be found best not to attempt altering the lead pattern with the finger, but always with the hammer, not forgetting the "balance" each time that it is so changed. This pattern when so fitted is intended to serve as a form on which to mould the celluloid, or in case a metal support is to be made, the pattern instead of the foot is used to make the cast upon which the workman fits the brace.

In working with celluloid the material is first cut out in proper shape, a scroll saw being best adapted for this purpose. It is well now also to finish the edges of the celluloid. Celluloid or rubber scrapers made for the use of dentists will be found well adapted for rounding the edges and they can then be made smooth with fine sandpaper.

The celluloid is now superimposed upon the lead pattern, which must be handled with some care, for while it withstands the pressure which is necessary, it can, nevertheless, be easily bent by striking the floor or any hard object with force. The celluloid is fastened to the lead pattern with clips or with rubber bands, and it is necessary to see that now and afterward during the shaping process the outer edges of celluloid and lead coincide.

By means of forceps with smooth jaws, plate and pattern thus clamped together are now lowered into boiling water, which must be of sufficient depth to

FIG. 2.

cover them; a granite-ware baking dish will be found a convenient vessel. As soon as the celluloid has begun to soften it should be gently pressed down to the pattern and when thoroughly flaccid the whole is removed from the vessel with the forceps by one hand and received by the other hand, which is protected from the heat by a towel folded several times. The celluloid, still kept hot by the lead underneath, is now made to fit the pattern accurately. This can be done quickly and with ease. The whole is now immersed in cold water for a few minutes and is then ready to apply to the patient. The plate may be given a finish by rubbing the whole of it with fine sandpaper.

Good celluloid is a material of great toughness and if sufficient force is used can be bent to a certain extent without heating. If any further adjustment of the edges is required, to prevent injury to the shoes, for instance, this can be quickly accomplished by using the forceps before mentioned, whose jaws are smooth and which is considerably bent on the flat. If it is desired to make a plate with an external flange, the pattern having been shaped accordingly, this must first be shaped frechand so that when the celluloid is placed upon the lead, the flange as well as the outer edges of the plate and pattern, respectively, may coincide. Figure II shows a plate made in this way.

The material which has been used in these experi-

ments is known by the trade name of "pyralin"⁸ and has been found of uniform quality. Three thicknesses have been used, $\frac{1}{16}$, $\frac{1}{8}$ and $\frac{1}{4}$ inch. The thickness to be used depends upon the weight of the patient and in scarcely less degree upon the flatness of the arch as shown by the impression. Material of $\frac{1}{8}$ inch is used as a rule for children only and for persons weighing less than 100 pounds.

The writer feels that he must speak with some reserve with regard to the durability of these plates, for he has been using them not quite six months. But one of the plates has been broken; this was in the case of a very active young man with perfectly flat feet and weighing about 150 pounds; the break occurred in jumping from a street car and the material was $\frac{1}{8}$ inch. The rigidity of the plate has been well tested in one patient of 172 pounds, who has been wearing it for five months. Although of $\frac{1}{8}$ inch thickness, the plate shows no appreciable change upon comparison with the pattern from which it was made. However, if such yielding occurred it could be easily remedied by reshaping it in the boiling water with the original lead pattern.

Absolute accuracy cannot be claimed for the above method, especially when celluloid is used, for it is the under surface of the celluloid which is shaped to the pattern instead of the upper, and the inaccuracy will be in direct ratio to the thickness of the material. In practice this has been found unimportant, however. In addition it does not appear that such a degree of accuracy has been reached in the treatment of flat foot as to constitute a serious objection. When the lead pattern is used to obtain the plaster cast in the manufacture of metal supports, the inaccuracy is, of course, much less.

