

THE SKIN TEMPERATURE IN LEPROSY

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The patients in our leprosarium have often complained of sensations of coldness, though the temperature of their rooms and their body temperatures were normal. With a view to explaining this peculiarity I have undertaken observations on the temperature of the skin in leprosy.

One may assume that in cases with very numerous lepromas of the skin, when as Dwischkow says the lesions ensheath the body, there will be deviations from the normal temperature, and that there will be such changes with extensive disturbances of sensory function. According to Klingmüller, Breuer established the fact that in an anesthetic area on the knee of a patient the skin temperature was always about one degree lower than elsewhere. McIlhenny confirmed this, finding that an anesthetic skin might be about two degrees below the normal. On the other hand, Baelz found in neural leprosy an increase of about three degrees on the affected side. Sticker found that in advanced neural cases the body temperature is decreased by from several tenths of a degree to one to two degrees. However, it is evident that a systematic investigation of the matter is still wanting.

It was not possible for me to use thermo-electric methods in testing the skin temperature, it being necessary to content myself with a simple mercury thermometer the bulb of which was flattened. Although such an instrument does not by any means give accurate measurements, it was found in several preliminary trials that it suffices for clinical purposes, and it has given useful comparative values. All of the thermometers used were continuously tested in water of known temperature. In accordance with the method of Reichenbach and Heymann I set the mercury column of the thermometer a little high before making the measurement; on applying the thermometer to the skin the column sinks and then rises again to a point which indicates the temperature of the skin.

To obtain as uniform results as possible I selected patients of middle age, which give average figures as compared with children and old men (Kunkel, Klick, Cobet, Kotschau, and Roeloff). Since both the skin and general body temperatures vary in the course of the day, all examinations were conducted

at a determined time, 10:00 a. m., all the selected places being tested at one sitting. All patients were thus examined before the noon meal, and not sooner than two hours after the morning tea, the purpose being to eliminate the increase of temperature due to taking food (Keller). To exclude the factor of bodily work, which also increases the skin temperature (Hankel, and others) I required all patients to rest in bed completely naked, with only a light cover. Since the thickness of the layer of subcutaneous fat influences the variations of the skin temperature (Hankel, Boyé, Cobet and others), the amount of such fat was designated, as in the anthropometric measurements, by a three-grade system. I selected patients that with regard to clinical appearances of the skin were most alike, though they differed as regards the subcutaneous fat. For controls normal men (i.e., men without any skin affection) were also examined.

