HYGIENE PROBLEMS OF
THE CAMPAIGN IN NORTH-WEST EUROPE—1944-45.¹

A REVIEW.

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The following quotation is from a lecture given by Field Marshal Montgomery to the Royal United Service Institution in London on October 3, 1945.

"No account of this campaign would be complete without some mention of the truly remarkable success of the medical organization. But it must be remembered that there were two factors which contributed greatly to the results achieved; probably no group of doctors has worked on better material and, secondly, they were caring for the men of a winning army. The men of 21 Army Group were fully immunized and fully trained; their morale was at its highest; they were well clothed and well fed; they were fighting in a climate to which the average British soldier is accustomed; hygiene, both personal and unit, was exceptionally good; welfare services were well organized. The exhilarating effect of success also played its part in reducing the rates of sickness."

The various factors contributing to the "remarkable success of the medical organization" have been described from the purely medical and surgical aspects by Bulmer (1945) and by Porritt, Debenham and Ross (1945). But,

¹A thesis submitted for the Degree of Doctor of Medicine of the University of Edinburgh and published with their approval.
apart from articles on isolated incidents such as Belsen, no attempt has been made to give an overall picture of the preventive medicine and epidemiological aspects of this campaign.

**History.**

Very briefly, this can be divided into four phases. The overcrowded Normandy Beachhead and its gradual enlargement were associated with unpleasant weather, dust, flies, and large-scale destruction of towns and villages.

Water supplies and sanitation were therefore of the greatest importance and were tackled energetically from the very first day of the landings. The disposal of dead animals was also a problem in some areas, but not insoluble when flames, explosives and bulldozers were available.

The **Second Phase** started with the leaving behind of the Falaise "pocket" with its masses of enemy dead—human and animal—and covered the rapid advance across the Seine to Antwerp, Brussels and Nijmegen.

The **Third Phase** covered the autumn of 1944 and the winter of 1945. Snow, bitter cold and heavy rain were experienced in Holland, Eastern Belgium and across the German border.

Operations in the Reichswald Forest became, of necessity, amphibious in places but the advance went on towards the Rhine.

Finally, there were the Rhine crossings and the rapid advances to the River Elbe and the Danish Border. This period covered the disintegration of the German Army in a completely disorganized society in a devastated country, the uncovering of the horror camps of Belsen and Sandbostel, and the disposal of vast numbers of ex-prisoners of war, displaced persons and refugees. The problems involved will be discussed in subsequent paragraphs.

**Preparation and Organization.**

It has been already stated that the men of 21 Army Group were fully immunized and fully trained, and that they were well clothed and well fed. Immunization was provided against typhoid, paratyphoid, tetanus and typhus. The results speak for themselves for only twenty-five soldiers out of the whole Army Group contracted typhus and only one outbreak of enteric occurred.

Experience in the Middle East had emphasized the great part which hygiene played in reducing the incidence of disease and units from that theatre were definitely "hygiene conscious." Units leaving England for the first time had not had this experience other than on short exercises, but their water and sanitary duty personnel were fully trained, and their divisional field hygiene sections were always on the spot to give help and advice. Clothing, equipment and feeding, although not on a lavish scale, were very satisfactory throughout the campaign and for the organization of these supplies great credit is due to the Royal Army Service Corps and Royal Army Ordnance Corps.

The organization of preventive medicine in B.L.A. was built up on experience of past campaigns. As the most forward R.A.M.C. representative,
the Regimental Medical Officer was responsible both for the health of his men and for their treatment when sick or wounded.

To assist him, Field Hygiene Sections were provided on the scale of one per Division, with additional sections at Corps and Army level.

A.Ds.H. at Corps and Army Headquarters supervised the work of these sections, whilst field sanitary sections were employed at Base and L. of C. under the supervision of D.A.Ds.H.

Overall direction of hygiene matters rested with D.D.H. at Army Group level, and he also controlled the mobile hygiene and bacteriological laboratories.

In practice this organization worked well. All sections were fully mobile, moving with their formations; and although perhaps wasteful of man-power in some respects, the organization ensured that hygiene problems could be dealt with immediately they appeared.

**Practical Aspects.**

(1) *Water Supplies.*—As might be expected, the provision of adequate supplies of water for drinking, cooking and ablutions was not a serious problem in N.W. Europe.

There was always the possibility that the enemy might use poison gas or, alternatively, poison the water supplies. Fortunately this did not happen although R.E. and Medical Services were fully prepared to deal with it if it had occurred.

Certain other difficulties did however arise.

In the confined Normandy Beachhead the rivers were few and their water used by very large numbers of troops. Close supervision was essential to prevent their becoming so polluted that they were unfit for drinking even with the treatment facilities available. In parts of Belgium waters with a very high iron content made chlorination difficult. Freezing of filters had to be closely watched in winter. Bombing, whether our own or the enemy's, was always liable to affect civilian supplies which were so largely drawn upon.

