Clinical and other Notes.

THE TREATMENT OF EXCRETA IN INDIA BY PERCHLORIDE OF MERCURY AND INCINERATION.

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The great importance and entrancing interest of the prevention of enteric fever among British soldiers in India must be my excuse for this communication, and for the opinions expressed, which are based on nearly eighteen years' experience of that country, and service in every part of it.

Our energies have been and now are directed against enteric fever on two very special lines, viz., (*a*) inoculation and rendering the soldier immune, and (*b*) removing the influence of the bacillus from the soldier and his surroundings, and thus lessening his chances of contracting disease. I refer in the present article to the latter of these. In hospital practice it has been the custom for a great many years to disinfect excreta, both solid and liquid, and render them harmless to produce further disease, and I think I am justified in stating that infection in hospital is comparatively rare. Out of seventy-seven cases in my experience since 1903 I only recollect one case, and that was not actually proved.

In 1906 an organised plan of destroying all enteric excreta by fire was introduced by the late Surgeon-General R. Harvey, Principal Medical Officer, Punjab Command. His simple sawdust and *chula* plan has remained the principle on which more expensive inventions have been grafted. Hospitals, at anyrate, are not and never have been of the slightest danger to troops in barracks, for they are too scrupulously watched and cared for. But notwithstanding all this care and attention in hospitals and barracks, enteric fever not only flourished, but began to assume very serious proportions, and the numbers rendered non-effective became considerable. Major J. C. Weir, R.A.M.C., the Sanitary Officer of the Punjab Command in 1903, was among the first to draw attention to the danger arising from barrack latrines and the flies which swarmed around them, and to suggest the importance of preventing the access of flies to the latrines. This resulted in a boom in patent fly-proof latrines. Thus our attention began to concentrate on latrines in barracks, where only two ways of getting rid of flies are possible, one by making a latrine absolutely fly-proof, and the other by rendering it an impossible place for a fly to exist in. One more point also began to be emphasised, and that was, that men apparently healthy, men suffering from the ambulant form

of enteric, and men discharged from hospital apparently cured, could infect any latrine. To make a latrine fly-proof is not only most expensive, but almost impracticable, so to render it impossible for flies to exist in the latrines was the only solution of the question.

Observation and examination gradually proved the latrines, the carriage system of excreta, and the trenches, to be points of great danger. The recognised and official dry-earth system was made as perfect as such a system possibly could be; more thorough disinfection of excreta was effected; and the methods of carriage and trenching were overhauled and improved; yet enteric fever showed no signs of abatement. But while advances have been made by military medical officers in cantonments, little or nothing has been done in civil parts adjoining the cantonments. A badly worked and badly supervised dry-earth system still remains, and is a danger in many cases to the cantonment.

The dry-earth system can be dismissed with a brief note. Thoroughly and well as it has been carried out, it is now wholly discredited. Among the many objections I will mention two: (1) No soldier ever applies 3 lb. of dry earth to an evacuation. If every man did so the four carts allowed per corps would not have sufficient capacity to carry the regimental excreta and urine, and the carriage to the trenching ground would immediately break down. (2) The great feature of efficiency in this method is to have the earth perfectly dry, and in a fine powder, but this is hardly ever obtainable. During the monsoons it is impossible to use dry earth, for a single day's rain is sufficient to prevent the required dryness and pulverisation. Again, in India uniformity is impossible, because soils differ so widely, the climate varies from very dry to very wet, and meteorological and terrestrial conditions are never similar in any two stations. It is, therefore, very evident that the dry-earth system, as carried out in India, is not only an uncertain, but a condemned one.

