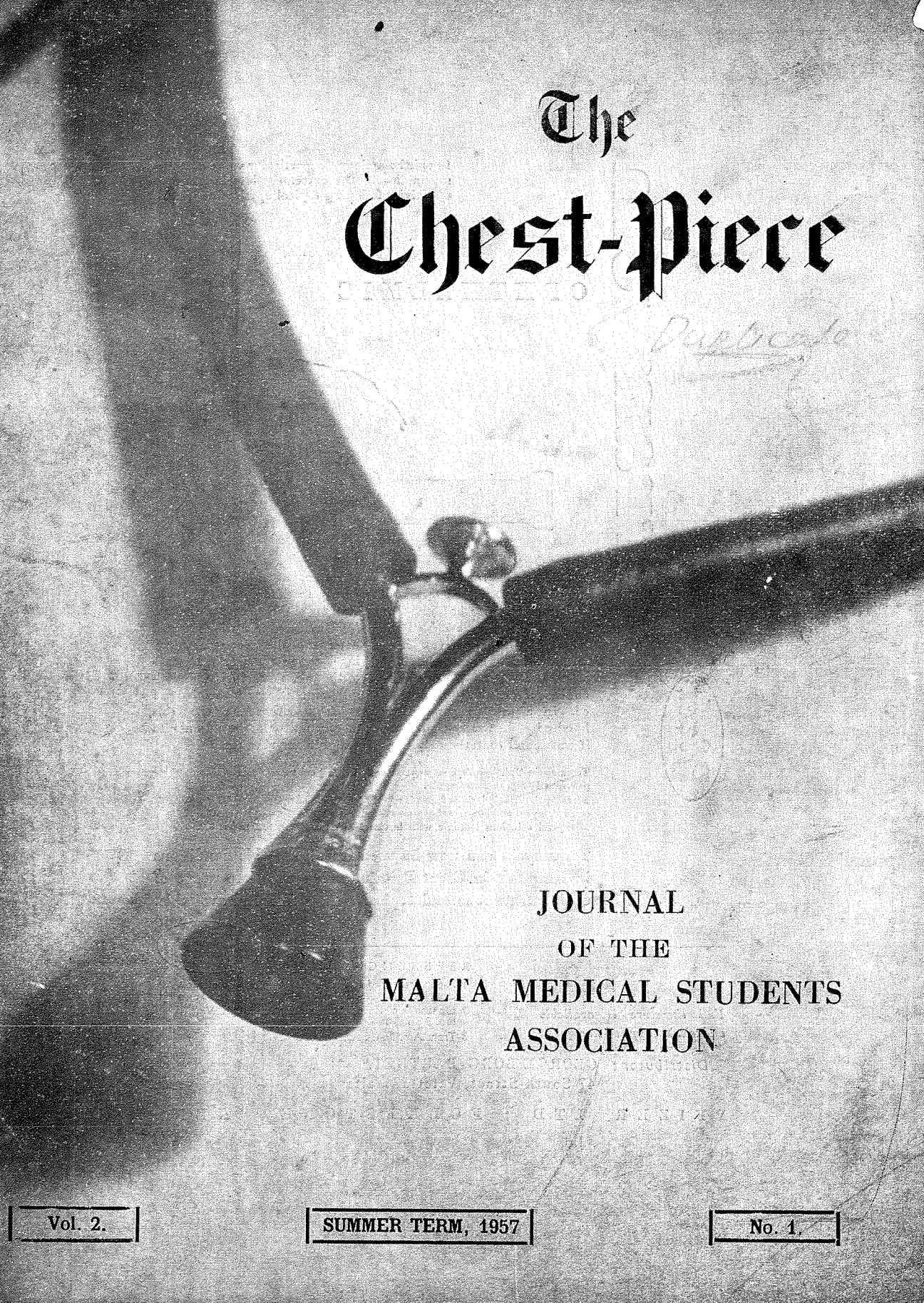

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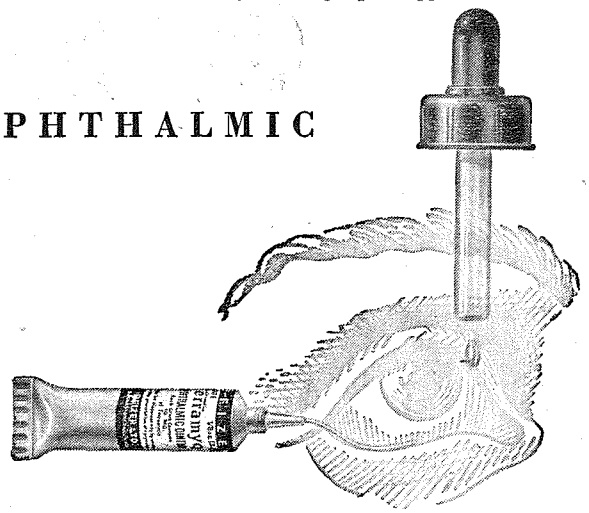