The methods used for sterilizing water were as follows:

(a) Every soldier who required it was issued with a water sterilizing outfit containing Halazone tablets and detasting tablets. A Halazone tablet liberates 4 parts per million of available chlorine, and one tablet will sterilize the contents of the soldier's water bottle. There is some loss of potency with storage, but the tablets were checked from time to time, and orders for the insertion of two tablets given when necessary. With such a water-sterilizing outfit the soldier was not dependent on water trucks or jerricans, when in forward positions where movement was difficult or impossible.

(b) Water trucks of 200-gallon capacity complete with testing boxes, filter powder, water sterilizing powder and taste remover tablets were supplied to battalions, regiments and units in accordance with their War Establishment. These trucks were fitted with power-operated pumps and Stellar filters and had a filtration capacity of 400 gallons per hour. Water tank trailers of 150-gallon capacity were supplied to some units, but their pumps have to be operated by
hand. This is a tedious business and such trailers were filled at R.E. water points whenever possible.

(c) R.E. water points were usually sited in Corps and Army areas, and were either mobile (trailer type) or static chloraminators. Mobile chloraminators have a capacity of 3,000 gallons per hour; static ones a greater capacity depending on the number of chloraminators installed at the point. The sterilized water was collected from these points in trucks, trailers and jerricans.

(d) Jerricans were also used by small units or detachments. The procedure was to fill the 4½-gallon jerricans from the best available source and treat the contents by gross chlorination with water sterilizing powder followed by detasting tablets.

Unit medical officers and personnel of Field Hygiene Sections kept a close check on the sources from which water was drawn and on the methods of treatment which were employed. Results were most satisfactory and no outbreak of waterborne disease occurred throughout the campaign. Some few cases of enteric were probably caused by drinking impure water or cleaning teeth with it; but these cases were always the result of negligence on the part of the individual and were not due to any lack of sterilized water.

(2) Sanitation.—The provision of latrines, disposal of refuse, sullage, and effluents from mobile laundry and bath units followed the accepted Army principles and call for no special comment. Continuous supervision was exercised by sanitary assistants, the amount of supervision that was required varying inversely with the efficiency of a unit.

(3) Rations and Feeding Problems.—During the period 1939 to 1944, the Army gained much experience in the provision of rations suitable for different types of operations and climates. As a result of this the troops operating in N.W. Europe received the following types of rations:

(a) The Twenty-Four-Hour Ration Pack: This contained biscuits, oatmeal blocks, combined tea, sugar and milk blocks, chocolate, boiled sweets, chewing gum, meat extract cubes, salt, sugar and latrine paper. This ration weighed 2 lb. 3 oz., was packed in a waxed cardboard carton, and gave a nutritive value of approximately 4,000 calories. A solid fuel cooker for preparing this ration was an individual issue to each man, and 20 cigarettes were issued for each forty-eight-hour period. As a landing or assault ration to be consumed for not more than ten days it was very satisfactory.

(b) The Composite (14 Men) Ration Pack: This pack was produced to cover a period of up to six weeks between the landings and the introduction of the ordinary field service ration. It was made up entirely of tinned commodities with variations to allow for a daily change of diet throughout the week. Seven varieties of “Compo” were available with biscuit, and three varieties for issue when fresh bread was available. Cooking facilities must of course be available under unit arrangements. The Compo pack with biscuit provided approximately 3,590 calories per day, and the Compo pack with bread approx. 3,520 calories. Compo packs were well liked at first, but as the weeks went by the variations appeared to decrease, due either to difficulties in supply or to lack of imagination. The chief complaints concerned the number of stewed
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meats and puddings which had a high fat content and which to many became unpalatable in summer, whilst biscuits were a very poor substitute for bread when eaten over a long period.

(c) Field Service Ration Scale: This scale succeeded the “Compo” period and was very similar to the ration provided for troops in U.K. Owing to difficulties in supply or local procurement there were variations in the issues of fresh meat and fresh vegetables, but on the whole it provided an adequate, balanced, and reasonably attractive menu. Allowing for 5 per cent waste it provided approximately 4,080 calories, and a supplementary ration of 400 calories was available for troops working under arduous or exposed conditions. 3,400 calories were provided for Women’s Services.

(d) Self-heating beverages (soups, cocoa, malt milk) were also available and invaluable for troops holding difficult or waterlogged positions, or under conditions of extreme cold. Armoured fighting vehicle packs and airborne packs were available for special purposes, as their names imply, but lack of space prohibits a detailed description.

Milk was provided as tea, sugar and milk mixture, or in tins or powder form. If bought in the raw state from farms, orders were issued that it must be boiled before use. Orders were also issued prohibiting the purchase of shellfish and ice-cream with the object of keeping the incidence of intestinal diseases to a minimum.

