REPORT OF THREE CASES OF BERI-BERI.¹

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INASMUCH as beri-beri is so infrequently met with in this country, the writer believes that the following report, though incomplete, of three cases under his observation will not be without interest:

On December 7 a case was admitted to the nervous wards of the Philadelphia Hospital under the care of my colleague, Dr. Mills. On the same day a second case, and on December 11 a third case were admitted into the nervous wards under the care of the writer. All three were colored men, and had been working in the phosphate beds of the Island of Pitou Navassa in the West Indies.

CASE I.—A. S., aged 39, colored. American by birth. Family history negative. Has had syphilis and drinks to some extent. Went to dig in the phosphate beds in the Island of Pitou Navassa in the West Indies in May, 1894. He arrived in the middle of June in good health. He was obliged to work at hard labor, digging among the rocks and exposed to the sun. His food consisted of old salt beef, most of which was spoilt, poor bread, and occasionally beans. There was no fresh water on the island, the water supply consisting of rain water collected in a tank and teeming with animal life. The quarters consisted of a large wooden structure with bunks four tiers high, into which were packed 140 men. In the latter part of July the men began to take sick. All of them were compelled to continue at work long after they showed signs of œdema. The patient himself was seized with general weakness, headache, dizziness, marked vomiting and diarrhœa; also, about this time, he noted swelling, which began, he states, in the back of

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the neck, shoulders and face, and which next made its appearance in the legs, the arms, and finally the trunk. The abdomen especially was swollen. Marked pain and tenderness also made its appearance over the surface, the condition increasing until the whole of the body was enormously swollen. He attempted to continue at his labor, but was finally obliged to take to bed, becoming so weak that he was unable to walk. Later his condition improved gradually. On November 1, with forty others suffering with the same disease, he was brought to this country and landed at South Amboy, N. J., November 15. He was detained in temporary quarters until able to walk, when he came to Philadelphia and was admitted to the Philadelphia Hospital on December 7.

At that time the following condition was noted: The gait revealed considerable weakness, but it was atypical. There was no foot drop or "stepping gait," as is so often seen in alcoholic multiple neuritis. Patient complained much of pain in the ankles on attempting to walk. There was general œdema, most marked in the legs. It was, however, distributed all over the body, and could be demonstrated with readiness over the forehead, sternum and arms as well as in the legs. The abdomen presented the following interesting peculiarity: The epigastrium was excessively prominent or swollen, the swelling passing freely into either hypochondrium, but not extending as far down as the umbilicus. It appeared to be due to an excessive distension of the stomach. The skin and subcutaneous connective tissue of the abdomen were also decidedly œdematous. Pressure upon the surface of the body, grasping the arms and legs, revealed more or less marked tenderness. This was especially noticed in the calves. Tenderness was, however, not elicited in the nerve trunks. No marked impairment of cutaneous sensibility or of the temperature sense was noted. There was no analgesia. Grip was diminished. No wrist drop, no foot drop. The knee-jerk appeared to be normal. Because of the œdema of the face the patient's countenance presented a peculiarly smooth appearance.

Examination of the lungs negative; no increase in hepatic or splenic dullness; apparently marked distension of the stomach. Examination of the heart revealed a soft mitral systolic murmur, not transmitted. A soft aortic murmur was also noted distinctly, not transmitted. Eye report by Dr. de Schweinitz, negative.

Urine negative. An examination of the blood by Dr. Gaylord revealed a moderate degree of leucocytosis.

The œdema, which was evidently subsiding at the time of admission, steadily diminished. The distension of the epigastrium also grew markedly less until December 13th, when for some unknown reason it recurred so as to be again quite marked. During its recurrence the patient complained of increased weakness and of a marked sense of oppression in the epigastrium.

The value of these cases is much impaired by the fact that they were all decidedly convalescent at the time of their admission to the hospital, and during the time that they have been under observation a continued amelioration has taken place.

