Malaria
as the Cause of
Intermittent and Recurrent Fever

By J. P. Bunyon

Other literature quoted
"Malaria"

as the Cause

Intermittent and Remittent Fevers

The terms Malaria and Marsh Febris are applied to certain invisible, aeroform exhalations given off from the soil after it has been moistened, under the influence of solar heat, and which have the power of producing specific poisonous effects upon the human body. Neither of these terms are very accurate, the word Malaria is intended not to be restricted merely to its literal signification of "bad air", but to denote air which contains a peculiar and specific poison. The expression Marsh Febris, on the other hand, would seem to imply, that these emanations were given off solely or principally from Marshes, but we shall afterwards see they abound, and produce their deleterious effects when no Marsh exist.

The symptoms and effects of Malaria, though
forming a subject of the greatest interest, is one which happily at present does not so imperatively demand the attention of the medical practitioners in this country, as it did in former times; for we find that with the advance of civilization and the improved cultivation of the soil, it has all but disappeared from our island. To those, however, whose lot may be cast abroad, especially in warm climates, an acquaintance with its habits and properties, becomes of great value, as they may often have it in their power, by attention to a very few simple precautions, to prevent or mitigate much disease and suffering.

From the earliest times it has been known that the inhabitants of wet and marshy districts were peculiarly liable to suffer from particular forms of fever, but Dancier, an Italian physician, seems to have been the first, who gave any definite or distinct account of the morbid agency which produced them—about the year 1695. In the nature of Malaria, however, it still remains a mystery; it is only known to us by its widespread and destructive effects, as being the sole cause of intermittent and remittent fevers. Better the water and
The air of malarious districts have repeatedly been made the subject of microscopic and chemical investigation, in hope of discovering the real nature of the noxious principle contained in them, but without the slightest success. The only gas found by Leigh (who experimented much on this subject) to be peculiar to marsh water was carburetted hydrogen. A series of chemical experiments on the air of malarious grounds, were made in 1779 by Galton, and afterwards by Mr. Jollie in 1819, but without arriving at any satisfactory results.

The mode of operation is also obscure, but it seems incapable of producing its injurious effects either when inhaled or when taken into the stomach.

The specific cause of malaria by producing fever in hot climates, most frequently of an intermitting and remitting type, is now so well known, and so universally admitted, that it seems superfluous to say anything in proof of it. Ten or two illustrations may however be quoted. Trench in his essay on this disease of the army incidental to Europeans in hot climates, gives the following:

"In the month of August 1758, Admiral Hoodrick, in the frigate ship of war, anchored in the Bay of..."
Cristane [in Sardinia], when twenty-seven of his men were seized with the epidemic distemper of this island, twelve of them in particular, who had slept on shore, were brought on board delirious, all of them labouring under a low fever, attended with great oppression on the breast, and at the exit of the stomatch, a constant retching, and sometimes a vomiting of bile, upon which a delirium often ensued. Those ferves changed into double fitures, and afterwards terminated in distinct quartan agues. It is worthy of remark, that in the ship which lay only two miles distant from the land, none were taken ill, but such as had been on shore, of whom three died: This instance is interesting as illustration of several points which we shall have occasion afterwards more fully to notice. 1st. The specific effect of malaria in producing fever. 2nd. Only three who were put on those who were affected. 3rd. The twelve who slept on those were attacked more violently than the others, who had not done so, and it shews to what a limited extent the influence of the poison extends, especially if it has to pass over water. Dr. G. Hutton remarks that at Kingston harbor in Jamaica where "the ships of war"
take in this water, being wet and overdyed, it commonly happened that the men employed in
filling the water casks on tatum pick, either at the time or a few days after, and then as ex-
amples, when, out of fifty or seventy men sent out on that duty, not one has escaped a fever.

That intermittent fever may, further, be caused by the reception of the poison into the stomach,
from drinking the waters of marshy districts. It has been shown in many instances, of which I
shall quote one given by Mr. Grainger among several others on this subject.

