situation ideal, and resists all attempts to alter it, even reverting to all his former phantasies in their new relationship. This is the state in which the father confessor would leave him, but the psycho-analyst must place the patient upon his own feet. In other words, the next stage in the treatment is dissolution of the transference relation. This is the most difficult part of psycho-analysis, because the resistances are as strong as ever. It is to be accomplished in exactly the same way in which the transference relation was produced—viz., by psycho-analysis. In this dream interpretation will again play an important part, for it will now prove a useful guide in our search for the future object of the libido. We must find new interests for the patient and encourage him in them, so that he may come once more into practical relationship with the world around him. During this process all his symptoms crumble away, and in the end he finds himself neither better nor worse than other members of the community around him, but just a normal person.

TYPHOID AND PARATYPHOID INFECTION.*

No. II.—THE DETECTION AND IDENTIFICATION OF B. TYPHOSUS AND B. PARATYPHOSUS.†

By GEORGES DREYER, M.A. OXON., M.D. COPENHAGEN,
PROFESSOR OF PATHOLOGY IN THE UNIVERSITY OF OXFORD;
HONORARY CONSULTING PATHOLOGIST TO THE THIRD
SOUTHERN GENERAL HOSPITAL;

E. W. AINLEY WALKER, M.A., D.M. OXON.,
LECTURER IN PATHOLOGY IN THE UNIVERSITY OF OXFORD;
HONORARY ASSISTANT CONSULTING PATHOLOGIST TO THE
THIRD SOUTHERN GENERAL HOSPITAL;

AND

ALEX. G. GIBSON, D.M. OXON., F.R.C.P. LOND.,
LECTURER IN MORBID ANATOMY IN THE UNIVERSITY OF OXFORD;
CAPTAIN, R.A.M.C. (T.); PATHOLOGIST TO THE THIRD
SOUTHERN GENERAL HOSPITAL.

THE problem of the detection of the B. typhosus and the paratyphoid bacilli resolves itself into a question of the application of methods which will reveal the presence of these organisms in mixed cultures of a variety of bacteria even when their relative numbers are very few; as, for example, in the fæces of convalescents or carriers. Where typhoid (or paratyphoid) bacilli are abundant almost any method, from plating high dilutions over large surfaces of ordinary agar to the use of the most elaborate media for the enhancement of the B. typhosus on the one hand, or the inhibition or elimination of its rivals on the other, will render the isolation of these organisms a comparatively simple process. But where they are few negative results are frequently obtained even after repeated examinations of the fæces.

In bringing forward the results described below it is not our object to enter into any detailed criticism of existing methods, many of which have been shown to possess very considerable value for particular purposes. A discussion of their respective merits and demerits does not lie within the scope of our present purpose, which is to point out briefly why negative results obtained by their use are often likely to be entirely misleading where relatively few of the bacilli are present. At the same time we wish to describe a new method of which the essential feature is an exposure of the suspected bacterial material to the influence of

actinic light. This method allows of the examination of much larger quantities than usual of the material in question with very little labour, and has enabled us to detect the B. typhosus or B. paratyphosus at the first examination where examination by other methods had again and again yielded negative results. For example, from a suspected carrier examined elsewhere on five different occasions with negative results, we isolated a few colonies of the B. typhosus at the first examination by the new method, though other methods tried at the same time gave a negative result.

Inhibitory Media.

In examining suspected carriers and in studying the persistence of typhoid and paratyphoid bacilli in the urine and fæces of convalescents from typhoid and paratyphoid fever, we have met with constant disappointment in the results obtained by using the various special media which have been recommended for the purpose. With most of these media the amount of the suspected material which can be worked up for investigation is relatively very small unless the number of platings made is largely increased. Any considerable multiplication of platings is, however, impossible when many examinations have to be carried out within a short period. Thus if only relatively few of the bacilli are present in the material examined they are likely to be missed.

But besides this difficulty, the rate at which typhoid and paratyphoid bacilli frequently appear to vanish during convalescence from fæces which are investigated by these methods forced upon us a suspicion of the possibility that the eliminating substances employed were actually destroying the bacilli sought for as well as those which it was intended to inhibit.