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REFERENCES

1 Paper presented at the Annual Conference of the Wills Eye Hospital Association, Philadelphia (March 16), 1951.
2 Ophthalmic use of Terramycin, Am.J.Oph. Vol. 3 : 4, No. 5 : 723-726 (May) 1951.
3 Trans.Am.Oph. Soc., Vol. XCIX.

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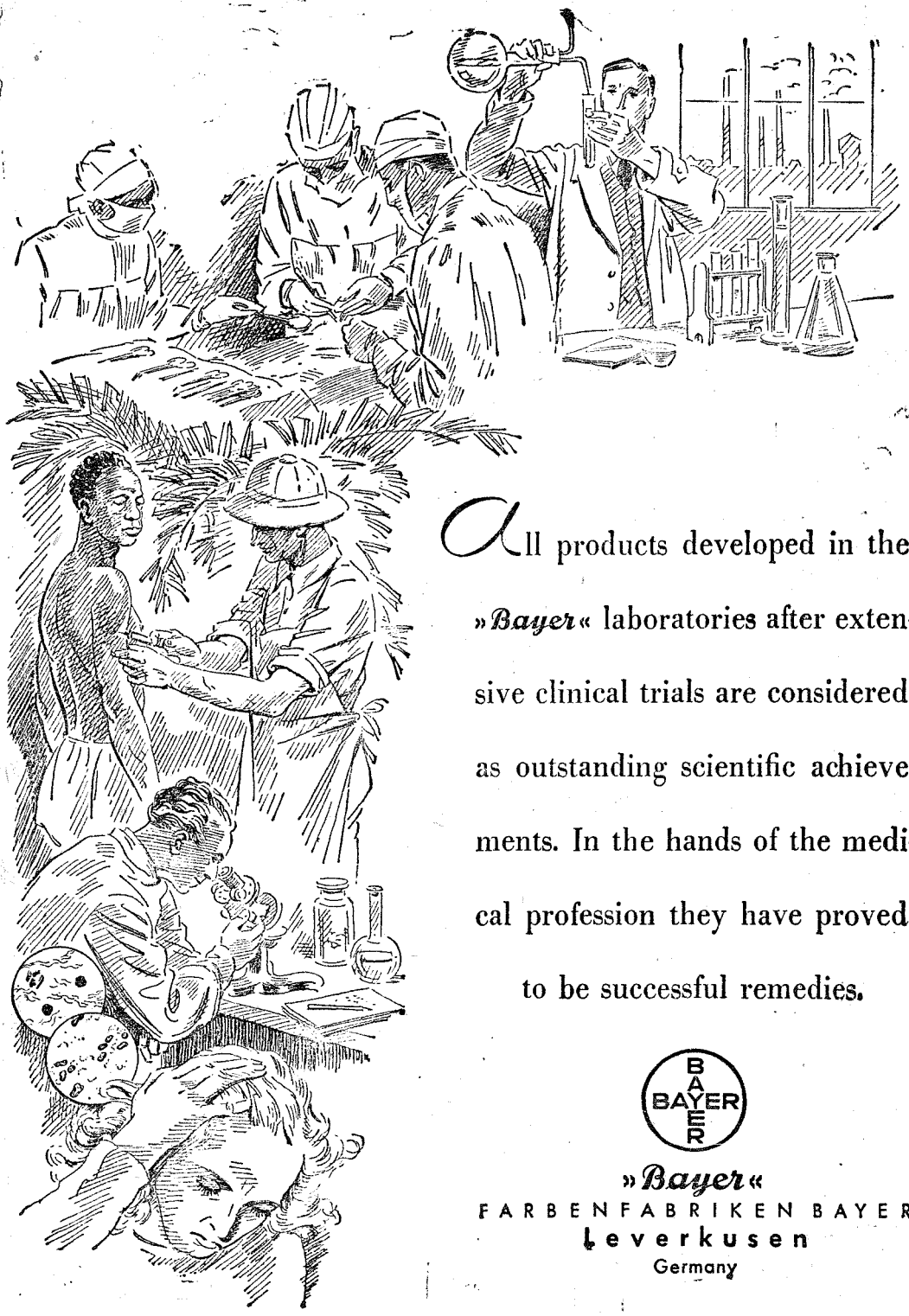

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Editorial

THE 'TESTS' QUESTION

Once more the vexed question of the so-called 'Tests' has come to the fore. We are taking this opportunity once more to appeal to the good sense of the authorities concerned to review the situation in the light of present-day circumstances.

