

SANITATION IN WAR.

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THE subject is too big to deal with here in its entirety, and therefore on taking up one branch of sanitation it is hoped that in choosing the subject of prevention of infections, an important one, one may raise sufficient material for discussion. Unluckily for medical officers, military conditions are not helpful for the prevention of infection and for segregation. If it were possible to segregate each unit, then disease would not spread, but up at the Front, where unit after unit occupies the same trenches, spread of infection from unit to unit must occur.

Even with regard to such different arms of the Service as cavalry and infantry, intimate contact occurs, owing to the former taking their turn in the trenches; again, with our White and our Indian troops contact, and close contact, at the Front is inevitable. At the base, things are only slightly different, for we get a mixing up of our cavalry and certain infantry units. In each of our cavalry camps we have infantry units attached, in the one R.A.M.C. in the other R.E.; besides this we have an enormous number of horses in the remounts close to us, and they will be nothing but a danger.

Again another source of infection of formations is due to the constant to and fro movement of men. We have B details and convalescents joining from the Front, we have men coming down on various duties, and from England we are constantly receiving reinforcements, and these from camps and places of which we know nothing. Segregation here again fails us; we could hardly divide up each base camp into three portions, as would be necessary to carry out proper segregation, for then the military point of view would fail, as segregation has to be carried out for some definite period. This period, in an endeavour to take in all infectious diseases, would require to be one of three weeks, which would probably suffice, except for mumps and a few cases of enteric.

Again, another source of infection exists in the civil inhabitants. Here we have to differentiate between troops in camps and troops in billets, where the latter are bound to come more or less in contact with the civil population. In camps this danger is hard to do away with, for we have various civil institutions—the Y.M.C.A., the cinemas, the shooting galleries, and last but not least, the various tuck shops and farms which abound on the edges of the camps and over which we have no jurisdiction, and in which uncooked foods and unauthorized drinks are available. Now that we have roughly reviewed our rampart against disease and see the many points where it fails, we have to see what safeguards can be taken to deal with and prevent the spread of infectious disease in our midst.

Drafts on arrival in camp are inspected. This is the first barrier; at this inspection the prior movements of the men should be ascertained, and thus a knowledge gained of conditions whence the men have come. Each infantry base has a definite number of units, and as successive lots of reinforcements arrive, their prior conditions will be known by the past history of previous reinforcing drafts. When a man reports sick one of the most important points to elicit is the length of time that he has been in camp; and invariably treat with suspicion the man who has come down from the Front, as there conditions are the most unfavourable. So when a case is suspected of being infectious it should be treated as suspect, and in this stage all necessary disinfections and segregation should be carried out.

All the above can be grouped under the heading of Protection of Man from Man.

Men have to be protected further, and this protection naturally falls into four groups:—

- (1) Preventive inoculations.
- (2) Protection by personal cleanliness and by periodic disinfections of blankets and clothing, &c.
- (3) By general cleanliness of camps.
- (4) By providing a treated supply of drinking water.

Preventive inoculations are used against enteric, and by raising the immunity of the individual we assist enormously in the protection given.

Overcrowding in camps simply means accumulation of dirt. Apart from this, disease may occur in a camp presumably full of healthy individuals, and may be due to the individual known as a "carrier." Here the term carrier will be extended to include animals and insects.

The chief carrier diseases with which we have to deal are the intestinal infections, chief among which are enteric and the paratyphoids.

With reference to these, according to season, so does the important factor, the carrier, vary. In winter, where the carrier is man, we have few carriers; it is our duty to search out all those who may be likely carriers, and after examination get rid of such as are detected. It is of the utmost importance, therefore, to see that no man is employed in the handling of food-stuffs who has at any time suffered from an infectious intestinal disease. All such men are barred. The staff of men employed on food-stuffs should be permanent, and should be examined to see if by any chance they may have suffered from a disease of this class without being aware of the fact, that is, the excretion of all such men should be examined. This in itself is not an easy matter, but the officers entrusted with these examinations have worked hard and rely on medical officers in charge of camps and billets to send for examination any men who may be taken on as cooks, dining-room orderlies, or messmen.