(4) Personal Hygiene.—Realization of the importance of personal cleanliness in promoting general bodily health and preventing skin diseases is now widespread throughout the Army, and unit commanders are aware of their responsibilities in this matter. Bathing and laundry arrangements for the troops were based on the provision of mobile laundries and bath units (M.L. and B.U.s). M.L. and B.U.s were under command of Corps but during operations one worked for each Division. In theory each M.L. and B.U. could provide a clean issue of underclothing and a shower bath for every soldier once a week. In practice this was not always possible because of operations, but as the bathing unit could operate in four separate sections, and extensive use was made of pit-head baths and improvised showers, etc., it is probably fair to say that on the average every soldier would have a bath and a change of underclothing every ten to twelve days, or more frequently than that. In addition to ordinary laundering, the M.L. and B.U.s impregnated shirts with A.T.S.O., a solution of D.D.T. (dichlorodiphenyltrichloroethane) which would kill any lice hatching from eggs. Anti-louse powder (A.L. 63) containing 5 per cent D.D.T. was also available for sprinkling on underclothing and rubbing into the seams of shirts, etc. The result of these efforts was to reduce louse infestation to a negligible figure; and of the cases of infestation which did occur, the vast majority were due to P. pubis. The incidence of skin infection was also kept well under control.

Before leaving the subject there are two points worthy of mention, and criticism.

The first is soap, of which 2 ounces had to be bought from N.A.A.F.I. every fortnight. This was insufficient for those soldiers employed in dirty
jobs, and there was sometimes delay in its distribution. Two ounces of soap per week were available as an Ordnance issue for troops to do their own washing where M.L. and B.U.s were not available. As might be expected, drying of this laundry under field conditions was often difficult, although many units were able to make improvised drying rooms when operations permitted. Some use was made of hot air disinfestors which had fallen into disuse with the introduction of A.L. 63, both for drying of laundry and for drying the clothing of the infantry soldiers returning from the front after periods of bad weather or the occupation of waterlogged positions.

The last point of criticism is "ointment prophylactic," issued to mechanics and fitters for the prevention of dermatitis. It was rarely available in sufficient quantities.

(5) Effects of Cold.—In the War of 1914-18 the incidence of trench foot was 0.503 per thousand. In the period under review (1944-45) it was 0.049 per thousand, although it would probably be more accurate to-day to ascribe this incidence to injuries due to cold. This low incidence is really rather remarkable, for it is much lower than that experienced by the Americans fighting under similar conditions and, so far as could be ascertained from interrogation of prisoners of war, very much lower than that of the German Army. The condition occurred mainly (a) in the Ardennes when snow and intense cold prevailed, where British troops were waiting for rather than engaging the enemy. Two-thirds of the cases reported there were very mild and, after treatment in forward medical units, returned to duty; (b) in the Reichswald Forest offensive between the Rivers Maas and Rhine. This offensive was conducted through half-flooded or waterlogged country, and in some places it became an amphibious operation. It is not possible to discuss the effect of cold in detail in this article, but the measures taken to combat them may be summarized as follows:—

(a) Tactical Handling of Troops: Periods of alternating activity and reserve in an advancing front; or the withdrawal (as frequently as possible) of all elements for purposes of warming during periods of intense cold.

(b) Foot Drill—Foot Inspections: The frequent massaging of the feet either by the soldier himself or a companion. Constant movement of toes and feet when in a static position. The use of foot powder and foot soap; both were issued when conditions indicated it.

(c) Socks: The superiority of the British sock with its higher wool content; its frequent changing when wet for dry socks carried by the soldier, or provided for him by the use of improvised dryers.

(d) All-Leather Boots: The provision of sound, well-fitting, and welldubbed boots. Rubber boots worn with two pairs of socks were especially valuable for sappers, sentries and signals personnel.

(e) Canvas Anklets: Although not giving the same protection, did not constrict the legs and circulation like puttees or leggings.

(f) Dress: Woollen battledress combined smartness with warmth and
looseness of fit. Leather jerkins or denims worn over the battledress gave increased protection without restriction of arm movements.

(g) Food: Troops could usually depend on one hot meal per day after the first day of the attack. This was brought from the rear areas in insulated containers and re-heated as necessary. Self-heating soup, cocoa or milk was also available, but the genius of the British soldier for "brewing-up" tea in almost any place or at any time of day (or night) undoubtedly played a very great part in the preservation of their morale and their physical condition.

(5) Training.—As the period under review was one of continuous fighting, and as 21 Army Group was within easy access of training establishments in the U.K., it was not considered practicable to establish a hygiene school in the theatre until operations had ceased. Field Hygiene Sections did, however, give courses of instruction in water duties and in sanitary duties when operations permitted them to remain in the same location for short periods. Casualties amongst water and sanitary duty orderlies were thus replaced by men from the same unit, and war establishments and reserves maintained.

General training in sanitation was also given in the L. of C. to a considerable number of low medical category Royal Artillery personnel. When trained they were posted to Field Hygiene Sections and proved of great value, particularly for work in D.P. and ex-P.o.W. Camps in Germany.

(6) Accommodation.—In the Normandy Beachhead all troops were in bivouacs in the ground or under canvas but, with the onset of winter and the occupation of Belgium, Southern Holland and the eastern border of Germany, units were scattered over a wide area. In this area it was possible to accommodate the majority of the "non-fighting" troops in schools, factories, houses, barns, lofts, etc., and to provide reasonable accommodation for fighting troops when they were withdrawn from forward positions for rest and refitting.