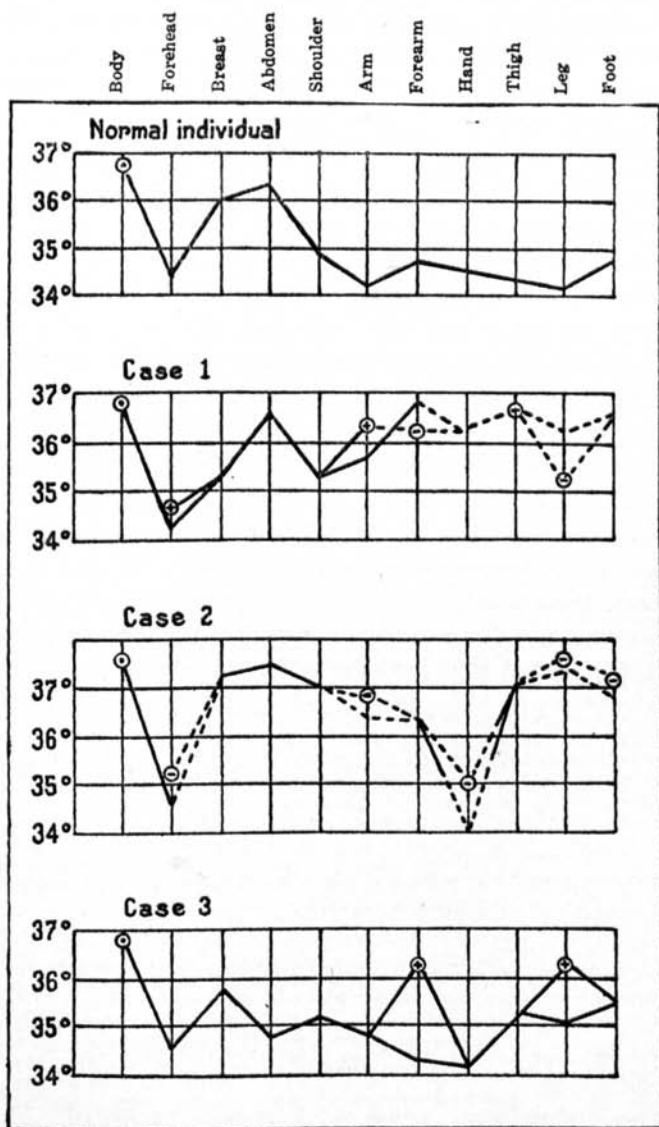
Considerable attention was paid the selection of the places to be measured. Regions rich in blood-vessels, especially over the muscles, give higher readings than those over ligaments and joints (Reichenbach and Heymann, Hankel, Kunkel, Kisskalt), and this is also the case over the liver and heart (Cobet and Bramigk), which is why I did not take any measurements of those regions. The limbs were measured in the same resting position since the different positions exert an essentially different influence on the temperature (Wolff). All measurements were made on only one side of the body, so that in a given area in some cases there would be no eruption, in others an eruption, and in still others disturbances of sensation. The places measured were: the middle of the forehead, on the breast above the middle of the pectoralis major muscle, on the abdomen at the navel (umbilical point), in the middle of the scapula, in the middle of the upper arm and of the forearm, on the back of the hand, the thigh, leg, and foot (in-step). The investigations were conducted on three cases with nodular leprosy, three cases with the neural type, and three cases with lepra reaction.

SKIN TEMPERATURE IN CUTANEOUS LEPROSY

CASE 1.—Pronounced facies leonina and many lepromas on hands and feet. On different parts of the body were quite old lepromas (1928) without necrosis, yellow-brownish in color and sometimes anesthetic (arm, thigh). There were also fresh reddish lepromata without disturbance of sensation, and also areas that appeared normal but that were anesthetic (back of the hand, thigh and legs).

CASE 2.—Pronounced case of cutaneous leprosy, with numerous nodules on the face (facies leonina); old anesthetic nodules on the back of the hand, insensitive places on the forehead, arm, back of the hand and feet; more recent superficial, red nodules on the forehead, on the legs—where in some places they form thick infiltrates—and on the foot.

CASE 3.—Well-nourished woman, with thick, deeply wrinkled infiltrations in the region of the eyebrows, individual nodules and infiltrations on the cheeks and



TEXT-FIG. 1. Skin temperatures of a normal individual (control) and three cases of cutaneous leprosy.

+ = leproma with sensation. - = leproma with anesthesia.

Solid line = area with sensation. Broken line = area with anesthesia.

chin, old scattered and pigmented infiltrations on the forearm, together with fresh lesions of an eruptive reaction, and on the legs a bluish-reddish infiltration.

The temperatures found in a normal (control) individual and in these cases of cutaneous leprosy are shown in Text-figure 1. From this it will be seen that in both normal and leprosy subjects the highest readings were on the breast and abdomen. These figures for the normal man are higher than the maximal figures as given by Oehler. The comparison between normal persons and patients with nodular leprosy shows that the latter, in general, have distinctly higher skin temperatures, though the body temperatures of the three cases tabulated were not above the normal figure. The conspicuously high figures for the breast and abdomen in leprosy may perhaps be explained by the fact that the measurements were made under a bed cover, though it was a rather light one. Oehler, Wurster, Benedict, show that the body warmth is higher in measurements under cover.

