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## THE THERAPEUTIC USES OF SEA WATER

### PART I: THE EFFECT OF INJECTIONS OF SEA WATER IN SCABIES\*

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THE rich mineral wealth and the enormous amount of energy present in the sea is lying still unexplored. If these resources are properly explored it is certain we will have a number of valuable products available for therapeutic and scientific advancement.

It was pointed out by us (Chowhan, 1941) that epileptic attacks and mental disturbances in man may be due to imbalance of mineral constituents of blood leading to disturbances in the water balance of the body. The knowledge that the mineral contents of sea water are more or less similar to that of body juices lead to the consideration that injections of sea water would be beneficial in the treatment of some of the mental conditions. Before venturing the parenteral therapy of sea water in human being, steps were taken to find out whether an injection of sterile sea water into the animal organisms would cause any systemic disturbances. Venkatachalam *et al.* (1943) tried intravenous injections of sea water in a few dogs which were used as experimental animals. In another batch of animals intraperitoneal injections were given. Such injections produced no untoward effects in these animals. In the case of one animal which happened to be suffering from *Canine mange*, it was noted that the animals got completely rid of this disease. The raw patches healed up and their hair began to grow rapidly on the denuded areas. Further trials were made on 20 animals suffering from *Sarcoptes scabie* and 30 animals suffering from follicular type of mange and one bull suffering from ringworm. All of these animals were cured of their lesions. These animals were given intravenous or intraperitoneal injections of filtered and sterilized sea water in doses of  $\frac{1}{2}$  c.c. per kilo body weight. A maximum dose up to

20 c.c. was tried on alternate days without any untoward effects.

Dhairyam (1944) reported that sea water with its iodine and saline contents stimulates the thyroids and the suprarenal gland cortex. In his cases, in the Mental Hospital, Madras, he obtained gratifying results with the parenteral administration of sea water in certain types of mental disorders, insomnia, generalized weakness, obesity and ascites, etc. The common belief and practice in certain seaside areas that sea baths are useful for skin conditions as scabies, led the above worker to try sea water therapy in three cases suffering from scabies. He reported very encouraging results. He suggested us to give trial of sea water therapy in army recruits.

During the years 1944 and 1945 there was a marked increase of incidence of scabies in South India and consequently there was a great loss of man-power to the army as persons suffering from scabies were rejected as unfit for recruitment. In order to conserve man-power it was later decided to enroll persons suffering from uncomplicated scabies into the army and to treat them in the military hospitals before despatching them to units for active military duties. This gave an opportunity to the senior author to pick out batches of recruits suffering from typical lesion of scabies and try sea water therapy on them. This investigation was taken in hand particularly in view of the fact that drugs, like sulphur and benzyl-benzoate used in the treatment of scabies as specific drugs, were practically not available in the market or were too costly for the extensive treatment of scabies in the civil, during the period of war. A search for such substitutes for the wartime costly drugs in scabies, it was considered, would be a valuable addition to the medical practitioners' armamentarium.

Recruits suffering from scabies were selected from the Recruits Training Centres at Bangalore, Technical Training Centres at Guntur, Bezwada and Madras and also from the Out-patients Department of the Golden Rock Hospital, South India, H. Q. Railway, at Trichinopoly. A trial was thus made on 280 patients.

#### Method of treatment

Sea water was collected at Madras harbour, about 2 miles away from the coast. It was filtered and kept in sealed bottles labelled as *Itch Cure*. Before injections the sea water was refiltered through double filter paper and sterilized by autoclaving or boiling for 5 minutes. Two or 3 c.c. of the sterile sea water were injected subcutaneously daily. A course of ten such injections was given and the clinical improvement noted.