A scale of 30 sq. ft. per man was aimed at, and although local overcrowding was at times unavoidable, there was no undue rise in the incidence of droplet infections. It was necessary to enforce "black-out" restrictions throughout this period, and as "black-outs" were frequently improvised, ventilation before "lights-out" and the removal of screens, shutters, etc., was sometimes inadequate.

After the crossing of the Rhine in March, 1945, movement was almost continuous for many units and tentage was used again. For those units moving more slowly there were plenty of buildings available, and as these buildings were German, occupation was effected without formality. The chief problems associated with accommodation were as follows:

(a) Overcrowding: To ensure that there was no gross overcrowding and that the best use was being made of all available accommodation.

(b) Water Supplies: Some soldiers will always remain under the impression that if water comes out of a tap it is quite fit to drink. As it frequently came from a shallow well in an adjacent farmyard, it was important to ensure that chlorination by any of the methods previously mentioned was always carried out.
(c) Sanitation: In many of the buildings occupied, the sanitary arrangements were quite inadequate for the number of soldiers residing there. Deep trench and bucket latrines were often required to supplement existing facilities.

(d) Hygiene of Surroundings: This required constant attention, for, when units received orders to move at short notice, the sites they vacated were often left in a most disorderly state. Such sites, having been chosen for their suitability (cover, water, easy access, etc.) will inevitably be the choice of units following on, and will eventually become very foul unless all units keep and leave them reasonably clean. Occupation of towns which had been heavily bombed or shelled also brought its problems, and accumulations of debris, and damaged water mains and sewers required watching closely lest they became a danger to the health of the troops.

(e) Carbon Monoxide Poisoning: Experience in the B.E.F. in France in 1939-40 had pointed out the dangers of this insidious and often fatal type of poisoning. Despite repeated instructions and orders, cases did occur in the winter months of 1945, usually when troops advanced to occupy fresh billets and decided to install stoves of their own initiative. Such stoves were either improperly constructed or had defective flues, and these defects in combination with inadequate ventilation caused a number of deaths.

Civilian Features.

(1) Refugees.—In comparison with other campaigns, the refugee problem in N.W. Europe was a small one. In Normandy many civilians lost their homes, their whole village or the major part of their town (e.g. Caen). Others had to be temporarily evacuated. Corps refugee camps were established and movement controlled by Civil Affairs Staffs until more permanent accommodation could be found. Similar arrangements were made in the area between the Rivers Maas and Rhine. Destruction of property in this area was very great, and an enormous number of troops had to be packed into it prior to the Rhine crossings. Civil Affairs had by now changed its name to Military Government, and was a much more powerful organization. The local inhabitants (Germans) were assembled and kept in selected areas until such time as it was expedient to allow them to return to their homes. The mere mention of these two areas may give a false impression of the refugee problem, and certainly does not do justice to the work of the Civil Affairs and Military Government Staffs. For, wherever there is fighting, there are inevitably refugees obstructing the progress of the Army. The fact that such obstruction was minimal is in itself a tribute to the immense amount of work which these Staffs dealt with so successfully.

(2) Displaced Persons.—This problem started after the Rhine crossings, as the Germans evacuated their slave labourers from Belgium and Holland before the Allies reached their camps. Once across the Rhine there was neither the time nor the transport for further movement.

Officially there were two types of displaced person, although both types were nationals from other countries working in Germany either voluntarily or involuntarily. The first type came from Poland, Russia, Italy, and the
Balkans and the plan was to keep him as far east and as near his homeland as was possible under the circumstances. The second type came from a country west of the Rhine, and he had to be sent home just as fast as transport facilities permitted. The total number of displaced persons to be dealt with was over two millions. Transport was, of course, the great difficulty, for all the bridges over the rivers and canals had been "blown" by the retreating enemy: the R.A.F. had played havoc with Germany's worn-out communication systems: and the Army was still busy fighting the battle up to and across the Elbe.

A system of camps was therefore set up to hold the D.P.s until transport could be arranged for them. The camps were set up on the River barriers (Rhine, Weser and Elbe) with the idea of preventing the eastbound D.P.s from filtering to the west, and of retaining the westbound until they could be evacuated through organized channels.

The establishment of such camps for hundreds of thousands of people would have been an immense problem under peacetime conditions, and it can be well imagined that to establish and operate them in a completely disorganized country during a war was really a tremendous feat.

The difficulties of accommodating, feeding, housing and providing medical attention, water, sanitary arrangements, and bedding for such a mass of humanity must be left to the imagination. Accommodation was first priority and this was made available in barracks, camps, factories, houses or even whole villages. Other necessities, if not immediately available, were provided as rapidly as possible by staffs who worked all hours of the day and night. Fortunately it was summer, and the D.P.s flocking westwards from all over Germany were neither critical nor involved in an epidemic. Those due to go east could not be repatriated immediately but better accommodation was available for them once the Westerners had gone. During the whole of this period of repatriation and resettlement the Army Medical Services gave all possible assistance to the Military Government Camp Staffs. Field Hygiene Sections probably worked harder than at any time during the campaign, and it is very satisfactory to be able to report that there were no major outbreaks of disease, and very few cases in which infection was carried to countries outside Germany. Providentially "V.E." day occurred at the beginning of summer. Had it occurred six months earlier or later, this story of the D.P.s would have been a much less happy one.

