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## Sanitation in War

BY DR. JOHN A. AMYOT.\*

AT a special meeting of the Canadian Club, on the 19th October, Dr. Amyot said:

*Mr. President; Members of the Canadian Club*,—Allow me to thank you for the opportunity you have given me now of addressing you on this particular subject of Sanitation in War.

In the British Army organization, one important branch of the work is that of looking after all that which we know as the Army Medical Services. They have a very special function to perform, that of looking after those that are sick and of trying to stop infection from those who are sick to those that are well, and of attempting, as far as possible, to prevent those around about the army and in connection with it who happen to be sick from transmitting certain kinds of disease to the army, in which we expect every man to be able to go on the fighting line. The sick soldier is an encumbrance. When the soldier starts out, practically, humanitarian views cease, so far as the relation of the officers to that man is concerned. You find the officer and those in charge do their best to try to keep this man in good health, but the soldier after all has to put everything else aside: he is there to fight for the cause, he is ready to give up his life for it. Just as the British Admiralty had to censure those who came to the rescue of the one vessel which had been torpedoed, because they let humanitarian feelings come into play and lead them to go there to help those sinking; but what did they do? They drowned all their own men by doing it! They got into danger, got torpedoed and destroyed. If they had remained away, probably only one-third of the number would have been lost. Great damage was done. To you who take the humanitarian view that was the proper thing to do; it was heroic; but in war every man

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must be effective; you have to bring every man possible there. When they get sick, you have to try to get them better, so they can go out on the fighting line again. When they are wounded, you have to do the same thing, for you hope to get them out on the fighting line. When a man is wounded on the fighting line, and the fighting is going on day after day, if his wound is slight he just simply lies there alone in the shade, without help. The history of this war shows that many men were left for three, four or five days, with no one to help them.

Now, I come to speak of a few of the risks a soldier takes, when nothing can be done. The first thing to think of when an army is going into war is the object in view, and everyone has to take his risk. Now, when we have that idea in view, we have an explanation of what is done, and the means of handling the men and the application of sanitation is all done with one object, to bring the men up into the fighting line. You don't want a man sick, because if he is sick that means one or two men to look after him; it means getting him into a wagon, and that wagon is going to be hindering the rest of the army, in its mobility, its means of getting about, in its advance or retreat—no, don't call it retreat—*withdrawing*. All the idea is to get the men there and keep them there in good health as much as possible.

Now, in the old wars the mortality from disease was terrific; the mortality of those wounded was also terrific. There was a time when if a man got his legs shot off or suffered other serious injury, ninety per cent. of those so wounded died. At the present time, applying Lord Lister's methods, based on old Pasteur's discovery, that horror is reduced. In the ordinary books, when you would read of a man getting wounded, just as regularly you would read of fever coming on, infection took place, the man tumbled about, became unconscious, and died of infection, or of gangrene. The mortality of the men would go up to ninety per cent. Those men would not go back to fight. But the present methods have reduced the mortality immensely, and in the case of injuries to the lower extremities, unless large arteries are torn and hemorrhage sets in so that the man bleeds to death, if we can get men over that stage, at the present time the mortality is as low as five per cent. Most of those men are able to go back into the fight. In the case of wounds in the upper extremities, a man can ordinarily get back. So it is of immense importance, that we are saving suffering and bringing men back into the fight.

Now, as to infectious disease. Men do suffer from all kinds of infectious diseases when they get grouped together. In each community you have to fight them all the time, but as soon as you crowd men together this danger is increased a great deal. We have to realize that the men must start and be kept in as good condition as possible. In order to prevent disease, you must have good men, and one of the first things is to have proper recruiting done, and a proper examination made of the men who are to be soldiers and to go forward. Often we hear of recruits who go up for examination who are turned aside, very much to their sorrow. They complain very bitterly of the army officers, and don't think they should be rejected. All they had, perhaps, was that the arch of the foot was down, the arch was not good, or the toes were a little crooked. But it is humanitarian to refuse such men, and it is material to refuse them so far as the army is concerned. A man with a flat arch can't walk, and soldiers are required sometimes to walk forty miles. Mind you, soldiers are going to be driven to the limit of human endurance. Have you ever gone twenty-four hours without food? You think then you are going to die! But think of going twenty-four hours farther, and walking all that time, too! That is what the soldiers have sometimes to do. If you think you can't walk any more, the sergeant is going to kick you and make you go on again, for twenty-four hours again. That is what war means! To meet that condition, the men are using everything in them, to the last ounce. A man that falls out, that can't stand the pace, becomes a straggler, and then a prisoner. Others have to hold back for him. So they can't let him into the army.

