indirect action of strychnine is not limited to one particular part of the cord.

It appears strange that the poison, when directly applied to the spinal cord, did not affect the nerve substance through entering it, either by imbibition or deosmose. Can it be possible that poisons deosmotically absorbed are not assimilated by the nervous system? or do they first require to undergo a change in the blood before they can act? That strychnine should produce convulsions when carried to the spinal cord by the bloodvessels, and not when directly applied, is certainly very remarkable. The solvent in each case is the same, the liquid part of the blood being nothing more or less than water, and the bloodvessels cannot bring the poison into more intimate connexion with the nerve-tubes than the hand can; for the ultimate capillaries do not enter the nerve-tubes, but only ramify on their exterior. If, therefore, the poison really acts upon the contents of the nerve-tubes, it must, to reach their interior, first pass by deosmose through the external sheath; and deosmose being a purely physical process, it matters not how, or by what means, the substance is brought into contact with the membranous tube of the nerve; for once there, its after-progress is in all cases identical. Now, as we have brought strychnine into the most favourable circumstances for the development of its action upon nerve substance, and no result has followed, we are forced to conclude that strychnine has *no direct* chemical or physical action on nerve matter. Seeing that the poison acts when conveyed by the bloodvessels, we must try and discover whether or not it is transformed in the blood into a more active poison, or if, though not itself transformed, it yet possesses the power of so modifying the organic constituents of the blood, as to render them not only useless for the purpose of nutrition, but even pernicious. Chemistry has as yet failed to reveal whether or not strychnine is decomposed and transformed in the blood into another substance more baneful than itself; but it has shown,* that the poison possesses the property of so modifying the organic constituents of the blood as to render them incapable of absorbing oxygen, and exhaling carbonic acid, and thus becoming fitted for the purpose of nutrition. It is well known, that "the continual afflux of scarlet blood is a condition very important to the normal molecular constitution of the nervous centres. This proposition especially holds good with mammals and birds; but is less strictly applicable to reptiles and fishes, in whom the interchange of the gases is less active."† When the oxidized materials required as nourishment by the nervous system are either deficient in quantity, or impaired in quality; disordered function of the nerves is the immediate result. We have a most striking example of the former condition in cases of hæmorrhage, where an insufficient supply of the oxidized substances is not unfrequently followed by convulsions; the latter is exemplified in cases where oxygen is prevented from entering the blood, and consequently the organic substances fail to become oxidized and fitted for their peculiar office. Lastly, the same thing occurs when even both the oxygen and the organic substances are present, but where the oxidizing process is either partially or totally arrested by the presence of a foreign substance possessing the property of hindering the constituents of the blood from combining with oxygen. Derangement in the function performed by the molecules of the nervous system occurs just as surely in the latter example as when either the oxygen alone, as in the second instance, or both the oxygen and the oxidizable materials, as in the first case, are wanting. Strychnine, I believe, from the results of the cited experiments, acts in the third of the three ways—that is to say, it has no *immediate* effect upon the nervous system, but acts indirectly through the power it possesses over the functions of the organic constituents of the blood. Many other poisons, I doubt not, exert their influence in a similar manner; for I have found, that hydrocyanic acid, chloroform, nicotine, alcohol, ether, morphine, and several other narcotics, have the same power of destroying the property possessed by the organic constituents of the blood of absorbing oxygen and exhaling carbonic acid.

A more particular study of the effects of different substances on the blood may yet not only furnish a clue to the actions of poisons in particular, but afford a direct explanation of the physiological action of remedies in general; and the more speedily our knowledge in that direction advances, the more rapidly will medicine be raised to its proper position amongst the inductive sciences.

* THE LANCET, June 7th and 14th, 1856.

† Valentin's Physiology, translated by Brinton.

ON

THE DIARRHŒA WHICH AFFECTED THE BRITISH ARMY IN THE CRIMEA IN 1854—55.

BY W. M. MUIR, M.D.,
SURGEON 33RD REGIMENT.

(Communicated by DR. ANDREW SMITH.)

Hospital, 33rd Regt., Jan. 11th, 1856.

SIR,—In reply to your "Circular Copy" of an extract of a letter from the Director-General, in which he calls for information on the "Diarrhœa prevalent in Camp," I have the honour to submit the following observations as the result of my experience on the subject:—

The diarrhœa which has prevailed in the 33rd Regiment during its service in the Crimea, has been of *two* distinct kinds, arising from totally different causes. The *first* prevailed extensively last winter (from October till March, 1855,) and was, in great measure, of a scorbutic character; the *second* manifested itself, and with a narrower radius of extension, during the hot months, (June, July, and August, 1855,) in association with sporadic cholera, colica, hepatic derangements, &c., and was due to other agencies. Unless this distinction be recognised, and clearly kept in view, there can be no agreement in opinion as to the symptomatology or treatment of the disease.

