"hortensia tint." The mucous membrane of the stomach was congested, with hæmorrhagic points about the pylorus; that of the small intestine was also congested, especially near the ileo-cæcal valve. Dr. Camara Pestana found in the stools of forty cases examined a spirillum like that of Koch.² S-shaped forms were also found. The spirillum is motile and has a flagellum at one end; it coagulates milk; the colonies in plate cultures on gelatine are more regular in outline than Koch's, and stab cultures show greater liquefaction on the surface than in the depth of the gelatine. Cultures in watery saline solutions of peptone gave no cholera-red reaction, so that no nitrites are formed (as they are by Koch's spirillum); Chantemesse found, however, that indol was present in these cultures. At the onset of the epidemic recent cultures of this spirillum grown on agar killed three guinea-pigs; a sample culture sent to Chantemesse had, however, lost this virulence.³

The interesting point in connexion with this epidemic is the confirmation it affords to the researches of Finkler and Prior on a small epidemic of choleraic diarrhœa which occurred at Bonn in 1884, in which these observers isolated from the stools of the cases their well-known spirillum. That spirilla closely resembling that of Finkler and Prior can exist in the sewage of an apparently healthy community is shown by the results of the examination which I made last February of Manchester sewage. The sewage was taken from the affluent sewer at the sewage works at Davyhulme and was of a dark colour, clearing, on standing, with a black deposit; the odour was tarry. Cultures of 50 c.c. each were made with 1 per cent. salt and 1 per cent. peptone, and kept at 21°C. for seven hours; next, ordinary saline peptone solutions were inoculated from the upper layers of these cultures and kept at 21°C. for eight hours; and then, from these, further inoculations of saline peptone water were made and kept at 21°C. for twenty-four hours. The peptone cultures had at first a very strong cheesy smell. These cultures were found to contain curved and straight bacteria, and after several plate cultures had been made the curved forms were isolated from the others and studied in pure cultures. The vibronic segments had the same appearance and size as those of Finkler; each was provided with a flagellum placed at one end in one of the rounded corners. In drop cultures single comma, S-shaped, and spirillar forms could be seen in motion. On gelatine plates the colonies, composed of large granules, were circular or oval, and had irregular borders occasionally when examined within twenty-four hours, but were usually liquefied in twenty-four hours, looking like colonies of Koch's typical spirillum of three days' growth. Stab cultures in gelatine showed a slight cupping of the surface of the track and a little liquefaction along the track in twenty-four hours; in forty-eight hours these conditions were more marked; in seventy-two hours the track had the shape of the finger of a glove; and in eight days almost all the gelatine was liquefied and slightly turbid. The liquefied gelatine plates had an aromatic odour, somewhat like that of fresh cow's milk. Bouillon cultures formed in twenty-four hours at 37°C. an easily broken film on the surface. On agar at 37°C. the growth was profuse and moist, of a yellowish grey colour, and opalescent at the edges. On potato the growth was profuse and moist. There was no coagulation produced by the spirillum in milk previously sterilised in the autoclave. One-fifth part of a recent agar culture was pathogenic to guinea-pigs when injected into the peritoneum. The cultures in saline peptone water kept at 37°C. for twenty-four hours did not give the cholera-red reaction, but the presence of indol was shown by the production of a purplish red colouration on addition of a few drops of weak solution of potassium nitrate and a few drops of strong sulphuric acid. Thus these cultures do not in twenty-four hours contain nitrites, but do contain indol. Some of the peptone cultures gave the cholera-red reaction after two or three days. When first isolated the organism did not stain well and resembled the "attenuation forms" of various observers. Koch has formulated certain tests as to the validity of the claim of a spirillum to be the spirillum cholerae asiaticæ: (1) It must be found in connexion with cholera; (2) it must give the cholera-red reaction in 1 per cent. peptone and 1 per cent. salt in watery solution kept from twelve to twenty-four hours at 37°C.; and (3) it must be pathogenic to guinea-pigs, as tested by

intra-peritoneal inoculation of recent cultures.⁴ It is interesting to note that Professor Delépine isolated spirilla answering Koch's tests from the stools and intestinal contents of suspected cases of cholera occurring in Manchester last September.⁵ Sanarelli last year, at a period when cholera was not prevalent in Paris, found in the sewage spirilla which were pathogenic to guinea-pigs and gave the cholera-red reaction in peptone water cultures; he found similar organisms in the water of the Seine and in the Versailles water-supply derived from the Seine. Now, Versailles has always remained free from epidemics of cholera.⁶ Neisser also isolated from the Berlin tap water last year a vibrio resembling that of Koch in every particular except that its colonies on gelatine plates were more finely granular, and smoother in the early stages as a rule than those of Koch's vibrio, and cholera was not epidemic in Berlin last year.⁷ Repeated examinations of tap water made in Manchester failed to yield any spirilla when examined in the same way as the sewage. The water-supply was *primâ facie* the vehicle of the cause of the disease if one may judge by the explosive form of the epidemic and its close sequence on torrential rains. The water-supply in Lisbon a few years ago⁸ was obtained from three sources—viz., the aqueduct of Alcantara, which carries water of good quality from without the city; water, also of good quality, from the River Alviella, 114 kilometres distant; whilst some houses got their supply for washing purposes from old and foul wells. If water from these wells had been used in any way, the epidemic spread after the first case had arisen in the neighbourhood of the wells would have been intelligible; on the other hand, the facts above mentioned respecting the water of Versailles and Berlin show that spirilla which are pathogenic to animals and give the cholera-red reaction when present in drinking-water do not necessarily lead to epidemics of cholera. This immunity may be due to the organisms being insufficient in number or virulence to cause cholera, or to the natural immunity of the community from various causes. Whatever may be the causes of this immunity from cholera of various places, or the relations to one another and to cholera of these various spirilla, one can, at all events, draw from the facts above related the commonplace, but very safe, conclusion that drinking-water should be kept apart from fæcal refuse.

