importation into, or sale within, their districts of any shell-fish the safety of which there is reasonable ground to suspect, and to make it the duty of any authority which permits the exportation of shell-fish from its district to show

CHART 2.

Lines and dots have same signification as before. "A" represents date of re-issue of warning; "B" of seizure and destruction of cockles.

that every reasonable care has been taken to keep such shell-fish as are to be found within its jurisdiction free from pollution.

Norwich.

SOME COMPARATIVE MEASUREMENTS OF THE LIVES OF LEUCOCYTES¹ WHEN THE CELLS ARE RESTING IN THE PLASMATA OF DIFFERENT PERSONS,

AND THE POSSIBLE APPLICATION OF SUCH MEASUREMENTS AS AN AID TO DIAGNOSIS IN INFECTIVE DISEASE.

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OF recent years I have been endeavouring to ascertain the effect produced by one person's plasma on the life of another person's leucocytes. It appeared reasonable to suppose that the plasma of a person suffering from an infective disease would be poisonous to the leucocytes of healthy persons. If this is the case it might also be reasonable to suppose that the same plasma would not be so poisonous to the leucocytes of another person suffering from the same disease, because it is probable that the cells would be already used to, or immune against, the toxin, and furthermore that if the toxin of one infective disease differs from the toxin of another infective disease, it might be inferred that an immunity on the part of a leucocyte against one disease will not render it immune against another. Therefore, provided it is possible to tell accurately when a leucocyte is dead—that is, if one can differentiate

a living from a dead cell—it also will become possible to measure the lengths of the lives of leucocytes after they have been removed from the body. And this will enable us to make comparative measurements of the lives of leucocytes when they are mixed with the plasmata of different persons. Supposing, therefore, it is true that an infected plasma shortens the lives of a healthy person's leucocytes but does not shorten the lives of the leucocytes of another person suffering from the same disease, it may be useful to reverse the process and assist in the diagnosis of infective disease by making measurements of the lives of such a patient's leucocytes when they are mixed with different plasmata. For instance, if the leucocytes of a person suffering from an indefinite infective disease are found to be easily killed by the plasmata of persons suffering from a variety of diseases but are not comparatively easily killed by the plasma of a person suffering from, say, typhoid fever, it might be inferred that the patient is suffering from, or has recently suffered from, typhoid fever, because his leucocytes are used to, or immune against, that disease.

The above is the enunciation of a problem which I set myself to solve several years ago, and this paper describes the experiments which have been conducted to investigate the last part of it—i.e., with the object of determining the actual measurements of the lives of leucocytes when they are placed in the plasmata of people who are suffering from various diseases. The earlier researches made in order to differentiate living from dead leucocytes have already been published in the *Journal of Physiology* (1)*, and the actual method employed to estimate how many living and how many dead cells there may be in a given volume of citrated blood has been described in THE LANCET of Jan. 16th, 1909 (2). This method may be again briefly summarised thus:—

Method for counting the number of living and dead leucocytes in a given sample of citrated blood.—The following solutions are prepared and a jelly is made from them. 1. A volume of Unna's polychrome methylene blue (Grübler) is diluted with two volumes of water. 2. A solution containing 2 per cent. of agar in water, filtered and sterilised. 3. An accurately neutralised solution containing 4.5 per cent. sodium citrate, 1.5 per cent. sodium chloride, and 0.225 per cent. atropine sulphate. 4. A 5 per cent. solution of sodium bicarbonate. In a test tube mix one cubic centimetre of the diluted stain, two cubic centimetres of the citrate solution, and three cubic centimetres of the molten agar solution. To this mixture a quantity of the alkaline sodium bicarbonate solution must be added in order to cause the excitant for leucocytes contained in the jelly to diffuse into the cells and the quantity added varies with the temperature of the room.² If measurements are going to be made in a room with a temperature of between 60° and 70° F., about 0.25 cubic centimetre of the alkaline solution should be added. The mixture is then boiled until it froths up the tube and a drop poured on to a slide and allowed to set so as to form a film. Supposing a given capillary tube contains the blood corpuscles of one person mixed with the plasma of another, the average number of living and dead leucocytes in the tube can be estimated by placing a drop of its contents on a cover-glass which is inverted and allowed to fall on the agar film. After two or three minutes the granules but not the nuclei of the living leucocytes will stain and those cells will show exaggerated amoeboid movements, whereas the dead cells will remain immobile. Moreover, the dead cells may be achromatic (3), in which case they will not stain. Their nuclei may appear as a single nuclear mass, or their nuclei may even stain, or the dead cells may have undergone other changes which have been described in former papers (1, 2). Field after field should be rapidly passed in front of a 1.6th inch or equivalent objective and the number of the living and dead cells counted. Several preparations can be rapidly examined and an average struck so as to give an estimate of the number of living and dead cells in the given capillary tube. No difficulty is met with in making the counts, for living can be readily differentiated from dead cells by the presence or absence of exaggerated movements.