Belsen and Sandbostel.

(1) Belsen is a name which will go down in history, and although much has been written on the medical and legal aspects it should be remembered that it was first and foremost a hygiene problem.

The first Army unit to enter Belsen was the 76 (Br.) Field Hygiene Section, and it spent the first night there under the “care” of the German guards, on April 15. Other Army units soon followed it, including the 30 (Br.) Field
Hygiene Section. Intelligence had notified 8 Corps of the existence of this camp, of the presence of disease, and of the failure of electricity and water supplies. No one, however, could have imagined the conditions which actually existed there; and these conditions could be neither believed nor appreciated by anyone who had not seen them with his own eyes. Approximately 38,000 men and women and 500 children were living under indescribably squalid and overcrowded conditions. The majority had lost all sense of moral values and cannibalism existed. There were enormous pits full of bodies, and more bodies lying either in heaps or singly throughout the two camps. Hospital accommodation was grossly inadequate, and typhus, enteritis and tuberculosis were widespread. Sanitary arrangements were practically non-existent. Even if they had been it is doubtful whether the inmates would have had the strength or decency to use them. It is not possible in this article to describe in detail the steps taken to deal with Belsen, but the chief problems were as follows:—

(a) Provision of drinking water: Twenty-seven water trucks were provided by the afternoon of April 16 as a temporary measure until R.E.s repaired the electrical and water supply systems.

(b) Provision of food: The R.A.S.C. arranged supplies from Military, Wehrmacht and Civilian sources. Initially, some of it was not suitable for the sick and starving inmates, but the best use was made of what was available.

(c) Disposal of the sick: Hospitals were opened in the neighbouring S.S. barracks, and all patients conveyed there were passed through a “human laundry” where they were thoroughly washed and dusted with anti-louse powder.

(d) Burials: Between April 16 and 30 approximately 12,000 were buried in Camp No. 1, and 500 in Camp No. 2 and the hospital area.

(e) Dusting with A.L. 63: Approximately 36,000 were dusted during the same period covered by para. (d).

(f) Bathing: Thousands were bathed by mobile bath sections and in bathrooms as soon as sufficient water was available.

(g) Latrines: 730 squatting type latrines each with four or five apertures were made and installed.

These paragraphs will give a slight idea of the difficulties encountered and overcome. The danger to those working in such camps is obvious, and will be mentioned in a later paragraph under “Typhus.”

(2) Sandbostel was a camp north-east of Bremen containing approximately 7,000 political prisoners and 15,000 United Nations P.O.W.s. Conditions were not so appalling as at Belsen but there were 791 cases of typhus, almost all amongst political prisoners. Much the same routine was followed as at Belsen, i.e. dusting with A.L. 63 after passing through a “human laundry,” attention to sanitation, and evacuation of the sick to near-by hospitals.

(3) The camps at Fallingbostel and Neuengamme were also very unpleasant places, but did not present anything like the same problems as existed in Belsen and Sandbostel.
EX-PRISONERS OF WAR.

During the period April 4 to May 4, 1945, 93,844 ex-P.o.W.s were uncovered in the British zone of operations in Germany. Of this total, 16,787 were from the British Empire, 4,270 were Americans, and the remaining 72,787 were of other nationalities, including Russians, Belgians, Yugoslavs, French, Polish and Italians. As their camps were uncovered, a plan similar to that used for displaced persons was put into operation. Collecting and transit camps were provided for the westbound ex-P.o.W.s, and they were accommodated, fed, given new clothing, and dusted with anti-louse powder whilst awaiting transport. Air transport was used on a large scale and, operating from airfields inside Germany, each plane had its complement of ex-P.o.W.s back in England within a matter of hours. Some few of these ex-P.o.W.s developed typhus after arrival in U.K., Belgium and France, but so far as is known there were no secondary cases. Repatriation of the eastbound ex-P.o.W.s was inevitably delayed until travel facilities with Russia, Italy, etc., could be established. These ex-P.o.W.s had therefore to remain in their camps or be moved into better accommodation. Their food, clothing, comfort and amenities were improved as rapidly as possible; attention given to bathing, camp hygiene, etc.; and regular dusting with anti-louse powder instituted. It was not an easy task to improve the lot of this class of officer ex-P.o.W., for many of them had done literally nothing for three, four or five years and seemed quite apathetic. In that respect they were worse off than the other rank ex-P.o.W.s who probably had a more unpleasant life, but they always had the stimulus of work and the necessity of fending for themselves. Many of these eastbound ex-P.o.W.s (and D.P.s) still remain in the British zone of occupation for political reasons. Discussion of their future is not within the scope of this article, but since the uncovering of their camps they have been a great responsibility for the Army from the hygiene and preventive medicine aspects, and it is only now (some months after V.E. day) that this responsibility is being taken over by U.N.R.R.A.