With the advent of summer the carrier will change. There must be men in every camp who, at some time, have suffered from enteric or allied

disease, and have become carriers; if their excreta be exposed to insects, such as flies, which have faeces for a breeding-ground, the flies will become infected and act as carriers by their habit of passing from faecal matters to food-stuffs.

Here, then, where the general movements are known, all flies have to be taken as carriers, and one must do one's utmost (1) to prevent fly breeding; (2) to kill all flies when found; and (3) to protect one's food-stuffs, latrines and infected patients.

(a) PREVENTION OF BREEDING OF THE HOUSE FLY.

All fermenting organic matter is suitable for fly breeding. Instinct has provided the fly with the habit of depositing her eggs in decaying substances which contain heat and moisture, and a manure heap is the best example of a fly breeding-ground, for once manure is well infected the total weight of the different instars or stages will weigh over one-third of the weight of the manure, and the number of flies the progeny of one female during a season amounts to millions and is inconceivable. Major Ainsworth has referred to the length of life of the different instars of the house fly and how they vary according to temperature. Here in Rouen the manure problem is a big one, for during the rainy season both carting and burning to any extent gave poor results; the resulting accumulation can be gauged when one knows that the daily output of horse dung is roughly a hundred tons.

The disposal of manure therefore is an enormous problem. If it were possible to sell this manure then no doubt it would be sold and so got rid of, but when there is a lack of transport and a paucity of farm labour the monetary value of the manure depreciates.

The manure is being dealt with in three ways:—

(1) Heaps are made of old manure, these are dusted with quicklime, covered with earth, and planted with hay dust and other seeds; the result will be mounds of grass.

(2) *Burning*.—As much manure is burned daily as is possible; presently incinerators will be built, which will greatly assist in the burning.

(3) *Dumping*.—A narrow-gauge train line has been laid to a natural depression, and here the manure is being dumped and will be covered with quicklime, earthed, and then planted over.

The above represents the work that is being done with reference to manure disposal; if any fresh manure cannot be tackled during the day, it will have to be sprayed over with paraffin, or with bleaching powder solution.

At the same time it must not be lost sight of that the house fly will breed in any collection of decaying organic matter.

(b) KILLING OF FLIES.

(1) By mechanical means—at night flies will shelter in buildings and tents; buildings such as hut camps can be sprayed with paraffin, tents

should be struck at reveillé, taking care to keep them closed, when the contained flies can be killed by rolling up the tents and keeping them rolled up till after the midday meal, when they can be once more pitched.

(2) *Fly Traps*.—These are of various kinds, but probably the best are those which are designed on an intimate knowledge of the habits of the fly. A fly requires water, and for the reason that it is unable to eat solids is restricted to a fluid diet, owing to its mouth parts consisting of a suction and not of a masticating apparatus. Every bit of food that a fly takes has to be dissolved in fluid, and a fly will invariably fill up with water prior to eating, its internal economy being so arranged that the fluid taken in is received into one organ, the proventriculum, from which it is pumped to and fro until saturation is complete, when it passes the fluid into its stomach; the practical application of this is that the normal house fly when it is not defecating is vomiting, and each fly speck may be contaminated with pathogenic organisms.

Now with this knowledge of the absolute necessity for fluids, the best trap is that of a five per cent. solution of formalin in a plate to which lumps of sugar are added; a stronger solution will be left untouched owing to its smell.

(c) PROTECTION OF FOODSTUFFS.

Dining-huts and cook-houses should be fly-proofed; this has been asked for, then all foodstuffs will be kept under cover and protected. The foodstuffs that require special attention are jam, butter, cheese and bread, all good media for bacterial growth. Even when fly-proofing is carried out, it is a good plan never to eat anything cold which can be eaten hot.

(d) PROTECTION OF LATRINES.

Here in latrines, as elsewhere, the great mucifuge is paraffin. The interior of buckets should be rubbed round with paraffin, the under surface of the latrine seats should be coated with the same substance, and the ground round sprinkled with paraffin from a watering can.

