 19th century. By exploring tea gardens in India, this study will further describe the use of tea gardens as places where inoculations against cholera were administered, a fact which strengthens the concept of "Gardens as Laboratories" In Garden History, gardens were also used as places for various experiments which involved the study of different hypotheses on plants as well as on animals (HICKMAN 2014: 229). At the start of the nineteenth century, the concept of expanding experimental set ups beyond laboratories was gaining momentum among scientists and hence the idea of field investigation became a trend in the production of knowledge. Gardens were considered as one of the most suitable places for this purpose as they consisted of plants, included animals and humans, and, in addition, the conditions could also be adjusted according to different requirements. Based on the needs, gardens also possessed specific rooms which were especially meant for medical and scientific practices. Gardens served in particular as fields of research on animals as well as plants. Hence, one of the last trends in the History of Science is to look at 'gardens as laboratories' (BALDASSARI 2017), in the sense that knowledge has been produced in these spaces. This study contributes to this vision as I am going to show how pilot-experiments of vaccination took place in tea Gardens.

Cholera in India before and after the British Rule

Although the first case of cholera was recorded as soon as 1563 in an Indian medical report, India would later become known as one of countries with the most victims of cholera in the early nineteenth century (JONES 2004: 56; LAWS 2017: 204), to such an extent that this country is often acknowledged as the "homeland of cholera".

During this period, the Indo-Pak subcontinent was undergoing political turmoil and the British Empire was striving to get hold of the region. Taking advantage of the weakening of the Mughal rule and its gradual decline, the British Government deployed military force into the areas where trade could be strengthened (MARTINEAU 1857:88-98). In addition, the East India Company, which was originally formed to promote trade between Britain and South Asia, steadily got involved in politics and played a prominent role in British imperialism. The company dominated approximately half of the Indian region and, as a result, the majority of British traders started controlling commerce (BOSE 1916:35-45). By the mid nineteenth century, most major cities had come under the control of the British Government after local wars. However, numerous public institutions underwent mismanagement, among which the ones in the health sector suffered the most. Though the British army had been successful in attaining control of the government by the mid-nineteenth century, the very next challenge would be the rebuilding of destroyed public bodies (KARASH 2007: 100; MESSENGER 2013: 73). The community faced a high mortality rate due to the lack of appropriate sanitary and health facilities. This led to the spread of various epidemics, especially cholera, and it resulted in a large number of casualties, both amidst local people and army troops. The foremost contributor to the transmittance of cholera was the absence of proper sanitation system (THOMPSON et al. 1999: 593).

A serious outbreak of cholera in Jessore (Bangladesh), in 1817, was probably among the first cases of cholera

pandemic in this region (PETERS 1965: 2-4). Yet its impact was restricted to those areas where inhabitants were living in foul conditions, lacking a healthy diet and working as laborers under harsh weather conditions. The disease engulfed major regions of state of Assam, including tea gardens. It also affected the areas which met sudden and frequent climate changes, presenting high rainfall rates and retaining air humidity. Hence, this disease was more prominent in the first six months of the year, when there were frequent rainfalls. The severity of the disease was reduced during the cold and dry weather (JAMESON 1820:2; KHOSLA 2006:141). Cholera most probably spread after the area received violent gusts of wind and heavy rainfall in the start of April, followed by frequent rains till the mid of June. During this time, the disease became very fatal. The victims suffered from extreme pain and spasms, vomiting and showing physical weakness (JAMESON 1820: XXIV). Although cholera first showed its signs in the surrounding regions of Bengal, as for example Calcutta, —where there was a high death toll— this region was considered as the home of cholera in the beginning of the nineteenth century. According to details received by the official keepers of major graveyards in the towns of Calcutta, there were over 5000 casualties in the year of 1818, and the highest mortality rate within the same year was observed during the months of February and March (NAIR and TAKEDA 2014: 89). Along with the local community, many of the British troops also became victims of cholera and some lives were lost. For example, the Nagpore region was raged by the epidemic which then further spread to the remote areas, reaching the army troops of the Saugor division, where it erupted violently. It affected 64 people, out of which 19 died. Similarly, another battalion, the 26 th native Infantry, with a strength of 868 soldiers, lost 18 of them [JAMESON 1820:300]. The critical conditions that both troops and local inhabitants faced caused alarm in the government. In 1863, the British Government of India received information from the Royal Commission describing the sanitary conditions of British troops in India and suggested the establishment of a Public Health Commission which would work for the improvement of sanitation and prevention of epidemics (MUSHTAQ 2009: 6; GUGGENHEIM and SODERSTROM 2009: 96).

