Clinical and experimental research in nineteenth-century Brazil: the circulation and control of knowledge in medical helminthology

Flavio Coelho Edler
Researcher at Casa de Oswaldo Cruz/
Fundação Oswaldo Cruz.

Av. Brasil, 4036/4. floor
21040-361– Rio de Janeiro – RJ – Brazil
edler@coc.fiocruz.br

Received for publication in January 2010.
Approved for publication in June 2010.

Translation by David Rodgers.

EDLER, Flavio Coelho. Clinical and experimental research in nineteenth-century Brazil: the circulation and control of knowledge in medical helminthology. *História, Ciências, Saúde – Manguinhos*, Rio de Janeiro, vol.17, no.4, July-Sept. 2010. Available at: http://www.scielo.br.

Abstract

The contributions of Brazilian physicians to knowledge of diseases caused by parasitic worms, during the second half of the nineteenth century, had distinct effects on three epistemic communities: Brazilian clinical anatomy, French medical geography, and the emerging field of medical parasitology. Accepting the heterogeneity of both the systems for legitimizing scientific facts and the epistemological practices observed by each discipline, the text provides a specific cartography of the period's medical knowledge, revealing the lines of force shaping the three disciplinary fields. The focus on the circulation, control and validation of medical knowledge reveals strong controversies and complicated negotiations between different epistemic communities.

Keywords: medical geography; circulation of scientific facts; history of the biomedical sciences; Brazil.

> Transport one of our most classic, well-renowned treatises to the tropics and it will not constitute a full or faithful representation of pathology... Each region has its own climate, its own hygiene, its own diseases, and its own treatments...
>
> (A. Dechambre, Introduction to the *Dictionaire encyclopedique des sciences médicales*, 1864, p.XXXIII)[1]

The history of science has recently produced a whole series of studies looking to comprehend the dynamics of different kinds of research practices and their specific forms of producing, controlling and validating knowledge. This literature has prompted a revision of the traditional image of modern science developing through an internal logic, based on the rigorous application of a universal methodology. Distancing themselves from this conception of science as a formal system of logically verified statements, historians and sociologists have sought to explore the analytic connections between the cognitive dimensions of knowledge and the socioprofessional contexts responsible for its regulation. This 'contextualist' approach has shown that scientific ideas disseminate through a complex process of adaptation, negotiation and interpretation just as contingent as the process involved in their production (Pestre, 1995; Latour, 2000; Raj 2007). Hence this focus on the circulation of knowledge – involving different circuits such as journals, scientific societies and congresses, all formally controlled by specialists – has revealed interesting aspects of the ways in which formulations accepted as scientific facts by a given speciality may become the subject of intense controversies and involve complicated negotiations when presented to other specialists (Benchimol, 1999; Kropf 2009).

Pursuing this historiographic approach, the present article is based on research into the emergence of helminth parasitology as a field of study in the medical world of Imperial Brazil in the second half of the nineteenth century. In previous articles I have investigated various aspects of the scientific controversies involving advocates of the parasitic origin to various diseases and those arguing for an environmentalist explanation of human pathologies (Edler, 2004, 2003, 2002). My intention here is to examine how this new knowledge became institutionalized, including its proponents' endeavours to obtain corroboration of their 'facts' in international academic forums. Accepting the heterogeneity of both the systems for legitimizing scientific facts and the epistemological practices observed by each discipline, I aim to sketch a particular cartography of nineteenth-century medical knowledge, revealing the lines of force shaping three disciplinary fields and the ways in which these questioned or attracted the leading figures in medical helminthology, keen to see their research findings incorporated into the legitimized scientific spaces of the era.

The first studies in medical parasitology in Brazil, produced from the 1860s onwards, aroused strong controversy. Supporters and opponents of theories proposing a parasitic origin to some diseases already well-known and studied by Brazilian physicians – intertropical anaemia, hematochyluria and Arabian elephantiasis – confronted each other in the scientific world for almost thirty years. This period coincided with the epistemological birth of helminth parasitology, a new research dynamic that, alongside bacteriology,

redefined the very notion of disease and its causality. These radical alterations in how pathological processes were conceived required an equivalent upheaval in the academic terrain. A new cartography of disciplines emerged, the disputes having transformed the theoretical debate into an arena where the desires for epistemological legitimacy and socioprofessional legitimization were indissociable.

As the polemic unfolded, the research tradition known as medical climatology, which postulated that the climate and telluric environment played a complex role in modifying physiological processes and engendering various pathologies, would encounter considerable reversals in the academic field. As the twentieth century dawned, it would lose its status as scientific knowledge. It should be pointed out that this environmental theory of disease, adapted to the mechanistic theoretical premises of physiopathology, had informed the clinical and hygienist practice of European academic medicine in the first half of the nineteenth century. It was not, therefore, a Brazilian idiosyncrasy. Later on I describe the system of scientific authority developed by the clinical anatomy and hygienist traditions to evaluate, certify and regulate the medical knowledge produced in Brazil (Imperial Academy of Medicine) and internationally (the disciplinary field of medical geography). This background is important since it helps explain the kind of institutional barriers faced by advocates of helminth parasitology in order to legitimize their own ways of investigating the nature of diseases.