If all the leucocytes appear to be dead, and especially if the agar jelly has not previously been tested, it is as well to

* The figures within parentheses refer to the bibliography at the end of the article.

² A scale has been given in the former paper.

¹ The word "leucocyte" refers to the polymorphonuclear leucocyte.

control the measurement—that is, to see that the jelly will actually excite living cells—by placing a drop of fresh citrated blood on to another part of the same film and noting whether stimulated movements of all the leucocytes occur.

Procedure for the preparation of capillary tubes containing the plasma of one person and the leucocytes of another.—It will simplify description if the details of sterilisation and the precautions for insuring asepsis are omitted. Since the presence of bacteria shortens the lives of leucocytes (2) it is obvious that aseptic precautions are essential, but the details for sterilisation are so well known that they need hardly be repeated. A capillary tube of glass is prepared which has such a diameter that blood will run into it by capillarity and at the same time its flow can be controlled by gravity. I use a tube with a lumen of about two millimetres. 15 portions equal to each other are marked off with a pencil. The marks begin at one end of the tube which is zero, but the tube is at least two inches longer than mark 15. The portions are rendered equal by calibration with mercury, and although the length of each is immaterial, I have found that about half a centimetre is a convenient length for practical purposes and I use a tube about 13 centimetres long. A neutral solution is made which contains 3 per cent. of sodium citrate and 1 per cent. of sodium chloride. Some of this is drawn up into the tube until its upper limit or meniscus stands at mark 6. Blood from the finger of the person whose plasma is going to be tested is added until the meniscus stands at mark 12, care being taken that no bubble of air separates the two fluids. Mixture is carried out by allowing the two fluids to gravitate up and down the tube six times. The tube is sealed and centrifugalised; the blood being driven towards zero. The end remote from zero is then unsealed and the portion containing the precipitated corpuscles is separated and discarded by cutting the tube at 4. Eight portions of the tube now contain citrated plasma. If, owing to the sealing process, much of the tube has been occluded at zero the upper meniscus may stand above mark 12. This can be corrected by tapping out the excess of fluid on to a sterile slide, controlling the amount removed by the finger on the end remote from the mark 4. The lower meniscus standing at 4 where the tube has been cut, and the upper meniscus standing at 12, blood from the finger of the person whose corpuscles are going to be tested is added until the upper meniscus stands at 13 (i.e., the mixture equals 1-9). Mixture is insured as before and the tube sealed. It will be seen that although the tube contains the plasma of both persons the corpuscles are bathed in a solution containing four times as much plasma of the first person as of the second. A series of tubes may thus be made.

Appliance to insure continual mixture and to prevent the corpuscles from adhering to the glass.—If a capillary tube prepared in the way which has been described is laid on a flat surface, the corpuscles will soon gravitate to the most dependent side and will ultimately adhere to the glass. The following appliance prevents this. By means of a simple clockwork movement a split drum is made to revolve once in about three minutes. The drum is so adapted that the mouth of a long test-tube (having a diameter of one centimetre and the cavity of which is lined with a roll of blotting paper) fits accurately on to it and revolves with it. The apparatus is so arranged that the tube is horizontal and is of such a size that it can be placed in the incubator if necessary. The capillary tubes inserted into the test-tube are continually tumbling over each other by gravity as the test-tube revolves, and in so doing revolve themselves. The blood cells in their turn are continually gravitating in different directions through the citrated plasmata. It has been found that this device prevents them adhering to the glass and insures them being evenly distributed through the citrated plasmata provided the ends of the capillary tubes are not bent over when sealed. This apparatus also insures all capillary tubes being subjected to the same conditions of temperature.³

Procedure for measuring the lives of the leucocytes contained in the tubes.—Samples of the contents of the capillary tubes are examined on stimulating agar by the method already described. If all the cells are alive the tubes are resealed and returned to the revolving apparatus to be examined later, and so on. By this means the percentage of

living and dead cells in a tube can be estimated. It is important to remember that in striking these averages only an approximate estimate can be obtained, and that therefore the greater the number of tubes made the better, as the error decreases with the greater number of leucocytes counted. In the experiments which I am about to record I have counted about 500 leucocytes in each case by making five films from each of five tubes, and counting about 20 leucocytes in each film. Since it is obvious that the greatest error may occur when the number of living approximates the number of dead cells in a tube, the following experiments would appear not to be very erroneous, judging by the application of Poisson's formula, which shows that supposing there are half a million leucocytes in the five tubes, which is an excessive estimate, a count of 500 cells would give a possible error of not more than about 6 per cent., even when the numbers approximate.

