Theories about the propagation of yellow fever: the scientific debate in the São Paulo press between 1895 and 1903

Soraya Lódola

Researcher, Laboratory for the History of Science and Technology/
Instituto de Geociências/Universidade Estadual
de Campinas (Unicamp).
Rua João Pandiá Calógeras, 51, Cidade Universitária
13083-870 – Campinas – SP – Brazil

sorayalodola@gmail.com

Edivaldo Góis Junior

Professor, Unicamp.
Avenida Érico Veríssimo, 701, Cidade Universitária
13083-851 – Campinas – SP – Brazil

edivaldo@fef.unicamp.br

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Abstract

This article describes the debate over theories about the propagation of yellow fever in the São Paulo press. Our time span was defined as the period between 1895 and 1903, a time that saw high indices of the disease in Brazil. Documentary research involved mass circulation newspapers in São Paulo and medical journals of the period. The empirical data was collected from the Public Archives of the State of São Paulo and from the library of the Faculdade de Saúde Pública at Universidade de São Paulo. It was observed a clash between theories as to the propagation of yellow fever that revealed a symbolic dispute for influence in the formation of the scientific field.

Keywords: yellow fever/history; history of medicine; the press; communication on health issues; Brazil.

Yellow fever: miasmas, contagion and bacteriology

In nineteenth century Europe, one of the most hotly contested debates in medicine revolved around the theories of contagion and of miasmas. Both theories sought to explain the cause of various diseases and brought with them theoretical and ideological concepts.

The theory of miasmas held that the cause of illnesses and epidemics was bad environmental conditions. Certain diseases developed as they adapted to specific environmental conditions. These conditions ranged from temperature to unhealthy living conditions. This view was fortified by the observation that diseases took a greater hold in unhealthy environments. The foul smells, allied to the lack of sanitation, drainage, drinking water and personal cleanliness, made the working classes more susceptible to disease. This theory supported the arguments of physicians working in the fields of hygiene and epidemiology who aimed to persuade public authorities of the importance of interventionist policies of basic health care, training in hygiene, disease prevention and medical care. Many health reformers supported the theory (Rabinbach, 1992; Rosen, 1994).

In contrast to the theory of miasmas, the contagionists argued that diseases spread through contact with a sick person. They were in favor of isolating the individual in order to control the disease and prevent epidemics.

The nineteenth century saw the dominance of the theory of miasmas over contagion theory. According to Erwin Ackernecht (1948), the arguments between the contagionists and the supporters of the theory of miasmas, the anticontagionists, showed not only the theoretical differences between the two sides, but also the opposing ideological and political positions that these tendencies represented. The contagionists represented a more conservative strand of medicine with their support for isolation, whilst the anti-contagionists, on the other hand, were liberals who called for more healthy living conditions.

However, with the development of the experimental science of Claude Bernard (1878), who was responsible for establishing the limits and specificities of experimental medicine, the debates surrounding earlier medical research underwent a gradual change. Within this context of changes in medical research, there were developments in microbiology that argued that agents of contagion existed, but that they could only manifest themselves when combined with other factors, such as social, climatic and economic conditions (Rosen, 1994). The paradigm for this standpoint was the research carried out by Louis Pasteur in 1856. The study involved the investigation of a disease that spread in silkworm nurseries. In the light of his research, he became convinced that two diseases were affecting the nurseries, and were caused by specific external agents, namely by different microbes. Incorporating this with ideas of vectors, human carriers and host insects, bacteriology had the tools to study the causes of many illnesses. In 1868, Antoine Villemin stated in his Études sur la Tuberculose that this disease did not originate in humans or animals or because of an unhealthy atmosphere. Its cause was a virulent process, a microscopic germ that was capable of multiplying within the organism and of transmitting itself through the air and contaminating other individuals (Vigarello, 1996).

Further research into other diseases emerged that disproved the idea of miasmas and the old theories of contagion. Georges Vigarello (1996) explains that with the theories of Pasteur,

a new concept of bodily care was born. It was discovered that the major enemy of bodily cleanliness was not perceptible to our senses, namely invisible microbes. Thus strict physical hygiene should be undertaken daily. Clean clothes were not enough to combat such diseases, it was necessary to get rid of these microorganisms through the use of water. Thus, hygiene assumed greater importance and became a greater factor in daily life during the twentieth century, introducing new habits (Prost, 1992).

In Brazil, as Edler (2002) explains, the medical environment at the time was heir to a large number of practices, concepts and methods. According to this historian of medicine, there were three principal groups in dispute during the nineteenth century: a group linked to clinical anatomy, a further group to medical topography, and a third to experimental medicine. The characteristic institutional area for the first group was the hospital; the second group was considered to represent statistical medicine, owing to its reliance on statistical methods, and was therefore treated with reserve; the last group, representing laboratory work, burst onto the scientific scene with an open challenge to the way medical knowledge was produced. In Rio de Janeiro, various societies and medical journals advocated the need to increase research into diseases prevalent in Brazil, with a view to dispelling the unhealthy image of the Empire in the eyes of European nations (Chalhoub, 1993; Edler, 2002). Nineteenth century Brazilian physicians encouraged the spread of local scientific research, in which new ideas on parasitic etiologies blended with theories on climate and race during the second half of the nineteenth century (Chalhoub, 1993).

