OBSERVATIONS ON DERMATOMYCOSIS IN PORTO RICO

REPORT ON THE FUNGUS COMMONLY ASSOCIATED WITH FOOT DYSHIDROSIS

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The organism here described has been found to be very frequently associated with foot dyshidrosis in Porto Rico. Although it should be suspected to be also related to dyshidrosis of the palms, we have failed, so far, to isolate it from this location. We may succeed in doing so when a greater amount of material is studied. We have also failed to isolate the organism from various dermatoses affecting other portions of the skin, in spite of the routine laboratory examination of a large number of specimens from cases in which some sort of fungus infection was suspected. The parasite under consideration, therefore, has been obtained exclusively from the active lesions of foot dyshidrosis.

METHODS

In most of the patients studied, the epidermis forming the roof of vesicles in acute plantar lesions were used for investigation. In a few of the cases the infected material was taken from lesions between the toes.

Small pieces of infected epidermis inoculated into proper media generally revealed in twenty-four to thirty-six hours a delicate tuft of aerial filaments. The fungus soon overgrew all the associated organisms rendering isolation an easy process during the third or fourth day.

After isolation, the parasite was grown repeatedly in Sabouraud's glucose agar for morphological study. This medium was prepared in strict accordance with the technique of Dr. Sabouraud. Chassaign peptone was obtained directly from Cogit and Co. in Paris. As it was impossible to obtain French sugar, Pfantiehl's dextrose having a specific rotation of 52.5 was used. This substitution would appear to make practically no difference according to Hodges' experience [1].

[1] Hodges, R. S.: Cultures of Ringworm Fungi on Sabouraud's Proof Mediums and on Mediums Prepared with American Peptones and Sugars. Arch. Dermat. & Syph., 18: (6) 852.

The resulting pH was 5.4. Immediately after preparation the medium was poured into Petri plates to a depth of ¼ of an inch.

The microscopical characteristics were studied in hanging drop cultures. The recently isolated organisms were first grown upon Sabouraud's glucose agar for a few days. Small pieces from the cultures so obtained were then transplanted into a series of tubes containing four per cent glucose broth for twenty-four hours, after which from fifteen to twenty hanging drops (four per cent glucose broth) were carefully inoculated under aseptic conditions with one or two of the growing particles. These cultures were set aside at room temperature and observed under the microscope every twenty-four hours.

MORPHOLOGICAL STUDY OF CULTURES

One-week cultures upon Sabouraud's glucose agar form a thick, plane, smooth, and prominent layer of fluffy growth about 1⅛ inches in diameter, having a circular contour and a knob-like projection at the middle. The central area is of a light cream color and shows a powdery structure. The periphery appears more duvetous and white. Examined from the back, a dull mauve pigmentation is observed toward the center.

At the end of two weeks the growth has generally doubled its diameter, its border losing regularity. Centrally the surface becomes more markedly powdery and rather granular in appearance. The creamy pigmentation, becomes duller in tone. A few irregular depressions are beginning to form around the central knob and the pigment at the back will be found to have considerably extended toward the periphery.

Cultures three weeks old have increased their size to about four inches in diameter. The central portion shows marked, irregular, radial folding and a thin, diffuse, snow-white, pleomorphic growth. From the back the mauve discoloration, which now extends to a short distance from the border, has become darker toward the center, taking at this place a dull greenish tone.

These morphological characteristics are strikingly constant and the organism may usually be identified by the gross appearance of the cultures (see Plate I).

MICROSCOPICAL CHARACTERISTICS

Direct microscopical examination of the infected epidermis properly treated with a forty per cent solution of potassium hydroxide re-

veals an abundance of long, undulating, septate and branching mycelial threads some of which have developed arthrospores (see Plate II).

Hanging-drop cultures are most frequently fertile revealing fructification forms often as early as twenty-four hours after inoculation. They are most flourishing when forty-eight hours old. The mycelial threads are from 3 to 6 microns in width, contain septa at variable intervals and often follow an undulating course. Forty-eight hours after inoculation many of these threads will show refringent portions of the protoplasm at the site of which there is considerable engorgement while the rest of the filament becomes thin and atrophic. These *protoplasmic condensations* may extend over a considerable distance or they may occupy only a short segment of the hyphae. Many of them appear divided into short articles by numerous transverse walls while the borders take a festooned appearance forming characteristic *arthrospores.* These arthrospores are most typical in cultures three days old.

