

ACCIDENTAL EXPOSURE TO INFECTION

In the Queries and Minor Notes section of the *Journal of the American Medical Association* [139 (1949) 893] a physician who had pricked himself with a pin used in testing for anesthesia asked what he should do about it. This question is a recurrent one, for in 1935 it was asked in *THE JOURNAL* [3 (1930) 230], and three correspondents contributed advice. More recently it has also been dealt with in *Leprosy in India* [18 (1946) 32]. Furthermore, it is one which involves or leads to considerations of fundamental nature on which there may well be decidedly discordant views. For its interest, therefore, the question is reproduced below, with permission, together with a condensation of the answer which appeared with it, and also one of a comment which appeared in the same periodical later. All of this material was sent to several of our contributors for comment, and the replies received are given.

Question.—I was testing a leper for skin anesthesia and accidentally stuck my own arm with the pin. About twenty minutes later I cauterized the site with sulfuric acid. Do you think it would be advisable to take a course of sulphetrone or some other suitable drug as a prophylactic? If so, how much do you recommend? R. S. NEWBOLD, M. D., Belgian Congo.

Answer.—The inquiry does not state whether bacilli were recovered from the skin of the patient, a point of paramount importance. The chance of transferring the infection from a negative case is considered nonexistent, whereas if organisms could be recovered there is at least a theoretical chance of transfer.

From the numerous recorded failures of deliberate experimental attempts to transmit leprosy to healthy persons by direct inoculation, it would appear that in this instance the possibility of transmission is exceedingly remote. The examiner's arm was apparently stuck only once with the questionably infected needle, and the point of contact was later cauterized. In experimental attempts at transmission repeated inoculations have been made, yet infection did not occur.

Instances of accidental infection have been reported, including that of Marchoux who, while operating on a leprosy patient, pricked the finger of his assistant in whom leprosy developed after several years. [The equivocal Lagoudaky case of self-inoculation is mentioned.] In the face of such reports it is understandable why concern should be shown by any one who feels that accidental inoculation has taken place, although it might be of the most superficial kind.

Since the sulfones show apparent chemotherapeutic activity in leprosy, it is also probable that they would be of prophylactic value, though such use of them has not been reported. On leprosy lesions the action of the sulfones is slow but certain. It is felt that they prevent the formation of new lesions, allowing the old lesions to disappear in much the same manner as occurs during spontaneous recovery. The exact mechanism of the

therapeutic activity is not known, but there is a suggestion that if sterilization does not occur there is at least a reduction of leprosy bacilli in the blood stream.

In the present instance, although the chance of infection is exceedingly remote, it is present and cannot be ignored. The recommendation of one of the sulfones for prophylactic use would imply that the mechanism of their action is understood, and their use would have to be prolonged. More practical would have been excision of a small area of skin followed by cautery. That some organisms have reached the blood stream is a rather remote possibility, and probably of no higher occurrence than is experienced by leprosy workers generally in their routine daily work and successfully combated by the body defense system. If the frame of mind would be improved by the use of the sulfones, there is no particular contraindication if they are used with discretion. An unequivocal scientific recommendation for their prophylactic use must await such basic consideration as the cultivation of the leprosy bacilli on artificial mediums followed by *in vitro* and *in vivo* studies of the effect of these drugs on the organism. Before that is done their use in prophylaxis cannot be recommended except on an empiric basis.

The following is a similarly condensed comment on this subject which appeared in the same journal as correspondence [J.A.M.A. 140 (1949) 113].

In commenting on the question whether the person who stuck his own arm with a pin used in testing a leprosy patient for skin anesthesia, should or should not take "a course" of one of the sulfones or some other drug as a prophylactic, I would for one thing give emphasis to the point made by your referee that, if the patient tested was bacteriologically negative, the inquirer has no real cause for worry. In fact, there would not be justification for serious worry on behalf of a healthy adult even if the lesions had been bacillus-positive lepromata instead of macular leprids.