From the period between 1866 and 1892 – spanning the beginning and end of the debates – I analyzed the contributions of 55 physicians from Brazil and 15 from Europe (French, British and German) involved in the polemic concerning the aetiology of the three diseases cited above. The debate took place in scientific associations such as the Imperial Academy of Medicine (1829-), the Rio de Janeiro Society of Medicine (1873-1880) and the Rio de Janeiro Society of Medicine and Surgery (1887-), as well as 13 medical journals: nine Brazilian (*Gazeta Médica da Bahia*, *Annaes Braziliensis de Medicina*, *Revista Médica Brasileira*, *Revista do Ateneu Médico*, *União Médica*, *Progresso Médico*, *Revista Médica do Rio de Janeiro*, *Revista da Sociedade Instituto Acadêmico* and *Brazil Médico*) and four overseas (*Lancet*, *Journal Therapéutique*, *Gazzete Médicale de Paris* and *Archives de Médecine Navale*). Over eighty articles were published during the course of the polemic. At least seven graduate theses and four theses for academic positions argued in favour of the parasitic aetiology of these diseases. In addition to the various articles produced by the *Gazeta Médica da Bahia* group, 41 articles were published in Rio de Janeiro medical journals on research findings in helminth pathogeny and treatment. References to the polemic also found their way into nineteenth-century European medical dictionaries such as Amédée Déchambre's work (1864) and into Brazilian medical compendia, including volumes compiled by Torres Homem (1885) and Peçanha da Silva (1886), as well as foreign compendia like the *Treatise on entozoa and verminous diseases of man and animals* by Casimir Davaine, the leading French authority on helminthiases (diseases or organic complications caused by parasitic worms) (Edler, 1999). As well as being a highly significant episode for Brazilian medicine – since the period saw the gradual emergence of the idea of causality of parasitic diseases still accepted today – the dispute was also perceived by contemporaries to involve a radical transformation in how human pathologies were explained.

Hence it is no surprise that various historians have become interested in studying this polemic. Classical historiography usually abstracts the complex array of theoretical and methodological problems in order to discuss these through a basic opposition: on one side, the supporters of 'scientific medicine;' on the other, the 'metaphysical spirits' who fought the parasitological ideas that would eventually prevail in the scientific world. While scientific medicine is usually identified with a certain idealization of laboratory practice, resistance to the scientific innovations introduced by experimental medical research is attributed to factious and irrational behaviour, prejudices and idiosyncrasies.

The most frequent version identifies experimental laboratory practice, backed by clinical practice, as the only legitimate scientific approach, leading many historians to interpret the resistance to theories of the parasitic origin of diseases as resistance to science itself, both its methods and its values (Warner, 1985b). This traditional schema assumes that the diverse range of scientific practices conform to a general set of methodological rules. In this model the formation stages of a new scientific object become entirely 'logical' and the dialogue between hypotheses and experiments simple and self-evident. Recently various studies, though, have reassessed the monolithic conception of science underlying this image. Science meant different things for different groups practicing academic medicine over the course of the nineteenth century (Warner, 1985a; Lawrence, 1985; Pickestone, 1993).

Questioning this false image means abandoning the category of science, along with everything reified in its wake, and turning instead to disciplinary fields that employ different sociocognitive practices. The development of knowledge cannot be seen as a cumulative process, dictated by an immanent rationality and logic. On the contrary, to understand the institutional discomfort caused by the debate, we need to recognize that it was not confined to a change in the accepted explanation of the causality of the diseases in question. Indeed the studies in medical helminthology extolled a new observational language, containing specific methodological rules and a strange conceptual schema sometimes at odds with the facts established by the orthodox clinical tradition (Edler, 2003).

Rather than taking the development of theories on the parasitic origin of the diseases as a natural and unproblematic moment in the advancement of scientific knowledge, we need to ask: how the scientific proposals formulated by the advocates of the parasitic origin of intertropical anaemia, hematochyluria and Arabian elephantiasis, involving hypotheses so alien to the institutionalized medical tradition, become epistemologically true? Put otherwise, how was their legitimacy acquired within the regional medical world of the period? In the absence of any universal tribunal, I present a sketch of the three arenas or systems of scientific authority which, by claiming for themselves a monopoly on validating and regulating the contemporary medical beliefs, had a direct influence on the directions taken by the controversy: clinical anatomy, medical geography and medical parasitology.

Alternative systems of scientific authority

The new ideas concerning the aetiology and pathogeny of the three diseases did not hover in a pure conceptual space. The scientific disputes were translated sociologically into the status of the groups involved in terms of their technical expertise and scientific

authority. The introduction of theories hypothesizing the parasitic origin of the diseases not only led to an alteration in the standards dictating what until then was considered an observable fact or relevant evidence, it also provoked a redefinition of the kinds of knowledge implied in the production of diagnoses and treatments. This epistemological sea change thereby called into question the established forms of expertise and traditional paths via which new knowledge was meant to circulate.

The proposed innovations involved a change in the hierarchy of the established disciplines and authorities since they affected the definition of scientific protocols and thus the nature of scientific proofs and facts and the ways of producing and validating them.[2]

Separating facts from hypotheses and ranking them in terms of their credibility was the main task of regional, national and international medical associations, organized around the emergent medical specialities, each claiming jurisdiction over specific areas of knowledge. In the empiricist context in which the nineteenth-century medical debate unfolded, these authorities presented themselves as the guarantors of aetiopathological knowledge. Their task consisted of controlling this knowledge, validating its truth or denouncing false theories as speculations bereft of an observational basis or wrongly inferred from observe data. As the established disciplines and the emerging research dynamics interacted and clashed with each other, the different groups were continually forced to define their methodological parameters of scientificity (Weisz, 2003). The epistemological discussion grew in prominence as medical geography, through the use of statistics, and helminth parasitology questioned the climatological aetiologies endorsed by the Brazilian medical authorities, loyal to the clinical anatomy and hygienist practices sanctioned by the faculties of medicine and the Imperial Academy of Medicine.

