greater than the above, the kidneys are thrown out of action and all the excretion is performed by the intestine, until a point is reached where the quantity in the blood is again brought below the "toleration point," when the kidney again takes on its excreting function.

4. If the concentration in the blood is greater still, the calcium is excreted also as calcium soap by the intestine.

5. The excretion of large quantities of calcium through the intestinal walls has an astringent action, and causes diminished action and paresis of the intestinal movements. The faeces cease to be excreted so freely, and if more calcium arrives in the blood the increased concentration of the calcium ion produces spontaneous intravascular clotting and death.

6. The calcium "toleration point," or the point of concentration of calcium in the blood above which the kidneys are unable to act, can be raised by injecting increasing doses of calcium chloride into the blood, provided time is given for the animal to complete the excretion of one injection before the next is given. This action appears to extend the theory of immunity into the inorganic world, and shows that the body can react to calcium salts much in the same way that it reacts to an organic toxin.

AN APPARATUS FOR X-RAY LOCALIZATION.

BY

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IN view of the present interest in this matter I have sketched (in isometric perspective) an apparatus with many familiar and some novel details. This is adapted for almost any of the prevailing methods of localization and for any part of the body, except perhaps the orbit. Any form of upright tube stand, if not too elaborate, will do; nor is any special table required, provided it is level, narrow, long, straight-edged, and transparent to x-rays. More particularly I would call attention to the plate-holder, which consists of an upper and a lower deck, connected similarly as in the case of the two beams of the ordinary parallel rulers, and capable either of being clamped in any position or of being used free. The lower deck can be slid along either edge of any straight table, and, being reversible, can be applied to the table from either side or end, and is not any obstacle to the passage of x-rays. The upper deck can, by means of adapters, support any plate or fluorescent screen, so as to slide from either side of the table to the other. On the fluorescent screen and in close contact with its surface can be placed a widely overlapping sliding protective glass shield (in sections if preferred) of lead-glass, slightly sand-blasted or otherwise roughened on its upper surface, and sufficiently optically transparent to act as a temporary recording surface for outlining the shadows by means of a lead pencil when the screen is lit up. This recording surface being much more extensive than the fluorescent screen, permits the position of the points of the plumb-bob upon it to be marked irrespective of the actual place of a, perhaps, small fluorescent screen, and at the same time provides some protection for the hands of the observer; the pencil marks can afterwards be washed off.

O_1 and O_2 are the first and second positions of the x-ray centre of emission, constituting the Base and parallel to the plane of the fluorescent screen, which plane is always horizontal if the surface of the table is so; x_1 and x_2 are the two points indicated by the successive positions of the point of the plumb-bob, where the vertical x-rays cut the picture plane, constituting the base on the plate; and m_1 and m_2 are respectively the first and second positions of the shadow of a foreign body thrown from O_1 and then from O_2 . If on the recording surface of the shield when the light is turned on we mark the points x_1 and x_2 and join x_1 with m_1 and x_2 with m_2 we get a sort of x-shaped figure; the point of intersection is the crucial point p . If the plane of the upper deck is truly horizontal and the plumb-line correctly centred over the x-ray centre of emission (as can be done once for all in various ingenious ways), then we know that the centre of the geometrical space occupied (but probably not completely filled) by any foreign body M is always in the vertical line $P M$ below p . The distance $p M$ is the depth of this "meta-

centre" of the foreign body below p and within the patient. By means of a free plumb-line we can now mark the point on the patient vertically below p , noticing carefully at the time the depth (if any) between the surface of the patient and the point p at the level of the upper deck. We can now dismiss the patient until he is wanted for operation.

To get the depth $p M$ we have only to plot out one or other of the triangles $O x m$, and mark in the position of p in some of the ordinary well-known ways. It is wise always for the radiographer to add half an inch or more

to the depth $p M$, once he is sure of his vertical direction, when he knows he is dealing with any irregularly shaped foreign body of any size much larger than a small shot or fragment. With an undistorted service bullet the surgeon may be safely left to make his own correction.

A good deal of the apparatus depicted can be improvised with the resources necessarily present when an x-ray installation can be installed and worked. As a rule existing practice prefers to get the point x and m , over each other and to ignore p as a separate entity; this also can fairly easily be done by means of this apparatus. I and II indicate the first and second positions of the brackets bearing the tube box and the plumb-line.