These controversies in the field of medicine are also explained by Sá (2006), where the systematic practice of experimental research, more specifically in bacteriology, led at the end of the nineteenth century to an aversion to rhetoric and pompous speeches. For the new generation of Brazilian physicians, followers of Pasteur's bacteriology, earlier medicine was excessively opinionated (Sá, 2006).

Awareness that great changes were taking place in medical theory and practice had repercussions on the debates within Brazil, where studies into yellow fever quickly resulted in a public debate between physicians. Winning the argument over matters involving the pathogenic agent and means of propagation of yellow fever would bring great prestige in the field, because there were many who longed to be known as the "Pasteur of the tropics" (Benchimol, 1995). However, the change was not consensual, because other physicians, in opposition, tried to resist the new scientific concepts of bacteriology.

These disputes with regard to the creation of a new "field," in the words of Pierre Bourdieu, may explain the clashes by specific symbolic capitals in Brazilian medicine in the late-nineteenth and early-twentieth century. In adopting this model of analysis, we must understand that this operation requires clarification of certain limits, since the objectives of Pierre Bourdieu are linked to the concerns of sociology. In his model for sociological analysis, it is important to show what he called "the fundaments of hidden domination." In other words, his object was the relationship between a material structure and the representations of social agents. Indispensable to Bourdieu's model of analysis are the descriptions of the mechanisms of reproduction, the "laws of social reproduction," that are explained by their economic structures, but at the same time by the symbolic dimensions of social agents. In this way, sociology is "the science of struggles for power" (Bourdieu, 1990).

In this way, the narrative of this historiographic research also sets out to show the power relationships between structures and historical subjects, or in the words of Bourdieu, the "social agents." This explanation is necessary, because historiography may have other aims that are not related to structures but to the specific cultural and local features of a particular group at a particular time, or even, where it is solely interested in structures, may interpret the history of public health on the basis of political and economic history.

Looking at Brazilian medicine as a field, it is susceptible to the specific disputes and interests of various individuals and social groups in conflict. Thus, the field is the *locus* where subjective representations and structural conditioners manifest themselves in the struggle for specific capital. But, to ensure "field formation," in addition to capital and specific interests, social agents must identify and legitimize rules defining the field that gives support to a *habitus*.

In describing this scenario in Brazil in the late-nineteenth and early-twentieth century, this study aims to give an account of the debate and the disputes over theories regarding the propagation of yellow fever in the São Paulo press. We therefore deal with how the physicians of São Paulo announced their discoveries in their intention to conquer the symbolic capital of scientific discovery. In the case of Rio de Janeiro, the debates involving yellow fever were examined in the studies by Benchimol (1999), Challhoub (1993) and Sá (2006).

In methodological terms, our time span was thus defined as lying between the years 1895 and 1903, a period that saw a great incidence of the disease in Brazil and the growing influence of bacteriology in theories regarding diseases. Documentary research was carried out in newspapers of wide circulation in São Paulo, namely *O Estado de S. Paulo*, *Diário Popular* and *O Comércio de S. Paulo*. In addition, we researched specialist journals such as *Revista Médica de S. Paulo* and *Boletim da Sociedade de Medicina e Cirurgia de São Paulo*. The documentary basis for this study consisted in 25 articles dealing with the theme of yellow fever. The empirical data was assembled in the Public Archives of São Paulo and in the Faculdade de Saúde Pública (School of Public Health) of Universidade de São Paulo (University of São Paulo).

Newspapers as a stage for medical debate over yellow fever

In the 1880s, the Rio de Janeiro physician Domingos Freire posited the propagation of yellow fever through an alga that was capable of contaminating water, air, uncooked food, hospitals and cemeteries. In search of recognition as regards his discovery, Freire sent his theories to the International Congress of Budapest in 1884, where he presented the cause, origin, pathogeny, treatment and prophylaxis for yellow fever. He wrote enthusiastically in major newspapers that his theories had been received with great interest, and had been "the object of such a demonstration of support that, on the basis of the resolution proposed and approved there, his investigations into the cause, origin, pathogeny, treatment and prophylaxis for yellow fever had been formally vindicated" (Nascimento, 1896, p.416). However, in 1896, the National Academy of Medicine in Rio de Janeiro, upon scrutiny of the official congress documents, stated that the work of Domingos Freire had simply been read and had not been put to the vote and could not therefore be classified as approved (Nascimento, 1896).

Jaime Larry Benchimol (1999), in his book *Dos micróbios aos mosquitos* (*From microbes to mosquitos*) gives a detailed analysis of the propositions of Domingos Freire with regard to yellow fever.

Freire commenced his work on yellow fever between late 1879 and early 1880. In 1880 he entered into intense debate in the mass circulation newspapers of Rio de Janeiro, particularly in *A Gazeta de Notícias* and *Jornal do Comércio* (Benchimol, 1999). There Freire entered into fervent discussions with physicians and laymen with regard to the causes and treatment of yellow fever. Eventually, in the context of field formation with the establishment of a *habitus*, in the initial panorama of the influence of bacteriology, the relationship of cause and effect between microbes and the disease confronted the theory of miasmas and contagion theory. But in addition to this, according to Benchimol (1999), he faced criticism from all quarters, for example from clinical physicians who trusted in their own empirical procedures, and even from other bacteriologists, who condemned Freire on ethical grounds, because he presented as fact interpretations that were merely hypotheses. Benchimol (1999) also highlights the confrontation that ensued during the 1880s between Freire and João Batista de Lacerda, a Rio de Janeiro physician, in the mass circulation newspapers of Rio de Janeiro.