"In July 1834, 360 soldiers, all in good health, embarked on the same day in three transport
ships at Rome, and arrived together at Marseilles. They were all exposed to the same atmosphere, influence,
and with the essential difference, supplied with the same food, and subjected to the
same discipline. On board one of the vessels were 120 soldiers. Of these 13 died of a destructive
fever during the voyage, and 88 more were taken to the Military Hospital of the Bastille
at Marseilles, presenting all the pathological characters proper to the fever of marshy situations.
It appeared upon inquiry that the water furnishes
to the soldiers on board the affected ship, had been taken, in the hurry of embarkation, from a marshy place near Mona, while the crew, not one of whom was attacked, were provided with wholesome water. It was further ascertained that the nine soldiers who escaped the disease had purchased water from the crew, and had not partaken of the marsh water. Not a single soldier or sailor suffered in the other transports, which were supplied with pure water.

The type which the fever assumes varies in different localities, and even in the same localities according to the temperature of the atmosphere at different times, when the temperature is low, it gives rise to intermittents, and simple remittents, but when higher, and the poison consequently in larger quantity, and probably greater intensity, bilious and malignant remittents are produced, and sometimes even continued fevers prevail from it. And it is interesting to observe that remittents contracted in hot climates often improve into intermittents on removal of the patient to a colder climate.

Owing to a certain temperature being necessary for the production of Malaria, the situations
which are infected by it, are limited to certain portions of the globe. Within the Arctic Circle it is quite unknown, and it is rarely to be met with in the colder seasons of the more temperate climates. It rarely manifests itself beyond the 50th degree of North latitude, and it is generally supposed that a temperature somewhat above 60° F. is required for its evolution. On the continent of Europe, it occurs an endemic along the low and level coast of Holland - in France it is endemic in Normandy - in the valley of Seine - It also abounds in some parts of Italy, Austria and Hungary. Some of the Mediterranean islands are often infected with it, once a year, or it may be only once in two or three years. In Asia the banks of the Ganges, and many other rivers are fertile sources of intermittent fever, and in Africa the course of the Senegal, Gambia, and other large rivers are the most frequent sources of the disease. In America the courses of the Mississippi - Missouri - Illinois and Ohio in the northern division, and the provinces of North and South Carolina - Virginia and Georgia in the South are well known to be prolific localities of Agua. The nearer these places in which it is evolved, are to the Equator, we find that there
The poison exists in greater abundance and virulence in the British isles, and similar climates, intermittent are the predominant forms to which it gives rise, proceeding southwards to Spain the shores of the Mediterranean and Italy, remittent are the prevailing forms, while in the more tropical countries, as the West Indies, the continued form of fever is not infrequently assumed.

We now propose to consider some of the chief conditions which are necessary for the development of malaria.

The necessity for a somewhat elevated temperature has been already alluded to. Its influence in the production of malaria may be further seen in noticing the seasons at which intermittent fevers most commonly break out. In no country are they less found to extend over a whole year, in those parts of the temperate zone where malaria is endemic, they begin to appear in the beginning of summer, if the weather be mild and warm, from this time they go on increasing till shortly after midsummer, when they receive a temporary check—probably from the greater frequency of winds and rains at that time. In the approach of autumn, however, they again become more frequent till the autumnal equinox, after which they
diminish in severity and frequency. The winter season is invariably exempt from Agues in the Temperate Zone, any cases of it which are to be met with at that season are those which have been contracted during the preceding autumn.

The absence of a certain degree of moisture is another condition requisite for the production of Malaria. This is shown by the diseases to which it gives rise, being limited for the most part to those districts of country, that are of a low humid marshy character. Such has been remarkably observed to be the case in our own island. Although now prevalent only to a very limited extent, Agues were, in comparatively recent times, by no means uncommon in England, especially in some parts of Kent, Essex, Cambridgeshire, Norfolk, Lincolnshire, and the East Riding of Yorkshire. This immunity, which we now enjoy, is doubtless chiefly due to the improved state of cultivation, and especially of the drainage, which puts a stop to the generation, and consequently to the effects of the malariae poison. We have a good example of the effects of cultivation in the case of East Lothian, where, in times not long gone by, Ague was very prevalent, but now that
the cultivation of the soil has been carried to a great extent, it is altogether unknown there. Along some parts of the shores of the Mediterranean, the coast of Holland, and some parts of America and India, large districts are rendered dangerous, and almost uninhabitable, at least during the wet seasons of the year, by the great evolition of Malaria which takes place from the soil.

