## ON MALARIAL FEVERS AND SITES, RELATING CHIEFLY TO ASSAM.

By John Meredith, M.D.

*(Continued from page 177.)*

I have endeavoured in my two former papers on these subjects, to place before the reader, in as brief and clear a manner as practicable, the results of my observations on the comparative healthiness of grasses and shrubberies about dwellings.

Before proceeding further with this subject, I shall again quote another extract from Dr. Parkes' really admirable work on practical hygiene. He lays it down that "brushwood is almost always bad, and should be removed; however, that its removal will sometimes, on account of the disturbance of the ground, increase malarious diseases for the time, and, therefore, in the case of a temporary camp, in a hot malarious country, it is often desirable to avoid disturbing it." If by brushwood, Dr. Parkes means shrubberies, bushes, plants with the character of trees, but growing only from 2 or 3 feet to 10 or 12 feet in height, I have to observe that the result of my observations leads me to a different conclusion, for I consider such brushwood healthy, and, in moderation, desirable about dwellings. Every one must have noticed the almost universal tendency to surround dwellings with bushes of flowering trees, and often every path and road about a house are flanked with such vegetations, which are cleaned and well tended. I can hardly think any one would deem the presence of such surroundings "almost always bad." One noteworthy instance of the advantage of a well-kept garden, I may mention, was that of a merchant in George Town. He had taken great pains to drain what would be called in India his *compound*—no easy matter in that city, where the streets are 3 feet below the level of the sea at high tide—and having drained it, he laid the ground out with a profusion of shrubs and bushes of various sizes and descriptions. Independently of the pleasant effect on the eye, of this vegetation, it was attended with marked improvement in the healthiness of the place, and in addition, it was noticed that mosquitoes rarely troubled that house; this, however, I consider more owing to the drainage than to the character of the vegetation. This instance when mentioned here does not, I fear, strike one as being particularly instructive; but on comparing this house and its compound with its neighbours, it appeared to me conspicuous, and well-calculated to inculcate a lesson. Instead, therefore, of taking it as an axiom that "brushwood is almost always bad," I am decidedly of opinion, all other matters being regular, that the reverse is the case. I do not know of a single instance where its bad influence can be shown, while I might cite many to the contrary; even medical literature, generally so barren on these questions, furnishes prominent instances of the prophylactic and curative influence of brushwood jungle in cholera, as when, by a series of zig-zag marches through such jungle, a body of men suffering from the disease very rapidly get rid of it.

I would fain here interpolate a note on the comparative healthiness or otherwise of sand reefs flanked by damp loamy soil. I am thinking now especially of the condition of the land in Essequibo, the western county of British Guiana; analogous conditions are met with, very possibly, in India and elsewhere. The general level of the land in the county, and for the matter of that in the colony, is very little, if any, above the level of the sea at high water. Through the colony there meander several of these sand reefs. I had not an opportunity of examining any of them, except those in the county above named. The reefs were a few feet higher than the loamy soil, and in a few instances, factories and extensive ranges of dwellings were erected on them, but the sites were unhealthy, much more so than those on the loamy soil. As an illustration, I will state first the case of a factory of the latter description; all the people's houses belonging to it were erected on piles from 2 to 4 feet above the ground. The estate was often under water, the flow from "a back" (as the boundary on the bush or forest side of an estate is termed, in opposition to "front" which indicates the line towards the sea or river) towards the sea not being cleared off sufficiently fast to keep the place dry. At this factory, there was very little sickness; in fact, notwithstanding its want of drainage, the place was looked upon as being remarkably healthy, much more so than neighbouring factories, that kept their engines fully employed in pumping their surface water up to the sea, and which were consequently better drained. The other is that of a factory situated about 15 miles from the last, whose buildings and houses are erected on sandy soil. Water never lies about the dwellings, nor are the houses erected on piles. The soil immediately about is, of course, porous and easily drained, but the situation is very much more unhealthy than the first described. Intermittent and remittent fevers are ever prevalent, and occasionally in an aggravated form, to say nothing of the irritation—nay, often destruction—caused by the "chigoe"—*pulex penetrans*—which exists always in aggravating numbers in sandy situations.

Appropriate to, and further illustrating this point is the case, which I often heard Dr. Manget, Surgeon General of Demarara, mention in connection with the epidemic of cholera which visited that colony in 1855-6, of two villages in Berbice—one was erected on piles on a low piece of land which was generally under water—fresh, flowing, not stagnant. The occupants used to go to and from their semi-lacustrine houses, to undoubted *terra firma* along a gangway of several yards in length. The other village was erected on an adjoining piece of dry land—a sand reef, I believe.

