

Original Articles.

AN ACCOUNT OF DR. LOUIS-DANIEL BEAUPERTHUY, A PIONEER IN YELLOW FEVER RESEARCH.*

BY ARISTIDES AGRAMONTE, M.D., OF HAVANA, CUBA.

In the year 1853, the Province of Cumaná, in the Republic of Venezuela, was no doubt properly considered by the enlightened nations of the world as one of the wildest and remotest regions of the earth; its closest foreign neighbor is the English island of Trinidad, which little imaginative effort may well establish as a fragment of the mainland, severed by seismic action during one of the numerous earthquakes which, even within the history of man, have carried terror and desolation throughout Venezuelan territory.

What could it interest the world then, that a virulent and extensive epidemic of yellow fever ravaged that obscure and benighted country in the year of which I write? Still, let us be thankful that because of the preservation of a few documents, the records of one who labored at that time in the same field as ourselves will not remain forever buried in the musty archives of those ancient institutions.

The subject of this biographic sketch was then forty-five years of age, having been born on the 25th of August, 1808, at Basse Terre, in the Island of Guadeloupe (French West Indies). After obtaining his degree of Doctor in Medicine from the Paris Faculty in 1837, he was appointed "Traveling Naturalist" for the Paris Museum of Natural History, returning in that capacity to the regions of the Orinoco, which he had evidently formerly visited.¹

He devoted most of his time to the microscopic investigation of disease, carefully studying, with the means then at hand, the urine, excreta, and secretions of his clients, with such patience and perseverance, that many ignorant though well-meaning persons were led to consider him a harmless "crank" on the subject of microscopy.

As early as 1838, he had evolved theories which ascribe a parasitic origin to all the infectious diseases; at that date he presented to the Academy of Science (Paris) an essay, written in collaboration with his college-mate, M. Adel de Rosseville, in which he attributed the cause of putrefaction to the presence of animalcules in organic matter.

The fact that this man in the early forties traveled through the wilds of Venezuela, investigating with a microscope the tropical diseases which came under his observation, makes him sufficiently deserving, to my mind, of the high place which I claim for him among the pioneers in the research of tropical medicine.

Leprosy was a "hobby" which he rode to the moment of his death, which, unfortunately for the subsequent development of his cherished branches of medicine, occurred in September, 1871, while, as director of the Leper Hospital at Demerara (Georgetown), British Guiana, he was engaged upon the humanitarian enterprise of carrying

* Read by title at the fifth annual meeting of the American Society of Tropical Medicine, held in Baltimore, March 28, 1908.

out a method of treatment based upon his parasitic theory of the disease. In connection with this, it is interesting to note that, as published by his colleague, Dr. Bakewell, of Trinidad,² Dr. Beauperthuy's treatment of leprosy particularly enjoined repeated bathing and excessive alimentation, both of which means are to-day considered as absolutely necessary for the success of the many vaunted methods. As evidence of his undeniable intellectual foresight, I quote the second requisite which he describes in his method of treating leprosy. He says: "The patients should live in as healthy a locality as possible, and not in the neighborhood of marshes, etc. They are required to sleep under mosquito nets so as to prevent the sting of insects, which irritate and inflame the skin and perhaps propagate the disease."

It was because of the favorable report rendered by a special commissioner of the English Government, that Dr. Beauperthuy was appointed director of the Demerara Leper Hospital.

But that to which I desire mostly to call the attention of the society is the fact that Beauperthuy, as early as 1853, distinctly saw the rôle played by mosquitoes in the spread of malaria and yellow fever. With regard to yellow fever, the "striped-legged mosquito" attracted his attention, and he was the first one, to my knowledge, who called it the "domestic" species, a fact which to-day has been conclusively demonstrated.