I. *The Diarrhœa of the Winter.*—This was the disease *par excellence* of the English army in the Crimea, and will long be recollected for its peculiarity, general prevalence, and fatality. I am not aware that it has ever figured in the category of camp diseases, probably because the circumstances in which it appeared are unique in the history of military operations. To say that it was scorbutic, is to indicate only half the truth. Scurvy was, no doubt, its great and efficient cause; but other agencies played a part, though perhaps a subordinate one, in its production. These arose out of the peculiar circumstances in which the army was placed, (without sufficient food, clothing, &c., and worn down by over-work;) and which conspired, with scurvy, to exhaust the powers of the men's constitutions, to impoverish and alter the constitution of their blood. Prolonged abstinence from succulent vegetables and fruits (the *sole* condition in the production of scurvy) would not alone have engendered this disease; indeed, a constipated, rather than a loose, state of the bowels, is the more ordinary accompaniment of scurvy; but if to that tainted state of the whole system, which we represent by the term scorbutic diathesis, we super-add the effects of insufficient food, extreme cold, exhausted physical energy, and depressed moral powers, we shall be brought nearer to the true origin of the disease, and be better able to understand why the strain of this general diseased state should have been exerted chiefly on the *bowels*, and manifested itself in the form of diarrhœa.

Let us, for the sake of illustration, suppose the case of an individual who has become predisposed to scurvy by a three months almost total privation of fresh vegetables and fruits.* Let us suppose the same prejudicial influence continued for two or three months more. In this state of constitution let him be fed solely on badly or half-cooked salt pork and dry biscuit. Let him stand for twenty-four hours at a time in wet trenches, exposed to intense cold, and in a half-naked state, and for the next five or six hours turn into a damp tent, to sleep on a wet floor and in damp clothes. Let him be worked until he is ready to drop down from fatigue. Let him have his sleep constantly broken by calls of duty, and his spirits depressed by the daily spectacle of dying companions, and the hopelessness of his own preservation. Let this ordeal be extended to several months, and then say in what class of organs should we expect disease to manifest itself most readily and prominently?

The irritating quality of the food, the suppressed functions of the skin, the weakened tone of the digestive apparatus, the well-known effect of depressing passions,—all point to the *bowels* as the parts most likely to suffer, and furnish an outlet for that serous exudation of the blood, induced by its general impoverishment and scorbutic alteration.†

* This was the case with the army in Bulgaria.

† Mr. Busk and M. Rouppé have disproved the prevalent notion that the blood is *impoverished* in scurvy, (the globules dissolved in the serum.) In the blood taken from scorbutic patients, the separation into serum and clot was

Now, the case supposed exactly represents the condition of the army in the Crimea, and furnishes the key, as it appears to me, to the origin and marked fatality of the diarrhoea in question. It was not only a form of scurvy, but it was something more. That something more would not have engendered it no more than it would have been produced by scurvy singly. It was the conjunction of the two which gave to this disease its peculiar character and unusual malignity.

If space permitted, it would not be difficult to show that the great proportion of the cases of fever, cholera, gelatio, dysentery, anasarca, rheumatism, and even catarrhal affections and sudden death, which figure in the Medical Returns of last winter as independent disorders, acknowledged the same origin, and were mere manifestations of the same diseased state under certain modifications. In fact, this scorbutic-anæmic diathesis (to coin a word for the occasion) pervaded and modified every state of diseased action at that time, and required to be taken into account both in diagnosis and treatment. The medical history of the first campaign of the army in the East is yet to be written, and the causes of its extraordinary sickness to be traced to their source, and its hidden features unmasked; and when such appears, it will form one of the most interesting chapters in military medicine.

Having made these remarks on the origin and nature of the diarrhoea which prevailed last winter, I now proceed to a description of its symptoms. The patient on admission was generally pale and thin; countenance of a sallow, dusky hue; tongue clean; lining membrane of mouth pale; gums spongy; and when the skin was examined, petechiæ, or other evidences of a scorbutic diathesis, were observable. The pulse was weak and slow, sometimes hurried; no febrile movement; appetite usually good, often ravenous; belly soft, with no pain or tenderness on pressure; skin dry and harsh; urine scanty and pale; the evacuations from the bowels watery, sometimes of a semi-consistent character, and of every shade of colour from chalk to chocolate, but most commonly of a pink hue; sometimes altogether bloody (venous), but never exhibiting the characteristic dysenteric dejection; bile was almost always absent, or present only in small quantity, the colour seeming to have been furnished by blood rather than by bile. The calls to stool were frequent, often incessant, and not checked by opiates or astringents; they were generally without warning, and so sudden that the patient had not time to get to the close-stool, or, if a duty man, outside his tent, before his bowels discharged their contents. So much so was this the case, that the encampment of every regiment was each morning thickly dotted with evidences of these unseasonable calls of Nature, and offered a fertile field for studying the character of these unnatural excretions.

Death usually took place by asthenia. It was not unfrequently preceded by mortification of the toes, rapidly involving the foot; or a state of low muttering delirium closed the scene. In three or four cases bloody urine was an accompaniment of the disease. There was great danger in moving a patient from one bed or tent to another, and not a few died soon after being removed.

