

up to one transmitter, and thus a teacher can instruct a group of children at the same time; and, secondly, that, as it is not necessary for the teacher to apply his mouth close to the transmitter, the pupils have a full view of his facial expression and lip movements, which is not the case when he has to direct his attention and his voice into the mouth of a speaking tube or trumpet.

In the experiments I have made with patients suffering from lesser degrees of deafness than the deaf-mute children at the Margate Asylum the utility of the telephone has been proportionately more apparent. I will mention two cases in illustration. The first was that of a young woman with nerve deafness so extreme that it was necessary to speak at the top of one's voice within two or three inches of her ear to enable her to hear, but with the telephone I was able to converse in a subdued voice with my mouth twenty-six inches away from the transmitter; in this case she received some assistance from reading my lips, though she was only a beginner in this accomplishment. The second case, a man with a similar degree of deafness, was able to hear his wife and myself conversing with him in tones hardly raised above a whisper, we being inside a room and he being outside with the door shut. I venture to give these two cases instead of quoting tuning-fork statistics because they convey approximately some notion of the possibilities of this instrument.

Whether future experience will bear out my preliminary investigations only time will show; the opportunities of a provincial surgeon for carrying out extensive scientific observations are naturally limited. In addition to much kind help from Mr. Max Binswanger of the General Electric Company I have received valuable assistance from Messrs. Maw, Son, and Thompson, who have skilfully carried out my suggestions as regards providing the instrument with appropriate-shaped handles, dry-cell battery, and case. The latter firm will be glad to show the apparatus to anyone interested in the matter. I understand that the cost of the instrument will place it within the power of purchase of persons of moderate means. Like all electrical contrivances it has the inevitable drawback of a battery and wires. It will consequently be suited to the more stationary requirements of the domestic hearth and the dinner table; in the church, theatre, or in courts of justice it could be easily fitted up at trifling expense for the convenience of persons with defective hearing. My friend Dr. Benson of Maida-vale has suggested that "Lamprophone" (λαμπρός, clear; φωνή, voice) would be an appropriate name in the event of the instrument proving itself to possess sufficient practical utility to warrant it requiring a special term to describe it. In conclusion, I wish to disclaim any special originality as an inventor; but in my attempt to adapt other men's ideas for the benefit of deaf people I trust that I may have done some small service, even if this paper only serves to stimulate others to carry my investigations to a more perfect issue.

Margate.

THE INFLUENCE OF GLYCERINE IN CULTURE MEDIA ON THE DIPHTHERIA BACILLUS.

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DURING the course of an inquiry into the life-history of the diphtheria bacillus outside the body I was led, owing to a kind suggestion by Dr. Blaxall, to try the effect of cultivating it on media to which glycerine had been added in varying proportions. It has long been known that the Klebs-Löffler bacillus will grow more profusely on nutrient agar-agar to which 5 or 6 per cent. of glycerine has been added than on ordinary nutrient agar-agar. Dr. Kanthack and Mr. Stephens, moreover, in a paper read before the Pathological Society on Jan. 21st, recommended a culture medium containing alkaline fluid, agar-agar and 5 per cent. of glycerine, and considered this medium to have a strong selective action on the Klebs-Löffler bacillus. In view of this apparently favourable influence of glycerine it seemed not unlikely that the addition of larger proportions of glycerine might make culture media still more selective for the

bacillus of diphtheria. On nutrient agar-agar media, to which from 12 to 15 per cent. of glycerine had been added, I found that those organisms which are commonly obtained when a serum tube is infected from a throat grew decidedly less readily than the diphtheria bacillus. Agar-agar tubes, containing varying proportions of glycerine between 6 and 15 per cent., were infected at the same times and with the same materials from cases of diphtheria as tubes containing serum or Löffler's serum, and thus impure cultures of the Klebs-Löffler bacillus were obtained. The cultures on the media containing the largest proportion of glycerine were always the least impure, although the employment of nutrient agar agar containing 18 per cent. of glycerine did not completely eliminate the contaminating micro-organisms. These large proportions of glycerine seemed to be specially unfavourable to the bacillary forms of these micro-organisms, although torulæ, sarcinæ, and cocci all appeared to grow less readily than the diphtheria bacillus. The addition of at least 9 per cent. of glycerine was required to get a less impure growth than that obtained on serum; indeed, when only 6 per cent. was added the growth was usually more impure than that on serum. My experience with the medium recommended by Dr. Kanthack and Mr. Stephens was not favourable. I have made twenty separate comparisons between this medium and serum by infecting tubes of each at the same times with the same swabs from the throats of diphtheria cases. In all except one instance the growth after twenty-four hours of the Klebs-Löffler bacillus was more impure on this medium than on serum. A further objection to this medium was found in the fact that the bacilli grown on it did not stain so readily with methylene blue as those grown on serum.