Unlike in Brazil, the debates in Europe took place in arenas that were considered legitimate. In Brazil, they overflowed from medical institutions and reached the public domain, such as newspapers, which made the dispute more acrimonious (Benchimol, 1995).

The newspapers were representative of massive press coverage. It is appropriate at this stage to recall that even where articles were written by the same physicians, because of the different readership, namely specialists in the case of scientific journals as opposed to laymen in the case of the newspapers, there was also a variation in vocabulary, because the incentive for publishing a scientific paper in a publication for laymen was the breadth and speed of circulation of new ideas and discoveries. Sá (2006) stresses that newspapers in the city of Rio de Janeiro during this period published scientific subjects intensively. The city press carried reports of new scientific discoveries, the travels of scientists and visits by foreign researchers, and even conducted interviews or reproduced speeches given before scientific institutions. The desire to give a picture of healthy urbanization, the specific characteristic of a *habitus*, gave science a symbolic dimension that was intimately linked with modernity.

Additionally, when physicians were interested in publishing their achievements and original work, the newspapers were the perfect vehicle. They were more suitable than scientific journals, because in the newspapers their results were presented without further discussion (Sá, 2006).

A similar situation prevailed in São Paulo. Most of the articles in the mainstream press were written by the physicians themselves. They were the ones who provided the information and lit the fires of controversy surrounding the debates with regard to diseases. The articles also differed as regards the intention behind them. They were extremely scientific or socially relevant when they contained guidance on how to prevent certain illnesses. In addition, they publicized vaccination campaigns and gave details with regard to the use of medication. Arthur Mendonça (1903a, p.58) wrote:

> In March 1889, I wrote in the columns of this same newspaper, then known as *Província de São Paulo*, a series of articles under the title: 'The perils that water can represent for

> us.' It was a summary of medical zoology and was an essential introduction to another series of articles that I wrote immediately afterwards, the subject of which was the epidemiology of yellow fever.

During this period, it was common for São Paulo physicians to publish their theories in the newspapers first before publishing them in specialist journals. Victor Godinho (1897, p.65) states in his book:

> The editorial office of *Estado de São Paulo* knows that I had no intention to cause controversy when I published my unassuming articles.
>
> I had written them to send to *Brazil Médico*, but thinking that they were largely of interest in the state of São Paulo and following the advice of my colleagues, I decided to entrust them to the good offices of *Estado de S. Paulo*.

In such circumstances, physicians themselves read the newspapers to become acquainted with the new theories being put forward by other physicians. This is seen in a quote taken from the book by Eduardo Magalhães (1899, p.69) on the discoveries of Sanarelli: "I read in the newspapers that Professor Sanarelli has discovered the prophylactic serum for yellow fever and that he is on the way to discovering the cure, or that he has already discovered both".

Articles appearing in the newspapers also had positive consequences among the medical fraternity. Since newspapers were published daily and enjoyed broad circulation, there was also a symbolic dimension connected with power and fame that indicated a subtle interest in prestige and recognition in the field of science.

> I did not have the good fortune to read the articles written by Dr. Luiz Pereira Barreto in *Comércio de São Paulo* concerning the transmissibility of yellow fever, because at the time I was not in the State of São Paulo. However, from everything I have heard about these articles from a distinguished colleague, I know that he is of the opinion that yellow fever is transmitted exclusively through water (Godinho, 1897, p.26).

As we have already said, there were intense debates over the various theories, and newspapers acted as the stage for these constant discussions. For example, Arthur Mendonça, a physician at the Institute of Bacteriology in São Paulo and editor of *Revista Médica de S. Paulo*, wrote in a newspaper criticizing a theory that had previously been published there by the Rio de Janeiro physician João Batista de Lacerda.

> In a letter published on the 12th in *Jornal do Commercio*, I explained that my distinguished colleague Dr. J.B. de Lacerda has forgotten the basic principles of experimental pathology, when he stated that the incubation period observed after a mosquito bite 'absolutely excluded the hypothesis of a toxin.'
>
> I appealed to the evidence produced by various authors, who showed that this incubation period was inevitable, whatever the dose of toxin inoculated (Mendonça, 1903a, p.133; emphasis in original).

It was in the newspapers that the discussions with regard to scientific discoveries and the "symbolic" dispute for recognition became most acute, as we shall show below in relation to the city of São Paulo.

The debates over the propagation of yellow fever in the press of São Paulo

In the late-nineteenth and early-twentieth century, São Paulo was one of the largest cities of immigrants in the world (Hall, 2004). According to data revealed in the research of Michael Hall (2004), in 1893 the city numbered more foreigners than Brazilians (54.6%). This was a trend that continued until the 1930s, when 67% of the population were foreigners or the children of foreigners.

São Paulo was a city built on the coffee industry. The volume of coffee exported through the port of Santos grew from 2.5 million bags in 1888-1889 to 7.8 million bags in 1900-1901 (Saez, 2004). This growth in economic activity also underpinned the growth of a middle class linked to the coffee business, which identified with country traditions, but also aspired to the ostentatious codes of behavior brought by modernity. Concomitantly, there was in increase in the demand for education and health, as an accompaniment to the trend of modernity and urbanization. In the network of relationships between individuals and the economic structure, physicians became well known and gained the respect of the public. Their achievements and discoveries were covered by the São Paulo newspapers and made them the subject of popular interest.

