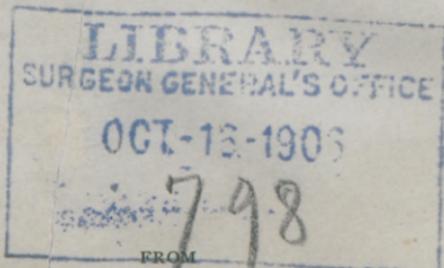
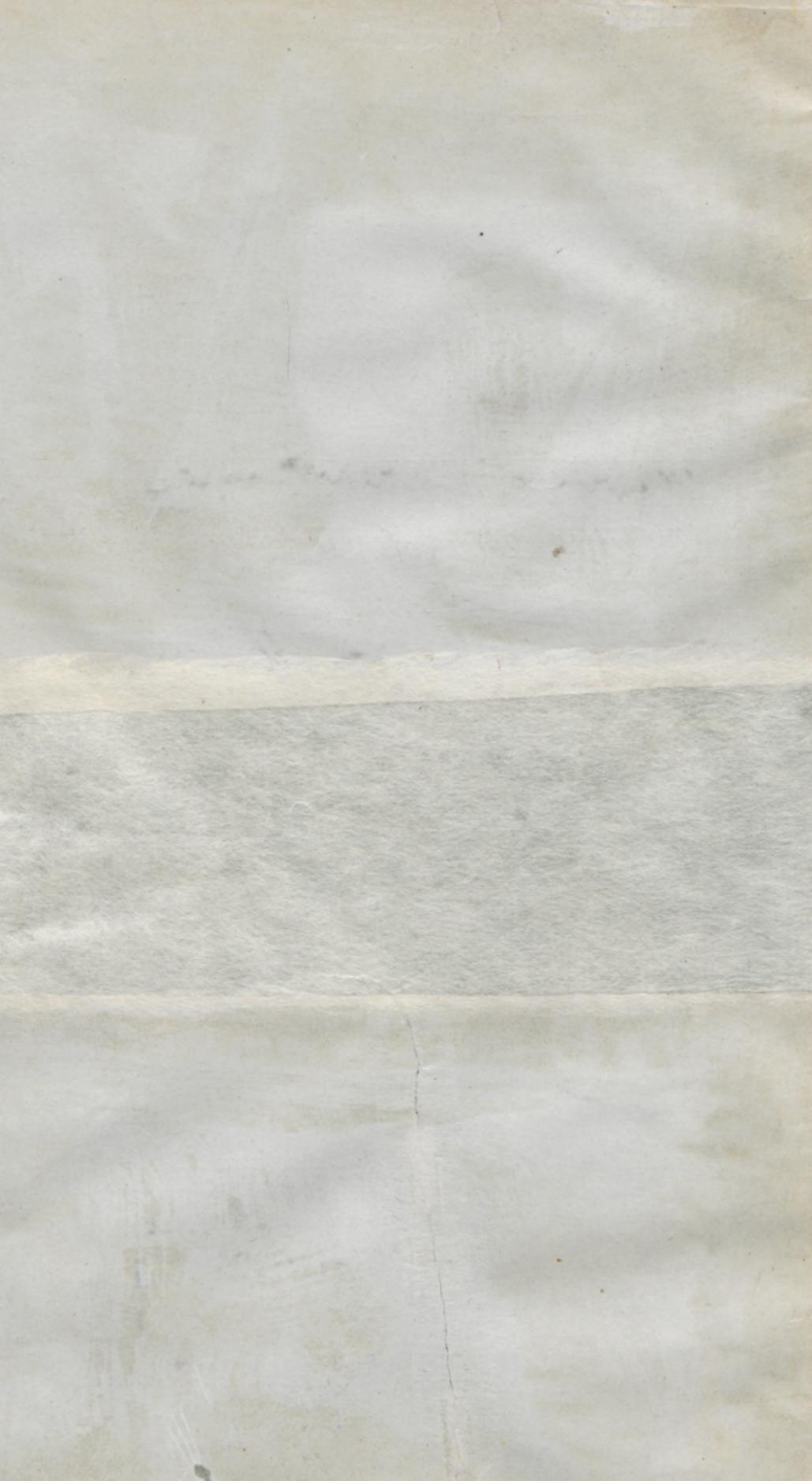


CARROLL (Jas.)