In view of the importance at the present time of retaining convalescent soldiers under observation and control until they cease to act as carriers it is essential that the method used in making examinations should be one in which a negative finding represents as nearly as possible a true negative. And an ideal method would be one where the report "not found" could be accepted as a true equivalent of "not present." But this can never be the case if the media employed are such as may destroy or inhibit the bacilli which are being sought for.

That the method of direct plating on so-called selective media often proves misleading has been shown by various observers, and notably C. H. Browning¹ and his co-workers who found in the course of their important work with brilliant green that direct plating on MacConkey's medium was unsatisfactory. It only enabled them to detect typhoid (or paratyphoid) bacilli in 6 cases out of 13, in all of which they were discovered by their method of "enhancement." Even in this latter method, however, as well as in its later modification by the addition of potassium tellurate² to the fluid used for the primary cultures plating on a special medium follows the enhancement. Accordingly we found it necessary to submit a series of the recognised selective media to actual tests as regards their effect upon the growth of different members of the colityphoid group.

Among the numerous special media which have been proposed the best known are those

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† THE LANCET, Feb. 13th, 1915, p. 324.

¹ C. H. Browning, W. Gilmour, and T. J. Mackie: Journal of Hygiene, vol. xiii., p. 335; Journal of Pathology and Bacteriology, vol. xviii., pp. 144, 146.

² C. H. Browning, T. J. Mackie, and J. F. Smith: Journal of Pathology and Bacteriology, vol. xix., p. 127.

of Drigalski and Conradi,³ MacConkey,⁴ Endo,⁵ Lentz and Tietz,⁶ Löffler,⁷ Conradi,⁸ and Fawcus.⁹ Of these media those of Drigalski and Conradi, MacConkey, and Endo were ultimately selected for special quantitative investigation. A very extensive series of experiments has been carried out; but it will be sufficient for our purpose to quote a few typical examples of the results obtained on these media with pure cultures, and with mixtures of pure cultures of *B. typhosus* and *B. coli* in different proportions. The paratyphoid bacilli have also been investigated in a similar manner. Experiments were made by preparing (a) high dilutions of pure cultures of *B. typhosus* and *B. coli* and (b) known mixtures of these pure cultures, and comparing the number of colonies of the two organisms which grew after plating on the surface of agar plates with the number of colonies obtained from the same quantity of the same dilution on the surface of plates of the three special media named.

We have not found in the literature that exact quantitative tests of the viability of typhoid, paratyphoid, and colon bacilli on such media have previously been made. Our results seemed so surprisingly contrary to expectation that the experiments were many times repeated for complete confirmation. The outstanding conclusion is that all these media eliminate a very large proportion of typhoid (and even paratyphoid) bacilli, and do not to any very notable degree inhibit the growth of *B. coli*. In saying this we do not at the present time at all intend to suggest that such media as those of Endo, MacConkey, and others are not excellent for the differentiation of these micro-organisms and for separating them when sufficiently abundant from a variety of intestinal and other organisms by selective elimination. But we maintain that for the isolation of typhoid and paratyphoid bacilli where they are relatively few in numbers, as in drinking water, in carriers, and in convalescent cases, their use is entirely misleading as regards the value of a negative finding.

Before giving figures for some typical quantitative experiments it is of interest to draw attention briefly to the results obtained by inoculating from pure cultures of typhoid, paratyphoid, and colon bacilli on plates of MacConkey's and Endo's media and ordinary agar. In each case the needle was charged from a single isolated colony and a streak was made on the surface of each medium in succession, beginning with MacConkey's medium and ending with the ordinary agar without recharging the needle. One example for each organism is given in Table I.

In other cases a series of mixtures of pure cultures of *B. typhosus* and *B. coli* in different proportions was prepared (e.g., 1 to 1, 1 to 5, 1 to 10, 1 to 15, &c.), and from these streaks were made on a series of media by means of a platinum needle recharged for each medium. The *B. typhosus* was not found on Drigalski and Conradi's medium or on MacConkey's medium when present in a mixture in a less proportion than 1 typhoid to 10 colon bacilli.

