

SELECTIONS
FROM THE
PUBLIC CORRESPONDENCE
OF THE
PUNJAB GOVERNMENT

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VOL. IV., NO. 2.

- I.—Correspondence regarding Tea Plantations in the Punjab Provinces.
- II.—Papers regarding the insalubrity of the Peshawur valley.

Lahore:

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1859.

Some remarks on the insalubrity of Peshawur, with suggestions for its remedy.

The low elevation of the valley of Peshawur has been supposed by some, as one cause of its unhealthness; the elevation, however, has little to do with the sanatory condition of a locality; for instance, Kashmere is 6,000 feet above the sea, yet notoriously unhealthy in the fall of the year; Rawul Pindee is very little higher than Peshawur, yet remarkably healthy.

Although Peshawur has ever been unhealthy, even for natives, yet it is, I believe, a fact that, when the European troops were first stationed there, they were comparatively healthy, the shelter being then very imperfect; ever since, mortality has been on the increase, last season being the worst, although it was one of the healthiest we have had for years in the Punjab, while excellent shelter was provided. It is manifest there must be some cause to account for this, irrespective of the natural unhealthiness of the place.

The diseases from which the inhabitants suffer are fevers, agues, diarrhoea, or those which are peculiar to marshy lands; naturally, however, the valley of Peshawur is by no means a marsh; indeed, without irrigation it would be a barren plain (as it is in many of the unirrigated localities) and doubtless as healthy as such places usually are; it has, however, by irrigation and cultivation, been made to contain all the noxious elements of a marsh. The valley is devoid of trees, a great advantage in a sanatory point of view; the European residents however, have made up for this (owing to the great fa-

cility the place affords) by surrounding their houses by a dense mass of trees and shrubs, which obstruct the circulation of air, and afford abundant material for vegetable decomposition; as this vegetation has advanced, so also has the unhealthiness of the residents, and there can be little doubt but that it will continue to advance, unless this pernicious system is put a stop to; further, the irrigation of these gardens is wholly carried on by a net work of open drains, disclosing offensive mud, impregnated with vegetable matter, generating disease; these when put together, afford a very large area giving off noxious effluvia.

The irrigated lands of the valley are broken up *twice* during the year for cultivation; this is another fruitful source of malaria of the worst kind, namely, a moist soil containing putrifying vegetable matter (derived from the roots still in it) and exposed to a powerful sun. *Bad water* is no doubt a cause of disease, for although the European residents drink well water, yet that must contain dissolved vegetable matter derived in its passage through the richly cultivated soil.

It may be supposed by some, that the causes of disease I have enumerated are insignificant, yet it is a well known fact in medical science, that a single inspiration of a malaria charged atmosphere, will cause disease, under predisposing circumstances. It is manifest that most of the causes I have noticed, may, to a great extent, be corrected, or destroyed; I might refer to undoubted authorities to prove that none of them are trifling, but that they offer of themselves an abundant source of disease, no matter what the elevation, or how high the

latitude. I will here only mention the well known names of Monfalun, Volney, and McCullah, in support of my views, or I would especially refer to the report of the Commissioners appointed to report on the sanitary condition of the towns of England, where the noxious effects of apparently insignificant causes (such as some I have pointed out) are clearly shewn.

To remedy this state of things, all irrigation in mud drains should be prohibited, and stone channels substituted where required. The branch of the Bara river, which passes through the town, should be made to run in a stone channel, for a certain distance, in the vicinity of cantonments; all irrigation should be put a stop to if possible for a distance of not less than three (3) miles from cantonments; for it has been proved experimentally in Italy, that marshy lands can influence to disease a locality 3 miles distant from them. Further, the barracks for Europeans should all be two storied, the upper storey for sleeping in,—for it is found to be a tolerably well established fact, that malaria is comparatively *inert* 16 feet from the ground, while it is well known that night is the time noxious vapours are most powerful, and the human frame most susceptible of disease.

The political importance of maintaining a large European force at Peshawur, is perhaps of itself sufficient to outweigh the immediate loss of revenue, if the suggestions I propose were carried out; yet, if the great cost to the country of every European Soldier, and the great annual mortality under existing circumstances, be considered, the loss in the first instance would be more than compensated. The cost of altering a barrack so as

to make it a double storey ought not to be great,—as the same foundations and roof suffice, and about 8 feet addition in height to the walls, as it is manifest the lower storey need not be nearly so high as at present, while double accommodation would be given in cases of emergency.