PRISONERS OF WAR.

This subject is mentioned because the number of P.o.W.s taken by 21 Army Group was very large, and their accommodation was often a considerable problem. The routine was that after capture, the German P.o.W.s were passed back to cages at Corps level and retained there for a short period until transport was available for their transference to Army and L. of C. Camps; or to the U.K. in the early days in Normandy. It was a hygiene responsibility to see that these P.o.W.s were efficiently "loused" with A.L. 63 at Corps level, and to ensure that the standards of food, water supplies, sanitation and accommodation in the camps were adequate. As the intake of P.o.W.s could never be estimated in advance, these standards often varied and were at times too low. In fact, when the cease fire was ordered on May 5 it was not considered advisable to put all the P.o.W.s "into the bag." They were therefore "sealed
off” in areas along the North German Coast and ordered to look after themselves (under British supervision) until demobilization could be arranged.

The Incidence of Disease.

(1) Enteric.—The mean monthly rate per thousand strength was 0·007 compared with a figure of 1·525 for the 1914-18 War. It would have been much lower but for an outbreak of B. typhosus infection which occurred in an armoured brigade in the early autumn of 1944. This outbreak has been described by Jordan and Jones (1945) and was a serious one. Of seventy-nine men and one Nursing Sister who contracted the infection eleven died. Complications and recrudescences were frequent. Despite exhaustive investigations and full use of a mobile bacteriological laboratory the origin of the outbreak was never discovered. It was made more difficult by the fact that the brigade changed its location and crossed the Seine before the first cases were finally diagnosed, and before it could be halted for full investigations to be carried out. Bulmer (1945) states “the efficiency of T.A.B. is not in dispute (our typhoid rate was 1/200 that of the B.E.F. 1914-18) but if patients are overwhelmed they will contract the disease, and apparently in an unmodified form.”

Dysentery.—Fortunately, almost all these cases were mild or very mild; many remained on duty, either treated or untreated, and few were evacuated to hospitals where bacteriological facilities were available.

August 5 to September 9, 1944, was the worst period, for during that time rates per thousand of 1·90, 4·57, 6·04 and 3·91 were recorded under the heading of “bowel complaints.” During this period the disease was largely spread by flies, but, almost certainly, to a lesser extent by food handlers. June and early July were unusually cold in Normandy and the fly season delayed. When it did arrive conditions were all in favour of fly breeding, for there had been intense fighting and great destruction in a small, largely agricultural area.

It is less easy to explain the incidence of “bowel complaints” which varied between 0·6 and 0·8 per thousand during December, 1944, and the following January and February. There were no flies at that time and the condition was more a mild gastro enteritis than a frank dysentery. Those cases which were examined bacteriologically yielded negative results, and this disease would appear to be similar or closely related to outbreaks which have been reported in the U.K. by Barnard (1945) and in America by Reimann (1945). Units affected did not experience an explosive outbreak and the possibility of any type of bacterial food poisoning could usually be excluded. In the absence of any proof of a virus infection, carriers may be held responsible.

W. M. Scott (1942) states that the persistence of dysentery in a normal community is sufficiently explained by the frequent occurrence of mild undetected cases capable of transmitting infection for a period of weeks, or even exceptionally, for some months, while leading their ordinary life. In addition to mild cases, dysentery carriers (and there must have been many after the Normandy epidemic) may continue to excrete the organism for
weeks after clinical recovery and healthy contact carriers are always found in any outbreak (Brit. Med. Journal, 1944). It seems reasonable to suppose that the incidence in winter was due to these factors combined with a diminishing immunity of the population at risk. Risk is the appropriate word, for sanitation and the hygiene of cooks, cookhouses, etc., cannot always be perfect during a battle. Under the circumstances chemoprophylaxis with sulphonamides seems justifiable, and its use is advocated in the Medical Research Council War Memorandum No. 10 (1945 edition).

(3) Pneumonia.—A mean monthly rate of 0.068 per thousand compared with 0.419 for the 1914-18 War. Sporadic cases only occurred, and the decreased incidence is certainly due in part to correct diagnosis—i.e. radiography and increased knowledge of chest diseases.

(4) Meningitis.—The monthly rate was 0.007 per thousand. Stocks of sulphathiazole were on hand for the prophylaxis of this disease, but they were never required.

(5) Influenza.—Accurate diagnosis of this condition by the examination of sera and garglings was not attempted because there was no call for it. The mean monthly incidence of conditions labelled “Influenza” was 0.253 per thousand, this being rather more than one-quarter of the incidence in 1914-18. The incidence was highest during the period mid-November to mid-February.
(6) Diphtheria.—Stuart (1945) states that from 1941 there had been in Northern and Central Europe an increase in diphtheria incidence unparalleled...
since control of the disease became possible. Since it was not practicable to institute an immunization scheme it was inevitable that some troops would contract the infection when they had opportunities for mixing with civilians and entering their homes. These conditions existed from mid-autumn, 1944, and the incidence of diphtheria in the Army increased steadily to a maximum of 0.145 per thousand per week in mid-January. After four weeks the incidence gradually declined to 0.015 per thousand at the end of the campaign. Practically all cases investigated showed that the infection was obtained from civilians rather than from other soldiers. There were a number of deaths due either to delay in reporting sick or to an unusually virulent infection.