It will be recalled that the students of the Final Course of Medicine and Surgery were to have sat for three examinations in June of this year, viz., Pathology, Ophthalmology and Hygiene and Preventive Medicine (the course of lectures in the latter subject normally extending over a period of twelve academic months, and the examination for which was usually held in January of the following year), and to sit for the final examinations in Medicine, Surgery, Gynaecology and Obstetrics, Mental Diseases, Forensic Medicine, Venereology and Dermatology in June of next year. The M.M.S.A. felt that it would be in our best interests if a balance were struck between the seven examinations to be held at the end of the third year Final and the two examinations to be held at the end of the second year Final. With this end in view, we forwarded a request to the University authorities kindly asking them to consider the possibility of allowing us to sit for four examinations this year and for the remaining five examinations next year. The University authorities appreciated our suggestion and consented to the redistribution of the examinations in question.

It should be recalled that sometime last year the University authorities had introduced an article in the Statute providing for the holding of a yearly Test in respect of each of the subjects which are taught over a period of more than one year, such Tests being considered only as 'qualifying examinations' — a student failing in these Tests would lose the Course, while the student who passed would have to sit all over again in the Final examination for the subject matter in which he was examined. This article had provoked sharp criticism from the student body as well as from other quarters, and it was held that the article was wholly unjust and unacceptable. Appropriate representations were made to the authorities, and at the end of May of last year, we were informed that the Tests would not be held that year, in fairness to those students who, until January of that same year had still been sitting for their Anatomy examination. Apart from the merits of the case 'per se', this argument certainly deserved the consideration it received.

Returning to the issue at hand, we have approached the authorities kindly requesting them to consider the implications of the article in question in view of the redistribution of examinations for, as matters stand, the very situation we had been trying to avoid would be reproduced. Unfortunately, no progress has so far been achieved.

A grave situation has thus arisen in which our vital interests are being seriously affected. We are, in fact, being asked to sit next June not for two examinations not for four examinations, but for seven examinations, viz., in Pathology, in Ophthalmology, in Hygiene and

Preventive Medicine, in Venereology and Dermatology, in Medicine, in Surgery, and in Gynaecology (the last three having the pseudonym 'Tests' affixed to them). Surely, this state of affairs is simply preposterous. It is absurd, to say the least, to almost treble the number of examinations without fully appreciating the serious implications of such a policy. Apart from the almost inhuman mental strain which is being imposed upon the students — a fact which, I am sorry to say, seems to be ignored by persons who have a moral responsibility to safeguard the student's welfare — the inevitable catastrophe which would follow would produce irreparable consequences upon our Final year of studies. The authorities are fully conscious of the fact that it is imperative that students devote the coming Summer holidays to an intensive course of Clinical work, and to a thorough revision of what has been covered during the past two years. Any measure aimed at compelling the student, directly or indirectly, to focus his attention on the work covered during this year, to the inevitable detriment of what has been covered last year is injudicious and cannot but have deleterious consequences. Besides, the repercussions on the attendance for the vital clinical work during the Summer holidays are too obvious to need elaboration.

It is clear, therefore, that the situation needs urgent and serious consideration. It is also no less clear that our actions demonstrate, beyond a shadow of doubt, our earnest desire to cooperate to the fullest extent in any measure designed at improving our academic standards vis-à-vis the highest standards of Medical Education. We are, and have always been, prepared to work as hard and as diligently as any other University students in the world, and to fulfil our duties with that sense of responsibility which is expected of Medical students and future doctors, but we are not prepared to stand by and have our vital interests put in jeopardy.