The inhabitants of the pile village were a dirtier lot than those of the other, yet when the epidemic broke out, the inhabitants of the first escaped, while those of the cleaner and better kept village were more than decimated by the disease, and suffered fearfully. The reason of this difference appeared to me to be similar in both instances, and not far to look for.

The water surrounding both the pile founded dwellings was not strictly stagnant. There was a daily flow—very slight at times it is true, but still a flow—towards the sea at ebb tide, and to this flow I ascribe the comparative healthiness of the locations.

The occupants of the dwellings were thoroughly filthy in their habits, merely throwing their refuse matters, &c., out at the doors, or let them down through crevices in their floors. If there were not actual flowing water under these houses, there most likely would be the favourite resort of pigs and ducks, but in the instances where there was flowing water, such water teemed with fish eagerly feeding amidst the filth. In the case of the higher and drier situations, such ready means of getting rid of offal was not practicable, and no regular conservancy established. The heat by day is greater on the sandy situations than on the others, while radiation at night is greater also, and the processes of decay of dead matter, seeing how closely connected they are with radiation, and of the evolution of other matters from this decay, are in consequence more rapid, and he who participates of these last nearest to their sources, receives them in their nascent and most potent form.

I shall submit next some observations on the character of the ailments met with among imported and other people living on land covered by high forest trees.

In the years 1862-63, I had occasion in the course of duty to visit several gangs of laborers employed on wood cutting grants in the south-western portion of British Guiana. These laborers were men belonging to various races, but the negro predominated. They all lived in the forest, far from any open

land, except, perchance, a swampy savannah, or such spaces as they might make by felling; but these were never much to speak of, since they had often to change quarters, as the supply of the green heart timber, which was mainly sought after, fell short.

The laborers seldom remain more than three months at a time in the bush, without visiting either the town or some of the plantations. I noticed that a very large proportion of those who lived in the forest became anæmic—in fact, etiolated.

Attacks of intermittent fevers were not uncommon, but these attacks were not, as a rule, ardent or severe. On the plantations they would not have been deemed particularly important, nor would they have been attended with such rapid anæmia as took place in the bush. A visit to the open, or sometimes a trip on one of the broad rivers of the colony, sufficed to set a laborer to rights, and enabled him to finish his allotted term of service. I have noticed the same sort of etiolation with fevers among some of the tea gardens in Assam—such gardens as were made in forests; but as the clearances increased, and the places became opened out and unconfined, the excessive tendency to anæmia ceased. I have not found among people located for a length of time in forests like the wood-cutters mentioned, any instances of severe bowel complaints, except once in Upper Assam, among a gang of P. W. D. laborers, who were hutted on the banks of a stream in an extensive bamboo forest, without any clearance, other than the public road on which they were employed, within miles of them. These people at the time of my visit to their temporary camp were suffering, and had been suffering for some time previous, from bowel complaints and also to some extent from fevers.

The cause of the bowel complaints I had no hesitation in ascribing to the quality of the water which was used. The stream was comparatively small, except during the rains, and had an excessive amount of ferruginous matter in its bed, judging from the usual indications.

From the above and other similar instances, I have come to the conclusion that a residence for beyond a short period in close high forests is very apt to be attended by a rapid anæmic condition, and weakness accompanied with attacks of malarial fevers, but that these fevers are not of an ardent nature. I have, however, noticed some very remarkable exceptions to this;—first, among the charcoal burners of different tea gardens in Assam, where gangs of men live nearly all the year round in rude huts erected on some forest land, preparing and looking after charcoal for their employers. These people live near the pits and the charcoal huts; the atmosphere around them is strongly impregnated with the smoke and other emanations from the pits, and at night they experience a very perceptible amount of warmth from the pit fires. These people enjoyed better health during the sickly years than their fellow laborers employed on ordinary garden duties:—they rarely suffered from malarial complaints, nor did I notice any instance of anæmia or etiolation among them, and weakly feverish men sent to join these gangs generally got better in health while at these works.

The next instance, which I shall mention, is that of the laborers employed at the petroleum oil springs at Makum above Jeypore, Upper Assam. I visited these people at the end of May 1868, in company with my friend Dr. White of Debroghur. The oil spring was in the midst of a high forest, a little off the right bank of the Dihing river; the laborer's houses were erected on a small cleared spot near the river. From the well to the settlement on the river, the smell of petroleum was everywhere perceptible—in some parts strongly so.

