Some Deficiency Diseases and Leprosy.[1]

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In the following remarks matters concerning the causation and prevention of beri-beri, scurvy and leprosy are discussed :—

Beri-beri.

Owing to the numerous and accurate observations which have been made in regard to beri-beri, it is now generally recognized to be one of the deficiency diseases. It is found largely among those who subsist mainly on rice from which the pericarp and aleurone have been removed, while recovery may result when unpolished rice is substituted for polished. A diet chiefly composed of white bread can also induce the affection, although Sir F. Taylor says this does not often occur, as it is rarely or never the only food [1]. This circumstance seems to afford a clue to its causation, as it shows at any rate that it may be induced by more than one unsatisfactory kind of diet. Numerous investigations have lately been made in regard to so-called vitamines, but the characteristics and chemical composition of any such bodies do not appear to be at present determined. Whatever the particular defect in dietary may be, beri-beri is comparatively infrequent in the more highly civilized countries.

Dr. W. H. Willcox noted during the recent campaign in Mesopotamia that it occurred in British troops whose diet mainly consisted of bully beef and white flour, and that it did not occur among Indian troops who lived on whole cereal flour and different pulses [2]. The difficulties that were encountered in supplying these troops with sufficient variety, and particularly of fresh foods, can be readily realized. Something in foods, whether vitamines or whatever it may later be found exactly to be, is lacking in some degree in tinned meats and probably also in dried vegetable products. Although the whole wheat berry and unpolished rice may be needed to supply effective nutrition when either of these is almost or quite the only food, it appears to be unnecessary to burden the digestive organs with husks and other material which are

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not easily or wholly digested, if various foods contain similar needed nutrient matter. The bleaching of flour, which in the opinion of many observers unfavourably affects necessary constituents, seems especially likely to destroy delicately constructed substances of which anything in the nature of vitamines is composed, owing to the methods which are employed to effect it.

Scurvy.

It has been held for a considerable time that scurvy can be induced by a deficiency in needed constituents that are contained in different vegetable products, and the provision of fresh lime juice has been found to prevent as well as relieve it on many occasions. Willcox says it occurred in the Army in Mesopotamia among Indian troops, but not in the British, and attributes this to the diet of the Indians being lacking in anti-scorbutic vitamines [3].

Leprosy.

This disease is prevalent in many parts of the world, and has been so for an unknown and incalculable period of time. There are considered to be records of its prevalence in Egypt and the East for thousands of years. England has experienced its ravages on many occasions, although it has not been seen in this country for over a hundred years. Sir Jonathan Hutchinson made considerable effort to ascertain the cause of leprosy, and travelled a good deal in different countries for this purpose. He appears to have been convinced that the food supply has considerable effect in its appearance, and notes that it never developed in the United States, with the exception of parts of California, attributing this to the circumstance that it is almost the only country where colonization took place without an initial stage of considerable hardships, and that a good variety in foods was practically always available [4]. In holding this opinion I do not think the judgment of Hutchinson is likely to have been at fault.

The study of the affection from an ætiological point of view presents a number of especially interesting features. It is considered to be due to the *Bacillus lepræ* discovered by Hansen in 1871. It is remarkable how closely the nervous symptoms of beri-beri resemble those of lepra anæsthetica. The numbness, anæsthesia, loss of power in the legs, arms and hands are very similar, as well as other symptoms, and may in both diseases result in muscular atrophy, with foot-drop and wrist-drop. Each is also particularly prevalent in the Far East. Lepra

anæsthetica can occur without association with lepra tuberculosa, and be present for a considerable time before the latter may eventually make its appearance, but Hutchinson says the tuberculous variety never occurs before the anæsthetic kind is in evidence. This appears to support the food theory.

