Between the Carlo R. and the Orleannais: public health and maritime prophylaxis in the description of two cases of ships transporting immigrants arriving in the port of Rio de Janeiro, 1893-1907

Fernanda Rebelo

Professor in the Bacharelado Interdisciplinar em Saúde/Instituto de Humanidades, Artes e Ciências Professor Milton Santos/ Universidade Federal da Bahia.
Ondina Campus
Rua Barão de Jeremoabo, PAF IV
40170-115 – Salvador – BA – Brazil

feferebelo@yahoo.com.br

Received for publication in May 2011.

Approved for publication in March 2012.

Translated by Naomi Suttcliffe de Moraes.

REBELO, Fernanda. Between the Carlo R. and the Orleannais: public health and maritime prophylaxis in the description of two cases of ships transporting immigrants arriving in the port of Rio de Janeiro, 1893-1907. *História, Ciências, Saúde – Manguinhos*, Rio de Janeiro. Disponível em: http://www.scielo.br/hcsm.

Abstract

We address the changes in Brazilian maritime prophylaxis by studying two cases of immigrant ships arriving at the port of Rio de Janeiro with epidemics onboard. The objective is to understand the etiology, means of prevention and methods used to combat the three diseases subject to international port regulations: yellow fever, bubonic plague and cholera. Until the late nineteenth century, quarantines were one of the main disease prevention practices. In the early twentieth century, microbiology and the concept of vectors in ports sanitation services emerged. Quarantines, which were already being criticized as antiquated and ineffective, were limited to a few cases, and new hygiene methods and technologies began to be applied in port sanitary defense.

Keywords: immigration; ports; public health; history; Brazil.

> The overloaded steamship Carlo R. leaving cholera morbus victims in its wake, makes us think of a fantastic horror story, which even Dante himself did not describe in his infernal circles: it reminds us of the legend of Ashaverus, the wandering Jew, who left death behind him wherever he went (Brasil, 1895, p.10).[1]

By 1892, cholera had already invaded several European countries, spread across France, crossed the Atlantic Ocean and begun to move inland in the United States. The steamships, especially those that crossed the ocean packed with immigrants, were the focus of the public health authorities' attention. These ships, which crossed the ocean leaving passengers dying from cholera in their wake, in the words of the Inspector-General of Health for Brazilian Ports, Doctor José da Silveira, gave the impression that they were the principal cause of the pandemic, because they carried the disease with them from port to port.

The migratory flow increased in the last quarter of the nineteenth century, reaching its peak in the first decades of the following century. Between 1881 and 1915, about 31 million Europeans immigrated to the Americas. Technological renewal, which provided faster, cheaper means of communication and transport, such as steamships, telegraph cables and railways, were decisive in this great wave of transatlantic migration. From that point on, immigration became part of the general circulation of merchandise, labor and capital (Klein, 2000, p.23-25; Leite, 2000, p.184-186).

In the 1850s, transport between continents was provided by sailing vessels weighing two hundred to four hundred metric tons, with a capacity of one hundred to two hundred passengers. The era of mass migration was, chiefly, that of the steamships, the ships that replaced sailing vessels beginning in the 1870s. Steamships shortened the travel time between Europe and America considerably. While sailing ships took, on average, six weeks to cross from Lisbon to Rio de Janeiro, steamships took only three. When the voyage was made without stopping, the trip could be shortened to two weeks (Leite, 2000, p.188).

For the passengers, the advantage of the steamships was not just the shorter travel time, but also their regularity and predictability. The immigrants almost always traveled on ships managed by large shipping companies with postal service contracts, and thus obligated to follow schedules. In contrast, both departure dates and travel time varied for sailing ships. Longer and of uncertain duration, these voyages were subject to all sorts of problems, including the physical resistance of the passengers and food storage. Since the steamships were predictable, they reduced waiting time, physical wear and health risks (Leite, 2000).

However, by accelerating voyages, the steamships intensified the circulation of microorganisms among different communities. Epidemics and pandemics became more frequent, and the control of microbes became inseparable from the monitoring of individuals. The diseases threatened the development of the capitalist economy, since they attacked the labor leaving Europe for America. Additionally, they harmed free trade with the imposition of preventive measures such as quarantines and disinfection of ships, baggage, merchandise and passengers in the ports of call and destination ports (Cueto, 2007, p.27-34; Löwy, 2006, p.15-19; Stern, Markel, 2004, p.1474).

Most ships carrying immigrants, traveling as third-class passengers[2], were English. The Royal Mail Steam Packet Company, the first to establish regular steamship service between England and Brazil, in 1851, was one of the most important companies making the Europe-Brazil-Rio da Prata voyage, transporting workers from Europe to the Americas (Benchimol, 1992, p.48). Starting in London, they stopped at many ports, including Southampton, Cherbourg, Vigo, Lisbon, Madeira and other European cities, before arriving in the final destination in South America. In Brazil, ships stopped in three ports before arriving in Santos: Recife, Salvador and Rio de Janeiro. People from all over the world boarded and left the ships at each stop.

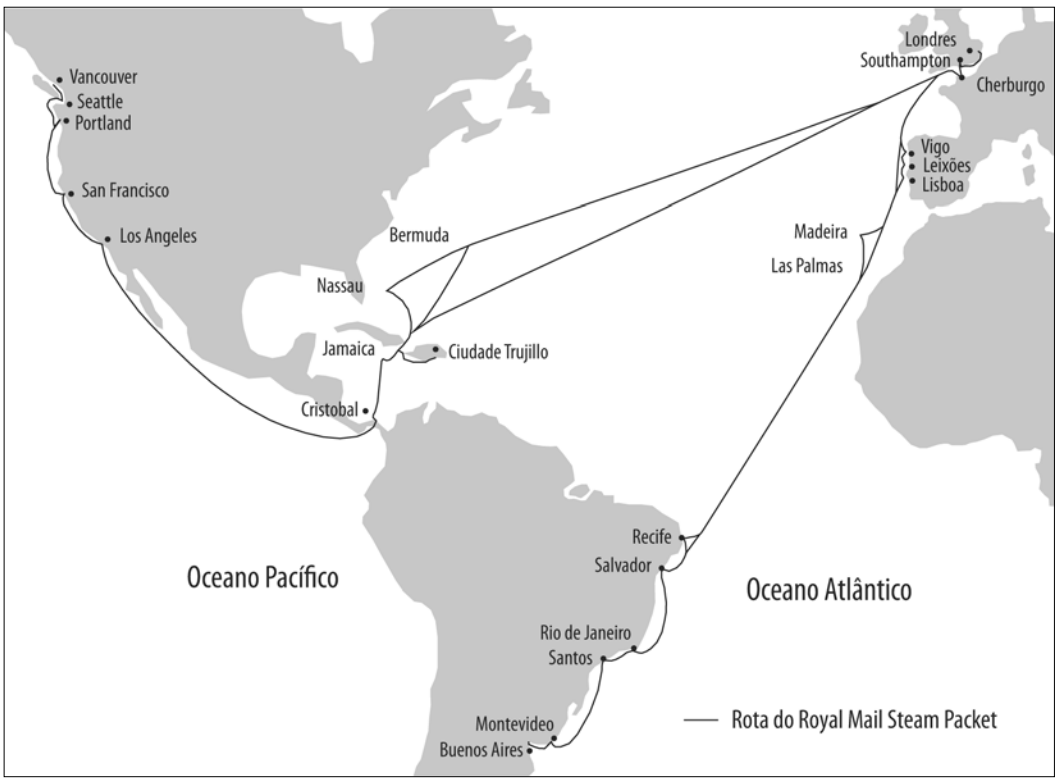

Figure 1: Royal Mail Steam Packet Company Route (Arquivo Iconográfico do Memorial do Imigrante, São Paulo)

Even though the etiologies of diseases were not well known in the nineteenth century, people did know that some were transmittable, linked to people being in contact in a closed area and 'poor hygiene.' It was also known that certain diseases were prevalent in some places, such as the bubonic plague in Asia and yellow fever in the Caribbean, and that they could become epidemics due to communication between communities (Weindling, 1995).

In Europe, epidemics likes measles and scarlet fever tended to stabilize on their own, occasionally appearing in new generations. The circulation of infections between continents then established a new classification for diseases: those from abroad were called exotic diseases. Normally, they spread from the port and cities inland, with high mortality rates (Porter, 1999, p.48, 58).

Migration required standardization of transoceanic and port areas, based on the understanding of disease etiology and forms of transmission. Maritime preventive measures were directly related to the scientific assumptions adopted by the professionals in the port hygiene services.

The objective of this article is to analyze how plague, cholera and yellow fever transmission processes were believed to work, and how epidemics were fought by the public health authorities in the port of Rio de Janeiro. It highlights the changes and continuities in sanitary theories and practices applied to the prevention of these diseases, which arrived onboard ships together with the flow of merchandise and passengers. As a methodological resource, it uses the description of two cases of ships carrying immigrants that arrived in the port of Rio de Janeiro with epidemics onboard: the Carlo R. in 1893 and the Orleannais in 1907.

The turning back of the steamship Carlo R. (1893)

In April 1893, Brazilian diplomatic missions abroad began to send official warnings about the spread of cholera via European ports to the office of Interior Minister Fernando Lobo Leite Pereira, in Rio de Janeiro (Documentos..., 1892-1897). The immigrant ships coming from Europe should only be admitted to Brazilian ports after sanitary 'treatment': disinfection of the vessel, baggage, clothing and passengers' other personal belongings using chemicals or water vapor. This sanitary treatment was performed at the Ilha Grande Lazaretto, in Abraão Cove, Angra dos Reis, a municipality to the south of the city of Rio de Janeiro. That is where ships were sent when the port health service identified suspected or confirmed cases of illness onboard (Documentos..., abr. 1893).

With the resurgence of the epidemic in Europe, the Brazilian government suspended the wave of immigration, refusing immigrants transported in steamships coming from Italy and Spain after August 16, 1893. All French Mediterranean and African ports were declared "infected." A quarantine was imposed on all "vessels infected or suspected infected" with cholera, and the situation returned to normal only at the beginning of 1894, with immigration from locations considered free of the epidemic once again allowed (Brasil, 1895, p.3-7, 1896, p.69).

