

## REPRINTED ARTICLES

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### ON ALOPECIA LEPROSA<sup>1</sup> A HISTOLOGICAL INVESTIGATION

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1. Loss of hair of the scalp in leprosy is diffuse at the beginning, with no peculiar erythrema or nodule-formation in the skin of the affected part. Erythrema and infiltration of moderate degree may first be detected at a somewhat advanced stage.

2. Histologically, the epidermis is usually thinned and flattened. The germinal layer shows light intracellular edema. Occasionally leprosy bacilli penetrate the epidermis and may be found extra- and intracellularly.

3. In areas of alopecia leprosy cellular infiltration is found relatively far down in the skin. There are considerable circumscribed foci of infiltration especially in relation to hair follicles, blood vessels, nerve-fiber bundles, sweat glands and sebaceous glands. The infiltration surrounding the hair follicle is notably marked, especially in the intermediate parts of the follicle, in the neighborhood of the so-called hairbed and hairbulb.

4. The infiltrating cells are mainly lymphocytes, fibroblasts, epithelioid cells, plasma cells, mast cells, giant cells and vacuolar lepra cells. The leprosy bacilli, dispersed or grouped extracellularly, in general occur mostly in the infiltrations. They are also to be found in the lepra cells, mostly in the form of globi.

<sup>1</sup> Author's summary of a detailed report in the *Japanese Journal of Dermatology and Urology*, 34 (1933) No. 3. The main article, in Japanese, contains 70 illustrations in the text and 3 plates. From translation by Dr. A. C. Santos.

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5. The connective tissue of the cutis is usually more loose than normal, depending upon the degree of infiltration.

6. The elastic fibers in the boundary layer between the epidermis and cutis, in the subpapillary layer of the cutis, and in the reticular layer, have almost disappeared everywhere that the infiltration is considerable. In one case even where there was no infiltration the fibers were markedly abnormal, loosened, broken and decreased in numbers.

7. The blood vessels are affected by the leprotic change, in different degrees depending upon their size and whether they are arteries or veins. The latter show cellular infiltration around them, and in several of them leprosy bacilli can be found in the wall; in a greater number the bacilli are accumulated in the intima. The elastic fibers in the walls of the veins are for the most part destroyed. Many of the veins are dilated and filled with blood. Some arteries show more or less thickening of their walls, but there is neither cellular infiltration of the vessels nor penetration by bacilli. The medium-sized and smaller vessels show more important changes than the larger ones. The changes of the capillaries are especially remarkable. Many of them are nearly or completely clogged, the lumen more or less obliterated, as a result of the infiltration and of the accumulation of lepra-bacilli in the intima.

8. In the peripheral nerve-fiber bundles proliferation of the fibroblasts in the peri- and endoneurium and the presence of numerous bacilli and lepra cells, has caused degeneration of the individual nerve-fibers. The cellular infiltration is ordinarily in the perineum, though rarely mast or plasma cells are also present in the endoneural lamellae. The number of bacilli and lepra cells is generally greater in the latter structure than in the surrounding tissues, except the nerve-fiber bundles and the perineurium. It is also remarkable that despite the slight infiltration around the fiber bundles, the endoneural lamellae show large numbers of bacilli.

9. In a majority of the cases, with the increase of the surrounding infiltration around the hair follicles and the consequent destruction of the papillae, the follicles are markedly atrophied and pushed up into the superficial layers of the skin. The cellular infiltration around the follicle spreads from the connective-tissue layer, often reaching the intermediate parts of the follicle, and at about the height

of the sebaceous gland it penetrates to the outer root sheath. Coincidentally with this infiltration, and with the entrance of bacilli to be described, the root sheath usually becomes thin and the outer root sheath markedly edematous. The bacilli penetrate the hair follicles, first and especially through highly vascular papillae, second through the intermediate part of the hair follicle, which is rich in vessels and nerves in the root layer at the height of the sebaceous glands. The bacilli have penetrated into the papillae of almost all hairs:

(a) Hairs of which the connective tissue of the follicles and papillae are hardly changed, and the latter are of normal size.

(b) Hairs of which the follicles have already undergone more or less infiltration, and of which the papillae are enlarged through proliferation and enlargement of the fibroblasts or through infiltration with epithelioid and lepra cells.

(c) Hairs of which the papillae and follicles are completely atrophied, so that they have lost their original form and appear simply as irregular aggregates of the connective-tissue cells.

When bacilli are detected in the skin tissue there are no papillae in which they do not occur. With regard to the bacilli in the root layer, they are found not only in the connective-tissue of the hair follicle, but also in the external and internal root sheaths, as far as the separating cuticle. They are found in the intermediate part of the follicle, most commonly in the outer root sheath, and then above the point of outlet of the sebaceous glands in the inner part of the root sheath and the separating cuticle. As a result of this the capillaries lying along the connective tissue of the hair follicle and in the hair papillae are frequently completely or almost completely closed through cellular infiltration and invasion of the bacilli.

10. The sebaceous glands are relatively well preserved, being usually less changed than the hair follicles. But with the obliteration of the latter they also become atrophic. Sometimes bacilli are found to have penetrated into the cubical cell layer and the glandular cells.

11. The *museuli arrectores pili* show changes that depend upon those of the hair follicle in much the same way as do the sebaceous glands, though of less degree. The individual muscle fibers are loose, spaces are formed between them and in the neighborhood of the nuclei, and in these spaces bacilli are frequently found.

12. The sweat glands show atrophy of various degrees. In several cases where this is apparent, the surrounding cellular infiltration extends up to the glandular epithelial cells. It frequently happens, also, that bacilli have penetrated between or into the gland cells, or into the glandular canals. In several cases, besides bacilli, acid-fast granules are also detected in the sweat glands.

From the foregoing it appears that the atrophic loss of the hair in leprosy alopecia originates through cellular infiltration around the hair follicles, penetration of the leprosy bacilli into the hair papillae and root sheaths, and stoppage of the capillaries in the connective tissue of the follicles and papillae through cellular infiltration and the presence of bacilli. It is probable that atrophy of the nerve fibers is also more or less related to the condition.