Before enumerating the actual measurements there is yet another question to be considered, a point upon which I wish to lay great emphasis—namely, that all measurements of the lives of leucocytes should necessarily be comparative. For instance, it would be fallacious to say that a typhoid plasma killed a person's leucocytes more rapidly than a septicæmic patient's plasma, when the typhoid measurement was made to-day and the septicæmic measurement made three days ago, for even if there was a great difference in the length of the lives and the same person's leucocytes were used one cannot say that that person's leucocytes were in the same state to-day as they were three days ago, although the person is apparently in the same healthy condition.

Again, I have shown (4) that the factor *heat* in accelerating the diffusion of substances into cells, also materially affects the lives of the leucocytes, since the cells are necessarily resting in a citrate solution which is itself poisonous to some extent, and even the temperature of incubators is variable. It is thus of the utmost importance that when the lives of a person's leucocytes, which have been placed in the plasma of a person suffering from an infective disease, are measured, a simultaneous measurement of the same leucocytes shed at the same time must be made in the plasma of a healthy person. And it is only by the difference between the two that the result can be determined. In other words, all measurements must be simultaneously controlled by other measurements and the contrast is the result. It is also obvious that since heat and the citrate solution both affect the lives of the cells, all tubes, whether containing infected or control plasma, must be subjected to the same conditions as regards temperature. And it is essential that the same citrate solution must be employed both for the test and the control. Unless these essential details are adhered to any measurements may be considered to be worthless. Leucocytes are very sensitive to changes in temperature when they are resting in citrate solution, but if a change occurs and all tubes are subjected to the same change the contrast in the length of life holds good. The most favourable arrangement of the citrate solution has already been given. It should be quite neutral, because if alkaline it shortens the lives of the cells.

Leucocytes appear to live longest at about 20° C. They will not live very long at 37° and at 10° will live longer than at 37° but not so long as at 20° C. I have already suggested (4) that this may be due to the accelerated absorption of the poisonous salts in the citrate solution caused by heat, and this will also explain the early death in the presence of alkali which also accelerates diffusion. I presume that the reason why they live longer at 20° than at 10° is because their normal temperature is about 37° C. and that they die in the cold in spite of the delayed absorption.

In the following experiments a temperature of 30° C. was employed with the specified citrate solution and control experiments were conducted in each case, the results given being the difference in the measurements between the test and control.

Measurements.

Length of the life of healthy person's leucocytes when resting in their own plasma.—As has been shown in a former paper (2), an average shows that all the cells are alive in 24 hours; the majority are alive in 36 hours; about 50 per cent. are dead in 48 hours; and all are dead in 86 hours.

Healthy person's leucocytes; other healthy person's plasma.—All cells were alive in 14 hours; about 50 per cent. were dead in 18 hours; the majority were dead in 22 hours; and all were usually dead in 28 hours. The difference between

³ Messrs. Watson and Sons, Limited, 313, High Holborn, London, E.C., can supply this apparatus.

these averages may be said to be about 30 hours. I conclude that the plasma of one person is poisonous to another person's leucocytes.

Healthy person's leucocytes; plasma from cases of typhoid fever.—All cells dead in 14 hours. Difference between test and control about six hours, which is the average out of four cases.

Healthy person's leucocytes; plasma from cases of malaria.—Majority of cells dead in 16 hours, a few alive in 18 hours. Occasionally 50 per cent. were alive in 16 hours. Average difference between 12 cases and their controls about two hours.

Healthy person's leucocytes; plasma from cases of phthisis.—Majority dead in 17 hours. Average difference between five cases and their controls about one hour. Sometimes it was as much as four hours, but in very chronic cases there was little difference.

Healthy person's leucocytes; plasma from a case of osteomyelitis.—50 per cent. dead in 14 hours. Repeated with a case of gangrenous appendicitis the films showed that the majority were dead in 14 hours. The differences between these cases and their controls were five hours and three and three-quarter hours respectively.

