FEVER THERAPY IN LEPROSY*

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Countless approaches have been made for centuries in the management of leprosy, but nearly all of the drugs and procedures used have been of questionable value so far as a specific remedy is concerned. The therapeutic armamentarium at present is limited as to procedures used and results obtained.

At the United States Marine Hospital (National Leprosarium) the following is the routine treatment: General institutional care, such as regulated habits and balanced diet; removal of secondary infections; chaulmoogra oil orally, varying in dosage from 5 to 75 minims thrice daily; benzocaine-chaulmoogra oil intramuscularly twice weekly in 3 to 5 cc. doses; and ethyl esters of chaulmoogral oil intramuscularly. Physiotherapy, hydrotherapy and electrotherapy are valuable adjuncts in treating nerve complications, and there are many other routine treatments for eye, ear, nose and throat conditions. Leprous laryngitis being a frequent complication of leprosy, tracheotomy is often necessary. In order to visualize the effects of therapy in general, it may be noted that from 1921 until October 1, 1938, there have been 969 admissions to the leprosarium, of which number 239 (or 24 percent) were discharged; 38 (or 16 percent) of the discharged cases became reactivated.

Previous experience in this institution has shown that the use of foreign proteins gave rise to acute leprous reactions with fever, and that that condition was followed by temporary improvement of the leprous lesions in a majority of the cases. It was thought that a trial of artificial fever therapy might be a means of proving whether or not the increase of temperature itself was a factor in the improvement. This fact, plus requests made by many patients, prompted the experiments with fever therapy. The enthusiasm of the patient body had its source in the favorable lay publicity given that method of treatment in newspapers and other current periodicals; hence there were many volunteers when the opportunity arose to apply it at the nearby U. S. Marine Hospital in New Orleans.

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METHOD OF TREATMENT

During January, 1935, a group of five patients was sent to the New Orleans institution, where each received eight fever treatments before being returned to Carville. After a rest period of seven weeks they were given six additional treatments. After another rest period of nearly six months, four of the five patients were given six more sessions of fever; the fifth patient did not wish to continue and a sixth one replaced him. In November, 1936, another group of twelve patients received one course, since when no further treatments of the kind have been given. In summary, four patients had three courses of fever therapy, or a total of 20 treatments each; one had two courses, or a total of 14 sessions; ten had one course of 6 sessions; one had 5, one had 3, and the last had 2 fever sessions. Thus a total of 164 treatments were given to the eighteen patients.

The Kettering hypertherm was used to induce the therapeutic fever.[1] This apparatus is an air-conditioned cabinet in which heat is transferred to the patient by conduction from heated moist air which is in constant circulation over the patient's body. The air condition in the cabinet was somewhat different with the two groups treated. For the first six patients the dry bulb temperature was maintained at 150° to 155°F. and the relative humidity 35 to 40 percent. For the last 12 patients treated the dry bulb temperature was 140° to 145°F. and the relative humidity 50 to 55 percent. The fever level was generally maintained at 105° to 106°F. for five hours, though a few treatments were given at a higher level of 106° to 107°F. and a few at levels somewhat less than 105°F. The treatments were given only at weekly intervals, since it did not seem wise to give them more frequently in a chronic disease such as leprosy.

The medication and fluids for both groups of patients were essentially the same. Sodium amytal, grains 6, was given before the treatment, and during it morphine, ¼ grain, was given as needed, an average of ½ grain being used during each session. Iced saline, 0.6 percent solution, was administered orally to replenish the fluid and chloride loss. Glucose and normal saline were used intravenously in some instances, more frequently with the last group than the first. Supportive medication, as adrenalin, ephedrine, caffeine and the like, was given as needed for cardiovascular complications. Calcium gluconate, administered intravenously, appeared to control tetany adequately in most instances.

