

## HISTORICAL BACKGROUND OF THE HUMAN TREPONEMATOSES

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The treponematoses have constituted, and continue constituting, one of the most debated themes of the brief history of paleopathology, and even bacteriology. Its origin, common or different, its expansion, its epidemiology, its population impact, its own history and its skeletal manifestations have constituted an inexhaustible source of debate, emission of new theories and volumes of literature on the topic. In the present work, we hope to form, in a succinct manner, the historic panorama of these diseases, discussing their possible origin, their historical milestones, the historical-medical geography and the paleopathological evidence.

**Key words:** Treponematoses, paleopathology, epidemiology.

*Las treponematoses han constituido, y aun siguen constituyendo, uno de los temas más debatidos de la corta historia de la paleopatología, e incluso de la misma bacteriología. Su origen, común o diferente, su expansión, su epidemiología, su impacto poblacional, su propia historia y sus manifestaciones esqueléticas han constituido una fuente inagotable de debate, emisión de nuevas teorías, y un ingente volumen de literatura sobre el tema. En el presente trabajo pretendemos plasmar de manera sucinta el panorama histórico de estas enfermedades, discutiendo su posible origen, sus hitos históricos, la geografía histórico-médica, y la evidencia paleopatológica.*

**Palabras claves:** Treponematoses, paleopatología, epidemiología.

### Origin of the Treponematoses

There are two major theories offered to elucidate the similarities among human treponematoses:

#### Unitarian Theory

This theory is defended by Hudson (1965) who suggests that there only exists a single treponematoses, presenting different clinical manifestations under different epidemiological conditions. He states that the oldest of the treponematoses was yaws, with Africa its center of origin. He suggests that the disease expanded from there to other parts of the world following human migrations 100,000 years ago.

Cockburn (1963) suggests that if the microorganisms of the treponematoses come from a common ancestor some relationship must exist among them.

#### Non-Unitarian Theory

The most important supporter of this theory is Hackett (1963, 1967) who suggests that the different clinical pictures are probably produced by treponemal mutations. At least four mutations have occurred in the last 10,000 years. He suggests that the first and oldest treponematoses must

be pinta, extending from Africa and Asia to America 15,000 years ago. He suggests that mutation occurred around 10,000 B.C. and that it was due to a more humid and warm environment. He suggested that for the origin of yaws that extended through Africa, Southeastern Asia and probably Pacific islands and Australasia. He suggested that a second mutation from yaws to bejel or endemic syphilis took place 7,000 years B.C. It was favored by an arid and warm environment in Sahara and Northern Africa, Central and Southwestern Asia, and Central Australia. He suggested that another mutation appeared around 3,000 B.C., coinciding with the development of urban areas in Eastern Mediterranean regions and Southwestern Asia. He suggested that bejel (typical in children of rural regions) mutated to venereal syphilis. The fourth and last mutation took place in Europe in the final years of the fifteenth century and it was favored by environmental and social conditions of the cities presenting more serious repercussions.

### Geography of the Treponematoses

Regarding the Columbian or pre-Columbian origin of the treponematoses, especially syphilis, Laín Entralgo (1963) premises his thoughts on three issues:

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1. There are data suggesting its presence in pre-Columbian America.

2. A great amount of literary and artistic sources describing treponemal lesions existed in Europe prior to 1492. Therefore, it is probable that some disease existed in the continent before the 1495' epidemic.

3. It is difficult to assess if the epidemic of 1495 was due to the importation of an American variant or if its effects were due to an increase in the virulence of the European bacilli.

On the other hand, Stewart and Spoehr (1967) point out that it is possible that an interchange of treponemae occurred between Europeans and Americans shortly after the discovery of America and that the people of both continents did not have immunity against the disease.

Two theories have emerged in trying to elucidate the geographic origin of syphilis: Columbian and pre-Columbian theories. Recently, a third theory has been added to those: Livingstone's "alternative hypothesis."