A fortunate circumstance has placed in my hands the documents which testify to the truth of the above statements, one of them, the *Official Gazette* of Cumaná, of May 23, 1854,³ a few paragraphs of which I shall quote here, is most valuable from an historical point of view, and I am happy for the opportunity afforded by the invitation of the American Society of Tropical Medicine, to present to our English-speaking colleagues these facts, as a late tribute, but a sincere one, to the memory of a fellow practitioner who, if not entirely unknown, has been absolutely overlooked or forgotten by our contemporaries.

He labored upon a sterile soil; the minds of men were not yet in a condition to accept views so iconoclastic of the old hypotheses, so contrary to the cult of miasms and other intangible and mysterious agencies of disease. And still, the preachings of the harmless "crank" attracted considerable attention among the political authorities of the surrounding country. We have seen that the Government of the Island of Trinidad appointed Dr. Bakewell to investigate Beauperthuy's treatment of leprosy, and the French Colonial Office detailed Dr. G. P. M. de Brassac, a navy surgeon of the first class, for the same purpose. The latter rendered a more complete report and entered upon an agreement with both Drs. Beauperthuy and Bakewell to try the method under discussion after becoming impressed with its merits in Dr. Beauperthuy's hands. Of Beauperthuy's ideas, it is needless to say that neither De Brassac nor Bakewell could understand a single word.

In his report, De Brassac says: ⁴

"In combating the ideas of Dr. Beaupterthuy, we shall not forget that we have known this excellent confrère, a veritable type of honorability and disinterestedness, always convinced and filled with good faith in his scientific errors. If instead of being a detached pioneer from the army of investigators, deprived voluntarily for more than thirty years of all aid granted by progressive science, Dr. Beaupterthuy had remained in contact with the workers of his time, there is no doubt but that the passion for research which characterized him would have made him one of the most remarkable among them."

But Finlay had also been considered a harmless "crank" by many, until the United States Army Board demonstrated the mosquito's agency in the spread of yellow fever, notwithstanding the fact that he had something more tangible on which to base his claims, from the fact that Manson had already demonstrated what the insect could do in transmitting disease since 1879.⁵

Until Manson's demonstration of filaria transmission, since Beaupterthuy's articles (1854-1870), no mention of insect agency in the propagation of disease can be found in medical literature. Finlay quickly followed, in 1881, with a paper read before the Havana Academy of Sciences,⁶ expounding the fundamental principles of a theory which we know to-day as the modern doctrine of yellow fever transmission, and which, unknown to all then, was in fact a regenerated and strengthened revival of Beaupterthuy's ideas, regenerated and strengthened by the accumulated knowledge of thirty years, which period had elapsed since its conception.

Man to man transmission of disease through the bites of insects was unknown before Manson's discovery; this was the point brought out by Finlay in his theory and in which it principally differed from Beaupterthuy's at the time of which I write. On the other hand, Finlay and Beaupterthuy had arrived at the same conclusion (the mosquito's rôle), by following a series of logical deductions, based exclusively upon the study of yellow fever epidemics. Neither one nor the other had knowledge, at the time of their respective publications, of any demonstrated evidence on which to base their claim, and, in fact, not until the publication of the investigations made by the United States Army Board was there any scientific proof that could be accepted by the medical world as incontrovertible.⁷

Two important points which were the subject of uncertain speculation were definitely settled only after the experiments of the Army Board above referred to (1900-1901); these were the period of incubation of the disease, and the time during which a patient may remain infective. Without both of these, to serve as a fulcrum, the mighty lever, even of such a master mind as Finlay's, could accomplish but little. In Beaupterthuy's time, when native and foreigner alike were stricken by the dreaded scourge, even the positive knowledge of immunity was lacking.

Before going any further in studying the value

of Beaupterthuy's work, which can only be done by just comparison and a careful estimation of its merit and of its time, I may be permitted to quote a few paragraphs from his original contributions to the medical literature of those days.

In the above cited *Official Gazette*, he says:

"In the performance of the duties which I have undertaken [city physician during an epidemic of yellow fever, in Cumaná], I have applied the experience obtained during fourteen years of microscopic investigations made of changes in the blood and other fluids of the animal economy in the fevers of all types.

