Leprosy

The Johns Hopkins Hospital,

Baltimore, April 13/97.

Dear Dr. Osler,

The following is, in brief, a description of the leprous nodules in the skin and subcutaneous tissue of the patients at present in Ward I. You already know that cover-slip preparations made by smearing the teased tissue from the area on cover slips and stained by Gram's and Ziehl-Neelsen's methods showed many bacilli having the characters of the B. leprae.

The sections of the skin and subcutaneous tissue containing the tubercles were stained in haematoxylin and eosine and in Carbol-fuchsin and methylene blue. As regards the former: - The tubercles are situated chiefly in the subcutaneous areolar and adipose tissues; they are usually discrete and always well-circumscribed.

Evidences of necrosis were not met with.
The tubercles are made up of cells of the epithelioid type, usually with single nuclei, but a rather unusual number of multi-nucleated cells are found in certain tubercles. The great majority of these cells – whether single or multinucleated – show the vacuolization described by Virchow. Often the cell protoplasm is enormously swollen and crowded with vacuoles. Now and then a smaller cell will have suffered partial colloid degeneration of its protoplasm. The nodules are sharply circumscribed by the connective tissue in which they lie altho' in the younger and forming nodules elongated outgrowths appear to be going on. These are however separated by more or less tissue from the original and older tubercles. Blood-vessels are numerous in the tubercles.

The behavior of certain of the skin structures is interesting. Sections of subcutaneous glands are included in the tubercles and these are

at one time quite normal in appearance and at another rapidly filling up with cells resembling the leprous cells until finally the contours are lost and they become a part of the tubercle. Some of the giant (multinucleated) cells of the tubercles are derived by confluence from the epithelial lining of these glands. They may also be seen to undergo the typical vacuolization. The arrectores pilorum are hypertrophied, a fact already pointed out by Buchanan. Sebaceous glands were very scanty in the sections studied so that nothing especial was made out of their relation to the tubercle formation.

The relation of the bacteria to the lesions are as follows:- In the tubercles they are present in the usual great numbers. There seems to me to be no reasonable doubt that they exist in the epithelioid and giant cells, surrounding the nuclei of these cells. Whether they also [illegible] at times within the nuclei themselves could not be determined. This case agrees with those studied by a host of others (Koch, Cornil, Unna, etc.) inasmuch as the organisms are found not to invade the epithelial cells of the sudoriferous glands and epidermis. Nor often in a tubercle appearance are obtained suggesting a few bacilli in sweat glands; but it is not excluded that the organisms are not in the interstitial tissue between the sections of the cords. On the other hand, the outer sheath (Haarbalg) of the hairs often contains bacilli in considerable numbers. Here Cornil is no doubt that Unna is correct in his statement that the bacilli exist in lymph spaces independently of cells. But this condition is found not within the tubercles as he supposed but in the corium. Small masses of bacteria may be easily discerned in the tissue spaces. They grow fewer in number and the cysts of the masses diminish as the epidermis is approached. The bacilli may however be followed to the epithelium of the rete layer. Just below this bacilli are found in clusters which much resemble in outline, although the pigment was wanting, Chromatophores. In this case at this time this fact is important when it is considered that the bacilli may be found in fair numbers in the horny layer of the surface of the epidermis. Here are two ways in which they may gain entrance through the unbroken skin to the surface. One is demonstrable in this case, namely from the sheath of the hairs. The other is by the action of Chromatophores, which it is well known emigrate between the epithelial cells

and are capable of reaching the surface. On the skin surface the number of bacilli is greatest in the pits where the horny scales are thickest.

The bacilli are found in the smaller blood-vessels in the tubercles. They infiltrate all the coats but exist in greatest numbers in the endothelial cells of the intima which often are crowded with them. These vessels are sinuous.

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I have not seen in my reading a reference to the occurrence of the bacilli on the surface of the intact skin. I should like to study further the epidermal scales from various parts of the body in order to follow their distribution. Or, if you prefer it, I shall be glad to assist in the house officer in charge of the case in this study. In any event I shall study more carefully the behavior of the Chromatophores or what I take to be these

structures. Perhaps it may be possible to have them tried the epidermis.

Sincerely,

Simon Flexner.

P.S. Cannot have a set of sections for you.

S.F.