As a general rule, in all new stations like Nowshera, gardens and irrigated lands, should be prohibited at the first, and where drains are absolutely necessary they should run in masonry channels.

Rawul Pindee owes its salubrity to its good natural drainage, and the almost impossibility of producing a high cultivation in the vicinity,—owing to the kunkery nature of the soil. It may be presumed, therefore, that it will be considerably increased as a station for Europeans; it will, therefore, be desirable to make the communication with it and Peshawur as complete as possible. I have no doubt but that a good tram-way might be laid down over the present line of road, without interfering with the traffic; a light locomotive engine might be used over this portion of the line, but high speed could not be attempted. Rawul Pindee might thus be placed within 9 hours of Peshawur, and the troops there relieved frequently, and at a small cost; between Pindee and Jhelum, a tram-way might also be laid down, but the inclinations of the present road are too steep, and the curves too sharp, to admit of its being run over by a locomotive; it could be worked by horses, a rate of 10 miles an hour in all weathers might be maintained between Jhelum and Peshawur. It may be questioned whether high speed railways will be found to answer in the Pun-

jab, where the great source of revenue will be from a goods traffic. Owing to the enormous wear and tear on all high speed railways, they cannot afford to carry goods at such a low rate as will meet the great requirements of the country, nor do they even propose to do so; certainly there is no produce in the Punjab that could afford to pay the rate now levied on goods on the railways in Bengal and Bombay; it must be remembered over how many miles, Punjab goods must travel ere they reach a port. Looking at the question as a whole, I think it will be found that a good system of *cheap* tram-ways is what will give the most effectual relief to the country, besides which, they can be laid down in one-tenth the time and at one thirtieth the cost it will take to open a high speed railway,—owing to the heavy and expensive nature of the works necessarily connected with it. Even if the question of the speed be regarded, it is manifest that, over a long line, it is better to be able to move at a moderately good rate than at a very high rate over a portion only; to lay down high speed railways as a system, is what the country could not afford. Indeed, high speed railways are only adapted for a rich and thickly populated country, and a high degree of civilization; doubtless short lines, where there is a great passenger traffic, will be found to answer their expectations.

No kind of communication can compete with water for cheapness. In this respect the Punjab possesses great natural advantages, in its streams,—navigable throughout the year; and which, when opened up by *cheap* steam navigation, will increase the wealth of the country to an extent which can scarcely be estimated,

The Jhelum river is undoubtedly the one which should be first opened up. I am intimately acquainted with the upper course of this river, and can state, from personal examination, that the few obstacles which exist in the channel are removable at a very small cost. Steamers might run at all seasons up to Jhelum, whence, with a tram-way to Peshawur, the communication with that important post would be placed upon a very complete footing.

I have roughly estimated the cost of laying down a complete tram-way from Jhelum to Peshawur, at ten and a half ($10\frac{1}{2}$) lakhs of rupees, or little more than has, I understand, been spent on the small station of Nowshera.

(Signed) W. PURDON, C. E.

January 23rd, 1858.

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No. 173.  
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FROM

LIEUTENANT E. H. PASKE,

Offg. Secy. to Chief Commr. Punjab,

TO

LIEUT.-COL. H. B. EDWARDES, C. B.,

Commissioner and Superintendent

Peshawur Division.

Dated LAHORE, 6th February, 1859.

SIR,

I AM directed by the Chief Commissioner to ~~Public Works~~ annex copy of a memo. by Mr. Purdon, the Civil Engineer at Pind Dadun Khan, on the

causes of the malaria in the Peshawur valley, with his recommendations as to the remedial measures which should be adopted.

2. While the Chief Commissioner believes that the remedies, suggested by Mr. Purdon, would neither prove so beneficial, nor could be so easily and cheaply carried out, as that gentleman supposes, there are some of his proposals well worthy of consideration. The Chief Commissioner would be glad if you would discuss the subject with Brigadier General S. Cotton, and ascertain what might be done, and by what means.

