

## AN ADDRESS ON THE HYGIENE OF ARMIES IN THE FIELD.

*Delivered at the Parkes Museum, June 21st, 1883.\**

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This subject is so vast, special, and complicated, that I can only promise to touch the fringe of it, and this in a roundabout way. I will not presume to lay down hard and fast rules by which armies in the field shall be regulated in sanitary matters in the future, but rather describe, in narrative form, some of my own experience, gained during the time I acted as the engineer member of a Sanitary Commission sent out to the army in the Crimea in the spring of 1855.

[Mr. Rawlinson proceeded to read the instructions issued to this committee. It was directed to investigate the condition of every hospital, infirmary, or receptacle for the sick, both as to interior ventilation and cleanliness and external surroundings. At the same time, the fullest powers were given to the Commission to obtain labour and other assistance for the carrying out of their recommendations. Mr. Rawlinson then resumed as follows.]

If General Orders could in all cases have been made applicable, and could have been obeyed, outside comment might cease, and the aid of a specially appointed Sanitary Commission during the Crimean war might not have been needed. It may, however, from experience, be assumed that there never will be General Orders framed sufficient to cover all contingencies; and we may also assume that there will be neglect now and then, from various causes. Some of the links in the chain of regulations will break, and confusion will follow. The General Orders for the army under the command of the Duke of Wellington in the Peninsula, in the Low Countries, and in France, 1809 to 1815, cannot probably be improved upon. Lord Raglan was secretary to the Duke, and he must consequently have been acquainted with the Duke's General Orders; and yet we see the utter confusion into which affairs drifted in the Crimea. The siege of Sebastopol became, however, exceptional.

To whom the failure in the Crimea was due, it is impossible now to say. It was not, however, to any individual, but rather to the absence of an independent sanitary department with the army, and to the want of one home department to direct and control, having also power to order all stores, and to inspect their shipment, and to see that the several stores were so arranged in the transports that they should be available in the order of their necessity, and not to have surgical appliances and medicines placed beneath a massive bulk of ammunition. Blunders of this class do not appear to have been avoided, even in the recent Egyptian campaign. The Royal Commission, which, under the Presidency of Lord Herbert of Lea, inquired into the sanitary state of the army after the Crimean War, resulted in Lord Herbert's regulations. One of these regulations provided that a sanitary officer should be attached to the quartermaster-general's staff. To this officer was to be committed the duty of examining into the sanitary condition of buildings selected for occupation by troops, and into the sanitary condition of towns or villages about to be occupied; he was also to make recommendations for organising a proper sanitary police, to preserve cleanliness, and for the removal of nuisances. But it will be seen that practical lessons, however well taught, and also that subsequent official inquiries, however ably conducted, have led up to very little that has proved to be really useful when the country again enters upon war. The army medical arrangements had drifted back into the old groove, the old forms of blunders and the old stories are repeated—namely, that the existing regulations are supposed to be, if not perfect, all that is requisite. In Government departments, I am sorry to say, that there is not, on all occasions, due respect shown to the feelings of permanent officials; and, in our case, we were not put into communication with the heads of the permanent medical department before leaving London, which, no doubt, gave offence, but for which the members of the Commission were in no sort of way answerable.

[Mr. Rawlinson proceeded to state that, when the Sanitary Commission arrived at the seat of their labours, they found the build-

ings used as hospitals in an unsanitary condition, the sewers of the great hospital which were foul, were frequently and thoroughly flushed, and their lower ends were covered to prevent the wind blowing up them into the building; the carcasses of a certain number of animals which lay in the neighbourhood of the hospital were removed and buried, and many handcart-loads of filth were also removed. The work of scavenging was carried on systematically until the hospital ceased to be needed, owing to the departure of the troops.]

Mr. Rawlinson then continued as follows: The Blue Book Report (1883) on the organisation of the Army Hospital Corps in Egypt reveals many blunders of a type as old as the service, such as confusion in transmitting materials for use, and something worse than confusion in contract supplies, both of materials and of provisions. Can there be no better service in future? War is a blundering, extravagant, and destructive business under any aspect; and the best framed regulations come to be disregarded, and, even where adhered to, they may at times be the worst possible extravagance. The Egyptian Report, 1883, most fully sets forth the confusion into which the regulations fell, and the suffering which resulted. Detachments of the army had, however, to be removed suddenly, and the *impedimenta* necessary for use could not follow as rapidly. Then, provision was made for contingencies which never happened, and, most fortunately for the men, the war came to an abrupt and unexpected termination.

Men in war are loaded like beasts of burden. They have to march under their *impedimenta*; the whole body may be bathed in perspiration; feeding must be irregular, and water may be absent or may be polluted, and in one night's bivouack the body may be chilled, so that fever to a large proportion of the men must be the result. That there must necessarily be great loss of human life in actual war will be self-evident to anyone who knows the least that is possible about the subject. No forethought can fully guard against excessive changes in weather. The fighting portion of a soldier's life is of short duration. It is not in battle that armies are destroyed, but on the field, in camp, and in hospital.