The patients under trial were isolated from others. A brief note of the clinical picture was recorded before the initial dose and after the 4th, 6th and 10th injections. No other treatment was given during the course of sea

\* A preliminary note read before the Military Medical Club, Bangalore, September 1945, and Indian Science Congress, Bangalore, Session January 1946, and in an abstracted form at the Indian Science Congress, Patna, January 1948. This work was done in a military hospital.

water therapy. The injection of sea water produced no local or general reaction except transitory pain at the site of injection. The fluid was rapidly absorbed. From table I it will be seen that after the fourth injection the irritation of the skin and severe itching subsided. The discharge from the impetiginous rash was slightly reduced. With further doses

treatment was started) there was practically not much relief. After the 5th and the 6th injections 51.4 per cent showed a clinical improvement and 29.7 per cent a marked improvement and after the 7th to the 10th dose 31.5 per cent showed a clinical improvement and 55.0 per cent cases showed marked improvement. Of the total 280 cases so treated with

TABLE I  
*Details of progress of a few cases of scabies treated with injections of sea water*

No.	Name	Religion	Age	Total number of injection	Condition before treatment	Condition after treatment
B5-1578	T. N.	H.	50	11 ++	Severe itching, ulcerative and suppurative lesions, extensive, all over the body.	After 4th dose lesion drying up. After 10th dose the ulcers scabbing and withering up. Itching relieved 80 per cent.
B5-2788	K.	H.	20	10 +++	Extensive lesion on penis, buttocks and other parts of body.	(a) After 5th injections, all lesions drying up. (b) After 10th injections, improvement 90 per cent.
B5-2104	R.	H.	26	4 +	Previously treated with sulphur but condition relapsed and lesions flared up again. Lesions over hands and deep ulcers on buttocks.	Lesion on hands improved. Admitted into the hospital for treatment of deep ulcers.
B6-4702	A.	H.	22	9 +	Previously treated in a hospital with sulphur. Relapsed lesions in groin, buttocks and scrotum.	All lesions dried and scabbing, cure 90 per cent.
A2-4279	G.	H.	20	8 +	Scattered on hands, legs and penis and scabbing.	Scabs drying up, relieved 60 per cent.
B8-1575	P.	H.	55	9 +++	Chronic, lesions, severe itching and ulcers all over the body.	All ulcers dry. Itching much reduced.
R-4254	A.	Ch.	54	8 +	Acute pustular type—hands, elbows and buttocks.	Dried up, scabbing and itching reduced.
A-5296	M.	H.	20	9 ++	Acute pustular and generalized, itching severe.	Scabbing, itching persisting, cure 80 per cent.
A2-4354	R.	H.	20	7 ++	Scabs, pustular eruption on buttocks and webs of left hand fingers.	Scabs drying, cure 50 per cent.
B2-2199	A.	H.	22	7 ++	Pustular, generalized all over lower limbs, buttocks, hands and penis.	Much improvement. Lesions drying up. Cure 80 per cent.
A3-3857	K.	K.	45	6 +	Diffused, papular lesions on waist, abdomen and chest.	Lesions improved. Itching still persisting.

+ = Mild.

++ = Warped lesion.

+++ = Extensive lesion.

the pustules appeared to be drying up and were covered with healthy scabs. After the tenth dose the whole of the lesion appeared to be simply dehydrated and the scabs started peeling off leaving behind healthy skin. The itching disappeared in about 70 per cent of cases. The observations on 280 cases treated with sea water are shown in table II.

The cases treated were grouped according to the number of injections given and the results recorded as: (a) number of cases treated, (b) cases showing no improvement, (c) cases showing clinical improvement, *i.e.* relief in itching and reduction of the number of pustules and the rash, (d) cases showing marked improvement, *i.e.* the cases which were considered practically cured, the lesion having dried up and the scabs peeling off and the patient having practically no itching. It will be noted that with the first 4 doses (*i.e.* fourth day after the

TABLE II

*Result of percentages of cure after different doses of sea water injected subcutaneously, 2 c.c. daily in 280 cases*

Doses	Number treated	No improvement	Improved	Marked improvement
1-4	94	86 (91.5%)	5 (5.3%)	3 (3.1%)
5-6	37	7 (18.8%)	19 (51.4%)	11 (29.7%)
7-10	149	11 (7.4%)	56 (37.5%)	82 (55.0%)
	280	104 (37.1%)	80 (28.5%)	96 (34.2%)

different doses of sea water 37.1 per cent reported no relief; 62.8 per cent reported very encouraging results (*i.e.* in 28.5 per cent and 34.2

per cent clinical and marked improvement respectively).