³ Drigalski and Conradi: *Zeitschrift für Hygiene* (1902), vol. xxxix p. 283.
⁴ MacConkey: Thompson-Yates and Johnston Laboratory Reports, vol. iii., part 3, pp. 40 and 151; vol. iv., part 1, p. 151; *Journal of Hygiene*, vol. v., p. 333; vol. viii., p. 322; vol. ix., p. 86.
⁵ Endo: *Centralblatt für Bakteriologie und Parasitenkunde*, Originale, vol. xxxv., S. 109.
⁶ Lentz and Tietz: *Münchener Medizinische Wochenschrift*, vol. 1., p. 2139.
⁷ Löffler: *Deutsche Medizinische Wochenschrift*, 1903, No. 36, Vereinsbeilage.
⁸ Conradi: *Centralblatt für Bakteriologie und Parasitenkunde*, Beilage zu Abteilung 1, vol. xlii., Referate, S. 47.
⁹ Fawcus: *Journal of the R.A.M.C.*, vol. xii., p. 147.

In the case of Endo's medium (and the medium of Lentz and Tietz) the *B. typhosus* was recovered from mixtures of 1 typhoid to 15 colon bacilli, but not from any lower proportion of typhoid to colon bacilli.

TABLE I.

Medium.	Experiments		
	(a) B. typhosus.	(b) B. para-typhosus (B).	(c) B. coli.
MacConkey's medium...	Slight growth.	Fair growth.	Rich growth.
Endo's medium	Slight growth.	Marked growth.	Very rich growth.
Ordinary agar '	Luxuriant growth.	Luxuriant growth.	Luxuriant growth.

Quantitative Experiments.

The dilutions were carried out with accurately graduated pipettes, and were made with sterile bouillon of the same batch as that in which the cultures were grown. The platings were always made with 20 c.mm. of the diluted culture (or mixture) measured by means of calibrated capillary pipettes. The fluid was placed on the surface of the medium and carefully spread over the whole area by continued gentle rubbing to and fro with a thinly drawn Pasteur pipette the last inch of which was bent at a right angle after sealing and turning up the end. The plates employed were Petri dishes of 9 cm. diameter and always contained the same amount of medium. The various media used in each set of experiments were prepared at the same time, and plates for each set were poured at the same time and were brought into use together after standing at the room temperature for a period of 8 to 24 hours.

TABLE II.—Showing the Number of Colonies which Grew on the Various Media in Experiments made with Various Known Dilutions of Pure Cultures of *B. Typhosus* and *B. Coli* respectively. (The experiments denoted by the same number were made at the same time in each case.)

Medium.	Number of colonies on plates inoculated with <i>B. typhosus</i> 20 c.mm.			Number of colonies on plates inoculated with <i>B. coli</i> 20 c.mm.		
	Experiments			Experiments		
	(1)	(2)	(3)	(1)	(2)	(3)
Ordinary agar	265	150	90	1100	550	86
Endo's medium	245	135	85	1000	500	60
MacConkey's medium	2	1	0	950	450	70
Drigalski-Conradi medium...	2	0	0	1050	500	64

The above table shows clearly that when relatively small numbers of typhoid bacilli are plated out they may entirely fail to grow on MacConkey's and the Drigalski-Conradi medium, even when there are from one to two hundred bacilli viable on ordinary agar present. Endo's medium, on the other hand, grew the great majority of the viable typhoid bacilli. This, however, is not the case unless the plates of Endo's medium are only very moderately dried before use. If Endo-plates and ordinary agar plates are allowed to stand for two or three days before use the Endo's medium becomes relatively very much more unfavourable. Thus in one case with 457 colonies on agar there were only 140 colonies on Endo's medium, and in another case with 100 colonies on agar only 4 of the bacilli grew on Endo's medium. As regards the *B. coli*, it will be observed that of the organisms viable on ordinary agar the great majority grew on all the media, though in this respect our general experience has been that MacConkey's medium is usually the least favourable of the three.

TABLE III.—Showing the Number of Colonies of *B. Typhosus* and *B. Coli* respectively which Grew from Mixtures made at the Same Time from the Same Cultures so as to contain (A) 3 *B. Coli* to each *B. Typhosus* and (B) 149 *B. Coli* to each *B. Typhosus*. (The mixtures were diluted 1/62500 before plating.)