SANITATION OF CAMPS (SAND AND WATER).

BY

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AN outbreak of diarrhoea in two companies of the 16th (S.) Battalion H.L.I. on December 16th, 1914, when ninety men were affected, caused an investigation to be made. Complaints as to the quality of the water supply had already been noted, and the valuable assistance of Dr. R. M. Buchanan, City Bacteriologist, Glasgow, was obtained. The water was, however, ruled out, as the number of men affected was only a fraction of the whole number using the same water supply. The same process eliminated the food supplies, which are daily inspected, and invariably of excellent quality.

In the search for evidence of local contamination it was found that the camp kettles were being scrubbed with sand picked up indiscriminately. Clean sand was provided, and orders issued that it only was to be used for scrubbing purposes. Thereafter no further cases occurred.

The ground at Gailes has been used yearly for over two decades for camp purposes; refuse pits have been opened and covered over; much traffic, horse and otherwise, has occurred in the vicinity of the drains, and indiscriminate use of sand meant the use of polluted material. A bacteriological report on the sand in question and valuable suggestions made by the bacteriologist are appended.

BACTERIOLOGICAL EXAMINATION OF SAND.

Sample 1 was collected from a small heap which had been used for cleansing food utensils and which presented a soiled appearance. It was examined same day to determine the nature and amount of bacterial contamination, if any. Sample 2 was collected from foundation pit for comparison with Sample 1.

Sand I.

Bacterial Content: 2,060,000 per gram in gelatine at room temperature; 95,200 per gram on agar at 37° C.

Colon Group (Lactose+ Indol+).—Details:

<i>B. coli</i> ...	Present in 0.01 gram.
<i>B. neapolitanus</i> ...	Present in 0.01 gram, absent in 0.05 gram.
<i>B. coscoroba</i> ...	Present in 0.05 gram.
<i>B. acidi lactici</i> ...	Present in 0.001 gram.
<i>B. proteus</i> ...	Present in 0.001 gram.

Sand II.

Bacterial Content: 21,200 per gram in gelatine at room temperature; overgrown with colonies of mould (mucus).

Colon Group (Lactose+ Indol+).—Absent in 1 gram. Details:

<i>B. coscoroba</i> ...	Present in 0.01 gram.
<i>B. proteus</i> ...	Present in 1 gram, absent in 0.1 gram.

The results obtained from the examination of Sand I serve to show the extent to which sand becomes polluted by its use in the cleansing of food utensils. The nature of the pollution indicates that this practice may become a source of dangerous contamination. The danger would be sufficiently guarded against by the use of clean sand from a sandpit placed in boxes. The requisite amount of sand would be lifted out and the possibility of its use a second time would thus be obviated.

R. M. BUCHANAN.

December 10th, 1914.

The result of an investigation into the water supply is added, as every year complaints are made as to its colour and turbidity, especially in wet weather. A large more or less permanent camp has been erected at Gailes, which may be further extended, the sandy soil and healthy situation, with ample manœuvring ground in the near vicinity, making this one of the most suitable localities for training purposes. It is desirable that an authoritative statement as to the water supply should be put on record.

SUMMARY OF REPORT ON WATER SUPPLY.

The water supply as delivered from several taps was examined bacteriologically on November 30th and on December 4th and 10th.

Owing to the interval between the collection and examination of the first and second samplings the numerical results have no value beyond indicating (1) the possibility of rapid multiplication of bacteria if the water is allowed to remain for any length of time in the end pipes, and (2) the need for systematic flushing of those standard taps which are not much in use.

The results of the third sampling (gelatine count 68 to 154 per c.cm.; agar count 26 to 52 per c.cm.; colon group—(a) *B. coli* "lactose + indol + " present in 100 c.cm., absent in 10 c.cm.; (b) other coliforms present in 10 c.cm., absent in 1 c.cm.) may be interpreted as indicating a fairly pure upland supply when local conditions and circumstances are fully taken into account. At the same time it may be stated that the total number of bacteria per c.cm. and the colon group content are comparatively high, and point to some contamination which, although not presenting evidence of a specifically dangerous nature, is undesirable, and most probably preventable. It is of a nature that suggests pollution of the reservoir by the intermittent visits of sea birds.