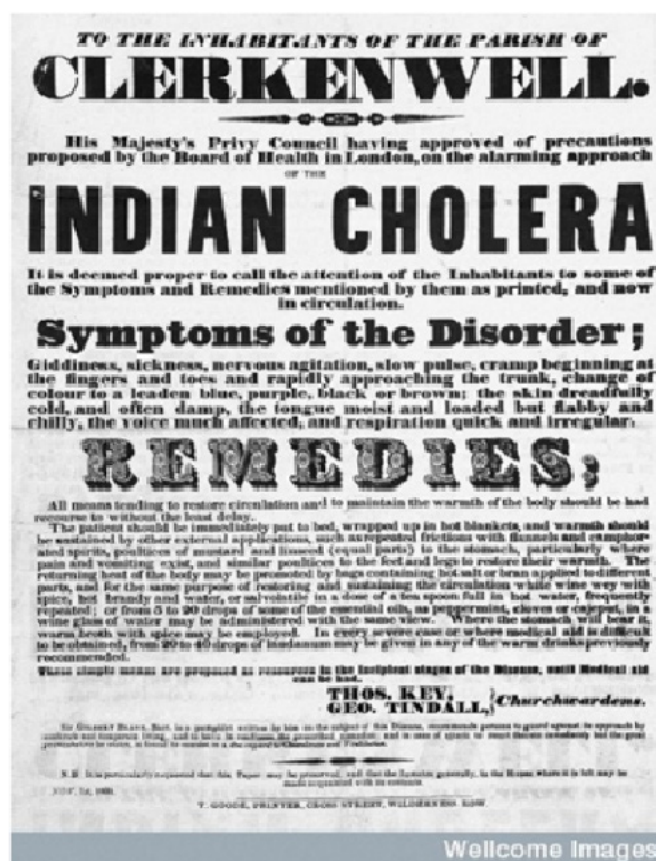


Figure 1. Broadsheet warning about Indian cholera symptoms and recommending remedies, issued in Clerkenwell, London, by Thos. Key and Geo. Tindall: Church wardens. London, 1831. Credit: Wellcome Library, London sanatorium] Princess Amelia Hospice, Funchal, Madeira. c. 1900. Private collection

The destruction caused by cholera in the east spread a ray of fear in the west and warnings were issued in local newspapers in order to raise awareness for the effects of cholera. Also in Clerkenwell, London, there was a warning issued regarding Indian cholera symptoms and remedies were recommended (Figure 1) (Wellcome library, London).

Cholera did not spread into Europe until the 1820s (THOMAS 2009: 162). After a few years, in 1823, cholera was reported to have spread in Europe and presumed to have come from India (KOHN 2007: 22; THOMAS 2009: 162). The second pandemic and first appearance of cholera in Europe dates back to 1831-1832. The travelers' movement was considered as a source of cholera transmittance to different parts of the world (BALY and GULL 1854:130-131). It is also believed that cholera entered Europe through the pollution caused by estuarine environments, contaminated by both human waste and sea residues (THOMAS 2009: 159).

Cholera is well-known for its starring role in epidemic diseases. All over history, it has occurred due to extreme natural disasters, wars, inadequate water treatment, poor sanitation, inadequate hygiene, famine and poverty, in which case its fatality rate may go beyond 20% (SOSA et al. 2009: 177). Cholera is mainly transmitted through contaminated food, water or by flies. It is caused by eating food, contaminated seafood and drinking water contaminated with the bacterium *Vibrio Cholera* (BARUA and GREENOUGH 2013: 210). Cholera is slightly inflammatory, never invasive, and rarely fatal if appropriate rehydration therapy is given (WISNER et al. 2002: 30; RAMAMURTHY and BHATTACHARYA 2010: 290). However, cholera results in severe watery diarrhea, which can lead to dehydration and even death if not treated properly. Cholera is categorized by voluminous diarrhea, which may lead to hurried hypokalemia, acidosis, dehydration and shock in 4 to 12 hours. Cholera is one of the water borne diseases that has remained as a major cause of mortality in countries with low socio-economic conditions, suffering from war and overpopulation (STILLE 1885:48). Therefore, any place with water in ponds or fountains might be a source for the spread of the disease. Additionally, cholera outbreaks also present a close connection to precipitation rates. Considering the climatic conditions in India, a correlation between the spread of the epidemic and rainfall levels could also be observed. The cholera epidemics were more pronounced in months with heavy rainfall. Six Indian provinces, Madras, Berar, Central, Bombay, Bengal and Assam showed more outbreaks of cholera primarily in the months with most prominent rainfalls (BELLEW 1885: 20-24). The state of Assam was among the first states where a tea plantation was experimented, mainly due to the texture of the soil and sufficient water made available through rainfall and other sources. The tea plants cannot tolerate stagnant water and therefore, the lack of a proper drainage system could result in the improper growth of plants as well as in the outburst of water borne diseases (BRYDEN, 869:80; SINGH 2006:188).

Consequently, and as an almost unknown fact, I argue that gardens also contributed to the spread of the disease. One such example is the number of tea gardens in India that showed record eruptions of cholera.