But heat and moisture alone cannot produce Malaria; earth is also essential. The moisture of the sea, or of large lakes does not produce it. Aedes are never found to prevail among sailors while at sea, whatever may be the latitude in which they may be situated, and it is only when they land upon, or come near the shores, that they become affected. As to the nature of the soil which is most favourable for the production of Malaria, our information is not very definite. Light loams, porous and sandy, as well as retentive clay soils, appear to be its most fertile sources. Even rocky districts, however, are not exempt from Malarious foci; they abound in the rocky shores and islands of the Mediterranean, Minorca, Saragossa, Sicily, and the West Indies islands, which are chiefly composed of coralline rocks. This is
probably to be attributed to the presence of Calcareous strata, which are remarkable for their openness, and for being traversed by cavities and fissures, which often contain water, and through which it may readily percolate. Argillaceous soils seem likewise in a remarkable manner to promote the formation of Malaria. This has been a recognised fact since the time of Linnaeus, who thought, that intermittent fumes existed only in those localities in which clay, insipicious to moisture, was an abundant element of the soil.

This kind of soil is very retentive of moisture, and therefore is dried with great difficulty. It probably acts merely by retaining the moisture near the surface, so that the solar heat readily affects it. This kind of soil, which exists in Essex, Kent, Surrey, East Keltisham, &c., where intermittent fumes were at one time to common.

It is an interesting fact that the emanations from the mosses appear not to be capable of producing Malaria, the inhabitants of such bogs or moors being exempt in a remarkable degree from intermittent fumes. This fact is strikingly exemplified in the instance of the Tennes Swamp, a marshy tract extending to many thousand acres on the frontiers.
of Virginia and North Carolina, where Ague is quite unknown, although in North and South Carolina and Virginia, it abounds to a very great extent.

The law come to a question which has given rise to considerable difference of opinion among some eminent physicians—namely, whether or not the existence of vegetable matter in a state of decay or putrefaction is necessary for the production of Malaria. That there is frequently much decaying vegetable matter in regions where Malaria exists, does not admit of doubt; but that it is an essential element in its production, is we think extremely improbable. Dr. Ferguson was the first to adduce arguments in support of this opinion, which we think are very conclusive. He showed that the decomposition of vegetable matter is constantly going on in many parts of the world, where no Malaria ever exists, and on the other hand, Malaria may, and often does abound in localities where there is no vegetable matter to decay.

Not having had an opportunity of perusing the original paper of Dr. Ferguson on this subject, I shall quote a few extracts given by Dr. Paton in his Practice of Physic, who also holds this view.

"In the year 1809, several regiments of our army
in Spain, took up an encampment in a hilly ravine, which had lately been a watercourse. Pool of water still remained here and there among the rocks, so fine that the soldiers were anxious to live under near them, for the sake of using the water. Several of the men were seized with violent remittent fever before they could remove the next morning. Well then (says to Ferguson) it had always been behind amongst us that vegetable putrefaction (the human decay) of vegetables was essential to the production of pestiferous miasma, but in the instance of the half dried ravine before us, from the stony bed of which (as soil men could lie for the torrents the very existence even of vegetation was impossible, it proved as pestiferous as the bed of a fen.

After the battle of Talavera, the army retreated along the course of the Guadiana river, into the plains of Estremadura. The country was sterile and dry, for want of rain that the Guadiana itself, and all the smaller streams, had in fact ceased to streams, and were no more than lines of detached pools in the courses that had formerly been rivers. The troops then suffered from remittent fevers of such destructive malignity, that the enemy, and all Europe, believed that the
British host was extirpated.

Ciudad Rodrigo is situated on a rocky bank of the river Aguera, a remarkably clear stream, but the approach to it on the side of Portugal is through a bare, open, hollow country, that has been likened to the dried up bed of an extensive lake; and upon more than one occasion, when this low land, after having been flooded in the rainy season, had become as dry as a brickyard, with the vegetation entirely burned up, there arose among our troops, fevers which for malignity of type, could only be matched by those before mentioned on the Guadiana.

Dr. Ferguson also remarks that in the most unhealthy parts of Spain, we may in vain, towards the close of the summer, look for lakes, marshes, ditches, pools, or even vegetation. Spain generally speaking is thus, though as prolific of fever endemics fever as Waldheim, beyond all doubt, one of the driest countries in Europe, and it is not till it has again been made one of the wettest, by the periodical rains, with its vegetation and aquatic weeds restored, that it can be called healthy, or even habitable with any degree of safety.

