

can quite understand however that both of these effects might follow. I do not think this symptom has attracted the special notice it deserves from the earlier observers. That they noticed it in their cases is very clear from their writings. Thus, in a case which Cavell saw two hours from the commencement of the disease, he says, "the skin was covered with a bright scarlet blush." Mouat in describing the early symptoms writes—"The whole surface became suffused or flushed, the face scarlet." Again Twining mentions that "the whole countenance appeared bloated and swollen;" and while describing the rash at a later period of the disease, expressly mentions parenthetically its being "seemingly quite distinct from the bloated suffusion of visage attending the first day of the disease."

You must have already gathered that the initial rash is met with at a very early period in the disease. You will in fact often find it fully developed the first time you see your patient, even an hour or two after the illness began. In rare cases it has not attracted attention till the second day. In a few instances it has seemed to fade a little, and again become more vivid. I have seen it quite disappear and then return, but this does not often occur.

(To be continued.)

ON MALARIAL FEVERS AND SITES, RELATING CHIEFLY TO ASSAM.

By JOHN MEREDITH, M.D.

(Concluded from page 251, Vol. VI.)

AFTER making the notes to which I alluded in my first paper on this subject, and collating them, certain inductions appeared to me to be deducible therefrom. In 1868 I was desired by the then Lieutenant-Governor of Bengal, Sir W. Grey, to put them together in an available form: I did so, and they were distributed as "suggestions relating to the care of labourers" with Act II of 1870; but to what extent I have not learnt.

I purpose here giving a summary of such portions of them as are immediately connected with the subject under consideration.

Taking first situations on which to erect dwellings, the pioneers of tea planting in Assam had, in many instances, not much to choose from in the way of sites: they had to place their lines and houses on grass plains, cutting down comparatively tall grass for the purpose. The grasses which chiefly abound on these plains belong to two species known to the natives as *Oolu* and *Bortani*—the *Imperata Cylindrica* and *Panicum Asperatum* of Botany. Situations thus chosen should have all tall grass cut down and cleared off. The ground on becoming exposed will be found to be uneven, and abounding in hollows which form ready water lodgments: all should be ploughed or levelled, so as to obliterate such places: this should be done to a distance of not less than a 100 paces from the dwellings, or the sites on which it is intended to erect them—the further it is carried the better. The clear ground lying between the dwellings and uncut grass should be planted with shrubberies, and laid out in garden plots. On no account should coarse grass jungle be allowed to grow in close proximity to laborers' huts, or any other habitation, nor should cut grass be allowed to lie and rot near. At the same time excessive shrubbery about houses is not desirable, but the thicker a belt of shrubbery is, when separating such grasses as described from the cleared spaces which should exist about dwellings, the better.

If it were always practicable to have situations on grass plains such as have been described, placed under some sort of cultivation before occupation, the unhealthiness of such situations would undoubtedly be much diminished after being thus utilized for a time.

The proximity of swampy places should be avoided, or if this

cannot be done, a thick belt of trees and shrubberies should be placed between them and all habitations.

Comparative immunity from malarial affections is obtained by throwing up a fence of earth round houses situated in sickly places, and planting bamboos, cactuses, pine apples, &c., on the top of the fence. A large number of the Assamese villages are thus surrounded. I noticed many instances of this among villages situated on what I believed to be excessively malarial sites at the foot of the Naga range of hills, in the district of Seesaugor, the inhabitants of which appeared all to enjoy average health and comfort; and even imported laborers located in the neighbourhood when similarly protected got on well, but when they were not, they suffered fearfully, as has been shewn in the case of the people at Tiphoot factory. When these earth fortifications are had recourse to with a top dressing of shrubberies, it is not of material importance what the nature of the soil outside may be.