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Microscopical report upon
A Fifth Case of "Fungous Foot" in
America.
by Sr. James Carroll, U.S.A.



THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES,
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Microscopic report upon

A FIFTH CASE OF "FUNGOUS FOOT" IN AMERICA.

By ~~J. H. ARWINE, M.D.,~~

~~ASSISTANT SURGEON GENERAL, U. S. A., FORT RINGGOLD, TEXAS,~~

Det. James Carroll, U. S. A.

~~D. S. LAMB, A.M., M.D.,~~

~~ARMY MEDICAL MUSEUM, WASHINGTON, D. C.~~

THE history by Dr. Arwine is brief, but the best that could be obtained.

Pedro B.; was born in Southwestern Texas; of Mexican parentage; aged forty-five years; married; six children. Family history good; no history of syphilis. He lived on a ranch thirty or forty miles from Fort Ringgold; had never lived elsewhere. The disease began about the year 1887 with severe pain in the left foot, lasting thirty-six hours. After this a red spot appeared on the foot. The man had chills and fever; no cause for the condition was known. Throughout almost the whole course of the disease the pain continued; it was most severe at night, and was worse in summer than in winter; toward the last it subsided. The only treatment was the use of a few simple household remedies. The local physicians diagnosticated elephantiasis, and advised amputation.

He came to Dr. Arwine on March 5 (or 6), 1889, complaining of the leg being too heavy to carry; there was then no pain. On the 16th Dr. Arwine amputated; there was but little shock; about eight arteries in addition to the tibials, all of which were much enlarged, were tied. Recovery was complete and without event; the more gratifying because the man's surroundings at the time of the operation were quite unsanitary.

The amputated part was sent to the Army Medical Museum, but was not in good preservation when received. It is numbered 11,699 in the pathological series, and consists of the left foot and lower half of the leg. The foot and ankle are much enlarged, and show the characteristic *buttons* of fungous foot (mycetoma, Madura foot, fungous foot of India); the buttons vary in size, and are most numerous and closely set on the dorsum of the foot (Fig. 1). The subcutaneous tissue shows numerous sinuses and fistulae filled with oily and white, pasty matter, mixed with innumerable rounded, brownish bodies measuring 0.5 to 2 mm. in diameter. The bodies were sometimes in masses, the diameter of a centimetre, and were most numerous near to and beside the bones. All the bones were honeycombed with cavities and fistulae, in which were similar masses; the bones of the foot were so friable that they could scarcely be handled. The tibia and fibula (Fig. 2) showed hyperostosis, especially in the upper part of the amputated portion; and as this was the part most recently affected by the disease, it seems probable that, so

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far as the bone is concerned, hyperostosis is the first effect of the irritation of the fungus. In some places, particularly around the ankle, was a dense mass of connective tissue (in one place nearly an inch thick), the result of the inflammatory process. The bones are mounted as 11,725.

FIG. 1.



From photographs taken by Dr. W. M. Gray, Army Medical Museum.

Dr. James Carroll, of the Army Bacteriological Laboratory, makes the following statement in regard to the microscopical characters of the tissues and fungi:

The specimen gave off a very disagreeable odor, showing that it was not in a good state of preservation. A portion of the skin and underlying tissue was removed from the posterior surface of the leg for embedding.

