The transverse bar at *r* has a staple, *k*, in the centre, from which the foot is slung. Transverse bars of ribbon aluminium are fixed at *b* and *e*, and to these a sheet of perforated zinc 5 in. by 10 in. is laced with wire to form a smooth support for the sole of the foot. From *d* a strip of ribbon aluminium runs at right angles to *FA* as far as the point *g*. Another strip of aluminium ribbon runs from *g* to the corresponding point on the other half of the splint, and the junctions at *g* are fixed by riveting.

These supports give the necessary rigidity, prevent the angle at *r* enlarging owing to the weight of the limb, and the respective supports *d* *g* fix the ends of the bandage which keeps the dressings in position. *L* is an arc of aluminium 4 in. in length with a central staple to which a cord is attached. It is placed in the toe of a sock in which is a small hole for the cord.

The arc *L* acts as a spreader to prevent crowding together of the toes when the foot is suspended.

FIG. 2.

FIG. 3.

Four loops of cord are fixed at *r* and *i* to sling the limb to a modified Balkan by means of weights, cords, and pulleys. A suitable cotton sock is cut obliquely from the heel to the middle of the instep. The arc of aluminium, *L*, is inserted into the toes of the sock and the cord allowed to pass out through a small hole at the extremity. The foot is cleaned with petrol or ether to remove the grease. The sock is applied dry and its outside painted with a solution of equal parts of Canada balsam in xylol, Venice turpentine, and ether. When dry a layer of cotton-wool is placed between the perforated zinc and the foot, and the two fixed together with a band of adhesive plaster round the dorsum. The cord from the arc *L* is adjusted until the bars *H* *I* are parallel with the bones of the leg. The latter is embedded in a plaster case extending down as far as convenient (about 6 or 7 in.) from the tuberosity of the tibia. The uncovered portion of the leg is supported

with suspensions of elastic webbing or bandage. The foot is now fixed at right angles to the leg.

Figs. 2 and 3 show the splint applied to a patient and slung by four cords, snap hooks, sandbags, and eight pulleys to a modified horizontal bar. This gives the patient free movement in bed and the attendants ready access to the wounds.

BRONCHOPNEUMONIA WITH SECONDARY HAEMORRHAGIC MENINGITIS AND RECOVERY.

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IN the course of a series of some 14 cases of bronchopneumonia in children, occurring nearly a year ago, the following somewhat remarkable case was encountered—to wit, a mixed meningeal infection with spontaneous recovery. The mixed infection was, so far as was ascertainable, due to Fraenkel's pneumococcus, together with Friedlaender's diplobacillus, the latter in great numerical predominance.

The original investigation was undertaken with a view to confirm or dispel Hutchison's suggestion that a streptococcal strain in bronchopneumonic infection is of grave prognostic import, quite apart from other considerations.

The sputum was obtained by first slightly irritating the pharyngeal wall and so causing a short onset of coughing and production of sputum, a sample of which was obtained on a sterile platinum wire and straightway inoculated on blood-agar, all contact with mouth or fauces being most carefully avoided. Thus the proverbial difficulty of obtaining infantile sputum was overcome.

The particular case in question was one of a series of cases of infantile bronchopneumonia admitted last January to a London infirmary. All but two were under the age of 3 years. A very large proportion of these cases showed the predominance of the pneumobacillus (Friedlaender's) both in smears and in cultures from the sputum.

It is relevant in this connexion to recall the chief morphological and cultural characteristics of these two pneumonic organisms, not for didactic purposes, but as a labour-saving device.

The *Pneumococcus lanceolatus* is Gram-positive, and stains deeply in sputum, often (in these cases) showing chains of two, three, or four pairs, and is encapsulated. As a rule there were series of long chains which showed all transitions from a typical streptococcal arrangement to a gradual separation into diplococci, the morphological explanation of which should prove interesting. On blood-agar the colonies were almost transparent, and very small when found separate, and this was only at the edges.