Take another man, with varicose veins: he is going to have pains in his legs, so he can't walk. A man with hernia, rupture, can't be taken, because he can't carry the load. In the exigencies some day he is going to have that sort of man is going to drop down and be sick. Sometimes they can patch him up for special service, but for regular work, unless they have to take men hurriedly he must be rejected. A man like that may be good in civilian work, but not in army work. Only the man with a good heart in him, that can be pumping blood vigorously through his body, can be taken. He has to carry from sixty-five to eighty pounds on his back, besides walking all those miles. If you have ever tried to do that you know the feeling. A soldier has to do it. If he can't do that, he should not be there. So you have to make that examination of the man.

Then we have to see if he shows sign of skin diseases, for the comfort of the rest of the men. First, skin diseases due to insects. Soldiers come back more or less lousy, and we have to try to keep them from that. It is not a laughing matter, as Col. Brock says. Decidedly it is not! That is one of the difficulties we have to meet.

Then we must see that the man has no teeth out, but has good teeth. Some day he will have to eat hard tack, or cold raw turnips, anything at all, even grass or roots. If he has not good teeth in his head he can't do that. A man that has not good teeth suffers from indigestion and stomach troubles. That man can't walk and do good work.

A man that can't see well is useless with a rifle, either to protect himself, or to do harm to the other fellow. If a man can't hear, he also is a clutterer. So in these things we have to see that the man is all right; we have to protect the rest of the men.

Then we have to limit ourselves in choice in the matter of age, with a view to resistance to disease. Men under forty-five are chosen, as those over that age have not the same resistance, and so they have to be rejected. Men are taken at an age superior to that when there is absolute necessity, or for special services. The thing is to get the healthiest men you can get.

Now, having got that healthy man, the Army Medical Service must be prepared to try to protect him from disease. A medical man is put in charge of every unit, whether an infantry batallion, or a cavalry regiment, or an artillery corps, or an Army Service corps, a medical officer is there to watch over the health of the men. He has his assistants. These look after the men every day, keep track of them, and if they find any individual that is sick they go to the medical officer with him. If he is sick they send him to a field hospital. If they find the man has fever, if it is a febrile case, he is probably sick from some infectious disease, or if it is just an ordinary cold, that is transmissible to the men; or if it is sore throat, or inflammation of the nasal cavity, that might lead to pneumonia; this man is isolated. These are picked up twice a day. The medical officer looks over them, sends them to where he can keep them under observation. You may think an ordinary cold does not mean very much, but an ordinary cold is serious among a group of men. You know how you feel yourself with a cold, especially if it is a severe one. Suppose five hundred men have colds, there is not much courage in those men until they are driven to the limit! But this man is not efficient, so you try to prevent colds from

developing. Sometimes measles, scarlet fever, or diphtheria arises from a cold. Measles is an ordinary disease, but it is extremely serious among groups of men. Under the conditions in which soldiers find themselves, their vitality is affected by lack of food, lack of rest, and mental conditions. So the object is to get the man back into camp, to get him well as soon as possible. At one time they just isolated him, but now they adopt means to keep the disease from spreading.

Then when the men are down there, when they come to battle, the Medical Service has another work to perform. In the lines they have their own stretcher bearers and their own sanitary squad, who look around and see that the water supply is of the proper kind. They are under orders from headquarters to see what kind of water is used. The food is looked after, too. If food is thrown around it gets infected from insects, and boot-infected. The sanitary squad must see that the food is kept clean, and that the men drink from the proper kind of water supply. The headquarter's officers look after the ponds or the kind of water to be used.

When they go into action, a whole group of men are taken right out of the ranks to act as stretcher bearers. When a man falls, they render him first aid, if he is bleeding they try to stop it. They put him behind the line, but they do nothing more. Sometimes they cannot even do that. You have seen pictures of these trenches, and you can understand that there are times when you can't go out and take the wounded men back. But where they can be taken, they are taken out behind that line. Then a second group, of ambulance men, St. John Ambulance men or stretcher bearers, take these men up, and carry them back to a dressing station. Each man in the army has a little package of dressing pinned in his tunic, and when he is wounded, if he can put it on himself he does so, or if not his companion does it for him. But if that is not sufficient, he is taken to the dressing station. There they get the men into little groups here and there, and as far away as possible from the firing line, and get them dressed. The ambulance men collect these groups and take them to a little hospital. From five or six of these distribution points they are gathered to one point, and from there are taken up and carried by ambulances to the clearing hospital. Those with certain kind of wounds are left behind, others are moved to the stationary hospital, twenty miles from the lines, and then to the cities, and sent back home.

These are the arrangements to look after the wounded. The general order is given not to treat a man on the field any more than is necessary, but to give only temporary treatment.