The Academy of Medicine and the regulation of Brazilian medical knowledge

> Nothing would seem more appropriate to shedding light on the causes of the numerous epidemics than the numerous medical treatises published over the last two centuries. We thought that careful comparison, after a large number of years, between the variable conditions of the atmosphere and the other general causes of morbidity, on one hand, and the diseases that develop under their influence, on the other, would enable us to recognize the constant relations between epidemics and the conditions in which they occur, and consequently to extract their causes. ... However the results have not matched the apparently well-founded expectations concerning this type of work, because the epidemics depend on causes that evaded our investigative means.
>
> (Alphonse Laveran, *Des maladies épidemiques*, 1895).

On what grounds did the Imperial Academy of Medicine claim a monopoly on knowledge of Brazilian pathology? Generally speaking, these grounds were the epistemological premises of medical climatology with its particular way of producing

knowledge on the causality of diseases through the production of daily series of meteorological observations, related to the statistics of certain ailments. Medical climatology proved successful in some European countries in organizing an extensive network of observers in a variety of regions with the task of recording the meteorological, telluric and topographic conditions and keeping a detailed list of current diseases. The medical societies that sprang up in different localities at the end of the eighteenth century sought to discover causal patterns by constructing coherent interpretative models of climatic variations and a complete map of diseases.[3]

The protocol for clinical observations ranged from the most general circumstances to the particular conditions of the patient. A good physician therefore examined the *circunfusa* (meteorology, hydrology, geology, climates and habitations), the *ingesta* (food and drink), the *excreta* (excretions and baths), the *applicata* (clothing and cosmetics), the *percepta* (customs, sexuality, personal hygiene), and finally the *gesta* (habitual movements, professional activities).[4]

My intention here is not to assume that the empiricist discourse of hospital medicine, as Ackerknecht called it, was a faithful reflection of medical practice during the period. Instead I interpret it as an ideal representation of this practice, and as such, endowed with a normative dimension crucial to our understanding of how the system of scientific authority was constructed. If the base of the system was hospital practice, its apex, formed by the medical societies, had to reflect or translate this practice. We can take the empiricist epistemological terminology as the starting point for a formal depiction of this system of authority, which included regional, national and international networks vying over the privilege of controlling and validating medical knowledge. The distinction between (certified) facts and (unconfirmed) hypotheses reflected the idea that the former resulted from habitual, repeated and consensual collective observations, while the hypotheses corresponded to rare observations or inductions with relatively little consensus among the institutions responsible for evaluating them (Daston, 1992). Hence what was a fact for doctors from one locality or members of a medical subspecialty might be taken as a mere hypothesis in other socioprofessional contexts. The hierarchization of facts and hypotheses was translated sociologically into a similar ranking of actors and institutions. The latter depended on the degree of trust invested in the qualifications or capacities of particular actors – individuals or medical networks – to act in accordance with the sensory-based protocol imposed by medical education and emblematically translated by the somewhat obscure idea of 'clinical touch.'

Here it needs to be emphasized that etiological discussions had a very different meaning in this context (Rosenberg, 2002). Rather than searching for a specific causal agent rooted in an ontological conception of disease, pre-Pasteurian medicine has a dynamic notion of diseases and presumed a complex hierarchy of causes. This understanding rejected the idea of diseases as entities. They lacked any existence in themselves, even though authors referred to them as distinct entities, almost always spatially localized in the solid parts of the body. The nature of a disease was directly linked to the individual's temperature and particular structure, physical constitution, and physiological and psychological dynamism. Hence the external agents – miasmas, heat, atmospheric pressure, humidity, parasites, chemical

gases, electricity, and so on – taken together or distinguished hierarchically, could never work in isolation to produce an illness. These agents were seen to contribute as predisposing or exciting causes to produce a situation that could potentially lead to a morbid state; they were necessary but never sufficient conditions. At an extreme, each patient possessed a particular physiological identity. A physician aware of the idiosyncrasies of the physical constitution of his patient or the latter's family, or who regularly practiced in a certain locality, was seen to be in a better position to identify and cure an illness than a physician who was a stranger to the family or place. Since medical pathology and therapeutics were seen to be knowledge specific to each locality, dependent on the respective climatic-telluric conditions, the jurisdictions of the institutions responsible for producing and applying this knowledge – periodicals, faculties, academies – were inextricably limited to the region where they worked.

Widely perceived as the essence of clinical practice, the idea of observation was linked to the rigorous application of the senses – the only legitimate source of knowledge – to medical phenomena. Through careful observation of a case, the physician could draw comparisons with similar cases. By deliberating rationally many similar cases, he could draw generic conclusions about diseases and therapeutics. Observing the effects of a treatment on a patient with particular symptoms, in a specific climatic-telluric environment, with singular habits and physical constitution, allowed the physician to derive prescriptions for treatment valid under similar conditions. Whether these clinical findings could be transposed to other conditions was something to be investigated.

The faculties of medicine, medical societies and journals were institutional forums invested with the task of constructing and validating the body of medical knowledge within the limits imposed by clinical epistemology. Medical knowledge could not be freely transferred from one region to another since it had to be re-evaluated before being used in a different context to the one in which it was produced. The universality of these premises legitimized the role of the Imperial Academy of Medicine in validating and regulating knowledge relating to Brazilian pathologies (Edler, 2003).