The nineteenth century's fifth cholera epidemic, from 1881 to 1896 divided the opinions of the sanitation officials in the federal capital. The director of municipal hygiene, Doctor José de Souza Lima, advocated the complete interruption of communication with the state of São Paulo, in which cases of 'lethal diarrhea' had appeared at the beginning of August in the Hospedaria de Imigrantes (Immigrant Boarding House). José da Silveira, port health inspector, held the same opinion. However, the head of the Sanitary Board, Francisco Castro, disagreed with the sanitary blockade that prevented entrance into Rio de Janeiro by land and sea, preferring disinfection, without hindering the free movement of people (Benchimol, 1999, p.251, 252).[3]

Among the preventive and defensive measures used by the Inspector General of Health of the Ports of Brazil was 'turning away' vessels[4], that is, the forced return of the ship to its port of origin. It was used in extreme cases, when there was a large number of sick and dead

onboard. This was the case of the Carlo R., a steamship with Italian immigrants that arrived at the port of Rio de Janeiro in September, 1893, with an outbreak of cholera onboard.

The Carlo R. sailed from Genoa on July 27. In Naples, 1,300 immigrants boarded, and it then continued on July 29 towards the Brazilian capital. The first death occurred on July 31. Instead of returning to the lazaretto in Naples, where patients could receive treatment, the captain continued the voyage, informing the Brazilian authorities that the cases were not cholera, but rather gastroenteritis. During the more than twenty days of travel, other deaths occurred. As the steamship was small, there was no place to isolate patients. Upon arriving at the Ilha Grande lazaretto, on August 24, the captain said that there were more than a hundred dead aboard. According to the Port Inspector-General of Health, there might have been more dead and sick, as the ship 'reeked' (Brasil, 1895, p.8-12).

> Last night we received the following letter: the tugboat Victoria, carrying coal, food, medicines and more aid to the Italian steamship Carlo R., only left the capital for Ilha Grande yesterday at 2:20 in the afternoon. Naturally, the tugboat will only arrive at night and can supply the steamship, awaiting in the Palmas cove since the evening of the 24th, with everything... Some of those sick with cholera have died, and their bodies were thrown overboard. Now, we will see what result from that steamship remaining in the cove for such a long time. We pray that the corpses of the cholera-stricken do not wash ashore (Jornal..., 29 ago. 1893, p.1).

The people, the authorities and the press were unanimous in their desire to see the steamship leave Brazilian waters as soon as possible, with no communication with the port, meaning that no one could embark or disembark, although this measure was not very humanitarian. Cholera inspired immense terror and was known for its lethality[5], as in less than a year it had decimated European, Asian and African ports.

When Carlo R. left Naples on July 29th, that port was not yet considered infected. The notice banning ships from ports infected or suspected to be infected with cholera was dated August 16. So, when the notice was published, the Carlo R. was on the high seas. Brazilian consular authorities continuously sent telegrams containing news on the health status of ports and cities abroad. Furthermore, according to international port regulations, the captain was obligated to provide voyage information to the ports of call and the final destination port. So, the Brazilian government soon learned of the arrival of the ship, coming from an infected European port with sick passengers onboard.

The captain followed the regulations and sent information about the disease onboard, but claimed that it was normal diarrhea, gastroenteritis, and not cholera. This omission or mistake cost the lives of hundreds of passengers.

As the steamship came from an 'infected port' and had sick passengers onboard, according to the 1889 health regulations it was banned from docking in Rio de Janeiro, and was therefore directed to the lazaretto on Ilha Grande. There the vessel would be sanitized, healthy passengers would be quarantined, and the sick would remain there for treatment (Brasil, 22 ago. 1889).

The Carlo R. was carrying over 1,400 immigrants, and 109 died during the voyage. There were still sick passengers onboard, and at the time of its arrival, three or four more steamships with immigrants were expected from Italy (Gazeta..., 27 ago. 1893, p.1).

The Ilha Grande lazaretto was not prepared to receive this influx of people. Therefore, as soon as the Carlo R. reached Abraão cove, it was ordered to cast anchor at a distance of three miles from the coast, where it would be unable to communicate with the mainland. The situation seemed so complicated, that the Vice-President of Brazil himself[6], Floriano Peixoto, in the middle of the Armada Revolt, sent telegrams to Ilha Grande, ordering that the steamship be forced leave Brazilian waters and that the other immigrant ships coming from Italy not be allowed to land and communicate with the mainland. The same notice was forwarded to the authorities of other Brazilian states:

> The Carlo R. was ordered to leave and will do so today, as soon as the supplies – which should leave here this morning – arrive. The Carlo R. is being escorted by the República. To replace it, the Lamego should travel to Ilha Grande. We advise the authorities to follow the order, no matter how inhumane it appears (Gazeta..., 27 ago. 1893, p.1).

Thus a cruiser[7], the República, and a tugboat[8], the Lamego, belonging to the Brazilian Navy, were tasked with leading the Carlo R. to Ilha Grande a few days before the second Armada Revolt, which erupted in Guanabara Bay on September 6, 1893. This demonstrates the special nature of the case and the terror that the presence of a ship with cholera near the city of Rio de Janeiro invoked in the community and in the authorities.

When the steamship entered the harbor at Ilha Grande, the director of the lazaretto, José da Silva Joaquim Sardinha, interrogated the captain, as was routine. Even from a great distance, he was "unpleasantly impressed with the nauseating smell coming from the steamship." Also impressed by the sickly appearance of the passengers and crew, he asked the captain if there was cholera onboard. He was told that there were only cases of "serious cholerine,"[9] but that more than one hundred passengers had died. The director of the lazaretto then ordered the ship to continue toward Palmas cove, also in Angra dos Reis bay, where it would be entirely isolated and guarded by the cruiser República, which had an assistant physician from the lazaretto aboard (Gazeta... 28 ago. 1893, p.1).

The Interior Minister, Fernando Lobo, and the Port Inspector-General of Health, José da Silveira, said that they were on their way, but a thunderstorm delayed the trip and they only arrived on the island the next day, August 25. It was decided that the ship would not be received, "and that they would be provided with everything they would need onboard." The captain asked for a hundred tons of coal, 15 live steers, wheat flour, vegetables, fruits, a large amount of disinfectant, medicine and especially "laudanum, a preparation of opium with sedative effect" (Gazeta..., 28 ago. 1893 p.1; Brasil, 1895, p.8-12).

The material left the port of Rio de Janeiro on the 28th, in a large sloop towed by the Victória; when it arrived at the lazaretto, it was sent to Palmas cove, where it anchored so the crew of the Carlo R. could remove the supplies. After the delivery, the sloop was burned (Gazeta..., 28 ago. 1893, p.1).

When the Carlo R. arrived at the lazaretto, there were three cadavers onboard, and the other one hundred and six had been thrown overboard – according to the newspaper *Gazeta de Notícias* (28 ago. 1893, p.1), during the journey from the port of Rio de Janeiro to Ilha Grande – and 16 passengers were sick.

On August 30, six days after anchoring in Brazilian waters, the steamship began the return journey to Italy, escorted for some time by the República. However, the disruptions in the city did not end there, nor did the people's fear cease.

On the morning of the 31st, the chief of Police Station 19 was hastily summoned to examine a corpse on Copacabana beach; residents and fishermen, terrified, suspected that it was one of the dead thrown overboard by the Italian ship. The police chief immediately asked the Directorate of Municipal Hygiene to immediately remove the cadaver with the necessary antiseptic precautions. At five o'clock in the afternoon it still lay on Copacabana beach, without any action having been taken. Exasperated, the police chief ordered Doctor Souza Lima, Director of Municipal Hygiene, to move the corpse to the cemetery (Gazeta..., 31 ago. 1893, p.1).

A rumor began circulating that the Carlo R. had not really left Ilha Grande on the 30th, as reported. The interior minister asked the Navy to reiterate the order that the República escort the ship far away from Brazil as soon as possible. Souza Lima, in turn, asked the police chief to inform him immediately if another cadaver washed up on the coast, believing it "possible, though not likely" that it was a victim of cholera thrown overboard the Carlo R. that "is still there, I'm not sure why, and a tremendous threat to our capital, which is at risk of repaying our generosity, indulgence, weakness, or similar with a horrible hecatomb" (Gazeta..., 1 set. 1893, p.1).

On September 2, the locals sighed in relief at the news that the steamship had at last left Palmas cove. However, residents of other nearby communities panicked. At dawn, a corpse "in an advanced state of putrefaction" appeared, floating near the Itaipu beach in Niterói. The police chief reported the case to the Director of Public Services, Doctor Francisco Tavarez, who ordered the corpse removed (Gazeta..., 2 set. 1893, p.1).[10]

The Carlo R. was forbidden to dock, without even going through the routine procedures: disinfection and quarantine at the lazaretto. It was ordered to turn back. This procedure was adopted when there was a large number of sick and dead passengers onboard. Thus, immigrants soon experienced the terror of remaining another month on a ship suffering from an epidemic. Many more deaths occurred on the return voyage. The Port Inspector-General of Health, Mr. José de Souza da Silveira (Brasil, 1895, p.9), justified this in the following terms:

> It may seem, at first glance, to those who do not study the measures with close attention and the necessary criteria, that the government and health authorities' extreme rigor in relation to the steamships mentioned above were acts of inhumanity, of true vandalism, contrary to the principles of brotherhood and which violate human rights; but those who have seen one of these ships transporting immigrants, especially the Italian vessels, true 'floating morgues' during epidemics, agree that the authorities responsible for ensuring public health could act in no other way (emphasis in the original).

The turning away of the "floating morgues" generated unease among the public health authorities and the community. The case of the Carlo R., as well as those of three other Italian steamships that arrived during this period in the same situation, reverberated in the capital's major newspapers[11] and was seen by the local communities and by the Italian authorities as an inhumane act by the Brazilian government.