[NOTE. — Since writing the above there has come to the author's notice an article by Möckmüller and Kafan in the *Neurolog. Centrbl.* of September 21, 1900. This has suggested a simpler and equally efficacious method of taking impressions of the feet. The following method has been found satisfactory: With a cotton swab the sole of the foot is moistened with a solution of tincture of iron and 70% alcohol, each 45; glycerine 10. Care should be taken in order that the entire weight-bearing part of the foot may be covered with solution; if the latter is used too profusely the impression will not be clear. The patient now steps upon a piece of white cardboard for about two seconds. The image is now developed by lightly painting the card with a strong solution of tannin in 70% alcohol. Möckmüller and Kafan use ammonium sulphocyanate in ethereal solution for developing.]

THE AGGLUTINATION BY THE PATIENT'S SERUM OF THE BACTERIA FOUND IN CYSTITIS AND PYELITIS, WITH A CONSIDERATION OF THE PLEOMORPHISM OF THE BACTERIA FOUND IN THESE INFECTIONS, ESPECIALLY AS REGARDS CHROMOGENIC PROPERTIES OF THE STAPHYLOCOCCI.

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SINCE the demonstration of the agglutination reaction by Widal in the case of the typhoid bacillus, numerous contributions have been made which describe similar instances of agglutination in the case of other micro-organisms. Thus, besides the enormous amount of work that has been done in this connection with typhoid, considerable attention has been paid to the diagnosis of Malta fever and of tuberculosis by similar means, while numerous isolated observations have

⁸ Obtained from the Arlington Company, 475 Broadway, New York.

been made describing the agglutination of various bacteria by the serum of their host. This communication will deal, in the first place, with a few cases of cystitis and pyelitis in which the bacteria giving rise to these infections have been tested with the patient's serum, to see whether or no they would be agglutinated thereby. Obviously, to be able to make this test satisfactorily, we must choose those micro-organisms with at least a moderate degree of motility, so that not only the clumping of the bacteria but the variations in their motility can be definitely studied.

CASE I. This was a case of cystitis of many years' duration, due to the bacillus coli communis in pure culture, the micro-organism in this case being more actively motile, and producing its characteristic changes upon the various media more rapidly than any other colon bacillus we have ever met with. The patient was an extremely anemic, poorly nourished girl, and the lack of resistance dependent upon her general physical condition coupled with the probably marked primary virulence of the micro-organism was in all likelihood the cause of the extreme activity of the bacillus in this case. The cystitis was present in its most marked type; the injection, ulceration and contraction of the bladder were most marked, although the condition existed alone, that is, was not associated with a renal infection. The condition had undoubtedly arisen after faulty catheterization more than ten years previously, and had been present ever since, constantly increasing in severity. The urine was acid, contained enormous numbers of pus cells and a moderate number of red blood and epithelial cells, with a trace of albumin, while a bacteriological examination made under the strictest aseptic precautions demonstrated that the bacillus coli communis was present in large numbers in pure culture. As stated before, the organism was very actively motile, grew rapidly and luxuriantly on all culture media, and produced the characteristic changes therein speedily and in a marked degree. The patient's serum was obtained by the method usually employed in the case of testing the Widal reaction in typhoid fever; that is, the blood was obtained in a pipette, the end of which was of fine calibre, and after the serum had separated from the clot the former was tested with an eighteen-hour bouillon culture of the micro-organism in the usual way, that is, with dilutions of varying strength examined ten, thirty and sixty minutes after the mixing of the bacteria with the serum. In dilution of 1 to 10 the reaction was distinct in ten minutes; almost complete, clumping with almost entire loss of motility, in thirty minutes, and absolutely complete in sixty minutes; in dilution of 1 to 20 the reaction was almost as positive, while in dilution of 1 to 50 the reaction was evidently beginning in ten minutes, there being some clumping and some loss of motility; in thirty minutes the reaction was positive, while in sixty minutes it was almost complete. It will thus be seen that the reaction in this case was absolutely positive.