Medium.	A 3 <i>B. coli</i> to each <i>B. typhosus</i> . 20 c.mm.		B 149 <i>B. coli</i> to each <i>B. typhosus</i> . 20 c.mm.	
	Typhoid colonies.	Coli colonies.	Typhoid colonies.	Coli colonies.
Ordinary agar... ..	133	430	1	500
Endo's medium	120	400	0	450
MacConkey's medium... ..	1	460	0	420
Drigalski-Conradi medium	0	303	0	400

Here it appears that even when there is one *B. typhosus* to every three *B. coli*, and there are upon the plates almost the extreme number of colonies which will usually allow of certain differentiation, only a single typhoid colony appeared on MacConkey's medium and none on the Drigalski-Conradi medium.

Experiment B shows how, as the dilution of the *B. typhosus* with *B. coli* increases, the number of *B. typhosus* found even on an ordinary agar plate diminishes below the expectation, only one colony being found instead of three. This we have found to be our regular experience.

TABLE IV.—Showing the Number of Colonies of *B. Typhosus* and *B. Coli* respectively which Grew from Mixtures made at the Same Time from the Same Cultures so as to contain (c) 1 *B. Coli* to each *B. Typhosus*, and (d) 19 *B. Coli* to each *B. Typhosus*. (The mixtures were diluted 1/62500 before plating.)

Medium.	C 1 <i>B. coli</i> to each <i>B. typhosus</i> . 20 c.mm.		D 19 <i>B. coli</i> to each <i>B. typhosus</i> . 20 c.mm.	
	Typhoid colonies.	Coli colonies.	Typhoid colonies.	Coli colonies.
Ordinary agar	100	132	4	150
Endo's medium	75	114	3	136
MacConkey's medium ...	1	121	0	161
Drigalski-Conradi medium	2	75	0	152

Here it is seen that only when the number of *B. typhosus* present approximately equals the number of *B. coli* are any colonies of *B. typhosus* found on MacConkey's or the Drigalski-Conradi medium. Observations such as those recorded in Tables II., III., and IV. are typical examples of the results obtained in numerous experiments with different media recommended for the isolation of the *B. typhosus*. They are sufficient to explain the fact (emphasised most recently by Browning, Gilmour, and Mackie in the case of MacConkey's medium) that primary platings on selective media frequently fail to yield colonies of *B. typhosus*, even when that organism is undoubtedly present. If a selective medium is employed at all at any stage of the isolation and identification of *B. typhosus*, the medium of Endo is to be recommended. The results with that medium in the tables shown are good. But this will only be the case, as already stated, if the medium is very carefully managed as regards its relative moisture.

For purposes of cultural discrimination between *B. coli* and *B. typhosus* Endo's medium constitutes the most beautiful differential medium with which we are acquainted. The colonies of *B. coli* are

well developed, of a deep red colour, and gradually acquire an intense metallic sheen, while those of *B. typhosus* are at first only faintly rosy in colour, and though they eventually become red they never acquire any metallic lustre.

TABLE V. (Mixture A).

Enhancement.	Medium.	Streak.	Colon.	Typhoid.
α.	Ag.	1	Continuous growth.	1 isolated colony found.
		2	Numerous isolated colonies.	No colonies.
		3	Isolated colonies.	2 isolated colonies.
	E.	1	Continuous growth.	No colonies found.
		2	Fairly continuous growth.	3 isolated colonies.
		3	12 colonies.	8 colonies.
	M'C.	1	Continuous growth.	No colonies found.
		2	Continuous growth at first, then isolated colonies.	No colonies found.
		3	Isolated colonies.	No colonies.
β	Ag.	1	Numerous isolated colonies.	More numerous isolated colonies.
		2	No colonies.	No colonies.
		3	No colonies.	1 colony.
	E.	1	Continuous growth at first, then isolated colonies.	18 isolated colonies towards end.
		2	1 colony.	1 colony.
		3	No colonies.	No colonies.
	M'C.	1	Numerous isolated colonies.	2 colonies.
		2	3 colonies.	No colonies.
		3	2 colonies.	No colonies.
γ	Ag.	1	13 colonies.	4 colonies.
		2	No colonies.	No colonies.
		3	No colonies.	No colonies.
	E.	1	2 colonies.	18 colonies.
		2	No colonies.	No colonies.
		3	No colonies.	No colonies.
	M'C.	1	A number of isolated colonies.	2 colonies.
		2	3 colonies.	No colonies.
		3	No colonies.	No colonies.