Tea Gardens

‘Tea gardens’ define the plantations of the botanical species of tea in the Himalayas Mountain, India, introduced by the British in the nineteenth century. This concept was developed in the aftermath of the conquest of India by the British East India Company, when a committee of researchers appointed by the British government decided to grow tea in a large area of wasteland. The Company approved of a tea committee office in Delhi, whose objective was to introduce the culture of tea growth into the region and explore areas that might be suitable for plantation. The seeds were firstly imported from China and experimentally planted in the Indian regions of Calcutta and Assam. The Assam state appeared to possess high potential for tea cultivation and hence the East India Company appointed a British superintendent to promote tea gardens there. The *Camellia sinensis* tea plant was among the first successful species of tea to receive approval for cultivation (INDIA 1855:463; CRYSTAL 2014).

In India, and until then, tea had only been used as a medicine among the native tribes of Assam. The first plantations were initiated by the British rulers in upper Assam in 1839 and they later on expanded to the lower part of the state (SINGH 2006:2).

The elevated regions were made up of successive terraces on small hills, and the soil consisted of light loam, containing clay stone, thus considered suitable for the plantation of tea gardens. If the area was very steep, it

would cause a speedy drainage of water from the land. Thus, the less steep tracts were selected for the planting of tea gardens in order to avoid the sudden loss of water and prevent the plants from drying. The existing plantations were mainly of oak trees and brushwood, some of which were cleared off for the purpose of tea cultivation. These selected lands had never been used for agronomy purposes before. Sandy soil with loam of decomposing vegetable matter was preferred to grow the plants. The paths, which measured approximately 10 feet, were carved through the gardens so as to let oxygen flow freely between the plants. These paths were also meant to keep the site clean (HAUSER 1890: 7-9). In addition, and as tea plants show better growth if they are provided with partial shade under the canopy of trees, tea gardens were also provided with the plantation of trees, especially since they protect the plants from high sunlight and reduce soil erosion (SARKAR et al. 2015:164).

The first tea varieties that were introduced for cultivation purposes were *Theaviridis* and *Theabobea*. Some wild native tea species were first discovered in the jungles of Assam. They were taken to botanical gardens for experimental plantation and then tentatively cultivated in open spaces. The growth of wild tea plants is favored by a highly moist climate; however, the clearing of jungles for cultivation purposes affected the climate of Assam by reducing humidity and hence the indigenous wild species could not show optimum growth as cultivated plants. Some of the seed varieties were then imported from China and cultivated in the gardens. Besides, the British Government also employed experts in tea plantation from China to commence tea cultivation in this region (BAILDON 1882:17; BRANSTEN 1860:16).



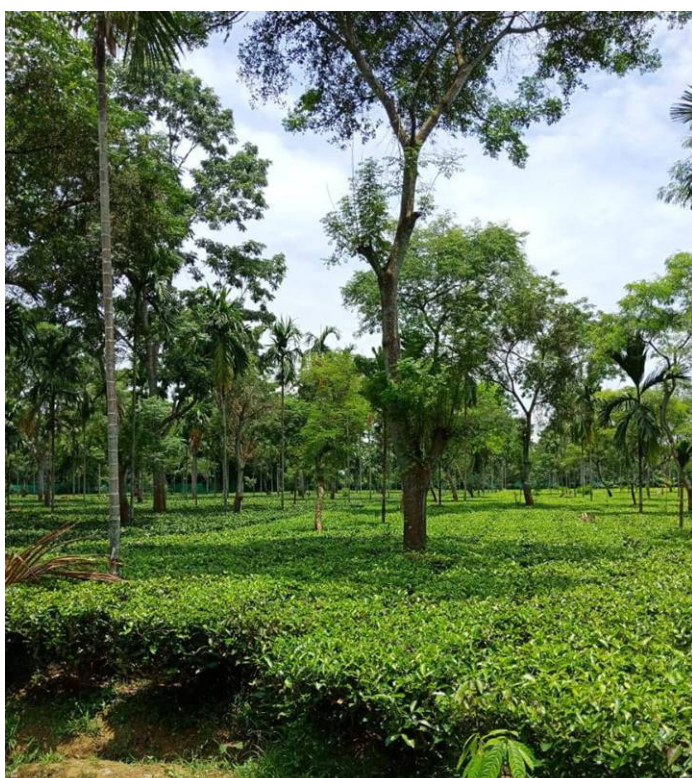
Figure 2. An image of a tea garden in a hilly area of the Himalayan Mountains (HAUSER 1890:5).

The design of terraces and trenches is in this case of great importance as they help carrying rain water. On the one hand, standing rain water can damage the roots of the plants, while, on the other hand, if water rushes down at great speed, it will push the rich fertile soil away from the roots. Hence, the terraces were designed at a right angle to the hills' slopes instead of direct down the hills. The first tea plants were grown on Government lands which were not previously used for other crops. Different states were selected for experimental purposes

depending on the soil, water and climatic conditions. In order to get a tea plantation to be profitable, there needs to be a good quality soil, moderately moist, and containing a light loam with well-mixed sand and decomposed vegetable matter. Hence, the selection of soil was the first studied criteria for plantation purposes. In certain areas, government preferred to buy already cleared lands directly from farmers (BRANSTEN 1860:13).