3. With regard to Mr. Purdon's different proposals and observations, I am to make the following remarks.

4. It is believed that the Peshawur valley, from the very first occupation, has proved injurious to the health of our European troops. In the first year, however, they were located in the Huzaree Bagh and Ghor-Kutra, neither of which places are salubrious positions. The Chief Commissioner, however, is inclined to think that, since the present cantonment has been so much cultivated, and so many trees have grown up, it has become more unhealthy than formerly. If this be the case, it would be expedient to clear away a large portion of the gardens, and some of the trees, particularly in the vicinity of the barracks. Until effectual means be devised and adopted for distributing the waters of the Barra river, the Chief Commissioner considers that it would be well worth consideration, also, whether it would not be expedient to divert the stream from cantonments. It could probably be easily done at a point which would be sufficiently near

to enable the inhabitants to obtain water for domestic purposes.

5. If this step be adopted, it might then be a question whether all irrigation, within three miles of cantonments, should not be stopped. But until we desist from allowing irrigation within cantonments, it does not appear reasonable to prevent it still further outside than is at present the rule.

6. The remarks of the Civil Engineer, on the advantages of double storied barracks, appear to be very just; but it is now rather too late to begin to construct such buildings. Such changes would never be effected without large expenditure.

7. The Chief Commissioner strongly recommends that stringent rules regarding gardens, be laid down for Nowshera. A garden or two for vegetables and general amusement, at a distance from the barracks, would do no harm, and be useful. The great security, however, to Nowshera is that the land cannot be constantly flooded by any stream in its vicinity, except at a great cost.

8. The Chief Commissioner sees no prospect of a tram-way being sanctioned between Jhelum and Peshawur; and, on the whole, he would rest satisfied if this road were completed and metalled. At present we have not funds even available for this purpose. Major Robertson, however, estimated that a tram-way from Rawul Pindie to Peshawur would cost thirty lakhs of rupees.

I have, &c.,

(Signed)

E. H. P A S K E,

Officiating Secretary.

No. 96 OF 1859.

FROM

CAPTAIN HUGH R. JAMES,

Commissioner and Superintendent

Peshawur Division,

TO

R. H. DAVIES, ESQUIRE,

Secy. to the Govt. of the Punjab.

Dated ABBOTTABAD, HUZARA, 11th August.

SIR,

BY your predecessor's letter No. 173, of 6th February, 1858, Colonel Edwardes was directed to report his opinion regarding certain remedial measures proposed by Mr. Purdon, Civil Engineer, with a view to mitigate the inciting causes of disease in the Peshawur cantonments; and my attention has been called to the same subject by your letter, No. 1,807, of 4th instant.

2. The delay which has occurred in complying with these instructions, enables me to add a very strong argument, to those which might previously have been adduced, to prove that Mr. Purdon's theory is based on incorrect surmises.

3. That gentleman assumes that the noxious malaria is confined to Peshawur, and that, in "unirrigated localities, the valley is, doubtless, as healthy as such places usually are." This opinion was formed during a visit of a few days, on which occasion the only portion of the valley seen by him was the Trunk Road between Attock and Peshawur.

4. But the fact is quite the reverse : the bleakest and most unirrigated parts are found to be as unhealthy as those on which there is the most extensive cultivation. I may instance Fort Mackeson, which is on the crest of a sloping ridge, and, therefore, possessed of a complete natural drainage : there is scarcely a tree visible, nor an acre of cultivation within several miles of it, water being only obtained from wells—and a few small springs in the neighbourhood. Notwithstanding these circumstances, there is no more unhealthy spot in the whole valley.

5. Again, Fort Michnee, on the high bank of the Cabul river, which at that place flows in a strong bed, and with such velocity as to carry down to a lower point all deposits which might be supposed to contain noxious elements, is in a vast unirrigated plain, on which no water can be brought by artificial means ; sickness has been found to be as prevalent there also, and of the same type, as at Peshawur.

6. Again, the barracks are situated in open parts of the cantonments, with scarcely any trees in the vicinity—certainly none which could in any way impede a free circulation of air. Being in front of cantonments, they are quite open in that direction for miles ; and irrigation drains, of the nature alluded to by Mr. Purdon, do not exist in their neighbourhood. Mr. Purdon instances the marshes of Italy ; but because these marshes (many miles in extent) are found to be injurious at a distance of 3 miles, it does not follow that the same injuries will be experienced within 3 miles of ordinary field cultivation.

7. In regard to the Officers' compounds, the great objection, in my opinion, is their confined limits ; in some

of the lines they are so closely packed, as to form, with their out-houses, regular villages. It is quite impossible to preserve, in such crowded positions, perfect wholesomeness and purity, or to admit the air sufficiently. The growth of vegetables in these little enclosures may increase the evil ; but, I believe, it is generally admitted, that *trees*, if properly pruned to a certain height, and not allowed to become so thick as to affect the ventilation, are eminently useful in carrying off elements which are hurtful to human life ; whilst their shade is a grateful relief from the otherwise almost insupportable glare and heat of Peshawur.