Healthy person's leucocytes; plasma from a case of purpura hæmorrhagica.—Majority dead in 15 hours; all dead in 20 hours. Difference from controls five hours.

Healthy person's leucocytes; plasma from a case of chorea.—All cells dead in 14 hours. Difference about six hours.

Leucocytes from cases of typhoid fever; plasma from other cases of typhoid fever.—Average from three groups of cases, all of which reacted to Widal's reaction and were in the third or fourth week of the disease except one which was convalescent. These groups include the cases mentioned above. There was never a difference of more than one and a half hours between the death of the majority of cells in test and control tubes.

Leucocytes from cases of malaria; plasma from other cases of malaria.—Five cases. The majority of cells in all cases were alive in 18 hours. Practically no difference from controls.

Leucocytes from cases of phthisis; plasma from other cases of phthisis.—Four experiments. 50 per cent. dead was the average in 18 hours; very little difference from controls, sometimes the cells lived longer than in the controls.

Leucocytes from cases of malaria; plasma from cases of typhoid fever.—The majority of the cells in most instances were dead in 14 hours. Differences varied from four to six hours.

Leucocytes from cases of typhoid fever; plasma from cases of malaria.—About 50 per cent. were usually dead in 16 hours and all were dead in 20 hours in all cases. Five cases tried; average difference about three hours.

Healthy person's leucocytes; plasma from cases of carcinoma.—Seven cases; all cells alive in 16 hours; a large number alive in 20 hours. Usually there was little difference between the effect of cancer plasma and that of a healthy person.

From the foregoing measurements it would appear that in the cases which have been experimented with the plasma of persons suffering from infective diseases is poisonous to a healthy person's leucocytes and to the leucocytes of another person suffering from another disease, but is not so poisonous to the leucocytes of another person suffering from the same disease. I submit that it may be reasonable to suppose that such may be the case in other infective diseases.

Precautions.—In comparing the lengths of the lives of leucocytes of persons suffering from chronic infective diseases both in another infected person's plasma and in healthy plasma, I have frequently found that such cells will not live so long as the cells of healthy persons subjected to the same conditions. This was further investigated by comparing the lives of leucocytes taken from cases of chronic illnesses in their own plasmata with the length of the lives of the cells of healthy persons in their own healthy plasmata. In cases of chronic phthisis, malaria, Hodgkin's disease,⁴ &c., I have found that the leucocytes will not live even in their own plasma nearly so long as if they belonged to a healthy person, as much as a day's difference having been observed; and we may infer that these diseases, and probably others

also, cause a loss of vitality in the patients' leucocytes, so that by this procedure the loss of vitality can be measured. It is important to remember this point, for if the making of a measurement is delayed it may be found that all the cells are dead in both control and test preparations. This method of measuring the lives of leucocytes may also prove of value in prognosis as well as in diagnosis.

I do not think that any difficulty will be met with in making the counts, with the exception of a possible one caused by the agglutination of the leucocytes. Occasionally large clumps are met with. If the cells are clumped, however, it does not necessarily follow that they are dead, far from it, for they may be very active, though I am of opinion that if clumped death will soon occur. The cells in a clump can generally be counted. Ruptured cells are counted as dead. If bacteria are seen in large numbers in a film the capillary tube is discarded. The revolving apparatus is not essential but more constant results have been obtained by its use. As far as possible I have purposely avoided handling the blood of the person whose leucocytes are to be tested, for fear of injuring the cells. The variations of the alkalinity of the plasma may, I think, be neglected, as it is not sufficient materially to alter the length of the lives of the cells. This is borne out by the experiments with cancer plasma, because that plasma is more alkaline than normal and yet does not shorten life.

Summary.

I fear that it is too early to arrive at any definite conclusions from so small a number of experiments, but I think that their publication is justified in order to explain the method employed and because the results are sufficiently promising to warrant further investigation, though the work must still be regarded as being in the experimental stage. I hope that this method will be tried by others, as the problem given in the enunciation may lead to important developments, and especially as this kind of research involves the striking of averages and a large amount of experiment to determine the points. The method may also be useful to others studying other branches of immunity. As I have already stated, my aim is to be able to assist in the diagnosis of infective disease by this method, but a large amount of material will be required before one can determine its value in this direction, and I have mentioned its possibilities with reference to prognosis. The stage in a disease in which measurable immunity appears in a leucocyte also remains to be determined.