There was a time when if a man was shot people would start after the bullet; now, unless a piece of cloth has gone in, or unless it is doing some damage mechanically, they leave the bullet there. The Japanese give the order not to perform any major operations on the field at all; many of the wounds are just temporarily dressed, or not dressed at all till the men were got back to Japan; the idea is to get them back on the line as soon as possible. Their losses, owing to their antiseptic, clean surgery, and by the practice of these methods, were very small.

Now, as to infection, we have other things to guard besides what I have mentioned. When an army goes into the field, it has to get a water supply here, there and everywhere, from springs, streams, lakes, sometimes only a little pond. When men are thirsty they are inclined to drink from any kind of supply. Now in an inhabited district, when it has to be taken from the ground, practically all these open supplies are dangerous. So the Army Medical Service has to see that none of that water is used unless it is purified. Mind you, many times they are purifying water which is already pure, but it is a great deal better to do that than to take risks, so it is better to start right in and take for granted that it is impure. So they have water boiling barrels, screens, filters, and chemicals to disinfect, including our old friend chlorine (laughter), which is very useful and successful. You can supply the men with good drinking water with difficulty, and sometimes you fail, but ordinarily, though it may not be palatable, yet they will not pick up diseases from it.

As to the things they may pick up from water,—well, there is typhoid. There were in the Spanish-American War, at Jacksonville, ten thousand men, and there were 2,600 cases of typhoid. Yet they had only 100 or 150 that died from bullet wounds out of that lot; there's how that cluttered them. It is an extremely serious thing. Typhoid means that the man is put back, needing a whole corps to look after him. Every man down is an encumbrance to the rest, and he is a cripple often for life, and carries back infection. Around Boston and Washington there are inheritances yet which they are not yet able to drive out, from typhoid contracted during the Civil War, and that was a long time ago. You can't tell where you have somebody carrying around typhoid bacteria: a person may be found infectious sometimes two or three weeks before the disease has showed itself. Those who have typhoid and recover from it may be infective, often for six months, or two years, or even twenty-five years after, they may carry the

infectious agent in the intestine. The more people are grouped together, the more danger there is. And an army may suffer from its own men, or from those people who are around it.

Another disease is para-typhoid, which is spread the same way, its infective agent being in the intestine, and it is taken from water.

During the Balkan War Asiatic cholera got into Turkey. When our men go there Asiatic cholera is probably one disease they will have to face. That, like typhoid, brings its man down, but it is far more infectious, because, besides the intestinal discharges, the infection is spread all around, the organisms get into the food, being carried there by flies, and everything around becomes infected. So where Asiatic cholera breaks out the terror is worst. Think of its effect on the morale of the men. That was one great trouble when the Americans tried to build the Panama Canal, as when yellow fever broke out they could not keep the people there. They spent more than \$30,000,000 for sanitary reasons that would never have been spent had it been that people would go down there, but they were panic-stricken. The same thing occurs when Asiatic cholera breaks out. The mortality from typhoid is about 10 per cent., but from Asiatic cholera it is 65 to 85 per cent., and in armies sometimes even higher, for nearly every man who goes down dies from it. That is one of the things from which you have to guard the water supply. It is a disease chiefly through organisms, and from flies getting at food. Then in typhoid, unless special caution is taken with stools from persons afflicted, infection gets into the water supply, as men are liable to walk on it, so you have to watch it all the time. These organisms are exceedingly small.

Besides that, there is dysentery, a tropical disease, bloody diarrhoea, due to the *shiga bacillus*. Fortunately there is not much of it here, but in Europe they have it. That disease lowers a man extremely, and it has a very high mortality. It is spread just as typhoid is.

Then unfortunately, among those diseases which are enemies of armies, and have wiped whole armies out up to this time, there is bubonic plague, the plague in Central Europe. They have been able, by strenuous efforts, to keep it down, but it is a terrific disease. It spreads as typhoid by contact from one to another, by infected food, by water becoming infected, and then when rats are infected by it and suffer from it they go long distances away, and men are infected. These organisms spread through the body of the rat and all the fluids in it, and

fleas jump off the rats and go more and more off and away, and these fleas, biting individuals who are susceptible, produce the disease. So there is that additional danger they run.

Then there is the disease of typhus. Many of you remember the "ship disease," of which immigrants died here in Toronto and all the way to Quebec. That is a disease spread by body lice chiefly. That is the reason we have it as a ship fever, or camp fever, or prison fever, where people are huddled together. How many of our jails are free from lice? So in camps. And how many ships, where people are herded together, are free from it? Where the disease gets in, it is not spread much by contact, but by biting.

Smallpox is another disease, not the kind we have here—we have been fortunate,—but the smallpox of the continent and in armies of the kind they used to have, when 300,000 were killed in London in one year alone,—that is the kind the army has to fight.