Another very illustrative instance from Dr. Watson is this:...
The river Tagus, is at Lisbon, about two miles broad, and it separates a healthy from a very unhealthy region. On the one side is a bare hilly country, the foundation of the soil, and of the beds of the streams being rock, with few open watercourses among the hills. This is the unhealthy side. But the Alentejo land on the other side, though as dry superficially, being perfectly flat and sandy, is most justifiable. Moreover, in and near Lisbon, there are numerous gardens, where they keep water, in stone reservoirs, during the three months of absolute drought in the summer season. These reservoirs containing water in the most concentrated state of freshness and purity, are placed close to the houses and sleeping rooms, the inhabitants literally live and breathe in their atmosphere, yet no one ever heard or dreamed of fever being generated amongst them from such a source, though the most ignorant native is well aware, that when he only to cross the river, and sleep on the sandy shores of the Alentejo, when a particle of water at that season, has not been seen for months, and when water, being absorbed into the sand as soon as it fell, has never known to the justice, he would run the greatest risk of being seized.
with remittent fever.

Again Dr. Ferguson states that ague and remittent fever prevailed to a great extent in August 1794 in the British encampments, in South Holland, where the soil was a level plain of sand without vegetation, except a few stunted heaths, but extensively inundated with water, not putrid, but clear and drinkable. From these facts and many more which might be adduced, I think we cannot hesitate to come to the conclusion that putrefaction, though a very frequent concomitant of malaria, is not necessary for its production.

This is not during rains, or at the time of inundations of rivers and lakes that malarious fens make their appearance, but after the lapse of some time, when the water has received also when a surface of moist ground more or less extensive has been exposed to the rays of a summer or autumnal sun. And it is from this cause probably as much as any other, that even in those countries where agues are endemic, some part of the year is exempt from feverous agues. Thus in Hungary, where these fens are extensive, it is chiefly after wet seasons, when the Danube and other rivers have overflowed their banks,
and inundate the surrounding level country, that the disease becomes general. It is not, then, the marshes or lakes, but their margins, which are either dried or in the process of drying, and all porous soils in which watery fluid may be readily evaporated, which are the true sources of malarious emanations. It has long been observed, that so long as the water of lakes, or marshes is sufficient to cover their basins, no fever emanates from them, but whenever, either by the progress of evaporation, or the deposition of new matter, the surface of the deposit is exposed, intermittent fevers become prevalent.

Johns [sic] Craigie quotes an instance from Europe, of a city being long healthy, notwithstanding that it was near its walls a deep lake, in which for the space of forty years, all sorts of impurities had been accumulated. The moment, however, that the mass of these matters by their increase, had reached the level of the surface of the water, a violent fever broke out, and continued such ravages that the mortality of the town was raised from 400 to 2,000 annually. Dr. J. Johnson, speaking of the endemic intermittent fever of Bengal, after describing the great inundations which take place sometimes in that country from the overflowing of
the Ganges, says: "The more complete the inundation, the more healthy are the inhabitants, till the fall of the waters in November and December, exposes a number of miry and slimy marshes, to the action of a still powerful sun, when those who are in their neighborhood, are sure to come in for a share of remittents and intermittents."

The following example of the danger following marshes to subside is given by Sir John Pingle: "The country round Buda had been inundated at the commencement of the war, for military purposes, but early in the summer 1746, the preliminaries of peace having been signed, the water was let off, and the grounds, which had been covered by it, were by this operation made bare and exposed to the sun's rays, so that a dangerous epidemic fever, the remittent kind soon daged at Buda, and the neighbouring villages. The states of Holland, being made sensible of this, gave orders to let in the water again, and keep it up till winter. An expedient which produced the desired effect, as it had done on other similar occasions. Water courses and beds of rivers also, that are dried up in summer, in warm countries, and thereby become sources of malarious fevers, are
frequently observed to become quite innocuous when filled.

From the circumstance of a moist surface of ground, exposed to the action of the sun and air, being necessary for the production of malaria, we find that agues may occur in situations where there are no marshes, although certainly, it is in the neighborhood of marshes, that they are chiefly and most frequently met with. Dr. Jones of Philadelphia and New York observed agues and remittents to be very general in New York after the autumnal equinox, when the season has been rainy, though there are neither marshy grounds nor pools of standing water in its vicinity, except that there is one pond about a mile above the city, from which the city is supplied with fresh water, but it is always pure.