True, accidental infection can occur, and by just such means; but known instances are rare. Mention has been made of the case reported by Marchoux [THE JOURNAL 2 (1934) 1-6]. Shortly before that de Langen, of Batavia, had reported a case of apparent infection by a contaminated hypodermic needle [THE JOURNAL 1 (1933) 220-225; condensed reprinting]. The most recent and interesting report of this category is that of Porritt and Olsen [THE JOURNAL 16 (1948) 514-519; extended abstract] of two men who were tattooed at the same time by the same operator and who both developed leprosy lesions in the tattooed areas somewhat under three years later.

Such occurrences are highly exceptional indications that infection of adult man by such means is possible. But people who work with leprosy patients frequently have similar introductions of bacilli without harm. Adult resistance being what it is, extremely few of the personnel of leprosy institutions have ever acquired the disease—and those who have done so have thereby laid themselves open to suspicion of gross and habitual carelessness.

As for prophylactic treatment, there is no indication whatever that any known drug would be of the least benefit. Years ago there was some discussion of prophylactic treatment of contact children with chaulmoogra

derivatives, but the practice never became established. The sulfones have proved to be exceptionally valuable in arresting the disease in active lepromatous cases, but the bacilli do not diminish as rapidly as lesions regress and apparently the bacteriologically negative maculoanesthetic and tuberculoid lesions do not respond as well. These facts would not encourage one to expect that the administration of any known drug in any feasible dosage would eliminate, by bactericidal action, a few recently introduced bacilli; and to take any drug in sufficiently large dosage to maintain over periods of months or years a blood level that might be bacteriostatic, to meet so slight a change of trouble, would be utterly irrational.

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The following comments have been received from contributors and collaborators to whom the foregoing material was sent.

From Dr. E. Muir, Purulia, Bihar, India:

I agree in general with the foregoing comments. If the case was not an open one, then the danger may be considered as nil. If it was open but the pin had not been used to penetrate the patient's skin, there might be no bacilli adhering to it—although that might happen—and the chance of infection would be extremely small, especially if the examiner's skin was not penetrated beyond the epidermis. But even supposing, at worst, that there was a fair number of bacilli on the pin and that there was penetration of the examiners' epidermis through which a few of them would be carried along, still the chances of progressive disease being set up are very small. Danielssen repeatedly inoculated himself and his assistants with leprosy material without producing the disease. The chances of infection in the case under discussion are so small that the best advice is to forget about it.

There is little justification in our present knowledge for the use of sulfones or other drugs internally as a prophylactic measure, that is, before signs of leprosy appear, though there are indications—and no more than that—that sulfones are effective in both tuberculoid and early lepromatous cases.

From Dr. Robert G. Cochrane, Lady Willingdon Leprosy Sanatorium, Chingleput, Madras:

The question is one which, for a long time, has concerned those dealing with leprosy. Speaking generally, the more familiar one is with the disease the less alarmed does one feel after such an incident. There are many ways other than pricking by which the microorganism can be introduced into the doctor's system, and I think that anyone who works with leprosy for any length of time is bound to have it introduced in one way or another. To prevent such happenings one would have to adopt such extreme precautions as the Japanese do (special overalls, high boots, rubber gloves, masks, etc.), which would tend to develop such a fear of the disease as to make working with it impossible.

While most leprologists recognize that leprosy can occasionally be acquired by single inoculations, they also recognize that it is very exceptional for an infection to arise in that way. The chance of acquiring it by

pricking is almost negligible in any event, and it is absolutely negligible when no bacilli can be found by standard methods of examination. My own practice—when I am aware of having pricked myself, and I must have done that innumerable times during the last 25 years—is to wash my hands particularly thoroughly; but if when cleaning up after work I find a cut or abrasion I just don't worry about it. I think that one need have no sleepless nights over such a possibility.

As for taking sulfone drugs as a prophylactic, I would consider that not only unreasonable but most unwise. We still know very little about the way in which these toxic drugs act; and although we know nothing about sulfone-resistant forms of *M. leprae* we do know that injudicious use of sulphonamides gives rise to resistant microorganisms. Therefore, even in treating leprosy I am against giving sulfone treatment in cases where we have no means of assessing its value, and no yard-stick such as the presence of bacilli by which to judge improvement.