If, like Cavallo and Chartier (1999), we regard newspapers as vehicles for the circulation of ideas, we shall understand that in the context of nineteenth-century Europe they represented a revolution in the spread of reading compared with books because of their low purchase price. They were thus more accessible to a wider public, including women and working people, and contributed to the proliferation of various practices directed towards specific groups. In their words, "in the nineteenth century, the history of reading enters the epoch of the sociology of differences" (p.36). In Brazil, and specifically within the context of modernization in São Paulo in the late-nineteenth and early-twentieth century, the habit of cultural reading began to spread to a broader elite. The leading newspapers of São Paulo, for example, reached a greater variety of readers linked to commerce and the world of work and also became the basis for the construction of public visibility of numerous cultural practices (Cruz, 2000).

The newspapers were devised for an urban and middle class public that was experimenting with reading a variety of articles about politics, economics, crime, art, sport and science. Heloisa de Faria Cruz (2000, p.79) stresses the growth of this market in São Paulo:

> At the same time, as opposed to books, there was a boom in the reading of journals and journals in São Paulo. Journalism was passing through a period of optimism. Parties to launch new journals became frequent and well attended. They were held with considerable ceremony in fashionable cafés or in one of the parks of the city, and were attended by the entire journalistic elite.

Thus, in São Paulo, the mass circulation newspaper was a fundamental means for achieving notoriety. As an instrument of relevance for public recognition, the medical fraternity frequently used it to publish its experiments. Among the many other controversies, the attacks and counterattacks with regard to yellow fever appeared in the main newspapers, including *O Estado de S. Paulo* and *Comércio de S. Paulo*.

In this context, there was increasing interest and knowledge on the part of the lay public in new technologies and in science. The topic of yellow fever attracted special attention, because

economic expansion was accompanied by a spread of the disease, a fact that was considered important in the search for the pathogenic agent of yellow fever during the period. Economic progress, higher immigration and advances in the means of transport were closely followed by outbreaks of epidemics such as yellow fever (Teixeira, 2001b; Telarolli Junior, 1996b).

With increasing urbanization, the theory of miasmas found its place in São Paulo. After all, acceptance of the theory meant greater control by physicians over city sanitation. An example of this was the publication of research carried out by Luiz Pereira Barreto, a physician who played a leading role in the Society for Medicine and Surgery of São Paulo. In March 1889, in a newspaper then known as *Província de São Paulo*, he published articles proposing that yellow fever was transmitted exclusively by water (Teixeira, 2001a).

In 1896, Luiz Pereira Barreto decided to publish his theories once more, this time in a specialized journal, *Boletim da Sociedade de Medicina e Cirurgia de São Paulo*, and subsequently in the *O Estado de S. Paulo* and *O Comércio de S. Paulo* newspapers. In his words:

> Whereas in the summers of 1889 and 1890, when the population of Campinas was served exclusively by water from wells, the city suffered from two severe and deadly epidemics;
>
> Whereas, once the construction of pipes and drainage had been finished in early 1891, and the population was supplied with drinking water in abundance from an unpolluted source, the epidemic ceased completely, so that not a single case remained (Barreto, 1896, p.1).

Luiz Pereira Barreto was of the opinion that poor water quality was responsible for the yellow fever epidemic. He based his conclusions on the outbreaks of the disease in Campinas in 1889 and 1890. He also pointed out that the epidemic had returned in 1892 after an accident involving the drinking water reservoir, which meant that the population needed once again to have recourse to the water from the wells. In his words:

> The Society for Medicine and Surgery of São Paulo hereby comes forward to declare the water in Campinas to be polluted and advise the authorities of the most urgent measures that must be taken, among them the following:
>
> > (1) Expropriate all the headwaters and remove all settlements, habitations and animal pens to be found there;
> >
> > (2) Immediately empty the reservoirs and allow them to remain dry for some time and take advantage of this time to disinfect them from top to bottom;
> >
> > (3) Advise the population only to use boiled water, and to ensure that all crockery is washed in boiling water, not forgetting milk containers;
> >
> > (4) Request the Companhia Paulista to kindly supply the population with pure drinking water, as it did so philanthropically in 1889; and to continue such supply for the whole time during which the reservoirs remain empty;
> >
> > (5) Remind the municipal or state authorities of the urgent need to locate four or five locomotives there for the sole purpose of supplying boiled water to the poor;
> >
> > (6) Remind the Campinas Water and Drainage Company of its basic duty to carry out without delay a review of all its pipework, with a view to confirming

> or disproving the theory of drinking water contamination by the underground water table;
>
> (7) Remind the health inspectors to keep a close watch on the manufacture of bread and beer, to ensure that such staple items are not made with polluted water;
>
> (8) Finally, to remind the municipal authorities that a committee of engineers should determine whether the water from Guatemin is or is not sufficient to supply the city, and in the case of an affirmative answer to dispense with using all of the headwaters of Jardim, these waters being more prone to contamination by virtue of the fact that more than one thousand people live there (Barreto, 1896, p.2-3).

O Estado de S. Paulo that until that point had not taken part in the argument, began to publish articles opposing the theory of Luiz Pereira Barreto that yellow fever was spread through the water supply. It published cases of families who, even though they had drunk only boiled water, had fallen victims to yellow fever. It also cited the case of an Italian ship berthed in Rio de Janeiro, where almost the entire crew had been affected even though they had drunk only boiled water. But the physician's reputation with the general population ensured that readers were interested in his research, which led to changes in behavior. It became common among the wealthiest families in São Paulo when travelling to the interior where the epidemics occurred, to take with them supplies of water from Minas Gerais where until then there had been no cases of yellow fever. This precaution was adopted after they read the recommendations made by Barreto in the columns of the São Paulo press (Telarolli Junior, 1996a, p.103-105).