Since this work was done this method of treatment has been made much more comfortable than before, and it is believed that these same patients would experience much better treatment now than they did with the technique employed at the time. The humidity of the air of the

[1]This apparatus was designed by Mr. Charles Kettering and Mr. Edwin C. Sittler of the Research Laboratories of the General Motors Corporation, in collaboration with Dr. Walter M. Simpson of the Miami Valley Hospital, Dayton, Ohio. It has been well described by Desjardin, Stuhler and Popp (1, 2) and also briefly by Ross (3).

cabinet is now maintained at nearly the saturation point, while the dry bulb temperature ranges from 115° to 128°F. The use of morphine and amytal has been discontinued, and in its stead pantapon in ⅓ grain doses is given before and during the treatments.

COMPLICATIONS OBSERVED

In studying any form of therapy it is essential to observe complications, in addition to evaluating the end results. In the case of fever therapy it must be determined what effect such complications play in the continuation or termination of a given session or of a course of treatments. In 15 of the 164 individual treatment *sessions* (9 percent) the time was cut from the scheduled five-hour period to from two to four and one-half hours because of complications; it was believed that in some instances, at least, fatalities would have resulted had treatment been continued in the face of the warnings presented. Conditions which led to interruption of treatment sessions were:

In 12 instances weak, rapid pulse. The blood pressure on some occasions was below 80 systolic.

In 1 instance extreme exhaustion. Blood pressure and pulse rate were satisfactory, but the patient insisted that he was too weak and exhausted to continue.

In 1 instance convulsions.

In 1 instance excruciating pain in the lower back. The pain came on suddenly and its cause was never definitely determined. This patient had seven treatments previously, and six subsequent ones, without a similar occurrence.

The *course* of the fever therapy was not completed in accordance with our schedule in 3 of the 18 cases. In two instances the course was terminated because of complications resulting from the treatment. One patient had severe epileptiform convulsions after four hours of his fifth session; for this reason he was not willing to continue and we did not attempt to persuade him to do so because of the risk of a similar occurrence. A second patient had two rather uneventful sessions but during the third developed a weak pulse and low blood pressure, and the treatment was terminated after two hours.

In this case the temperature returned to normal, but within 3 hours it had risen to 103°F., where it remained for seven hours. A few hours later it again rose, to 104°F., and from that time on for nine days he continued to run an irregular temperature ranging from normal to 104°F. During the course of the fever he developed multiple petechial to large

hemorrhagic areas over the face and ears. There was a slight increase in the icteric index but no visible icterus. The red blood cells decreased to 3,420,000 and the hemoglobin to 65 percent; the white cell count was 4,000, the differential count showing 70 neutrophiles, 22 small mononuclears and 8 large mononuclears. Coagulation time 2½ minutes, bleeding time 2 minutes, clot retraction time 6 minutes; platelet count 136,000. Most of the skin lesions cleared up in about six weeks and the patient's pre-treatment condition was gradually reached except that gangrene of the external ears developed, with partial loss of those parts.

The third patient who failed to complete the course as outlined took two treatments without difficulty. A few days after the second one he developed an acute upper respiratory tract infection which caused him to become quite weak, and in view of his age (55 years) it was deemed unwise to continue.

Aside from the complications that necessitated termination of treatments, there were others which should be mentioned. One patient went into shock after the completion of a treatment. Another, after his eighth treatment, developed an acute nephritis which persisted for several weeks, but he was able later to take two additional courses of treatment (12 sessions). However, after the first treatment of the second course he again developed nephritis, of less degree, and there was nausea, vomiting, increased nonprotein nitrogen, urea and creatinine, together with albumin and casts in the urine. This condition subsided within a few days and the patient was then able to continue his course without interruption. In another case nephritis developed several months after the third course of treatment, and this has persisted up to the present time.

Restlessness in varying degree was noticed in 113 of the 164 treatments, and delirious episodes occurred on 26 occasions, but none of these reactions were sufficient, in themselves, to cause the termination of treatment. Nausea and vomiting in varying degree occurred during the sessions on 82 occasions, and after them 40 times; in 4 instances this condition persisted for two to four days afterward. Marked weakness was experienced after 12 sessions, and in most of these cases the patient was confined to bed for one to three days. Another complication of treatment was tetany, which though not frequent was more so than in other diseases treated by this means. Calcium gluconate, given intravenously, usually relieved this condition. Some few patients complained of headache, abdominal cramps and abdominal distention, during and after treatment. Eight of them had herpes of the lips, seven after the first treatment.