(From Dr. N. D. Fraser, Swabue, South China:

The statement and question of Dr. Newbold are simple, and I think the temptation to get involved in a long dissertation on the etiology and transmission of leprosy is to be avoided. Nevertheless, the statement is a little too simple to make an answer easy. Did he stick himself with a stabbing stroke causing a microscopic penetrating wound, or with a glancing stroke causing a superficial excoriation? Before sterilizing the site with sulphuric acid 20 minutes later, did he wash it with soap and water immediately after the incident?

If the damage was a glancing scratch and the part was washed, I think there is every reason to rest assured that infection cannot take place. If the wound was a penetrating one, and the site was cauterized because simple washing was considered inadequate, it is still far from likely that there have survived any organisms that the natural resistance of the body cannot overcome. And if the patient under examination was found to be suffering from bacteriologically negative lesions, then no further reassurance is needed.

If, then, there has been no inoculation that natural resistance cannot overcome, it would be unwise to attempt a course of prophylactic medication. It is important, however, that resistance should be maintained at a high level, and the diet should be supplemented with iron or vitamins as necessary.

545x From Dr. José N. Rodriguez, Manila, Philippines:

My own opinion in this matter happens to coincide with the views expressed in the letter to the editor of the *Journal of the American Medical Association*.

I would like to emphasize particularly the fact that the prophylactic value of the sulfone drugs remains to be established, and that since we do know that toxic effects may follow their administration in doses which are considered minimal, it is possible that their use under the circumstances of the case might do more harm than good.

After all, these accidents do happen to all of us in the work, not only once but repeatedly, without undesirable effects. The worker posing the question, therefore, need not lose sleep over the matter. The best he can do is to keep himself physically fit.

260 From Dr. A. Dubois, Antwerp, Belgium:

I thoroughly share the opinions expressed in the J. A. M. A. material; that is to say: (1) In the case of a patient with rare bacilli, the probability of infection is, *a fortiori*, slight. (2) If the sulfones have a prophylactic action, it is not known. If it were assumed that there is such an action, the question would remain how long they should be used. The long incubation period of leprosy does not facilitate the answer. (3) In short, I doubt that there is any reason for uneasiness and advise doing nothing.

From Dr. R. Chaussinand, Institut Pasteur, Paris:

Attitude à adopter dans le cas d'une blessure par un instrument médical non stérilisé ayant servi à l'examen ou au traitement d'un lépreux:

(1) Faire saigner abondamment la plaie et éviter toute cautérisation pouvant déterminer une nécrose tissulaire.

(2) Si l'examen bactériologique des lésions du lépreux en cause se révèle abacillaire ou paucibacillaire, le blessé ne court pratiquement aucun risque de contracter l'infection. Dans l'état actuel de nos connaissances, l'institution de mesures préventives paraît donc inutile.

(3) Par contre, si les lésions du lépreux en cause contiennent de nombreux bacilles, les risques de contamination, bien que faibles, sont réels. Quand le sujet blessé se montre insensible à la réaction de Mitsuda, une action préventive éventuelle des sulfones étant possible, il semble indiqué de tenter ce traitement, dans le cas de plaies profondes ou d'une certaine étendue. Cette médication préventive consisterait alors en un traitement complet aux sulfones d'une durée non inférieure à deux ans.

(4) Il serait très utile que l'action préventive des sulfones soit étudiée systématiquement dans les institutions hébergeant des enfants apparemment indemnes de lèpre, ayant été en contact avec des parents lépreux. La durée et les circonstances du contact, ainsi que le type de lèpre des parents seraient à déterminer d'une façon précise. Ces enfants seraient testés à la réaction de Mitsuda avant le traitement et, ultérieurement, une fois par an.

From Dr. Guillermo Basombrió, Buenos Aires, Argentina:

Regarding the question raised by Dr. Newbold, the material which was sent with it seems to treat the subject so exhaustively as to make any further comment superfluous.

578 From Dr. S. Schujman, Rosario, Argentina (translation):

The following points are to be considered:

If the patient was bacteriologically negative, there is nothing to worry about, because the source of infection is lacking.