(7) Jaundice.—(a) Infective hepatitis was present throughout the campaign. For the first six months the incidence varied between 0.020 and 0.075 cases per thousand per week. In subsequent months the rate was in the region of 0.15, with a maximum of 0.225 in mid-April, 1945. These figures were not unexpected as there has been a steady rise in the incidence of infective hepatitis during the past four autumns (Witts, 1944). The position must, however, be regarded as unsatisfactory whilst we are without any method of prophylaxis against a disease which, although very rarely fatal, is a serious drain on man-power and a strain on medical facilities.

(b) Weil's Disease: This disease is usually contracted by bathing in infected canals and water courses. In Normandy, however, Bulmer (1945) estimated that there were probably about 100 cases altogether, and suggests that washing, shaving, and cleaning teeth in unsterilized water may be equally important methods of infection. Sera from two cases agglutinated grippo-
typhosa (Buckland and Stuart, 1945)—a strain of leptospira spread by continental water voles, which produces an attack of Weil's disease without jaundice.

(8) Venereal Disease.—A mean monthly rate of 2·116 compared with 2·474 in the 1914-18 war is a sad record and implies that the present war has "put back the clock" twenty years so far as V.D. is concerned. It should, however, be noted that these figures are for all troops under command of 21 Army Group. The incidence amongst British troops was relatively low—at least until the campaign ended and fraternization was permitted. During the first four months the incidence was approximately 0·1 per thousand, but with the advent of more static conditions there was a steady rise throughout October and November to 0·70 per thousand. Thereafter the rate varied between 0·6 and 0·75 per thousand until hostilities ceased.

The usual methods of education, propaganda and personal prophylaxis were provided, along with unit or central prophylactic ablation centres. Unfortunately, these ablution centres were little used, probably because of the failure of our education and propaganda, and the modesty of the British soldier. Experience in the Middle East had shown that placing brothels out of bounds was a definite advance in the control of V.D. The same rule was therefore applied in N.W. Europe, and applied to cafes as well when there was any doubt about the conditions therein. As it is rather pointless to go on treating V.D. without controlling the sources of the disease, every effort was made to trace infected women by the use of a detailed questionnaire completed by the...
soldier patient. This entailed much work for the various authorities—Medical, Provost, Civil Affairs (Military Government) and Civil, but it gathered in for treatment a considerable percentage of women who would otherwise have continued to spread the disease. Throughout the campaign penicillin was used for the treatment of both gonorrhoea and syphilis. Its use produced an enormous saving in time, transport and man-power, for treatment could be completed in an average of fourteen days for syphilis and twenty-four to forty-eight hours for gonorrhoea. Uncomplicated cases could be treated in forward medical units (usually at Corps level) or in General Hospitals in Base and L. of C., in the certain knowledge that there would be very few relapses, and that the men were being rendered non-infective very rapidly.

(9) Typhus.—This disease might have been omitted were it not for the fact that twenty-four members of the British Army contracted it whilst working at Belsen and one (a medical officer) at Sandbostel. "No lice, no typhus" is essentially true, and as the Army was not lousy (see paragraph 10) it may be of interest to consider how infection was acquired. Those who were infected were working amongst hundreds of cases of typhus in filthy dust-laden buildings. They were dusted with anti-louse powder most religiously, bathed regularly, but not all were swathed in completely protective garments (overalls, gloves, masks, goggles, etc.). The methods by which the rickettsia enter the human body are stated to be through (i) the skin, (ii) by inhalation, (iii) possibly through the conjunctiva, and it is considered that the cases under review were infected by one or other of these methods. Once the typhus patients had been through the "human laundry" they became non-infective, and personnel nursing them were not at risk.

Conclusions to be drawn from experiences in the B.L.A. are as follows:—

(i) Three injections of typhus vaccine confer a high degree of immunity, and should typhus then be contracted it is rarely fatal. A booster dose should be given when indicated.

(ii) Personnel in close contact with "uncleansed" typhus patients should wear boots, overalls, gloves, masks (and perhaps goggles). This ensures that the very minimum of skin is exposed. They should be bathed, and dusted with anti-louse powder every day, and not be asked to work long hours in their hot anti-typhus clothing.

(iii) Personnel working amongst loused typhus patients should be dusted daily lest the odd louse get through "the laundy." No other precautions appear to be necessary.