The Chinese are fully aware of the advantages of these earth-works, judging from Colonel Fisher's book—"Personal Narrative of Three Years' Service in China," pages 25-26. Speaking of the neighbourhood of Canton, he says:—"Some of the views were charming. A striking and pleasing feature of this part of China is the position of the villages, which, situated on plains cultivated in the minutest manner, if such an expression can be used, are surrounded by luxuriant hedges of the graceful feathery bamboo. Now there is always a reason for everything, and there is for this. Long experience has taught the Chinese that the least healthy site for a dwelling is the side of a hill. Mind I am speaking of a hill in a country where the low ground is almost constantly under water and exposed to the rays of a powerful sun; for such is the condition (necessitated by climate, and for the growth of rice) of a great part of the South of China.

"They will cultivate the hills as long as they can irrigate them, and if they are too dry, they will use them as burial places, but live on them—never.

"They invariably settle down in the middle of their rice grounds, but as invariably surround their villages by thick bamboo; or, in the case of a town, by a wall higher than the tops of the houses inside.

"The insidious miasma will roll and wreath itself up the hill sides; and I think I am right in saying it will never descend again after topping the wall, nor will it penetrate the bamboo shield raised to ward off its approach." He then goes on to mention that the troops quartered on Magazine Hill were as healthy during the cold weather as those in the centre of Canton, but these last had much the better of it during the hot season. The hill was surrounded by low ground. A similar occurrence took place at Chusan, from the like cause. There was severe sickness among the troops at the elevated places.

There is, however, one very serious objection to these enclosures, as I observed in North Luckimpore a few years ago, when cholera broke out in the station and the surrounding villages; many of these were surrounded by earth-works surrounded by thick bamboo fences, which in many cases were quite impenetrable, and there were but single inlets into the enclosures. Cholera proved most destructive in these enclosed hamlets, and clung to them for a much longer time than to places lying in the open, or only surrounded by sparse brushwood. But these, I imagine, are only instances of when a good thing has been overdone—carried, in fact, beyond that line of prudent moderation which one finds it so difficult to define.

Plateaux, elevated but a little distance above an undrained plain, are not desirable situations, as one may conclude from the story of Putlah Rawah and other places already mentioned. Another very clear instance of this, which may be added to those already mentioned, is that of Niziri Khat factory in the district of Nowgong, Assam, and which I reported on to the Commissioner of the Division in May 1867. At this factory the laborers' houses were situated on a grass-covered hill, about

20 feet higher than an extensive swampy plain lying to the north. The houses were unsheltered by shrubbery, closely surrounded by coarse grass jungle, and were of defective construction;—their occupants suffered fearfully from malarial fever and bowel complaints.

Colonel Fisher, adopting the usual theory regarding miasma, describes it as rolling and wreathing up hills, &c., leaving on the mind the impression that it is something which approaches from a distance, attracted by elevations, and finds in them its most congenial abode. However, excluding all theory, I assume under the circumstances that no one will deny that raised plateaux on grassy plains are more sickly than the level of the plains themselves, certain essential conditions being present.

The explanation of this appears to me to be briefly as follows. It should be borne in mind what has already been said about radiation being greater from grasses than from other matters. Persons living within the range of this radiation suffer from exhaustion incident both to the heat, as I have already mentioned, which is experienced in grass jungle during a hot day, as well as to the chills which take place in them at nights.

But chills and heats are not the only assailants of health: in such localities the products of decay are ever present in proportion to the activity of the process itself.

In addition, a hill presents a greater number of points of radiation than a plain, and this radiation takes place upwards as well as laterally from each exposed point. For an illustration, let us say that the radiation from a space 20 feet square on a plain, equals 400; in that case there would be more than double this amount from a pyramid with the same extent of square for a base and a height of 20 feet. Plateaux are not met with in the form of pyramids, it is true; but still the figure answers the purpose I have in view, namely, that of showing a reason why such situations may prove more unhealthy than the plains themselves.

Elevations present more points of radiation than plains, in proportion to the greater extent of their superficies as compared to their base.

Plateaux are not, however, always necessarily sickly, like Pulta Rawah or Nizri Khat: in the proportion that radiation and eremacausis are modified and interfered with—the first by the growth of trees and shrubberies, and the last by the removal of coarse grasses, decaying vegetable or other matters and stagnant waters; in so far as their unhealthiness diminished, and they become habitable and fitting places of abode.