The figures for the healthy areas in the leprosy approach the higher limits. Comparing the temperatures of the fresh, red lepromas with those of areas without lepromas the former are higher. On the other hand old, inactive lepromas and lesions that are anesthetic give lower figures than those surfaces which have retained sensibility. From these facts one may draw the conclusion that the increase of the body warmth can be attributed to the specific granulomas in the skin.

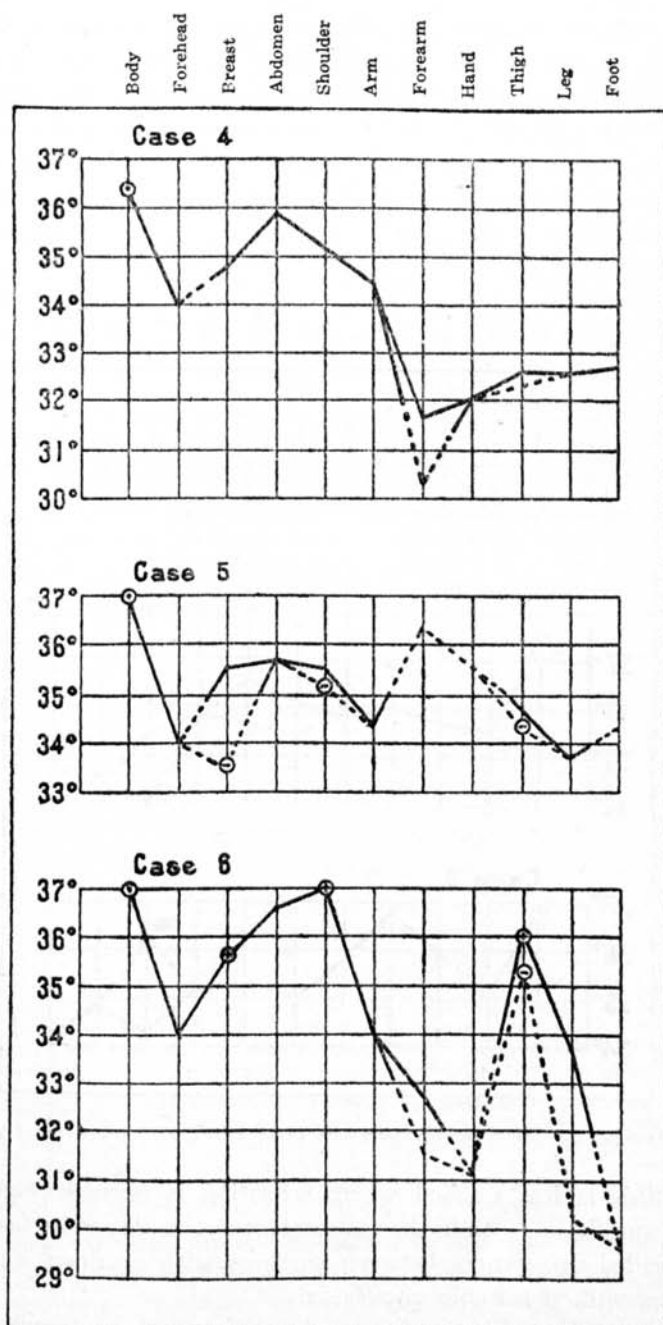
SKIN TEMPERATURE IN NEURAL LEPROSY

The following three cases were examined. The temperatures obtained are shown in Text-figure 2.

CASE 4.—The patient had no eruption of any kind. Complete loss of sensibility in certain regions of the forearms, hands, thighs, legs and forehead; distinct atrophy of muscles, principally in the arms, forearms and hands; fingers contracted, claw hand; atrophy of the legs.