The laborers consisted of men, women and children, and numbered 59. They had been at the place for nearly two years, and during the whole time, only one old woman, who went with her friends, had died at the place, and against this, there had been 7 births:—all had thriven well and enjoyed good health. There was not a case of etiolation or anæmia among them. Sometimes some of them would get occasional attacks of fever, but never any of a prostrating nature; bowel disorders were not complained of, nor were the people troubled with ulcers following leech bites, such as certainly would be the case at any other clearance of a similar nature in Assam.

The fact was that leeches, frogs, centipedes, lizards, &c., &c., rarely came within the influence of petroleum. Mosquitoes and sandflies were decidedly shy of places where its odour was unusually strong. Another rather noticeable feature may be mentioned, *i. e.*, those strong black coleopterous beetles, that fly about in such abundance in some places in Assam, at certain seasons, were frequently found of a morning to have been drowned in vast numbers in the tanks and pools of petroleum, lying about the springs. Apparently in flying past the wells on their course, they became embarrassed by the odour, fell into the reservoirs, &c., and died. I mention these circumstances only to show the very powerful influence which petroleum seems to have on all animals of low organization as well as on vegetables.

It appeared to me that the case of the laborers at Makum was an unusually instructive one. At all situations whether they were employed by the Public Works Department on roads, passing through forest jungles, or on tea gardens closely surrounded by such jungles, I have invariably found much suffering from leech bites, and irritable ulcers, consequent on the bite, in addition to frequent attacks of malarial fevers; but at Makum there were no ulcers, nor did the people suffer from fever to any harassing degree.

Analogous to the cases of charcoal burners and petroleum workers, is that of labourers employed about the building of sugar factories. For the information of such as may not have had an opportunity of seeing some of the arrangements of a sugar manufactory, I may mention that after the cane is cut in the fields, it is conveyed to the mill, passed between ponderous rollers, where all the juice is forced from it, until nothing remains but a fibrous mass which rapidly dries. The cane in this state is termed "megass," and is taken away from the mill and stacked in adjoining yards. In the *megass* yard, there is always present a strong saccharine smell.

This *megass* has strong antiseptic power, which was extremely well illustrated in a case that happened in Demarara a few years ago, and which was described by Dr. Dalton of that colony; it was this:—a labourer was one day missed, and all search for him proved fruitless. After a time, while the stacked *megass* was being carried to supply the furnace, the body of the missing man was found under a quantity of this material, which, by all accounts, must have fallen on him, while, possibly, he was lying asleep near the stack, and suffocated him. It was certain that the body had remained imbedded in this expressed cane for many days, if not weeks. I have not the references by me to state the exact time: notwithstanding, the body when exhumed was found to be nearly free from decomposition. This will appear all the more remarkable when the temperature of the air is considered, which was above 80°, and that in a moist climate, where, under ordinary circumstances, very marked decomposition would be perceptible in less than a day.

It is a common observation among colonists that the saccharine emanations before mentioned are eminently healthy and preventive of malarial fevers, &c.

Acting upon this, when I was officiating as medical officer to about a dozen estates' hospitals for a period of ten months in 1863-4, I used to direct that feverish laborers, who were

put in place

employed out in the fields, should be transferred to the *megass* yard for a time, and the change was generally attended with good results. Labourers suffering from intractable or irritable ulcers were also improved by being kept amidst the expressed dry cane:—the ulcers took on healing action, and the patients' health otherwise improved. At one time I had some of this *megass* placed about the beds in the hospitals: necessarily only a small quantity could be used for this purpose. I was not, however, satisfied that any marked benefit was derived from this use of it, any more than I am of marked good results attending the suspension of little panniers of charcoal in many hospitals and dispensaries in India. At the same time, I fully believe that tangible good results would follow in both instances, provided only a sufficient quantity of the materials were employed.

I have mentioned the circumstances of the charcoal burners in the forest, and petroleum workers at Makum, in my various reports to the Commissioner of Assam. I am desirous of adding another remark regarding this last after reading some observations on the matter in the report of the Sanitary Commissioner of Bengal for 1868. On the day I visited the springs, I, as a matter of course, made my enquiries at once about the health of the laborers and of other matters relating to them. On ascertaining the facts already noted, I called Dr. White's attention to them, and was glad to find that they excited his interest as fully as mine. Dr. White, in a note that he made of the visit and soon after forwarded to the Deputy Commissioner of the district, mentions that he believes the healthy influence of the oil to be due to the carbolic acid or its elements which exist in petroleum. I am not, however, able fully to concur in this, since carbolic acid belongs more to the alcohols and ethers than to the hydrocarbons; after all, both the series are extremely complex, and possibly any one or more of their components might lead to similar results.

Then, again, what are the components of the emanations from the burning charcoal pits? Something besides heat is thrown off, probably; the composition of this is analagous to, if not identical with petroleum, naphtha and their allied substances.