I do not suggest that leprosy is caused by the taking in of bacilli in fish, but there seems to be the likelihood that when the food supply mainly consists of it a deficiency in dietary occurs. Friedenwald and Ruhräh say salting modifies the flavour of fish [5]. According to Liebig one-third of the nutritive value of meat is lost by extraction during the process, and it may then be reasonably expected to have some such unfavourable effect on fish [6]. Leprosy is common in Iceland and on the west coast of Norway, and Hutchinson says it more generally prevails on the sea coast, or near lakes and rivers, where fish is largely or mainly consumed. On looking into the composition of fish, it is seen that none of them contain carbohydrates with the exception of shell fish [7]. The obtaining of a sufficiently liberal supply of the last-named fish would not be possible in some districts; but even if it were the amount of carbohydrates they contain might not be sufficient to maintain the proper balance in constituents. It seems to be the case that a diet chiefly composed of fish is unsuitable, perhaps especially so when salted, and it is likely that leprosy may eventually be recognized as partly a deficiency disease, sometimes owing to the predisposition caused by a diet mainly of fish, and at times to another dietary which is deficient in various necessary elements.

That leprosy is contagious has been a matter of belief for centuries, people having been accustomed to avoid the society of lepers and to banish them to out-of-the-way places, but although this is so, the theory of contagion is not generally accepted. Sanitation has advanced with rapid strides in different countries in comparatively recent years, but is well known to have been highly imperfect in ancient times, and even now is still little in evidence among some nations in comparison with that which is the case in Britain and elsewhere. That the attendants at the Hendela Leper Asylum in Ceylon do not contract it, is said to be unfavourable to contagion theories. On the other hand, Father Damien de Vensta, who left Belgium to go to a leper asylum in the Sandwich Islands in 1873, was observed to be suffering from leprosy in 1882, and died from it in 1889. Precautions as to person and clothing are usually some of the first things in which nurses and

hospital attendants are instructed, but a priest being comparatively unversed in medical affairs might tend to neglect them to a certain extent, while attendants are not likely to do so. He may also have been less inclined to be careful in dietary and environmental conditions, while the nature of his calling may have contributed to possible infection. That this seems to have been the case can be gathered from Edward Clifford's "Father Damien," in which is described how the latter often lived in a polluted atmosphere, washed the bodies, dressed the sores, visited the deathbeds of those who were suffering, and even digged their graves. His case appears to favour contagion.

Tubercle bacilli show a considerable resemblance to those of leprosy, but exactly by what agencies the tubercle bacilli enter the body is in all cases of course not wholly determined, as for instance in regard to the effects of a spray of secretion from the mouth of another, and of tuberculous meat. It may be, and it is I think likely, that the bacilli of leprosy also enter the system in various ways. That the reason of the occurrence, apart from bacilli and mode of infection, differs in the main in the two diseases is evident, as tubercle is still prevalent in all countries while leprosy is not. Leprosy is not considered to be hereditary, but is said to resemble tuberculosis in a possible predisposition [8]. The bacilli have not been found in earth, dust, water, food or air. They increase greatly and are highly infective, and it is stated that few diseases show equal infection [9]. The bacilli leave the body by the nasal, salivary, lachrymal, mammary, seminal, or pulmonary secretions, and the urinary and intestinal excretions [10].

Owing to the overcrowding, ineffective housing, and other unfavourable environment in eastern countries and elsewhere, the opportunities of contagion appear to be manifest, especially in districts far removed from modern methods. Sanitation and hygiene are quite ineffective in different parts where leprosy is prevalent, in the abodes which are largely one-storey wooden or mud erections, often pervious to rain and dust, all around them and in the streets, while public places, as inns, are also said to be particularly uncleanly and insanitary. Ablutions of person and clothing are often almost unknown; lepers sit about in doorways or in the streets, and are stated to believe that if they can communicate the disease to another their own infliction will be lessened or relieved [13].

Latrines and urinals may not be cleanly or satisfactory in position or may be used in common by many in out-of-door places, and the bacilli may enter the body of a person predisposed to infection by the urethral