To summarise the method by which I endeavour to assist in a diagnosis in a case of infective disease, a small quantity of blood from a patient is mixed with eight times its volume of the citrated plasma of other persons who are known to be suffering from certain infective diseases and also with the citrated plasma of a healthy person. For this last purpose I sometimes use my own plasma. The method has been described. The capillary tubes are kept together in the revolving apparatus for about 14 hours. Then some agar films are prepared from jelly which will excite movements in living leucocytes and samples of the contents of the tubes are examined on these films. The number of living and dead cells are averaged and the difference between the lengths of the lives of the cells when resting in healthy and infected plasmata are determined. When an infected plasma is found which will not comparatively shorten the lives of the patient's leucocytes, it seems probable that the patient is suffering from the same disease as the person from whom the plasma was taken. I generally confirm this procedure by reversing the process and trying the patient's plasma on the leucocytes of other persons suffering from the disease determined, taking care to make controls in this case as well as in the first by making measurements with healthy plasma and with the plasma of persons suffering from other diseases.

The method described in this paper has two disadvantages: first, in keeping the tubes at 30° C., and, secondly, in counting 500 leucocytes in each case, which is most tedious. The rest of the method takes very little time; collecting the plasmata and mixing them with the patient's corpuscles is soon accomplished, and when the tubes are in the revolving apparatus they require no further attention until the time has come to estimate the number of living and dead cells in them. The agar jelly can be made from stock solutions as specified and kept in test-tubes for months as moulds will

⁴ It has been noticed that stain will diffuse more readily into the blood cells of these patients—that is, that these diseases, and probably other chronic illnesses, cause a lowered "coefficient of diffusion" in blood corpuscles.

not grow on it. Films are rapidly prepared by boiling the jelly in a tube in a spirit-lamp flame.

With regard to the two disadvantages, an incubator working at 30° C. is not usually within reach even in laboratories, although Hearson's apparatus will maintain this temperature if fitted with a special capsule. Since my aim is to make this possible diagnostic method suitable for practical purposes even away from the vicinity of a laboratory, I dispense with an incubator and employ the ordinary temperature of a room, say between 60° and 70° F. In order to do this the citrate solution is modified. If the solution already specified were used at such a temperature the leucocytes might live for a long time even in an infected plasma, and a day or two might elapse before sufficient deaths occurred among the cells to make a contrast. Consequently I deliberately shorten the life of the cells by using a solution containing 1·2 per cent. sodium citrate and 1 per cent. sodium chloride. As the same solution is employed for all tubes the artificial shortening of life does not appear to vitiate the results. There are several ways by which this shortening of life can be accomplished, though I consider the lowering of the sodium citrate content to be the most suitable. Using this solution it has been found that the majority of healthy cells in another healthy person's plasma are dead in about 24 hours if kept at the room temperature, which, of course, may be variable. So a contrast can usually be obtained within 24 hours of mixing the bloods. With regard to the second disadvantage, I hope by experiment to ascertain the minimum number of leucocytes which it may be necessary to count to obtain a trustworthy average. I am sure that a smaller number than 500 will be sufficient. I am also experimenting with a greater concentration of plasma with a view of obtaining a wider contrast between the length of the lives of cells in healthy and infected plasma.

In conclusion, I wish to suggest that this method may also be useful from a medico-legal aspect, for I have found the leucocytes alive in the blood removed from the hearts of bodies which have been lying in the mortuary for 24 hours or more, and it may be possible to state how long a person has been dead by estimating the percentage of living cells so many hours after the death of the subject.

Bibliography.—H. C. Ross: (1) On the Death of Leucocytes, *Journal of Physiology*, vol. xxxvii., 1908, p. 327; (2) On a Combination of Substances which Excite Amoeboid Movements in Leucocytes, *THE LANCET*, Jan. 16th, 1909, p. 152; (3) On the Cause of Achromasia in Leucocytes, *THE LANCET*, Jan. 23rd, 1909, p. 226; (4) On the Modification of the Excitant for Leucocytes composed of Methylene Blue and Atropine, *THE LANCET*, Jan. 30th, 1909, p. 313.

Liverpool.

Clinical Notes:

MEDICAL, SURGICAL, OBSTETRICAL, AND THERAPEUTICAL.

A CASE OF OBSTRUCTION OF THE BOWELS, AT FIRST SIMULATING GASTRIC ULCER.

BY D. M. MACDONALD, M.D. ABERD.