This new mindset in relation to water was not specifically Brazilian, but a modern phenomenon created by scientific studies. For example, in France at the same period, washing with water was gradually taking the place of dry baths and the use of perfume, because increasingly individualized modes of behavior and the greater store set on medical knowledge made possible new uses for water and for care of the body (Goubert, 1986; Vigarello, 1996).

The theories of Luiz Pereira Barreto not only encountered resistance from the São Paulo press but also came into conflict with the view taken by the Health Services Administration, headed by Victor Godinho, because for him water was only one of the elements responsible for the transmission of yellow fever. According to the Administration, water had to be considered jointly with air circulation, soil type, diet, natural phenomena – such as wind direction, electrical discharges, temperature and rainfall – the presence or not of outsiders, and the migration of persons from one place to another. Furthermore, another concept was gaining force, namely Sanarelli's theory.

In June 1897, Giuseppe Sanarelli, a scientist based in Montevideo who enjoyed a high reputation, announced at a session of the National Academy of Medicine in Rio de Janeiro that he had discovered the pathogenic agent of yellow fever. A man with a wide knowledge of cholera and typhoid fever, who followed a strict methodology and used the most advanced scientific techniques of the time, Sanarelli made various converts to his theory. The microbe that he called "ictheroid bacillus" was to be found in the blood, as opposed to other theories that held that the pathogenic agent installed itself in the digestive apparatus, generally in the stomach or the intestine.

The press published this important news with great fanfare. In 1898, Sanarelli, the discoverer of the "ictheroid bacillus," was in São Paulo at the invitation of certain physicians, for the purpose of developing epidemiological research in the town of São Carlos do Pinhal. He had the support of leading Brazilian scientists, such as Carlos Seidl, Victor Godinho and Arthur Mendonça. Luiz Pereira Barreto also subsequently supported the idea that the disease was spread through mold, as had been proposed by Sanarelli (Teixeira, 2001a).

During the month of March there was universal coverage in the mass circulation and specialist press of São Paulo of the conference attended by Sanarelli at the Society for Medicine and Surgery of São Paulo. *O Comércio de S. Paulo* and *Boletim da Sociedade de Medicina e Cirurgia de São Paulo* published in full the speech in which he explained how the bacillus was discovered.

For two days, the *Diário Popular* reserved part of its front page for coverage of the arrival of Sanarelli and the discoveries announced by him at the conference (Conferência..., 9 mar. 1898; Sanarelli, 8 mar. 1898).

> The reception that the people of São Paulo and his countrymen gave him yesterday must have flattered the distinguished medical man, who saw how the capital city of our state knows how to render homage to true scientific merit (Conferência..., 9 mar., 1898, p.1).

Following Sanarelli's announcement, Domingos Freire also went to the Rio de Janeiro newspapers to assert that in the 1880s he had discovered *cryptococcus xanthogenicus* as the true pathogen of yellow fever (Telarolli Junior, 1996a, p.114).

At a meeting of the National Academy of Medicine on October 27, 1898, Affonso Ramos declared that "in the light of logic, science and simple common sense, the *micrococcus* of Dr. Freire cannot fulfill the etiological function with which he insists on endowing it" (Academia..., 1898, p.403). Affonso Ramos even suggested the establishment of a committee to analyze the work of Domingos Freire. The meeting reveals the atmosphere of controversy that enveloped the debates over yellow fever when we consider the defeat of the proposal by Affonso Ramos based on the view expressed by Sousa Lima:

> I confirm that I voted against the proposals of Dr. Affonso Ramos simply because the members of the academy whose research in bacteriology entitle them to constitute the committee that Dr. Ramos is proposing have already given their opinion with regard to the work of Dr. Freire and are considered by him to be his enemies (Academia..., 1898, p.403).

Efforts to find the pathogen of yellow fever intensified and increased in importance because physicians believed that once the pathogen was discovered, the creation of a therapeutic serum and a vaccine would follow. Moreover, the "symbolic" aspect of this creation would link the conquest intimately with its creator, in the same way as the relationship between an artist and his work, leading to recognition and prestige (Bourdieu, 2005).

A further debate in the newspapers took place from 1903 onwards. Luiz Pereira Barreto returned to the discussion of yellow fever in *O Estado de S. Paulo*, but this time he proposed mosquitos as the carriers of the disease. His opponent in the same newspaper was Arthur Mendonça.

The activities of these groups, in the context of the standardization of practice, led to a series of struggles for space and influence, proceeding from very different outlooks (Almeida, 2000). Arthur Mendonça (1903a, p.53-54) summarized the controversy that year:

> In an article published in *Estado de S. Paulo*, I sought to show the lack of any basis for this doctrine. The report published today in *Estado* and signed by Drs. Pereira Barreto, Silva Rodrigues and Adriano de Barros shows that Dr. Barreto has abandoned water in order to throw in his lot with mosquitos.