Addendum.—At the recent congress at Budapest Chantemesse stated that the Lisbon spirillum, after intraperitoneal inoculation of several animals in succession, acquired temporarily the typical characters of the Indian spirillum.⁹

Manchester.

A CASE OF LEUCOCYTHÆMIA APPARENTLY CURED BY BONE MARROW.

BY W. G. BIGGER, M.B. R.U.I., M.R.C.S. ENG.

As leucocythæmia is generally considered of necessity a fatal disease, I think that particulars of a case in which improvement has occurred under treatment with bone marrow may be of interest. The case is also unusual from the length of time that the disease lasted.

The patient, a lad aged twelve, came under my observation about six years ago suffering from splenic enlargement with anæmia and the usual symptoms accompanying it, such as palpitation, dyspnœa, &c. Previously to this he had attended various hospitals in London, and immediately before coming under my care was under treatment at the Hospital for Sick Children, Great Ormond-street, for "splenic cachexia." During the past six years he had had from time to time courses of arsenic and iodide of iron. Under this treatment the anæmia had always improved, but until recently the enlargement of the spleen had not varied. Some two months ago the disease acquired a more active character and the boy rapidly sank into a critical condition. The spleen became much larger than before and completely

⁴ Koch. La Semaine Médicale, 1893, p. 265.

⁵ Brit. Med. Jour., 1894, vol. i., p. 120.

⁶ Annales de l'Institut Pasteur, 1893, p. 693.

⁷ Günther: Einführung in das Studium der Bakteriologie, p. 293. Leipzig, 1893.

⁸ Enmerich, quoted by Arnould in article "Eau" in Encycl. des Sciences Médicales, 1885, vol. xxxi., third series, p. 547.

⁹ La Semaine Médicale, Sept. 12th, 1894, p. 415.

² Chantemesse points out that it differs from Koch's in its shape, being more like a crescent with pointed ends and a swollen centre.

³ Abstracted from "L'Épidémie Cholérique de Lisbonne." By A. Chantemesse. La Semaine Médicale, June 13th, 1894, p. 271.

filled the left half of the abdomen, extending into the iliac fossa and across the middle line for two or three inches. Associated with this enlargement of the spleen there were very rapid emaciation and marked anæmia, accompanied by an icteric tinge. To these symptoms were added diarrhoea, pyrexia, and frequent attacks of epistaxis. The pulse was very rapid, and there were dyspnoea and palpitations on the slightest movement. There was no enlargement of the lymphatic glands. In spite of full doses of arsenic and iron the anæmia and wasting continued to increase, and this so rapidly that I could see a change for the worse at every visit, and the case assumed an almost hopeless aspect. It was at this juncture that Dr. Fraser's paper on a Case of Pernicious Anæmia treated with Bone Marrow¹ appeared, and it occurred to me that possibly an equally good result might be obtained in leucocythæmia. The boy's mother readily fell in with my suggestion and provided him with a supply of bone marrow, which he ate spread on thin slices of bread. It was given raw as I did not know what the effect of cooking might be on the activity of the marrow. For the first two or three days the result did not appear to be satisfactory, as the spleen became more tender and complaint was made of acute pain over the splenic area. (This may have only been a coincidence, and due to one of the attacks of localised peritonitis common in this disease.) The pain was relieved by hot fomentations and soon passed away, and the spleen became less tender, and by the end of the first week of the new treatment the patient looked and felt so much better that there was no doubt as to the advisability of continuing it. At first there was some repugnance towards the raw marrow; but this soon passed off, and there was no difficulty in getting down two or three slices of bread, thickly spread with marrow, three or four times a day. The improvement in the boy's condition after the first week was little short of marvellous. The anæmia and jaundice disappeared, and the skin and mucous membranes acquired a healthy colour. The symptoms due to the anæmia at the same time passed off, and in three weeks the boy was able to walk about without shortness of breath or palpitation. The temperature also became normal, and has remained so. *Pari passu* with this improvement in the general symptoms the spleen diminished in size, so that by the end of a fortnight the lower edge had receded to a level with the anterior spine of the ilium, and the inner edge did not extend beyond the middle line. At the same time the organ was less bulky and heavy, the thick rounded edge giving place to a thin margin under which it was possible to easily insert the fingers in palpation. At the present time, after a month of the treatment, the boy is better than I have ever known him to be, and the spleen continues to diminish in size; though still extending about three inches below the ribs, it causes no inconvenience and is not at all tender to the touch. Too short a time has elapsed to allow of any conclusion being drawn as to the completeness or permanency of the cure. The results, however, in this case as far as it has gone are very encouraging, and I hope that others with larger opportunities will give the treatment a trial and by publishing their results enable the profession to judge how far this newest therapeutic agent is of value in this and kindred diseases.