Sporulation may be observed best at the end of two days. Graceful *"thyrses"* bearing both lateral and terminal, pyriform, ovoid or almost round *conidia* are usually seen in great abundance at this time. The size of the spores is quite variable. Some are 2 by 3 microns, while others may be as large as 4 by 6. The terminal elements may reach even larger dimensions and develop transverse septa taking the characteristics of fusiform organs. Some fertile elements show a fairly marked tendency to branching.

"Fuseaux" are usually abundant after forty-eight hours. Their size varies within a wide range, the largest measuring approximately 12 by 60 microns. Their ends are rounded and their sides festooned. They are divided by transverse walls into a number of compartments—2 to 8. They may grow as the terminal elements of conidia-bearing hyphae, but more frequently they emerge from special filaments giving rise only to these organs. Ordinarily they are not born directly from the sides of a fertile thread, but at the end of lateral branches growing from it.

Characteristic spirals are also encountered in drop cultures.

COMMENT

The cultural characteristics of the parasite above described show resemblance to a number of known species: (*a*) *Trichophyton granulosum* and (*b*) *Trichophyton lacticolor* (*Sabouraud*); (*c*) *Tricho-*

phyton gypseum, variety C (*Hodges*), and *Epidermophyton gypseum* (*Mac Carthy*).

We would hesitate to include it in the first two species. Our organism does not appear to attack the hair. We have failed to isolate it from the rare cases of tinea of the scalp occurring in this Island and nothing could explain the absence of the specific trichophytia in a region like Porto Rico where the organism concerned is so very frequently encountered in foot lesions. Moreover *Trichophyton granulosum* does not produce fusiform bodies in hanging-drop cultures while the organism here described does. On the other hand the latter does not produce the nodular organs which are so characteristic of *Trichophyton lacticolor.*

Hodges would seem to classify the organism described in his paper as Trichophyton granulosum (''Trychophyton gypseum, variety C''). We should like to remark in this connection, however, that Trychophyton granulosum as described by Sabouraud does not produce either ''fuseaux'' or spirals both of which were present in the organism reported by the former author. Be that as it may, cultures of our fungus were rich in arthrospores and protoplasmic condensations none of which were noted by Hodges in his description. Otherwise, Hodges' organism and ours are indeed very closely similar.

So far as *Epidermophyton gypseum* (*Mac Carthy*) is concerned, cultures of that species ''in goutte pendante'' never gave rise to *fuseaux.*

Under such circumstances the classification of the fungus under study becomes a difficult matter and it would seem advisable to wait until more information is gathered in connection with some of the organisms more recently described before a definite classification is attempted. For the present we shall be satisfied to give out the results of our observation in this field with the hope that they may throw some light on the subject of epidermophytosis.

BIBLIOGRAPHY

(1) Mac Carthy, Lee: Epidermomycoses, with presentation of six new parasites. (1925), Ann. de Derm. et Syph., 6:19.

(2) Sabouraud: Les Teignes, (1920).
Trichophyton lacticolor: p.p. 362 and 623
Trichophyton granulosum: p.p. 357 and 621

