leads to the question of predisposing causes, of which I will mention three : 1. Constitutional, hereditary or acquired (which I have already touched upon) ; 2. Age ; 3. Want of acclimatisation.

Youth and immaturity very strongly predispose to all forms of endemic tropical fever ; even in this country, enteric fever is chiefly a disease of early manhood. But, as far as military statistics are concerned, age and acclimatisation are not to be separated as predisposing causes. This arises from the fact that the young soldier is necessarily a recent arrival, and a recent arrival is nearly always a young soldier.

I am indebted to Deputy Surgeon-General Tydd for the following statistics for British troops in Bengal, for 1878, with regard to enteric fever. In that year there were 166 deaths from enteric fever, which were reported from nearly every division, and indeed from almost every station, in the Presidency. This was nearly three times in excess of the average of previous years ; and note the following : about 75 per cent. of the deaths took place in the second and third quarters of the year (summer and autumn) ; nearly 50 per cent. were among men during their first year in the country ; and 60 per cent. were those under twenty-four years of age.

The process of natural selection, or weeding out of the subjects most susceptible to endemic causes of disease, is, therefore, a very rapid one ; and, whatever may be the true etiology of enteric fever in these Indian stations, it is certainly not to be disassociated from the very marked proclivity which constitutional type, age, and want of acclimatisation (or weeding out) exercises among a body of men.

I will conclude by a short special reference to intertropical enteric fever, as seen in the army.

I assume we are agreed that we may call any case of continued fever, in which the specific bowel-lesion is recognised, enteric, without reference to an assumed cause. Starting from such an hypothesis, I cannot help thinking that the said enteric lesion is to be found in several forms of a closely allied fever ; and that, although anatomically specific as a lesion, it does not necessarily spring from only one specific cause.

Enteric fever is usually seen in this country in an epidemic form—that is, it tends to propagate itself through the media of air, food, or water ; and I doubt not that it may occur and spread in an identically similar way in tropical countries. But we can at once subscribe to the doctrines of such eminent exponents of the disease as Budd and Murchison, and at the same time not shut our eyes to the fact that the theories of these great men cannot and do not, always and wholly, explain the phenomena of sporadic enteric fever in such places as Bermuda, Gibraltar, or an Indian cantonment.

Surgeon-General Gordon has shown that fever, with enteric lesion, occurs in India, which cannot reasonably be accounted for either on an assumption of direct propagation, or a filth origin *de novo*. Propagationists say that it is not the theory that is at fault, but the observer, who does not bring sufficient science or skill to bear on the investigation. If the disease arise only from specific germs, then we must assume an almost certain ubiquity and indestructibility for such germs. If the disease always have a filth-origin, how do we account for its appearance, say, in the virgin wilds of Zululand ? I maintain that in hot climates the theories of propagation, or of pythogenesis, applied to enteric fever, often seem utterly at fault.

I could give many instances of this which have come under my own observation. Over and over again, in Bermuda and Gibraltar, I have seen isolated cases of enteric fever, both in barracks and private houses, which a filth-theory alone could not possibly explain. For, if such cases arose from soil or water pollution, how came it that scores of other people, living under identically the same conditions, were not similarly affected ? Or, if soil and water contamination be the cause of the disease, why should it be so only in summer and autumn ? Such sources of the disease are equally present, and ought to be quite as active, during the mild winter and spring in subtropical localities.

If a cesspit system and a porous absorbent rock be at the bottom of the mischief in Bermuda, as has been often asserted, then we must find some other explanation in Gibraltar, where there is impervious limestone, and elaborate main drainage conservancy. And so, by a process of logical involution, the etiology of endemic sporadic enteric fever in the tropics becomes a matter of exceeding difficulty and perplexity. We are bound to look at causation from every point of view ; but this becomes difficult when preconceived opinions are apt to beset us on every side.