or rectal orifices. The bacilli may be communicated from one person to another by the use of the same towels, handkerchiefs, or any material used for similar purposes; also by the nasal, pulmonary, or seminal secretions, and possibly by contact with those wearing sweat and skin-scale impregnated garments. Clothing of the feet and legs may be non-existent or imperfect, so that cuts and abrasions of the lower extremities would be likely to afford a ready entry for bacilli from excretions under generally insanitary conditions. Father Damien was scalded on the foot when he was known to have anæsthetic leprosy and later was told he had more serious complications [14]. The natives of Ceylon have attributed the onset to the bite of a rat [12], and such wounds may admit infection. Women are said to be less prone to the disease than men, and this may possibly be attributable to their having more regard for sanitary methods in certain respects. The question of the entry of bacilli through the medium of blood-sucking insects has been investigated to a considerable extent with negative results for the most part. If this were the usual mode of infection it is probable that the matter would have been already determined on the basis of knowledge now forthcoming in regard to other insect-borne diseases. But it may be possible that insects on occasions transfer bacilli on their exteriors from persons affected, or excreta to another having wounds or abrasions of the skin. There appear to be a number of ways coming under the head of contagion in which the bacilli may gain access to the system.

Hutchinson was of opinion for a time after the discovery of the bacillus of leprosy that the matter of causation required no further investigation, but later became aware that this was not the case. His death occurred in 1913, when the knowledge of deficiency diseases was not so far advanced as is at present the case, but owing to his efforts and those of numbers of other investigators, it now seems possible to arrive at conclusions more likely to be acceptable—namely, that leprosy is largely predisposed to by ineffective feeding, also by defective personal hygiene, sanitation, housing, and general unhygienic environment; the bacilli gain access to the body in manners such as described, with the possible subsequent addition of the whole chain of tuberculous manifestations and disabilities.

The question of prevention seems to resolve itself into the need of conforming to customs and habits found efficient in England and elsewhere, particularly in regard to food, and other effective predisposing agencies, with, in addition, the isolation of those infected with the

Bacillus lepræ. Needless to say, prevention is far from being a purely medical question, as matters relating to a number of other affairs are involved, and while housing and sanitation require attention in this country, the need of such is almost incomparable in degree with that in different oversea, eastern and other lands. With effectual organization, determination, will power, man power, and other necessary factors set actively in motion, it is in my belief possible that matters could shortly be greatly improved, and with output of sufficient energy, in a decade or two the devastating disease become almost, if not entirely, eradicated from countries where it is now prevalent, and relegated to the position of a disease of the past as has been the case in this country and in others.

On Dietary.

Although I am not acquainted with the habits in regard to diet of all kinds of birds and beasts, from observation of those in England, there seem to be none in their free state that confine themselves mainly to one kind of food. The early bird, after catching and disposing of the worm, continues throughout most of the day to seek for and obtain a good variety of different cereals, or other vegetable or animal matter, which quickly disappear into its crop; the domestic fowl will also actively pursue a similar course if it gets its own way sufficiently; while a farmer has too much common sense both from the needs of the case and considerations of his pocket to attempt to prepare well-fed beasts for the meat market by sustaining them on any but a good, wholesome, and varied dietary. The instincts of dumb creatures thus appear to afford indications to man in respect to feeding and the maintenance of health.

It seems to be evident that mankind partakes of foods both for enjoyment and sustenance, and one can hardly imagine practically any members of the white races in either social class anticipating with particular pleasure the ingestion of three meals a day consisting chiefly of rice, fish, or any one kind of food stuff from one year's end to another; or expecting to rise from the table after such meals with the sense of satisfaction they are accustomed to experience after meals consisting of a suitable and properly moderated variety of foods. Milk is generally considered the most perfect in its chemical composition, but requires to be supplemented at an early age by other foods if nutrition is to be continued according to the requirements of modern highly civilized races. Large numbers of persons in far eastern overseas countries and

elsewhere do not conform to the customs of modernized nations in regard to dietary. What the reason of this may be is not my purpose to attempt to discuss closely, but possibly it is largely owing to centuries-long habits and customs which tend to cling and are not easily cast off. It may also be that the failure fully to appreciate the value of advances in other nations, or unwillingness to bend the back sufficiently in honest toil, and cause the brow to sweat in turning over the soil, has something to do with it. The moral of these diseases as far as food supply is concerned appears to be that a mixed diet of fresh and wholesome foods is best, and that if such is not available, no matter what the cause of the defect may be, troubles in regard to health are liable to make their appearance. No one can deviate from the principles of health with safety, this being brought under the notice of most practitioners daily and often more than once in the twenty-four hours.

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