The fact generated diplomatic disagreements. The largest exporter of labor to Brazil, Italy made a point of citing the event a year later, when discussing health legislation related to immigration during the Nineth International Sanitary Conference.[12]

On September 6, 1893, nearly fifteen days after the arrival of the ship at the port of Rio de Janeiro, a final report published by the local press revealed another perspective on the Carlo R. case:

> A trustworthy gentleman writes to us from Bananal: "on the 3rd, an Italian claiming to have been a passenger on the Carlo R. appeared on the farm of Dr. Pinto Torres, in the Capitão Mor neighborhood, in the municipality of Bananal; he claimed to have disembarked along with other companions upon payment of a pound sterling.[13] He told of the horrors he had suffered onboard with cholera morbus. He disembarked in Angra dos Reis and suffered from lack of food while making his way through the forests inland. Dr. Pinto Torres aided him and then made him leave the farm, at which point he headed in the direction of the Central Railroad" (Gazeta..., 6 set. 1893, p.1).

The report shows that there were loopholes in the system for reception and inspection of ships and passengers in the port of Rio de Janeiro. The most widely used disease prevention model, the quarantine, was being criticized. Traditional maritime disease prevention began to be perceived as a set of arbitrary, disjointed, and authoritarian measures, as a protectionist mechanism and a source of recrimination and rancor between nations. The ability to circumvent the system with bribes, clandestine voyages, captains who denied the occurrence of disease onboard, hiding places for travelers and goods, and port authorities who hid signs of epidemics, showed the ineffectiveness of disease prevention models based on contagion theories (Brasil, 1902, p.296, 297; Cueto, 2007, p.33).

Quarantines in the nineteenth century

As Ackerknecht has indicated (Sep. 1948), contagionism, the belief that diseases were transmitted through direct contact with the sick person or with objects touched by him – the theoretical basis sustaining quarantines – was an obsolete theory in the first half of the nineteenth century. Contagion and quarantine were sources of problems for the rapidly growing class of merchants and industrialists in Europe, including losses and limitations on business expansion, and were also a government tool for bureaucratic control. Thus anticontagionism, or the belief that miasmas – the poison from rotting animal and vegetable matter – disseminated through the air caused diseases, was the predominant theory accepted by the medical and scientific community during almost the entire nineteenth century.

Even the most radical anticontagionists admitted the existence of some contagious diseases such as syphilis and smallpox. However, the three important diseases against which the quarantine was directed, bubonic plague, yellow fever and cholera, seemed to confirm anticontagionist hypotheses by overcoming all sanitary barriers imposed to contain them. For advocates of the miasma view, in general, there was no relation – but rather coincidence – between the simultaneous arrival of epidemics and ships, as they did not believe that diseases could be imported from infected locations, nor that they were transmitted from person to person (Ackerknecht, Sep. 1948, p.573).

The 'big three' diseases were the major public health problem of the period. Epidemics of smallpox, influenza, and meningitis also ravaged Europe at the same time, but did not generate preventive and emotional responses similar to those of the plague, yellow fever and cholera. Probably because they did not kill as many or as dramatically, nor resulted in the hated quarantines (Ackerknecht, Sep. 1948, p.569).

Cholera swept the world in four major epidemics during the nineteenth century, spreading true terror. In 1821, the disease, which had begun in India, knocked at the gates of Europe. France and Russia applied measures such as quarantines and military cordons. However, cholera invaded Russia in 1831, and the rest of Europe the following year despite radical disease prevention measures at ports and borders. This fact served as a strong argument for the proponents of the anticontagionist view. In 1848, the disease once again broke through European sanitary barriers, which proved yet again the ineffectiveness of quarantines and sanitary cordons (Ackerknecht, Sep. 1948, p.575).

Ackerknecht (Sep. 1948, p.567), in his classical text on anticontagionism in the nineteenth century in Europe, demonstrates the existence of fine-tuning between the political system and public health. He argued that the choice of a particular form of disease prevention was dictated by the type of political regime. Thus, an autocratic ideology favored treating epidemic diseases as contagious, and thus quarantines were used. Liberal regimes, in contrast, opted for a variety of local measures, paying attention to social problems such as trash removal, soil drainage, removal of unhealthy homes and potable water supply too. Instead of quarantines, they preferred to correct the deficiencies in the environment as a way to prevent diseases.

However, as indicated by Peter Baldwin (1999), the relationship between preventive sanitary measures and political ideology was more complex, since commercial interests were not uniform. According to the author, it is true that the style of rule left its mark on disease control, although it was more significant to understand how an understanding of the threats of epidemics was shaped by the style of state intervention designed to combat them.[14]

The fact is that opposition to quarantines in the nineteenth century grew along with the expansion of international trade. And, while the mercantile groups identified them as being the result of tyrannical regimes, the medical community associated them with disease prevention practices implemented without scientific rigor. Many anticontagionists were prominent scientists, and the struggle for this theory represented a war on behalf of science, against absolute authorities and religious mysticism, and in favor of scientific rigor instead of speculation about the etiology of diseases (Ackerknecht, Sep.1948, p.567; Harrison, 2006, p.203).

The rhetoric on contagion and anticontagion was, however, far from being homogeneous among government officials and European scientists. While, for some, the spreading of cholera to Russia in 1830, despite strong sanitary defenses, was evidence of the ineffectiveness of quarantines, to others it demonstrated that the disease prevention practices had not been properly implemented and enforced during the epidemic. As Richard Evans (Aug. 1998) showed, authorities in Hamburg did little to fight cholera in 1832 and 1848, while the Prussian authorities, less dependent on trade, insisted on the contagiousness of the disease and the need for restraints on trade and on the free movement of people (Harrison, 2006, p.206).

As Ackerknecht noted (Sep. 1948, p.564), the history of the theory of contagion and, therefore, the use of quarantines to prevent epidemics, is not linear, but a continual series of ups and downs, acceptance and rejection. Even a few contagionists thought quarantines were ineffective for diseases such as cholera, which had been demonstrated able to overcome any kind of sanitary barrier.

Krista Maglen (2002) examined the history of quarantines in England and the establishment of the Port Sanitary Authorities (PSA) in 1872 as an alternative system for protection and a means to correct the deficiencies in quarantines in order to prevent infections. Historiography leads us to believe[15] that the quarantine became redundant in British ports in the late nineteenth century, but Maglen claims that this practice continued when passengers with diseases considered exotic arrived – such as the plague and yellow fever – and continued to play an important role in daily port operations until 1896, when it was abolished, though not without controversy among health and scientific authorities. The author shows that the system established with the creation of the PSA was maintained for a quarter century in parallel with the old quarantine system.

Thus, even in the context of the extreme English liberal political model, the division between the contagion and miasma theories should not be understood to have been decisive in favor of the anticontagionist side. Baldwin (1999, p.15) prefers to explain the English disease prevention model in public health as more informed by anticontagionism than that of continental European countries. Actually, what existed at the national level was the juxtaposition of environment-focused and contagionist prophylactic measures.

While those focused on the environment sought evidence to support social reforms and the fight for liberty, in the European nations that applied quarantine measures, the argument for using them was far from being seen as a violation of civil liberties, but rather a sanitary measure for the benefit of all (Baldwin, 1999, p.19, 24).[16]

The emergence of bacteriology showed that the two theories – contagion and miasma – could be in perfect harmony in some respects: diseases might emerge in one location and then be transmitted; dirt could multiply microorganisms; the grouping of people in a closed location was unhealthy and capable of producing diseases (Baldwin, 1999, p.5).

When cholera arrived in Brazil in 1893, the physicians at the Federal Sanitary Institute thought that contagion was indisputable. During the course of the epidemic, however, the importation of the disease and the question of contagion were the subject of debate in the medical community. The opponents of the official diagnosis of cholera morbus, mostly local authorities, sought to demonstrate that the cases of diarrhea – in their opinion without sufficient evidence that it was cholera – did not come from the Paraíba valley, but were rooted in the local environment, "under the influence of climatic and telluric factors combined with individual predispositions and eating habits that favored the outbreak of intestinal disorders" (Benchimol, 1999, p.255).

The truth is that supporters of the microbial view had no conclusive explanations for the emergence of the epidemic, which quickly overtook the sanitary barriers constructed in Brazilian cities and ports. The links in the chain of the infection were lost in the routes that immigrants took from the ports to the farms in the Paraíba valley (Benchimol, 1999, p.256).

Sanitary protection of Brazilian cities during the cholera epidemic of 1893 was through the imposition of sanitary cordons, with the military stationed along the roads, holding travelers under quarantine through force. "The war-like ambiance prevailing in Brazil favored the adoption of this type of measure to assess the harmlessness of suspicious persons and objects and ensure disinfection and forced surveillance for several days" (Benchimol, 1999, p.257).

In fact, except in critical periods during epidemics, Brazilian public health, similar to that in Europe, was inspired by the measures that the French public health specialist and physician Adrien Proust (Marcel Proust's father) had adopted in France in 1890 to prevent the spreading of cholera from Spain, where the epidemic reigned, without causing international complaints against sanitary cordons and quarantines. The basic components used by Brazilian public health authorities in the sanitary defense of cities, housing, the environment and people were disinfection using steam, heat and germicides (Benchimol, 1999, p.271).[17]

Most Brazilian physicians agreed with the Bavarian hygienist Max von Pettenkofer's (1818-1901) theories, particularly his *Boden Theorie*, which advocated the idea that, for an epidemic to arise, four factors were necessary: the specific germ; certain conditions relating to the place and weather, and individual predispositions to contract diseases. The germ, by itself, would not cause disease in the absence of the other three factors, which excluded the idea of direct contagion (Benchimol, 1999, p.279).

The Brazilian followers of Pasteur wanted public health prevention measures to be based on germ theory, in a 'modern style' like that applied by the French. Sanitation performed in the early twentieth century in Rio de Janeiro, however, was more similar to the Prussian approach. Pereira Passos' urban reform was founded on soil theories and miasma hygiene (Benchimol, 1999, p.284).

Reception and inspection of ships and passengers in the port of Rio de Janeiro

The concern with the entry of diseases through Brazilian ports began at a time when the country was still free of yellow fever, cholera and the plague. In 1843, the Ministry of the Empire issued a decree requiring the inspection and quarantine of foreign vessels that might be contaminated with some unknown disease (Sardinha, 1916, p.7).[18]

In 1886, because of the cholera epidemic in Argentina and Uruguay, the Brazilian government decided to take more systematic measures to prevent the invasion of the epidemic across the Rio da Prata, closing its ports to ships from Argentina and Uruguay, which generated a number of complaints and diplomatic conflicts (Chaves, 2003, p.149).