Appropos of this remark, I conclude by quoting from a paper on Pandemic Influences, by Inspector-General Lawson, in which he says : "The advance of knowledge has been much impeded by the disposition, so strong among medical writers and observers, to regard disease as they individually see it, and refer its prevalence and character to circumstances affecting obviously the population within their immediate sphere ; which, had their observations been extended to other countries,

a similar prevalence of disease might have been found under local circumstances very different from those thought so essential to its occurrence among themselves."

A CONTRIBUTION TO THE ETIOLOGY OF TYPHOID FEVER.

By J. MCNEILL, M.B., Homerton Fever Hospital.

AT the present time, when eminent men differ much in their opinion regarding the etiology of typhoid fever, it might be of importance were I to give the history of sixteen cases which I attended in the Island of Colonsay in 1876. The Island of Colonsay lies off the west of Argyllshire. It is separated from the neighbouring islands of Mull, Jura, and Islay, by belts of the Atlantic, twelve to eight miles broad. Small eminences and intervening hollows, scarcely deserving the name of hills and valleys, make the surface of the island very irregular. The soil of the valleys is peat, clay, sand, and gravel, pure and in combination. The valleys are generally cultivated. The hills are mostly made up of hard whin rock, covered with a thin layer of peaty soil, giving growth to a fine crop of heather. The population in 1871 was 456. The people are distributed all over the surface of the island, so that at any place there are not more than a dozen families, within several hundred yards of each other. With the exception of a few fishermen, the people are all given to agriculture. They generally build their houses in the valleys, or a little way up the hills. They never meet in large numbers, except at kirk, at a wedding, or a funeral. Typhoid fever broke out in six houses. Three had the disease in the first house, four in the second, two in the third, one in the fourth, five in the fifth, and one in the sixth. With the exception of one man, all the patients were under thirty years of age. The distance between the houses in which the disease broke out, with the exception of the second and third, was more than two miles. Between those two there was only a distance of about one hundred yards of level ground. All the affected families got their water-supply from different wells. Each family had a sufficient number of cows to provide their own milk. Their other provisions were got from various sources. They had no drainage in common. The subsoil water could not possibly permeate from the premises of any one of the families to those of another, as rocky eminences, cultivated valleys, and lakes, intervened between all the houses, with the exception of the second and third ; these two got their water-supply from two different wells, with a distance between the wells of about two hundred yards of level ground. None of the houses had a sewer in connection with it. The bedpan was used for all excretions, and emptied immediately at a safe distance from the house. During the epidemic, carbolic acid was poured into the utensil before use ; and immediately after use the contents were poured into a hole dug in the earth forty or fifty yards from the house, and covered over with chloride of lime and earth. When I visited the island in April, the first family were convalescent, and the second family were suffering from the fever. At first, I thought that the impure water which this family drank was the cause of the disease, as the water was renewed by the drainage of a manure-heap. On inquiry, I found that three other families drank the same well-water, and they were all in perfect health. I was also told that the well must have been polluted in the same way for years, and no one was anything the worse for it. On further inquiry, I was told that a servant-girl went home to the island from Bridge of Allan, four or five months before, in a state of ill health ; and that this girl was a particular friend of the first member of the second family that suffered. This was probably the origin of the whole epidemic, as will be afterwards shown.

First Family.—A member of this family was the servant-girl already alluded to. From the description which she gave me of her illness, I came to the conclusion that she suffered from typhoid fever. As soon as her employers in Bridge of Allan could get quit of her, they sent her home to Colonsay. Her clothes were not washed, and she suffered from diarrhoea after going home. Her mother and sister washed her clothes. In a short time, her brother and two sisters had an attack of fever and diarrhoea. The father and mother, who escaped, were considerably above forty years of age. This family lived in a house about two and a half miles from the second.

Second Family.—The first member of the second family that suffered was a particular friend of the girl who came home from Bridge of Allan. She went to see her friend, and remained a night, nursing her brother and sisters. Between two and three weeks afterwards, she felt ill, and went through a very severe attack of typhoid fever. In succession, a brother and two sisters suffered from the same complaint. This is the family that was ill when I visited the island in April. The first family was by that time, as I stated, convalescent.

