AN INAUGURAL DISSERTATION
ON
Malaria

SUBMITTED TO THE
PRESIDENT, BOARD OF TRUSTEES, AND MEDICAL FACULTY
OF THE
UNIVERSITY OF NASHVILLE,
FOR THE DEGREE OF
DOCTOR OF MEDICINE.

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MARCH 17, 1857
W. T. BERRY & CO.,
BOOKSELLERS AND STATIONERS,
NASHVILLE, TENN.
Malaria

The position of opinion is that vegetable decomposition has nothing to do with the production of malarial fevers. I take this stand with a great many others of the medical profession, notwithstanding the labours of so many celebrated physicians who have written volumes to prove to the contrary. As a proof of the opinion I entertain, I will cite you to several instances of this fever killing whole armies where there was not the first vestige of a vegetable nor never had been.

In August, 1794, after a very hot and dry summer, the British army in Holland encamped at Rosendaal and Oosterhout. The soil, in both places, was a level plain of sand, with a perfec
by dry surface, where no vegetation existed, or could exist, but stunted heath
plants. It was universally supposed to be within a few inches of the surface,
with water which, so far from being pantrid, was perfectly potable. There
fewer of the intermittent and endemic type appeared among the troops in great
abundance. It is interesting to observe that the soil in Waleria is precisely
similar. Mr. Gilbert Blane describes it as consisting of a fine white sand,
known in the eastern countries of England by the name of silt, and about
a third part of clay. It was after a hot and dry summer, also, that the
British army suffered on that island from the endemic fever, to a degree
which Dr. Ferguson speaks of as being almost unprecedented in the annals of warfare. In the year 1809, several regiments of the army in Spain took up an encampment in a hilly ravine which had lately been a water course. Pools of water here and there among the rocks, so pure that the soldiers were anxious to bivouack near them for the sake of using the water. Several of the men were seized with violent delirium fever before they could move from the bivouack the next morning. Till then (says Dr. Ferguson) it had always been believed among us that vegetable putrefaction (the humid decay of vegetable) was essential to the
production of pestiferous miasmata; but in the instance of the half dry ravine before us, from the stony bed of which (as evil men could lie for the torrents) the very existence even of vegetation was impossible; it proceeded as pestiferous as the bed of a few. After the battle of Salavera, the army retreated along the course of the Guadacan River, into the plains of Estremadura. The country was so arid and so dry for want of rain, that the Guadacan itself, and all the smaller streams, had in fact ceased to be streams, and were no more than lines of detached pools in the course that had formerly been rivory. The troops there must suffered
from semitute fevers of such destructive malignity, that the enemy, and all Europe, believed that the British host was exterminated. Rodrigo is situated on a rocky bank of the river Agenada, a remarkably clear stream, but the approach to it on the coast 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 early season, had become as dry as a brick ground, with vegetation utterly burned up, there arose to the troops fevers which, for malignity of type, could only be matched by those before
mentioned in the Gaudiana. Many more facts to the same purpose are related in Dr. Ferguson's paper, which is in every way well worth the perusal of any one desiring further information upon the subject. He tells us "that in the most unhealthy parts of Spain, we may in vain, toward the close of the summer, look for lakes, marshes, ditches, pools, or even vegetation. Spain, generally speaking, is thin, though as prolific of endemic fever as Walcheren, beyond all doubt one of the driest countries of Europe; and it is not till it has again been made one of the mosht, by the periodically rains, with its vegetation and aquatic weeds restored, that it can be
Called healthy, or even habitable with any degree of safety. Our circumstances of contrast will now mention. The river Tagus is, at Lissbon, about two miles broad, and it separates a healthy from a very unhealthy region. On the one side is a bare rocky country, the foundation of the soil, and of the beds of the streams, being rock, with few open water courses among the hills. This is the healthy side. But the Alentejo land, on the other side, though as dry superficially, being perfectly flat and sandy, is most productive. Moreover, in and near Lissbon there are numerous gardens, where they keep water, during the three months, absolute drought of the summer season.
stone reservoirs. These reservoirs, containing water in the most concentrated state of foul
ness and putridity, are placed close to the houses and sleeping rooms: the in-
habitants literally live and breathe in their atmosphere. "Yet no one ever hears
or dreams of fever being generated amongst them from such a source; though
the most ignorant native is well aware that were he only to cross the river, a
sleep on the sandy shore of the same
lago, where a particle of water at
that season had not been seen for months,
and where water, being absorbed
to the sand as soon as it fell, was
never known to be putrid, he
would run the greatest risk of
being seized with instant fever.
Now these facts, and facts like these, seem to prove that the malaria, and the product of vegetable decomposition, are two distinct things. They are often in company with each other, but they have no necessary connection. Wherever, in a malarious country, exists for the evidence of putrefaction, will readily, says Dr. Ferguson, too long after producing malaria, it appears to be requisite that there should be a surface capable of absorbing moisture, and that this surface should be flooded and soaked with water, and then dried, and the higher the temperature, and the quicker the drying, the more efficient, the more plentiful, virulent (more virulent, probably, because more plentiful).
is the poison that is evolved. The pre
reduction of animal is sometimes spoken of as an element in the for-
mation of malarious poison.