"These observations, made in the equinoctial and tropical regions, were of great aid to me in recognizing the causes of yellow fever and the appropriate means of combating this terrible disease. As to my work regarding the etiology of yellow fever, I shall abstain from making it public just at present. My investigations in this direction are part of an extensive work in which the results present facts, so new and so different from the accepted views, that I must not publish them without bringing to their support the most evident demonstrations. On the other hand, I am sending to the Academy at Paris a sealed letter which contains a résumé of the observations which I have collected up to date (1854), and the object of which is to insure against all events the propriety of my discoveries regarding the causes of fever in general."

It is my intention to obtain from the legal heirs of Dr. Beaupterthuy authority to open the letter to which he refers; it is no doubt fraught with interesting data and thus we shall rescue one more document from undeserved obscurity.

Further on he says:

"The disease known as yellow-typhus, black-vomit, etc., is produced by the same causes which induce the intermittent fevers.

"Yellow fever cannot be considered as a contagious disease. The cause of this disease develops under climacteric conditions which allow it to spread at once or successively; these conditions are those which favor the development of mosquitoes (insectes tipulaires, maringoines, etc.)."

"The mosquitoes introduce into the skin their *sucker*, composed of a grooved sting or spur with two lateral saws; they instil into the skin a venomous fluid, which has the property of snake poisons. It softens the blood cells, produces a rupture of their tegumentary membranes, dissolves the parenchymatous portion and facilitates the solution of the coloring matter in the blood plasma. This dissolvent action seems to facilitate the flow of the blood through the capillary duct of the mosquito's 'sucker.'

"The agents of this infection (yellow fever) present great number of varieties, not all of them being equally harmful. The variety known as 'Zancudo bobo,' which has *white-striped legs*, is to a certain extent the *domestic species*. It is not the most common and its sting is comparatively less painful than that of the other species."

The following is an interesting statement,

which shows Beauperthuy's power of observation and his good judgment.⁸

"It is not necessary to search very far in order to find why typhus icteroides is so common along the seacoast and so rare in the interior of the country and in localities little frequented by mosquitoes. In Basse Terre, capital of one of the West Indies, it has been observed that the epidemics of yellow fever do not extend their harmful influences as far as the town of Matouba, situated barely three miles from said city. It must be admitted that this distance is entirely too short to preserve, by itself, the town of Mantouba against the supposed noxious effluvia exhaled by the coast and which the winds, when blowing from the east, would transport within a few minutes; on the other hand, this distance from the sea, that is, from the locality inhabited by mosquitoes, is more than sufficient to preserve against their action and the serious inconveniences which they produce."

Beauperthuy thought that mosquitoes obtained the yellow fever poison from the putrefying organic matter in the stagnant waters in which they breed; this grave error is quite excusable when we consider the meager medical attainments of his day.

Speaking of malaria fever, he says:

"The intermittent fevers are severe in proportion with the abundance of mosquitoes, and these fevers disappear or lose much of their intensity in the woods which, on account of their altitude, contain but few of these insects.

"The marshy emanations are reputed as more energetic during the night than in the rest of the day. These are the hours in which mosquitoes are most active.

"To protect themselves against the fevers, the Indians employ certain preservatives, and those who inhabit the unhealthy valleys place burning coals (a brazier) at the entrance of their huts. This method is very effective for barring mosquitoes.

"Of all means employed to protect themselves from the action of mosquito bites, the most efficient is that followed by some Indians, which consists in rubbing the skin with oleaginous substances."

Upon acclimatization, he says:

"Perhaps we ought to look upon acclimatization only as an inoculation. It is not that the febrile virus introduced under the skin of man preserves him from the fevers, but that it diminishes the harmful action of these diseases and makes them lose a great part of their gravity. It acts as the variola inoculation, although the latter does not always preserve from pustulous infections. This analogy is still more evident in yellow fever, which generally affects the individual only once."