In his writing on the diseases of the army in St. Domingo Bay, "It must be admitted, that frequently" malaria arose when there are no very certain appearances of a marshy soil. The brook and "marshes," (St. Domingo) do not appear surrounded with marshy and yet the fever reigns in both these places with great activity. It will generally be found in these situations that the soil is either porous and penetrable, or very retentive of moisture, and
either takes a long time to dry, or is ultimately dried by the sun, and moistened by rain. Such is the character of various parts of Italy, Spain and North America, which are well known to be very prolific of agues and remittents, and yet no marshy exist in their vicinity.

Different states of the atmosphere have a considerable influence upon the development, and effects of malarious exhalations. Calm states of the atmosphere favouring their noxious influence on the body, and high winds mitigating it. The effects of malaria may be comparatively slight, even in places where it is given off in great abundance, provided there be a quick renewal of the atmosphere passing over their surface, preventing the stagnation and concentration of the poison. While on the other hand, stillness of the atmosphere increases the injurious effects of malarious effluvia on the human body, by favouring its accumulation in the lower strata, and its circumscribed limits. Hence it is frequently noticed that agues may be prevailing in a district in the latter part of summer, but at the period of the autumnal equinox, they receive a temporary arrest from the high gales, which usually occur at that period. But though winds undoubtedly
prevent the action of the poison in some situations, they also frequently favour its action in others. Thus Pliny gives an instance of a pleasure party, consisting of thirty ladies and gentlemen, who had sailed to the mouth of the Tiber, and in consequence of the wind having suddenly changed to the south, blowing in its course over marshy land, twenty-nine were immediately attacked by puerperal fever. It was supposed by Dr. Linnd that easterly winds in spring had a peculiar power of extinguishing malaria from the soil.

Dr. Bancroft, again, contendted that the easterly wind was merely an exciting cause of fever in those persons who had contracted the poison during the preceding summer and autumn, but which had remained dormant during the winter. I am not aware that it is now considered to have any specific effect.

When malarious vapours have to pass over water, they lose their morbid qualities, even though it be but a short distance from their source. The reason of this probably is, that from its specific gravity being greater than atmospheric air, it tends to keep close down, and is absorbed by the water in its passage over it. This idea is favoured by the fact which was formerly mentioned, that fever may be caused by drinking the water of malarious districts.
Sir Gilbert Blane gives the following account of what took place at Flushing. Not only the crews of the ships in the road of Flushing were entirely free from the endemic, but also the guard ships, which were stationed in the narrow channel between this island (Flushing) and Breendon. The width of this channel is about six thousand feet, yet though some of the ships lay much nearer to one shore than to the other, there was no instance of any of the men or officers being taken ill with the same disorder as that with which the troops on shore were affected.

Dr. Land gives the following instance: "The Commander of the Her Majesty's Forces, in the months of July and August 1744, lay off the mouth of the Scheldt, it was observed that one or two of the ships which lay nearest the shore began to be affected by the malarious poison from the land; whilst others lying further out at sea, at least a very small distance from the former, had not a sick man at the same time.

Malarious effluvia cannot retain their morbid influence to a great height, particularly, owing probably to their specific gravity being greater than that of atmospheric air. Their power of causing disease diminishes rapidly as the distance from the earth increases. Dr. Hunter in his work on
the diseases of the army in Jamaica observe - " The barracks at Spanish Town consist of two floors, the first upon the ground, the second above the first. The difference in the health of the men on the two floors was so striking as to engage the attention of the Assembly of the island (Jamaica), and upon investigation it appears that those have taken ill on the ground floor, for one on the other. The ground floor was not, therefore, used as a barrack afterwards." Mr. Breda relates the following facts regarding the Clinical wards of the Hospital at Padua - "The wall of that wing of the building, where these wards are situated, is washed by a branch of the sluggish Brenta, and it frequently happened that the windows of them, which were about sixteen feet from the surface of the water, having been carelessly left open until too late an hour, several of the patients were attacked with intermittent fever, in some instances of the putridious kind. This never occurred in the women's ward, which was immediately over those of the men, though there is no reason to believe that more can afterwards in fluently the windows of those than of the latter." The same fact is illustrated by the following case given by Dr. Walfish, an army surgeon, in a report on the health of the men at Martinique.
"By a calculation made in this report, it appears he says that in the month of August, one case of
fever presented itself in every twentieth man of
these quarters on the ground floor; and in each
thirtieth man of those quarters on the upper
floor. During that part of the month of September
which has elapsed, each twenty-fourth man was
attacked with fever of those stationed in the upper
room, and each fourth among those in the lower.

