

THE TREATMENT OF SCABIES

BY

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A great deal of confusion exists concerning the best methods of treating scabies.* Every method has its advocates or detractors. Much of this confusion is caused by inaccuracies in diagnosis of infection and inaccuracies in assessment of cures. At the present time the disease is in the public eye, and many irritating skin conditions unconnected with *Sarcoptes* are apt to be diagnosed and treated as scabies, though, on the other hand, mild cases are often overlooked. Scabies can only be diagnosed with certainty when the mite *Sarcoptes scabiei* can be demonstrated or, at least, an unmistakable burrow seen. Another difficulty arises in assessment of cure. Many treated cases still show signs of extensive secondary impetigo or eczema even though the primary scabies has been cured. In such cases mild applications may cure the secondary complications and thus get the credit of curing scabies, which they are quite incapable of doing.

It is commonly believed that a long soak in a hot bath, followed by vigorous scrubbing, is an essential part of any scabies treatment and that this soaking and scrubbing will in itself often cure the disease. Results given below show that almost 100% of cases of scabies can be cured if efficient medicaments are used without any bath or scrubbing at all. If a well-established burrow is soaked and scrubbed, the brush can be applied vigorously to the lesion for as long as ten minutes without dislodging the parasite, and unless the scrubbing is severe enough to draw blood it is unlikely that many of the mites will be removed in this way. Really thorough scrubbing, often repeated, may sometimes cure scabies (Dixon, 1941), but this does not appear to be a practicable method for general use. Gordon and Seaton (1942a), from their work on *Notoedres*, suggest that scrubbing may be an important preliminary part of scabies treatment. Their view is in part based on an examination of the lesions produced by *Notoedres*; these are covered with scabs and dry exudate, whereas in human scabies live mites are seldom so protected. In spite of this, however, it is desirable that before applying a parasiticide the body should be soaked in a hot bath and rubbed well with soap, as this may enable the medicament to penetrate the skin more readily.

It is dangerous to assume that a patient has, or has not, been cured mainly because of the disappearance or otherwise of symptoms such as irritation. Some patients continue to itch for weeks after all parasites have been killed, while in other cases methods which we know to have practically no effect on the parasites will give at least temporary relief from irritation, especially if the patient believes they are efficacious. Many writers state that the methods they advocate will cure "resistant" cases which have not responded to other treatments. We have found no indication that the parasites are much more difficult to kill in some individuals than in others. There are, however, as stated above, considerable differences

in the rapidity with which symptoms such as itching disappear; but a more potent acaricide does nothing to allay these symptoms—it may easily have the opposite effect.

In our experiments on the treatment of scabies we have assessed our cure primarily by an examination of the adult female mites removed from treated cases. We have developed methods by which we believe that over 90% of the ovigerous females can be detected. Samples totalling 1,200 mites removed from 441 cases suggest that about 90% of the ovigerous females seen on examining the skin are alive, the remaining 10% having died *in situ*. If only dead mites are found after treatment this suggests that the method is likely to be successful, but such results must be confirmed by a study of the relapse rate. Of 1,500 cases treated by us, approximately 1.7% had a recurrence of scabies; but as only three individuals relapsed within ten weeks we are probably safe in assuming that the recurrences were mainly reinfections. (Incidentally, a further 2.6% of patients returned apparently uncured a few days after treatment, but these were found to have no living *Sarcoptes* and merely a persistent itching, which gradually disappeared without further scabies treatment.) If, on the other hand, it is possible to find any live mites 24 hours after completing a treatment, this leaves no shadow of doubt that the treatment has not been successful. It should be noted that if even one live mite is left a recurrence of the disease is likely. It may take several weeks before the recurrence manifests itself fully, for this time must elapse before a reasonably large mite population can be built up again. Our results are based mainly on examination of the ovigerous females, but preliminary experiments suggest that the medicaments which kill these are also reasonably effective against the eggs. Incidentally, eggs killed with benzyl benzoate or sulphur seem to be "fixed" and remain normal in appearance when incubated; we therefore find it difficult to interpret Gordon and Seaton's (1942b) results, for they assessed the potency of drugs against *Notoedres* by the percentage of eggs which degenerated after treatment. Nymphs, larvae, and adult males occur more superficially than females, and it seems unlikely that they will escape more easily. Timoney (1924) finds, with the *Sarcoptes* attacking the buffalo, that eggs are only slightly more resistant than adult females; all other stages are less resistant. We have also found that there is a very high mortality during development; if a proportion of live eggs are left deliberately they seldom give a reinfection. The chances of a reinfection where, say, 5% of the eggs survive are exceedingly remote in all but those cases with abnormally high populations of *Sarcoptes*.