8. This system of small compounds always appeared to me a great mistake, when the actual necessities of an Indian station are considered ; but I think it was intended, by the late Sir Charles Napier, to erect barracks for the officers, and the sites would have been sufficient for that purpose. When, however, that project was set aside, it became necessary to divide them off into compounds, which thus became smaller than those of any other station in India.

9. I will now turn to the argument alluded to in my 2nd para., viz., the perfect salubrity of Peshawur last year, 1858, when, both in cantonments and in the valley generally, there was no sickness to speak of. Now, irrigation continued as before, and vegetation was more advanced than in any previous season. This fact alone, therefore, shows that we must look elsewhere for the cause of disease—and for one which has a general and not a local applicability.

10. The fact of no rain having fallen until very late in the year, is commonly mentioned in explanation of this

unusual freedom from sickness ; and, as far as I can learn, the same result has always been observed under similar circumstances. I am unable myself to draw any conclusions in the matter ; but I think it not improbable that scientific enquiries, assisted by these data, might throw more light on the subject ; and that the nature of the soil, when acted on by rain, and the general conformation of the valley, will be found to present features which would account for its unhealthiness, and to counteract which, no local efforts would suffice.

11. Such being the state of the case, I do not recommend any of the measures suggested by Mr. Purdon ; for I feel assured that, even were they fully carried out, at an expense which the Government are not perhaps prepared to incur at present, we should find the station as unhealthy as ever. The only step I would propose, beyond a continued and careful supervision of conservancy arrangements, is the knocking down one-third of the houses, where they are too crowded ; and this may be effected probably without inconvenience, when the details of regiments to form the garrison are permanently decided upon.

12. Mr. Purdon's suggestion, regarding double storied barracks, wherever such buildings may be required hereafter, will be well worthy of adoption ; they must, I should think, be conducive to health in all localities.

13. The remaining question of a tram-way from Jhelum to Peshawur, appears to have been disposed of by the late Chief Commissioner.

I have, &c.,

(Signed) H. R. JAMES,
Commr. and Supdt.

No. 200.

DIVISION HEAD QUARTERS,

MURREE, 20th August, 1859.

SIR,

IN acknowledging the receipt of your letter, dated Murree, 18th August, 1859, I have the honor, in compliance with the wishes of His Honor the Lieutenant-Governor of the Punjab, to forward a memorandum on the subject of the insalubrity of the Peshawur valley, with suggestions for its remedy.

I have, &c.,

(Signed) S. COTTON, *Major-Genl.*,
Commanding Peshawur Division.

To

THE MILITARY SECRETARY
PUNJAB GOVERNMENT, }
Murree.

MEMORANDUM No. 1,181.

Having carefully perused the memo. of Mr. Purdon, Civil Engineer, dated 23rd January, 1858, and the other documents accompanying it, on the subject of the "insalubrity of the Peshawur valley, with suggestions for its remedy," I have the honor to record my opinion on the same, as required by the Lieutenant-Governor of the Punjab.

1. The admirable remarks of Captain James, the present Commissioner of Peshawur, are so entirely in accordance with my own sentiments on the subject of the insalubrity of the Peshawur valley, that I might copy

every word, or nearly so, of that officer's report, when placing on record my own sentiments on the subject. In giving my opinions, therefore, generally, on the subject, I might, without troubling the Lieutenant-Governor further, briefly refer to those of Captain James' as my own. Captain James has, like myself, been many years connected with Peshawur, and it will be readily understood why we entertain the same opinion relative to local circumstances.

I must, however, offer some additional remarks, chiefly in support of what Captain James has already stated.

2. Mr. Purdon's opinions and suggestions, which have been given on a most imperfect knowledge of the localities referred to, are most unquestionably not to be depended upon. Mr. Purdon, it is quite evident, knew little or nothing of the Peshawur valley, excepting the localities which fell under his observation whilst traversing the road from Attock to Peshawur, and those localities in and about the city and cantonments. A proof of this is given at the commencement of Mr. Purdon's memo., in which are these words, "The valley of Peshawur is by no means a marsh, indeed, without irrigation, it would be a barren plain."