Brazil's attitude eventually provoked a crisis involving overproduction of goods in those countries, mainly cattle and beef jerky, as they temporarily lost one of their biggest markets. About 70% of production was no longer exported, and the value of the export tax levied doubled, to 27% of the final price of products from the region (Chaves, 2003).

As commercial losses were large, the governments of Argentina and Uruguay rushed to propose to Brazil an agreement that better regulated international sanitary relations between the three neighboring countries, the Agreement of 1887, signed in Rio de Janeiro by the representatives of the parties. According to the provisions of that treaty, all major Southern exports, such as beef jerky, alfalfa, grains, flours and animals, were scratched from the "list

of suspicious objects or those susceptible to retaining and transmitting contagion" (Brasil, 1904a, v.3, p.12).

A precise list of which products could transmit cholera had to be drawn up. The opinions of experienced physicians from the three countries were sought. João Batista de Lacerda, Director of the National Museum, and Nuno de Andrade, Port Health Inspector, represented Brazil. The most important thing was to standardize the port inspection system, but laboratory tests had to be carried out to determine whether a product was contaminated or not (Brasil, 1911, p.A-N1-41).

During the convention, experiments were performed on beef jerky at the Physiology Laboratory of the National Museum in Rio de Janeiro. Robert Koch's assumptions about the comma bacillus, discovered in Egypt in 1883, were adopted. According to some physicians on the scientific committee organized for the convention, however, the etiology of cholera and its contagiousness was still unconfirmed (Chaves, 2006, p.4).

Doctor Nuno de Andrade, president of the convention's scientific committee, recommended the use of sulfurous acid in cholera cases since its use in a humid atmosphere, with the formation of hydrogen sulfide gas, would have positive results. João Batista Lacerda, a renowned Brazilian scientist and director of the Physiology Laboratory of the National Museum in Rio de Janeiro, despite not having refuted the knowledge of his colleague and superior on the commission, stated that, according to the Koch's studies, he was convinced that the germ causing cholera was not air-borne. Even so, the technical committee approved the use of sulfurous acid as a disinfectant on vessels (Chaves, 2006, p.10-11).

The Sanitary Agreement signed in 1887 by the Brazilian Empire and the Argentine and Uruguayan Republics, and to which Paraguay adhered shortly afterwards, was enacted on August 22, 1889, through Decree No. 10318. One of the questions was for which diseases would the ports apply sanitary measures. It was decided that the measures would focus on the category created during one of the conferences, namely "exotic pestilential diseases," which included yellow fever, cholera morbus and the Asian plague (Brasil, 22 ago. 1889, art. 1º).

Thus, exact definitions were created so that the control measures could be applied in the form of legislation in the three countries. It was determined that: an infected port was one in which an epidemic of any exotic pestilential disease was present; a suspect harbor was one in which isolated cases of one of the diseases occurred, or through which vessels coming from infected localities had passed. An "infected ship" was one on which there was a case of pestilential disease. A suspect ship was one from an infected port, or a port suspected of being infected, without a case of pestilential disease during the voyage; or one from a clean port, but which called at an infected or suspected port; or one with deaths onboard from non-specific illnesses or repeated cases of any disease; and those not bearing a bill of health or international free access certificate after undergoing sanitary treatment (Brasil, 22 ago. 1889).

Three categories of ships were defined: steamships carrying fewer than a hundred passengers; steamships to transport immigrants, and possibly also mail, with over a hundred passengers; and sailing vessels (Brasil, 22 ago. 1889, art. 5º).

Ships in the first and second group required the presence of a physician onboard and a water vapor disinfection chamber. Ships wanting to enter the ports of the three countries that signed the convention then had to carry a bill of health issued by the sanitary authority of

the port of origin and endorsed by the consuls of the destination countries at the same port of origin or port of call. This certification had to be presented to the sanitary authorities of the ports of call by the ship's captain and delivered to the authority at the final port where the ship docked. Bills of health were not required between ports in the same province (Brasil, 22 ago. 1889).

The consulate's visa was written on the back of the certification and stamped with the consulate's seal. If the consul made no objection to the wording of the bill of health, the ship received a single entry visa. Otherwise, the consul general added a note to the visa with some explanation. The bills of health with amended visas, after inspection in the first port of one of the countries party to the agreement, were accompanied by a sanitary certification signed by the authority of that port, which described the treatment to which the ship had been submitted (Brasil, 22 ago. 1889).

There were two types of health certifications: 'clean,' meaning no cases of disease in the port of origin or ports of call; or 'dirty' if the ship had experienced epidemic or isolated cases of exotic pestilential diseases (Brasil, 22 ago. 1889).[19]

The port had shifts of physicians in charge of performing the sanitary inspections of ships entering or leaving, coming from abroad or heading overseas. Some of the physicians in charge of inspection visited inside ships already at anchor, while others paid external visits to ships that had just arrived at port.

The internal sanitary visits were preferable for vessels which had hoisted their national flag on the foremast, which meant that there were sick passengers onboard. If the passenger was suffering from a common malady, the sanitary authorities communicated with the captain in writing. This notice authorized him to treat the sick individual onboard or on land. If, however, the sick person was suffering from a contagious disease and the sanitary authority determined that it was an exotic pestilential disease, the ship was sent to the Ilha Grande lazaretto (Andrade, 12 abr. 1890).

At the lazaretto, the ship could be under one of two types of quarantine, a strict quarantine and an observation quarantine. The ship was isolated in both cases. In the observation quarantine, the ship had to stay until the maximum incubation period for the disease had passed – ten days for yellow fever, eight for cholera morbus, and twenty for Asian plague – counting from the date the ship (or passenger) arrived at the lazaretto, but disinfection was not performed (Andrade, 12 abr. 1890).

In a strict quarantine, after passengers disembarked at the lazaretto, cargo was unloaded and the ship and objects suspected of transmitting the disease were disinfected. This was applied to infected vessels and to those on which cases of an unspecified illness had occurred. There were two objectives: to isolate passengers with an exotic pestilential disease during the incubation period, and to disinfect objects suspected of being able to transmit the disease (Brasil, 22 ago. 1889).

The observation quarantine consisted of a rigorous examination, performed by the lazaretto's physician. He checked the ship's books, including those from the onboard clinic, pharmacy, and medical prescriptions, as well as existing drugs, comparing them with the patients on the ship. During this examination, a lazaretto employee was sent to inspect the ship's compartments, and could even interrogate passengers and crew ((Brasil, 22 ago. 1889).

The duration of the strict quarantine was also the maximum incubation period of the pestilential disease that the authorities wanted to avoid, counting from the date of the last case occurring during the voyage. If the time elapsed after the last case of pestilential disease was less than the maximum incubation period of the disease, the passengers remained in quarantine the number of days necessary to reach the maximum incubation period. This type of quarantine was practiced at the lazaretto, except when there was not enough space, in which case the time was spent onboard (Brasil, 22 ago. 1889).

Passengers suffering from pestilential disease when the vessel arrived were transferred to the isolation hospital; the others spent the quarantine period at the lazaretto (Brasil, 22 ago. 1889).

During epidemic periods, ships arriving in Rio de Janeiro, Montevideo or Buenos Aires from ports known to be clean were free from quarantine and inspections – when health conditions onboard were satisfactory, as attested by the health authority. In this situation, it was limited to the unloading of goods, the disembarkation of passengers and the delivery and receipt of mail, provided that these operations were conducted safely, free from any infection, and the ship had not communicated with any person or object at ports either infected or suspected to be infected. These facts were proven by a document signed by the sanitary authority of the port where the ship put in, endorsed by the consul of the country of destination and also certified by the sanitary inspector of the country of destination (Brasil, 22 ago. 1889).

The external health visits were paid to all ships arriving from foreign ports in order to verify the state of health onboard, determine the appropriate measures to restore hygienic conditions, impose quarantines and enforce compliance (Andrade, 12 abr., 1890).[20]

In external visits, as soon as the ship arrived in the harbor, a physician was sent out and, before climbing aboard, interrogated the captain of the vessel. If the ship were in good health, the physician would proceed to board the ship to confirm the captain's allegations and allow or deny the ship free access.[21] If, however, before entering the ship, the physician had reason to believe it was 'infected,' with sick passengers onboard, he ordered it to proceed to the harbor of the Ilha Grande lazaretto for inspection by the physician in charge (Andrade, 12 abr. 1890).

Microbes, vectors and 'new hygiene' technologies

In the early years of the twentieth century, some changes in the standards for prevention and combating the three major epidemics changed in Brazil as a result of some concepts related to prevention theory and practice that were still controversial in the scientific community in the final decades of the nineteenth century, but by the early twentieth were proven and well-articulated.

As Benchimol indicates (1999, p.439), the word vector came to mean something very precise. Instead of antagonism between the old miasma hygiene and the new science of microbes, what occurred was a correction of the action of the old assumptions in light of the strategies of the new assumptions, "resulting in a reciprocal translation advantageous for their mutual interests and goals."[22] For each disease one wanted to fight, the old hygiene had to wage battles against the forces of nature, the topography of cities, and waterlogged

soil. With the microbe specific to each disease, the Pasteurians indicated the direction the battles should take.

Efforts to solve the yellow fever problem given specific microbes did not, however, change the use of multiple strategies to combat this disease.[23] When Oswaldo Cruz took over the management of public health in 1903, he corrected the course of action by targeting the vectors of yellow fever and the bubonic plague and by placing emphasis on smallpox vaccination (Benchimol, 1999, p.440).

In the early twentieth century, the old models of detention – of people and/or vessels – for a certain number of days, to ascertain the presence of some kind of infectious disease, was challenged by the 'new hygiene,'[24] which proposed isolating the sick, vaccination and health monitoring[25] of sick passengers. "The quarantine regime had its swan song," in the words of the Minister of Justice and Internal Affairs, Sabino Barroso Junior, in his annual report to the President (Brasil, 1902, p.293).

The detention of ships in lazarettos was replaced by the purging of contaminated materials (disinfection using Clayton's gas apparatus) and by medical surveillance of the passengers who disembarked, who now had freedom of movement provided they indicated where they intended to reside, where they would be visited by officials from the Inspector-General of Health of the Port of Rio de Janeiro during the disease's incubation period (Brasil, 1902, p.296).

