SCIENCE

NEW YORK, APRIL 10, 1891.

MALARIA AND THE CAUSATION OF INTERMITTENT FEVER.[1]

DR. TOMMASI-CRUDELI and others have claimed that intermittent fever is caused by a bacillus.

Drs. Laveran, Osler, Council, and others have proved, to their own satisfaction at least, that intermittent fever is caused by a microscopic hæmatozoön.

At the meeting of the American Medical Association in Cincinnati, in May, 1888, I presented what I then considered, and still consider, to be incontrovertible evidence that intermittent fever is caused by exposure to changes of atmospheric temperature; that ordinarily its causation is quantitatively related to, and apparently controlled by, the range of atmospheric temperature.[2] It seems to me that both these lines of evidence, which appear to be so divergent, may be true. I feel sure that my own line is; and I have very great confidence in those who have presented the other line of evidence in which they are expert.

Therefore, although those who have held the germ theory of the causation of intermittent fever have not, so far as I know, accepted the evidence which I have collected and published, yet I feel impelled to again ask attention to it. I attempt this the more readily, because the facts and considerations, which it seems to me to make it appear possible that both lines of evidence may be true, were, in the main, held in mind when I read my paper two years ago; but there was not then time to elaborate, and I therefore only referred to, but did not fully state them.

I suppose that all here are probably familiar with the literature of the subject of the bacillus of malaria, and also that relative to the hæmatozoön of malaria, discovered by Laveran. I may therefore devote my time exclusively to that other phase of the subject on which I have collected evidence, and which is probably little known.

The most important evidence which has been presented by myself is as follows: —

1. Statistics of sickness from intermittent fever in Michigan during a long series of years, arranged to show the relation of intermittent fever to changes in atmospheric conditions, and which have proved to my mind that the controlling condition is associated with atmospheric temperature, the sickness rising and falling with the temperature.

2. Statistics relative to intermittent fever in the United States armies, elaborated from the medical and surgical history of the war of 1861–65.

An abstract of a summary of conclusions, based upon the evidence which I collected, is as follows: —

"2. The controlling cause of intermittent fever is exposure to insidious changes, or changes to which one is unaccustomed, in the atmospheric temperature.

"3. In the mechanism of the causation of intermittent fever, the chief factor is the delay in re-action from exposure to cool air. This delay, extending to a time when greater heat-loss should occur, results in the abnormal accumulation of heat in the interior of the body, and in disturbed nervous action, — the chill; and the final re-action is excessive, because of the accumulation of heat, and sometimes because it occurs at the warmest part of the day.

"4. The fever is the excessive re-action from the insidious influence of the exposure to cool air; and it is periodical because of the periodicity of nervous action, and, because the exposure and the consequent chill are periodical, owing to the nightly absence of the warmth from the sun.

"5. Residence in valleys or low lands through which or upon which cold air flows at night, and thus causes insidious changes in the atmospheric temperature, favors intermittent fever.

"6. In our climate, those measures, such as drainage, which enable the soil to retain warmth during the night, and thus reduce the daily range of temperature immediately over such soil, tend to decrease intermittent fever among residents thereon.

"7. In the cure and prophylaxis of intermittent fever, those remedies are useful which lessen torpidity and tend to increase the power of the body to re-act promptly to insidious changes in atmospheric temperature."

Preparing, now, to forge a link, in the chain of evidence, which was omitted from my paper, Sir William Moore, who has had great experience and observation in India, says, "So-called malarious fevers are caused by sudden abstraction of heat, or chill, under the influence of cold, and more especially of damp cold. These effects of chill are more marked in hot climates, because of the antecedent exposure to great solar heat, the anæmia and skin debility resulting from heat and the disregard of suitable precautions."

I think that my statistics indicate that another reason for there being most intermittent fever in hot climates is because the difference between the day and the night temperatures is the greatest in hot climates, and consequently the demands upon and resulting disturbances of the heat-regulating apparatus of the body are greatest in hot climates.

Intermittent fever is most prevalent in hot climates. In temperate climates, intermittent fever is most prevalent in the warm months. Here a reason similar to that just given applies, — it is then that there is greatest difference between the day and the night temperatures.