Ag. = Ordinary agar.

E. = Endo's medium.

M'C. = MacConkey's medium.

TABLE VI. (Mixture B).

Enhancement.	Medium.	Streak.	Colon.	Typhoid.
α	Ag.	1.	Continuous growth.	No colony found.
		2.	Numerous separate colonies.	1 colony.
		3.	12 colonies.	No colonies.
	E.	1	Continuous growth.	No colony found.
		2	Numerous partly fused colonies.	1 colony.
		3	Isolated colonies.	1 colony.
	M'C.	1	Continuous and broken line of growth.	No colony found.
		2	Numerous partly fused colonies.	No colonies.
		3	Isolated colonies.	No colonies.
β	Ag.	1	30 colonies.	2 colonies.
		2	3 colonies.	No colonies.
		3	No colonies.	No colonies.
	E.	1	Closely set separate colonies.	4 colonies.
		2	5 colonies.	2 colonies.
		3	5 colonies.	1 colony.
	M'C.	1	20 colonies.	No colonies.
		2	No colonies.	No colonies.
		3	3 colonies.	No colonies.
γ	Ag.	1	13 colonies.	2 colonies.
		2	1 colony.	No colonies.
		3	No colonies.	No colonies.
	E.	1	6 colonies.	1 colony.
		2	No colonies.	No colonies.
		3	No colonies.	No colonies.
	M'C.	1	8 colonies.	No colonies.
		2	No colonies.	No colonies.
		3	No colonies.	No colonies.

Ag. = Ordinary agar.

E. = Endo's medium.

M'C. = MacConkey's medium.

The Method of Enhancement.

It is no part of our present intention to discuss in detail the brilliant-green enhancement method of Browning, Gilmour, and Mackie. In their hands, and in those of other observers, it has yielded very satisfactory results. Besides its action in the enhancement of the *B. typhosus*, the use of brilliant green has the advantage of exerting a bactericidal action on Gram-positive organisms. This action of the group of dyes to which brilliant green belongs was first demonstrated by two of us in work carried out with Kriegler^{10 11} and with S. G. Scott.¹² It has been fully confirmed by Browning and his co-workers, as well as by Krumwiede and Pratt¹³ and others. Browning, Gilmour, and Mackie further showed that brilliant green, which contains four ethyl groups in place of the four methyl groups of malachite green, is more favourable to the enhancement of the *B. typhosus* than the latter, which had been used by Löffler, Lentz and Tietz, and others.

As regards the practical utility of the brilliant-green enhancement method (which would be employed in preference to the later method with potassium tellurate¹⁴ added where there was possibility of the presence of *B. paratyphosus* (B)) we venture to suggest a modification. Browning plates out the enhanced cultures on MacConkey's medium. If they are plated out on Endo's medium or on ordinary agar instead, the chance of finding *B. typhosus* or paratyphoid bacilli, if present, is very greatly increased, as the following observations show.

Of the undiluted mixtures A and B in Table III. 20 c.mm. were added to two series of brilliant-green peptone-water tubes according to the method of Browning, Gilmour, and Mackie. Each tube contained precisely 5 c.c. of the medium. After 24 hours' growth at 37° C. the cultures were plated on ordinary agar, Endo's medium, and MacConkey's medium by making three successive strokes on each medium with a narrow loop. The loop was recharged for each plate. The results from three different strengths of brilliant green (1/10,000 solution 0.15, 0.4, and 0.8 c.c., indicated by α , β , and γ respectively) are shown in Tables V. and VI.

What Table V. shows is that, in accordance with the quantitative estimates given in previous tables, MacConkey's medium is inferior to Endo's medium and to ordinary agar for the detection of the *B. typhosus* after enhancement. Its use may lead to negative findings even when typhoid bacilli are actually present in some numbers.

Table VI. again shows the disadvantage of plating on MacConkey's medium after the enhancement. In all three cases the *B. typhosus* failed to appear on plates of this medium, although it was found both on Endo's medium and on ordinary agar. It may be added that on diluting the brilliant-green peptone-water culture β of Table VI. to 1/250 and plating out 20 c.mm. of the dilution by spreading on the surface of poured plates of ordinary agar, Endo's medium, and MacConkey's medium, about 100 colonies of *B. coli* were found on each medium, with two colonies of *B. typhosus* on the agar, one colony on Endo's medium, and none upon MacConkey's medium. Thus, as the result of the enhancement the relative number of *B. coli* had

decreased and the number of *B. typhosus* had increased both relatively and absolutely. The ratio found on plates before enhancement was 1 *B. typhosus* to about 500 *B. coli* (see Table III., B), but had now become 1 or 2 *B. typhosus* to each 100 *B. coli*.