Further on we find:

"Contagious diseases are transmitted by inoculation. A certain period must elapse between the action of an infecting cause and the start of a visible lesion."

"The expression 'winged serpents,' used by

Herodotus, is well applicable to the tipulary insects and the action of their bites upon the human economy."

The collection of Beauperthuy's papers, published under the title of 'Travaux Scientific,' contains a great deal of matter which is just as absurd in our judgment to-day as his mosquito theory must have been to his contemporaries; there is a good quantity of chaff and irrelevant material in his writings; numerous pages are filled with obscure meaning, but now and then, as through a rift in heavy and accumulating clouds, a ray of light, clear and distinct, shines forth to give us a glimpse of the truth which he could see, no doubt, in spite of the bigotry and ignorance of the times.

Finally, allow me to quote a paragraph from another article:

"The attachment to old ideas is always protected by indifference and indolence. The worship of errors is otherwise as passionate as that of truth. It is necessary to remove from medicine those erroneous explanations which disfigure it. Truth can be established but very slowly; it cannot come forth except after a struggle, after having destroyed the errors which occupied its place. It was only after thirty years of debate that Harvey could demonstrate the circulation of the blood, a thing in which the proofs are easily established. The products of the imagination shining with greater splendor than the real facts are often substituted for the truth. Fantastic glares! Physicians, in the impossibility of discovering the causes of a great number of diseases, imagine an invisible power, occult, intangible to our senses and beyond our means of investigation. The routinary spirit of many physicians is content with this vague appreciation of the sources of most diseases and makes no effort to penetrate into the real causes of epidemics and of contagious diseases which are still unknown. From this point of view, science requires a complete renovation."

I consider the evidence here presented quite sufficient on which to base a claim for recognition of this investigator, lost in the devious by-ways of tropical America; it seems to me that it also serves to prove that, like all great truths which have been brought forth in medicine, since the earliest history of the art, the modern doctrine which explains the propagation of yellow fever had a prolonged and distressing evolution extending over a period of half a century.

If we eliminate the questionable credit which has been ascribed to Nott, who in 1848 vaguely suggested the possibility of insect transmission for both malaria and yellow fever, we find that in 1854 Beauperthuy speaks plainly of mosquitoes spreading epidemics of yellow fever and that he, thinking several species were responsible, fixes upon the domestic habits of the striped-legged variety; then, in 1881, Finlay defends the hypothetic mosquito transmission, introduces the feature of man to man infection and presents the striped-legged and the *Culex pipiens* (*C. cubensis*) as the probable vehicles of

infection; later he retains only the striped-legged mosquito as the propagator of the disease. Then in 1900-1901, the experiments of the United States Army Board definitely settle the question of mosquito transmission; they establish the exact maximum limit of incubation in man, the minimum in the mosquito, the infective period of yellow fever cases and fixes the guilt upon the single species *Stegomyia calopus*. Subsequent investigators have only corroborated the findings of this board.

REFERENCES.

- ¹ Beauperthuy: De la Climatologie. Thesis presented to the Paris Faculty of Medicine, Aug. 23, 1837.
- ² Bakewell, Dr. R. H.: Dr. Beauperthuy's Cure of Leprosy, in the "Star of the West," Port of Spain, Trinidad, March 24, 1870.
- ³ Beauperthuy: Gaceta Oficial de Cumaná Año 4, No. 57, May 23 1854.
- ⁴ De Brassac: Une Mission à Cumaná. Rapport adressé à M. le Directeur de l'Intérieur de la Guadeloupe. Imprimerie du Gouvernement, 1869.
- ⁵ Manson: Transactions of the Linnean Society, 1879-1883.
- ⁶ Finlay: Anales de la Real Academia de Ciencias, etc. Vol. xviii, pp. 147-169, Aug. 14, 1881.
- ⁷ Reed, Carroll and Agramonte: Etiology of Yellow Fever. (An Additional Note.) Transactions of the Third Pan-American Medical Congress, Havana, 1901.
- ⁸ Beauperthuy: Travaux Scientifiques. Impremier Nouvelle. A. Belier et Cie., Bordeaux, 1891.