CASE II.—A. F. A., aged 27, Negro; birthplace, Arabia; occupation, seaman. Family and personal history negative. Syphilis and alcoholism denied. In May of the present year patient was under treatment in the Philadelphia Hospital for lobar pneumonia. In June he sailed to the West Indies, where he was employed on the Island of Pitou Navassa digging phosphate. His food consisted of salted beef, bread and beans. He was compelled to use for drink rain water which was filthy and dirty. After four months of hard labor his health began to fail. He first noticed an eruption on his arms and legs; this eruption he describes as being elevated, hard and dry, followed by desquamation and accompanied by considerable itching. This eruption ran its course in a few weeks, but hard nodules persisted in the skin in various situations. One and a half months after the appearance of this eruption, about the first of August, the abdomen and legs began to swell. This swelling was accompanied by considerable pain. No swelling occurred over the thorax, arms and head. The onset of symptoms was accompanied by marked weakness in the legs, necessitating his going to bed. According to the patient's statements neither foot drop nor wrist drop were at any time present. A more detailed history of his symptoms could not be obtained because of the great difficulty of communicating with him, the man speaking but little English, and being anything but intelligent.

Upon admission to the hospital, December 7, 1894, the following condition was noted: No œdema of legs or abdomen. According to the statement of the man, it had been absent for some forty days. Examination of the nerve trunks failed to reveal tenderness except over both

sciatics. Pressing or grasping the legs, thighs and upper arms elicited marked symptoms of pain. The abdomen appeared exceedingly painful to pressure. The patient also complained of pain over the left side of the head. There was also a slight cough, with a moderate amount of expectoration. The appetite was good; the patient stated that he occasionally suffered from nausea, but that he did not vomit. The bowels were constipated. He was able to get out of bed and to walk. His gait was merely paretic, being neither ataxic nor spastic; neither was it at all like the "stepping gait" so often noted in multiple neuritis due to other causes. Grip weak on both sides; K. J. apparently a little diminished. No atrophy of muscles. Cutaneous reflexes somewhat exaggerated. Tactile and thermal sense normal; no analgesia, no eye symptoms. Eye report by Dr. Schweinitz, negative. Examination of the other organs revealed the following:

Lungs.—Marked depression of supra and infraclavicular spaces on both sides the chest; feeble inspiratory movements; no increase in vocal fremitus; percussion resonance normal; no rales heard over chest.

Heart.—Impulse not perceptible. Heart sounds regular; soft mitral systolic murmur, not transmitted.

Liver and splenic dullness normal.

Urine.—Specific gravity, 1022; no albumin, no sugar.

Temperature chart shows slight rise above normal.

CASE III.—W. H., 21, Negro, American by birth; occupation, boat builder. Previous history negative, with the exception of syphilis four years ago. No history of alcoholism. Left Baltimore August 3, 1894, in good health. Arrived at the Island of Pitou Navassa August 23. After three weeks of severe manual labor, digging phosphate on a diet identical with that mentioned in describing the previous cases, the patient noticed that his feet and legs began to swell. The swelling was accompanied by marked weakness, while general soreness made its appearance over the entire body. The pain was especially marked over the anterior portion of the chest, and on one occasion he suffered markedly from dyspepsia. On two occasions he spat blood frothy in character and had a cough, which still persists. In addition, he suffered from headache, vertigo, nausea, vomiting, belching, and marked constipation. His symptoms improved shortly before leaving the island, but on No-

vember 6, while four days out at sea, the œdema returned, the feet, legs and face being swollen; the abdomen was exempt. He lost the use of his hands—became weak, as he expressed it, in his joints—and had burning sensations all over the body. Whenever he attempted the erect position he suffered from vertigo and palpitation of the heart. On one occasion, he states that he passed blood by the bowels. During this attack he noticed also that his urine was of a reddish color and that he had to void it five or six times at night. Upon admission to the hospital, December 11, the following condition was noted: Patient complained of aching pains in both feet and ankles, equally marked on both sides. Sometimes these pains were “jumping” (paroxysmal) in character. The patient complained of no subjective numbness of the legs or arms, but spoke repeatedly of burning sensations in the feet, especially the toes. When asked to leave his bed the following peculiarities of the gait are noted: Patient walks very cautiously, complaining of soreness in the soles of the feet. No ataxia or spastic character noted in the gait, no tendency to foot drop, no “stepping gait,” as observed in alcoholic neuritis. K.J.+, very slight ankle clonus on both sides. No wrist drop; grip diminished on both sides.