But the evidence I have just set before you refutes this supposi-
tion as completely as it excludes the alleged necessity of vegetable
decay. Therefore neither animal nor vegetable decomposition is suf-
ficient to generate fever of any kind.

Dr. Huxley's facts are generally in accordance with the observa-
tions which others have made upon the same subject: and his
views will be found to account for some phenomenon which the
ordinary theory of vegetable pu-
Iraction did not cleverly explain where is good reason for believing
that in all cases the poisonous emanations proceed from parts of the
surface that have been flooded or the dried, rather than from parts
that are still wet, or putrid.

And this elucidates a circumstance very often noticed, viz., that nei-
dbouring places especially high and low lands lying near each
other change their character in respect to salubrity upon the oc-
currence of rains. The low grounds, which
had previously been dangerous, become healthy when they are
flooded over. And the higher
lands, which are made wet, and
which rapidly dry again, produce
the malaria abundantly. For the same
reason, the edges or borders of swamps,
which of course expand or contract
according to the wetness or dryness of
the season, are more unsafe than their
centers. The drying and half dried mar-
gins of the purest streams may be
prolific of the evil, when, from
the want of confining banks, those
margins have been flooded by the
rising of the waters. There is no obser-
vation more general than that, in ma-
larious places, agues and intermittent fe-
vers abound now in hot and dry
years than in those which are cold
and moist. And this influence of
temperature it is which mainly de
termin.
the differences observable in regard to the fever at different elevations, and in different seasons of the year. In the higher grounds of the West Indies ages occur as in this country; as you ascend and the mean atmospheric temperature increases, symptoms are one with the mean lowest and hottest part of the fever becomes continued. The following instructive facts are stated by Dr. Ferguson. In 1816, the British garrison of English Harbour in Antigua, was disposed in three separate barracks, on fortified hills surrounding the dockyard. One of the main barracks was on an eminence named Monk's Hill, 600 hundred feet above the level of Mars Hill.
The other two were situated on an eminence
the ridge, one at height of 500 hundred,
and the other at the height of 300 hundred
feet. So pestiferous were the miasms
among which the dock-yard
was placed, that it often happened
to well-seasoned soldier, coming
down from Monk's Hill, and morn-
ing the night guard in perfect
health, to be seized with furious de-
lirium while standing sentry, and
to expire within less than 30 hours
after being carried up to his barracks,
with a yellow skin, and having had
black vomiting. Those in the barracks
on Monk's Hill who did not come
down, the superior officers, the wo-
men, children, and drummers,
had no fever of any kind. Seventeen artillery men, in the barrack at the
height of three hundred feet, did not come down to the night guard. Every
one of these men was attacked with
remittent fever, of which one of
them died. As the barrack on the side
of the ridge, at the height of five
hundred feet, there scarcely occur-
red any fever worthy notice. Thus,
in the same place, the malarial,
in the level plain, caused con-
tinued fever, resembling, and I belie-
ve identical with, yellow fever:
at the elevation of three hundred
feet it gave rise to remittent fever;
and at the height of five or six hun-
dred feet its influence was scarcely
felt at all. On the neighbourhood of the Fontine marshes you see the villages perched curiously on the intervening hills; the Italians having been taught by experience that these elevated spots afforded comparative security against the effect of the miasma. Wherever the malarial forebears, it produces its peculiar consequences chiefly in certain seasons: and it is in the autumn especially that ague and aguish fevers occur; that is to say, after the heat of summer, and the hotter and dryer the preceding summer, the more frequent and fatal the autumnal fevers. The effects of these morbid effluvia upon the human body vary much.
under different circumstances. There
they are most concentrated and deadly.
Their operation may be almost imme-
diate. Witness their speedy influence
upon the soldiers who descended at
night from Mount Hell. So also the
soldiers who have gone on shore for a
different night only, have been attacked