The medical geography research program

> The study of pathologies, seen in terms of their relationship to climates, has not overly excited the attention of [French] physicians. The reason for this indifference is the distrust of everything that has not been subject to the observational scrutiny of our scientific metropolis, allied to the difficulty in controlling through direct observation the facts and doctrines reaching us from distant countries.
>
> (A-F. Dutroulau, *Topographie médicale des climats intertropicaux*, 1858)

> There is also one indispensable condition for the statistical findings to inspire confidence: namely, the observer's morality, good faith and knowledge, since not all men have the qualities to affirm the

> value of a fact and there are more than a few of whom one could ask, like Bordeu: with what right do you observe? With what right do you judge that you have observed? Who told you that you had observed?
>
> (J. Gavarret, *Principes generaux de statistique médicale*, 1840).

Medical geography was consolidated as a research program in the mid nineteenth century, claiming jurisdiction over the medical knowledge produced outside the European environment. It played an essential role in constructing the idea of the originality of the pathology of hot or tropical climates, assuming the task of mediating between 'scientific facts' and etiological theories.

From the last quarter of the eighteenth century onwards, the studies made by medical topography extended beyond Europe's frontiers, following the trade routes and networks of colonial expansion. Its advance into tropical regions, along with the discovery of new diseases such as yellow fever, tetanus, framboesia, elephantiasis, piã, maculo, mal-coeur and ainhum, reinforced the belief in the inextricable relationship between particular illnesses and the environmental conditions of certain localities, predominantly defined in climatic terms (Dettelbach, 1996).

The pathologization of space would acquire a new dimension during European colonial expansion, with the unprecedented mobilization of a vast set of nosological, pathological and therapeutic phenomena across the globe. The ample commercial exchange combined with the European colonialist policy provoked the simultaneously practical and theoretical problem of understanding why certain diseases were confined to particular regions of the planet, while others had a different impact and a distinct endemic pattern there. The experience of physicians in the colonial armed forces was combined with the clinical practice of those living and working in the tropical colonies and former colonies, generating an intense exchange of medical facts and theories between the scientific centres of the Old World and the medical groupings emerging on the periphery.

Medical geography became a dynamic pole of the medicine of the period, capable of impelling a research program that involved thousands of physicians on the periphery of the centres of European culture, who employed the conceptual tools of clinical anatomy and medical statistics in their clinical practice and who gradually incorporated micro and macrobiological parasitology. I already mentioned earlier that the idea of the singularity of tropical pathology and therapeutics was not limited to the physicians working on the periphery. The same epistemological discourse – that is, the same premises concerning pathological causality and the same rules for regulating and validating medical knowledge – governed the clinical practice of academic medicine in the main European centres.[5] This new space of medical power dialogued not only with the general practitioners dispersed throughout the colonies but above all with the hygienists and administrators in these regions.

In Jean-Christian Boudin's view (1857), medical geography could only be constructed on a statistical base. The application of numbers in the observation and comparison of clinical facts would introduce another technology of scientific proof alongside pathological anatomy. The endemicity, gravity and frequency of a disease, the salubrity of a country or region[6], and the preeminent issue of the acclimatization of Europeans to the tropical

colonies were all questions to be translated into numbers. The very terms 'frequency,' 'endemicity' and 'salubrity' presuppose a statistical expression. New medical facts were produced exclusively through the mobilization of figures.

The *Archives de Médecine Navale* and the world-map of human diseases

As well as adapting the therapeutics and hygienic rules prescribed by the treaties of European pathology, the diverse literature produced by medical geography concentrated on the following topics: a study of the pathology particular to each region; problems of human cosmopolitanism and hygiene acclimatization rules; regional endemics; the existence or absence of fixed morbid types; and forms of epidemic propagation and prevention.

For Boudin's French disciples, the development of the "science of the relations between diseases, climates and races" would still depend for many more years on collecting clinical observations from across the globe. These records would have to be submitted to "a severe critique from a rigorous scientific method, especially in terms of the deductions to which they might lead" (Méricourt 1864, p.7).

In the mid 1870s, Jean Baptiste Fonssagrive (1876), a physician with the French Navy, remarked on the way in which climatologists of the time handled the complex question of aetiology, arguing that "the method that they use to reveal the contribution of each physical, chemical or living element" in the production of a disease depended on the "imprecise observations of physicians from different localities, combined with highly inconclusive statistics" (p.118). He lamented the fact that statistics assessed things as a whole, failing to distinguish each separate agent, which compromised the rigour of the presented data (p.118). For Le Roy de Méricourt (1864a), director of the *Archives de Médecine Navales*, the most precise results were obtained through attentive and patient clinical study. "We must not forget," he warned, "that statistics, despite its real value, is merely an instrument. It cannot serve alone to constitute a science. Very often its abuse only leads to errors and premature conclusions" (p.6).

These and other epistemological problems were associated with the structural implementation of a world-wide program of medical research. The organization of this international scientific network promoting the production and control of the circulation of medical facts and theories in non-European regions received fresh impetus from the 1860s onwards, when physicians from the French Navy founded the *Archives de Médecine Navale*. This periodical allowed physicians from numerous countries to organize in a global network, enabling them to review established knowledge and contribute with their own observations. Very quickly, medical climatology became the basis for a world-wide research program. As well as raising the profile of the field, *Archives* instilled the area with a previously unseen dynamism. By sustaining that "long-lasting work in climatology and exotic pathology" depended on "continual efforts to enhance and correct diverse observations" (Méricourt 1864b, p.13), the periodical inaugurated a new space for little known physicians working in the remotest regions of the planet, allowing them to join the international scientific community. Their works would be read, debated and commented on by leaders from the field, circulating the authors' names far beyond the parochial sphere in which they worked.