I regret exceedingly that I had no opportunity, from the circumstances in which I was placed, of making a post-mortem examination of any fatal cases. Had I done so, I should probably have found the intestinal canal generally pale, with limited ecchymosed patches here and there, and perhaps a few small ulcerations in the mucous membrane of the colon; a pale and somewhat atrophied condition of the liver, with yellow or little bile in the gall-bladder, and evidences of serous effusion in most of the shut cavities. All this, however, is supposition, deduced from the *ensemble* of the symptoms and the predominant scorbutic character of the disease.

The indications of *treatment* corresponded with the view I have presumed to take of the etiology of the disease—that is, two-fold. The first, to supply to the blood that peculiar but as yet unknown principle which exists in succulent vegetables and fruits or their preserved juices, and the abstraction or want of which is the proximate cause of scurvy; the second, to exalt the powers of life, and stimulate the enfeebled functions of every organ, by repairing the impoverished quality of the blood.

These conditions could only be fulfilled by the exhibition of antiscorbutics, combined with nourishing food, generous wine, rest, and warmth. Medicine, as might have been anticipated, was of no use, unless combined with, or employed after, these indispensable requisites. Removal to the rear, where alone

as perfect, and took place as rapidly, as in healthy blood. Their analysis, however, does not enable them to say what is the *peculiar* change of the blood in scurvy.

the patient could command a warm bed, wholesome diet, and repose to mind and body, was the surest means of preserving his existence, and effecting the re-establishment of his health.

II. The diarrhoea of the summer was a different disease, and required a different management, from that which has just been described. It assailed chiefly the new comers, was of tractable character, soon terminating in health, and leaving no bad effects behind. It seemed to be due to atmospheric changes—to the difference in temperature between day and night. The surface of the body, unnaturally excited to action by the solar heat, became suddenly chilled by the cold and dews of night and early morning. This sudden check to the perspiration, deranging the balance of the circulation, threw the blood inwards upon the bowels; hence the diarrhoea in question. As it was occasionally associated with sporadic cholera, the offensive state of the trenches and latrines there (to which cholera was traced) may also have exerted some influence in its production. The dejections were watery, but of feculent character; sometimes overcharged with, sometimes deficient in, bile, just in proportion as the liver was implicated, and moved, by the stimulus of heat, to greater functional activity, or total oppression. No case proved fatal, thus exhibiting its disalliance with the cachectic form, formerly described.

The cure of this form of diarrhoea was readily effected by measures directed to correct the functional derangements of the liver and skin, and maintained by the use of flannel worn night and day.

It is interesting, and may not be out of place, to remark, that this form of diarrhoea differed essentially from that which prevailed so extensively in Bulgaria in the autumn of 1854, in association with *epidemic* cholera, and which seems to have been chiefly caused and kept up by that peculiar state of the atmosphere denominated *choleraic*.

From the foregoing hasty and imperfect sketch of the forms of diarrhoea which I have met with in practice here, it will be seen that my observations and experience do not correspond with what it has fallen to Dr. Lyons to witness. I have not met with that form of disease which he has described, in which the egesta differ little from the ingesta; certainly not as the "diarrhoea prevalent in camp." Perhaps this disagreement may be in part explained by supposing that his remarks apply to my first form, when it was *becoming* modified by the improved condition of the army in the early spring—that is to say, when the scorbutic diathesis was removed, but the bowels remained still weak and irritable. In such circumstances, quinine offers a reasonable adjuvant of cure, and also of prophylaxis. In the cachectic form, its use was positively injurious, increasing the irritability of the bowels and quantity of the discharges.

Dr. Smith's suggestion, however, I shall not lose sight of, should that form of diarrhoea which Dr. Lyons describes, but which I have failed to recognise, come before me.

Dr. Hall, Inspector-General, Crimea.

ON POINTS OF IMPORTANCE CONNECTED WITH THE TREATMENT OF ULCERATED LEGS.

By THOMAS WESTLAKE, Esq., M.R.C.S.

It will, perhaps, be universally admitted that there never was a period when mere theory and school-teaching so lamentably failed as in the early events connected with the late Crimean War. Our medical officers, although distinguished in the hospitals at home, soon discovered, when the stern realities and monstrous difficulties of epidemic disease and dangerous wounds were presented to them before and after battle, that instead of theory and book-knowledge, they could alone depend on practical observation and unwearied personal attention.

But it will be asked, What has the Crimean War to do with the treatment of ulcers? I reply, that little beyond the theory of the treatment of ulcers is taught in our schools and hospitals; and although the principles of treatment may now be considered as brought to perfection by Paget and Quekett, still the practice, the real treatment of ulcers, is deplorably at fault. But I would ask, Is it in the wards of an hospital that you can expect to find ulcers treated successfully? The time of the surgeon is known to be of great importance; the ulcer