The plucking of the tea leaves at the right time contributes to its proper growth. Hence, the leaves should be plucked after two to three years of their sowing and excessive plucking from the same plant should be avoided. The experts in tea plantations were appointed to train local laborers for the plantation and collection of leaves. The laborers were advised to avoid the plucking of leaves from young plants. Only the leading shoots should be topped, which could result in making the plants bushy and hence yield more tea. (HUI et al. 2004:961)

The concept of tea plantation was introduced by the British Government and it underwent a great expansion under British rule. The government took action to attract and encourage local farmers to plant tea on their lands. By 1894, the total area reserved for tea cultivation comprehended 1054922 acres (A.S.R 1900:85). Only in the Assam district of Cachar, the estimated number of inhabitants involved in tea cultivation rose to 50,000 in 1901 (ALLAN, B.C. 1905:40). The major challenge for the tea industry was the collection of good quality leaves. Only the young leaves collected from a three to four-year-old plant are appropriate for tea making. If the leaves are old and hard, they will not curl, and they cannot therefore be selected for the preparation of tea. The Government announced rewards to those who collected fresh leaves and delivered them to tea factories: “The first party who will bring pukka first 100 maunds of good fresh leaves will receive Rupees 300. The first party who brings 50 maunds, Rupees 100. The first party who brings 25 maunds, Rupees 50. The first five parties who bring 12 maunds, Rupees 30 each. The first ten parties who bring 10 maunds, Rupees 20 each. Each party must show that the leaves brought have been gathered from different plantations.” (BRANSTEN 1860:32) Still, and according to laborers, the wages offered by the authorities were too low as compared to the hard work involved in this task. This caused an uproar in the community. Later on, the Government announced a 30 to 50 percent increase in salary (BRANSTEN 1860:32; VARMA 2007: 1).



Figures 3 and 4. Views of tea gardens in the Assam State, India. Photograph by Gautam Singh (3) by Pukhan Chitrare (4)

Tea gardens became an important legacy the British left in India and the tea industry of India has undergone a steady progress in India until present days, as the country has become one of the leading worldwide tea exporters.

Tea Gardens and Cholera

Tea gardens accommodated in their surroundings colonies of laborers who worked for their maintenance by ploughing lands, establishing terraces, providing manure, as well as collecting and transferring tea from gardens to the nearest railway stations. The plantation regions were marked and distributed in smaller zones. Each zone was headed by an in-charge with a team of laborers. The colonies of these laborers were overcrowded, each house accommodating a huge number of dwellers whose number would often exceed its capacity. Tea gardens were the places where, alongside tea plantations there were huts for laborers and bungalows for managers. The managers were considered as the supreme power and gardens were like their kingdoms, places where even the police were not allowed to enter without the prime permission of the managers. According to Bordoloi, a politician, lawyer



and tea planter from Assam, “A manager may assault a laborer, insult him and take girls after girls from the lines as his mistresses, yet there will be none to dispute his action or authority. It is only at sometimes when the manager’s cruelty surpasses all bounds that the laborers set upon him and assault him. Had it not been for the fear of Britishers and the guns and pistol they possess, and the fact that of their beck and call all the constabulary and magistracy of the district would come over there and punish the laborers, rioting would have occurred pretty frequently in these small dominions” (SINGH 2006: 16).

Figure 5. Bucket with collected young leaves from the tea garden. Photograph by Gautam Singh.

Additionally, the lack of proper sanitation had led to the rise of heaps of sludge and filth around the colonies. In these colonies, the human discharges were deposited near houses. These low living conditions resulted in the outbreak of various epidemics, among which cholera was a predominant one. A major cause for the spread of cholera was the dumping of fecal discharges of cholera patients into water systems. Hence, cholera had been the major cause of death in regions where tea was cultivated. The disease persisted in these gardens due to different situations. For example, a man who had carried his sister’s dead body to bury it, having been a victim of cholera, had then himself proved to be infected with cholera and died. Soon after, a deadly epidemic would cause and result in a large number of deaths (BRYDEN1869: vii; SMITH 1870:25).

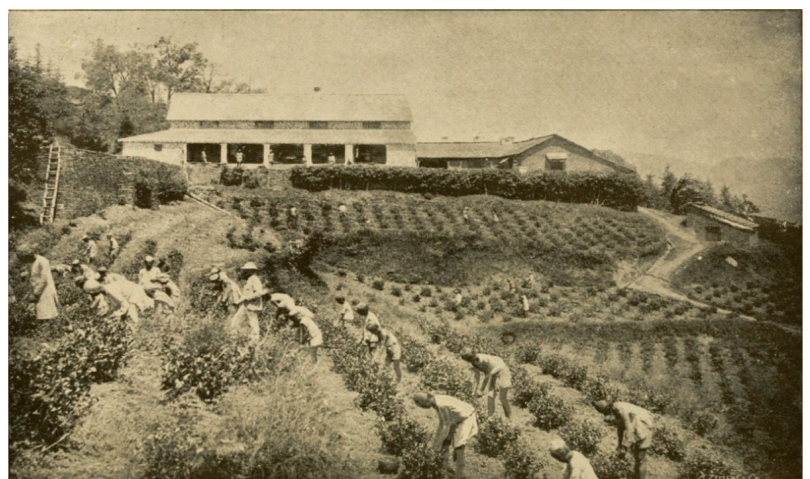


Figure 6. Laborers picking tea leaves from Tea Gardens.