This led to the formation of a circuit of professional legitimization with its own system of ranking and evaluation in line with the contemporary clinical culture. There was, then, a permanent distrust of the credibility of the clinical data obtained by peripheral medical networks. While the 'facts,' to 'inspire confidence,' were seen to depend on the "observer's morality, his good faith and knowledge," as Jules Gavarret (1840, p.127) averred, the leading figures in medical geography wanted to ensure proper regulation of the flow of facts and theories circulated by their journal.

As we saw in the epigraph to this section, A-F. Dutroulau, an eminent physician from the French Navy, emphasized his distrust of the pathological studies produced by distant countries that had not been subject to "the scrutiny of the scientific metropolis." Now the response of Le Roy de Méricourt, editor of *Archives de Médecine Navale*, to this epistemological-political demand was to assert the scientific status of the physicians from different European navies, who formed a "an organized phalanx of workers" (Méricourt 1864b, p.8) whose studies could be taken as entirely trustworthy.[7]

Thus alongside the articles written by established authors, *Archives* enabled the intervention of innumerable anonymous physicians in scientific disputes. They created a two-way system that allowed the exchange of scientific ideas in this area of medical knowledge. Another recognized authority in medical geography remarked on the lack of credibility of the microscopic observations made in tropical regions in the emerging domain of parasitic diseases: "From the scientific viewpoint, the papers by many physicians from such places possess a very questionable or conditional value," Auguste Hirsch (1864, p.69) claimed. This warning indicates the kind of problems related to microscopic, taxonomic and pathogenic investigations undertaken by the first generation of Brazilian physicians to embrace the postulates of medical parasitology. As we shall see below, this group lacked a well-established observational language and was itself helping to forge the scientific concepts and facts that would later be incorporated into the process of instructing future generations.

Bridging the gaps separating the peripheral medical networks from each other helped erode the dominant positions, allowing the emergence of new medical authorities.

Medical parasitology and the control of helminth observations

> [Ancylostoma] has been encountered, it seems [*il parait*], in Mayotte by Doctors Grenier and Monestier (cited by Moura); it has also been reported, it is said [*dit-on*], in Abyssinia and India.
>
> (Casimir Davaine, *Traité des entozoaires*, 1877)

From the 1860s onwards various topics became established as canons by more and more researchers in the field of natural history, with growing intersections with physiologists: the problem of alternate generations; the key concepts of intermediary host and parasite life-cycle; helminth ecology; the main characteristics of parasitism and its limits (other non-parasitic forms of association, such as mutualism and commensalism); habitats; parasite reproduction; species association (parasite and host); organic degradation of

parasites; morphological changes; reciprocal actions between parasite and host; parasited parasites; parasite life span; propagation; preservation; and means of defence against parasites (Farley 1972). The importance of these new parasitological 'facts,' combined with the debate on the causality of certain diseases, was – I stress – directly correlated with the relative increase in autonomy and power of the system of authorities that gradually became institutionalized in the medical world, along with this new abstract language.

Many of the new contributions came from the European colonies where numerous physicians of different nationalities were overturning long-held beliefs concerning some tropical pathologies: Joseph Bancroft (1836-1894); Theodore Bilhars (1825-1862); Raphael Blanchard (1857-1919); Timothy R. Lewis (1841-1886); Patrick Manson (1844-1922); Karl G.F.R. Leuckart (1822-1898); Wilhelm Griesinger (1817-1968); Adolpho Lutz (1855-1922); Otto E.H. Wucherer (1820-1873); Julio de Moura (1839-1892), among others. Although Davaine, the leading French authority in helminthology, continued to argue that verminous diseases were rare in humans, presenting themselves as exceptions, these still unknown physicians – British, German, Brazilian, French and Italian – strove to expand parasitology's domain of 'facts' beyond conventional boundaries.

The parasitological model shared by the few practitioners of this emerging branch of medical research left many questions unanswered, even after the discovery of sexed forms of pathogenic helminths: what was their source of origin, their habitat, their form in the outside world? How and by which route did they penetrate the organism? At what stage of evolution did the parasite invade the host – ovular, larval or sexed? What was its organic habitat in the adult state? What happened to the embryos ejected by the organism through urine and other organic liquids? Colonialism had enabled the development of this research program at a global scale, and many physicians of diverse nationalities competed to discover one or more of their aspects.

The discoveries concerning the pathogenic forms of helminths reformulated a series of questions in the field of pathology in a language alien to the medical tradition, the answers to which presumed expertise in the new areas of knowledge – systematics, ecology, parasitology, biogeography, entomology, helminthology. In the final decade of the nineteenth century, these different research dynamics combined with other nascent subspecialties – protozoology, bacteriology – to produce the repertoire of disciplines linked to tropical medicine.

In this context, the social rules of controlling inductive inferences changed. Observational control based on the new techniques threatened to curtail drastically the hospital institution's sphere of expertise, superseding the socioprofessional hierarchy found in clinical anatomy. The authority of territorial medical societies – which had flourished in conjunction with hospital medicine, committed to a sensory epistemology that supposedly expressed the clinical consensus of regional or national medical networks– was increasingly contested by the new sociocognitive practices with their more restricted forms of access, such as medical statistics, and laboratory disciplines such as experimental physiology, chemistry, histology and helminth parasitology.