The Brazilian Health Regulations of 1904 prioritized sanitation of the environment, the port and the city, with the aim of creating stronger resistance to infections in these locations. In order to eliminate quarantines,[26] however, more technical personnel were needed to vaccinate and follow passengers during the surveillance period; in addition to reorganizing the city and the port, and exterminating locations considered to be focal points of epidemics: slums and lower class housing where people were crowded together[27] (Brasil, 1902).

Changes, however, do not take place abruptly. In addition to new legislation, new standards and measures had to be established; plus new habits, principally on the part of the port inspectors, employees and physicians. They had to prepare to deal with the new preventive procedures, and with modern disinfection instruments and techniques, such as the Clayton apparatus.

> In the port of Rio de Janeiro, the disinfection service has been completely modified, thus saving us, sir, from the depressing spectacle that provided the foreigner, performing comical disinfection using 'sulfur pots' and 'a bucket' containing antiseptic solution..., an ignorant worker sprayed the shoes of passengers with this solution. This service, of course, was not managed by the port physicians, who would have been ashamed to be seen leading these disinfection operations (Brasil, 1904a, p.42; emphasis in the original).

So initially, on September 30, 1901, a notice was issued stating that quarantines would be used only for infected ships and, in this case, disinfection of merchandise and baggage would be carried out in addition to medical surveillance of disembarking passengers. Innovation of this type was very complicated, and both public health authorities and the government knew this because, with rare exceptions, the states completely lacked "precise, scientific guidance" and a structured, effective health service (Brasil, 1902, p.297).

Brazil, as a signatory of the 11th International Sanitary Conference, signed in Paris in 1903, and of the South American Sanitary Convention signed in Rio de Janeiro in 1904, was then

committed to implementing the reformulations agreed upon in the meetings with respect to sanitary services in its sea and river ports, which were at that point extremely substandard. (O Brazil-Medico, 1905, p.228).[28]

To comply with the provisions of those treaties, at least the principal Brazilian ports had to be provided with sanitary facilities so that they could begin isolation of patients and disinfection of vessels and all objects and people capable of carrying contagion. Thus, isolation hospitals and disinfection stations had to be built in those ports urgently. In addition to the physical facilities, administrative reorganization of services was also necessary, with more personnel for surveillance, vaccination, isolation, inspection and disinfection (O Brazil-Medico, 1905).

Oswaldo Cruz was then asked by the Minister of Justice and Internal Affairs, J.J. Seabra, to undertake a long expedition to the sea and river ports of Brazil, in order to verify, on-site, the improvements needed to correct each port's deficiencies. Between September 1905 and February 1906, in the middle of restructuring Rio de Janeiro's port, the director of Public Health undertook his journey through all Brazilian ports, from North to South, in order to collect data for their reorganization (Lima, 1997).

The 1887 South American Convention contained a provision requiring building lazarettos in other Brazilian ports. Thus, they began drawing up plans for the construction of disinfection stations at the ports in the states of Pará, Bahia and Pernambuco. These stations were built, but were not operated continuously during the following years, which hindered trade (Ofício..., 16 dez. 1913).

In an official letter sent on December 16, 1913 to the Minister of the Interior, Uladislau de Freitas, the president of the Amazonas Trade Association, forwarded a request made by Messrs. Booth & Co., agents in Manaus of The Booth Steamship Co., Ltd., based in Liverpool. The British agents requested the creation of a disinfection station in the North. If ships arriving from European or North American ports in northern Brazil were declared infected, they had to go all the way to Ilha Grande, wasting over twenty days on the two-way trip (Ofício..., 16 dez. 1913).

For some time there was a lazaretto near the port of Manaus, based on Tatuoca island in Marajó Bay, built after the signing of the 1887 South American Convention, but by 1912 it was already in ruins (Ofício..., 5 jan. 1912).

In 1903, the Rio de Janeiro port disinfection service underwent a complete transformation. One of the new stars of modern prophylaxis was Clayton's gas apparatus, which was used to disinfect vessels, cargo and baggage, promising to kill any type of vector (mouse, flea, mosquito) and microbes.

Disinfection with a solution in a sulfur pan, which had so embarrassed the then director-general of Public Health, Doctor Oswaldo Cruz, was replaced by a barge carrying the Clayton apparatus, gas chambers, formaldehyde chambers and sulfur dioxide gas, international technical innovations for prophylaxis. This barge was divided into two sections, one for contaminated objects, and another for purged objects. All operations began to be managed by a port physician (Brasil, 1904b, p.354).

In Rio de Janeiro, there were three disinfection stations on land, managed by the Isolation and Disinfection Service, an organization linked to the Municipal Directorate of Hygiene

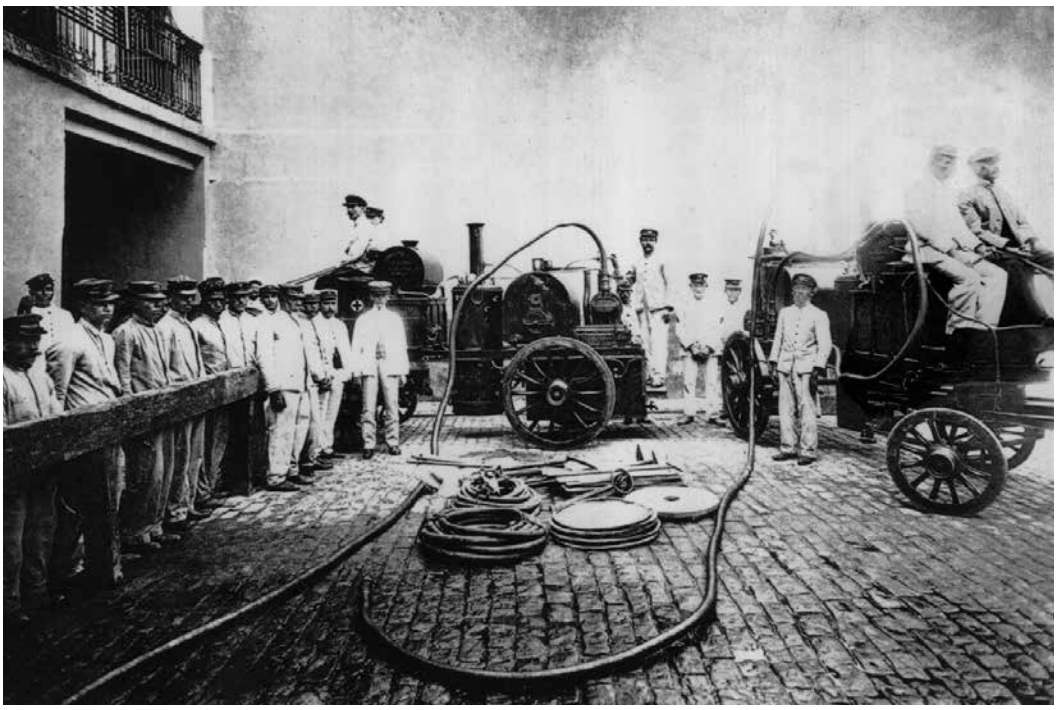

Image 2: Clayton apparatus used in disinfection and fumigation processes; group of uniformed disinfection personnel of the Directorate-General of Public Health (Acervo COC/Fiocruz, s.d.)

and Public Assistance: The Central Disinfection station[29], on rua Clapp, near praça Quinze de Novembro, inaugurated in 1890; the Engenho Velho station, previously a slaughterhouse, now praça da Bandeira, and the rua da Relação, in the Santo Antônio district, both built in 1891. In 1894, the Central Disinfection station was equipped with modern equipment made in Germany, called Geneste Herscher chambers. In 1904, Oswaldo Cruz inaugurated yet another disinfection station, in Botafogo, on the site occupied today by the Rocha Maia Hospital (Benchimol, 1999, p.291-292).

With the arrival of Oswaldo Cruz at the Diretoria Geral de Saúde Pública (Directorate-General of Public Health/DGSP), in 1903, a specific inspection station for disease prevention services was created in the port, the Isolation and Disinfection Inspectorate, chaired by Doctor Jaime Silvado. The service was conducted following the new conceptual framework on disease transmission promoted by Oswaldo Cruz in his campaign against vectors (Brasil, 1904b, p.41; Benchimol, 1999, p.284).

One novelty of the Clayton apparatus was the possibility of installing it onboard a boat which could then draw up alongside the vessel to be disinfected without the need for unloading. This prevented the possible invasion of the harbor by vectors, mainly rats that entered when the ship docked, normally via ropes and platforms (Brasil, 1904b, p.42).

The new disinfection service was inaugurated on October 17, 1903, in the midst of an epidemic of bubonic plague in the city. In order to protect the Brazilian coast from the epidemic raging in Rio de Janeiro, Oswaldo Cruz installed a Clayton gas disinfection unit on all ships leaving the capital for other Brazilian ports (Silvado, 15 ago. 1903, p.5).

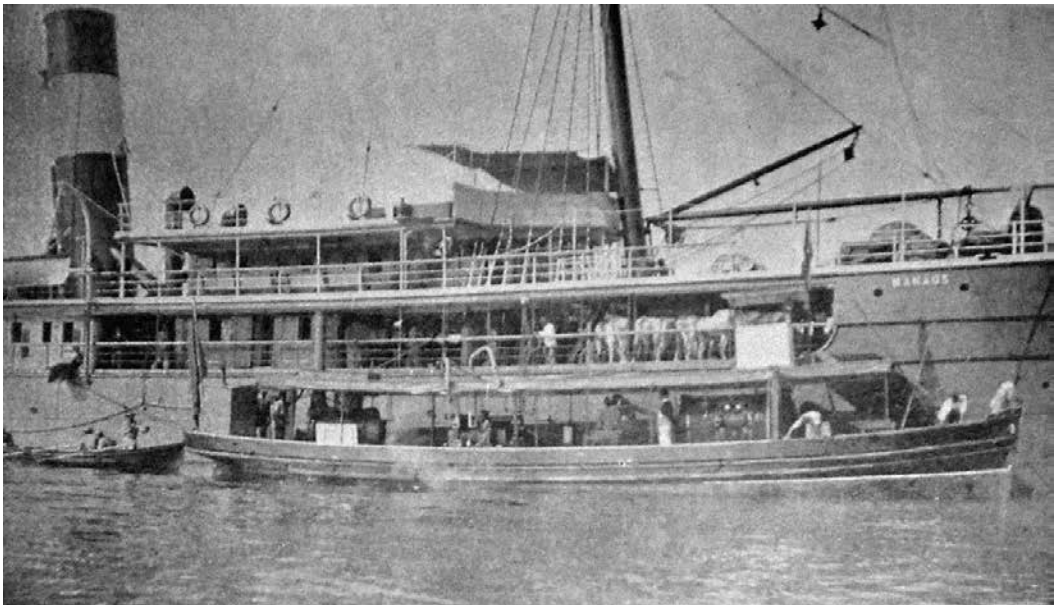

Image 3: The disinfection steam sloop working next to the steamship Manáos shortly before its departure; photo by Marc Ferrez (Silvado, 15 ago. 1903, p.10)

A steam sloop, measuring about twenty meters long by five and a half meters wide, was prepared to perform the service. A German chamber manufactured by Geneste Herscher, and two Clayton apparatuses were installed onboard (Silvado, 15 ago. 1903).