In 1903 I was appointed to the command of the Station Hospital, Sialkot, and proceeded there in July, and found myself in the middle of a severe outbreak of enteric. The causes were the usual ones, viz., bazaars and supplies, &c., but the dry-earth system flourished. In 1905 another severe outbreak occurred, and the earlier cases were derived from camps where the dry-earth system obtained on the road between Rawal Pindi and Sialkot; another outbreak was attributed to some tampering with the supplies. The dry-earth system was still carried on. The Medical Officer in charge of one corps was anxious to abolish dry-earth and substitute a modified perchloride system, and this I tried for the rest of the year, and on December 31st, 1905, I induced the General Officer Commanding to order the abolition of the dry-earth system and the introduction of the wet perchloride system throughout the British portion of the Cavalry Brigade. The results have been most striking.

SIALKOT.

	Cases	Mortality
1903	40 ..	12
1904	39 ..	9
1905	7 ..	2
1906	— ..	—

MURREE,[1] 1906.

	Cases	Mortality
Depôt	2 ..	—
Station Hospital ..	— ..	—
Cliffden	— ..	—

MUREE, 1907.

	Cases	Mortality
Depôt	— ..	—
Station Hospital ..	— ..	—
Cliffden	— ..	—

WESTBRIDGE, 1906-7.

I held sanitary charge of two British regiments and three batteries. There were three admissions for enteric and no deaths. These three admissions were infections from Lahore cantonments.

THE WET SYSTEM OF PERCHLORIDE OF MERCURY OR CARBOLIC ACID.

The wet system of perchloride of mercury as practised by me requires attention to the following details. I claim to have discovered nothing, but only to show how this system can be worked in a businesslike, practical, and economical manner. My long experience in India, and the many trials I have made, have convinced me that it is an efficient system and suitable to cantonments. The principal points are the following :—

(1) Preparation of the solution.
(2) Apparatus, receptacles, pans, conservancy carts, &c.
(3) Method of application.

Preparation of the Solution. — This is made on the following formula :—

℞ Hydrarg. perchloridi .. .. .. grs. 40
Sodii chloridi .. .. ,, 80
Pot. permang. .. .. ,, 3
Aquæ ad .. .. pints 8

Sig. "POISON."

This makes a solution of the strength of 1 in 2,000. The question of strength is one upon which opinions differ. Major Lavie used 1 in 4,000, and reporting on a period of two years, stated that it was "most satisfactory," there being a complete absence of smell and flies. Others recommend a strength of 1 in 500. Koch found that a solution of

[1] Sixty-three enteric transfers passed through here. At the Depôt alone the dry earth system remained.

1 in 1,000 killed spores in ten minutes, whilst simply moistening the ground was sufficient to arrest their powers of development. At first I used a dilution of 1 in 1,000, but latterly one of 1 in 2,000. I think that is quite sufficient for all purposes.

The poisonous nature of corrosive sublimate has been advanced as a reason for its non-employment. In a dilution of 1 in 2,000, a tumblerful of solution might cause symptoms, but it would have such an unpleasant taste that no one would be likely to drink much by accident. I have never known anyone affected by this solution, except pariah dogs prowling about barracks at night and drinking the solution at the back of the latrine; many have been laid low in this way. Ordinary precautions are, of course, necessary, and these are met by making the powders at the hospital and handing them to trained sanitary orderlies. Perchloride of mercury is not more dangerous than the oxalic acid in the possession of every soldier for cleaning purposes.

The Material.—An Indian barrack latrine consists of a certain number of movable seats separated from each other by a wooden partition. Underneath the seat is placed a glazed earthenware pan fitting closely to the lower portion of the wooden seat. The pan is withdrawn from the back to a brick enclosure in which the receptacles are placed, and where the excreta are kept until removed to the trenches by the conservancy carts. I have noticed no special effect on these as the result of perchloride of mercury. The average life of the glaze in any case is about three months, if as much. The receptacles at the back are usually of two sizes. They are made of iron, and each is fitted with a cover. They should be air-tight, but as a matter of practice are not. It is usual to paint them with tar, and this invariably tends to loosen the cover. The conservancy cart is a receptacle lying between two wheels on a cranked axle and drawn by a buffalo. It is fitted with a double cover, and it is air-tight if the cover is correctly adjusted. These carts work the first two or three hours after dawn, and convey the excreta and urine from the latrines to the trenching grounds, a mile or so out of the station.