These new languages or conceptual schemas began to be accompanied by new pathological facts, not only inaccessible to clinical experience but also, in many cases, in

collision with it. During the period in which medical parasitology and the fields of knowledge associated with it were becoming institutionalized, a new intraprofessional dynamic was instilled with the formation of groups pursuing a career strategy that included informal apprenticeship in these emerging areas of knowledge.

Auguste Hirsch (1864), one of the leading European authorities on tropical pathology in the mid nineteenth century, exposed the decline in the status attributed to clinical anatomy's diagnostic techniques when he referred to the problems with microscopic observation in tropical regions in the emerging domain of parasitic diseases: "From the scientific viewpoint, the papers by many physicians from these places [Mexico and New Granada] possess a very questionable or conditional value. This is especially apparent in those cases where the exact method of scientific investigation is essential to establishing the facts. The same does not apply to the case of the works of British physicians on a disease endemic to India..." (p.70). This warning from the author of one of the most celebrated compendia in medical geography of the nineteenth century, *Handbook of geographical and historical pathology*, indicated that the difficulties related to microscopic, taxonomic and pathogenic investigations on plant microparasites created a new division within the profession. New forms of technical expertise were redefining medicine's long-standing areas of jurisdiction, weakening the system of scientific authority constituted by clinical anatomy. The established etiological facts corresponded to the hierarchy of authority in the field. The description of new entities associated with the production of a known disease, in terms accessible only to those versed in medical parasitology's vocabulary, implied a questioning of the established medical authorities.

The task of separating and hierarchizing well-founded 'facts' from mere 'hypotheses' became increasingly difficult for the authors of pathology treatises untrained in the new parasitological knowledge. By interacting with and confronting the climatological tradition, these new research programs forced the different medical research traditions to review their methodological parameters almost constantly. In an even more compelling way than medical statistics, helminth parasitology and bacteriology questioned many of the aetiologies then accepted on the basis of clinical practice through their symptomatological and anatomopathological observations.

Conclusion

> This *il parait* [it seems] and *dit-on* [it is said] is unjustifiable. I referred at length to Grenier and Monestier's observation, and I translated on sentence of an article, published in *The Lancet* by Spencer Cobbold, concerning the entozoa most common in Abyssinia. ... I am at a loss to explain the illustrious helminthologist's reservations.
>
> (Julio de Moura, "O sr. Davaine e a doutrina parasitária...,"*União Médica*, 1882)

In the final decade of the nineteenth century, parasitological research, initially linked to a small group of diseases and in perfect harmony with the notion of environmental causality accepted by the climatological tradition, became a global etiological doctrine – a

new paradigm, in other words. The institutionalization of the new orthodoxy would imply a redefinition of the concepts of disease, causality and the main agents and mechanisms involved in its production. However the crisis in the climatological paradigm, which preceded the new consensus on the specific aetiology, was due in large measure to the development of the research program initiated by medical geography. Greater empirical control of the environmental theories of pathology speeded the development of discordant versions of this paradigm, clearing the way for acceptance of more heterodox theories.

In the case of medical helminthology, its institutionalization in Brazil would provoke numerous controversies – as occurred too in European medicine – precisely when it started to employ its own conceptual tools to investigate diseases that had previously been part of the scientific patrimony of well-established medical groups, reconstructing their aetiology, diagnosis and treatment. The historical narratives that present their appearance in the academic landscape as a simple specialization of medical knowledge tend to describe its institutional development as something 'natural' and unproblematic. For this very reason, when the new orthodoxy sedimented the rupture with meteoropathological theories and could rely on well-established methodological canons and an esoteric vocabulary, its former opponents were described in a derogatory, caricatured and moralist way, accepted uncritically by traditional historiography.

By contrast, I look to situate the institutionalization of this new knowledge within a context in which medical groups organized around distinct and still non-legitimized sociocognitive practices began to dispute professional spaces with the aim of securing exclusive jurisdiction over them.[8] Here we can pick out, at international level, the European authorities of medical geography and medical helminthology, both belonging to subordinate disciplinary fields, and at national level the Imperial Academy of Medicine, forming the official mouthpiece of orthodox medical thought.

To gain legitimacy, the pioneers of helminth parasitology would have to redefine the space and rules for producing knowledge about medical pathology, as well as question the expertise of the established hierarchies, that is, the medical world's pre-existing systems of scientific authority. In achieving this aim, the proponents of the emerging discourse helped to construct or reinforce a number of alternative institutional networks and circuits, such as the Rio de Janeiro Society of Medicine (1873-1879), the unofficial Brazilian medical periodicals and the *Archives de Médecine Navale*, responsible for promoting the most important scientific network in research in medical climatology.

Three aspects set this process apart. On one hand, neither helminthology nor medical geography comprised the main current of European medical thought, which for the most part remained oblivious to the evolution of studies on tropical pathology and the advances in parasitology; on the other hand, in the specific case of intertropical anaemia, hematochyluria and Arabian elephantiasis, pathogenic theories already existed, taken as established fact by the Brazilian and European (French) clinical authorities who presumed a climatological aetiology. The third aspect, highlighted by the historian Julyan Peard (1997, p.16), is that the British and French helminthologists were themselves not keen to give too much importance to the contributions of Brazilian physicians, which provoked the latter to insist continually on their contributions and priorities being properly

recognized. An example of this is Julio de Moura's irritation with Davaine's reservations concerning his article, as the above epigraph shows.

The institutionalization of tropical medicine did not entail the loss of all the connections between the old and new actors as the latter sought to monopolize the medical topics related to tropical pathology. Clinical semiology, pathological anatomy, sanitary demographics, statistical nosogeography, prophylaxis and even therapeutics were testimony to the elements of continuity. The new orthodoxy implied a redefinition of the role of meteorological agents in the hierarchy of disease causality: they were downgraded from efficient cause to predisposing cause. The same happened to the former leading figures of medical geography: they had to withdraw to the sidelines while a new script began to be written and enacted by new protagonists.