Third Family.—This family lived about one hundred yards from the second. Some member of this family used to call on their neighbours daily, to inquire how they were getting on. In a short time, a daughter (about twelve) suffered from fever and diarrhoea. She was not confined to the house longer than a fortnight. After her recovery, her father (about thirty-seven) had a very severe attack of typhoid fever.

Fourth House.—As soon as the parents of the last girl saw fit, they sent her to school. The school-house was about three miles and a half away. As the girl was weakly after the fever, her parents engaged lodgings for her near the school. Her clothes were washed, but not disinfected, before she left her parents. She did not suffer from diarrhoea after leaving her home. She slept with the servant-girl in her new abode. In about a month, the servant-girl became very ill, and suffered from typhoid fever. This servant-girl never visited any of the sick people before she took ill. She was sent home, a distance of about six miles, before diarrhoea commenced. No one in her employer's house suffered after her departure.

Fifth Family.—The servant-girl's home was a low, badly ventilated, two-chambered dwelling-house. After she went home, the father, mother, and seven of the family lived in the house. Six of them slept in one apartment about fourteen feet square, and three slept in the kitchen. In succession, three sisters and two brothers suffered from typhoid fever, two of whom died. A little baby (about one year and a half), the father (about fifty), and mother (forty-five), escaped.

Sixth House.—When the last family were ill, a woman came a distance of about six miles, and visited them. She did not stay in the house longer than ten minutes. She did not partake of anything in the house. She noticed a very disagreeable smell from a recent alvine discharge. She went home, and remained in her usual state of health for three weeks. At the end of that time, she commenced to suffer from a severe attack of typhoid fever. All who lived in the house left immediately, except the husband, and an old woman who acted as nurse. In about two months, she was convalescent. The house was disinfected, and no one else suffered from the disease. The nurse was above forty, and the husband considerably above thirty, years of age. Both escaped.

I may mention that the cases occurred in the above order, and that eleven months elapsed from the time the servant-girl came home from Bridge of Allan till the last case was convalescent.

Taken in a straight line, the distance between the first and the last house is about seven miles. Taken in the zigzag way by which the contagium must have passed, it is over seventeen miles.

Conclusions or Inferences.—1. The exhalation from the lungs, skin, urine, or fresh stool, must be infectious; because the sixteenth case could not have got the disease in any other way. 2. There is danger of infection for some time after the stoppage of the diarrhoea; for the only reasonable way of accounting for the way in which the servant-girl in the fourth house got the disease is, because she slept with the girl who suffered from the fever and diarrhoea a few weeks before. Whether the breath, the exhalations from the skin, urine, or feces, contained the contagium, I cannot say. 3. Persons over thirty are not so susceptible as under that age; and over forty, they are less susceptible still, because the father and mother, both above fifty, escaped in the first house; father and mother, both above forty, escaped in the second; mother, above thirty, escaped, but father, above thirty, took the disease in the third house; husband, above thirty, and nurse, above forty, escaped in the sixth. All these had to attend to the sick during their illness. 4. The period of incubation was twenty or twenty-one days in the sixteenth case.

IS ENTERIC FEVER CONTAGIOUS?

By H. DONKIN, M.B., F.R.C.P.,
Assistant-Physician to the Westminster Hospital.

THE following facts tend to support the contagiousness of enteric fever: a view lately readvocated in this JOURNAL by Dr. Collie of Homerton, whose series of papers on this subject is most valuable, from the careful observation and accurate reasoning by which it is marked.

During a period of over three years, three nurses, all young women, took enteric fever in the East London Hospital for Children at Shadwell. The cases were typical, and declared themselves within a few weeks after the nurses had begun to tend enteric patients. These nurses, in common with the rest of the residents in this hospital, had been exposed to the chronic influence of bad drainage for some time before they sickened with enteric fever: two of them for many months; one of them for at least two years. The fact of the very faulty drainage (which is now being thoroughly rectified) was established by a recent exhaustive inspection, and with almost equal force by a long

series of maladies, chiefly incident on the resident staff, and referable, from their nature, to poisoning by sewer-gas.