(e) INFECTED PATIENTS.

In tented hospitals which cannot be fly-proofed, the use of mosquito curtains is essential, otherwise flies will settle on a semi-conscious or unconscious patient's open mouth.

Passing now to the paratyphoids, these have shown an increase in incidence. In the last 100 cases of enteric group, typhoid accounts for 70, *Bacillus paratyphosus* B for 24, and *B. paratyphosus* A for 6 cases. These diseases have been spread by human carriers.

Other Infectious Diseases.—Scarlet fever, measles, cerebro-spinal meningitis, mumps, etc.

SCARLET FEVER.

In the civil population we have scarlet fever; the disease is conveyed by contact and by milk. Base Standing Orders and Routine Orders both refer to the prohibition of fresh milk in camps, yet little heed is paid to those orders by medical officers in charge of camps and less by units themselves.

MEASLES.

Here again we have a disease which is occurring amongst the civil population, but the cases which are cropping up are contact cases, and the only means of prevention are diagnosis in the early stage, i.e., coryza, with search for Koplik's spots, and insisting on strict segregation. That segregation is not properly carried out can be gathered from the fact that a man, isolated in one of the camps, with a sentry over the tent, was accidentally killed in the town of Rouen.

CEREBRO-SPINAL MENINGITIS.

This disease appears to have been imported. An epidemic occurred in the north of France about a year ago, and cases have also occurred amongst the civil population. The disease is spread by human carriers, the specific micro-organism being harboured in the nasal secretions. Isolation of contacts is essential, especially contacts of cases which have shown marked coryza in the initial stages. All such contacts have to be segregated until such time as their nasal secretions can be examined bacteriologically for the specific germ and a negative report rendered.

MUMPS.

This disease has been practically confined to our native troops, amongst whom it is prevalent; this is probably due to Eastern habits of hawking and spitting promiscuously, coupled with customs of food preparation in close proximity to fouled ground, as well as to a habit of eating out of a common dish.

TYPHUS FEVER.

With the prevalence of the body louse one must refer to the possibility of an outbreak of typhus fever. For this to occur one must have infected lice, and a careful investigation of the health statistics for the north of France for the last few years showed one case which occurred in 1913 at a village outside Havre. Our duty as regards the diminution of lice is not lessened by the above facts. Men coming into camp should be inspected, and when found infected should be treated.

Inspection for body louse: The most heavily infected part is the crutch, but as it is inconvenient to make a man strip, it is generally sufficient to examine shirts. These should be turned inside out, each side seam and the collar band, especially the surplus fold at the back of the neck, should be inspected for eggs, and the man's body examined for bites.

Treatment is both preventive and curative. All men should use the paraffin which is allowed for this purpose, which is both a preventive and curative measure. At present men suffering from lice are sent to hospital, and where one man in a tent is found infected, all the other occupants of the tent should be examined. When the disinfectors for camps and billets are finally built, each man will undergo the following treatment: He will undress in one room, hand his infected clothing and blankets through a window to the disinfecting room (foul side); he will then take a bath, and when this is finished he will pass into another room, where he will find his disinfected clothing. In billets the flat iron has been used with excellent results. Where clothes can be boiled, boiling in salt solution is satisfactory. The eggs are fragile, as they are operculated.

In conclusion may I say that when a case of infectious disease is diagnosed, the one course of action is to proclaim all the facts to those concerned, so that preventive measures may be carried out. Lessen by every means the number of carriers—human by the methods in existence, insect by carrying out all recommendations for their diminution. Where orders exist let us all carry them out with good will, and let us remember that ignorance of an order is no excuse. I apologize for having taken up your valuable time over simple facts, but as I have stated orders must be obeyed.

Lieutenant-Colonel McNAUGHT, discussing Major Ainsworth's and Captain Marett's papers, said that these officers had not claimed nearly enough for what the Sanitary Department had done during the past months, with a staff quite inadequate for the purpose. He congratulated them heartily upon the results that they had achieved. A great deal of the success was due probably to the fact that in the present campaign the sanitary officers and sections had much greater power than was the case in South Africa. The new Armies will bring many new problems, and a very great responsibility rested upon the sanitary officers concerned.