It would appear, furthermore, that not only in
the tenants of the upper apartments of the house,
morfe fever from malarious fevers, but when they
do attack them, they do so in a much milder
form, than those lower down. The evidence as
to the distance, in a vertical direction, to which
these febrifac exhalations may from injuries is
rather contradictory, and it has not yet been de-
termined with accuracy. Some supposing that it
is nearly iner at a height of twenty feet, others
that it may under certain circumstances be
attracted by hillades to an elevation of 1,000 feet.

The latter opinion is supported by Sir Gilbert
Blair, who gives this first as an example how
the high grounds were infected, while the low lands,
markedly places in the vicinity, were free from its
injurious effects. But it may be questioned, whether
in these instances, the malarious is not actually gen-
erated on the hills, as we know it often is, under
certain conditions, and at considerable elevations.

Another remarkable and well known property of
the malarious poison is its tendency to be attracted by,
and adhere to the foliage of trees. The inhabitants
of all malarious districts are well aware of this fact,
so they are careful to avoid, as much as possible
going, or at all events sleeping, under undergrowing
trees; but this peculiarity may often be turned to good
account, thus encouraging and settlements may
be made with the greatest security to the lessons
of the most pestilential marshes, provided a line
of trees intervenes and dwellings and even towns
may be kept free from the pernicious effects
of the malarious poison by the interposition of
a belt of trees between them, and the source of depression.
The evils resulting from cutting down woods which
intervene between marshes and dwellings are ex-
emplified by the following instance of Mr. Rigau-
'nez de St. Stephen, on Mount Arguelto, a conve-

dence is situated, which was famed for the celebrity
of its air. But since the forest which surrounded
it have been cleared, it has become unhealthy.
Again at Belletri, near the Pontine marshes, the cutting down intermediate wood occasioned immediately, and for three successive years, fever and other diseases which committed great ravages. The same effects were observed from a similar cause, near the Campo Salino, and in many other instances.

In all marshy districts the poison is most active during the night. Hence travelling by night in these districts becomes very hazardous. All boats of travel in Italy contain injunctions to travellers to avoid crossing the marshy districts during the night. Shepherds also avoid these situations at that time, being well aware of the pernicious effects. The nearer the ground also, the more instant and destructive is the poison, so that those who are so injurious as to sleep on the ground in the open air at night, incur a double risk of suffering from its effects. Various reasons have been assigned for its greater virulence at night, such as the body being more susceptible to its influence by the fatigue of the previous day, the absence of light, the poison being conducted along with the moisture. Probably each of these causes may influence
its action.

As already stated the marsh poison is capable of being conveyed from one place to another, so that a place otherwise healthy may in this way become infected with it. In its transit it is occasionally accompanied by a mist to which it very probably attaches itself, and is carried along like a fog. This property of being capable of being transported to a distance from which it was generated, is no doubt very beneficial in preventing its concentration in one place.

Thus seems to be no definite period between the reception of the poison into the body, and the manifestation of its effects. In the districts where it exists in its most virulent and deadly form, its operation is extremely rapid, sometimes for an intense form being produced within a very few hours after exposure to its influence. In those places, on the other hand, where it is not generated in so great abundance, or in so concentrated a form, an indefinite, and it may be a considerably lengthened period of incubation may exist. Many facts tend to show, that the poison may linger quiescent in the bodies of those who have been exposed to its influence for a considerable
time after their removal from the malarious district. Such persons may be attacked with Ague six, eight, or even nine months after their residence in healthy districts. This is supposed to explain the reason of some cases of intermittent fever occurring in spring or in the early part of summer, before the conditions supposed to be necessary for the production of Malaria have made their appearance. They have probably been contracted by exposure to the poison during the preceding summer or autumn, but it had lain dormant in the system, until perhaps, the incursion of some exciting cause, which develops the disease, such as cold, damp, &c. These cases are always observed to be of a mild character and to yield readily to appropriate treatment.