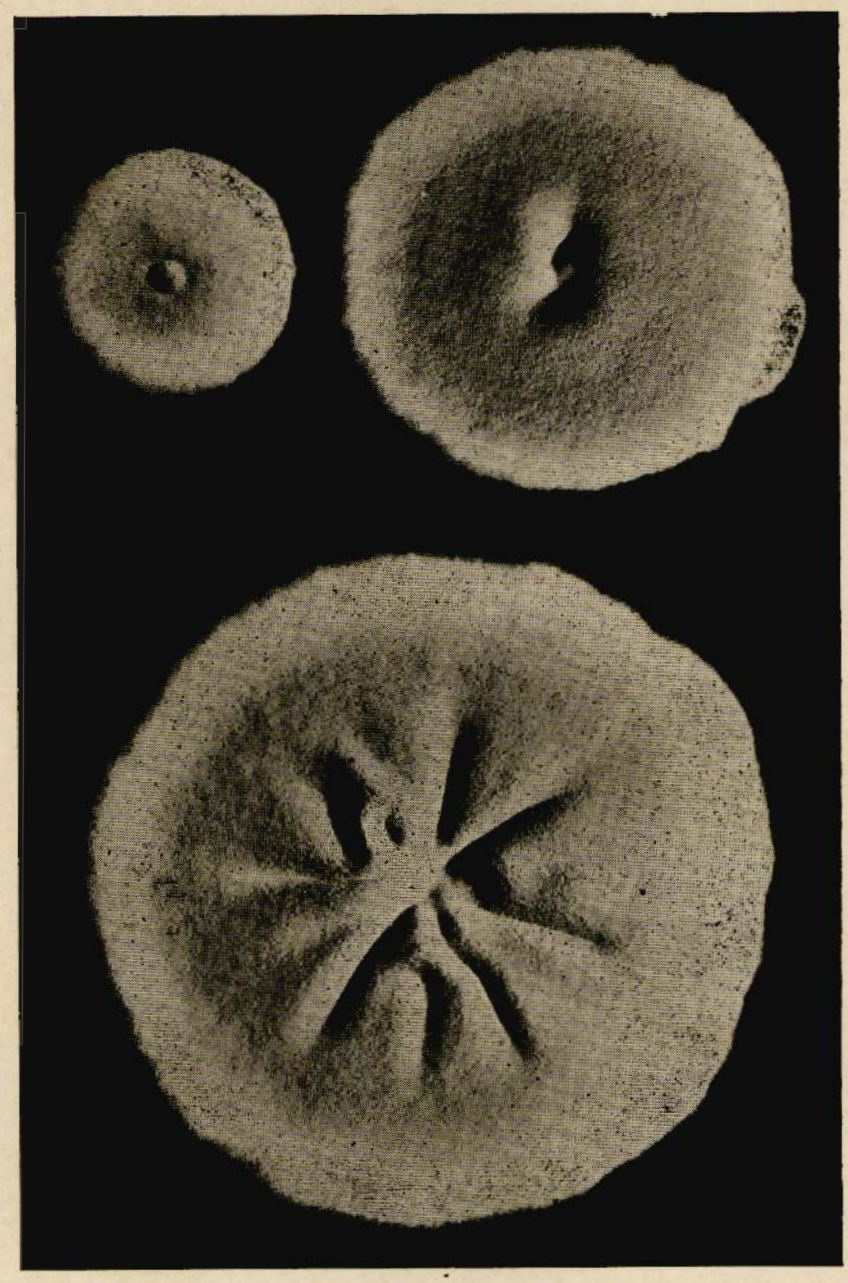
(3) Weidman, Fred D.: Laboratory Aspects of Epidermophytosis. (1927) Arch. Dermat. & Syph. 15:(4) 415.

(4) Karrenberg, Carl. L.: The Present State of Epidermophytosis in Europe. (1928) Arch. Dermat. & Syph. 17: (14) 519.

(5) Hodges, R. S.: Ringworm of Nails. (1921) Arch. Dermat. & Syph., 4: (1) 1.