Occasional mild burns occurred, but they were not severe enough to lead to cancellation of further treatment.

In 66 percent of cases there were hyalin and granular casts in the urine after fever sessions. Albumin was also present in most of these instances. These urinary abnormalities cleared up promptly in all cases except those mentioned above. A complete study of the biochemical changes in the blood was made on the first group of patients by Sister Hilary Ross, medical technician at Carville, whose report has already appeared (3).

The pulse rate before treatment varied from 70 to 100 per minute and returned to this level, or lower in most instances, within a short time after the temperature had returned to normal. During treatment the average maximum pulse rate was 147 per minute; on seventeen occasions it ran over 160 per minute, and, as has been said, it was necessary to terminate twelve of these treatment sessions. The blood pressure before treatment averaged 116 systolic and 71 diastolic, and one hour after the treatments were completed the average was 94 systolic and 51 diastolic; it went down to 80 systolic or lower during 37 of the 164 treatments. The average loss of weight for each course of treatments was 4.4 pounds, but this loss was regained in a short time in all instances.

EVALUATION OF RESULTS

Having considered the complications observed in these patients, we may now proceed to the evaluation of the results obtained. Of the first group of six cases, four have definitely gotten worse; one case, which had also showed progression, died of pneumonia; one patient is now bacteriologically negative and has been paroled. Of the second group of twelve cases, in nine the disease has progressed, two are stationary, and one has died of carcinoma. Therefore, of the eighteen patients treated thirteen have gotten worse, two have remained stationary, one has been paroled and two have died; in these last two cases leprosy had also definitely progressed.

In many cases the healing of ulcers caused by secondary infection was noted. There also occurred temporary clearing up of mycotic infections of the finger nails and toe nails, this phenomenon being noted in four patients.

Although the disease has progressed in the majority of the cases, these changes are in all probability a manifestation of

the ordinary course of leprosy and have not necessarily been aggravated by the pyretotherapy.

The following case reports are submitted, listed in the order in which the patients reported for treatment. Cases 1 to 6 constituted the first group, Cases 7 to 18 the second one.

CASE 1. Reg. No. 610. White, male, aged 37 years, single, native of Louisiana. Admitted to the National Leprosarium on September 28, 1928, an active, advanced case of mixed type, the nodular form predominating. His history is that he has had leprosy since the age of 12 years, when he was admitted to the Louisiana State Leper Home. After remaining there for eight years he absconded, returning to the National Leprosarium voluntarily in 1928. Family history: Leprosy on the maternal side; three brothers and one sister have the disease at the present time. Physical findings: Since admittance the disease had been slowly progressive, and there were now diffuse thickenings of the skin over forehead, cheeks, chin, back of neck and backs of hands; numerous small discrete nodules scattered over arms, face, back, and legs; and many copper-colored spots over various parts of the body. Ulnar nerves palpable. Eye-brows missing, as well as hair over arms and legs, with only a scanty amount on face. Anesthesia of hands, extending up to the mid-forearm and over the ulnar surfaces of forearms to elbow, and over feet and lower thirds of legs; also in many of the old macules scattered over the entire body.

After twenty pyrethotherapy treatments: When returned to Carville the patient stated that he felt much improved. There appeared to be improvement in the movements of the fingers, all areas of secondary infection had healed, and a mycotic condition of nails of fingers and toes had disappeared. This patient later developed nephritis which persisted from July, 1936, to the present date (October, 1938). On March 5, 1937, he suffered asphyxiation from leprous ulceration of the larynx and a tracheotomy was performed. This case has shown definite, continuous retrogression.