The pneumobacillus, on the other hand, is Gram-negative. It is also encapsulated, and both forms reveal encapsulation remarkably well in sputum. The colonies resemble knobs of ivory, and a stab culture shows a characteristic "nail-like" form with a process in the substance of the agar; the "head" is a heaped-up mass, densely white. The organism is non-motile. This latter fact, together with morphological considerations, and its presence in sputum, also the absence of intestinal symptoms, enabled one to make sure that one was not dealing with *B. enteritidis* of Gaertner, which has one or two similar characters. It is, for instance, Gram-negative, and produces haemorrhagic lesions, including a single recorded case of "meningitis haemorrhagica," a clinical entity for whose existence this organism is held to be solely responsible, when considering the group it represents.

The sputum contained other organisms besides these two, such as staphylococci and diphtheroid rods, but these were not of significance in regard to the meningeal symptoms.

CASE.

A boy, aged 18 months, was admitted on December 29th, 1914, with marked meningeal and chest signs and symptoms.

History and Condition on Admission.

Save for the fact that he had not been ill before two days earlier, and that he had been fed on cow's milk, no history was

* Muir and Ritchie; *Manual of Bacteriology*, 1913, p. 383.

forthcoming. On admission the temperature was 97°, and, curiously enough, remained subnormal throughout, possibly indicative of a severe haemia, and so of a bulbar toxæmia, with paralysis of the heat-regulating centres. The respirations were 42, the pulse 112.

Central Nervous System.—The meningeal signs and symptoms were as follows: There was head retraction to a marked degree, *tache cérébrale* and Kernig's sign, with rigidity of the legs, the right leg being flexed more than the left; he screamed intermittently but frequently in a typical manner. The knee jerks were increased, and the plantar response was (probably because he had not learnt to walk) doubly extensor, but notably brisk. He had a left internal strabismus. He appeared to be thin, and showed loss of flesh whilst under observation. He was extremely peevish and mentally irritable. The three highest mental faculties were all impaired—to wit, attention, judgement, and self-control. No convulsions occurred.

Respiratory System.—The child had pneumonic breathing, patchy dullness at the lower angles of the scapulae, below the left clavicle, and markedly at the bases, with fine crepitations.

Sputum.—Examination of the sputum showed a large number of pneumobacilli, strepto-diplococci (adherent pneumococci in chains in all stages of separation up to twenty pairs or more), and ordinary detached pneumococci.

Lumbar puncture yielded about 10 c.c.m. of turbid fluid, with a negative haemoglobin spectrum. This was centrifugalized, and also inoculated on blood-agar directly. Cultures of pneumobacilli and pneumococci were found alone. The former enormously predominated.

After-History.

On the seventh day of illness (January 3rd, 1915), that is, five days later, the condition of the child had markedly improved. He was much quieter, and screamed only occasionally during the day, but he was still restless at night, crying out often. The following mixture was found to be effectually sedative: Pot. brom. gr. iv, tr. bellad. m. iij, glycerine m. x, aquam ad 3j; sig. 3j nocte p.r.n. Head retraction and squint were still present, as also was Kernig's sign. The pneumonic condition was much the same as before, but pneumonic breathing, instead of being continuous, only occurred if the child were disturbed. The pulse was 85 and the respirations 30. Eight days later, on the thirteenth day of illness (January 11th, 1915), lumbar puncture was again performed and the fluid was thickly haemorrhagic, and cultures showed abundant colonies of Friedländer's bacillus and a few pneumococcal colonies also.

The condition of the child improved after this. Only a few rhonchi were noted in the chest, and pneumonic breathing had ceased. Cerebral scream had also vanished, but the child was irritable. Kernig's sign could not be obtained; there was no squint, and much less head retraction.

On January 15th, 1915—that is, the nineteenth day of illness (four days later)—the child was sitting up and taking an interest in his surroundings, to all intents and purposes quite well, although thin and wan to the eye. The lungs were now clear.

Lumbar puncture, cultivated on blood-agar, showed pure Friedländer's bacilli. The fluid thus obtained was still haemorrhagic.

On January 18th—that is, twenty-second day of illness—a final lumbar puncture was performed. The fluid was tinged with blood, but quite sterile on inoculation.