[Note.—Sept. 19th: The boy is now perfectly well and the spleen of normal size.]

Streatham-common, S.W.

CASE OF ACUTE TRANSVERSE MYELITIS DEATH; POST-MORTEM EXAMINATION.

By C. S. EVANS, M.B. CAMB., M.R.C.S. ENG.

THE patient was a man aged twenty-four, strong and muscular. One month ago he was noticed to look ill one evening, with "redness of face and head, with trembling." He worked, however, next day and after. For one month he daily did one kind of work only, unloading hay from the cart to the rick, and for fourteen days "felt it very hard" and thought it "strained him," but he did not give up until Aug. 4th, when he took twice the ordinary time (two and a half hours) walking home. On that day he remarked he "had had a cold for a fortnight."

The next day he felt worse, "aching all over," and on the 6th fell "from weakness" and took to his bed. On the 7th I saw him first. He complained of "aching all over," and of nothing else. The temperature was 101° F., sweating was profuse, the conjunctivæ were congested, the pupils were equal but small, and there was no special backache or headache. The right arm was much enfeebled; he could hardly raise the hand to the head. The grasp also was very feeble. He had had no sleep for two nights.

Aug. 8th.—He says he "cannot hold up his head." (He can, but only with great effort.) The right arm cannot be lifted at all. There is no grasp, and the fingers can hardly be stirred. There is no special or localised pain at all. His mind is clear and cheerful. The left arm is slightly enfeebled. There is no anæsthesia. Pin-stroke is more acutely felt on the right arm and chest on the right side, especially about the sixth dorsal nerve area. No knee-jerks are obtained. There is no optic neuritis. The legs are only slightly and equally enfeebled. He has hallucinations of sight, but none of hearing. He has slight, transient, hazy delirium in the night. (He drank cider, but was not intemperate. There had been no fall or known trauma.) There is no tremor and no cramp. The breathing is solely diaphragmatic even in forced inspiration. There is some difficulty in swallowing during the day.

Aug. 9th.—He died quietly in the early morning with increasing difficulty of breathing. He was unable to speak during the last half-hour. He was apparently conscious and free from pain to the last. "Two or three hours before death the breathing ceased once so long, he was thought to be dead."

Only a partial necropsy was permitted forty hours after death. Near the middle of the cervical enlargement the cord was diffuent. Above and below this the right anterior cornu looked redder, softer, and larger. The theca in the upper half was thickened. Only the cervical part of the spine could be dealt with.

Family history.—The paternal grandmother was between seventy and eighty years of age, and kept a public-house in the village. The paternal grandfather was forty-five years of age when he died from "decline" (?). The father is living, aged sixty, and fairly strong, but subject to lumbago. The maternal grandmother was between fifty and sixty years of age. The maternal grandfather is eighty-five, "hale, hearty." The mother is an extreme case of fibrous ankylosing osteo-arthritis, has been bedridden for five years, can only move the hands from one hip to the other and her head, and has had symmetrical patches of skin gangrene and bladder crises, but no definite signs of "ataxy." Of five brothers one (older) died from aneurysm, one (younger) died from phthisis, and three are living; of the sisters two are living and in fair health, and two died in infancy. The family live where his father lived for fifty-nine years, and where the grandmother lived before him.

Notes of microscopical examination of the cervical cord, by Mr. J. H. TARGETT.—The spinal cord of the patient shows very acute transverse myelitis. The anterior cornua are crammed with leucocytes, the vessels much dilated, and the large motor ganglia are swollen and indistinct. Many of the white fibres have utterly perished, though I did not choose the most diffuent part of the cord. Sections were taken from different parts, and they showed varying degrees of the same change in the cervical enlargement, and two inches lower down the dorsal cord "seemed healthy" (not cut).

Remarks.—As to the etiology, regarding osteo-arthritis as at least associated with spinal defect, inheritance may have played a part in causation. The myelitis was probably due to influenza. Regarding the character of the man and his work, I am sure that there was an unusual, prolonged, and severe demand made by hard and monotonous labour on the musculature of the arms and upper spine.

St. Thomas's-street, S.E.

CELLULITIS FOLLOWING MULES' OPERATION.¹

By SYDNEY STEPHENSON, M.B., F.R.C.S. EDIN.,
SURGEON TO THE OPHTHALMIC SCHOOL, HANWELL, W.

FROM a scientific standpoint the record of a failure is often not less important than that of a success, a truism

¹ A paper read in the Section of Ophthalmology at the annual meeting of the British Medical Association at Bristol, Aug. 3rd, 1894.

¹ Brit. Med. Jour., June 2nd, 1894.