(iv) A.L. 63 powder (containing 5 per cent or 10 per cent D.D.T.) is a most effective agent for killing lice. Had it not been available in almost unlimited quantities for the Army, the D.P.s, and the ex-P.O.W.s, it is certain that typhus would have been almost as great a problem as it has been in the past. To be really effective in populations at risk a "lousing service" should be set up, with a maintenance service for the power-operated dust guns. Although D.D.T. was used on a large scale, no toxic effects were reported. It was chiefly in powder form, but fairly extensive use was made of D.D.T. in kerosene at the end of the campaign. Its use produced only occasional skin rashes.
and these were considered to be due to the kerosene and not to the D.D.T.

(10) Skin Conditions.—Scabies was prevalent throughout the campaign.

CRUDE WEEKLY RATES OF INCIDENCE OF SCABIES (NEW CASES ONLY) 21 ARMY GROUP & B.A.O.R. IN N.W. EUROPE.
UP TO 28 APRIL 45 — BRITISH, CDN. AND ALLIED CONTINGENTS.
AFTER 28 APRIL 45 — BRITISH AND CDN. ARMY ONLY.

CRUDE WEEKLY RATES OF INCIDENCE OF PEDICULOSIS COMPLAINTS (NEW CASES ONLY) 21 ARMY GROUP AND B.A.O.R. IN N.W. EUROPE.
UP TO 28 APRIL 45 — BRITISH, CDN. AND ALLIED CONTINGENTS.
AFTER 28 APRIL 45 — BRITISH AND CDN. ARMY ONLY.
The incidence varied between 0.2 and 0.4 per 1,000 during the first five months. Thereafter it increased every week to a maximum of 1.4 per 1,000 in March, 1945, and continued at 0.8 to 1.1 for the rest of the campaign. It was treated effectively with benzyl benzoate; D.D.T. appeared to have no effect on it, and the incidence was a good index of the opportunities which the troops had for close contact with the civil population.

Pediculosis was almost entirely of the Phthirius pubis variety once the major part of the Army had left the Normandy battlefields. As might be expected its incidence curve followed the same line as those for V.D. and scabies.

(11) Malaria.—The highest rate was 1.8 per thousand and was recorded in June, 1944. This included both primary cases and relapses, and occurred in those soldiers who had previously served in the Mediterranean area or Middle East. During the succeeding three months the incidence declined rapidly to around 0.025 per thousand where it remained for the rest of the campaign. A very few cases were recorded where infection had been acquired in France and Belgium, but in view of the potential reservoir and the presence of mosquitoes capable of transmitting the malaria parasite, these were not unexpected.

(12) Comparison of Sickness and Injury Rates.

The most interesting feature of this table of hospital admissions is the relatively high sickness rate. During a long war in which every effort had been
made to produce and perfect weapons of destruction and mutilation, the incidence of deaths and wounds might have been expected to be far greater than the incidence of disease. This, in fact, was not the case. And it is even more remarkable when one considers that 21 Army Group was operating in a temperate climate.

Admissions to hospital for accidental injuries showed little variation throughout the campaign.

**Summary.**

(1) The campaign in North-West Europe from the assault landings to the "cease fire" presented certain problems never previously experienced.

(2) The hygiene organization provided to deal with these problems has been explained, together with the methods adopted to solve them. Particular reference has been made to water supplies, food, personal hygiene and accommodation, as these factors are all important in the prevention of disease, and the limitation of its spread.

(3) Civilian features in form of refugees, displaced persons and ex-prisoners of war, have been discussed in some detail. Their disposal was a tremendous operation and had to be undertaken whilst the Army was still fighting. Had this operation not been successful a most dangerous state of affairs might have arisen in Europe.

(4) The incidence of the more important infectious and contagious diseases has been given and it is considered that the figures compare very favourably with those of other campaigns. Cases of pneumonia, influenza, meningitis,
and typhus, were negligible. Enteric could have been placed in the same category but for an isolated outbreak of seventy-nine cases. The very low incidence of louse infestation achieved by adequate bathing and laundry arrangements, and the use of A.L. 63 and impregnated shirts, provides a remarkable comparison with the 1914-18 war when 95 per cent of troops became infested after short periods in the trenches. The incidence of dysentery and venereal disease cannot be regarded as satisfactory, although the latter is today a moral rather than a medical problem. In considering the incidence of disease, and particularly the so-called "social diseases" (V.D., scabies and pediculosis) it must be remembered that France, Belgium and Holland had been occupied by the Germans since 1940. During the occupation standards of environmental hygiene had deteriorated, the incidence of disease had increased and food and drugs had become increasingly difficult to obtain. These factors prevailed in Germany, but not to the same extent. There were, however, additional risks in the "blitzed" towns, the "horror" camps, and the millions of displaced persons and prisoners of war.

CONCLUSION.

This article has been written by one who was a member of the British Second Army. In a war which extended from the English Channel to the Danish Border it is obviously impossible to obtain a complete picture of all the operations and the work carried out, and I should therefore like to thank all those members of the medical services—officers and other ranks—who's observations, conversations and reports, have helped in the preparation of what must be an inadequate record of their achievements.

I should also like to thank Major-General E. Phillips, the Director of Medical Services, for permission to forward this article and to use the records, etc., of the campaign at his Headquarters.

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