with the fever before they could return
to the ships. As have shown from facts
which rest upon Dr. Forsyth's author-
ity, that the products of vegetable
decay and decomposition may be as often
cocexist with malaria, but are dis-
tinct and separable from it, and by
means so essential to its formation. And
then argument which seems to be
useless; after such strong evidence
to refute the doctrine of malaria by vegetable decomposition, is as follows: if it was so produced that it would be found to exist north of the forty-fifth degree of north latitude where vegetable matter is very abundant, but malarial fevers do not prevail there. You never hear of a case north of this line. Having proved beyond a doubt that vegetable decomposition has nothing to do with the production of malaria. The foregoing facts are data from which, I shall endeavor to draw some conclusions to prove that heat & water are only necessary to produce this agent; besides others among that will be brought forward to substantiate the same thing.
Earth is said to be an essential element in the production of malaria, which is by no means a necessary condition of its evolution at all times, as I expect to prove before I close this subject. An argument to advance against this theory is to show that malaria is extricated by different kinds of soil in Holland at Rosendael and Aardenburh, the soil at both places, was a level plain of sand, being pervaded within a few inches of the surface with water, which cut out this malarious principle and at Walcheren a similar but different soil composed of white sand and clay evolved this same agent. Clay soil will do the same thing and any kind of soil...
on the habitable globe that is loose, penetrable, and porous, that will absorb moisture appears highly favorable to its formation. On the 18th of the year 1809, several regiments of army in Spain took up an encampment in a likely ravine which had lately been a water course. Pools of water still remained here and there among the rocks, so pure that the settlers were asking to bivouack near them for the sake of using the water. Several of the men were seized with violent delirium fever before they could move from the bivouack the next morning. But as the distance of the half dried ravine before us, from the stone bed of which far sail never could be
for the torpor) is a proof that earth is not an essential element in the production of this poison. Air is also thought to be an essential element in the production of this agent which it does, and will ever do until its advocacy being forth proof that it exercises an influence on the production of Malaria. The only thing it is capable of doing in my opinion is to convey it from the spot where it was generated, and to other places which, else be free from it and healthy. This conveyance of the poison, like a cloud or fog, from one part of the surface of the ground to another, it is very important to attend to in all places, and especially so in tropical climates,
where the wind blows for a long time together from the same quarter. We are thus enabled to account for the apparent exceptions to the last mentioned property of the malaria, viz., its preference of low to elevated situations. You will readily understand how the mosquitoes may roll up, and hang accumulated upon, the side of a hill toward which a current of air sets steadily from or across a neighboring marsh. Nay, the poison may be thus blown over a hill, and deposited upon the other side of it. A knowledge of these facts ought to be valuable in determining the choice of campments, and of sites for dwelling houses in any district.
letters in hot climates, especially where trade winds prevail, would do well to avoid founding town on the lee side of swampy or suspicious ground. It is said if heat and moisture were alone adequate, we should find the fever prevailing among sailors when out at sea; but it is not so whatever be the temperature under which they cruise. Every well informed medical man knows that malaria lose their noxious properties by passing over even a small surface of water, would show the great inconsistency of the assertion above, and scatter the tendency of the argument as it were with a mild confusion.
If it could be produced out at sea, what would be some of this agent if it is probable that it would be absorbed by the water as fast as generated, therefore how can its effects be felt out upon the ocean? When this is an utter impossibility when it is produced upon land by heat and moisture the moment it is conveyed to the matter by the wind, if there ships cease to move or exist. Many instances can be referred to, where some of the crew of ships have landed on a malarious coast, and have all been attacked by the fever; while the rest of the sailors, who remained on board, continued all healthy and well. Though the ship was close to the shore.