The practical value of the selective action of nutrient agar-agar media, containing large percentages of glycerine, on the Klebs-Löffler bacillus was much discounted by the very small total growth obtained after twenty-four hours' incubation, where the proportion of glycerine present was 12 per cent. or higher. A trial was, therefore, made with serum to which 6, 10, or 12 per cent. of glycerine had been added. By this means beautifully clear media were obtained, which seemed to require heating to a degree or two higher than ordinary serum in order to induce firm setting. With these media very similar results were obtained to those with glycerine agar-agar. When 6 per cent. of glycerine had been added the resulting growth twenty-four hours after infection from a case of diphtheria was about the same as on ordinary serum, and there seemed to be no more selective action on the Klebs-Löffler bacillus than with serum. With the employment of higher percentages of glycerine there was apparently a decided selective action, but the total growth was proportionately diminished. In two cases apparently pure growths were obtained on 10 per cent. glycerine serum, whilst the cultures on serum and the Kanthack-Stephens medium, obtained by infection with the same materials at the same times, were very impure from the presence of other bacilli and cocci. On the other hand, however, on two occasions streptococci were found in the cultures on 12 per cent. glycerine serum, while the growths on serum and the Kanthack-Stephens medium were free from this impurity.

A more promising result from my experiments than this selective action was the manner in which the individual bacilli stained with Löffler's alkaline methylene blue after growth for twenty-four hours on these glycerine-containing media. The bacilli showed a remarkable affinity for the stain and metachromatism was very conspicuous. After growth on glycerine serum each bacillus showed, when stained, a deep violet dot at each pole, with frequently one or more dots in between, whilst the remainder of the bacillus was colourless or faint blue. The other micro-organisms in specimens from impure cultures were nearly always stained blue, the only exception being that occasionally a few cocci took up the violet colouration. This staining result was invariable in twenty-one instances in which specimens were made from glycerine serum cultures obtained from cases of diphtheria, and in each case all the diphtheria bacilli were so stained. A similar constant result was obtained with pure cultures on glycerine serum and cultures obtained from two guinea-pigs that had been infected with diphtheria. Specimens from growths on agar-agar to which 9 or more per cent. of glycerine had been added stained with methylene blue in exactly the same way, but the bacilli were more irregular in shape and size than those grown on glycerine serum; some were remarkably large and thick even in

specimens from pure cultures of diphtheria on the glycerine agar-agar.

All persons with experience in staining diphtheria bacilli with alkaline methylene blue know how variable may be the results obtained. Sometimes the organisms take up the stain in a precisely similar fashion to that in which, as described above, the bacilli grown on glycerine serum take it up; in this case, however, as a rule only some of the bacilli become so stained. At other times, while the bacilli still show polar staining, the stained parts are blue and not violet. Not uncommonly, too, no polar staining is obtained, the ends of the organisms appearing drawn out, tapering, and unstained, whilst only one or more dots in the centre are stained. Lastly, the stain may be quite evenly distributed, and the bacilli can only then be recognised as diphtheritic by their clubbed ends and slight curving. Bacilli are not infrequently found both in normal and in inflamed throats which grow readily on serum, and which are so extremely like the Klebs-Löffler bacilli that they have been called pseudo-diphtheritic. These bacilli are usually stained quite evenly by methylene blue, but sometimes they are more deeply stained at the ends, and the ends may be clubbed and the bacilli themselves slightly curved. Hence it is fairly often a matter of very considerable difficulty for the most expert observers to say whether a specimen from a particular culture contains any Klebs-Löffler bacilli or not. Some pseudo-diphtheritic bacilli of this character were obtained by me from the throat of a healthy child and were in stained specimens very difficult to distinguish from diphtheria bacilli. When grown on glycerine serum or glycerine agar-agar, however, these bacilli showed, on staining with methylene blue, no metachromatism and were stained blue and not violet. They were thus easily distinguished from diphtheria bacilli. The growth of these bacilli on media containing a considerable percentage of glycerine was much less profuse than that of the Klebs-Löffler bacilli.

I have ventured to publish this short communication, although I am still experimenting on the influence of glycerine in culture media on the bacillus of diphtheria, because I believe that the employment of glycerine in such culture media will render the recognition of the Klebs-Löffler bacillus more speedy and more certain. In the laboratory we were able almost invariably to pick out by their appearance under the microscope stained specimens of the cultures on these glycerine-containing media from specimens of the cultures on serum or the Kanthack-Stephens medium, although the various tubes had been infected at the same time with the same swabs and the specimens had been stained for the same length of time with, the same stain. The appearance of the Klebs-Löffler bacillus, after growth on these glycerine media, is, when stained with methylene blue, so characteristic that the merest tyro could recognise it after being once shown a specimen. To get this characteristic staining it seemed to be necessary to have about 9 per cent. of glycerine in the culture medium, although I only once failed with 6 per cent. glycerine serum, and then most of the bacilli showed the characteristic staining. I would, therefore, recommend the addition of about 9 per cent. of glycerine to the culture media for the diphtheria bacillus, and I prefer glycerine serum to glycerine agar, as the growth is usually greater and the appearance of the bacilli grown more characteristic. With higher percentages of glycerine the total growth is rather scanty, while any selective action exerted by the additional glycerine does not seem to me to offer sufficient compensatory advantages for the diminished growth.