CASE II. This was one of an acute infection of both bladder and kidney, due to bacillus proteus vulgaris. The history of the case in brief was as follows: After an operation for chronic recurring appendicitis without abscess formation the patient was catheterized by an orderly whose technique was remarkably bad. On the third day after the operation the patient developed all the symptoms of an acute ammoniacal

cystitis with large numbers of pus, blood and epithelial cells in the urine, while four days later he developed also the symptoms of a left pyelonephritis. The culture from the kidney and from the urine was that of the bacillus proteus vulgaris (the cultures from the kidney were made directly, two weeks later, when the kidney was opened and drained to relieve the pyelonephritic condition). The urine at all times contained large numbers of triple phosphate and ammonium urate crystals, while considerable albumin was also present after the kidney became infected. The testing of the agglutinating power of this patient's serum from the cultures of the bacillus proteus vulgaris obtained in the case were made as in the preceding instance, and, as in that instance, the micro-organism was a very motile one. In dilution of 1 to 10 in ten minutes the reaction was marked, in thirty minutes almost complete, and in sixty minutes absolutely complete, while in dilution of 1 to 50 the reaction was definitely beginning in ten minutes, positive in thirty minutes, and almost complete in sixty minutes. The reaction was thus as positive as in the preceding case.

CASE III. This was one of cystitis of four years' duration, associated two years after the beginning of the cystitis with a pyelitis, both due to the bacillus proteus vulgaris. At the time of the development of the cystitis the patient was in an extremely anemic condition (hemoglobin 50%), and was obviously in a state especially suitable for the development of infection. After the development of the pyelitis, the symptoms of cystitis became markedly less, so that at the time the patient came under observation both vesical lesions and symptoms were very slight. The urine from the bladder contained numbers of pus cells, some red blood and epithelial cells and considerable albumin, was either slightly acid, neutral or slightly alkaline in reaction, and contained large numbers of the bacillus proteus vulgaris in pure culture. The urine from the right kidney obtained by ureteral catheterization contained large numbers of pus cells, some red blood cells and some renal epithelial cells, considerable albumin, was invariably alkaline and also contained the bacillus proteus vulgaris in pure culture. The urine from the left kidney was absolutely normal. The agglutination test in this instance, made as before, gave the following results: In dilutions of 1 to 10 no reaction was noticed in ten minutes, in thirty minutes there was a suggestion of slightly decreased motility and a few clumps, while in sixty minutes the reaction was still more suggestive but not positive; in dilution of 1 to 50 the reaction was not present. Thus in this case the reaction if present at all was so in a very slight degree.

CASE IV. In a case of acute cystitis due to the bacillus typhosus in a patient who did not have typhoid fever, where the vesical infection was presumably introduced by catheter, the bacilli obtained in pure culture from the urine were unfortunately not tested with the serum of the patient; the bacilli were, however, tested with the serum of another patient who was suffering with a typical attack of typhoid fever, and reacted with this serum positively even in dilutions of 1 to 80.

These 4 were the only cases of cystitis and pyelitis in which this test was made, but the absolutely positive reaction in 2 of the 3 cases in which a complete test was made, and a suggestive reaction in the third

case, suggest that this might be frequently found in cases of cystitis and pyelitis. The fact that one case in which the reaction was positive was one of an acute infection of but two weeks' duration, and the other positive case, a chronic case of many years' duration, would suggest that the reaction may begin shortly after the infection has been set up and may continue for a long period of time.

These cases, although few in number, suggest a possible means of differentiating the bacteria in those cases of cystitis and pyelitis where there is doubt about the bacteria causing the infection, and they also suggest that in this class of cases there is possibly developed a certain reactive tendency of the organism as a whole against the special infection.