A point that the speakers had raised was the question of civilian appendages to camp and units. Colonel McNaught urged inspection of all such bodies, religious and otherwise. Frequently these organizations were left to take care of themselves, a source of considerable danger to all who came into contact with them. He remembered an instance in South Africa where two fatal cases of dysentery were traced directly to the civilian organizations in connexion with camps.

Referring to the question of prophylactic inoculation against typhoid fever, the speaker thought that much depended upon dealing with the matter at once in each unit, before the men could be prejudiced against the value of the measure by certain of their companions.

As regards sanitation at the actual Front, we have so far undoubtedly had great luck. This good fortune cannot be expected to persist

unless the most stringent measures are enforced and obeyed by all concerned.

Captain TATE observed that as an ex-sanitary officer and one who had seen the work at the Front, he was very interested in Major Ainsworth's and Captain Marett's papers. He referred to the extreme importance of dealing effectually with the clothing and equipment of men who have contracted typhoid fever. In Lahore he had had a striking example of this. An outbreak of enteric occurred in a cavalry regiment, and in spite of all precautions cases still kept appearing, in spite of all regulations. It was discovered eventually that the infection persisted in the clothes of the attendants upon the first cases in the epidemic. At any rate, whether *post hoc* or *propter hoc* no fresh cases occurred when the kits had been thoroughly disinfected.

One of the speakers had referred to the importance of flies in the conveyance of typhoid infection. Some years ago Captain Tate had conducted experiments to ascertain the true value of this statement. Flies were fed upon infected material and six days later typhoid bacilli were recovered from them. Referring to his experience at the Front, the speaker observed that in September, on the Aisne, flies occurred in myriads. It was really providential that no outbreak of enteric fever then occurred, inasmuch as "carriers" must have been present. In a village adjoining where he was stationed the most appalling insanitary conditions prevailed. However, an incinerator was eventually established and the whole village thoroughly cleared in spite of the attentions of German "snipers." To keep flies away from latrines he advised that the floors be composed of a solid mixture of sand, petroleum and tar. He had seen latrines so constructed and no flies ever occurred in their neighbourhood.

Colonel B. SKINNER said that for the last fifteen years the policy of the Army had been to strike at the root of this matter by educating each individual. With regard to the question of sanitation, combatant officers had been instructed and it was their duty to instruct the men under their charge. The result was that when the present Army started its campaign no army was better equipped in knowledge of sanitary science affecting the field. These men, however, had now been expended. In fact not more than about half were left. What would happen, therefore, with the new Army now arriving in France? Matters were on an entirely different footing. The officers, indeed, had in most instances had no training at all in sanitation. The result must inevitably be a large increase in the amount of disease, unless the Medical Service came to the rescue. The medical officer alone could save this Army from the epidemics that threaten it. Information must be spread broadcast by all concerned, and unity of action is most important at the present time. In matters of sanitation well established lines must be adopted and carried through. Diverse opinions and controversial discussions at the

moment should be "taboo." It is only in this way that the lay mind can be defeated. Superstition in the lay mind is a very strong factor, especially in matters relating to sanitation. The speaker cited particularly the question of aerial-wise infection, and the hold that this has got upon the lay public. Therefore unity both in statement and action of the medical profession is a factor of all importance. A few simple rules, learnt from experience, must be adopted on all sides. It is not the time to be original. In fact in matters of sanitation there is not much scope for originality. The medical officer should work on broad lines and spread his knowledge broadcast.

Referring to the question of prophylactic inoculation against typhoid which had been raised by one speaker, Colonel Skinner advocated immediate action, even if troops were on the move. If it was certain that a regiment was travelling on the morrow then no time should be lost in inoculating the men, even if it involved an inoculation on the eve before the journey. The full dose should be given under such circumstances. He quite agreed with Colonel McNaugh's remarks on this subject. The motto should be "strike at once."