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A CASE OF DOUBLE EMPYEMA; RECOVERY.

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A BOY aged eleven years first complained of feeling unwell on May 21st, 1895. I saw him in the evening, at which time he had severe pain in the left side. The temperature was 104° F., the pulse 120, the respirations 60, and a well-marked friction sound was heard. A diaphoretic was given and poultices were ordered for the chest. The following morning the chest was strapped and in the evening the pain was much easier and the temperature had fallen to 101°, the respiration

to 48, and the pulse to 120. On May 23rd the morning pulse was 96, the respiration 30, and the temperature 100°; in the evening the pulse was 96, the respiration 30, and the temperature 100°. On the 24th the morning pulse was 116, the respiration 30, and the temperature 99°; in the evening the pulse was 120, the respiration 35, and the temperature 100·4°. Effusion on the left side was now above the angle of the scapula. On May 25th the morning pulse was 132, the respiration 30, and the temperature 99°; in the evening the pulse was 132, the respiration 30, and the temperature 101°. He now complained of pain in the right side and a well-marked rub was found there. On May 26th the morning pulse was 120, the respiration 45, and the temperature 100·6°; in the evening the pulse was 140, the respiration 42, and the temperature 101°. The effusion on the left side was subsiding and that on the right side increasing, so that dulness was about two and a half inches on the left and just above the angle of the scapula on the right side. For the next ten days the temperature continued between 98·4° and 100°, some days not reaching the latter height. The pulse varied from 116 to 134, and the respiration from 40 to 50 per minute. The breath sounds were quite superficial and there were some moist râles at the bases accompanied by a little rusty expectoration. The dulness had diminished to two finger's breadth on both sides and was not at all marked. Vocal fremitus and vocal resonance were well marked on both sides, but the patient had lost much flesh. Sir T. Grainger Stewart agreed that there was no immediate indication for tapping, though occasion might arise at any time. On the evening of June 6th the patient had a severe attack of dyspnoea, and the pupils were irregular, the left being larger than the right, so I decided to make an exploratory puncture with a hypodermic needle on the left side where the dulness was rather more marked than on the right side. This was done at the eighth interspace below the angle of the left scapula. Nothing came into the syringe, but the needle gave me the impression of being in a cavity, and on withdrawal a small speck of pus was seen in the end. I therefore used a large-sized (No. 3) trocar and cannula and with Dieulafoy's aspirator withdrew fourteen ounces of greenish, curdled pus. The following day the temperature rose to 101·4° and I decided to put in a drainage-tube. The incision was made at the site of the puncture and eight ounces of curdled pus were withdrawn. A dressing of cyanide gauze with plenty of salicylic wool over it and wood wool wadding over that was applied, but in four hours the dressing had to be repeated. The dressings were repeated twice the next day and the cavity washed out with a solution of boracic acid and listerine in water. A fresh dressing was applied almost every day until June 24th, and during this time the amount of discharge gradually diminished and kept perfectly sweet. The temperature, however, had become hectic in character, the pulse varied from 120 to 150, and the respiration from 36 to 50 per minute. The right side remained much the same until June 19th, when there was apparently a slight increase in dulness. The pulse was 154, the respiration 54, and the temperature 102·4°. The patient, too, had become a mere skeleton, there being, for example, hollows between the tibia and fibula along their whole length and a similar emaciation of the rest of the body. The dulness on the right side increased steadily, so I resorted to the aspirator on June 22nd. The puncture was made in the axillary line and sixth intercostal space, thirty-eight ounces of pus being withdrawn. The puncture was carefully closed with collodion. Next morning the temperature was 99° and in the evening 99·8°. Three days later (June 26th) the temperature rose to 101°, the pulse to 144, and the respiration to 57, so the right side was again aspirated, twenty-five ounces of pus being withdrawn. The left side was discharging so little at this time that it was thought best to remove the tube, which had been gradually shortened. The temperature now kept below 100°, until the evening of the 29th, when it reached 102·4°. Aspiration resulted in the withdrawal of seventeen ounces of bloody pus. Next day the temperature kept below 99°, but reached 100·4° on July 3rd, and since the wound on the left side was quite closed I made an incision in the sixth interspace and axillary line on the right side and inserted a tube. About eight ounces of bloody pus were removed. The wound was dressed every day until July 13th and the cavity carefully washed out on each occasion. On July 19th the drainage-tube was removed and in another week the wound was closed. The patient was extremely weak, but rapidly recovered strength, and by the middle of August was quite well and has remained so.

It is interesting to notice how feebly the physical signs