The pleomorphism of many micro-organisms under varying conditions has been frequently dwelt upon by numerous bacteriologists. Thus the morphology of the tubercle bacillus may be made to differ quite markedly according to the media upon which it has grown; the motility of the typhoid bacillus varies markedly under varying conditions. The virulence of the streptococci and staphylococci lies within widely divergent limits, dependent upon many previous factors in the life history of those micro-organisms; and, of course, many other cases of like nature might be added. The factors in the development of these various forms of the same micro-organism are probably to be found by a careful study of the previous life history of the organism in question. In cystitis we have an especially favorable field for studying the pleomorphism of the organisms which give rise to this condition. Thus we may have varying grades of resistance of the patient due, in the first place, to the general condition of the patient's health, whether she is robust and healthy or anemic and poorly nourished, and in the second place, to the condition of the bladder itself, whether it has recently undergone trauma, whether it is in a condition of anemia or congestion, whether there is constant retention of a portion of the urine, etc.; and also there may be various factors definitely dependent upon the micro-organism itself. Thus the virulence may vary markedly, depending upon its previous history and habitat, whether its existence has been parasitic or saprophytic, also upon the number of micro-organisms which were initially introduced. The condition of the urine also plays an important rôle; thus upon the presence of considerable, a small amount of, or no albumin depends the fact whether or no the micro-organism will find a medium favorable for its growth.

The multiplicity of these factors has shown us marked pleomorphism in our cases of cystitis and pyelitis, over 80 of which have been carefully studied bacteriologically. The results of these experiments, as will appear in full elsewhere, go to show that the colon bacillus is the commonest cause of cystitis and pyelitis in women, while various staphylococci, the tubercle bacillus and the bacillus proteus vulgaris are also quite frequently found, and numerous other micro-organisms are found in exceptional instances. The pleomorphism of the colon bacillus in the various specimens found by us was very marked; thus its shape differed from that of a rather long, not very thick rod to a form difficult to distinguish from a coccus; its motility in some cases was very active, in the majority of cases sluggish, and in a few cases *nil*

as far as we could determine. Marked variations were also seen in its behavior upon the various media. In some cases the growth was very profuse, and the changes in the various media (production of indol in pepton, coagulation and acidification of milk, the production of gas on glucose agar) very marked and very rapid, while in other cases the growth was very scant and the changes slow and slight. Although no definite conclusion could be drawn regarding the significance of these various forms, generally speaking it seemed that the more virulent micro-organisms were those which approached more the slender rod-shaped bacillus in form, in which the motility was most marked and in which the changes produced in the various media were most marked and most rapid.

In the case of the staphylococci, morphological pleomorphism was not so marked as in the case of the colon bacillus, as one would naturally expect. The rapidity and profuseness of the growth upon the various media and the changes produced therein differed, however, quite markedly in the different cases. The staphylococci found in our cases were the staphylococcus pyogenes albus and aureus and a white staphylococcus especially characterized by its marked ability to decompose urea and the slowness with which liquefaction of gelatine was produced. We were especially interested, however, by certain peculiarities in the chromogenic properties of these bacteria. In 2 cases the growth from the urine upon agar consisted of a number of small colonies of light lemon color. Transplantations from these upon potato gave colonies of a darker yellow color, while two subsequent transplantations from this latter upon agar gave colonies with the typical orange color of the staphylococcus pyogenes aureus. In a third case the primary culture consisted of growths almost white in color, which after six successive transplantations gave colonies of the same typical color as those of the staphylococcus pyogenes aureus.

These results, while few in number, are very suggestive in regard to the relation between various members of the staphylococcus family and suggest that many of what we now consider separate species may have arisen originally from a common staphylococcus, and the variations in cultural peculiarities, in chromogenic tendencies, etc., may have been directly dependent upon the various factors, favorable or otherwise, which surrounded the special micro-organisms since that time.

THE MANAGEMENT OF ABDOMINAL TESTICULAR ECTOPIA ASSOCIATED WITH INGUINAL HERNIA.¹

BY CHARLES A. POWERS, M.D., DENVER, COL.

ON June 18, 1900, Dr. Barkwell, of Cheyenne, kindly referred to me H. C., a boy of fourteen years, who gave a history of having had a reducible bubonocoele on the right side for one year. The testis on this side had never been found in the scrotum. The hernia had been unusually painful and he was unable to wear any sort of a truss. Examination revealed a right oblique inguinal hernia of moderate size, not passing beyond the external ring. The testis on that side was not in the scrotum, and, as said before, it had never been found there. Just above the external ring there was a small, tender lump; this was movable and thought to be the testis.