The Terai Plains in the state of Assam were among the first tea gardens where cholera cases were identified. The cause for the disease outbreak was associated with the circulation of cholera-infected laborers from the bazars of Terai into the tea gardens. Thus, rather than finding protection from disease in those gardens, as they were thought to be healthier places, the laborers' mobility contributed to spread of cholera in those green areas. Later on, in 1886, other gardens like Chargola, Kalain, Kurkurie, Cachar etc. were infected with cholera, many of them located in Assam (COATES 1875: 11, DAVIDSON 1892:432).

As mentioned, laborers at Cachar's tea garden similarly became victims of cholera. The Cachar hills were turned into tea gardens in 1855-56 and soon the whole region became famous for tea cultivation. As the tea plantation was so extensive, the local labor force proved to be insufficient. So, the need for employing people from other regions arose and it attracted many native people from surrounding areas to migrate to the Cachar district in search for employment. These laborers came from Madhya Pardesh, Madras, and Bengal, which were impoverished areas. They initially joined the tea gardens with a contract of three to four years. The climatic conditions of the Assam region were quite favorable for growing tea, but the elevated temperature and highly moist atmosphere made it difficult for laborers to live a healthy life. Furthermore, the overcrowded houses lacking proper sanitary conditions led to the spread of cholera and hence affected tea cultivation (SINGH 2006:3-13). This particular tea garden became very important for the history of medicine as it was one of the major places in India where cholera vaccines were administered to infected people.

Some other regions that also suffered from cholera outbreaks are presented in Table 1.

Table 1. Observation made by M. Haffkine from March 1894 to July 1895, in the tea Gardens of Assam, India (FERNANDEZ 1895:174-175; HAFFKINE 1895:11).

	Garden	Cholera Cases after inoculation
1	Chargola garden	4
3	Karkurie tea garden	6
4	Kalacheerra tea garden	2
5	Pallabund tea garden	2
6	Degubber tea garden	2
7	Adam tila tea garden	2
8	Lungla tea garden	3
9	Burnie Braes garden	3
10	Loobacherra garden	4
11	Kalaincherra garden	2
12	Cachar garden	8

Providing suitable sanitary conditions at religious gatherings was definitely another challenge that the British Government had to face. Pilgrims from infected gardens also travelled to holy places. Therefore, the provincial administration was called to take necessary action so as to provide appropriate sanitary conditions; to prevent the outbreak of cholera epidemic, precautionary measures should also be adopted to remove the accumulated filth on daily basis (Great Britain, 1868:2).

Cholera treatments

Gardens have traditionally been considered as places of psychological relief and have served to enhance the beauty of the environment. During the early modern time period, gardens were further explored as places where scientific experiments and medical practices were performed (CURTIS 1778, 10-12; HICKMAN 2014: 229-247). Tea gardens in India were used as places where, besides the production of tea, trials of cholera treatments were carried out.

Amidst these treatments, there were experiments with domestic medicines made from herbs, flowers and shrubs, so as to overcome the symptoms of cholera. Cholera pills consisted of Assafoetida, black pepper, and opium. A few of them were preferred and they consisted of cayenne pepper, opium, and Ipecacuanha (BELLEW, 1885: 72). The use of mineral lemonade and castor oil were also tested by different physicians, but the results were unfavorable and the patients suffered from continuous fever along with other persisting symptoms of cholera. Other recommendations included the treatment with camphor, kitchen salt in water, laurel water, etc., garlic, warm baths, cinnamon oil and opium grains (BROCKETT 1866:228-236).

Though some of these remedies were considered by physicians as being effective, they still could not manage to control the epidemic and an alarming number of cholera cases occurred. Hence, besides the remedies, and due to the alarming situation of the laborers in tea gardens, the cholera inoculations were tested in various tea gardens of the state of Assam. The first dose of vaccines was inoculated in the beginning of 1895 and a second dose was administered in the middle of that year (THE BRITISH MEDICAL JOURNAL 1895:736-738). During the period of time that separated these two vaccinations, 14 cases of cholera occurred in Kurkurie garden, of which most cholera patients were those who had moved to the inoculated garden in search for employment over this period of time and had come in contact with the disease upon the first 14 days of their arrival. Following the government's decision, the infected laborers of the Cachar tea gardens were also advised to receive cholera vaccines on an experimental basis. As a result, the inoculations of the cholera vaccine helped reduce the disease's mortality and only 8 fatal victims were recorded. Similarly, the Kalain tea gardens were also inoculated, a fact which helped reduce the mortality rate (BRITISH MEDICAL JOURNAL 1900:587).