The Clayton apparatus was not new only in Brazil, but also in Europe. It began to be used during practically the same period in both the port of Rio de Janeiro and in Dunkirk, France. In the previous year, 1902, the unit was still being tested to verify its effectiveness in disinfection of clothing and objects.

On September 27, 1902, the director of the Pasteur Institute in Lille, Doctor A. Calmette, undertook a series of experiments in order to determine the disinfectant action of the gas

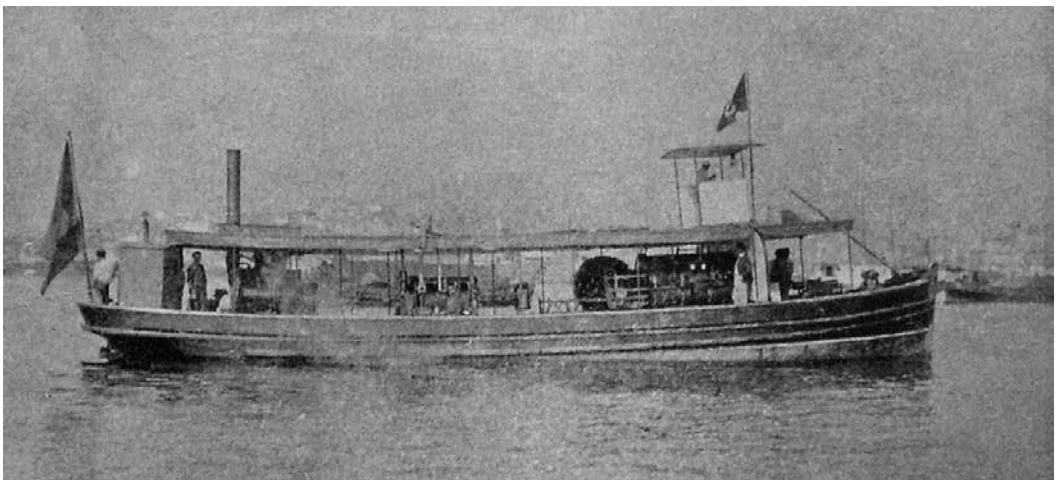

Image 4: The disinfection steam sloop; photo by Marc Ferrez (Silvado, 15 ago. 1903, p.10)

on clothes and objects artificially contaminated by "pathogenic microbes: typhoid fever, cholera and plague," chosen because they were of the greatest interest in maritime disease prevention. Doctor Duriau, health officer of the port of Dunkirk, and Mr. David, chief chemist of the French finance ministry, also participated in the experiment, and were asked to study more specifically the effects of dry sulfur dioxide gas on rats and on various goods (Calmette, Hauteville, 1902, p.449-451).

The tests concluded that the use of dry sulfur dioxide gas, produced under pressure using the Clayton apparatus, under the conditions in which it was employed (8% concentration), was quite effective in disinfecting ships, and rendered any objects contaminated by typhoid fever, cholera and plague microbes harmless. Furthermore, the process destroyed all the rats and insects like fleas, bedbugs, cockroaches etc., without significantly changing the most delicate goods such as furs, hides, grains, sugar, meat, and fruit, nor causing any damage to metal objects (Calmette, Hauteville, 1902, p.451).

They thus recommended that all marine sanitation services in France be equipped to use the new disinfection method, to avoid lengthy quarantines. The technique was also applied to defend the ports against the invasion of cholera and plague, always threatening in France. Similarly, large shipping companies were advised to install a Clayton apparatus onboard each vessel. Shortly thereafter, in Brazil, according to the 1904 health regulations (Brasil, 8 mar. 1904, art. 47), the disinfection apparatus became mandatory on ships making voyages lasting more than 48 hours.

Performed at the port of Rio de Janeiro, disinfection using the Clayton apparatus meant that ships did not need to go to Ilha Grande for sanitary procedures. The result of disinfecting the holds full of goods was visible only hours or days later, when the vessel arrived at the port of call, where unloading took place and the vector insects were seen to be dead (Brasil, 1904a, p.43).

1903 and 1904 were significant for Brazil in terms of participation in international events such as conferences[30] and conventions. One such event was the country's second participation in a European health conference, held in Paris in October 1903, in order to renew the scientific bases of the earlier agreement of 1897, which focused on preventing the plague and cholera. According to studies on the plague, indicating the mouse as its main transmitter, new guidance on disease prevention measures was needed (O Brazil-Medico, 1905, p.227).

The 1903 Paris Conference, which brought together 21 countries, recommended the implementation of John Snow's discovery related to cholera: the disease could be prevented by ensuring that water consumed was not contaminated with waste. This resulted in an important change in the hygiene of ships and ports, as well as in the surveillance of travelers and crews from infected locations. It is also indicated that the plague could be countered by removing rats from ports and ships. Furthermore, remedies against the disease, such as Yersin's serum and Haffkine's vaccine, had been available since the nineteenth century (Cueto, 2007, p.28).[31]

The diplomat Gabriel de Piza was the Brazilian representative in Paris. Although the focus of this convention was only on the plague and cholera, Piza was able to bring up the issue of yellow fever.[32] The American mission in Cuba in 1900, coordinated by Walter Reed, found that yellow fever is transmitted by the mosquito *Stegomyia fasciata*. The Paris Convention accepted preventive measures based on the studies of the mission as scientifically proven.[33]

All nations had to modify their regulations, from that point on, in accordance with the new guidance, which recognized that species of mosquito as the transmitter of yellow fever (Cueto, 2007; Brasil, 1904a, v.3, p.15).

The second important international event in which Brazil participated was the convention with neighboring countries Argentina, Uruguay and Paraguay, which took place in Rio de Janeiro in June 1904.[34] The modification of the sanitary treatment of vessels from infected ports was long one of the greatest desires of Brazil and other South American nations because of the numerous trade losses as a result of quarantine regulations. The abolition of this system in the region was the first of the advantages of the convention (Cueto, 2007, p.228; Brasil, 1904a, v.3, p.16).

The second advantage was the acceptance by neighboring nations of Brazil's prevention measures for yellow fever, which waived disinfection of clothing as a preventive measure based on scientific principles, pursuant to art. 15(E) of that convention (Brasil, 1904a, v.3, p.16).

Change and continuity in the prevention of the plague, cholera and yellow fever

The 1904 South American Convention recommended different prevention measures for the bubonic plague, cholera and yellow fever, ratifying the practices of patient isolation, surveillance of the healthy, disinfection of ships, luggage, clothes and personal effects, and preventive vaccination. The new legislation dictated changes aligned with new scientific assumptions, related to the understanding of insect vectors in the transmission of diseases (Brasil, 1904a, v.3, p.15).

Health surveillance was to be applied to all passengers, but with certain differences for the first, second and third classes. For first and second class passengers, surveillance was to take place on land, ensuring individual freedom of movement, and the health authority could use the health passport system, requiring an advance cash deposit to be returned when medical observation terminated (Brasil, 1904a, v.3, p.15).

As for the third class passengers, mostly immigrants, surveillance could be carried out on the ships, and under the restrictions deemed convenient by the sanitary authority. This gave the authorities autonomy to use the preventive measures they felt were most appropriate, including quarantines, which, theoretically, had been abolished by the new legislation, but continued to be applied in specific situations (Brasil, 1904a, v.3, p.15).

In the case of the "Levantine plague," ships calling at "infected or suspect ports" were to take the necessary precautions to prevent the passage of rats over cables, chains and other means of contact with land. After unloading, they would be subject to procedures to exterminate rodents (Brasil, 8 mar. 1904, art. 24, 25).

The ship sanitary inspectors[35] had to be present during the embarking of passengers at ports contaminated with the plague and prevent embarkation of individuals with evident or suspected signs of the disease. When judged appropriate, the inspectors could require the disinfection of the baggage of the third class passengers before it was loaded onto the ship. If the plague appeared onboard, the inspector isolated the patient in an appropriate location, disinfected their personal belongings, and vaccinated all consenting passengers and crew (Brasil, 8 mar. 1904, art. 26, 28).

At the port of arrival, the 'harmless ships,' i.e., those which, although they left contaminated harbors, had no cases of disease during the crossing, were then free to circulate, which meant they could dock at the port without problems. Their passengers and crew remained under health surveillance for five days, counting from the time of landing.

In the case of 'ships infected' by the plague, the same procedures used when harmless ships arrived were followed and then, after passengers disembarked, the ship was disinfected, then rats were exterminated and clothing and personal belongings were disinfected before unloading. These operations were to always be performed with the Clayton apparatus or any other system appropriate for performing the service. After completion, cargoes could be unloaded without restrictions (Brasil, 8 mar. 1904, art. 29-32).

In the case of a 'port contaminated' by yellow fever, before departure, ships calling at these ports had to take the necessary precautions to prevent invasion of the ship by mosquitoes. After unloading, they were subjected to the treatment considered most effective for exterminating mosquitoes by the health authority (Brasil, 8 mar. 1904, art. 33, 34).

Ship health inspectors were expected to monitor embarkation, preventing the boarding of people with yellow fever symptoms. During the crossing, the inspector had to thoroughly monitor passengers and crew, inquiring and checking for mosquitoes, larvae or nymphs onboard, and destroying them with whatever means necessary. If cases of the disease appeared during the crossing, the inspector isolated individuals using suitable mosquito netting, preventing passengers from being bitten (Brasil, 8 mar. 1904, art.35-37).