I believe that perspiration is probably a factor in the causation of intermittent fever. I do not base this opinion merely upon the facts just stated, relative to place and time of greatest prevalence, but mainly upon two facts, as follows: perspiration tends to cause chill, because of the fact that evaporation from moist clothing tends to lower the temperature rapidly. I believe that a chill, especially at the warmest time of the day, is not infrequently sufficient to start the disease intermittent fever. Excessive perspiration tends to change the condition of the blood; and chill tends to change the condition of the blood in some such way as follows: when the surface of the body is strongly contracted, the blood is driven from all the surfaces; the circulation is impeded; the blood parts with some of its fluid, and with it the salts, which pass into the urine; then there comes a demand of the tissues for blood; thirst is great, which, when satisfied, again fills up the blood-vessels. This rapid changing of the proportion of fluid in the blood tends, I believe, toward the solution or breaking-up of the red-blood corpuscles. My belief is that the destruction of the red corpuscles is greater than it would be if only the proportion of water in the blood was changed; that the destruction occurs partly through a disturbance of the proportion of certain salts in the blood. It is not difficult to see how this may be. Excessive perspiration takes out salts, especially sodium chloride, in considerable quantity; the urine passes out salts in considerable quantity. On the other hand, the water drank to quench the thirst does not ordinarily take salts into the blood, except in cases where common salt is given as a remedy, which is sometimes done by non-professional persons. According to experiments made many years ago, in the circulating blood, in health, the red corpuscles are preserved by sodium chloride from being dissolved in the albumen. As this paper is not an exhaustive treatise on this sub-

[1] Abstract of a paper read at the forty-first annual meeting of the American Medical Association at Nashville, Tenn., May, 1890, by Henry B. Baker, M.D., of Lansing, Mich.

[2] "Malaria and the Causation of Periodic Fever" (Journal of the American Medica' Association, Nov. 10, 1888).

ject, but is intended to be suggestive to other investigators. I do not now attempt to collate recent evidence on the changes in the blood. In order, however, to account for the destruction of the red corpuscles, the formation of the pigment, and for the phenomena of intermittent fever, I see no need for the micro-organism which is alleged to be parasitic in the blood, in intermittent fever. It seems to me that all of the phenomena can be accounted for about as well without the parasites as with; but it seems to be a general fact in nature, that, whenever a highly organized being commences to break down, there are generally organisms that await the occurrence; and, when the breaking-down process is of elements microscopic in size, I believe that micro-organisms are generally there. I accept the evidence of the eminent men who have reported that they are present in the blood in intermittent fever.

But if we grant that malarial fever is caused by micro-organisms parasitic in the blood, it has remained to be explained how it is that the micro organisms only cause intermittent fever under certain conditions of the atmosphere. That intermittent fever does occur under some conditions, and does not occur under other conditions, has long been positively known. I claim that the statistics which I have collected prove what those conditions are, and that the relation of those conditions to intermittent fever is quantitative and causal. I refer more especially to the evidence relative to the half million and more cases of intermittent fever which occurred in the United States armies during the war in 1862–64, and to the evidence of the recorded experience of physicians in Michigan during eight years.[1]

HEALTH MATTERS.

Ether-Drinking.

MR. ERNEST HART, editor of the *British Medical Journal*, has lately published some statistics and important information relative to the above subject. The matter is of very great value, directly and indirectly, says Henry Conkling, M.D., in *The Brooklyn Medical Journal* for April. It calls attention to the internal use of a remedy which, as a powerful cardiac stimulant, has been used but little of late. The published statistics have been collected, in part personally, and also by communication with medical men, clergymen, and others in the various parts of Ireland where the custom prevails.

The earliest history of the habit goes back to 1842. The greatest amount of ether used for drinking-purposes was in 1876. A few years after this date there was a diminution in the consumption; but it has since increased, until at the present time the amount nearly equals that of 1876. The majority of the ether (methylated ether) comes from large English houses, being sent sometimes to wholesale Irish firms, who retail it, or directly to the smaller dealers. It is put up in stoppered bottles or metal vessels. It is sold to the consumers in groceries, taverns, and public-houses, selling for two cents (United States money) for two drams. Its very small cost enables the dose to be frequently repeated. From two drams to half an ounce is the amount usually drunk; and this is repeated from two to six times during the day, depending on the personal habits. One or two cases of confirmed drinkers are mentioned where one pint of ether was generally used, when on a debauch, in divided doses.