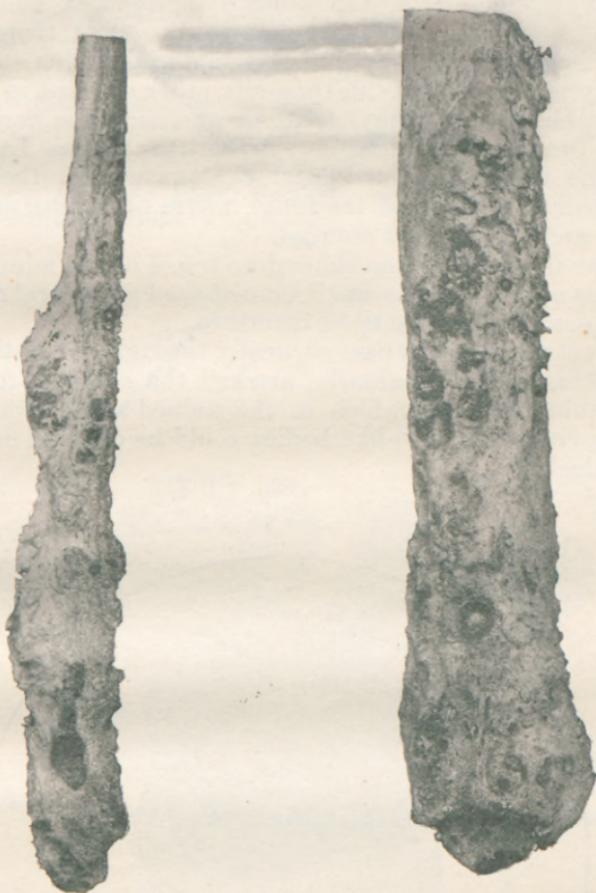
Small hempseed-like bodies were found in considerable numbers free in the connective-tissue spaces and sinuses. They were of a yellowish-brown color, some darker and some lighter, generally rounded or lobulated in outline, and their surfaces slightly roughened. In size they varied from about 1 to 3 millimetres.

These seed-like bodies were easily crushed upon a slide, and appeared to consist of a dense, brittle, cortical layer, enclosing a central grayish, pulpy mass of pultaceous consistency. All attempts to identify the structural elements of these bodies resulted in failure. They were

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macerated in water, caustic potash solution, etc., and were crushed and examined in the fluids, or were dried upon the slide and stained by various methods, but no positive evidences of a mycelium or other definite structure could be determined. The central pulpy material appeared

FIG. 2.



Outer side of tibia and inner side of fibula; shows hyperostosis, osteitis, and fungous masses in the cavities. (From a photograph taken by Dr. Gray.)

to have undergone complete disintegration, and in consistency was almost caseous. The cortical layer broke up into vitreous, yellowish, brownish, or colorless granular masses which showed no distinct striation or other definite arrangement.

Among the stains tried were thionin and Weigert's modification of Gram's method. With tissue sections complete failure was the result in all attempts to stain the cell nuclei. Nothing better could be obtained than a diffusely colored structure, the minute details of which could only be recognized by differences in the form and arrangement of its components. Large numbers of mastzellen were found uniformly scattered throughout the subcutaneous connective tissue. These were not more numerous in the vicinity of the fungous masses than elsewhere, and they were easily recognized under the immersion lens by their form,

their very numerous hæmatoxylin-tinged granules of uniform size, and by their nuclei, which could often be seen as clear, unstained bodies, somewhat like the nucleus of a malarial parasite.