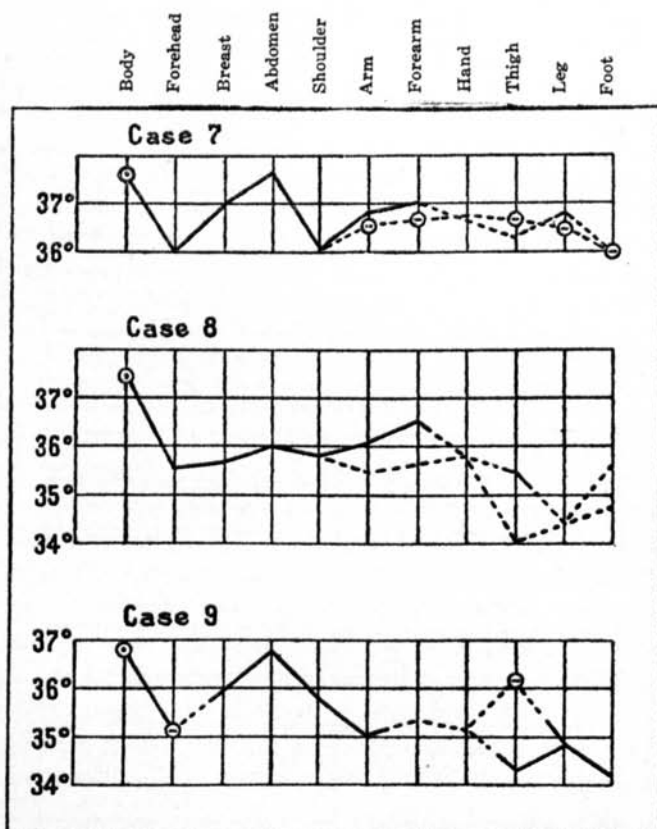
CASE 5.—Neural leprosy with macules on the breast, back and hand. These are old, retrogressive, with red infiltrated borders. On the breast and scapula they are insensitive; these are recovering and are becoming pigmented. On the forearms are insensitive spots, and areas of light brown pigmentation on the thighs and legs. The patient complains of marked though inconstant pain in the forearms and hands.

CASE 6.—Neural leprosy with rose-red spots, fusing one with another like garlands, on the breast, back, and thighs. On the breast and back are fresh foci of quite vivid red color, with full sensitivity; on the thighs are spots that are similar but insensitive; on the forearms, hands and legs, and also on the instep, are large areas with decreased sensitivity. On the instep and back of the hand is complete insensitivity with marked atrophy of the interosseous muscles, and there is also atrophy of the forearms and partly of the legs.



TEXT-FIG. 2. Skin temperatures of three cases of neural leprosy.

The skin temperature in patients with neural leprosy is in general lower than in those with the nodular form. However, fresh eruptions in the form of fresh-colored spots with retained sensibility give higher temperatures. The behaviour in Case 5, where a higher temperature was found on an apparently normal place in the forearm, was apparently caused by a specific process in the deeper parts. If there is much atrophy of the muscles the surface is considerably cooler,



TEXT-FIG. 3. Skin temperatures in three cases with lepra reaction.

though this is less marked where sensation is normal than where there is anesthesia. As in the cutaneous type, there are in the neural type decided differences between surfaces with retained sensibility and those with detectable anesthesia.

The text-figure shows that in this type there are much greater differences between different areas than in the cutaneous type. This

may be explainable on the ground that the latter form offers a uniform picture in which the whole skin is covered with a large number of lepromas close to or merging with one another, whereas in neural leprosy this uniformity of distribution is lacking. Here there are individual spots more or less separated from each other, with quite large surfaces of apparently normal skin, then regions with more or less disturbance of sensitivity, and in some cases atrophy.

SKIN TEMPERATURE IN LEPRA REACTION

CASE 7.—Cutaneous leprosy, with discrete, medium-sized lepromas, quite thick, fewer on the face than on the body and limbs. At present there is lepra reaction with increased body temperature to 40°C. and reddening of the nodules, with pain.

CASE 8.—Neural leprosy without eruption. Anesthesia of the limbs and muscular atrophy. At present lepra reaction, without much increase of the body temperature (37°C.). On the thigh is a marked eruptive reddening in the region of an old spot which was caused by an ointment containing iodine.