The new pattern meant that the qualifications, professional careers and validation mechanisms became regulated by peer groups organized around their separate disciplines. Scientific knowledge began to be developed within these disciplines, which, as well as monopolizing access to each sociocognitive practice, also functioned as political institutions, distributing privileges and responsibilities for expert knowledge and structuring the claims on public and private funds channelled towards scientific research (Vessuri 1991). As the studies by Löwy (2006), Stepan (1976) and Benchimol & Teixeira (1993) show, the research institutes created in Brazil at the beginning of the republican period followed the models sanctioned by the select professional elite of scientists working in similar European institutions.

NOTES

[1] All quotations in this article have been freely translated from the original Portuguese.

[2] Ilana Löwy (1996) argues that the construction of a system of scientific authority (power/expertise) within scientific disciplines is inseperable from the social process of validating 'scientific facts.'

[3] On the relevance of statistics still fixed to determinist premises, see Hacking (1990). Berge (1984, p.366), Weisz (1995) and Foucault (1979) emphasize other intellectual sources to the emergence of public hygiene.

[4] This medical classification system was still used in various treaties on hygiene and climatology in the mid nineteenth century.

[5] Warner (1985b) expresses the same view concerning Southern medicine during the American Civil War period and Naraindas (1994) concerning British colonial medicine in India. Worboys (1996) adopts an identical viewpoint.

[6] A country's salubrity was measured by comparing its overall ratio of sick and deceased people to that of other nations.

[7] He himself, however, declared his own reservations concerning the contribution of British physicians who, he wrote, gave "excessive importance to figures," as well as possessing a "defective nosological terminology," speaking "frequently a scientific language different from our own [French]" (Méricourt, 1864b, p.8).

[8] The idea that the medical profession, after the irruption of the process of specialization, began to comprise a diverse set of groups organized around distinct sociocognitive practices, each fighting to impose its jurisdiction over a specific region of medical work, is present in various authors, such as Warner (1985a) and Pickestone (1993), though its most elaborate theoretical formulation is provided by Abbott (1988).

REFERENCES

ABBOTT, Andrew.
The system of professions: an essay on the division of expert labor. Chicago: The University of Chicago Press. 1988.

BENCHIMOL, Jaime Larry.
Dos micróbios aos mosquitos: febre amarela e a revolução pasteuriana no Brasil. Rio de Janeiro: Editora Fiocruz. 1999.

BENCHIMOL, Jaime Larry; TEIXEIRA Luiz Antônio.
Cobras, lagartos e outros bichos: uma história comparada dos institutos Oswaldo Cruz e Butantan. Rio de Janeiro: Editora UFRJ. 1993.

BERGE, Ann F. la.
The early nineteenth-century french public health movement: the disciplinary development and institutionalization of hygiène publique. *Bulletin of the History of Medicine*, Baltimore, no.58, p.363-79. 1984.

BOUDIN, Jean-Christian. M.F.J .
Traité de géographie et de statistique médicales et des maladies endémiques comprenant la météorologie et la géologie médicales, les lois statistiques de la population et de la mortalité, la distribution géographique des máladies et la pathologie comparée des races humaines. Paris: J.-B. Baillière et fils. 1857.

DASTON, Lorraine.
Objectivity and escape from perspective, *Social Studies of Science*, London, vol.22, no.3, p.597-618. 1992.

DAVAINE, Casimir.
Traité des entozoaires et des maladies vermineuses de l'homme et des animaux domestiques. Paris: Librairie J.-B. Baillière. 1877.

DECHAMBRE, Amédée.
Introduction. In: Dechambre, Amédée (Ed.). *Dictionnaire encyclopédique des sciences médicales*. vol.1. Paris: G. Masson & P. Asselin. p.I-XL. 1864.

DETTELBACH, Michael.
Global and aesthetic empire: Humboldt's physical portrait of the tropics. In: Miller, David Philip; Reill, Peter Hanns. *Visions of Empire*: voyages, botany, and representations of nature. Cambridge: Cambridge University Press. p.258-292. 1996.

DUTROULAU, Auguste Frédéric.
Topographie médicale des climats intertropicaux. Paris: J.-B. Baillière et Fils. 1858.

EDLER, Flavio Coelho.
Opilação, hipoemia ou ancilostomíase?: a sociologia de uma descoberta científica. *Varia História*, Belo Horizonte, vol.2, no.32, p.48-74. 2004.

EDLER, Flavio Coelho.
A medicina no Brasil Imperial: fundamentos da autoridade profissional e da legitimidade científica. *Anuario de Estudios Americanos*, Buenos Aires, t.LX-1, p.139-156. 2003.

EDLER, Flavio Coelho.
A Escola Tropicalista Baiana: um mito de origem da medicina tropical no Brasil. *História, Ciências, Saúde-Manguinhos*, Rio de Janeiro, vol.9, no.2, p.357-385. 2002.

EDLER, Flavio Coelho.
A constituição da medicina tropical no Brasil oitocentista: da climatologia à parasitologia médica. Dissertation (Doctorade) – Instituto de Medicina Social, Universidade do Estado do Rio de Janeiro, Rio de Janeiro. 1999.

FARLEY, John.
The spontaneous generation controversy (1700-1860): the origins of parasitic worms. *Journal of the History of Biology*, Dordrecht, vol.5, no.1, p.95-125. 1972.