In this he is entirely in error; in the first place, a very considerable portion of the valley is marshy, particularly after heavy rain; and, secondly, there is, in the Eusufzye district, a very considerable extent of corn fields, which nothing but the rain from heaven could possibly reach,—so high and dry are these fields, on which the finest crops of corn in the world are produced; but the Eusufzye district, notwithstanding these favorable circumstances,

is by no means free from the malarious fevers of the valley.

3 In the year 1856, when the whole of the Peshawur force, or nearly so, (european and native) was prostrated with fever, I prevailed on the Government to allow me to march a force of the three arms, of both colors, out of the Peshawur cantonment. The force consisted of 4,000 men; and, having proceeded across the Cabul river, at Nowshera, I encamped on various, and carefully selected spots, in the heart of the Eusufzye country. Assistant Surgeon Farquhar, of the East India Company's Service, who had served with the Guide Corps at Hoti Murdan for a considerable time, informed me of several villages in Eusufzye, the inhabitants of which, he had observed, generally, to be free from the malarious fevers of the valley, and the consequent affections of the spleen. I proceeded with the force to the spots so favorably reported on by Dr. Farquhar, and found, in every one of these villages, that the inhabitants were laid down with fever. The troops of my force suffered very much from fever, although somewhat benefited by the change of air, the spots selected for the encampments being high and dry and with good drinking water. I had taken with me into camp, on the occasion referred to, the troops suffering least from fever in the Peshawur cantonment, with a view to giving the experiment as fair a trial as possible. Owing to the extreme sickness of the troops at that time in the Peshawur cantonment, Major-General Reed, then Commanding the Peshawur Division, was under the necessity of recalling my force to Peshawur, to assist in taking the ordinary duties of the station, so thoroughly

prostrated were the whole of the troops there. I returned accordingly to Peshawur, fully impressed with the belief that there was no part of the Peshawur valley free from this malarious fever. In travelling through the Peshawur district, a year or two previously, in company with Dr. Farquhar, I passed the remains of some deserted villages between the cantonment of Nowshera and the mouth of the Kohat Pass (generally a dry and uncultivated country), which Doctor Farquhar informed me had been depopulated in his time by malarious fever. Fort Mackeson is on that line of road, and, as described by Captain James, is one of the most unhealthy spots in the valley; there is no cultivation or irrigation worthy of notice near to Fort Mackeson. No medical officer has seen more than Dr. Farquhar of the Peshawur valley; he is a talented and intelligent officer, and his observations have not been confined to the Peshawur cantonment.

4. As with Mr. Purdon, so it has often been with others, writing on the subject of the insalubrity of Peshawur,—their opinions being generally founded on circumstances coming under their observation, within and about the city and cantonments, of the great military station. Being by much the most populous of all localities in the valley, there is, of course, a proportional sickness, and possibly the proportion is greater than elsewhere, as epidemics are well known to prevail more proportionately in densely populated places, owing to people being huddled up together.

5. In regard to applying remedies in the cantonment, by which we might hope to mitigate the lamentable evils attendant on diseases at the periodical visitations,

I believe every thing is done that can be done. I do not think that the gardens in Peshawur produce any seriously bad effects; officers and their ladies, who are surrounded by gardens, suffer less than the soldiers,—who have generally no gardens round their barracks; neither do I think that the running stream, which waters the cantonment and city, produces any bad effect; much greater attention is paid now than formerly, to the free passage of the stream; and lodgments of water, by its overflowing, are now not permitted to remain. I think the trees in cantonments are rather of benefit to its inhabitants than otherwise, provided the lopping of them is sufficient for circulation of air in the immediate vicinity of dwelling houses. The only barracks now, which have gardens immediately around them, are those of the Artillery Division, the European Soldiers of which are, and ever have been, (since I have known Peshawur,) immeasurably the most healthy.

6. The Peshawur fever is of that nature that, when once it lays well hold of its victim, it generally sticks to him until he re-crosses the river Indus; and frequent attacks produce organic diseases. I, therefore, always strongly recommend that troops should be relieved frequently; and I also urge on the Government the necessity of keeping as few troops in the Peshawur district as possible, content with the safety of our possessions. Mr. Purdon's idea of a tram-way, as regards military requirements, in cases of succour being called for, I consider absurd; because, no dependence whatever could be placed on such means of transporting troops, where reinforcements are hastily required, as depending on a rail or tram-way; in

such a country, liable to insurrectionary movements, the supports might be in an instant cut off. Rawul Pindee is too far distant from the Indus, to be a good support to the Peshawur frontier. I know of no advantage whatever attending the location of a very large force at Rawul Pindee, excepting that it is a healthy station; but as we have recently proved that other localities, exist, equally healthy close up to the left bank of the Indus, with every possible advantage of a political and military nature, I lose no opportunity of endeavouring to persuade the Government to take advantage of them. One thousand men ready to pass the Indus in sound, good health, in a moment's notice, would, at times, be of more value to Government than any number of troops located in such a country as Peshawur—subject as it is to visitations of extraordinary sickness.