The amount that produces intoxication depends on the individual. The ether is drunk in a single swallow, sometimes diluted, and again taken pure. The intoxicating effects are quickly produced, and quickly pass away. It is possible, therefore, as the author observes, for an *habitué* to become intoxicated many times in a short period.

A small dose causes a feeling of exhilaration, the drinker laughing, dancing, and being quite wild in his movements. If the small dose be not exceeded, there is no period of marked depression following the stimulation; but in larger quantities a state of stupor is frequently present, and, as the effect passes away, a feeling of weakness is left.

[1] Diagrams and statistics were given by Dr. Baker in support of his position.

It will be seen, in reading the individual accounts given in the paper, that mania is a marked feature very commonly presented, the drinkers often becoming very violent.

In moderate amounts, no lesions anatomical in their nature are produced. Of the two intoxicants alcohol and ether, the former probably causes more bodily derangement.

In ether-drinkers who have continuously consumed large quantities, a train of nervous and circulatory disturbances is generally present. Emaciation has been observed in certain cases, and occasionally the skin is of a cyanotic hue. The more moderate drinkers generally suffer from various forms of stomach troubles. In all cases there has been observed a marked change, in the way of deterioration, in the moral character.

The relation of ether to insanity was also investigated. No satisfactory evidence of the drug being directly causative could be gathered, but physicians to certain of the insane-asylums regarded it as detrimental in all cases where there was latent insanity. Death is probably not hastened in any great degree, although, by interfering with nutrition, the general health may become impaired.

Attention is called to the fact that there is danger to the user from having the drug near the fire or lights of any kind. The author believes that the practice probably prevails in certain parts of large cities.

It is interesting to observe how common the use of ether as an intoxicant must be, in the districts investigated, when the public conveyances are frequently impregnated with its odor.

This curious and novel paper teaches one valuable therapeutic lesson: the effect of the drug has been shown to be rapid and transient. In its use, therefore, as a cardiac stimulant, this point should be recollected, and no long intervals should go between the time of giving the various doses. Its rapid action makes ether a safe and valuable remedy for hypodermic use in conditions of syncope.

Poisonous Mussels.

A case of fatal poisoning of a mother and four children from poisonous mussels is reported by Sir Charles A. Cameron, M.D., in the *British Medical Journal* for July 19, 1890, and republished in *The Brooklyn Medical Journal* for April.

The first symptoms came on in twenty minutes after eating the stewed mussels. These were a prickly ("pins and needles") pain in the hands. Five persons ate of the dish, one lightly; and in one hour afterward one of the children died, and an hour later the mother and three other children. One child and the servant recovered.

The chief symptoms were vomiting, dyspnœa, swelling of the face, loss of co ordination of movements, and convulsions. The patients died asphyxiated. The mussels were fresh, and were obtained from a pond which was a mixed salt and fresh water pond, and received some sewage. The mussels, on examination, were found to have large livers and brittle shells. A leucomaine was extracted from the liver of the mussels which resembles Brieger's mytilotoxine ($C_6H_5NO_2$). The liver seemed to be the seat of the poison, which had been before noticed by M. Dutertre of France. The cause of this peculiar disease, the author thinks, is due to the foul water in which the mussels lived.

The livers of these mussels were examined microscopically by Dr. McWeeney, and in a preliminary note published in the *British Medical Journal* of Sept. 13 he describes at least five different organisms appearing in his cultures, one of which, he thinks, is the specific organism of the poison.

The important lesson is, that mussels from stagnant or sewage-laden waters should not be eaten.

Influenza in the German Army.

The medical department of the Prussian War Office has furnished statistics of the epidemic of influenza from the medical records of the German Army, an extract from which is given in *The Boston Medical and Surgical Journal* for March 26. The name "grippe" is supposed to be derived from the Polish word "chrypka," which means catarrh. The epidemic appeared in the army suddenly at the end of November, 1889, and in March was