You will say, "Are there all these terrors?" If sanitary laws could be carried out among armies, they could be kept in control, but there are difficulties in the way. The diseases are often due to organisms which are present in discharges from patients, and these infective organisms are spread by means of drinking cups, fingers, infected food, flies getting on to food, infection getting into water supplies, and thus being spread in these ways often long distances. The work of the sanitary squad is to prevent this transmission.

In this particular war we are not dealing with armies as they would ordinarily be: they are made up of everybody you can get, and these are rushed into camp and trained as well as possible in a short time, and put on the fighting line. This is a war of every citizen, it is not a soldiers' war this time. You can't hire soldiers, but everybody has to go into it. It may come close enough to us before it is finished: it may be that it will be necessary for everyone in this room to get up and fight. That is the way it is with them in the Old Country, and in Belgium and France. In France, from house after house, father, son, everybody in the house is gone to the war, whole streets are depleted, everyone between twenty and forty years has gone to the front. It may happen, before this thing is done, we might have to do the same. With army organizations such as we have in this war there are difficulties in the way. With trained soldiers you can say, "Do this thing," and it is done; there is not the same difficulty. But now we have to have a whole lot of consideration from one to another, and we must have some means of trying to control the transmission of dis-

cases. Fortunately we have men handling most of these severe diseases. The first one is smallpox. Every soldier, I was going to say, in a civilized army, is vaccinated against smallpox. All our Canadians of the first contingent are, probably to a man, vaccinated against typhoid fever, with the hope that when they come into conditions that they could not avoid or control, vaccination will protect them, as others have been protected. We have done it with that end in view. If bubonic plague brings down any of our men it will have to be resorted to for that also, and so with Asiatic cholera. Not always the whole army has to be vaccinated, but those operating in that direction where there is danger. Fortunately we have something that is extremely effective and useful in the method of vaccination. We have even vaccination against dysentery. So these methods probably will have to be used.

You will say, perhaps, "Why all these precautions? Is it as serious as that?" Well, let me give you some figures with reference to outbreaks, and the difficulties which armies up to the present time have had to face. I will mention a few examples, and these can be easily seen to prove the value of sanitation. For instance, in the French forces in 1809 there were 240,000 men, and at one time as many as 58,000 men were in the hospital, whom they had to consider in any movements they proposed. One-fifth of them, practically, there in the hospitals! You can see what an encumbrance that was. And a great proportion of them died. Among the British, in 1812, of 30,000 men, 11,000 were in hospital, many of those with extremely serious diseases, who afterwards died. At the siege of Saragossa, in 1809, among the Spanish and English, the loss, on the average, was 400 to 500 men a day, not from wounds at all, but from disease. That is what armies have to face! During the Crimean War, in 1854-5, in six months, from October to March, there were 52,000 men in hospital, but only 3,800 of those because of wounds, the rest because of disease; just as fatal as wounds, and much more painfully fatal, too. During the American Civil War, of the northern army 102,000 men were killed or died of wounds, but there were 201,000 who died from disease. In our South African War, there were 12,669 men and non-commissioned officers who died of disease, and 7,000 from wounds. Among the officers there were 712 in the same time died of wounds, and 404 from disease: you see the better conditions under which they were saved them.

Now, things have changed somewhat. During the Russo-Japanese War, following the rigid sanitary precautions which the Japanese took, when it was possible the common soldier

took a special bath before he went into battle, and at its conclusion took another. (Applause.) So if he was wounded, there was less risk of infection. The food they took was prepared for them in little sealed packages, for every man individually, it was not thrown or shoveled to them, but put up in individual parcels. The water they drank was purified, as much as possible,— there are times when you can't do this. They vaccinated the men as much as they could. And then great precautions were taken with wounds. Thus the conditions were reversed, and instead of having a bigger proportion of men killed by disease, or dying from disease, we find the high mortality due to wounds. The thing was practically reversed: only about one-fourth of those who died, died of disease. The Russians did the same thing. We have to give the Russians credit for their organization, and the minimum of loss resulted. The mortality was in the same way about one from disease to four from wounds. And remember, too, that the fighting was carried on, a lot of it, in midwinter. You remember that the battle of Mukden was fought for ten days, and at no time was the temperature warmer than 4 below zero! The men could not lie down, but had to keep moving. Just imagine the limit of human endurance! What a lowering of resistance, and what hardship they went through. Instead of as in other cases, 12,000 dying of disease and 7,000 of wounds, we find it the other way about, say 1,000 men killed by disease, and 4,000 by wounds. The whole thing is reversed, and there is no reason why that should not be reduced even further.

In the war such are the conditions our poor fellows are going to face. That is the condition the sanitarian has to face, and it is a very difficult one. I thank you, gentlemen, for your attention. (Applause.)