#### Columbian Theory

This suggests that syphilis was introduced in Europe in 1493 after the return of Columbus. As it was a new disease its expansion was very fast. However, it was not until the first decades of the sixteenth century when the American origin of syphilis was accepted, especially by Spanish physicians such as Fernández de Oviedo or Díaz de Isla.

#### Pre-Columbian Theory

Italian physicians Leoniceno and Massa felt that the disease was present in Europe long before the discovery of America, but that it was not differentiated of other diseases as leprosy. Steinbock (1976) supported this contention, premised on the many references to "venereal leprosy" and "congenital" and "hereditary leprosy" in the European medical literature. He also felt this supported because of alleged efficacy of "Saracen ointment" containing mercury for the treatment of leprosy (which is not effective against leprosy), while mercury was used as a remedy against syphilis during almost four centuries.

#### Livingstone's "Alternative Hypothesis"

Livingstone (1991) suggests that there are no reasons to think that treponemae suffered similar mutations through their evolution in the human species. He suggests that the increasing number of cases in America after its discovery was due to the introduction of a more virulent variant coming from the Old World. Contacts with tropical Africa increased at the same time of the discovery, producing more opportunities for the adaptation of a type of African treponema to the environment of the Americas. At the same time, the increase in sexual practices in Europe during the Renaissance would be anticipated to increase the transmission rate of microorganisms among humans, with assumption of subsequent increase in their virulence.

#### History of the Treponematoses

According to Cockburn (1963), first human treponematoses are different from present, due to the small size of human populations of that time. With increase in population size, more acute infections occurred.

Baker and Armelagos (1988) state several questions about the history of treponematoses, especially syphilis:

1. Is it true that a syphilitic epidemic occurred in the last years of the fifteenth century?

2. Was this epidemic the result of the differentiation of syphilis and its world recognition as a distinct condition from leprosy?.

3. Was due this epidemic to the increase in the size of the cities and to the improvement in European hygiene?

In the opinion of those authors, everything suggested that a true epidemic occurred and that it was due to increase in the sexual transmission of the infectious organism (as Livingstone pointed out later). On the other hand, they suggest that the possibility of the presence of syphilis in the Old World is based on obscure and ambiguous descriptions. However, several cases presented to the scientific community place serious doubts on their assertion.

Syphilis was recognized as a distinct condition several decades after the epidemic of the late fifteenth century, shortly after the return of Columbus and his sailors from the first trip to America. Let's go to the history.

In 1495, the Spanish Army of Gonzalo de Córdoba, the Great Captain, besieged the French troops of Charles VIII in Naples. A strange and severe epidemic appeared among the defenders during the siege. The disease began with loathsome sores and ulcers and terrible skeletal pain, following by invalidhood or death. After the surrender of the French, returning to their homes, they spread the microorganism to Italy, France and Germany. Around the year 1500, the whole continent was attacked by the effects of the epidemic. As the Spanish physician López de Villalobos wrote "it was a plague that was never seen before". The French called the disease "morbus napolitanicus" and the Italians and Spaniards called it "morbus gallicus".

It is not surprising that a huge amount of medical and non-medical literature regarding syphilis appeared in those years. The first reference to the disease was that of the Italian Niccoló Leonicensi (1497) in his "Libellus de epidemia quam Itali morbus gallicus vocant". The Spanish physician López de Villalobos published his "Tratado sobre las pestíferas bubas" a year later, shortly after the Italian Giovanni da Vigo introduced the mercury ointment in the treatment of the disease. However, the most important text in those years on syphilis was the poem by the Italian Girolamo Fracastoro. Entitled "Syphilis sive morbus gallicus" (1530), it provided the term with which the disease would be known in the next centuries. For a long time, however, the predominant term was that of "morbus gallicus" or "French pustule" (Arrizabalaga 1993). The only people in Europe rejecting it were obviously the French, who called the new condition "morbus napolitanicus", "morbus italicus" or "morbus hispanicus" (Rodríguez Maffiotte 1981). A few years later, the Italian surgeon Leonardo Botallo proposed the term "lues venerea".