The results with larger doses or after prolonged sea water treatment therapy is still under investigation.

*Rationale of the sea water therapy in skin conditions and the other skin diseases.*—Quinton (1898-99) enunciated the view that in a great majority of animal organisms the internal mediums, the circulatory fluid or hæmolymph, from its inorganic compositions is but a representative of sea water. It is practically certain that the life on this planet began in the ocean and that the present terrestrial forms of lives are descendants of forms that once lived in the sea. The concentration of cations, hydrogen-ions and the diurnal variations of the body fluids of the sea animals is allied to that of the sea water. As the living organisms gradually ascended higher and higher in the zoological ladder and their bodies became free from and independent of the direct contact of the sea water, the salt contents of the body fluids were modified to meet the requirements of the specialized cells which those fluids bathe. Macallum (1903) advanced the view that the blood plasma of vertebrates and invertebrates with a closed circulatory system is in its inorganic salts but a reproduction of sea water of the remote zoological period in which the prototype representatives of such forms first made their appearance. The inorganic composition of the blood sera of mammals and that of ocean of to-day bear a striking resemblance. This resemblance is not in concentration for the salinity of the ocean, is almost three times that of mammal blood serum, but is in the relative proportion of the Na, K and Ca as indicated in tables III and IV. There is, however, a considerable variation in the Mag. in ratios. The relative concentration of Na, K and Ca and Mag. in the sea water and the body juices of various types of animals is shown in tables III and IV: here the Na-ion was taken as 100.

TABLE III

*The proportions of metallic ions in the sea water and other physiological fluids taking sodium as 100*

	Na	Ca	K	Mag.
Ringer's solution ..	100	3.34-7.71	5.86	..
Sea water ..	100	3.34	3.66	11.99
Fluid juice (Aurelia) ..	100	4.13	5.18	11.43
Fluid juice (Cyanea) ..	100	3.86	7.67	11.31
Serum of the dog ..	100	2.52	6.86	0.81
Serum of other mammals.	100	2.58	6.69	0.80

After Macallum, A. B. (1903): *The Journal of Physiology*, Vol. 29, p. 213.

The alteration or disturbance of general organic and inorganic constituents of the body

TABLE IV

*The proportion of sodium, potassium, calcium and the magnesium content of sea water and of various body fluids. The figures are based on chlorine content being taken as 100*

	Chlorine	Na	K	Ca	Mag.
Sea water ..	100	86	1.9	2.1	9.3
Lobster ( <i>Homarus</i> ) ..	100	96	3.9	3.4	0.85
Man ..	100	130	5.2	2.6	0.9

Heilbrunn, 1937: *The Outline of General Physiology*, 1937, pp. 35 to 57. W. B. Saunders and Co., Ltd.

fluids is known to manifest certain clinical symptoms. The conditions as bronzing in *Diabetes bronze (hæmochromatosis)*; pruritus ani et vaginii with intertrigo; boils and carbuncles in diabetes mellitus; pellagra, cheilosis, phrynoderma and scurvy, etc., in the deficiency of vitamin A, B complex and C, etc., are some of the well-known examples. Deficiency of sodium chloride retards the growth of the skeleton. Hens are reported to produce less vigorous chicks and the pregnant rabbits abort in a mineral hunger. In man there is an imperfect growth and deficient nutrition as a result of salt deficiency. Salt-poor diet in cattle causes symptoms of human rickets, osteomalacia, in dogs and pigs weakness, trembling and paralysis occur on low salt diet (Mhaskar, 1948). The general condition and the health of the host also plays an important part in determining the susceptibility of the individual towards artificial infection and towards spontaneous recovery. Monnig (1938) maintains that *Demodex*, a very prevalent parasite, occurs practically on the bodies of all dogs. It produces *Mange* only when the general health of the animal has been affected by diseases which lower its natural resistance as distemper and by weakening the skin resistance as strong irritants or too frequent soap washes.