7. I beg particularly to refer, in conclusion, to the remarks of Captain James, contained in the 9th and 10th paras. of his admirable letter, No. 96 of 1859, accompanying these papers,—which I consider so thoroughly conclusive as to the effects of cultivating lands in and round the cantonments of Peshawur, that scarcely any additional remarks need be made. The visitations of malarious fever are periodical; and these visitations may not occur for a year or two, owing to the absence of rain, probably, or other causes; but when general sickness breaks out, the whole valley is affected. Captain James very properly asks—If it was the cultivation of the country (which is always vigorously carried on by irrigation) that produced malaria, how

is it that we have very healthy, as well as unhealthy, seasons ?

(Signed) S. COTTON, *Major-General,*
Commanding Peshawur Division.

MURREE, }
20th August, 1859. }

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*Memorandum by C. MACKINNON, ESQUIRE, Inspector General of Hospitals, North-Western Provinces, dated—October, 1859.*

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I have carefully perused Mr. Purdon's paper, and accompanying documents. His conclusions, as to the causes of the unhealthiness of Peshawur, appear to me to be drawn from insufficient data. In some of his facts, such as the increased unhealthiness, of late years, of the cantonment of Peshawur, he is not borne out by the medical returns of the troops. Some of his suggestions for improving the sanitary condition of the station, are not without value; but if they be looked on by him as likely to remove the sickness at Peshawur, and to render the Peshawur cantonment healthy, he has certainly arrived at a conclusion which is so sweeping as to be erroneous.

2. In common with all the lower valleys of Afghanistan, malarious fevers are endemic in the Peshawur valley. At the fall of the year they prevail, more or less, in all these valleys, but are worst in those of a swampy nature,—though valleys, apparently dry, are by no means free from them. They are observed also to prevail most extensively after wet seasons.

3. When the site of the Peshawur cantonment was first selected, Dr. Dempster, the senior medical officer of the station, pointed out that, from the close vicinity of swampy ground to the site proposed, the cantonment, if placed there, would certainly prove most unhealthy. Military reasons, however, decided the question ; and, in spite of the professional opinion then given, the correctness of which has been fully verified by subsequent fatal experience, the cantonment was built on its present site.

4. To the north of the cantonment lies an extensive swamp. As in all other localities, where swamps and a hot sun exist, this must prove a fertile source of malaria. When this swamp can be thoroughly drained, the first step, in the sanitary improvement of Peshawur, will have been taken. It has been supposed, but on no sufficient grounds, that the thorough drainage of this swamp would be attended, in the first instance, with an increased evolution of malaria, and a consequent increase of disease ; but I hold that such experience, as we can avail ourselves of at Peshawur, is contrary to this opinion. After dry seasons, Peshawur is well known to be more healthy than after wet ones ; and the drainage of this swamp would, for the first year or two, place it much in the same position as it is now after a very dry season. At all events it ought to be attempted, for it must influence materially the health of Peshawur, if it be not a main cause of the severity of the sickness which prevails there. While this swamp remains undrained, I see little prospect of other sanitary measures materially mitigating that sickness.

5. The irrigation canals, which irrigate the vicinity of Peshawur, should be so adjusted as not to interfere with

the natural drainage of the surrounding districts. It is believed that at present they interfere with it materially ; and wherever the natural drainage of a district is interfered with, either by canals having been placed in the natural course of that drainage, or by their embankments obstructing it, the health of the population is certain to suffer. The cantonment of Kurnal, which we were obliged to desert, is a striking instance of this. The re-adjustment of these canals for irrigation, so as wholly to avoid all interference with the natural drainage of the district, is, therefore, a most important point in improving the sanitary condition of Peshawur.