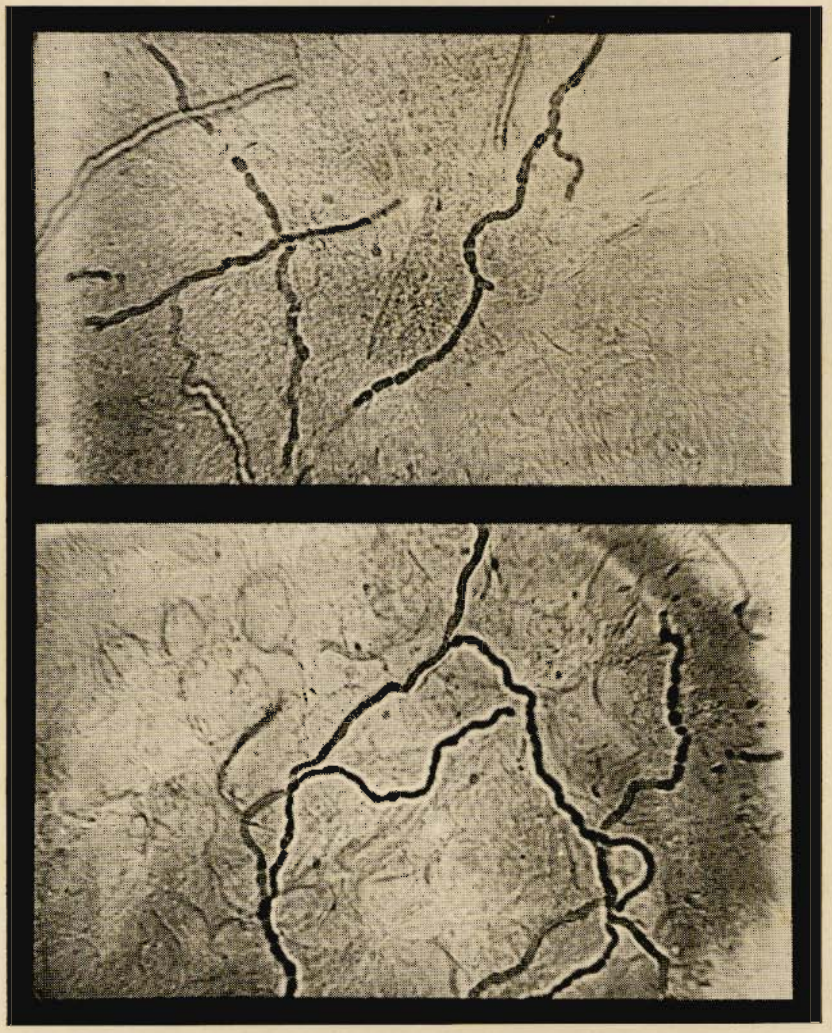
(6) Hodges, R. S.: Cultures of Ringworm Fungi on Sabouraud's Proof Mediums and on Mediums Prepared with American Peptones and Sugars. Arch. Dermat. & Syph., 18: (6) 852.

CHART I



CULTURES 7, 14, AND 19 DAYS OLD UPON SABOURAUD'S GLUCOSE AGAR.