Further, what are the combinations which are so perceptible in sugar factories' *megass* yards? Most likely one or several of the hexatomic alcohols and ethers under which saccharine products are classed. In speculating thus—if the term should be used in this manner—one necessarily feels that he is treading on the confines of positive knowledge, and should beware of theorizing.

(*To be continued.*)

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## RELAPSING FEVER IN LOWER BENGAL.

By R. T. Lyons, *Assistant Surgeon, Bengal Medical Service.*

Within recent years, several epidemics of fever, of a most destructive nature, have occurred in various districts of Lower Bengal. It would appear from Dr. Elliot's report, published as a supplement in the *Calcutta Gazette* for June 1863, that since 1824, fever has periodically broken out as an epidemic in the Jessore, Baraset and Hooghly districts. In 1862, a terrible epidemic appeared in the Hooghly, Nuddea and Baraset districts; and the Government of Bengal appointed a commission, of which Dr. Elliot was a member, to enquire into the causes of the fever, and to propose measures for its prevention in future years. From Dr. D. B. Smith's first annual report for 1868, of the sanitary administration of Lower Bengal, I have obtained the following particulars. In 1846, an epidemic occurred at Jessore. The amount of fever was perfectly appalling, and the mortality most excessive. In the city of Jessore, with a population of about 6,000 people, 10 deaths occurred daily. No other epidemic, it is stated, occurred in the city up to 1865, in which year there was a great outbreak in all the adjoining districts, which was believed to have originated in Jessore. It appears that the inhabitants consider an outbreak of fever in September, October and November of each year a normal occurrence, and only exceptional outbreaks, such as those of 1846 and 1868, occasion alarm. In May and June, 1868, an epidemic occurred in a large village called Dhamptee in Tipperah: out of a population of 3,000, 300 were attacked, and 40 died within one week. At Rampore Bauleah, or Rajshahye, a "bad form of fever" prevailed in and near Dooteah at the end of the rainy season. It is said to have been "something like an epidemic," and many persons died. In July, 1868, a "very bad form of fever" prevailed all over the district of Rajshahye. Europeans and natives were equally affected, and "a good many" died of it. In 1865, the 11th Regiment, Native Infantry, lost 250 men at Patbakowah in the Julpigoree district, and "suffered greatly in its march through the terai." At the close of 1866, Burdwan was affected with an epidemic. The disease spread from the Hooghly and Nuddea districts to a large number of villages near Mymarree and Culna. The predisposing cause was the famine of 1866, during which the poorer classes suffered very severely, and of these classes the village population is almost entirely composed. The mortality was very considerable, and resulted rather from the sequelæ than from the first attack of the fever. About three-fourths of the people of a village would suffer from the epidemic, and the mortality amounted to 6 per cent. In the Selimabad division of Burdwan, consisting of 123 villages, containing 51,925 persons, 884 deaths occurred from the "epidemic fever," or 17 per thousand. In the Gungooria division, containing 38 villages, with a population of 27,221 persons, 1,259 deaths, or 46·1 per thousand. This heavy mortality resulted in three or four months. In 1865, severe "epidemic fever" broke out at Rajmahal. In Dr. Smith's annual report for 1869, allusions are made to a "terrible visitation of fever" at Burdwan aud Serampore, in the 24-Pergunnahs and the Hooghly district, but details are not given. It would also appear that "epidemic fever" has visited many other places besides those above mentioned.

Regarding the nature of the fever which has been so widespread and destructive, the reporters have not given any definite explanation. The majority have contented themselves with calling it a "malarious fever," the symptoms of which are "those of malarious fevers generally," but more violent. While the predisposing causes were privation and famine, as already stated, the exciting cause, we are told, was "a malarious atmospheric wave gradually spreading in a north-west direction." It would appear, however, that the above cause has been affirmed in a mood of desperation, for no other manifest reason, than because it is difficult to assign any other than malaria for "this highly malarious fever" (page 230 of Dr. Smith's report for 1868). The perusal of reports containing a semeiology and etiology of the above nature, has compelled Dr. Smith, the sanitary commissioner, to form, not unreasonably, the conclusion that the "epidemic fever" of Lower Bengal is not relapsing fever, but "a typical malarious epidemic fever, due to local causes, such as want of drainage, partial or complete stagnation of water courses, and saturation of the soil with moisture. It is not characterized by a relapse or a crisis, and it is not contagious. . . . The study of masses of recorded facts proves this beyond doubt" (page 534 of the report for 1868). Reasoning upon the same data, Mr. W. J. Moore of Rajpootana, in an article called "Sanitary reform in India," which appeared in the *Calcutta Review*, and was