In an article entitled "Transmission of yellow fever by mosquitos," Luiz Pereira Barreto (1 mar. 1903, p.1) replied on the first page of *O Estado de S. Paulo*:

> Meanwhile, my good friend and distinguished colleague Dr. Arthur Mendonça alleges that, seduced by the resounding experiences of the American physicians, 'I have abandoned water in order to throw in my lot with mosquitos.' Everybody who knows Dr. Mendonça well knows that sincerity and candor are two of his principal characteristics. As these qualities in my illustrious opponent are indisputable, how can we resolve the problem of his lack of respect towards the American physicians and his clearly unjust treatment of my person? My illustrious friend will pardon me if, for a moment, I submit his triumphalism to an impartial philosophical analysis. My illustrious colleague feels mortally wounded in his most intimately held, dearest and most sacrosanct beliefs. In the sincerity of his anguish, any change of view in medicine seems to him to be a crime as heinous as that of a turncoat in the political sphere. The problem we face, therefore, is the role of sincerity in its relationship with the march of ideas and the progress of science.

The reply of Arthur Mendonça reveals the emotional nature of the scientific debate in the newspapers. In an article published four days later, he wrote:

> Dr. Barreto then launched into vilification of my person, calling me unpleasant names and demeaning me. He called me a vagabond, accused me of a lack of patriotism, and abused Professor Sanarelli. He then went on to expound his concern with the diseased state that mosquitos produced in the individuals under observation in the Isolation Hospital, and later explained the magnificent results that were obtained in Campinas and Cuba following extermination. … The Koran of American physicians now shows that drainage that suppresses the mosquitos in Campinas is also capable of increasing them, as happened in the unfortunate district of Vila Buarque, according to the bulletins issued by the Health Service Administration. There never was such a whimsical vector as the Aedes aegypti mosquito. Unfortunately, however, it is today public enemy number one – a phantom that the government is pursuing in a relentless manner. Its wings bring down complete ridicule upon the medical profession and fritter away government funds on those same wings (Mendonça, 5 mar., 1903, p.1).

In our view, the debates that were played out in the newspapers were merely opening gambits, a first phase where publication had no need for deeper scientific arguments, but brought into play the issues in order to persuade the general public. However, in the scientific journals it was necessary to convince the author's peers, because it was in this field that the *habitus* was shaped.

The debate in the São Paulo scientific journals

Unlike newspapers, the readership of the scientific journals represented the elite of São Paulo. The authors had distinguished themselves in their medical careers, both in the field of research and in the public office that they occupied. The medical fraternity of São Paulo was a part of the governing class that enjoyed the benefits that the symbolic representation of its activities had within the *habitus* of modernity, urbanism and science.

The journals also showed that the best-known physicians assumed their authority not only from the empirical data collected under the auspices of experimental medicine and bacteriology, but also from the weight of their names. It mattered little if they were exalted or heavily challenged, and this determined the defining rules of that *habitus*, as we shall see from the leading medical journals of the period.

First, *A Revista Médica de S. Paulo* (1898-1914) was owned by Victor Godinho, who was an inspector in the Health Service Administration of São Paulo and director of the Isolation Hospital. The journal was edited by Arthur Mendonça. Under his influence, the position adopted in most of the articles favored Sanarelli's theories. Various articles opposing the ictheroid bacillus explanation were also printed, though they were always countered by the arguments of Arthur Mendonça in favor of the discovery of the Italian physician.

On the other hand, *Boletim da Sociedade de Medicina e Cirurgia de São Paulo* (1895-1941) was the medium for publishing the scientific views of the Society. Here one can discern the greater influence of physicians linked to the Institute of Bacteriology. It is clear that the journal gave prominence to the publications of important physicians at the Institute, such as Emílio Ribas and Adolpho Lutz, who, as we shall see, adopted the theory of the transmission of yellow fever by mosquitos, thus repudiating Sanarelli's theory.

During the course of the 1890s, the bacteriologists had already achieved overriding domination in the field. This was reflected in the specialist journals that in the case of yellow fever focused the debate on the definition of the microorganism that caused the disease, which undoubtedly represented an important symbolic capital. However, other topics, such as the prevention of yellow fever, also found space. An example of this occurred in 1896, when Esteves de Assis stated in the *Boletim da Sociedade Médica e Cirúrgica de São Paulo* that yellow fever spread via mixed propagation by air, water and soil.

> Water plays a role simply as a vehicle, but it does not enjoy the privilege of transporting it, because contamination of the subsoil by infiltrations from sewers and latrines, i.e. the infection of any location, is the cause of the spread.
>
> ... I believe, therefore, that if we ensure, besides the provision of GOOD WATER, proper SOIL DRAINAGE, the extinction of INFECTED CUBICLES, the STRICTEST HEALTH MONITORING, carried out daily even in normal times, so that the most beneficent results are achieved, and ISOLATION, COMPULSORY ON THE APPEARANCE OF THE FIRST CASES, we shall have the ideal conditions for preventing an outbreak of yellow fever (Assis, 1896, p.5; emphasis in original).

Prevention, however, was a secondary debate, because the bacteriologists knew that the establishment of the pathogenic agent would subsequently define both prevention and treatment. In this context, Sanarelli's theories came under new criticism. Benchimol (2003)

tells us that the bacteriologists led by Adolpho Lutz confirmed the presence of the ictheroid bacillus in the blood of patients. Thus Lutz began by supporting the first part of Sanarelli's theory, but was emphatic with regard to the second part, where he rejected the treatment of yellow fever by means of serum therapy. Later, in a report published in *Revista Médica de S. Paulo*, Adolpho Lutz questioned Sanarelli's theory per se regarding the bacillus, giving details of experiments carried out in 1898 at the Bacteriological Institute of São Paulo:

> SANARELLI's discovery has been confirmed in Rio de Janeiro, New York and Cuba, where they found bacilli considered identical. The descriptions, however, are not sufficiently accurate to provide conclusive proof that it is the same bacillus in every case. Certainly where the characteristics show some differences, as happened in Rio de Janeiro, there may have been some confusion with certain colibacilli of modified characteristics (Lutz, 1901, p.317; emphasis in original).