If the case was bacillus-positive, there are three important facts: (a) That only a very small percentage of adult persons who live in intimate and prolonged association with such patients contract leprosy. (b) That all [*sic*] attempts at experimental inoculations of man, using material very rich in bacilli, have failed. (c) That it is not enough to live in a contagious milieu, or to be inoculated voluntarily or accidentally with leprosy material, to contract the disease; there is required a special predisposition, and that condition is unusual in adults.

It is true that cases of accidental infection have been reported, but the number is very small and of no significance when we recall the thousands of healthy persons who have worked for many years in the

various leprosy institutions, and the great number of them who undoubtedly have had repeated accidents like that under discussion without ill effects.

I believe that the correct thing was done when the site of the injury was cauterized. Had the Mitsuda test been performed and a positive reaction obtained the peace of mind of the individual would be the greater; if the result had been negative he should be examined occasionally. In neither case, however, would I advise any treatment, with a sulfone or chaulmoogra, as a prophylactic measure, for we could not with scientific basis fix the duration of treatment. The so-called prophylactic treatment is a very different thing from the treatment of an actual case of leprosy, for there would be created in the mind of the person concerned a double doubt: first, whether he is infected, and second, whether the treatment was sufficient to liquidate a possible infection. For that reason I do not consider it indicated or justified.

290 From Dr. J. M. M. Fernandez, Rosario, Argentina:

I agree completely that the possibility of accidental infection in such cases is very remote, even supposing that the patient was bacteriologically positive. Everyone who has worked with leprosy patients for any length of time has experienced similar accidents with no serious effects.

The measures to be taken, I believe, should be determined by (1) the bacteriological status of the patient's skin, and (2) the lepromin reaction of the individual suffering the accident. (a) With the patient bacillus-negative and the individual lepromin-positive, I believe that the accident should not be given importance and that only reasonable observation for a certain period is needed. (b) Even with a bacillus-positive patient, if the lepromin reaction is frankly positive I believe the probability of acquiring infection, at least of the malignant type, is very remote; but I would advise periodic observations, clinical and immunological, for a certain length of time. (c) If, however, the lepromin reaction is repeatedly negative—the patient bacillus-positive—the case should be submitted to closer observation, and perhaps there would be justification for sulfone treatment.

The indication for "prophylactic" treatment in any such case is admittedly a moot question, because there is no proof that it may be protective. In children living with their lepromatous parents the chaulmoogra drugs have proved to be without preventive effect. What we know of the mode of action of the sulfones does not permit the assertion that they have any preventive property. However, Souza Campos [Havana Congress; also *Revista brasileira de Leprologia* 16 (1948) 89] has reported that previously lepromin-negative children have become positive reactors under treatment with diasone; and if that claim is confirmed it may be that prophylactic treatment may be justified in individuals suspected of infection who are lepromin negative, until their reactions become positive.

The lepromin reaction reflects very faithfully the state of resistance of the organism, and although a positive reaction in a suspected individual does not mean that he is immune to contagion, it does permit the assumption that, in case he contracts the disease, it will probably be of benign type. Many years of experience in the study of contacts has inspired in me this confidence in the lepromin reaction as an element of prognosis in cases exposed to infection.

From Dr. V. Pardo Castelló, Havana, Cuba:

I am in complete agreement as to the impossibility of deciding this momentous question without the information whether the case was or was not lepromatous. Even if the patient was suffering from the most infectious type of leprosy, however, it would be impossible to predict the outcome of an accidental inoculation. However, if defenses were adequate the bacilli would be destroyed *in situ* and no general infection would ensue.

In appraising the extent of such defenses the lepromin test should be considered. When I was director general of the Bureau for the Prevention of Leprosy (1940-1944) we inaugurated a new leprosy hospital in Oriente Province, and the rule was established that no physician, nurse or other employee should be allowed to serve there unless he gave a positive response to lepromin, negatively reacting persons being considered more susceptible than the others. If the inquirer was lepromin-positive, one would be inclined to belittle the possibility of infection even if the case examined was lepromatous. However, even in such a case the possibility that a tuberculoïd lesion might develop at the site of inoculation would have to be considered, as in the case of the two U. S. Marines infected in tattooing.