The problem in that time was to know if syphilis was a new disease. For the Italian Leonicensi and Massa, it was not a new one but a new form of an old disease. Conversely, the Spaniard Díaz de Isla and Fernández de Oviedo suggested that syphilis was brought from Haiti by the sailors of Columbus. The first cases were those of Barcelona in 1493, from the soldiers of the Great Captain, the condition affecting Naples two years later. This hypothesis was accepted by other authors during the sixteenth century.

Syphilis was not only considered a new disease in Europe. McNeill (1984) reported its arrival in India in 1498, brought by the Portuguese of Vasco da Gama. Less than a decade later, the condition arrived to China and Japan (according to Suzuki 1991, the first brush of virulent venereal infection took place in Japan in 1510 converting very soon in a true epidemic).

Given the horrible consequences for the sick and the spectacular signs that the disease showed, the demographic impact of syphilis was very important (McNeill 1984). By the end of the sixteenth century, the incidence began to decrease and its fulminant form and disabling manifestation were less than previously noted.

The concept "lues venerea" began to be questioned after 1750 (Arrizabalaga 1993), due to the work of the illustrative European pathologists. The latter tried to elucidate if that term refers only to a disease or a group of diseases. The term was replaced in the medical literature by "morbi venerei", encompassing chancre, gonorrhoea, buboes, and syphilis.

The term syphilis became dominant after the third decade of the nineteenth century. At the middle of the last century, Philippe Ricord, specialist in venerology at the Hôpital du Midi in Paris, demonstrated the presence of the then so-called "syphilitic virus". Since then, syphilis and gonorrhoea were recognized as two different clinical conditions.

Albert Neisser discovered the gonococcus (microorganism responsible for gonorrhoea) in 1879. Ten years later, August Ducrei identified the *Haemophilus ducreyi* agent responsible of chancre or ulcus molle. *Treponema pallidum*, the agent of syphilis, was discovered in 1905 by the German bacteriologist Fritz Schaudinn. A year later, Wassermann, Neisser, Bruck and other German scientists introduced the first bacteriological procedure for early diagnosis of syphilis, the Wassermann reaction. According to Laín Entralgo (1963), this reaction and the introduction of the chemotherapy (based on Salvarsan and Neo-Salvarsan) by the German Paul Ehrlich were decisive for the changes produced in venerology between 1848 and 1914.

E.H. Hudson published the first description of non-venereal syphilis or bejel in 1929, after studying the disease among Arab Bedouins. He suggested an intermediate nature of this disease compared to yaws and venereal syphilis. This was the basis for the unitarian theory of the treponematoses (Kiple 1993).

### Paleopathological Evidence

According to Baker and Armelagos (1988), the evidence of possible cases of treponematoses in Europe prior to 1930 is scarce and non-conclusive. They suggested that most cases were isolated long bones of uncertain archaeological origin. Steinbock (1976) suggested lack of evidence because of absence of syphilitic stigmata in the large series coming from Egypt and lack of conclusive evidence in the cemeteries of the Medieval European leprosaria until the sixteenth century. However, several probable examples of treponematoses have been recently diagnosed in the Old World prior to the discovery of the Americas.

Stirland (1991) found the well-preserved skeleton of a young adult at Magdalen Street (Norwich, UK), dated between 1100-1468 A.D., showing a marked, extensive, bilateral periostitis involving both tibiae and fibulae. Radiologic evaluation supported treponemal disease. Differential diagnosis include pyogenic osteomyelitis, osteomyelitis of Garré and Paget's disease, although the extension and bilateral involvement of the condition are absent in those conditions. Other skeletons of that cemetery show similar lesions, although not so florid.