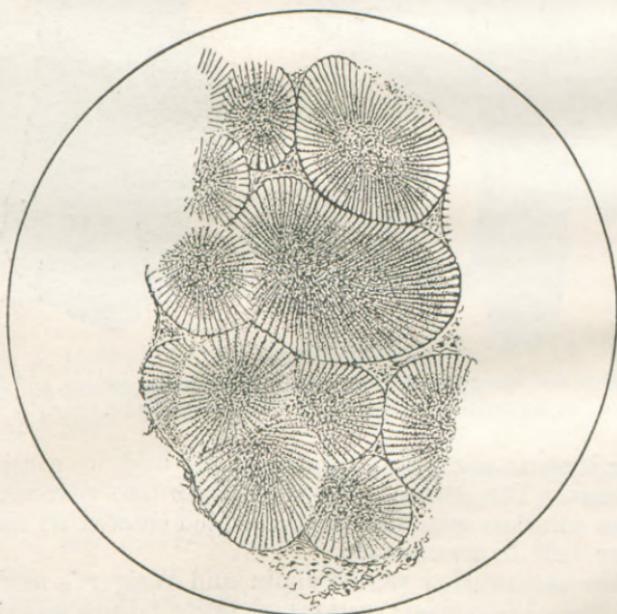
A conspicuous feature of the section was the presence in many of the lymph-spaces adjacent to the fungi of abundant amorphous granular material of a yellowish-brown color, which was very refractive. This was probably hæmosiderin. In other lymph-spaces, and, indeed, in some of those containing the above-described pigment, there were aggregations of finely and coarsely granular material, which stained a little more darkly with hæmatoxylin than any other element in the tissue.

I was unable to satisfy myself as to whether these were small portions of the fungus or cell detritus. As between the two I would incline rather to the former than the latter explanation, for the reason that in the immediate vicinity of the fungi, where numerous pus-cells were present, no such picture was obtained.

Other than these the section showed no traces of the minuter elements of the fungus apart from the small, club-shaped peripheral rays attached to the hempsced bodies now to be described.

The section was made to pass vertically through one of the elevations upon the skin, which, apparently, marked the outlet of a discharging sinus. Within the sinus, which in the stained section was 3 to 5 mm. in diameter, six small, seed-like bodies could be counted upon the slide with the naked eye.

FIG. 8.

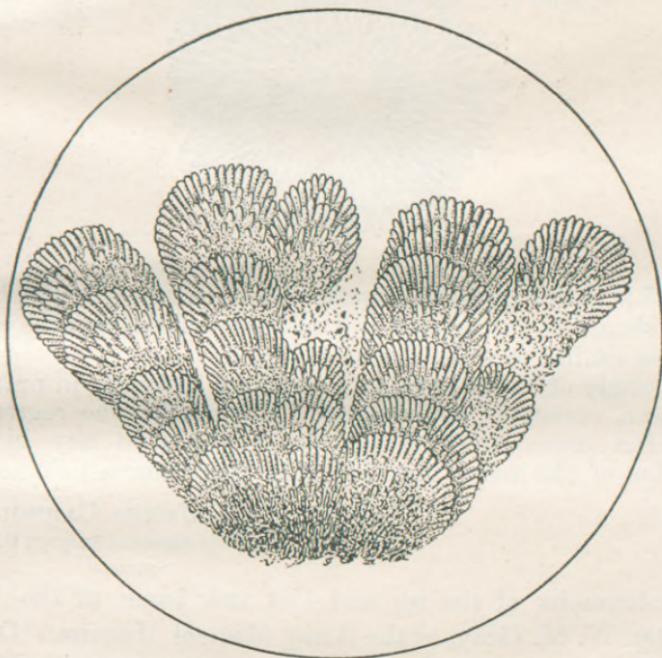


Several of these projected above the level of the skin into the pouch-like sac upon the surface. The walls of the sinus were formed of distinct lines of connective tissue. Just within the wall and around and between the fungous bodies large numbers of pus-cells could be seen with the microscope. These were easily recognized, because in places a

number of them showed characteristic nuclei in the sections stained with hæmatoxylin and eosin.

Under the low-power the hempseed bodies were found to be made up of aggregations of smaller masses, some of which were rounded, others fan-shaped, reniform, or lobulated. One or two showed a fernleaf-like branching arrangement. Many of these smaller units exhibited a distinct radial striation, which could be followed from the periphery to the centre, or, in the fan-shaped bodies, to the base or pedicle. The majority showed at the periphery a marginal zone of very small, club-shaped rays, which were remarkably symmetrical in form and arrangement. The central radial striations of the larger bodies were seen to be continuous with the lines of contact of these delicate rays about the periphery. In many of them a rather indistinct concentric striation could also be distinguished.