I do not believe that a course of any of the sulfones would be a preventive in any case. But, after all, how much do we know about the action of those drugs? Are they bactericidal in their effect on the bacillus of Hansen? Are they bacteriostatic? Do they act by increasing the defensive capacity of the reticuloendothelial system?

Finally, I may say that in 35 years of the practice of medicine, and 30 years of the practice of dermatology and the handling of several hundreds of cases of leprosy, I have more than once pricked myself accidentally with the needle with which I was exploring the skin of leprosy patients. In each case I just squeezed out a few drops of blood and applied tincture of iodine liberally. So far as I know—and I should know—I am still free from Hansen's disease.

From Dr. A. R. Davison, Medical Superintendent, Westfort Institution, Pretoria, South Africa:

In my opinion the chances of transferring infection by a single accidental pinprick are extremely remote. In using the intradermal method of treatment by chaulmoogra oil it not infrequently happens that the operator accidentally punctures himself. I have seen scores of such instances without ill effects following. I would not recommend prophylactic doses of sulfones. In the extremely unlikely event of a lesion developing I would recommend its excision. We have treated six cases by amputation of solitary lesions and in no instance have secondary lesions developed.

ADDENDUM

The previous discussion of this matter in *THE JOURNAL* 1935 was started by a physician who, forty-five minutes after such an accident, had had a piece of skin "the size of a large buttonhole" removed and had started prophylactic treatment with a single injection of a chaulmoogra preparation above the injury. He asked whether he should go on to take a "prophylactic course" of such a drug. The clinicians who supplied answers—Drs. J. L. Maxwell of China and C. B. Lara and J. N. Rodriguez of the Philippines—all made little of the danger of infection and indicated

doubt of the value of prophylactic injections. Two of them pointed out that such accidents are commonplace and unavoidable, but suggested that the injections might be taken if they would make the individual more comfortable in mind. "To expect the greatest benefit" from such injections, Lara wrote, they "should be made into at least one-half inch around the site of accidental puncture, thoroughly infiltrating the tissues." One treatment, he believed, should suffice.

The item in *Leprosy in India* resulted from an inquiry if it would be dangerous, and if so what should be done about it, if a person were to prick himself with the needle used to give an injection to a patient. The editor replied, in substance, that there was nothing to be alarmed about. There is no danger at all with a neural case, and apparently not much even with a lepromatous one. Intentional inoculations of healthy persons have on the whole given negative results. "The only exception is Arning's case in Hawaii," and details of it—not all of them correct—are given. The various cases of accidental inoculation cited by Rogers and Muir are a relatively small number which only show the possibility of infection through injured skin, and the individuals must have been susceptibles.

In the unique publication entitled *Leprosy in Hawaii*, with its appendix (Board of Health, Honolulu, 1886), is a statement of some interest by Dr. G. L. Fitch, one-time (1882-1884) resident physician at the Settlement on Molokai Island, who held firmly that: "leprosy is an absolutely non-contagious and non-communicable disease from a leper to any other person by any possible combination of circumstances, except by heredity." The statement referred to, used as one of many arguments to back up his opinion, was:

"Turning back to instances, on June 24th, A. D., 1882, while engaged in making a post mortem examination of a boy who had died with leprosy the day previous, I scratched my wrist on my sleeve button and did not discover the wound until it had been covered with blood from the boy's body for a full half hour. I have never experienced the slightest bodily inconvenience from the wound. Some months ago, I regret I cannot give the exact date, Dr. E. Arning inoculated his finger while making a post mortem examination of a leprosy cadaver. I called his attention to a scratch on his finger, just as he was about to begin the operation, but he took no precautions, and as a consequence, his arm shortly afterwards swelled clear to his body, and he suffered severe constitutional disturbance, but he has not developed leprosy."

It appears that Arning was annoyed by this statement, because of the implication that he did not believe that leprosy was inoculable.

—EDITOR.