6. Mr. Purdon suggests that the irrigation canals within the cantonment should be of stone. Undoubtedly the improvement would be a great one, so I fear would be the cost. At present, the mud channels, in which the water runs, are easily broken down, are liable to overflow, and to form pools in which water stagnates. These are all erroneous sanitary conditions, which ought to be corrected. I doubt whether any amount of supervision would obviate these accidents, while the channels continue of the same friable material as now ; but, at the same time, the evils which arise from them are comparatively limited in their operation, and can have no very extended influence in increasing the yearly sickness which prevails at Peshawur. If it were otherwise, we should find *that* sickness greatest in the officers' compounds, where these water channels are most numerous. The reverse is the case.

7. Cutting down the trees within cantonments is a measure of more than questionable utility. They sur-

round chiefly the officers' bungalows, and the officers are probably the healthiest residents in Peshawur. The barracks are little affected by them, the space round these being clear. They can thus have little or no influence on the health of the troops. They act as a protection against the malaria which is generated without cantonments; and I have heard Dr. Cox, an old Peshawur resident, say that his servants never escaped fever until the trees round his bungalow grew up. I believe, therefore, that they are useful at Peshawur, and that their growth in belts around cantonments should be encouraged. To render them innocuous to health, all the decayed leaves which fall from them, in compounds or other situations where they are numerous, should be swept together and burnt; and their lower branches should be pruned so as to allow free circulation of air around their trunks.

8. Mr. Purdon proposes to put the troops into upper storied barracks. The suggestion has often been made before, and is unquestionably a good one. If it would secure the troops from the influence of malaria, it would be worth while to incur the expense even now. What says our experience of Peshawur? The fort is not less than 40 or 50 feet above the level of the valley, yet the residents there do not escape fever; still less would they be likely to escape it at a height of 16 feet. With this evidence staring them in the face, Government are not likely to incur the expense that Mr. Purdon's suggestion would involve; though it cannot be doubted that the troops would be less exposed to the influence of malaria on a well raised upper story than on a ground floor. Still, the experience of the fort shews us they would not escape altogether.

9. Mr. Purdon's suggestion to stop all irrigation within three miles of cantonments, may be tried when the swamp is drained, and the irrigation canals so adjusted as to leave the natural drainage of the district, around cantonments, free. To carry out the measure sooner, would, I fear, result in only a useless sacrifice of revenue.

10. I consider that Mr. Purdon deserves credit for having brought these suggestions forward. Sanitary science is yet in its infancy; it has not yet become a subject of general acquirement, and few out of our own profession know much about it; it is, therefore, to Mr. Purdon's credit that he appears to have bestowed some attention on the subject.

11. There are some peculiarities connected with the position and climate of Peshawur, the effect of which, on the health of the inhabitants, no sanitary measures can ever wholly remove. These peculiarities foster the existence of malarious fevers; and all that the most enlightened sanitation will probably be able to effect, will be to render this disease of a milder type, perhaps of less frequent occurrence, and less destructive to human life, than it is at present.

12. The district of Peshawur lies, as it were, in a basin, environed by lofty hills, the drainage of which it receives. It is subject in the hot and cold seasons to a stillness and stagnation of atmosphere, not met with in more open positions. This must favor the accumulation and concentration of malaria, naturally generated in a valley of its peculiar position and conformation; for, at the season when this malaria is most rife, there is an absence of those winds which would sweep it away and purify the atmosphere. There is, therefore, all the greater

necessity for such judicious sanitation as will be likely to diminish the causes productive of malaria, and reduce them to a minimum. This, it appears to me, is to be effected only by draining the swamp to the north of the cantonments thoroughly; by readjusting all the irrigation canals, so that they shall neither interfere with, nor in any way obstruct, the natural drainage of the district; by strict attention to the system of irrigation within the cantonment itself; and, if necessary, either to construct masonry channels for the distribution of the water, as recommended by Mr. Purdon, or else to do away with irrigation within cantonments altogether; and by the closest attention to the interior cleanliness and thorough drainage of the cantonment itself.

13. These measures I should expect to lessen the virulence of the malaria that prevails at Peshawur, in some measure to protect the troops from it, and to render it less fatal to health and life than it is at present. That we shall ever be able, by any sanitary measures, wholly to eradicate the endemic fever which prevails there, is a more than doubtful expectation,—as this appears to me partly to depend on the natural conformation of the valley, fostered by its atmospheric peculiarities.

(Signed) C. MACKINNON,
Inspector General of Hospitals, N. W. P.

(True Copies.)

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