Any buildings to be used by sick or by broken-down and wounded men may, as taught by Sir John Pringle, have the windows removed to prevent injury by polluted air, and any improved apparatus provided for water-supply may be brought into use. Food in a concentrated and portable form may also be served out, and the horrible salt junk and ration-pork be in future dispensed with. A spirit-ration is liable to be most injurious in several ways, and should not be used except as a medicine.

For water-supply, light carts of steel, similar in form to watering-carts in towns, may be of great utility, as one horse or one mule would easily draw to a distance of one or two miles from 100 to 200 gallons of water, to be served out to the men in the positions occupied. Portable water-filters can also be easily arranged, to be similar in form to the light steel water-carts; so that water for hospital purposes may be filtered even in its transmission.

Where an army for a time becomes stationary, a sanitary corps will find ample work to do in improving roads, in surface-draining, in scavenging, and in ventilating any permanent buildings used as hospitals; and if the service will permit the use of working parties, enormous benefits may be secured to entire force in the field. A skilled sanitary officer will be a man of many expedients springing from close and intelligent observations; and, in his works, he will strive to save labour. Every country has its character impressed on its surface contours, and these the geologist and engineer will read at a glance. Wide and flat areas will indicate, as a rule, a soft subsoil; a steep gradient will indicate a subsoil of some hard material, such as gravel; rock will generally show above the surface; where there are mountains, there will usually be, at the base, mounds of material, particles weathered from the rock and admirably suited for road-forming, as it may be excavated and sorted so as to save the labour of quarrying and breaking for road-making. In future wars it is admitted that picks and spades may require to be used as much, if not even more, than rifles. All officers will, therefore, have to learn something of engineering. If soldiers can use pick and spade to provide earthwork shelter from rifle-bullets, they may also use these implements for sanitary purposes. A working army will be more contented if they find that their labour tends to their safety and comfort. Idleness is an incentive to vice, and leads to insubordination. A modern army will be a very different body of men from those forming the Peninsular army under Wellington, and must be treated very differently. Flogging is for ever done with, and it is most disgraceful to have any attempt at its renewal.

The General Orders of the Duke of Wellington are considered good

\* The Address has been somewhat condensed.

examples; but the Duke, in the Peninsula, ever did something more than unceasingly refer to even to his own General Orders. His personal observation was incessant, his perceptions rapid; and consequently his instructions, outside any order-book, were practical, being suited to the conditions and requirements of place and time. The suggestions of the great Duke point to something to be done by commanders of regiments outside of cut and dried formal regulations.

I think it may be gathered from my remarks, that I do not set myself up as a practical teacher of army hygiene in the field. The purport of this paper is rather to show that, to preserve an army in health, either in barracks or in the field, will, as in the past so in the future, require active intervention on the part of the commander-in-chief, of the generals, and of the colonels and officers, outside any printed regulations, however full and ample. As the Duke of Wellington explained on one occasion, to the House of Lords, that martial law was no law other than the will of the commander-in-chief; so, in future, the commander-in-chief, during a state of war, must have the power to relax any published General Order or regulation if necessary, to make better provisions for the army. A sanitary staff, as provided for by the late Lord Herbert, distinct and separate from both Commissariat and Army Medical Departments, should be with and part of the army, under the direct control of the commander-in-chief, who shall have power to order and expend in this service as he may think necessary, that is, that any amount of extraneous labour may be provided and paid for which he deems necessary, and the country in which he is can supply.

The army in the Crimea was saved in a great measure by voluntary efforts from home, by relations and the general public shipping out warm clothing, by Florence Nightingale and her lady-nursing, by distribution of food suited to sick men in hospital, and by extra voluntary furnishing of medical comforts, and also by the labours of the Army Sanitary Commission. The expenditures by all these parties were, however, mere fractions in the gross cost of the war; if these entire extras had been provided for, it would only have amounted to about half a week's expenditure of the cost of the war.

In touching on this question of army hygiene, even at this day, I know that I am venturing on disputed ground. But that enormous improvement took place in the British army in the Crimea from some cause or causes, after the advent of the Sanitary Commission, cannot be disputed; but, officially the credit has never been accorded to that commission. The one great fact was, however, made unmistakable, namely, that from the spring of 1855 the health and condition of the British army began to improve, until, by the autumn of that year, the entire force in the field was in a state of health, and was under a less rate of mortality than when in barracks at home, and this continued until the close of the war. The French, the Sardinians, and the Russian soldiers, however, knew of no such abatement of camp and hospital sickness, the destruction of life having gone on up to the close of the war. Full details may be found in the Army Returns of the several nations, and in a pamphlet by Surgeon-General T. Longmore, entitled "The Sanitary Contrasts of the British and French Armies during the Crimean War." 1883.