CASE 9.—Neural leprosy with large, very superficial spots on the face, arms and legs. At present lepra reaction without much increase of the body temperature (37°C.). On the thigh is a marked eruptive reddening in the region of an old spot which was caused by an ointment containing iodine.

When the body temperature rises that of the skin naturally also rises, quite independently of the presence of leprotic changes like nodules, macules, loss of sensibility or muscular atrophy. According to Geigel the increase of skin temperature does not correspond to the height of the fever. Such increase is especially marked in cutaneous leprosy, as in Case 7 for example, where it reaches 38° to 39.7° (see Text-figure 3). An ordinarily strong lepra reaction, as in Cases 8 and 9, causes general increase; in the majority of the parts the skin measured showed temperatures over 35°, which is higher than those of clinically similar cases without reaction. In reaction cases there are still the same relations as in nodular and neural leprosy regions, with anesthetic parts giving lower figures than sensitive regions, but local skin manifestations of the reaction itself give high figures regardless of their exact appearance or the condition of sensitiveness. These results have been gotten in many reaction cases, of which those given are simply illustrative.

DISCUSSION

In considering the results of our investigation it is to be borne in mind that the skin temperature is increased in a region when specific processes are at work in the deeper parts beneath, because of

changes in the blood vessels. In every acute inflammation or eruption the temperature rises; for example, Iselin has observed in phlegmons a skin temperature of 35° to 37°C . with a body temperature of 39°C . Changes have been observed in diseases of the internal organs, especially in the joints, and also in tuberculous and syphilitic diseases, by Kothe, Melchoir, Cobet and Bramigk, Mau, Melchoir and Wolff and others. The etiology of the affection does not play any role in this effect.

Summarizing our results in leprosy we have two phases. On the one hand there is increased skin temperature in patients with nodular leprosy, especially over the lepromas, where it is higher than in the neighboring regions without lepromas. The same is also true in lepra reaction. The temperature over young lesions, both nodules and macules, is higher than over old ones in retrogressive stages. The increase is due to the large number of blood vessels in the lepromas. The results obtained are influenced by the fact that such lesions are present to a greater extent than is evident clinically; they are to be found in apparently normal skin, which may explain the increased temperature of such skin.

On the other hand there is a decrease of temperature in patients with nerve leprosy. Anesthetic regions are cooler than those with normal sensitiveness, and this is true in both types of leprosy, regardless of whether nodules or macules are present, and also in both the quiescent and reaction states of the disease.

Especially low figures are gotten in regions with muscular atrophy. In all probability these effects are caused by the changes in the nerves, which are due to specific leprosy changes. The decrease in atrophic regions in advanced stages of neural leprosy is apparently ascribable to inactivity of the atrophied muscles. Claus and Bringel, who observed such decreases in alcoholic neuritis, also explain it partly through loss of the muscular function. In my cases, however, the decrease in regions where there is only loss of sensitivity, without muscular atrophy, must be attributed solely to the nervous changes.

As is known, the optimal temperature—i.e., the condition when one feels neither cool nor warm—is between 32° and 35°C . (Kunkel). In lepers the skin temperature passes beyond these limits of "well feeling." The low temperatures in nerve leprosy, especially over the joints, explain the chilling and coldness frequently complained of by lepers.

CONCLUSIONS

1. In nodular leprosy the skin temperatures are in general higher than normal.
2. Over the lepromas they are higher than in neighboring, apparently normal skin.
3. In neural (maculo-anesthetic) leprosy the temperatures show bigger differences than in the nodular type, and are in general lower.
4. Over macules in neural leprosy they are higher than in the unaffected skin.
5. In both types of leprosy regions with anesthesia are cooler than those with normal sensibility.
6. The temperature is decreased over regions with muscular atrophy, and is still lower when both anesthesia and atrophy are present.
7. With lepra reaction in the nodular type the skin temperature is increased, but this is less marked when there is anesthesia than in its absence.
8. Over lesions which are in the reaction state the temperature is markedly increased, even when the body temperature is not especially raised.