FONSSAGRIVE, Jean Baptiste.
Climats. In: Dechambre, Amédée (Ed.). *Dictionnaire encyclopédique des sciences médicales*. vol.29. Paris: Paris: G. Masson & P. Asselin. p.13-121. 1876.

FOUCAULT, Michel.
Microfísica do poder. Rio de Janeiro: Edições Graal. 1979.

GAVARRET, Jules.
Principes généraux de statistique médicale. Paris: J.-B Baillière. 1840.

HACKING, Ian.
The taming of chance. Cambridge: Cambridge University Press. 1990.

HIRSCH, Auguste.
Du pied de madura: addition à l'histoire du parasitisme vegetal. *Archives de Médecine Navale*, Paris, t.2, p.68-83. 1864.

KROPF, Simone P.
Carlos Chagas e os debates e controvérsias sobre a doença do Brasil (1909-1923). *História, Ciências, Saúde-Manguinhos*, Rio de Janeiro, vol.16, suppl.1, p.205-227. 2009.

LATOUR, Bruno.
Ciência em ação: como seguir cientistas e engenheiros sociedade afora. São Paulo. Editora Unesp. 2000.

LAVERAN, Alphonse.
Des maladies épidémiques. Paris: G. Masson. 1895.

LAWRENCE, Christopher.
Incommunicable knowledge: science technology and clinical art in Britain 1850-1814. *Journal of Contemporary History*, London, vol.20, no.4, p.503-520. 1985.

LÖWY, Ilana.
Vírus, mosquitos e modernidade: a febre amarela no Brasil entre ciência e política. Rio de Janeiro: Editora Fiocruz. 2006.

LÖWY, Ilana.
Ludwik Fleck and the notion of 'boundary object'. Paper presented at 1. Seminário Internacional Sobre Filosofia da Saúde, 1996. Florianópolis. 1996.

MÉRICOURT, A. Le Roy de.
Rélacion entre la présence de l'ankylostome duodénal et la cachexie aquese ou mal-coeur. *Archives de Médecine Navale*, Paris, t.8, p.72-73. 1867.

MÉRICOURT, A. Le Roy de.
Introduction. *Archives de Médecine Navale*, Paris, t.1, p.5-11. 1864a.

MÉRICOURT, A. Le Roy de.
Introduction. *Archives de Médecine Navale*, Paris, t.2, p.5-13. 1864b.

MOURA, Julio de.
O sr. Davaine e a doutrina parasitária da hypoemia intertropical. *União Médica*, Rio de Janeiro, no.2, p.315-324. 1882.

NARAINDAS, Harish.
A genealogy of the advent of tropical medicine. In: Moulin, Anne-Marie. *Médecines et Santé*. vol.4. Paris: Unesco. p.31-56. 1994.

PEARD, Julyan. G.
Tropical disorders and the forging of a Brasilian medical identity, 1860-1890. *Hispanic American Historical Review*, vol.77, no.1, p.1-44. 1997.

PESTRE, Dominique.
Pour une histoire sociale et culturelle des sciences. *Annales, Histoire, Sciences Sociales*, Paris, vol.50, no.3, p.487-521. 1995.

PICKSTONE, John V.
Ways of knowing: towards a historical sociology of science, technology and medicine. *British Journal for the History of Science*, London, no.26, p.433-458. 1993.

RAJ, Kapil.
Relocating modern science: circulation and the construction of knowledge in South Asia and Europe, 1650-1900. Basingstone: Palgrave Macmillan. 2007.

ROSENBERG, Charles E.
The tyranny of diagnosis: specific entities and individual experience. *The Milbank Quarterly*, New York, vol.80, no.2, p.237-260. 2002.

SILVA, João Damasceno Peçanha da.
Tratado das febres. Rio de Janeiro: Tipografia Central. 1886.

STEPAN, Nancy.
Gênese e evolução da ciência brasileira: Oswaldo Cruz e a política de investigação científica e médica, Rio de Janeiro: Artenova. 1976.

TORRES HOMEM, JoãoVicente.
Estudo clínico sobre as febres do Rio de Janeiro. Rio de Janeiro: Lopes do Couto & C. Editores. 1885.

VESSURI, Hebe.
Perspectivas recientes en el estudio social de la ciencia. *Interciencia*, Caracas, vol.16, no.16, p.60-68. 1991.

WARNER, John Harley.
The idea of Southern medical distinctiveness: medical knowledge and practice in the Old South. In: Leavitt, Judith Walzer; Numbers, Ronald L. *Sickness and health in America*. Wisconsin: The University of Wisconsin Press. p.53-70. 1985a.

WARNER, John Harley.
Science in medicine. *OSIRIS*, Chicago, 2nd. series, vol.1, p.37-58. 1985b.

WEISZ, George.
The emergence of medical specialization in the nineteenth century. *Bulletin of the History of Medicine*, Baltimore, vol.77, no.3, p.636-575. 2003.

WEISZ, George.
The medical mandarins: the French Academy of Medicine in the nineteenth and early twentieth centuries. New York: Oxford University Press. 1995.

WORBOYS, Michael.
Germs, malaria and the invention of Mansonian tropical medicine: from 'diseases in the tropics' to 'tropical diseases'. In: Arnold, David (Ed.). *Warm climates and Western medicine: the emergence of tropical medicine, 1500-1900*. Amsterdam: Rodopi. p.181-207. (Clio Medica 35 The Wellcome Institute Series in the History of Medicine). 1996.

uuuUUU