The Light Method.

Although the method of enhancement has yielded excellent results, it has the drawbacks that a considerable number of enhancing cultures are required to make sure of including the most favourable concentration of brilliant green, and that it lengthens the process of isolation by some 24 hours. In the method which we are now about to describe relatively large quantities of the suspected material are

FIG. 1.

The lamp employed by the authors for exposure of the agar plate to the arc light.

worked up for examination and isolated colonies of *B. typhosus* or *B. paratyphosus* (A) or (B) may be obtained within 12 to 24 hours by the use of a single plate. The method was devised by one of us (G. D.) and is based on the experience of numerous previous investigations on the biochemical action of actinic light. It consists in the subjection of an ordinary agar plate liberally spread with the bacterial emulsion to a graduated exposure to the rays of an arc light. The arc formed between silver electrodes has so far given us the most satisfactory results.

Technique.

The illustration (Fig. 1) shows the lamp which we employ. It consists of two small metal pillars bracketed upon an insulating slate base. The pillars carry the horizontal arms upon which electrodes, water-cooled in the manner devised by Bang, are screwed. These arms can be approximated to each other by means of thumb-screws. They consist of an outer tube within which runs a smaller inner tube serving as inflow for the cooling water which returns by the outer tube.¹⁵ The arc is made by an electric current of 5 to 7 ampères with a voltage of 30 to 35 volts. The cooled electrodes give a perfectly cold arc light whose action is entirely free from any heat effect. In exposing an inoculated plate the lid is removed and the agar surface is directly exposed to the arc at a distance of about 6 cm. Upon the Petri dish is placed a sheet of blackened metal (or cardboard) in which an oblong window has been cut. By means of another sheet of blackened metal the window, which is at first fully open, is gradually closed. The different exposures given along the strip of window may with advantage be 30, 60, 90, 120, 150, 210, and 240 seconds, with a current of 7 ampères and 30 volts. In making such a plate from 0.5 to 1 c.c. of faeces are broken down in 2.5 c.c. bouillon and allowed to stand for about two hours. Two or three large

¹⁵ An apparatus which will be quite adequate for the purpose can be made at a comparatively small cost.

¹⁰ Dreyer, Kriegler, and Ainley Walker: *Journal of Pathology and Bacteriology*, vol. xv., p. 133.

¹¹ Kriegler: *Centralblatt für Bakteriologie und Parasitenkunde*, vol. lix., p. 481.

¹² Dreyer, Scott, and Ainley Walker: *Journal of Pathology and Bacteriology*, vol. xvi., p. 146.

¹³ Krumwiede and Pratt: *Journal of Experimental Medicine*, vol. xix., p. 501.

¹⁴ Browning, Mackie, and Smith: *Journal of Pathology and Bacteriology*, vol. xix., p. 127.

drops are then taken from the upper part of the fluid (preferably after brief centrifugalisation) and spread over the surface of an agar plate in the manner already described. The plate, which should be distinctly moist, is then subjected to the action of the arc light as already described, and incubated with the agar uppermost.

The method has been tested on mixtures of *B. typhosus* and *B. coli* in the following proportions: 1 to 1, 1 to 10, 1 to 20, 1 to 30, 1 to 50, 1 to 80, 1 to 100, 1 to 150, and 1 to 200. In every case where there were not more than 50 *B. coli* to each typhoid bacillus numerous isolated colonies of the latter were always found on some portion of the exposed area of the plate. Where there were more than 50, but fewer than 200, *B. coli* to each *B. typhosus* a few colonies at any rate of the latter have almost always been discovered on the plate. Indeed, in one experiment in which there were at least 500 *B. coli* to each *B. typhosus* a few isolated colonies of the latter were recovered. The colonies of *B. coli* on the exposed portion of the plate are well developed, whitish, and opaque, while those of *B. typhosus* are tiny, dewdrop-like, and quite transparent after 18 to 24 hours. From the latter streaks are made on the surface of plates of MacConkey's medium, Endo's medium, and ordinary agar in the order named with a once charged needle in order to confirm the diagnosis. The resulting growth is subsequently submitted to the usual tests.