The Method of applying the Perchloride of Mercury System.—At the back of each latrine I only allow the exact number of receptacles to scale, and an earthenware urinal for the use of natives. The solution is kept in an ordinary oil drum of a capacity of 4 gallons, and through the screw opening is placed a pint tin syringe. The drum is painted red and labelled "Poison." In addition, a small iron skewer is allowed. I insist on nothing else being stored there, such as extra pots and pans, and clothes of the *mehter*. A pan having been used, the *mehter* removes it, disintegrates the solid contents with an iron skewer, and places them in the receptacle, cleans the pan, and returns it to its place with a syringeful of solution in it. The test of a good latrine is *absolute* cleanliness and

absolutely no smell. If there is the faintest odour it means that some more solution must be syringed over it.

Urinals are treated in the same way. I used sago tins for the purpose. In the corner above the trough the tin is fixed and arranged so that the solution drops into it. Here again the test is as above. I have noticed smell in a much-used iron urinal in the hottest sun. This must also be frequently syringed all over.

This concludes the description of the wet system of perchloride of mercury.

Carbolic acid in solution 1 in 20 is as equally effective as perchloride of mercury, and it is frequently used. The objections to it are: (*a*) It is a volatile acid and requires constant renewing; the mercuric salt is more stable and permanent. (*b*) The smell of carbolic acid conceals other smells and this is not the case with perchloride, that is to say, that any putrefactive smell can be recognised with the latter but not with the former. (*c*) Carbolic acid being used in so small a dilution as compared with perchloride of mercury, is more expensive.

As the dilution (perchloride of mercury) I have mentioned does not ward off flies altogether, the use of kerosene oil in any form has been found very effective. Kerosene alone or mixed with tar and earth makes a very good floor for any latrine, and flies do not settle on it. I think, therefore, that perchloride of mercury used as above to kill all bacilli, and kerosene lightly wiped over the wood-work and the upper part of each *gumlah*, will absolutely ward off all flies; either alone is insufficient, but both used together as suggested mean security.

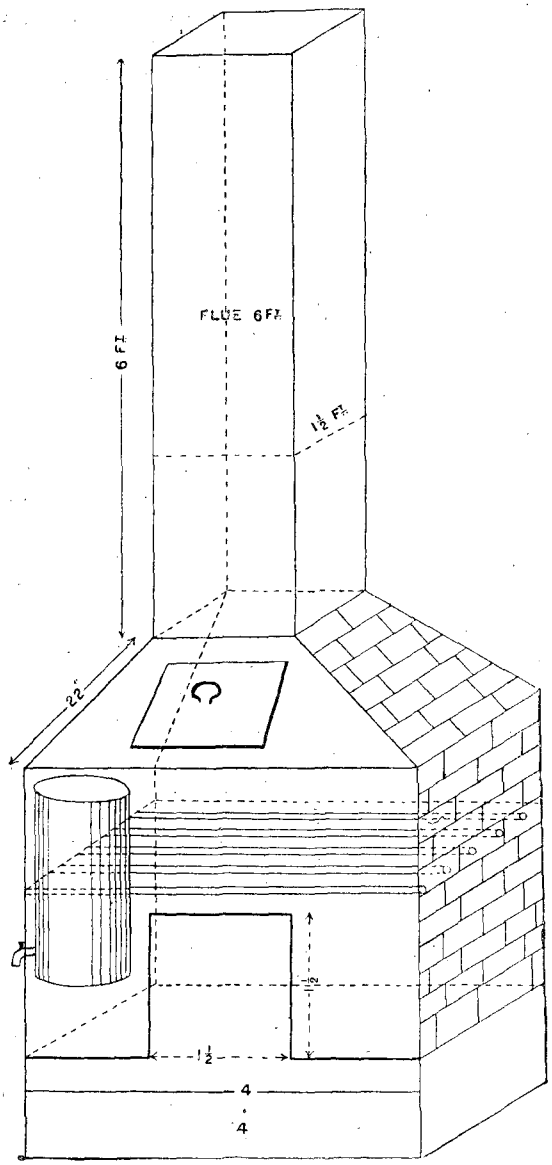
This brings me to the last stage of the disposal of the excreta, solid and liquid, from the latrines. The regulation method is that the excreta are carried by night-soil carts to trenches at a distance and buried. This method is well known and requires no detailed description. The horrors in the way of smells, &c., the dangerous foci of disease formed by the contents of these carts leaking, or the cart breaking down or turning over, are matters all who have lived in India have experienced, and these can be dismissed without further remark.