The longest periods of incubation occur in cold, or temperate climates, the shortest in hot climates, and as a general rule, the disease will be most violent in those cases, when the period of incubation has been shortest, and vice versa. Dr. Bancroft thinks the attacks of fever uncommon before the ninth, twelfth, or fifteenth days. Dr. Jackson believes that attacks can rarely be before the seventh day, they more commonly occur.
about the fourteenth, and often not till the expiration of six weeks or two months after exposure to the poison. The average period is probably from one to twelve or fourteen days. The following is an instance given by Dr. Hunter, in which the latent period was at least four months. In 1793, the West Suffolk regiment of Militia, after suffering from March fever to severity at Hills barracks, that they lost twenty two men between the months of February, and the latter end of June, encamped in the first week of July at Watford, in the neighbourhood of St. Albans, and with the fatigue of the March, and the duties of Camp, their sick list soon amounted to one hundred out of five hundred; and, of these, there were twenty ill of fever in the hospital, which had all the characteristic marks of a bad remittent. During the four months of the campaign, ten died of fever in this regiment, twelve, a greater number than what died of all other diseases put together, in the eleven other battalions, that were encamped on the same ground; and in the month of October, some even taken ill of the fever, who had never had it before, that is nearly four months after they had ceased
to be exposed to the Caucus of the disease at Milca
barracks.

Strangers going to a Malarious district are
much more readily affected by the poison, than
the natives of the place, and they are said to be
differenty affected according to the district from
whence they came. It has been observed that tho
of the British troops who were natives of Mountain
ous districts and dry soils, were more frequently
affected than those who had come from flat
and moist situations. And it is generally found
that sailors, accustomed to breathe the pure air
of the ocean, are more liable to be affected than
others, especially if they have changed from a
cold to a warmer climate. It is also remarked
that if persons are exposed to Malarious exhal
ations, when fatigued with hard labour, or
long fasting, the poison takes effect upon the body
more readily, and produces in a very short time
the worst forms of fever. Women are not so often
attacked as men, but this is most probably due
to their not being so much exposed to the poison.
After residence in a Malarious district for
some length of time persons become accustomed
to it, or become less susceptible of its poisoni...
effects, but they again lose this insusceptibility to the bad effects of the effluvia, by removing to, and residing for some time in places where the air is more dry and salubrious. The inhabitants of the marshy district may even it is said become more liable to be attacked by the fever, by removing to another marshy district. But though residence in malarious situations renders those who have recovered from the first attacks of the endemic fever, much less liable to be affected by them afterwards, and exempt to a certain extent from the more acute forms of the disease, yet the impurity of the air is such that, the inhabitants of such places are almost always affected by chronic disease. They are described as being hollow, feeble, sickly, and thriftless; they become prematurely old, and their intellect and spirits are low and feeble. An remarkable exception to this, however, is mentioned by Dr. Ferguson, in the case of the negro, to whom, he says, marsh malaria is no poison: the cause of this he attributes to the typhus of the skin, but how this should operate, it is difficult to understand. It is stated by Dr. Jackson that white persons, born and residing in the marshy unhealthy
districts of lower Georgia, seldom live to the age of forty, and that, at Petersburg in Virginia, they rarely reach twenty-five, and although they may never have been the subject of sickness, they are weak and sickly, so injuriously does endemic influence operate on the constitutions of the white races, even though it never may induce acute disease. It is very different, however, he remarks when one of the parents belongs to the indigenous inhabitants.

A good deal can sometimes be done in the way of preventing the generation of malaria, as well as avoiding its injurious influences. Draining and cultivating marshy grounds, when practicable, is ultimately one of the most effectual means of putting an stop to these emanations. In situations where this cannot be done, advantage would often be derived from covering the whole surface over with water, since malarious exhalations are only evolved when the mud and soil of the bottom and sides of lakes are exposed to the action of the sun. It may sometimes be of considerable advantage to plant trees to lessen unhealthy places, in order to screen those living in their vicinity from their injurious influences, seeing they
have the power of attracting the poison, or of confining it to its source. The choice of residence affects much the health of the inhabitants. When the winds blow from particular quarters, at certain seasons, and hours of the day, buildings or encampments should be so placed as to be, especially during the night, to windward of the prevailing sources of the endemic poison. Ships also should observe this precaution, as much as possible, and at the same time keep at some distance from a Malarious coast, in order that the poison may be absorbed by the water before reaching them, should the wind carry it in that direction. Buildings either in the vicinity, or to the leeward of any sources of Malaria, or situated on a deep, moist or boggy, or alluvial, soil in a Malarious district should be very high, the ground floor left unoccupied especially at night, and the side looking towards the source of the noxious effluvia always kept shut. It will be superfluous to enumerate all the other means of avoiding the effects of these exhalations, as this would only be reiterating much of what has already been said.

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