THE patient was a thin, wiry-looking woman, aged 34 years, who had had no children. She complained of pain in the epigastrium with persistent vomiting. In February, 1907, she had an attack of dyspepsia with pain over the stomach which gradually abated under treatment. She was next seen by me on Dec. 6th. She was taken ill on that day while out at farm work and took to bed complaining of pain in the epigastrium, which she said came out at the back, and constant vomiting. The vomit consisted first of food, then of partially digested blood, and ultimately of blood itself. She was given morphine subcutaneously and was fed on milk and lime-water for a few days. The pain soon became tolerable and the vomiting almost disappeared. The bowels were moved by injection. There was melæna at the time. All this time the abdomen was exquisitely tender to touch in the epigastrium and slightly so over the descending colon. Up to now the temperature and pulse were normal. A week after the initial illness the patient one morning developed acute pain over the abdomen generally, which was tympanitic and extremely tender. Vomiting was constant and consisted

largely of bilious matter, brownish-black in colour, and of which a pint would sometimes be vomited at a time. The enema yielded no result and peristaltic action was visible through the abdominal walls. The pulse was now 120 and the temperature was 96° F. I saw the patient about 4 o'clock that afternoon. Vomiting was still persistent and her face had a sunken anxious look. The appearance, nevertheless, at this stage suggested more an obstruction than a rupture of the bowels. The pulse was of fair volume and she lay on her side with her legs drawn up. In consultation with Mr. A. Don of Dundee it was decided that the case was one for laparotomy. On his opening the abdominal cavity, under chloroform, there was a little free clear serous fluid which at once negatived a serious bowel rupture. The stomach and upper part of the cavity were first explored, but nothing was found to account for the serious condition. The intestines were filled with gas, especially the descending colon. Attention was next directed to the lower part of the cavity where many adhesions in the pelvis were found. The omentum was first freed from the pelvis and ligatured and cut away opposite the abdominal wound. The bowels were then freed in the pelvic cavity, the adhesions being recent with the exception of a loop which seemed to be firmly fixed to the apex of the bladder. This was not interfered with. The appendix and other organs were normal and there did not seem to have been any hernia.

The probable explanation of the pain in the left side, which was what the patient complained of most when I saw her in the afternoon before operation, would seem to be that the colon, probably its sigmoid flexure, was bound down by the omentum or some of the adherent coils of intestine, and that a reverse peristaltic action was causing pain over the splenic flexure. Another explanation of the pain would be that the dragging on the omentum caused by the peristalsis of the bowels to which it was adherent would be exerted on its fixed point in the epigastrium and splenic omentum and this would account for the most severe pain being in that region.

The patient made a complete recovery from her illness, though the pain continued for some days on the left side. There was no vomiting subsequent to the operation.

Dunkeld, N.B.

TRAUMATIC NASAL FISTULA.

BY SOMERTON CLARK, F.R.C.S. EDIN.,

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THE patient, a male Afghan, aged 50 years, was admitted to hospital on Nov. 28th, 1907, with the history that as he was grazing flocks near the Mohmand country six months previously, the Mohmands attempted to carry off his property and a fight ensued during which he received a blow from a stone in the face under the left eye, driving in the maxillary bone. On admission he was found to have a wedge-shaped piece of bone 1½ inches long jammed in the junction of the nasal and superior maxillary bones. This was removed by lion forceps and the skin edges, which were very friable, were undermined and brought together. Owing to tension on the flaps union was only partial, and so six weeks later a second operation was performed. After this a fistula of the size of a pin's head remained and the patient went to his own country. On his return the fistula was of the size of a quill. He was again admitted. This time a piece of skin was dissected from over the lacrymal bone and turned over so as to form a lining membrane for the left nasal cavity. By this method tension was avoided. The flap was inserted into a slit on the nasal side of the fistula. The patient left hospital on Dec. 16th, 1908, with the fistula completely closed.

Dera Ismail Khan, India.

ROYAL MEDICAL SOCIETY OF EDINBURGH.—At a meeting of this society, held on Jan. 29th, Dr. John Gilmour being in the chair, Dr. J. G. Greenfield read a dissertation on Lead Poisoning. At the outset Dr. Greenfield referred to the great prevalence of lead poisoning at the present time and to the inadequate prophylactic measures which are often taken. He went on to describe the symptoms of lead poisoning, dealing especially with the nervous phenomena and showing how the latter might simulate many nervous diseases. Dr. Greenfield was heartily thanked for his paper.