However, if we do not remove the excreta, we must dispose of them in another manner, and this must be by absolute means. This, I think, has been solved by incineration, and has been developed and associated in India with the name of Surgeon-General H. Hamilton, C.B., I.M.S., and Lieutenant-Colonel H. A. Haines, R.A.M.C.[1] The latter officer is associated with a larger form of incinerator, but the former rather advocates a smaller one. Incineration is no new idea, and many have been built at the large towns in India. These are costly to build and expensive to use. I do not refer to incinerators which can be built at a small cost and are economical in their working. Under the direction

[1] See JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, January, 1908, p. 34.

of Surgeon-General Hamilton, C.B., I.M.S., I built thirty-six of these incinerators in 1907.

FRONT ELEVATION.



The fuel used is litter and rubbish, horse litter if procurable is most suitable; this is kept in a dry shed. A layer of about 6 inches is placed over the grating, and the solid excreta, having been strained of all liquid,

are laid upon it, and covered by a layer of litter. More solid excreta can then be added, and the incinerator filled up with litter. It is then lighted from the bottom, and beyond occasional stoking no further attention is required. Anything more simple it is difficult to imagine. It is very often urged that the incinerator requires supervision, meaning a sort of special supervision, or a supervision of a skilled character. This is an error; skilled supervision is unnecessary, and at the Station Hospital the incinerator can be left safely in the hands of the Jemadar ward-sweeper. Another objection is smell. There is at first a slightly pungent smell, till the incinerator has warmed to its work, but there is nothing hurtful or deleterious in this, and it depends to a large extent on the moisture remaining with solid excreta. We overcame it by getting a good blaze on at once, and stoking well for the first quarter of an hour. The liquid excreta are the principal cause of smell, and it should be a strict injunction to the attendants not to let them boil. If raised to 160° or so, all hurtful germs of disease from this source are practically destroyed, and care should be taken that no vapour of steam is emitted. The economy is very considerable. In cantonments on the plains the introduction of incineration means the abolition of all the carriage of excreta from latrines to trenches.

THE SIALKOT INCINERATOR, AND INCINERATION IN THE FIELD.

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The pattern of incinerator in use at Sialkot has been designed with a view to the complete combustion of human excreta, fæces and urine, with the aid of barrack sweepings (including dead leaves) or soiled stable litter, or both combined.

From the drawing it will be seen that the incinerator is of simple design, consisting of a furnace fed from above. The draught enters from four holes below the grating. The furnace is dome-shaped within so as to avoid corners wherein draught would be *nil*. The chimney is over the centre of the furnace. The feed-hole is on the dome just above the commencement of its curve from the side walls, but this feed-hole may be omitted in cases where a long chimney is not necessary, as in the field-service pattern.

The dimensions shown in the drawing are those of an incinerator capable of destroying in one day the refuse and excreta of a company—say 100 men—without excessive tax upon the sweepers in charge. This is calculated upon the work required in winter, when the urine for disposal is increased in quantity.

For the British troops at Sialkot one of these incinerators is built