Increasing cases of cholera in the Indian subcontinent also invited scientists from other parts of the world to test the effectiveness of cholera vaccines in order to control cholera outbreaks. Several trials for the cholera vaccine were conducted in Kolkata and other cholera prevalent areas in India, from 1893 to 1896 (ARTENSTEIN 2009: 91).

During this time period, a Russian scientist, Dr. Waldermar Haffkine (1860-1930)¹ focused his study on the cholera vaccine and tested it in the tea gardens of India (GERMANIER 1984: 15). On 18th 1892, he was working on an attenuated form of the bacillus (*V. Cholerae*) and also performed his first test on humans. In 1894, he vaccinated 116 out of 200 people living in a cholera-prone slum of Kolkata (NAIR and TAKEDA 2014: 51; PLOTKIN 2011: 5). The inhabitants who were inoculated showed resistance to the cholera attack in the season following the completion of the vaccination process. In 1894-1895, approximately 20,000 people were vaccinated

1 Waldermar Haffkine, born on March 15th, 1860, in Odessa, Russia was the son of a Jewish School Master and received his early education in Berdiansk. He earned his degree in Natural sciences. Later, he joined Pasteur's laboratory and investigated the treatment of cholera.

in the tea gardens of Assam (HAWGOOD 2007:11-12). When comparing, the mortality rate among non-vaccinated groups ranged from 22 to 45 %, whereas the one among vaccinated groups was only 2%. He returned to India and, in 1896, restarted his cholera vaccine trial with 30,000 people over a period of seven months (KOHN 2007: 400).

A second attempt to treat cholera was made in March 1927. At that time, the political turmoil in the country was the major hurdle. Gandhi's movement of "Satyagraha" (holding fast to the truth) took a more critical direction and local inhabitants who were strong followers of Gandhi started boycotting British goods and other activities. The British Government responded in a reciprocate manner, a fact which further aggravated the chaos within the community. Such conditions worsened the scientific investigation of the cholera disease and its cure by foreign doctors and scientists. One of the prominent names among these doctors is the one of D' Herelle², who selected the region of Punjab, notorious for cholera endemics, to do his field studies. Due to the political context, D'Herelle opted for field studies and joined two other physicians: Major Reginald Malone and Dr. M. N. Lahiri. They carried out pilot-experiments in the field. The study was based on the impact of anticholera ampoules which were distributed among the villagers to investigate their effect in combating the disease. During this research, data of about 198 patients was collected, 74 of which were treated with the ampoules. The results were highly surprising and the mortality rate among the treated patients dropped to 8% while it was still quite high in untreated patients (63%) (D'HERELLE 1930: 1-32).

Thus, the tea gardens of Assam also served as field laboratories, where trials of cholera vaccination were successfully carried out and cholera was controlled to a major extent.

Conclusion

Tea Gardens in India were primarily meant for the cultivation of tea and its export, but during the nineteenth century, cholera epidemics turned them into the home base for a disease that led to a high number of deaths. Cholera was considered as one of the most life-threatening diseases of that time, and it was assumed that India was the "homeland of cholera". The epidemic not only intimidated the communities but it also isolated individuals or even families from the rest of society. Water contaminated due to lack of well-organized municipal supplies among communities living in tea gardens was one of the prime factors for the spread of cholera. This paper has thus described another perspective of gardens in which they are not considered as a mere source of aesthetics, relief and therapy but it can also turn into a place of stress and disease. These disease gardens can provide an opportunity to scientists to perform scientific trials. Hence, in the case of the tea gardens of India, the scientists experimented laboratory generated vaccines to cure the patients affected by cholera.

References

"Inoculations against cholera in India" (1895) *The British Medical Journal*, V. 2, pp. 735-739.

Report of the Army Medical Department (1882), Great Britain, n/r

ADEVI, Anna, MARTENSSON, Fredrika (2013) "Stress rehabilitation through garden therapy: The garden as a place in the recovery from stress", *Urban Forestry & Urban Greening*, V. 12, N. 2, pp. 230.

2 Félix d' Hérelle, was born in 1873, Montreal, Canada. He was a famous microbiologist who is well known due to the discovery of the bacteriophage (a virus that attacks bacteria).