From the above observations it may be safe to conjecture that the introduction into the body of salts, in natural proportions as found in the sea water, may play an important rôle in the adjustment of the different salts of the body to their normal physiological level. The clinical trials have shown that parenteral introduction of sea water produces a definite improvement in skin condition as in the case of scabies and the mental conditions. Whether such improvements are due to the alteration of salt contents of the body juice or is due to the stimulation of the complex body defence mechanisms is still open for further investigation.

*Advantages of sea water therapy over drugs in the treatment of scabies and other skin conditions*

Sea water treatment is safe, cheap, and the resources are inexhaustible. This type of treatment may very well substitute the wartime

expensive drugs like sulphur, and benzylbenzoate. The treatment is very clean and has the advantage over the prolonged and messy use of sulphur ointment. In addition the patient experiences a feeling of general well-being after a course of sea water treatment.

### Summary

1. It has been suggested that a number of clinical symptoms can be noted in cases where there is an alteration of mineral contents of blood:

2. The body juices and the blood serum in its organic constituents and composition are but a representative of sea water since the present terrestrial and avian forms of life are descendants of forms that once lived in the sea.

3. Subcutaneous injections of sterile sea water, in doses of 2 to 3 c.c. daily, have been advocated in various skin conditions particularly in scabies.

4. Sea water therapy was tried in 280 cases suffering from scabies. Of the total cases treated 60 per cent showed a distinct relief in their symptoms and were considered practically cured after a course of ten injections of sterilized sea water in doses of 2 to 3 c.c. daily.

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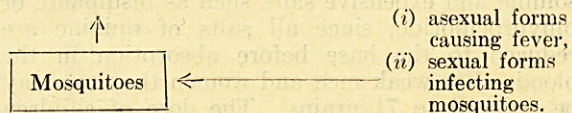
## TREATMENT OF MALARIA \*

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IN considering the treatment of malaria it is necessary to take into account two things, namely, the different stages of the development of malaria parasites and, secondly, the action of different drugs on different stages in the cycle. There are three stages in the human cycle with corresponding three forms of parasites in man. They are :—

A. Sporozoites → B. Tissue forms → C. Blood forms :



A. *Sporozoites* are forms of parasites that, as you all know, are injected by the mosquito into man. They occur in the blood for a short while only, about half an hour. No symptoms are produced by them and no drug is known to affect them. They do not invade the red cells as previously believed.

B. *Tissue forms* represent the intermediate stage into which the sporozoites develop and from which the asexual blood forms which produce fever arise. The sporozoites after being introduced into human body by mosquito first grow and multiply in the endothelial tissues. Such tissue forms have been demonstrated by some German workers, and James and Tate in bird malaria. Very recently Shortt and Garnham have demonstrated them in monkey malaria, and we hope in the near future they will also be seen in human malaria.† And it is rational to accept their existence as no parasites are seen in the blood for a week or so after injection of sporozoites by the mosquito; even transfusion of blood is unsuccessful during this stage. They are called pre- or exo-erythrocytic (e.e.) forms, i.e. the forms outside the erythrocytes. Here a sort of storehouse is formed from which new forms of the parasites are released into the blood, which eventually cause fever. The latter are readily acted on by most anti-malarial drugs and the fever is controlled, but the tissue or e.e. forms tend to persist especially in B.T. cases and may periodically give rise to blood forms causing relapses.

C. The *blood forms* include :—

- (i) asexual parasites (rings, schizonts, rosettes and merozoites) causing fever. After several generations of schizogony they also give rise to  
 (ii) gametocytes which cause no fever but infect anopheline mosquitoes biting an individual.

Next we come to the actual treatment of an attack of malaria. For chronological reference we may mention three eras of drug therapy—the

\* Being a lecture delivered to the medical officers of mines, Asansol, in January 1948.

† Exo-erythrocytic forms have now been demonstrated also in man by Shortt and his colleagues.