Harmless ships that had left or called at ports infected with yellow fever, but that took the necessary precautions, were received without restrictions at the port of arrival. Their passengers and crew underwent surveillance for six days. After disembarking passengers, mosquitoes, larvae and nymphs onboard were exterminated and, at the discretion of the health authority, preventive measures could be taken with respect to the clothing and personal belongings of the passengers. The cargo was to be received without restrictions (Brasil, 8 mar. 1904, art. 38-40).

Vessels that called at ports contaminated by 'Asian cholera' prevented passengers in transit and crew from going ashore, except for essential operations. Before departure, ships considered to be contaminated had to clean and disinfect their water tanks (Brasil, 8 mar. 1904, art. 41-43).

Ship health inspectors monitored passengers as they disembarked, preventing the entry of people with symptoms of the disease. They also required prior disinfection of baggage. Monitoring continued during the crossing, and if passengers became ill, they would be isolated, and their clothes and personal effects disinfected (Brasil, 8 mar. 1904, art. 43-45).

In the port of arrival, the harmless ship that had passed through sanitary treatment was released for free circulation, and the passengers and crew underwent surveillance for five days, counting from the date of departure from the last contaminated port. The infected vessels were forced to follow the sanitary authority's rules in order to avoid contamination of the port's waters. The sick were allowed to go ashore and were isolated and, next, the ships were unloaded and subjected to rigorous disinfection. Clothes and personal belongings were purged. The other passengers were disembarked and subjected to sanitary vigilance for five days. The cargo, no matter its nature, did not undergo any procedure (Brasil, 8 mar. 1904, art. 46, 47).

There were some differences in the preventive measures for the three diseases. With the use of the Clayton gas apparatus, unloading of cargo was performed without restrictions, which solved the problems related to delays and damage of goods at the port. In relation to the reception of passengers, however, the application of different measures to first, second and third class passengers continued to generate embarrassment for passengers traveling in third class. While the first class was given the right to free movement – with the use of sanitary passports and a cash deposit to be returned when medical observation was complete – the third-class passengers were forced to submit to whichever preventive measure the health authority deemed most effective, including quarantines, and these measures were directly related to immigration control policies.[36]

According to Löwy (2006, p.33-34), the Pasteurian revolution changed the nature of research on diseases, but its influence on types of prevention measures was limited. The isolation of the bacteria causing the plague and cholera and the explanation of the role of rat fleas in the transmission of the plague did not alter prior preventive measures to a great extent. Extermination of the rodents was more practical than eliminating their parasites. With regard to yellow fever, effective eradication was only possible after the description of the role of the mosquito as a vector. The certainty that transmission occurred only through the mosquito *Stegomya fasciata* (later renamed *Aedes aegypti*) made quarantine measures obsolete.

Next, I will examine the second case of a ship of immigrants, the French steamer Orleannais, which arrived at the port of Rio de Janeiro in 1907, suffering from an epidemic of bubonic plague. All of the precepts of modern prophylaxis, the 'new hygiene' were applied. This case was so successful that it became a model for the disinfection service in the port of Rio de Janeiro.

The plague on the Orleannais: a model case

In 1907, the disinfection service of the port of Rio de Janeiro had been operating under the direction of Doctor Jaime Silvado for four years. The order from the DGSP was to perform rigorous anti-pest prophylaxis, and Doctor Silvado followed this to the letter (Brasil, jan. 1908, p.A1-1).

The harbor seemed to be in good health. No serious problems related to epidemics had occurred there for at least three years. To demonstrate the efficiency of their service, Doctor Silvado, in a report sent to the GPSD in 1907, described four successful cases of ships that had been disinfected, and their epidemic outbreaks controlled. One was the Orleannais, which was carrying immigrants.

Coming from Marseille with stops in Spanish ports, it docked in Rio de Janeiro with eight hundred immigrants. There were two deaths during the crossing, and the bodies were thrown overboard after being diagnosed by the onboard physician as bubonic plague. The steamer arrived at the port with other sick passengers, who were sent to the São Sebastião Hospital in the Caju district, located near the port. Of the eight hundred immigrants of various nationalities crowded in third class, 102 were to go ashore in Rio de Janeiro and five hundred in Santos. The rest would go to Montevideo and Buenos Aires (Brasil, 1908b, p.4; Gazeta..., 1 nov. 1907, p.4).

On October 31, 1907, news began to emerge in the Brazilian press about a ship quarantined due to the plague at the Port of Rio de Janeiro. The marine police prevented the disembarking of passengers, and a medical examination, performed when the ship was outside the Villegaignon island in Guanabara bay, verified the presence of the disease. Given this situation, the port physician, Doctor Joaquim Sardinha, reported it to the Directorate of Hygiene, which sent Doctor Emilio Gomes onboard to examine the blood of one of the patients. The patient was sent ashore to be properly treated (Correio..., 31 out. 1907, p.2).

Meanwhile, authorities and the community began to worry about having a ship suffering from an outbreak of bubonic plague near the city. As a preventive measure Major Trajano Louzada, maritime police inspector, ordered that the vessel be guarded throughout the night, so that "no reckless individuals, unaware of the danger," boarded her, until the authorities decided what to do to prevent the spread of the disease. Inside the steamship, the passengers were beginning to suffer from a shortage of food. In Buenos Aires, the final port of the ship, fear also reigned (Correio..., 31 out. 1907; Gazeta..., 5 nov. 1907, p.2).

The Orleannais was a serious, very difficult case. According to Doctor Silvado, disinfection of a steamship in such unsanitary conditions, and overcrowded with passengers, could not be done in the port. So he resolved to send it to the Ilha Grande lazaretto, where it could be disinfected thoroughly without passengers onboard, and without haste. The disinfection inspector had asked Doctor Pedroso, replacing Oswaldo Cruz at the head of the DGSP at that time, to bring the ship to Jurujuba cove in Niterói, a city in the state of Rio de Janeiro, where he thought the procedures could be carried out conveniently, as the cove was near the port. However, the site, the former location of the isolation hospital Paula Cândido, later called Santa Izabel, was not prepared for such an undertaking. Thus, the Orleannais was sent to Ilha Grande (Correio..., 31 out. 1907; Gazeta..., 5 nov. 1907, p.2).

This case highlighted the need to install a station in the port where ships could be disinfected – a problem already identified by Oswaldo Cruz when he inspected the ports of the Brazilian republic on his voyage in 1905-1906. The disinfection barge, named Pasteur, was not enough in this type of emergency, given the large number of passengers (Brasil, 1908b, p.5).

Silvado then went to the lazaretto aboard the barge Pasteur, together with Doctor Henrique Aragão of the Manguinhos Institute, on November 1, 1907, at seven o'clock in the morning, arriving at the island at four o'clock in the afternoon. The director of the lazaretto – which, although not used as an isolation hospital, still operated as a disinfection station – went aboard the Pasteur to greet the two physicians, which headed for the Orleannais, already at anchor in Abraão cove. "The ship was filthy, as was common in French steamships used for this type of cargo" (Brasil, 1908b, p.5).

The physicians told the captain that the passengers would be allowed to go ashore, and the baggage would be moved to the disinfection station at the lazaretto. The immigrants were immunized by Doctor Aragão, while Silvado disinfected the ship and the clothes of the crew (Brasil, 1908b, p.5).

The next day, November 2, passengers began disembarking. Disinfection onboard was performed with antiseptic solutions, with all compartments fumigated, from the hold to the captain's room. "The Pasteur chamber worked well, disinfecting the crew's clothing" (Brasil, 1908b, p.5).

On November 4, the work was finished, and the physicians left Ilha Grande. The Orleannais returned to the port of Rio de Janeiro, and was allowed to disembark some passengers and unload cargo. It continued to Santos, where another five hundred immigrants went ashore, and the remainder went to Buenos Aires. No new cases emerged. In the Argentine capital, the steamship was also allowed to freely circulate. "The epidemic explosion was curtailed" and the captain and the ship's doctor were satisfied with the service. The passengers who intended to remain in Rio de Janeiro went ashore, and remained under medical surveillance during the disease's incubation period (Brasil, 1908b, p.5; Gazeta..., 6 nov. 1907, p.3).

Final considerations

This article addressed the changes in maritime disease prevention practices in the port of Rio de Janeiro in the late nineteenth century and the first decade of the twentieth century. We analyzed two cases of ships carrying immigrants and arriving with an outbreak of an epidemic onboard, at different times, the Carlo R. (1893) and the Orleannais (1907), focusing on the sanitary defense practices used to prevent and combat the epidemics that arrived with the large flow of goods and passengers.

With the emergence of the concepts of microbiology and disease transmission by insect vectors, quarantines, which were the prevention practice most used at end of the nineteenth century by institutions receiving and inspecting ships and passengers, were replaced by other practices, such as health surveillance and vaccination. New hygiene technologies such as the Clayton gas apparatus and disinfection barges allowed the unloading of cargo and disembarking of passengers without the 'danger of contagion.' The steamship Orleannais was a successful case of interruption of an onboard epidemic, preventing it from spreading to the city and to the next ports where the ship would put in. Unlike the passengers on the Carlo R., which was turned away and prevented from reaching Brazil, with the result that more than five hundred passengers died during the return trip to its home port in Italy, those on the Orleannais were allowed to disembark, the sick received treatment, and healthy passengers passed through the disinfection process.

The case of the Orleannais was an example of a good response from the public health authorities when receiving passengers with communicable diseases. At the time, the Sanitary Service of the Port of Rio de Janeiro was equipped and operated regularly, with properly configured disease prevention practices, based on technologies, conventions and regulations. The arrival of ships with an outbreak of contagious diseases, therefore, was no longer an exceptional problem because prevention practices for this type of situation had become routine. There were standard procedures for these circumstances: disinfect the ship, baggage and passengers using the Clayton apparatus and disinfection chambers; isolate the sick and keep uncontaminated crew and passengers under observation during the disease's incubation period.