SUTURE OF THE PATELLAR TENDON: REPORT OF THREE CASES.

BY CHARLES F. PAINTER, M.D.,

Orthopedic Surgeon to the Carney Hospital, Boston.

THE following three cases are recorded because of the comparative rarity of the condition and the necessity for its surgical treatment. Rupture of the quadriceps tendon or its avulsion from attachment to the patella is of quite frequent occurrence and numerous instances of this have found their way into medical literature. The short, broad and very strong tendon extending from the patella to the tibial tubercle is much less likely to rupture than is the thinner, more widely attached tendon of the quadriceps. Consequently muscular violence is more prone to effect a tear in this than in the patellar tendon.

In fact, so far as the personal experience of the writer is concerned, the ruptures of the patellar tendon have always resulted from direct violence to the tendon itself. It may be that there was a contributory factor present in the violence of the muscular contracture of the quadriceps, but violence directed to the tendon itself was the conspicuous feature. In one case the division of the tendon was brought about through an incised wound of the skin. In the other two the patients fell heavily upon the flexed knee, striking in one instance upon a hard wood floor and in the other upon the ground. The injury was in men in all three instances, as is commonly the case. Men are more subject to traumatic influences and also it may be that the wearing of skirts offers greater protection to the knee when a fall is sustained upon the flexed leg. The two patients here reported who received their injuries through falls upon the bent knee were both adults, one well along in years and the other in the prime of life. It is not, therefore, necessarily because of any senile fragility that such ruptures occur. In the two cases where the patients fell upon the knee

the rupture took place at or very close to the line of attachment of the patellar tendon to the patella. In the incised case the division of the fibers of the tendon was also so close to the patella that it was impossible to sew into that portion of the ruptured tendon which was attached to the patella, and the sutures had to be passed through the substance of that bone or its marginal cartilage.

The disability which follows an injury of this nature is greater than that which follows fracture of the patella where the separation of the fragments is considerable and the final union is purely a fibrous one. The insertion of the vastus internus and externus into the capsule of the knee joint and the lateral prolongation of their insertions down upon the head of the tibia and fibula are of very material assistance in the preservation of function when the patella is fractured and imperfectly united or the main part of the quadriceps tendon is torn from the patella. Without an intact patellar tendon, however, the last few degrees of extension, which are so essential, cannot be secured, though in the cadaver it has been demonstrated that extension of the leg is possible with a divided patellar tendon.

The symptoms of this condition seem hardly worth discussing. The two cardinal and distinguishing ones are the loss of ability to extend the leg and a palpable hiatus in the continuity of the patellar tendon. In addition to this all the symptoms of severe trauma may be present if the rupture was brought about by direct violence without rupture of the skin. Swelling and local tenderness may obscure the hiatus in the tendon and the severity of the trauma may be, for a time, a sufficient explanation of the inability to completely extend the leg. Incised wounds through the skin over the course of the patellar tendon should always be carefully explored to avoid overlooking a section of this tendon. The instance (Case I) of this kind here reported illustrates the importance of observing this caution.

Fixation in complete extension, either in plaster, or preferably upon a posterior wire splint which will permit of the application of ice bags to lessen swelling, will render the diagnosis easier and make it possible earlier. The x-ray, in a lateral view, is capable of revealing a break in the continuity of the patellar tendon, after swelling and effusion have subsided. One case was complicated by a hematoma in the knee joint, necessitating a free opening into that articulation and flushing out the clotted blood.

Operative treatment.—The incision which the writer has employed has been a straight, one directly over the patellar tendon, beginning at the tibial tubercle and extending up over the lower half of the patella. The sheath of the patellar tendon is fully three quarters of an inch in breadth and at its attachment to the patella is separated from the synovial membrane by quite a thick layer of subserous fat. In elderly patients this fat may be so atrophied that the synovial membrane is practically a part of the