CASE 2. Reg. No. 684. White, male, aged 28 years, single, native of Louisiana. Admitted in March, 1930. Leprosy active, of mixed type, the nodular form predominant. Family history: An uncle on paternal side had leprosy. Physical findings: The face presented a solid mass of small nodules, with coalescence of lesions over chin and forehead and beginning leonine countenance. Many copper-colored discrete nodules scattered over the back of neck; on the back, chest, arms, buttocks, and legs many discrete nodules of various sizes, in some areas over back and chest coalescing to form plaques. Many circinate brown patches with depigmented centers scattered over entire body. Infiltration of skin over entire face, hands, and feet, with many suppurating nodules over face, hands, arms, and legs; also some superficial ulcers over ankles. Voice characteristically husky, due to leprous ulcerations of larynx. Ulnar nerves palpable. Absence of eyebrows, also of hair over face, chest, arms, and legs. Many areas of anesthesia in the depigmented centers of the patches or macules; also anesthesia of ulnar surfaces of forearms extending to outer surface of little fingers.

After twenty pyretotherapy treatments (eight in the first course and six at two other periods): It was noted on the second admission (April 15,

1935) that there was improvement in the size of edematous nodules over entire body, especially over face; most of the ulcerated areas had healed but this was probably due, in part at least, to rest in bed and absence of trauma; likewise the diminution in size of nodules may have been due partially to temporary degradation. This patient became progressively worse. Nodules over face, hands, and body began to suppurate about six months later, and in about one year he developed nephritis; the larynx became more ulcerated and the voice was so husky that he spoke with difficulty. In January, 1938, he developed lobar pneumonia and died.

CASE 3. Reg. No. 774. White, male, aged 59, married, native of Georgia. Admitted in June, 1931, an active, advanced case of mixed type, of about twenty years duration, nodular changes predominating. Family history negative. Patient served in the army during the Spanish-American War, in the Philippines, where undoubtedly he contracted the disease. It had been extremely active, but for two years prior to 1935 a gradual but marked improvement was noted. Physical findings: Marked infiltration of skin over face (leonine appearance), pendulous ear lobes, and much discoloration of skin over entire body evidencing old macular lesions which had subsided. Anesthesia present on feet and extending to mid-legs, on hands to wrists and on ulnar surfaces of forearms, and also in many areas over body where there had been macules. Ulnar nerves palpable. Eye-brows scanty, and hair over chest, arms, and legs absent.

After twenty pyretotherapy treatments: After the first eight treatments, neither untoward effects nor improvement was noted. After the two later series the patient returned very enthusiastic, although no material change in his condition was noted. Neither before nor immediately after the treatment did this patient show any clinical or bacteriological evidence of activity. Eight months later there was noted a raised, macular bacteriologically positive lesion on the buttocks. Since that time the disease has been gradually progressive and there are now many active lesions.

CASE 4. Reg. No. 698. White, male, aged 42 years, married, native of Louisiana. Admitted in June, 1930, an active case of mixed type; had been a patient prior to this admittance but had absconded. Family history: Immediate family negative; wife, from a leprous family, had the disease. Physical findings: Face covered with red, nodular patches; ear-lobes nodular and enlarged; brownish macular areas, varying from small spots to large patches, over arms and entire body. Ulnar nerves enlarged and palpable. Feet anesthetic, anesthesia extending to upper two-thirds of legs; also loss of sensation on ulnar surfaces of forearms. Eye-lashes and hair over chest, arms, and legs absent. Ulceration in posterior nares.

After fourteen pyretotherapy treatments (one course of eight treatments and a second of six): This patient did not show improvement in any way; he stated that his condition was worse but on examination no material changes were noted. After six months he began to show progression of the disease, which has continued to date. He now has very marked leprous laryngitis with ulceration and almost complete loss of voice, collapse of the nasal cartilages, and many new nodules and leprous patches scattered over the body. His general condition is very poor.