Several times the advocates of a new method have suggested that it is much simpler than the old one because fewer applications of medicament are needed or because the bath and scrubbing can be omitted. These statements have been made without testing the old method to see whether it might also work under the simpler conditions. The main errors in assessment of scabies treatment have thus often led to an under-estimation of the efficacy of old methods, while at the same time the efficacy of certain new methods has been greatly over-estimated.

Details are given below of tests with most of the treatments in common use. In many cases the methods have been tried

* A full summary of recent literature concerning treatment is given by Gordon and Seaton (1942a).

latter condition the deposit would be white, and not yellow. We find that one application of these solutions is hardly more effective than dusting with flowers of sulphur, and even after three applications a substantial proportion of the parasites remain alive. This method is troublesome to use, and the results are so unsatisfactory that we can see no reason for continuing with it. Moreover, it lends itself to zealous over-treatment.

Sulphur Lather Tablets.—Sulphur lather preparations have been used with apparent success in America (Nolan, 1938), and samples of a similar preparation ("sulfomil") were received through the kindness of Messrs. Glaxo Laboratories Ltd. In preliminary tests these appeared to give favourable results, for patients stated that the itching was greatly relieved and no sign of any dermatitis was produced. When, however, the effect of this preparation on the parasites was assessed with greater accuracy it was not found to be more effective in killing the *Sarcoptes* than the other medicaments which deposited sulphur powder on the skin. Even after three daily applications a substantial proportion (about 50%) of the parasites were still alive.

Sulphur taken Internally.—One of us has already reported (Mellanby, 1941) that sulphur taken internally appears to have no effect on *Sarcoptes* in the skin. Even if sulphur is taken in as large a dose as can be consumed without causing severe physical discomfort (10 g. daily for 10 days) the parasites appear to be entirely unharmed at the end of the period, and fresh mites can be induced to burrow normally.

Derris Root Preparations

Derris Root Lotion.—Rotenone, which is one of the active insecticidal products from derris root and some other plants, is known to be very effective in killing many species of insects. We are informed by the Cooper Technical Bureau that tests of rotenone-containing preparations against scabies in animals have given unsatisfactory results, although these products are highly effective against insect parasites on the same animal. Further, derris is notorious for causing dermatitis in man, and unless it has substantial advantages in the treatment of scabies its use is not one which recommends itself. The derris root lotion is essentially a suspension of derris root in water (4 oz. of derris root, 1 gallon of water, a small quantity of soap flakes). The results show that it is fairly toxic to *Sarcoptes*, but even after three days 21% of the mites survived and about 50% of the patients still harboured living *Sarcoptes*. This result is much inferior to that obtained by one application of sulphur ointment. Incidentally, we obtained derris root of known rotenone content through the Cooper Technical Bureau; samples bought in the ordinary way show considerable variations in strength.

Rotenone Emulsion.—A 2% emulsion of rotenone called "sarevan" advocated for the treatment of scabies was obtained through the kindness of Messrs. Evans Sons Lescher and Webb Ltd. It is interesting to compare the proportion of rotenone in this product with that found in other medicaments. The usual strength used in animal dips in veterinary practice is 1 in 16,000; the derris root lotion mentioned above contains approximately 1 part in 1,000; sarevan contains 1 part in 50! Notwithstanding this relatively enormous concentration we have not found sarevan outstandingly successful. A number of patients were treated with 4 applications, as recommended by the manufacturers, and a satisfactory cure was obtained, but some of them developed an intractable scrotal dermatitis. One application of sarevan still left about a quarter of the mites alive, so this method also was found to be much less effective than sulphur ointment.

Benzyl Benzoate

Benzyl benzoate is by no means a new treatment for scabies. It is the main active ingredient in balsam of Peru, which has been used for a very long time. Benzyl benzoate itself, in the form of "perinol," was advocated by Sachs and Juliusberg as long ago as 1900. This medicament was, however, first popularized by Kissmeyer, who in 1937 reported very favourable results from its use. Our conclusions support Kissmeyer's results, but we find that in unskilled hands, with insufficient supervision, benzyl benzoate lotion may be applied in such

a way that some burrows are missed and relapses are apt to occur.

Benzyl benzoate lotion (25% benzyl benzoate, 35% soft soap, 40% spirit), the usual form in which this compound is applied, was found to be 100% effective, and equally satisfactory cures were obtained whether or not the patient was scrubbed. As there is some difficulty in obtaining soft soap and spirit, other benzyl benzoate preparations have been tried. A simple solution in methylated or industrial spirit was very effective, even as low a concentration as 10% benzyl benzoate killing 99% of the parasites. A solution containing only 5% proved less satisfactory, though more efficient than any other anti-scabies treatment except sulphur ointment. A solution in spirit is more difficult to use than the benzyl benzoate lotion as it is not easy to distinguish which parts of the body have been covered.