The plate shown in Fig. 2 is from an experiment in which there were 50 *B. coli* to each *B. typhosus* in the mixture used for plating. The large colonies along the exposed strip are colonies of *B. coli*, while the numerous small colonies are colonies of *B. typhosus*. The density of the mixture used

FIG. 2.

Slide showing large colonies of *B. coli* and numerous small colonies of *B. typhosus*.

for plating is indicated by the complete opacity of the growth outside the limits of exposure to light. In view of the encouraging results of these experiments we have recently applied the method in the examination of the faeces of convalescents and suspected carriers. Of the cases examined *seven* have already yielded positive results by this method *at the first examination*, though the ordinary methods failed to afford any evidence of the presence of *B. typhosus* or *B. paratyphosus*. In five of the cases *B. typhosus* was isolated from the light plate and in the other two *B. paratyphosus* (*B.*).

Obviously, the number of cases is at present much too small to justify a confident opinion regarding the ultimate practical utility of the method. But our results have up to the present been so satisfactory that it seems desirable under existing conditions to offer the method for the use and criticism of others, even though our evidence from actual cases is at present scanty.

A CASE OF

RUPTURE OF THE HEART IN A CHILD.

By JOHN ANDERSON, M.B., C.M. GLASG.,

DIRECTOR OF CLINICAL LABORATORY, VICTORIA INFIRMARY, GLASGOW.

THE case is of interest, firstly on account of the age of the child, and secondly on account of the occurrence of a congenital stenosis of the coronary arteries and other manifestations pointing to inherited syphilis. The history was very meagre and unsatisfactory. The child, a girl 5 years of age, was, as far as we could learn, in good health up to the morning of her death. She had been somewhat neglected and was poorly nourished. About 9 A.M. on the morning of the child's death the woman in charge of her left the house, and the child was to stay in bed until she came back. On her return half an hour later she found the child had got out of bed and was sitting on the floor, looking ill and complaining of sickness. There was no history that the child had fallen out of bed. A little stimulant was administered, but as there was no sign of improvement the woman became alarmed and took the child to a neighbouring ice-cream shop, where she left her in charge, while she went in search of a doctor. The proprietor of the shop, afraid the child was dying, carried her to the nearest police office in the hope of obtaining the services of the police surgeon, but the child expired on the way. There was a history that eight weeks previously the child had had a fit, and a year ago she was in the parish hospital under treatment for eczema.

Necropsy.—The pericardium was distended with fluid blood. A hæmorrhagic area, 1 in. in length by $\frac{3}{4}$ in. in breadth, was noted on the anterior aspect of the heart along the line of the interventricular septum at its upper third, and also a small perforation within this area. The heart was removed and examined. It was normal in size, pale in colour except at the hæmorrhagic area. On opening the cavities a slight degree of dilatation was noted, but there was no hypertrophy of their walls except, perhaps, a small area in the left ventricle at the immediate apex, where the muscular substance was altered in appearance, abnormally pale, and somewhat translucent. The columnæ carneæ were unusually delicate and in places thread-like in character, and this condition was more noticeable in the case of the left ventricle.

The lesion which had given rise to the rupture was of remarkable character: a hæmatoma, $\frac{1}{2}$ in. in diameter, had formed in the wall of the left ventricle and septum at the place of discolouration above noted. Its cavity was filled with blood clot and its walls were ragged and granular. At its lower aspect it had ruptured externally into the pericardium, and a large probe could easily be passed through the aperture, which was situated $\frac{1}{2}$ in. from the base of the ventricle. The thinned inner wall communicated with the interior of the ventricle by a large and irregular aperture, which was continuous with an extensive rupture across the inner portion of the posterior wall of the chamber. The torn area almost encircled the ventricle, and reached as far as a point immediately beneath the position of the left auricular appendix. The laceration occupied a fair depth of the muscle, and the wall of the ventricle, when viewed by transmitted light, was quite translucent. The right ventricular wall was intact. The valves were of normal size and their curtains were healthy.