Examination of the nerve trunks revealed tenderness over both brachial plexuses, over the median, ulnar and musculo-spiral nerves of both upper arms and of the ulnar at the elbow and of the median and radial at the forearm. In the left arm this tenderness was less marked than in the right. Comparatively little pain is excited by gripping the arm or the forearm. Tenderness was found to exist in both sciatics, internal and external popliteals, and in the anterior and posterior tibials of both legs. No tenderness was elicited in the trigeminal distribution.

Tactile and thermal sense was found to be everywhere normal. Analgesia was, however, noted over the right leg, below the tubercle of the tibia, excepting a limited area just in front of the external malleolus, over the dorsum of the foot and over the ball of the foot. In the left leg analgesia was also found, excepting over the two malleoli. There was also marked analgesia over both arms and forearms. In other portions of the body the pain sense appeared to be normal. The muscles responded well to faradism, but this response was accom-

panied with pain and more or less cramps in the muscles.

Examination of the various viscera revealed the following: Heart—Impulse faintly visible in fifth interspace within the nipple line. Heart sounds regular, but diminished in intensity; no murmurs.

Lungs.—Slight impairment of resonance at right apex; increased vocal fremitus and resonance; prolonged expiration; vesiculo-bronchial breathing; no rales.

Liver and splenic dullness normal.

No œdema noticed in any portion of the body at time of examination.

Urine was acid; showed a specific gravity at 1011; a trace of albumin; no sugar.

Eye report by Dr. de Schweinitz negative.

Temperature chart reveals a temperature which on two occasions was decidedly subnormal. Pulse and respiration revealed no peculiarity.

Various forms of beri-beri have been recognized. In some cases the œdema predominates; in others the cardiac symptoms are in excess; in others still there is more or less marked atrophy of the muscles, and in a fourth group we find the symptoms evenly distributed, or in which the symptoms develop to but a moderate degree.

In Case I. the dropsical symptoms were particularly marked, while in Cases II. and III. no special group of symptoms predominated. Time will not permit us to enter into a discussion of the pathology of these cases, but it has been abundantly established by the researches of Scheube, Bälz, Pekel-Haring and Winkel that the nervous phenomena are directly referable to a neuritis. This neuritis appears at first to be degenerative in character, the changes being first noted in the myelin and axis cylinders, and later in the neurilemma, endoneurium and other connective tissue elements. The pain is doubtless to be referred to this neuritis as are many of the other symptoms. For instance, in cases in which heart symptoms have been very marked autopsies have revealed neuritis of the cardiac branches of the pneumogastric. The great distension of the stomach, which is noted by various writers and which was present in Case I., is also, perhaps, to be referred to a neuritis of the gastric branches of this nerve. Various pathological changes have also been noted in the spinal cord. These, however, very probably occur subse-

quently, and much later than the changes in the nerve trunks. Among the changes noted are degeneration and disappearance of the multipolar cells in the anterior cornu and proliferation of cells into the central canal.

Though wrist drop and foot drop seem to have been absent in the cases under consideration, Bentley has published a number of photographs showing both of these conditions occurring in beri-beri; and although in our cases the gait failed to reveal the high stepping character so frequently observed in multiple neuritis, Bentley has published a number of photographs in which this stepping quality is beautifully shown. It is therefore probable that in our cases these characteristics of gait and of the position of hands and feet were wanting, either because they are cases of moderate severity or because they are decidedly convalescent.

The cause of beri-beri is still an open question. Quite a number of investigators have conducted bacteriological researches, but their results lack uniformity. This is true not only of the researches collectively but of some of them individually. Thus it is exceedingly probable that the cultures obtained by Pekel-Haring and Winkler were impure. Indeed, it is quite certain, as abscesses followed some of their attempts at inoculation, that they were dealing with cultures containing pyogenic germs instead of or in addition to the germs of beri-beri.

A general review of the subject inclines one to the view advanced by Glogner, Scheube and others, that beri-beri is really due to a micro-organism derived from the soil, an organism which is, perhaps, like the hematozoan which appears to be the cause of malaria. Many of the circumstances connected with the etiology point to a paludal origin. If so, it must be an organism entirely distinct from that which produces malaria inasmuch as beri-beri is essentially an afebrile disease and also lacks that other great characteristic of malaria, periodicity. Further, quinine, so effective in malaria, is valueless in beri-beri.