The child was normal in behaviour, slept and fed well, and was not in the least fretful. All nervous signs had disappeared, including squint. A second examination of the sputum showed staphylococci, pneumococci, also pneumo-streptococcal forms, and notably enormous numbers of pneumobacilli in smears.

The question arises whether what was taken for pneumobacilli were not in reality *B. enteritidis* of Gaertner, since this organism has been known to cause a meningitis characterized by haemorrhagic lesions likewise. Against this is the fact that this case showed no intestinal symptoms, and that 13 other cases of bronchopneumonia in the same ward showed no intestinal symptoms, and all showed in the sputum predominance of pneumobacilli, which were morphologically pneumobacilli and had the pathognomonic "nail-like" culture form. Unfortunately, lack of apparatus prevented me testing the indol and lactose reactions, but I can assert that the organism was non-motile. Moreover, I venture the opinion that clinical guidance was both confirmatory and reliable in this case. So far as I can ascertain, *B. enteritidis* has not been recorded in the etiology of bronchopneumonia. I therefore ruled out *B. enteritidis*.

Some writers identify the pneumobacillus with *B. lactis aerogenes*, which occurs most commonly in sour milk. That this may be true I do not dispute theoretically, but even so this is irrelevant to the essential substance of my thesis. Possibly it may be argued that this series of cases is in favour of this more improbable contention, since children in poor circumstances at such a tender age and with such careless mothers as some of them have, may well receive sour milk for food. But it seems strange that a normal inhabitant of the intestine should, for no

particular reason, suddenly migrate to the meninges to assume a pathogenic rôle, having previously attacked the bronchial mucous membrane. The total absence of intestinal disorder also contravenes this particular explanation. It is therefore not unnatural to conclude that one was dealing with a strain of true Friedländer bacillus as originally contended.

Critics may rightly ask why splenic and blood cultures were not made. The answer is that the particular case occurred in an investigation undertaken for a totally different purpose, and that it was not until I came across the notes of the case in revising the others that it occurred to me to record it; then the opportunity for making such cultures had gone, the child having disappeared.

I have noted the case for a dual purpose. Firstly, to demonstrate the prognostic value and manner of sputum examination in children with bronchopneumonia, and secondly, in the hope that a clinical variety of meningitis, with a favourable prognosis, may be established—and this is submitted as a desirable objective from the medical, from the maternal, and especially from the national point of view, in face of the heavy toll of childhood which meningitis in all its forms exacts to-day, when more than ever do we require to conserve a healthy childhood.

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TRAUMATIC RUPTURE OF THE SPLEEN: SPLENECTOMY: RECOVERY.

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A HEALTHY married woman aged 31, the mother of four healthy children, spent the first twenty-one years of her life in South Africa and never had a day's illness. Since living in this country she has from time to time suffered from a fairly severe degree of anaemia, but has never needed a doctor except for her confinements.

On August 6th, at 3 p.m., she found a nail projecting through the sole of her boot. She stood up on a kitchen chair to reach a set of boot lasts and a hammer from a shelf (Fig. 1). The chair tilted forwards, the hind legs

FIG. 1.

FIG. 2.

FIG. 3.

leaving the ground, her feet slipped. She fell forwards, striking her epigastrium on the edge of the chair-back (Fig. 2). Her weight then carried the hind legs of the chair to the ground, and she received a second and more severe blow as the hind legs regained the ground (Fig. 3). She continued with the job in hand, picked up the boot lasts and hammer which had slipped from her grasp, and having satisfactorily knocked down the nail in her boot, again stood on the chair, and replaced the boot lasts on the shelf. This accomplished she felt faint and sick, walked upstairs to her bedroom, and lay down.

One of her children was then dispatched to me. Unfortunately I was out, but on my return at 6 p.m. I went to her house and found a colleague had in the meantime been sent for and had, about twenty minutes previous to my arrival, given morphine gr. $\frac{1}{4}$ hypodermically. The patient was lying in bed blanched and nearly pulseless, with the