CASE 5. Reg. No. 899. White, male, aged 46 years, married, a native of Greece. Admitted from California in January, 1933, an active advanced case of mixed type, the nodular form predominant. Duration about fifteen years. Family history negative. Physical findings: General leprous infiltration of skin over entire face, especially over forehead. Diffuse thickening over knees, elbows, and dorsa of hands and ankles. A few small, dark reddish patches on back, and on abdominal wall a large patch with a dark brownish border and depigmented center. Large areas of anesthesia on the dorsa of feet, heels and ankles, and around knees and elbows; also on ulnar surfaces of hands, extending to wrist. Slight atrophy of interosseous muscles of both hands; hands slightly edematous and purplish. Ulnar nerves enlarged and palpable.

After twenty pyretotherapy treatments: Ward notes made after the first course of eight treatments stated that the lesions on his face had become more prominent during the stay in the hospital. After completion of the entire course the thick indurated areas on the forearms appeared to be unchanged. This patient claimed great improvement in his physical condition, but the only material change observed was a clearing up of small ulcerations on his hands. Subsequently the disease has gradually progressed, about as would be expected in this active form of nodular leprosy.

CASE 6. Reg. No. 1085. White, male, aged 24 years, single, native of Texas. Admitted August, 1935, an early case of nerve type leprosy. First symptoms supposed to have appeared about one year before. Family history: Has one brother with leprosy. Physical findings: The only evidence of the disease was a faint, faded macule on left buttock and another, barely visible, over left knee. Sensation in these areas greatly diminished. Anesthesia also present on ulnar surface of left forearm.

After five pyretotherapy treatments: Because of convulsions treatment was discontinued. He had improved before the treatments began and improvement continued afterward. The macules faded completely, but there was no change in the areas of anesthesia. Beginning in April, 1937, bacteriological examinations were negative for twelve consecutive months and in March, 1938, the patient was discharged as an arrested case. A physical examination in September, 1938, found him still negative.

CASE 7. Reg. No. 986. Mexican, male, aged 33 years, married, a native of Mexico but admitted from Texas in May, 1934. An active early case of mixed type, of about one year's duration. Physical findings: Numerous reddish patches scattered over body; a depigmented macule on left thigh; infiltrated skin over forehead. Small areas of anesthesia on dorsum of left wrist; mild sensory disturbances on ulnar surfaces of hands.

After six pyretotherapy treatments: No material change was noted and the condition now is apparently stationary.

CASE 8. Reg. No. 1110. White, male, aged 22 years, single, native of Louisiana. Admitted in December, 1935, an active early case of mixed type. First symptoms had begun about four years previously. Family history: Has one brother who had the disease. Physical findings: Diffuse thickening of skin over face, forehead, and earlobes; over buttocks, thighs, and legs several light copper-colored patches, varying from 5 to 15 cm.

in diameter, the larger of them circinate. Numerous discrete nodules scattered over body, arms, and legs. Areas of anesthesia on feet and hands, and over the patches or macules. Numerous ulcerating nodules on hands, and one small ulcer on plantar surface of great toe. Little finger of right hand contracted. Marked atrophy of interosseous muscles of right hand and slight of left hand. Eye-brows scanty, hair absent over arms and legs. Patient had gonorrhea before admittance, and this was still present when he reported for fever therapy.

After six pyretotherapy treatments: No material change in the general condition, though small ulcerations had healed. The gonorrhea had cleared up and has not recurred. At the present time there are more new nodules over the face and many new leprous lesions on the body.

CASE 9. Reg. No. 1201. White, male, aged 38 years, married, of Italian parentage but native of Louisiana. Admitted in September, 1931, an active case of mixed type, the nodular form predominant, duration about ten years. Family history negative. Physical findings: Nodular masses covered forehead, cheeks and chin; ear-lobes nodular; many nodules scattered over arms, legs, back, and abdomen; except on the abdomen the nodules had coalesced to form large plaques. Round, circinate, raised patches varying in size from about 2 to 4 cm. on shoulders, back, buttocks and arms. Skin over face, hands, arms, and body dusky. Thinning of eyebrows. Ulnar nerves enlarged. Atrophy of interosseous muscles of hands. Anesthesia over hands to wrists, of feet to above ankles, and in scattered areas over body.