But, spite of the numerous cases of diarrhoea, sore-throats of great severity, and nondescript, albeit marked, cases of pyrexia, which took place during these three years with such persistence that at last the term "Shadwell fever" became commonly used amongst our residents, the only cases of enteric fever which arose in the hospital were those of the nurses to whom I have alluded.

What was there to make a distinction between the circumstances of these nurses and those of their fellow-residents, most of them probably liable, through their youth, to take the disease; and all of them living in a sewer-poisoned air, which often, presumably, included in its baneful ingredients the exhalations from the decomposed stools of many enteric patients admitted from time to time into the wards? They had all three been in constant attendance on cases of enteric fever.

I submit this piece of evidence, apparently confirmatory of the unpopular, though, if true, important view, of the contagiousness of enteric fever, under the impression that the *drain-theory*, supported as it is by a great cloud of no mean witnesses, has an authority somewhat out of proportion to the amount of strict and unbiased reasoning on which it rests. The evidence brought forward by the late M. Piedvache of Dinan has been over lightly treated; nor can we omit to observe that, even in Dr. Cayley's Croonian Lectures, no mention is made of the recent arguments urged by Dr. Collie in favour of this serious disease possessing, like its relatives, the quality of being, in some manner, "catching".

ENTERIC FEVER IN THE PACIFIC.

By P. HERBERT METCALFE, M.R.C.S.Eng., Norfolk Island.

Dr. GEORGE WILSON, in his *Handbook of Hygiene*, points out somewhat particularly the necessity of attending to the periodic cleansing of wells. A case lately under my care would seem to confirm Dr. Wilson's opinion, and at the same time point to the theory that typhoid fever may be generated *de novo*.

I am the resident medical officer to the community of Norfolk Island; and on this island, in latitude 29° 3' S., longitude 167° 58' E., four hundred miles from the nearest inhabited land, in January this year I visited a gentleman who had arrived from England the September previous. I found him suffering from an unmistakable attack of typhoid fever. The most prominent symptoms of that disease were well marked. The supervention of the attack was gradual. Headache and aching limbs, with a feeling of exhaustion and loss of appetite, had existed for some days; and giddiness was complained of. The tongue, at first moist and coated, subsequently became red and glazed; and the face was somewhat flushed. About the twelfth day, there was abdominal tenderness on pressure in the right iliac region, and the typical rose-rash was very distinct. Abdominal pain increased during the succeeding week; whilst about the nineteenth day there was slight diarrhoea, with traces of blood in the stools. A gradual rise and fall of temperature extended over a period of six weeks. The thermometer rose above 105.6° Fahr. Convalescence was gradual and tedious. Now, this gentleman joined the Melanesian Mission on this island in September 1879; and up to that date he had never had any illness. Several years before he left home, he lost a sister from enteric fever; and a brother also suffered from it at the same time; but since that date he had never come into contact with any case of this disease. How, then, did he contract this attack?

To my certain knowledge, there has been no enteric fever here for upwards of fifteen months. In the beginning of the year 1877, a man is reported to have died of it at the Mission; and in 1868 there was an epidemic of some fever here, though I cannot ascertain of what kind. These are the only instances of which I can hear of anything like typhoid fever existing on the island. Anyway, here is a veritable case of typhoid fever generated in an island of the Pacific, four hundred miles from the nearest land, fifteen months for certain (probably much more) after any fever has existed in the island, and only one person has been attacked.

The water-supply at the Melanesian Mission is obtained from wells; and, after careful inquiries, I found that my patient was the only person who had been drinking water from a well that had a reputation, unknown to him, of being unclean. The water in this well was used for washing purposes and cooking only. Upon examining the well, I found that on one side of it, at a distance of about seven feet, was an open sewer; and that, just opposite to the well, much of the sewage-water became so stagnant as to form an offensive cesspool. I suggested that the well should be cleaned out; and my suggestion was at