"You could not have a better or more striking example of this than what took place at Walcheren. Not only the crews of the ships in the road of Flushing were entirely free from the influence; but also the gale was felt by ships which, stationed in the narrow channel between this island (Walcheren) and Breslau. 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. Commodore Mitchell's squadron, which lay at anchor on
the channel between South Cleveland and the island of Walcheren, in both which places the distemper raged, was neither afflicted with the fever nor the flux, but amidst all the sickness enjoyed perfect health; a proof that the moist and putrid air of the marshes was dissipated, or corrected before it could reach them. To the production of this deleterious agent, a certain degree of temperature seems necessary. It does not exist within the arctic circle: nor does it manifest itself during the colder seasons of more temperate climates. As it existed before it is not traceable beyond the 45th degree of North Latitude;
and it is supposed to require for its development a continuous temperature higher than 50 degrees of the Crenheit's thermometer. The nearer we approach the equator the more abundant, virulent, and pernicious does the poison become, whereas even the poison is evolved at all. As we go south, in Spain, and along the shores of the Mediterranean, the intermittent becomes the predominant form; and (what is very instructive) there contracted often improve into remits upon the removal of the patient to a colder climate; under the tropical heat, in the west Indies for example, the fever frequently assume
the continued firm. There is reason to believe that flooding of a porous earthy surface with water and subterranean drying of the surface under a certain degree of heat, constitute the sole conditions of the generation of the poison. About the year 1835, a hurricane passed through Montgomery County, Pennsylvania near Palmyra, blowing down trees, houses, and nearly everything else along where it passed. A family of relations of mine living in this portion of country where the hurricane passed through, had never had in their family interminable or deminimal fever, previous to this event; but after the hurricane almost annually.
My father's family who lived at a very sickly place; where these fevers prevailed nearly every year in his family. Concluded from this unfortunate circumstance that he would send some one or other of his family when labouring under these fevers to live with relations who lived at the identical place which has been spoken of above where these material fevers did not exist for their health which he did for a good many years previous to the hurricane where they were always restored to their former state of health. The prevalence of these fevers at this particular locality cannot be accounted for
or traced to any local cause at a distance from this place, if such a cause did exist the poison would be generated and wafted by the wind through the open space occasioned by the falling of the timber. Most of the trees that were blown down are now forming the soil and a new growth of timber has put up waving about in great luxuriance and since all this which happened according to the common course of nature there has not been a case of chills or fever. If such an upset can establish by proof what I have stated about said place, what does this prove that the malaria was produced by the
hot rays of Sun shining down upon the earth in this timber. The reason that malarial fevers are more prevalent at water courses is because the water during the winter overflow the lowland and a great deal of it is absorbed and the hot rays of the Sun of the succeeding summer beam down upon these places after they become dry produce the malarial poisons. To account for its prevailing to such a great extent in newly settled country in this way the inhabitants when they move in the first thing is to build houses, which must be done out of green timber they will the trees or cut some down and the
Timber being dead the water that is in it no longer circulates then
the Sun's rays shining upon this water in the wood produce the
malaria. Jan 30th 1857.

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