CHART II

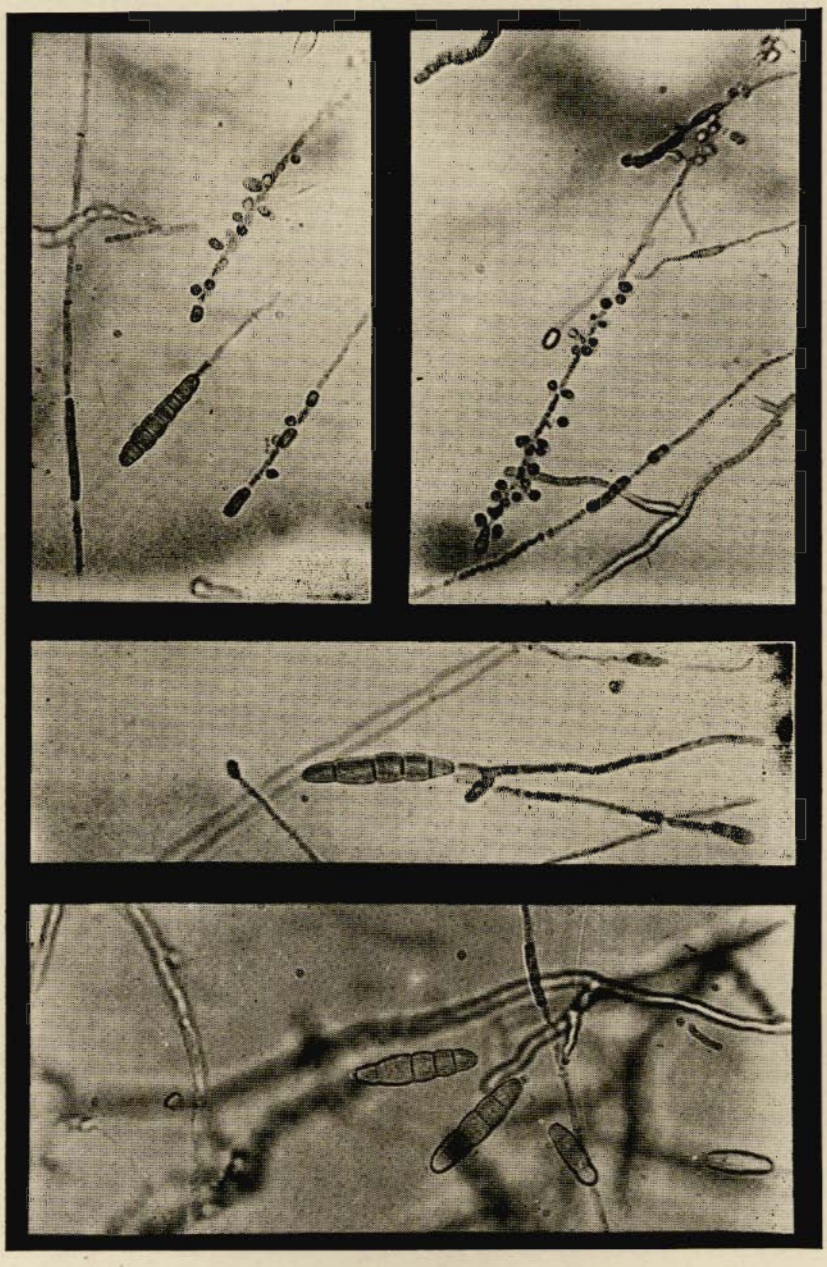


INFECTED EPIDERMIS

CHART III

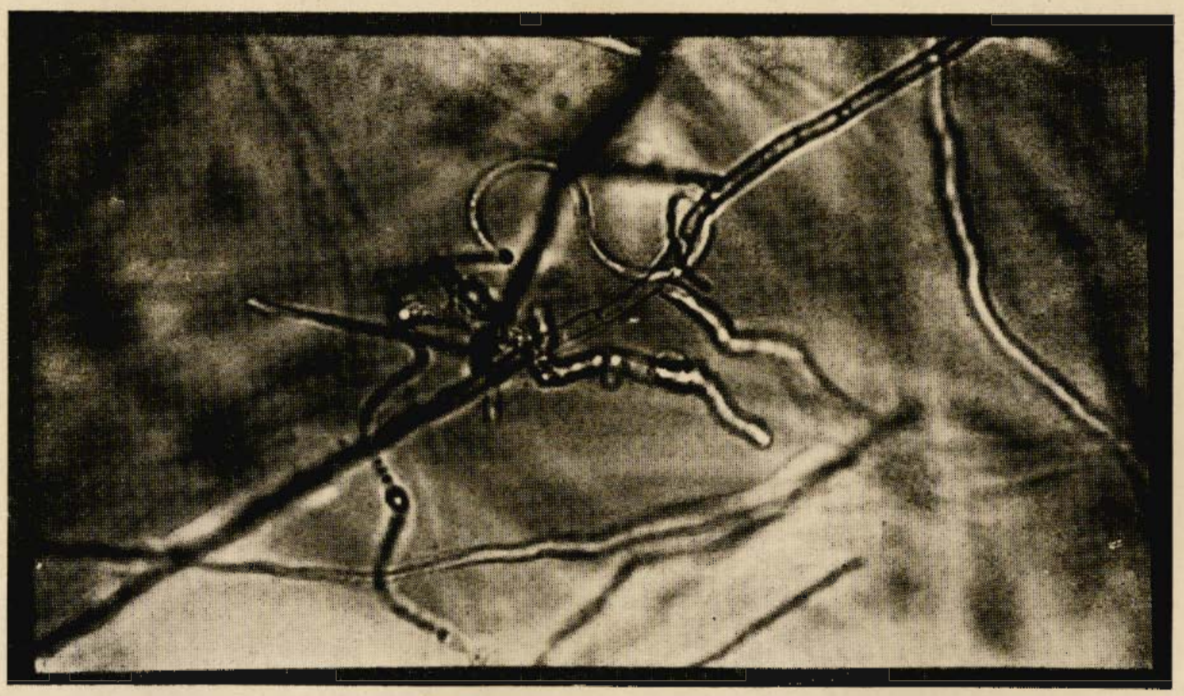
HANGING-DROP CULTURE: ARTHROSPORES, PROTOPLASMIC CONDENSATIONS AND SPORE-BEARING HYPHAE

CHART IV



HANGING-DROP CULTURE: "FUSEAUX", CONIDIAS AND PROTOPLASMIC CONDENSATIONS.

CHART V



SPIRALS ARE ALSO DEVELOPED IN DROP CULTURES