He ended his report by saying that he did not believe that the bacillus was the pathogenic agent of yellow fever: "However, if the committee believes that it has been proved that the micrococcus described is the pathogenic agent of yellow fever, most bacteriologists will beg to differ" (Lutz, 1901, p.318).

Adolpho Lutz was an important representative of bacteriology in São Paulo and in Brazil, and was not satisfied with domestic publication to deny the discovery of the bacillus in question. In 1901 he sent a letter to the president of the Royal Academy of Medicine in Turin that was subsequently published in *Revista de Medicina e Cirurgia de La Habana*. In the letter Lutz summarized the work carried out by his team, showing that the discoveries of Sanarelli were invalid.

> You will see how, in total agreement with all the observers, I maintain that the serum of SANARELLI has not produced a single favorable result in the patients treated by this method. … Moreover, it is well known that its preventive qualities have been of no effect in most cases in which the experiment has been tried. And I will further assert that in our experiments carried out with the bacillus isolated in São Carlos and recognized as genuine by SANARELLI, the serum has not given any protection against the effects of inoculation in animals subjected to our experiments (quoted by Mendonça, 1901, p.2; emphasis in original).

The disputes over the theory had an influence on the researchers at the Institute of Bacteriology in São Paulo. Believing in Sanarelli's theory, Artur Mendonça, who had been a researcher at the Institute until then, published his views in *Revista Médica de S. Paulo*, and concluded by saying: "In my opinion, the etiological problem with regard to yellow fever has been clearly and fully resolved by Dr. SANARELLI, and if there are any obscurities, these are also to be found in much older, more established studies, such as those regarding typhoid fever" (Mendonça, 1901, p.5).

This conflict between the theories led to the resignation of Artur Mendonça from the Institute one year earlier, in 1900 (Dantes, 2001).

The arguments might have come to an end in 1900, when an American military-medical mission in Cuba published the results of experimental studies to test the theory of the transmission of yellow fever put forward by the Cuban physician Carlos Finlay (Teixeira, 2001b). Finlay argued that yellow fever was propagated by a female mosquito. This thesis

was supported by new theories in bacteriology, linked to concepts of specific external agents, namely the vector, the human carrier and the host insect. However, a simple acceptance of this new theory would run counter to the interests of certain Brazilian physicians involved in scientific disputes, as Bourdieu (1983) points out. The introduction of bacteriology in Brazil was not a passive assimilation of ideas originating in economically and culturally advanced countries.

> Between the time when Pasteurian medicine was viewed as a threatening dogma and the time when it was embraced by the whole medical fraternity and placed in its pantheon of certainties, there was a long series of arguments in which the protagonists were for the most part physicians searching for the pathogenic microbes and assuming all the risks involved in the advancement of theories that were for a long time debated both inside and outside Brazil (Benchimol, 1995, p.69).

This mistrust by physicians with regard to the role played by the mosquito as vector was the cause of many disputes in Brazil (Benchimol, 1999). In 1903, the *Revista Médica de S. Paulo* published various articles detailing experiments carried out on patients, which either proved or disproved the theory of the Cuban physician Carlos Finlay.

One of these experiments was carried out at the Isolation Hospital, with the aim of testing the hypothesis of yellow fever contagion through contaminated clothes. With no strict ethical rules in force at the time, the physicians kept three Italian immigrants in the hospital for a period of ten days, during which they wore the clothes of sufferers and slept in their nightclothes. The physicians recounted:

> The patients opened three flasks that had been hermetically closed and sealed. One of them contained the urine of a patient suffering from yellow fever (from Casa Branca), the second contained black vomit, and the third feces mixed with blood (from Ribeirão Preto), and the contents of the three flasks were poured by the patients over the clothes they were wearing and over clothes that were scattered on the floor. It should be stated that the clothes had been previously shaken out. Such was the smell in the air that we all felt suffocated, and the sense of mold was particularly intense and disagreeable, the concentrated effect of which we felt in the throat. … They continued to be submitted to the dirty clothes test during the night, and made sure to shake them every time they had to prepare their beds. … On May 10, we checked for the last time that MALAGUTTI, PAROLETTI and SINISCALCHI [the names of the Italians] continued to enjoy a highly satisfactory state of health and that there was no reason to justify fears as to possible incubation. The three were discharged and left the hospital that same day, radiantly healthy and affirming the excellent treatment given to them by the Isolation Hospital during the period of their confinement (Barreto, Rodrigues, Barros, 1903, p.282; emphasis in original).

Other research carried out by Ivo Bandi involved various experiments with the vector mosquito of Finlay. In his words:

> In the same way, negative results were obtained from all the bacterioscopic research carried out in sections on a series of mosquitos that had been fed with the blood of sufferers from yellow fever at various stages of the disease, and immersed in paraffin. … We may therefore conclude that the most careful research of various kinds on mosquitos does not shed any light on the theory that yellow fever is transmitted by them (Bandi, 1903, p.427).