Palfi et al. (1992) reported a case of possible congenital syphilis in a fetal skeleton from the cemetery of Costebelle (Hières, Var, France) dated between the third and the fifth centuries A.D. The authors state that this case constitutes an argument against the theories on the migration of the *Treponema pallidum* from the New to the Old World at the end of the fifteenth century. However, some feel that the Costebelle membrane calcification without periosteal reaction actually represents a lithopedion or "stone baby".

There are several examples from Iraq (500 A.D.) and India (100-700 B.C.) and many others from Australia and Pacific islands. Borobia Melendo and Mora Postigo (1992) presented a possible treponemal case in an adult female from the Samar Cave (Philippines Islands). They reported typical treponemal lesions on the frontal, left parietal and both malar bones, but unfortunately provided no radiocarbon dating.

According to Guerra (1990), the first diagnoses of treponematoses in pre-Columbian New World skeletal remains was made by Wyman in

1871 on specimens found in the caves of Southeastern US. Five years later Jones diagnosed treponematoses in skeletons from stone coffins and tumuli at Nashville, Franklin and Old Town (Tennessee), and Hickman (Kentucky) (Steinbock 1976; Hackett 1983). However, Virchow and Putnam rejected those diagnoses (at the end of the nineteenth century and beginning of the present century).

The largest and most detailed study on syphilis in South America was made by the Peruvian Julio Tello (1909), although his results remain controversial.

It is impossible to cite here all the specimens in whom diagnosis of treponematoses have been made in pre-Columbian Americas. Therefore, I only refer to the places where were found. There are abundant cases in Florida (Lighthouse Mound, Tick Island, and Palmer Mound); Georgia (Irene Mound); Alabama (Moundville); North Carolina (Late Woodland Hardin); Delaware; Virginia; and Maryland.

Reichs (1989) has recently described a case of treponemal disease in an adult female (dated 500 years ago) from Hardin Site (Gaston County, North Carolina). The author (in the absence of criteria) suggested that it was probably a case of a variant of endemic syphilis or bejel.

Ortner (1986) presents a case of congenital treponematoses in a pre-Columbian child of 3 to 4 years of age from the Fisher Site (Virginia) showing a combination of enamel hypoplasia and periostitis. The skeleton of an adult female, located near the child, had chronic granulomatous lesions in the cranial and postcranial skeleton.

A number of probable cases of treponematoses have been reported in human remains from Woodland and Mississippi (Lower Illinois River Valley). In the opinion of Cook (1984), periostitis and osteitis are very common in the skeletal collections of the American Midwest and are similar to the features of endemic syphilis in the samples of Middle Woodland and to those of yaws in Late Woodland. Further cases have been registered over the Illinois River in Schuyler and Fulton counties. Several probable cases have been observed in Arkansas, from the St. Francis, White and Black rivers, and Crittenden and Mississippi counties. Other examples come from Kansas City (Missouri), Morris Site (Oklahoma), and Chow Creek Site (South Dakota).

Evidence of pre-Columbian treponematoses is poor in the Northwest, while in the Southwest (California, New Mexico, Colorado and Arizona) is more abundant.

Central American examples include several from the Postclassic Period of México (Hidalgo, Coahuila, and Morelos) and Preclassic Valle de Tehuacán. Other cases have been found in Guatemala (Zaculen and Altar de Sacrificios), Belize, Antilles, and Santo Domingo.

Most cases of pre-Columbian treponemal disease in South America come from ancient Peru. Some of the first cases in the paleopathological

literature were described by the Peruvian Julio Tello and the North American H.U. Williams, although most of their diagnoses are controversial. The sites of provenance are: Paracas (early Nazca Culture), Valle de Cañete, Machu Picchu, Valle de Urubamba, Paucarcancha, and Patallacta. Other examples come from Colombia (Aguazuque) and Argentina (Río Negro, Valle del Río Chubut y Calchaquí). Correal Urrego (1989) describes three cases from Aguazuque (Soacha, Cundinamarca, Colombia) dated between 5025 and 4030 B.P. For the author, the most probable diagnosis is yaws.

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