Results of benzyl benzoate emulsions in water have also been tried. Several different emulsifying agents, including lanette wax S.X., cellofas, and stearic acid with triethanolamine, have been found equally effective. An emulsion containing 10% of benzyl benzoate appears to be on the weak side, giving results closely resembling those obtained with a 5% solution in spirit. It should be noted that the emulsion goes considerably further than the spirit solution, only 2 fl. oz. being required to cover the body, as against 3½ oz. of spirit solution. This means that approximately the same amount of benzyl benzoate is applied to the body with a 10% emulsion as with a 5% solution. A 20% emulsion appears to be completely satisfactory.

The *National War Formulary* gives a benzyl benzoate emulsion containing 25% of benzyl benzoate and 2% lanette wax S.X. The formula in the Appendix to this paper seems to us as efficient, and if many cases have to be treated it will effect important economies.

Other Sarcotides

Dimethyl-diphenylene Disulphide (Dimethylthianthrene).—This substance, which was formerly marketed by Messrs. Bayer under the name of "mitigal," was obtained through the kindness of Imperial Chemical Industries Ltd. It is normally used undiluted on the body; it does not seem to produce any dermatitis or discomfort, and kills 100% *Sarcoptes* after one application. Unfortunately the substance is expensive in normal times, and at present is practically unobtainable. Preliminary experiments suggest that even when diluted down to 5% in medicinal paraffin it is still efficient. Work on dimethyl-diphenylene disulphide emulsions in water is now in progress.

Lethane.—Organic thiocyanates, such as lethane, are very effective against lice, and it has been suggested that they will also kill *Sarcoptes*. A 2% solution of lethane in medicinal paraffin appears to kill only about two-thirds of the mites after one application. Stronger solutions (i.e., 10%) cause the patient very considerable discomfort, and still are less efficient than benzyl benzoate or sulphur ointment.

Pyrethrum.—Various pyrethrin-containing substances have been tested. A commercial preparation containing pyrethrum extract in a petroleum jelly ("A.200") was obtained through the kindness of Messrs. Mitchell Cotts and Co. Later, substances of accurately determined pyrethrin content were prepared by Dr. J. T. Martin of the Department of Insecticides, Rothamsted Experimental Station, Harpenden. These tests do not suggest that pyrethrum extracts are particularly valuable against human scabies.

Betanaphthol.—Only two cases were treated with 10% betanaphthol ointment. Twenty-four hours after treatment 27 mites were removed; of these, 5 (18.5%) were alive. As only 2 live mites were removed from the 225 cases treated with 20% benzyl benzoate emulsion, it is clear that betanaphthol is a much less satisfactory medicament.

Discussion

The experiments described above indicate that of the treatments of scabies in common use two only, sulphur ointment and benzyl benzoate, are satisfactory. It is interesting to compare the *in vitro* reactions of *Sarcoptes* to these preparations. It is well known that the mite will survive for several days when stuck in sulphur ointment on a glass slide; we have

confirmed this observation. Sulphur ointment appears to be effective only when some active products due to the interaction of the sulphur and the human body are liberated. Benzyl benzoate, on the other hand, is rapidly lethal to the mites, which are killed within five minutes of contact away from the body.

It should be noted that it is almost impossible for a patient to apply either liquid preparations or creams satisfactorily to himself; therefore, if it is not possible to get another person (preferably trained for the purpose) to apply these remedies, it is better to use sulphur ointment treatment.

APPENDIX : DIRECTIONS FOR PREPARATION OF BENZYL BENZOATE EMULSIONS

The following three emulsions containing 20% of benzyl benzoate have been found satisfactory. If a 25% emulsion is preferred this can be made by increasing the benzyl benzoate and decreasing the water in the appropriate quantities.

Benzyl benzoate	200 mls
Lanette wax S.X.	10 g.
Water	800 mls

Melt the lanette wax on a water-bath, add the benzyl benzoate, and heat the mixture to a temperature of between 60° and 70° C. Pour the mixture into the water, previously heated to the same temperature, and stir until cold.

Benzyl benzoate	200 mls
Stearic acid	20 g.
Triethanolamine	5 mls
Water to produce	1,000 mls

Melt the stearic acid with the benzyl benzoate on a water-bath. Mix the triethanolamine with half the quantity required of warm water, and pour into the stearic acid-benzyl benzoate mixture cooled to about 30° C. Shake to form an emulsion. Add enough water to produce the required volume.

Benzyl benzoate	200 mls
1% solution of cellofas W.F.Z.	800 mls

Shake together to form an emulsion. Put through a cream-making machine or homogenizer.