After six pyretotherapy treatments: No noticeable change except that for a few months the disease appeared to be stationary. Gradually, however, it progressed and many new lesions have appeared.

CASE 10. Reg. No. 1064. White, male, aged 45 years, married, native of Louisiana. Readmitted June, 1935, after having absconded in 1934; the first admittance was in 1930. This case was one of active advanced mixed type, the nodular form predominant, duration about 11 years. Family history negative. Physical findings: Face and ears covered with nodules, many of them confluent. Scattered over arms, hands and legs many discrete nodules. Over body numerous raised plaques, light brown in color. Many of the nodules were suppurating, especially on the arms. Extensive areas of anesthesia over hands and feet and scattered over body. Eye-brows scanty and hair absent on arms, legs and chest. Totally blind, due to leprous infiltration.

After six pyretotherapy treatments: There was no material change and the patient has gradually gotten worse. There are now many new lesions, and the old ones are more extensive.

CASE 11. Reg. No. 1126. White, male, aged 48 years, married, a native of Texas. Admitted first in June, 1931, since when he has absconded several times; last admittance in March, 1936. An active advanced case of mixed type, skin form predominant; duration about 13 years. Physical findings: Numerous nodules scattered over face and ears, confluent on forehead and chin forming a rather large area of thickened skin; also many nodules of various sizes on arms, legs, chest and back. Over the

body the skin showed bronze-colored discoloration. Eye-brows scanty, hair over arms, legs and chest absent. There was severe conjunctivitis of both eyes, with iritis of left eye. Anesthesia of hands, feet and forearms, with scattered anesthetic areas over entire body.

After six fever treatments: The patient was very enthusiastic, claiming that he was greatly improved, but improvement was limited to the eyes. He became progressively worse until about six months ago, since which time there has been no material change.

CASE 12. Reg. No. 1090. Female, white, aged 21 years, married, native of Florida. Admitted first in 1932, absconded in 1934, readmitted August, 1935. An active case of mixed type, duration about eight years. Family history negative. Physical findings: General infiltration of skin over forehead and cheeks, with small nodules in the lobes and scattered along the margins of both ears. Numerous small nodules on dorsal surfaces of some fingers of both hands. Hips and thighs covered with light brown, mottled pigmentation. Atrophy of interosseous muscles, both hands. Eye-brows scanty, hair over arms and legs absent. Anesthesia of hands and feet, with scattered areas over entire body. All fingers except thumbs showed some degree of contraction; great toes also contracted.

After six fever treatments: For some time there was evident improvement in patient's general health, but the disease has been slowly progressive. In the past year there has been marked increase in the contractions of the fingers, and more leprous nodules.

CASE 13. Reg. No. 1087. Male, white, aged 25 years, single, native of Florida. Admitted first in 1932, absconded twice, readmitted last in August, 1935. An active case of mixed type, of about 13 years duration. Family history: One older brother has the disease. Physical findings: Diffuse infiltration of skin of face, forehead, cheeks, chin, ears and nape of neck. Numerous bluish colored patches roughly 3 cm. in diameter scattered over legs and just above knees. Many old scars over legs, especially below knees. Anesthesia on hands to wrists and feet to above ankles, also in scattered areas over body. Small ulcerations over feet and legs to knees. Loss of eye-brows and of hair over arms, legs and chest; beard scanty. Contraction of little finger, right hand.

After three fever treatments: This patient was returned with necrotic areas of both ears, and many hemorrhagic areas on the face and body. After six weeks the necrosed areas healed and the hemorrhagic ones disappeared. No improvement of the general leprous condition was seen. There has been a gradual sinking of the nose, due to absorption of the nasal cartilages, and also a generalized increase of leprous activity.

CASE 14. Reg. No. 903. White, male, aged 31 years, married, a native of California. Admitted September, 1931, an active case of mixed type, with nodular manifestations predominant, duration about 12 years. Family history negative. Physical findings: Diffuse thickening of skin over entire face, especially on the forehead where many nodules had become confluent. Numerous nodules in ear lobes and also scattered over body, where there were many pigmented patches, often raised. Eye-brows and hair over arms, legs and chest missing. Diminished sensation on ulnar

surfaces of forearms, extending to the last three fingers of both hands; also anesthesia of the feet and in scattered areas over body.