- ALLAN, B.C. (1905) *Assam District Gazetteers*, V. I, Calcutta: Cachar.
- ARTENSTEIN, Andrew (2009) *Vaccines: A Biography*, New York: Springer Science & Business Media Publisher.
- BAILDON, Samuel (1882) *The tea Industry in India*, London: W.H. Allen & Co.
- BALDASSARI, Fabrizio and OANA Matei (2017) "Gardens as laboratories: the History of botany through the history of gardens", *Journal of early modern sciences*, V. 6, N. 1, pp. 9-19.
- BALY, William and GULL, William (1854) *Report on the cause and mode of diffusion of epidemic cholera*, London: John Churchill.
- BARUA, Dhiman and GREENOUGH, William (2013), *Cholera*, New York: Springer Science & Business Media LLC.
- BELLEW, Walter (1885) *The history of cholera in India from 1862 to 1881: being a descriptive and statistical account of the disease*, London: Princeton University, Truener Publisher.
- BOSE, Sudhindra (1916) *Some aspects of British rule in India*. Doctoral thesis, Iowa: State University of Iowa.
- BRANSTEN, M.J. (1860) *Report upon the present condition and future prospects of tea cultivation in the North West provinces and in the Punjab*, Calcutta, n/r, pp.16-32.
- BRITISH MEDICAL ASSOCIATION (1900) *British Medical Journal*, V. 1, N. 2045, pp. 587.
- BRITTON, Nathaniel (1896) "Botanical gardens", *Bullet of the torrey botanical club*, V. 9, pp. 331.
- BROCKETT, Pierpont (1866) *Asiatic cholera: its origin, history and progress, over two hundred years, and the devastations it has caused in the east and west; its ravages in Europe and America in 1831-2, in 1848-9, in 1854-5, and in 1865-6*, Hartford: L. Stebbins.
- BRYDEN, J. (1869) *A report on the cholera of 1866-68 and its relation to the cholera of previous epidemics*. Calcutta: Office of the superintendent of the Government printing .
- CHRYSTAL, Paul (2014) *Tea: A very British Beverage*. London: Amberley Publishing.
- COATES, M.J. (1875) *Report of the sanitary commissioner for Bengal for the year 1874*, Calcutta: Bengal Secretariat Press.
- CONAN, Michel (2007) *Contemporary garden aesthetics, creations and interpretations*, Washington: Harvard University Press.
- CURTIS, William (1778) *Proposals for opening by subscription, a botanic garden to be called the London botanic garden*, London: Talbot-Court Grace Burch-street
- HERELLE, Felix d', MALONE, Reginald Hampstead, LAHIRI, Mahendra Nath (1930) "Studies on Asiatic Cholera", *Indian Medical Research Memoirs*, N.14, pp. 1-61.
- DAVIDSON, Augustus (1892) *Europe, northern and western Asia, India, Ceylon, Burma*, New York: Y.J. Pentland publisher.
- DUNCAN, John (2016) "Observing climate impacts on tea yields in Assam", *India Applied Geography*, V. 77, pp. 64-71.
- FARUQUE, Shah and NAIR, Balakrish (2008) *Vibrio Cholerae: Genomics and Molecular Biology*, Wymondham: Caister Academic.
- FERNANDEZ, Lawrence (1895), *The Medical Reporter: A Record of Medicine, Surgery, Public Health and of General Medical Intelligence*, V. VI, Calcutta: Medical Publishing Press.
- GARNIER, Jean (1878), *Catalogue méthodique de la bibliothèque communale de la ville d'Amiens* by J.J.B.A. Garnier, New York: Oxford University Press.
- GERMANIER, Rene (1984), *Bacterial vaccines*, Orlando: Academic Press Elsevier.