Without giving the details furnished by Surgeon-General Longmore, I may state, from pp. 17, 18, that the British army in the first winter had 2,286 deaths from fevers of all kinds; in the second winter, the number was reduced to 129. The reduction in the deaths from typhus was from 164 to 16. Amongst the French troops, the deaths from typhus were 90 the first winter, 10,278 the second winter. The French had no sanitary commission, the hospitals remained unscavenged, unventilated, and their hospital drains unimproved, the result being excessive overcrowding, until men and doctors alike perished; the British hospitals being absolutely free from typhus cases. Taking these results into account, Surgeon-General Longmore states: "It is well that the practical lessons in sanitary science afforded by the events of the Crimean War, should not be allowed to pass out of mind." In these remarks I cordially agree.

**THE EMBANKMENT VENTILATORS.**—The London Trades' Council have issued a circular to the 14,865 working men members in the London district, calling their serious attention to the recent action of Parliament, and especially the Metropolitan Board of Works, "in seeking to deprive the travellers and the workmen permanently employed in carrying on the traffic of the Metropolitan District Railway, of the ventilators recently constructed there for the advantage of the public using the line." A committee has been formed, with Mr. G. Anderson, M.P., as chairman, to oppose the Bill of the Metropolitan Board of Works for the removal of the ventilators.

## ABSTRACT OF LECTURES

### ON THE METAMORPHOSIS OF SUCTORIAL FISHES AND BATRACHIA.

*Delivered at the Royal College of Surgeons of England.*

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#### LECTURE IX.—THE METAMORPHOSIS OF THE BATRACHIANS.

THE change undergone by the Tadpole, in its passage into the Frog, is so great as to merit the name of a metamorphosis. It consists essentially in the reduction and atrophy of a series of provisional embryonic organs, and the appearance of adult organs in their place.

Two pairs of limbs appear nearly simultaneously as small buds, one pair on each side of the body, and anteriorly and posteriorly in relation to its long axis. The hinder pair show themselves at the junction of the tail and body, while the anterior pair are concealed under the opercular membrane. The lungs acquire greater importance, and both branchial and pulmonary respiration go on for some time together. When the adult organs have acquired a sufficient degree of development, the gills are finally entirely lost. There is also a change in the region of the mouth; the horny beak is thrown off, and the mouth loses its suctorial character. The eyes, which have hitherto been concealed under the skin, become exposed on the surface; and at this time the front limbs appear. With these external changes, important internal modifications take place in the mouth, the vascular system, and the viscerai arches. A gradual atrophy of the tail occurs, commencing at the apex, and results in the complete absorption of this organ. The long alimentary canal becomes shortened, and the diet of the animal becomes changed from herbivorous to insect-eating or carnivorous. The above are the changes which occur in the metamorphosis of the Frog; but some modifications of this process are found in other Batrachians. Several forms are known which are hatched in the adult form; this metamorphosis seems to take place in the egg, though its exact amount is a matter of doubt. In *Pipa*, the larva leaves the cells on the back of the mother in a condition closely resembling the adult. The embryo develops a long tail in the egg, which is absorbed before hatching. The larva of *Rhinoderma* is stated to be without external gills, and appears to be hatched while still in the larval pouch of the male. The tadpole *Pseudis paradoxa* attains an immensely greater bulk than the adult—a peculiarity which may be a question of nutrition, or may perhaps be explained by supposing that the larva resembles a real ancestral form which was much larger than the existing frog. Another form of perhaps still greater morphological interest is the larva of *Dactylethra*. Its mouth is not inferior in position, suctorial, and small, but is very wide, like that of Siluroids and *Lophius*, has an underhung lower jaw, and extremely long tentacle from each upper lip, and possesses no trace of the primordial horny jaws of the ordinary kind. In conformity with these characters, the head is extremely flat or depressed, instead of being thick and high. There are no claspers beneath the chin; the branchial orifice is not confined to the left side, but exists on the right side also. The tail, like the skull, is remarkably chimeroid; it terminates in a thin, long, pointed lash; and the whole caudal region is narrow and elongated, as compared with that of our ordinary Batrachian larvæ. The fore limbs are not hidden beneath the opercular fold. The actual complexity of the organisation of different tadpoles, and their relative size, as compared to the adult, vary considerably; the tadpoles of the toads being the smallest, and those of *Pseudis* the largest. The external gills reach a very great development in certain forms which are hatched in late larval stages. It seems, however, that this development is due to those gills being especially required in the stages before the hatching. Thus, in *Alytes*, in which the larva leaves the egg in a stage after the loss of the external gills, these structures reach, in the egg, a great stage of development.

The various features in the anatomy of the Tadpole point to its being a repetition of a primitive vertebrate type, the nearest living approach to which appears to be the Lamprey. The resemblance between the mouths of the Tadpole and the Lamprey is very striking; and many of the peculiarities of the larval skull of the Batrachians, especially the position of Meckel's cartilage, and the subocular arch, probably find their parallel in the Lamprey. The