After six fever treatments: No improvement was noted, and gradually the disease has progressed.

CASE 15. Reg. No. 1099. Mexican, male, aged 48 years, married, a native of Mexico, admitted from Arizona. An active case of mixed type. Family history negative. Physical findings: A moderate amount of diffuse thickening of skin over forehead; some light brownish, mottled patches over upper back and shoulder girdle; small brown patches on thighs. Anesthesia of hands and feet. A large ulcer about 5 cm. in diameter extended from the outer canthus of right eye to the median line of bridge of nose, involving much of the right side of nose. Slight atrophy of interosseous muscles of hands. Eye-brows, eye-lashes, and hair over face, arms, chest and legs absent. Voice husky, indicative of leprous laryngitis.

After two fever treatments: No change observed. The ulcer of the face has gradually become worse. At first it was thought to be luetic, but biopsy proved it to be a squamous cells epithelioma (grade II). Death occurred in August, 1938, as a result of the tumor, which had extended to the right frontal region.

CASE 16. Reg. No. 946. Female, white, aged 30 years, married, a native of Louisiana. Admitted in October, 1930, an active case of mixed type, discharged as an arrested case in July, 1932, and readmitted in July, 1933, with the same classification as before. Family history negative. Physical findings: Diffuse thickening of skin over forehead, cheeks and chin, with many small discrete nodules scattered over face and ears; also over various parts of body. There were many large, variously-shaped macules scattered on back, thighs, abdomen, buttocks and lower limbs. Considerable anesthesia on hands to above wrists and feet to above ankles.

After six fever treatments: No change in general condition at first, but within the past year the disease has progressed very rapidly, with the appearance of many new lesions and involvement of the eyes.

CASE 17. Reg. No. 771. White, male, aged 23 years, single, a native of Louisiana. Admitted June, 1931, an active case of mixed type, the nodular form predominant. Family history negative. Physical findings: Numerous nodules over face, forehead, ear lobes and nape of neck, with diffuse thickening of skin over forehead and chin, and also of arms and legs. Contraction of nearly all fingers, with some bone absorption of distal phalanges. Scattered over entire body, especially back, abdomen and thighs, were copper-colored spots with varying degrees of depigmentation. Anesthesia of hands and feet, and in scattered areas over body. Small ulcerations on ankles and hands.

After six fever treatments: The condition has progressively become worse. Many more ulcerations than before, much more contraction of fingers and bone absorption, and new lesions have appeared.

CASE 18. Reg. No. 1067. Female, aged 24 years, single, a Puerto Rican, admitted from New York in April, 1933, an active case of mixed type. Family history negative. Physical findings: Numerous small confluent

nodules on cheeks and forehead. A few large, light brown, circinate macules on arms and shoulders and over lower extremities. Anesthesia of feet and ulnar surfaces of forearms. Slight atrophy of interosseous muscles of hands. Eye-brows scanty, hair over arms and legs absent. Slight contraction of both little fingers.

After six fever treatments: Condition has remained about stationary.

SUMMARY

1. A total of 164 fever treatments were given to a group of 18 leprosy patients.

2. Fever was induced in the Kettering hypertherm, in most instances the temperature of the patient being maintained at 105° or 106°F. for five hours.

3. In 15 out of the 164 fever sessions complications caused the termination of treatment in less than the scheduled time.

4. Since receiving the fever treatment 13 of the patients have become worse, 2 have remained stationary, 1 has been paroled, 1 died of pneumonia and 1 died of carcinoma.

5. It is our opinion that fever therapy has been of no benefit in the treatment of these cases, the disease having progressed as would have been expected otherwise, without interruption in its course. The treatment was helpful in clearing up secondarily infected ulcers and mycotic infections of finger nails and toe nails.

6. Details of each case are presented.