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NARCO-ANALYSIS IN THE TREATMENT OF WAR NEUROSES

BY

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Many and diverse are the methods that have been used in exploring the meanderings of the neurotic mind. In the early days of psycho-analysis Freud (Breuer and Freud, 1893) employed hypnosis in overcoming the resistance of his patients, and, later on, in his dream analysis utilized the recurrent narcosis of natural sleep. However, the methods of psycho-analysis and all its derivatives are intricate and require considerable skill, time, and special training. In war the problem of having to deal with greater numbers of neurotics in the Services compels the profession to improvise less intricate and more rapid techniques. During the war of 1914-18 Hadfield's (1920) technique of hypno-analysis was most effective. Since 1929, research in the use of drugs as an aid to gaining insight into and rapport with patients suffering from mental and nervous illness has been in progress.

The drugs which are most useful for this purpose are the barbiturates. Bleckwenn (Lorenz, 1930) of Wisconsin, in 1929, was the first to use sodium amytal in an endeavour to gain

closer rapport with his psychotic and psychoneurotic patients. Nembutal appeared in 1930, evipan in 1932, and pentothal in 1934, and these drugs have since been freely used. Other drugs that have been experimented with include cocaine, hashish, and mescaline (Lindemann and Malamud, 1934), alcohol, and medinal and paraldehyde (Hauptmann, 1934). Workers in this field also include Stungo (1938) and Campbell (1938), who employed evipan, Mallinson (1940), who has published an account of its use in the Royal Navy, and Dicks and Stungo (1940) and Sargent and Slater (1940), who have reported their experiences in the E.M.S.

The term "narco-analysis" was first devised by J. S. Horsley (1936) for the technique which utilizes a narcosis artificially induced by a barbiturate for the express purpose of facilitating the analysis of a patient's mental content. The barbiturates employed are those which have proved so useful as intravenous anaesthetics. When used as narcotics the dose is of course much smaller. In this respect it is of interest to note that hypnosis, which is the essential preliminary to hypno-analysis, was first employed in orthodox medicine as an anaesthetic by Elliotson, Esdaile, and Braid (Bramwell, 1913) for surgical operations before the discovery of chloroform or ether.

The Present Investigation

Fifty soldiers suffering from neuroses were treated by this method. The drug used was pentothal sodium—sodium ethyl (1-methyl butyl) thio-barbituric acid. It is similar in action to sodium amytal and nembutal, but safer in that it is less toxic and more readily eliminated. It is a respiratory depressant and lowers blood pressure temporarily, and is detoxicated by the liver, but has no effect upon the kidneys, so the only physical contraindications to its use are respiratory disease, low blood pressure, and liver embarrassment. These were rarely met with in healthy young neurotic soldiers. It should not be used in varicose veins if this can be avoided, because of the probability of delayed phlebitis.

Indications for Narco-analysis.—When a neurotic is admitted to hospital it is first of all essential to take a complete psychiatric history. Next a physical examination is conducted and any necessary physical treatment given. Although this has usually been done before the soldier reaches a psychological unit, it is surprising how physical signs are sometimes missed by physicians and surgeons of repute, doubtless because during their examinations the display of some gross functional symptoms by the patient has biased their judgment against a physical diagnosis. Next follow several psychological interviews in which one endeavours to explore the motives behind the symptoms. It is important to be in possession of all the facts of which the patient is consciously aware. If an impasse is reached in which the patient, though trying his best, cannot honestly remember the painful matters that have been repressed, and if this repression remains impervious to all psychotherapeutic efforts quickly applied, then one resorts to narco-analysis. It is explained to the patient simply that he will be given an injection to help him to get better. It will make him sleepy, but will have no untoward after-effects. Soldiers are at liberty to refuse injection, so it is necessary to win their approval by persuasion. At times all sorts of wild rumours have been current in the wards to the effect that (a) the injection will weaken the patient's will power, (b) under it they will be forced to say everything they wish to keep secret, and (c) every word uttered will be taken down by a stenographer and afterwards used in evidence against them. At times such rumours have prevented me from having a case to treat in this way for months on end, and then a few successful cases make the technique popular again.

I have found intravenous sodium pentothal of assistance in (1) hysteria in its various manifestations; (2) anxiety states; (3) the after-effects of head and spine injuries; (4) borderline psychoses, mental deficiency, and epilepsy when the diagnosis was in doubt; and (5) simulation and malingering.

Administration of the Drug.—The time chosen for injection is about 2 hours after a meal. The patient is made comfortable on a couch or bed in a quiet room and is reassured. The collar and belt are loosened and the median basilic vein is prepared for venepuncture. An ampoule containing 0.5 g. (7.5 gr.) of sodium pentothal is opened and dissolved in the barrel of a