Despite the new technologies, however, the Orleannais' trip to the lazaretto, inoperative at the time, was inevitable. Like the Italian steamship Carlo R. with passengers with cholera in 1893, the French steamer with passengers suffering from the plague, in 1907, also had to

dock at the structure built on Ilha Grande that, throughout history, has served as an institution for the isolation of people, whether as a lazaretto, prison or penal colony.[37]

With new hygiene technologies, applied beginning shortly after the 1904 public health regulations, the perverse preventive practice of turning ships away – which was used in 1893 in the case of the Carlo R., sent back to its home port without any treatment for the sick passengers onboard – was avoided.

The new port sanitary protection practices provided more security for the authorities and the communities in combating epidemics; more 'rational' prophylaxis, governed by established scientific assumptions and sanitary regulations. However, despite the beliefs of contagionists or those who focused on environmental conditions, or even the emergence of microbiology, the specter of contagion prevailed with respect to the immigration question and remained over time, as well as the need for isolation, disinfection, inspection, tests and many other processes based on the distrust generated by the immigration process.

NOTES

* This article is part of the author's doctoral dissertation, entitled *A travessia: imigração, saúde e profilaxia internacional (1890-1926)*, defended at Casa de Oswaldo Cruz/Fundação Oswaldo Cruz, Rio de Janeiro, in 2010 under the supervision of Marcos Chor Maio and co-supervised by Gilberto Hochman.

[1] In this and other literal quotations of texts from non-English languages, a free translation has been provided.

[2] Under Brazilian legislation, passengers traveling in second or third class paid by the Brazilian government were classified as immigrants (Brasil, 1908a, p.114).

[3] Despite the quarantines and disinfections implemented at the Ilha Grande lazaretto by the port sanitary service to prevent the epidemic from moving inland, cholera took hold in Brazil in November 1894. The people in the Paraíba Valley, an agricultural region located between Rio de Janeiro and São Paulo to which the flow of foreign workers was destined, fled in panic. Railway traffic between the states of São Paulo, Minas Gerais and Rio de Janeiro was stopped, resulting in the total isolation of the city of Rio de Janeiro, the capital of the Republic. For a detailed account of the cholera epidemic inland, see Benchimol (1999, p.249-298).

[4] On the reception and inspection of immigrants in the Rio de Janeiro port at the end of the nineteenth century and the start of the twentieth, especially the issue of forcing ships to make a return voyage, see Rebelo, Maio, Hochman (2011).

[5] Cholera, with its frightening symptoms (large volumes of diarrhea, vomiting, abdominal cramps and violent muscle spasms) caused people to panic, especially onboard ships. "The patient's face becomes bluish, his skin withers, his hands and feet get cold, blacken, shrivel and wrinkle" (Lewinsohn, 2003 p.109-110). Death came quickly, sometimes within a few hours after the onset of symptoms.

[6] The newspaper mentions the vice-president because, between November 3, 1891 and November 15, 1894 Floriano Peixoto, who was Deodoro da Fonseca's vice-president, took power without calling elections after the latter's resignation, which was unconstitutional. Sectors of the navy, monarchists and some of the press instigated a revolt, which resulted in the Armada Revolt in Rio de Janeiro and the Federalist Revolt in the state of Rio Grande do Sul. For further information on the subject, see Neves (2003, p.15-44) and Flores (2003, p.45-88).

[7] Cruiser: a fast battleship (Luft, 1987, p.154).

[8] Tugboat: a vessel equipped to tow another boat (Luft, 1987, p.471).

[9] Cholerine, in the late nineteenth century was "a cholera that appears in one or two isolated cases, which occurs at any time and place independent of an epidemic... The symptoms do not evolve and the disease is much milder than what is known as Asian cholera, which attacks a large number of individuals" (Chernoviz, 1904, p.1436).

[10] On a similar case involving a ship of Chinese immigrants who arrived in San Francisco in 1899, suffering from the plague, see Barde (Apr. 2003). In that case, the bodies of Asians appeared on the coast, marked with

the words Nippon Maru, the ship's name, and this caused the local authorities to suspect the effectiveness of the federal quarantine.

[11] See Jornal do Commercio (29 ago. 1893, p.1); Gazeta de Notícias (27 ago. a 2 set. 1893, p.1).

[12] During the Ninth International Sanitary Conference in 1894, the country had the opportunity to recall what had happened in the previous year: four ships had undergone thorough medical inspection in their home ports, leaving Naples in perfect health. However, the passengers were refused as immigrants in Brazil. One of the steamships, the Carlo R., returned to Italy with 522 dead. The Italian delegation used the episode to oppose the proposals of the United States, which tried, unsuccessfully, to persuade the representatives of other nations of the importance of sanitary control of European immigrants to the Americas (Howard-Jones, 1975, p.73).

[13] From 1817 to 1913, the pound remained stable and became the main currency in international business transactions. One pound at that time was a considerable sum; it purchased, for example, a full men's suit. British workers earned three shillings for a day's work of ten hours, and therefore less than one pound per week. See Munro (s.d.); Ross (2000).

[14] For a critique of Ackerknecht's explanatory model (Sep. 1948), in addition to Baldwin (1999), see also Harrison (2006) and Maglen (2002).

[15] See Hardy (1993) and McDonald (1951).

[16] With respect to the influence of environmental medicine in Brazil in the first decades of the Republic, see Maio (2004).

[17] The disinfectants used in these processes were sulfur, for passengers, and zinc chloride and carbolic acid for luggage. As for clothes and belongings, the process was done using hot steam under pressure, applied in a chamber or using Geneste Herscher's spraying equipment (Andrade, 12 abr. 1890). For more on disinfection, see Benchimol (1999, p.249-298).

[18] Until 1850, Brazil was known for the healthfulness of its climate. The inhabitants of the vast South American continent enjoyed exceptional good health. European travelers said the east coast of South America, from Pernambuco to the Rio Prata, was one of the most healthy regions in the world (Cooper, 1975, p.672-673).

[19] The prevention model employed by the Health Services of the Port of Rio de Janeiro after the 1887 Convention was similar to that adopted by English ports during this period. The English Bill of Health was a signed certificate containing information about the health of the ship and which the captain of the steamship had to obtain before leaving the port. It could be 'clean' (without infection), 'touched' when it had put in to an infected port, but with no disease onboard), 'suspected' (with rumors of infection) or 'foul' (dirty, with sick passengers onboard). For a description and analysis of the English model, see Maglen (2002).

[20] For a description and analysis of the model for reception and inspection of immigrant passengers in US ports, see Birn (1997); Fairchild (2006) and Kraut (1994).

[21] Free access was the authorization issued by the sanitary police so that a vessel could enter the port and unload cargo and passengers (Brasil, 1895).

[22] Benchimol (1999, p.439) follows the argument of Latour (1984).

[23] According to Caponi (2002), classic hygienists, mostly infectionists, far from disappearing, found support in Pasteurian theory, which resulted in the continued use of disinfection and control of the unhealthy conditions in urban centers. The interaction between contagionists, who did not doubt the existence of germs, and infectionists, worried about "unhealthy air," generated the continuity between the theories proposed and the sanitary measures implemented.

[24] The expression new hygiene, used here as a convenient way to indicate certain differences in legislation and sanitary practices in the two periods, also appears in the government reports studied.

[25] According to art. 12 of the International Sanitary Convention of 1904 between the American Republics of Argentina, the United States of Brazil, Paraguay and Uruguay, sanitary surveillance was understood to be medical observation of passengers or pedestrians coming from contaminated locations or those suspected of contamination, within a period not exceeding the incubation period of the disease to be avoided, and carried out by the health authority.

[26] The quarantine in Brazil, despite having been eliminated in 1904 by health legislation, remained as a form of prevention in some critical epidemic periods, such as the Spanish flu (1918-1920) (Chagas, 3 fev. 1920). About the Spanish Flu in Rio de Janeiro, see Brito (1997).

[27] To learn more about the issue of urban reform at the beginning of the century in Rio de Janeiro, see

Benchimol (1992), and Chalhoub (1996). Specifically on the modernization of the port of Rio de Janeiro during the same period, see Albuquerque (1989) and Rocha (1995).

[28] On the international sanitary conferences in Europe, see Bynum (1993); Mateos Jiménez (2005); Howard-Jones (1975); and Goodman (1952). For more information about the American health conferences, see Howard-Jones (1981); Lima (2002) and Cueto (2007). On the South American Convention of 1887 between Brazil, Argentina, and Uruguay, see Chaves (2008).

[29] For description of the purging process in the Central Disinfection station, see Benchimol (1999, p.292).

[30] In April 1903, the Brazilian delegates to the Second Latin American Medical Congress, held in Buenos Aires, were the physicians João Batista Lacerda, Antônio Augusto de Azevedo Sodré, Francisco Farjado and Julio Afrânio Peixoto (Brasil, 1904a, p. 20). For more information on the Latin American congresses, see Almeida (2006).

[31] Almeida (2006, p.741) indicated that the Pan American medical conferences were relatively in line with the resolutions made in sanitary conventions, recommending sanitation works, control of American ports to combat the bubonic plague and yellow fever, and seeking the establishment of Ministries of Public Health in each country and uniform quarantine systems.

[32] The internationalism preached at European conferences had its limits, as seen in the exclusion of tropical diseases – such as yellow fever – which did not threaten the European continent. On this issue, see Bynum (1993).

[33] For analysis and discussion of the historiography of the controversy surrounding the scientific discovery of the mosquito as the vector for yellow fever in 1881 by the Cuban physician Carlos Finlay, and its confirmation only in 1900 by the American commission led by Walter Reed and Ronald Ross, see Benchimol (1999, p.383-429).

[34] The physicians Antônio Augusto de Azevedo Sodré, professor of the Rio de Janeiro School of Medicine, and Oswaldo Cruz, Director-General of Public Health, were delegates (Brasil, 1904a, v.3, p.8).

[35] The 1889 International Health Regulations, which originated from the 1887 convention, created the position of Ship Sanitary Inspector at ports in Uruguay, Argentina and Brazil. The inspectors were physicians of the respective nationalities and their job was to monitor occurrences during voyages and report them to the health authorities at the port of arrival (Andrade, 12 abr. 1890).

[36] See Ramos (2003).

[37] On the social control institutions established on Ilha Grande over the years, see Santos (2009). On the Ilha Grande lazaretto in particular, see Santos (2007).

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