Artur Mendonça, who was also opposed to Finlay's theory, published a series of articles in an attempt to prove that the mosquito was not the vector of yellow fever. In an article in *Revista Médica de S. Paulo*, he described another disease that he called "inflammatory fever;" this indeed was probably caused by mosquitos.

> A careful study of FINLAY's observations and those of American physicians in Cuba and a committee of physicians in São Paulo, shows clearly that the diseased state produced by the bites of mosquitos fed with the blood of sufferers from yellow fever is nothing more than the 'inflammatory fever of the Antilles,' 'that the country folk there call *sapeca*.' … The individuals in the Isolation Hospital of São Paulo who were bitten by mosquitos fed with the blood of sufferers from yellow fever in São Simão did not manifest the hemorrhaging, jaundice or nephritis, that are features of this disease; how then can it be concluded that they manifested the typical symptoms of yellow fever? (Mendonça, 1903b, p.200-201; emphasis in original).

In this article, he added a case recounted by Nava, in which two Italians died after handling the clothes of sufferers.

> The case cited recently by Dr. NAVA in Juiz de Fora, where two Italians caught yellow fever after being in contact with the clothes of sufferers that had been preserved for many years, shows clearly that the transmission of true yellow fever operates independently of mosquitos (Mendonça, 1903b, p.202; emphasis in original).

Another article, published by the same physician in *Revista Médica de S. Paulo*, made a connection between people living near marshes and the occurrence of the disease, and stated that where a sufferer did not live in a marshy area, he must certainly have had contact with persons living in such areas (Mendonça, 1903c).

However, the theories of those physicians who opposed the theory that yellow fever was propagated by mosquitos lost credence during the course of the 1900s, when research institutes breathed new life into the debate. This can be seen in the case of the Institute of Bacteriology in São Paulo. One of its members, Emílio Ribas, played an important role in the matter of yellow fever. In *Revista Médica de S. Paulo* he showed that the measures taken in various towns in the State of São Paulo to control the mosquito responsible for transmitting yellow fever produced the expected effect in controlling the disease. In his words:

> Everything leads us to believe that not only are the results gathered in the few recently infected towns intimately connected with efforts towards the extinction of the Culex mosquito, but also that in many other towns there were no epidemics of yellow fever because of the measures taken. These have prevented the repetition of a general epidemic, or one that was as extensive in its geographical area as the one that afflicted us in 1889. … By way of conclusion, we believe that the basic measures for the proper prevention of yellow fever are:
>
> (a) the extermination of mosquitos and of the conditions that allow them to proliferate;
>
> (b) notification and treatment of every case, even suspected cases, as rapidly as possible;
>
> (c) measures towards protection against *Stegomyia* for all persons particularly susceptible to the disease (Ribas, 1903, p.516).

In Rio de Janeiro, the arguments also abated when Oswaldo Cruz became Director General of Public Health in 1903 and successfully took steps to exterminate the mosquitos responsible for transmitting yellow fever.

Articles on yellow fever gradually became less frequent. Public disputes were slowly becoming less acerbic with the publication and confirmation of research carried out in Cuba. The successful application of measures against the mosquitos responsible for the disease, both in São Paulo by Emílio Ribas, and in Rio de Janeiro by Oswaldo Cruz, discredited the other theories. Opponents were silenced and there was a consequent lack of interest in new articles in the mass circulation press.

Final considerations

When we analyze the documents, we see that the disputes were most evident at the time the field of study was formed, because the creation of codes and rules to include or exclude members is fundamental (Bourdieu, 1983). In the case of medicine in São Paulo during the period, with the formation of different groups linked to opposing ideologies, theories and practices, the adepts of bacteriology won the argument, thereby establishing a procedural limit, a *habitus* for scientific medicine, in which rhetoric and seemingly authoritative arguments collapsed in the face of laboratory experimentation.

Even though the theory of miasmas lingered on regarding the transmission of yellow fever through water, in the context of debate with various differing theories of the propagation of yellow fever linked to bacteriology, the latter prevailed. The medical clashes in São Paulo, featuring Barreto, Godinho, Mendonça, Lutz and Ribas, reveal the experimental nature of research in the field of public health during the period, but also give an idea of the political power of liberal physicians, who defended health policy and for a time, 1900 to 1903, successfully resisted the evidence produced by the new discoveries. However, the resounding victory of those laboratory physicians who followed Pasteur silenced the arguments of both the anticontagionist liberals and of the contagionist conservatives. What mattered from then on was the experimental data upon which the theories were based.

We have shown a scenario in which medicine in São Paulo was convulsed by intense struggles for power. In his study of the "symbolic" production of intellectuals, Pierre Bourdieu (2005) argues that in science an ideological relationship between the intellectual, his text and the public prevails. In this sense, we may take the view that when physicians choose mass circulation newspapers as a vehicle to communicate their ideas, in a context of changes in the theory and practice of medicine, they choose them as a powerful tool for broadening their social networks and for forming groups. Such choices also provide evidence that as much as contributing towards the elucidation of a scientific problem, the physicians sought prestige and recognition and according to Bourdieu (2005) this quest is characteristic of intellectuals. The symbolic capital of this *habitus* was to be found in the production of knowledge, translated into discoveries involving various diseases, such as yellow fever in the specific case studied here. Thus, the conquest of nature was not limited to observation, but at the explanation of diseases as regards their etiology, prevention and treatment. Consequently, scientific discovery represented prestige and power in the field.

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