FIG. 4.



The above description applies to the section stained with hæmatoxylin and eosin. Gram's method proved of no service with these specimens. Safranin yielded a very good picture of the gross masses with their peripheral rays and general striation. With thionin exquisite preparations were obtained, which began to fade, however, in a few days.

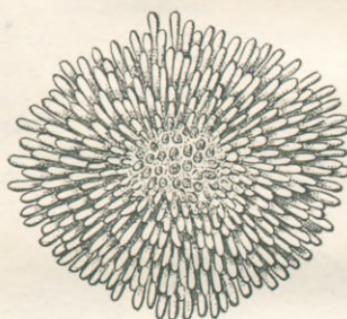
The accompanying pen-and-ink drawings were made from thionin and safranin stained sections by Dr. J. C. McConnell, of the Army Medical Museum.

Fig. 3 (safranin) shows the arrangement of the smaller units into the larger masses, the whole picture probably representing one of the isolated hempseed bodies. In the section from which the drawing was made the centres of the bodies were somewhat denser than shown in the drawing; they presented more of a homogeneous, finely granular

appearance, with a less distinct striation, except as to the periphery, where it is plainly marked. Apart from the lines where the druses are in contact with neighboring contiguous ones, the margins should be undulating, as they appear in Fig. 4.

Fig. 4 (thionin) shows in a beautiful manner the larger half of a hemispherical mass, consisting of imbricated processes arising as branches from a central stalk or base. The minute club-shaped elements were almost as distinct in the specimen as they appear in the drawing, and the interspaces between the processes were occupied by emigrated polymorphonuclear leucocytes, by which also the fungous mass was to a large extent surrounded. This body was situated in the sac-like expansion formed at the opening of the sinus upon the skin.

FIG. 5.



In Fig. 5 is shown a small body that was completely isolated. In my opinion it should be interpreted as a cross-section through the extremity of a process similar to those shown in Fig. 4.

After a study of these sections I have no hesitancy in pronouncing the fungus a variety of actinomyces. It is much to be regretted that the imperfect preservation of the tissue precluded any histological investigation of the lesions resulting from its presence.

JAMES CARROLL,

Acting Assistant Surgeon U. S. Army.

The photographs of the leg and foot and bones of the leg were made by Dr. W. M. Gray, of the Army Medical Museum. One shows well the characteristic *buttons*; the other, the fungous masses on and in the bone.

The cases thus far reported from America are as follows: Adami and Kirkpatrick (*Transactions of the Association of American Physicians*, 1895, vol. x. p. 92): Male, aged twenty-one years; Canada; ten years' chronicity, right side of the body. Hyde and Senn (*Journal of Cutaneous and Genito-urinary Diseases*, New York, 1896, vol. xiv. p. 1): Male, aged twenty years; United States; thirteen years' chronicity, left side of the body. Pope and Lamb (*New York Medical Journal*, 1896, vol. lxiv. p. 386): Male, aged twenty-seven years; Texas; eight years' chronicity, right side of the body. Wright (*Transactions of the Association of American Physicians*, 1898, vol. xiii. p. 471): Female, aged twenty-six years;

Italy and United States; six months' chronicity, left side of the body. Arwine and Lamb: Male; aged forty-five years; Texas; twelve years' chronicity, left side of the body.

It is probable, as suggested by Prof. Adami, of Montreal, that a careful examination of museums would disclose additional specimens; it is probable, also, that many cases of this disease have been erroneously diagnosticated as elephantiasis. Inasmuch as the two American cases in possession of the Army Medical Museum came from Texas, it would seem likely that that section of country would be an inviting field for research. Since, also, in India at least, the disease is found almost exclusively among the peasantry who go barefoot on the soft-ploughed ground, tropical and semi-tropical America ought, theoretically, to furnish many more cases than the few which have been reported.

The subject has been written up so fully by previous reporters that it seems unnecessary to do more than refer to their papers.

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