- GUGGENHEIM, Michel and SÖDERSTRÖM, Ola (2009), *Re-shaping Cities: How Global Mobility Transforms Architecture and Urban Form*, New York: Taylor & Francis.
- HAFFKINE, Waldemar (1895), *Anti-cholera inoculation*, Calcutta: Thacker, Spink, & Company.
- HAUSER, Isaiah (1890) *Its origin, cultivation, manufacture and use*, New York: Rand, McNally and company publishers
- HAWGOOD, B. J. (2007), “Waldemar Mordecai Haffkine, CIE (1860–1930): prophylactic vaccination against cholera and bubonic plague in British India”, *Journal of medical biography*, V. 15, pp. 9-19.
- HICKMAN, C. (2014), “The garden as a laboratory: the role of domestic gardens as places of scientific exploration in the long 18th century”, *Post-Medieval Archaeology*, V. 48, pp. 229–247.
- THOS, Key and GEO, (1931) “Tindall Broadsheet warning about Indian cholera symptoms and recommending remedies”, London: Tindall, Church wardens.
- HUI et al. (2004) *Handbook of food and beverage fermentation technology*, New York: Marcel Dekker, Inc.
- INDIA [GOVERNMENT] (1855) *The law relating to India and East India Company; with notes and appendix*, London: WM H. Allen & Co.
- JAMESON James, (1820) “Reports on the epidemic cholera morbus, As it visited the territories subject to the presidency of Bengal in the years of 1817, 1818 and 1819”, *The Government Gazette Press*, n/r.
- JIANG, Shan (2014) “Therapeutic landscapes and healing gardens: A review of Chinese literature in relation to the studies in western countries”, *Frontiers of architectural Research*, V. 3, pp.141.
- JONES, Melvyn (2004) *The Making of Sheffield*, Barnsley: Wharnccliffe Books, Barnsley, UK.
- KARSH, Efraim (2013) *Islamic Imperialism*, New Haven: Yale University Press.
- KHOSLA, S. N. (2006) *Digestive System And Liver Ailments (All You Should Know About)*, New Delhi: Peacock Books.
- KOHN, George (2007) *Encyclopedia of Plague and Pestilence: From Ancient Times to the Present*, New York: Facts On File.
- LAWS, Edward (2017) *Aquatic Pollution: An Introductory Text*, New York: John Wiley & Sons, Inc.
- LEDERBERG, Joshua and DAVIS, Jonathan (2001) *Emerging Infectious Diseases from the Global to the Local Perspective: Workshop Summary*, Washington: National Academies Press.
- MARTINEAU, Harriet (1857) *British rule in India*, London: Smith, Elder & Co.
- MENON, Jisha (2013) *The Performance of Nationalism: India, Pakistan, and the Memory of Partition*, New York: Cambridge University Press.
- MESSENGER, Charles (2013), *Reader's Guide to Military History*, London: Taylor & Francis Publisher Group.
- MUSHTAQ, Muhammad (2009) “Public Health in British India: A Brief Account of the History of Medical Services and Disease Prevention in Colonial India”, *Indian journal of community medicine: official publication of Indian Association of Preventive & Social Medicine*, V. 34, N. 1.
- NAIR, Balakrish and TAKEDA, Yoshifumi (2014) “Cholera Outbreaks”, *Current Topics in Microbiology and Immunology*, Berlin: Springer-Verlag, V. 379.
- PENUEL, Bradley and STATLER, Matt (2011) *Encyclopedia of Disaster Relief*, California: Sage Publications.
- PETERS, Stephanie (1965) *Cholera: Curse of the nineteenth century*, New York: Benchmark books Marshall Cavendish.
- PLOTKIN, Stanley (2011) *History of Vaccine Development*, New York: Springer publisher.
- PODOLSKY, Scott (2014), *The Antibiotic Era: Reform, Resistance, and the Pursuit of a Rational Therapeutics*, Baltimore: Johns Hopkins University Press.

- RAMAMURTHY, T and BHATTACHARYA, S. K. (2010) *Epidemiological and Molecular Aspects on Cholera*, New York: Springer.
- RICHARDSON, Beth (1998) *Gardening with children*, Connecticut: Taunton Press.
- RIZWI, S.N.H. (1970), *East Pakistan District Gazetteers: Chittagong*, Virginia: University of Virginia-East Pakistan Government Press.
- ROGERS, Kara (2011) *Infectious Diseases*, New York: Britannica Educational Pub.
- CHOWDHURY, Anurag et al. (2015) "Inventory of shade trees in tea gardens of sub-Himalayans region of West Bengal", *The international journal of science and technology*, V. 3, N. 12, pp. 164-168.
- SCHOFIELD, Victoria (2010) *Kashmir in Conflict: India, Pakistan and the Unending War*, London: I.B.Tauris.
- SELENDY, Janine (2011) *Water and Sanitation Related Diseases and the Environment: Challenges, Interventions and Preventive Measures*, New York: John Wiley & Sons, Inc.
- SINGH, Shyam Narain et al. (2006) *Socio-economic and political problems of tea garden workers: A study of Assam*, New Delhi: A Mittal publications.
- SMITH, David (1870) *Report of the sanitary commissioner for Bengal, for the year 1869-70*, Calcutta: Bengal secretariat office.
- SOSA, Anibal and BYARUGABA, Denis (2009) *Antimicrobial Resistance in Developing Countries*, New York: Springer Science & Business Media.
- STILLE, Alfred (1885) *Cholera, its origin, history, causation, symptoms, lesions, prevention and treatment*, Philadelphia: Lea Brothers & Co.
- TALBOT, Ian (2007) "A Tale of Two Cities: The Aftermath of Partition for Lahore and Amritsar 1947–1957", *Modern Asian Studies*, V. 41, pp. 151-185.
- THAPAR, Romila (1978) *Ancient Indian Social History: Some Interpretations*, India: Orient BlackSwan publisher.
- THAPAR, Romila (2004) *Early India: From the Origins to AD 1300*, Berkeley: University of California Press.
- THOMAS, Amanda (2009) *The Lambeth Cholera Outbreak of 1848–1849: The Setting, Causes, Course and Aftermath of an Epidemic in London*, North Carolina: McFarland & Company Inc., Publishers.
- THOMPSON, E. et al. (1999) *History of British Rule in India*, New Delhi: Atlantic Publishers & Distributors Limited.
- TIMMRECK, Thomas (2002) *An Introduction to Epidemiology*, London: Jones and Bartlett Publishers.
- VARMA, Nitin (2007) "Chargola Exodus and Collective Action in the Colonial Tea Plantations of Assam", *Sephis*, V. 3, N. 2, p. 1.
- WISNER, Ben, ADAMS, John (2002), *Environmental Health in Emergencies and Disasters: A Practical Guide*, Albany World Health Organization Ann Arbor: Michigan ProQuest.