R. M. BUCHANAN.

DR. R. THOS. JONES, J.P., Harlech, has been appointed High Sheriff for the County of Merioneth for 1915-16.

THE Foundation Oration of the Union Society of University College, London, will be given by Lord Parmoor on Thursday evening, March 18th, at 8.45 p.m. The lectures will be founded on a text from George Herbert: "Do well and right, and let the world sink." The annual dinner will be held in the college refectory on the following evening at 7.30 p.m. It is particularly hoped that members serving with His Majesty's Forces will avail themselves of this opportunity of meeting old friends. Tickets for the dinner, 5s. each (men only), can be obtained from Mr. Godfrey H. Ince, at the college.

EPIDEMIC CEREBRO-SPINAL MENINGITIS.

BY

J. C. G. LEDINGHAM, M.B., D.Sc.,

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WHAT I have got to say in regard to the bacteriology of epidemic cerebro-spinal meningitis is doubtless familiar to many, but it is perhaps well, in a general discussion, to restate briefly certain points in connexion with the biology and distribution of the meningococcus which have a distinct bearing on the epidemiology of this disease.

The meningococcus of Weichselbaum is universally regarded as the essential specific cause of epidemic cerebro-spinal meningitis, as also of certain forms of sporadic meningitis. It belongs to a small group of Gram-negative diplococci, the only other important member of which is the gonococcus. In many relationships, and especially the serological relationships, it bears a close family resemblance to the gonococcus, and if the distribution of the gonococcus were other than it is, there is no doubt that the difficulties in differentiation surmountable though they are, might be greatly increased. Records of cerebro-spinal meningitis, as we know it, are wanting before the year 1805, and the daring hypothesis has been put forward that the meningococcus may have arisen as a mutant form of the gonococcus, with its seat of predilection in the meninges instead of the genital tract.

It would be idle, however, to speculate further on this point at present, as research is hampered by our inability to communicate either cerebro-spinal meningitis or gonorrhoea, as we know them, to laboratory animals. The serological and other affinities that exist between the meningococcus and the gonococcus find an interesting parallel in those that exist between the bacillus which causes pseudo-tuberculosis in rodents and the bacillus of human plague.

The meningococcus is a delicate short-lived organism and requires for its successful isolation and for a variable time after isolation the presence of serum, ascitic fluid, or some such substance in the nutrient medium. Later it can grow without these additions, but it still retains certain properties which mark it off as an organism which cannot under any circumstances lead a saprophytic life outside the human body. These properties are its great susceptibility to (1) cold, and (2) to drying. It will not grow below 25° C., and cultures kept at room temperature very rapidly die out. If no precautions are taken against drying the organism dies out even at 37° C. in a few days, but if such precautions are taken it has been found possible to keep the organism alive for so long as six to ten months. The observations of various authors vary somewhat, and it is unnecessary to cite details, but all are agreed that the meningococcus is an organism which is extremely susceptible to external influences of the kind mentioned.

When found in the lumbar fluid of cases of meningitis, the meningococcus is readily identified by its Gram-negative character and its frequent intracellular disposition. After isolation, the growth is distinguished by its emulsibility in saline, its action on certain carbohydrates, and its behaviour towards an agglutinating serum. As organisms other than the meningococcus are only very rarely met with in samples of fresh lumbar fluid from cerebro-spinal cases, some of these tests may legitimately be dispensed with, especially if work is pressing; but in the case of suspicious organisms isolated from the nasopharynx of cases or carriers, identification tests have necessarily to be more strict in view of the fact that other Gram-negative diplococci, such as the *Micrococcus catarrhalis* and the group of chromogenic diplococci, are liable to occur in this situation. The criteria employed for the identification of meningococci from the nasopharynx have probably not always been of a uniformly strict character, and this fact has undoubtedly to be taken into consideration in appraising the percentages obtained by various workers who have searched for carriers either during the epidemic season or at epidemic-free periods.

It would be exceedingly desirable to have an agglutinating serum which would act with some uniformity against meningococcal strains of various origin. In hunting for carriers it would be invaluable, but so far the difficulties