Passing next to the consideration of habitations in forest clearances, I would recommend that houses should be erected as much in the open in these clearances as possible, and not immediately under the shade of trees. These cleared spaces when recent I have always found in Assam to be uneven and channelled by water action, and I have no doubt the conditions are similar in other countries where there is an equal amount of moisture. These water channels, &c., should be thoroughly obliterated, and the ground around the proposed site should be levelled and treated as mentioned in regard to sites on grass plains. Neglect of this preparation is apt to be attended with serious consequences to the health of the occupants of the sites, as I particularly noticed in the case of one of the gardens of the Jorehaut Tea Company a few years ago.

Too much attention cannot be paid to the necessity of preventing stagnant pools forming about dwellings, especially when these dwellings are of flimsy construction, and capable of affording but little shelter from atmospheric changes, as temporary houses usually are. These clearances become healthier after they have become exposed to the sun's rays for a certain time, levelling and clearing being carried on in the mean time.

Slopes of hills are perfectly eligible for habitations, provided the sites do not immediately overlook low swampy lands, without a proper amount of trees and shrubberies intervening, and the clearances are not small and confined.

The banks of large streams, provided the grounds are otherwise eligible, always make good sites. In selecting these sites attention should be paid to the prevailing directions of the wind, so that the breeze may flow over the river towards the habitations, and not in the opposite direction.

The banks of small jungle streams are not however equally desirable on account of the almost incurable tendency of people of certain classes to use the waters of these streams, no matter whether they be wholesome or not. The same objections are applicable to the banks of *hoolahs*, as broad muddy ravines are termed in Assam and Eastern Bengal. The water in these, unless when flooded, is always sluggish or stagnant, and usually, a vast amount of vegetable matter is undergoing decay in them. Habitations should be sheltered by rows of trees and shrubberies from these shallow *hoolahs*; but if there be a steady flow of water in them, they are not then unhealthy; under such circumstance, however, the chances are that they will contain more of the character of regular streams than *hoolahs*.

Grounds, which approach the character of sand reefs, bounded by low and comparatively swampy ground, should, if possible, be avoided.

The bottoms of hills or gorges in tropical countries, where two or more hill slopes trend, are generally condemned as unfit places to live in.

The only place that I am acquainted with answering to this sort of situation, is the site of one tea garden in Assam, and this was certainly unhealthy, but I was more inclined to attribute the cause of the sickness to the close proximity to the lines of a large patch of low grassy land, and the almost utter absence of shrubbery and cultivation from the site.

Hardly less important to the situation selected is the description of house erected on it for one to live in. A vast amount of suffering was brought about in Assam a few years ago through the absence of proper habitable dwellings for the imported laborers to occupy. Sufferings from this cause, I apprehend, are not uncommon in other parts of India as well as Assam. I do not think it expedient to enter on any lengthened recapitulation of the "suggestions" offered affecting houses, and the ways to keep them habitable. The object should be to construct houses which would really be a protection against rain and atmospheric changes.

It is, moreover, the result of experience and observation with regard to laborers, and I suspect the thing is equally true in the case of people who are not laborers in this sense, that those who have good houses to live in perform a greater average amount of work, owing to their being healthier, than people occupying defectively-constructed dwellings, although alike in other respects.

The quality of the water used is as important, if not more so, in some cases, than the description of houses occupied. In addition to what has already been stated in the paper mentioned, I would here remark that I hardly understand the principle of recommending waters in tanks, &c., as wholesome, simply because they contain certain qualities of aquatic plants. In fact, I do not see in what way floating weeds, &c., in tanks improve the quality of the water at all. Aquatic plants, like other plants, have but a limited term of life: that ended, they decay, and the products of this decay remain mostly in the element in which they were generated. I can imagine nothing among these either wholesome, or in any way desirable, nor, as far as my reading has extended, has the most elaborate analysis suggested any. I think it here also unnecessary to repeat what I have already stated at some length in the paper named, and to which I would refer such of my readers as may be more particularly interested in these matters—as well as for remarks which I thought proper to offer on hospitals, food, and general matters relating to the care of Hindu and other laborers imported into tea districts.