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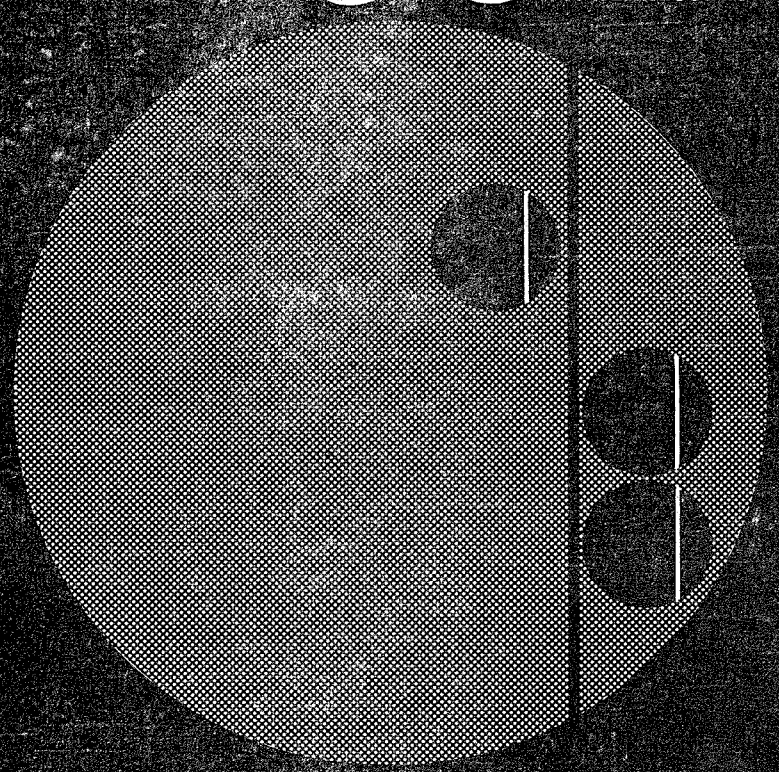

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Filter Paper Electrophoresis – Some Clinical Applications

J. L. GRECH M.D.
from the Department of Pathology, St. Luke's Hospital, and the Royal University of Malta.

The term "electrophoresis' is applied to the physico-chemical process of migration of colloid particles in an electric field. Electrophoresis has made possible the separation of the various protein and lipoid components of serum and of other biological fluids. The method of boundary electrophoresis introduced by Tizelius in 1935, and subsequently modified (Tizelius, 1956), remains a complex laboratory procedure suitable only for research purposes. With the introduction of the simplified technique of filter paper electrophoresis by Wieland and Fischer in 1948 (Franglen, 1953), electrophoresis found greater practical application. The latter technique has greatly contributed to the isolation and identification of the various forms of abnormal haemoglobin (Motulsky, Paul and Durrum, 1954; Lehmann, 1957).

The Tizelius Electrophoresis

When a solution of a single protein is layered on a buffer solution in a tube through which a current is passed, the protein layer migrates towards the anode. When a mixture of proteins is layered the various proteins move in different boundaries for a variable distance which depends upon their respective charge. This phenomenon is referred to as 'boundary electrophoresis'. Since each protein layer is heavier than the buffer solution it is necessary to introduce an immobilizing agent e.g. glass powder, in order to prevent the deposition of the various fractionated protein components.

The essential part of the apparatus for the Tizelius electrophoresis is represented diagrammatically in Figure 1. The centre is a U-tube (A) which is jointed to two armed tubes (B and C). The left arm of the U-tube is filled with glass powder (G), and then the protein solution (P) is introduced. This is followed by buffer solution which fills the remaining parts of the apparatus, including the electrode tubes (B and C). A constant current is supplied through the electrodes for a number of hours, and the protein components separate into different fractions in tube A. The migration of the different boundaries can then be recorded by means of special optical methods which measure the minute changes in refraction of the different layers.

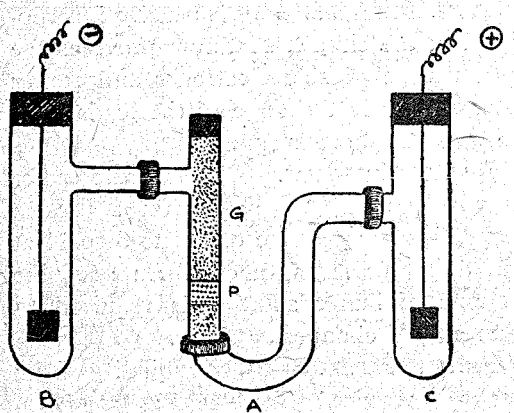

Figure 1. The Tizelius electrophoresis apparatus.

Filter Paper Electrophoresis

Filter paper electrophoresis is a micro-method requiring only a simple, inexpensive apparatus. Unlike the classical Tizelius method, it does not reproduce clearly the actual migration of all the colloid components; the results obtained by the two methods are therefore, not strictly comparable.

The essential apparatus consists of an electrophoresis chamber and an electrical power unit.

ends of the strip. Evaporation and disturbances from air currents are prevented by hermetically sealing the chamber with a

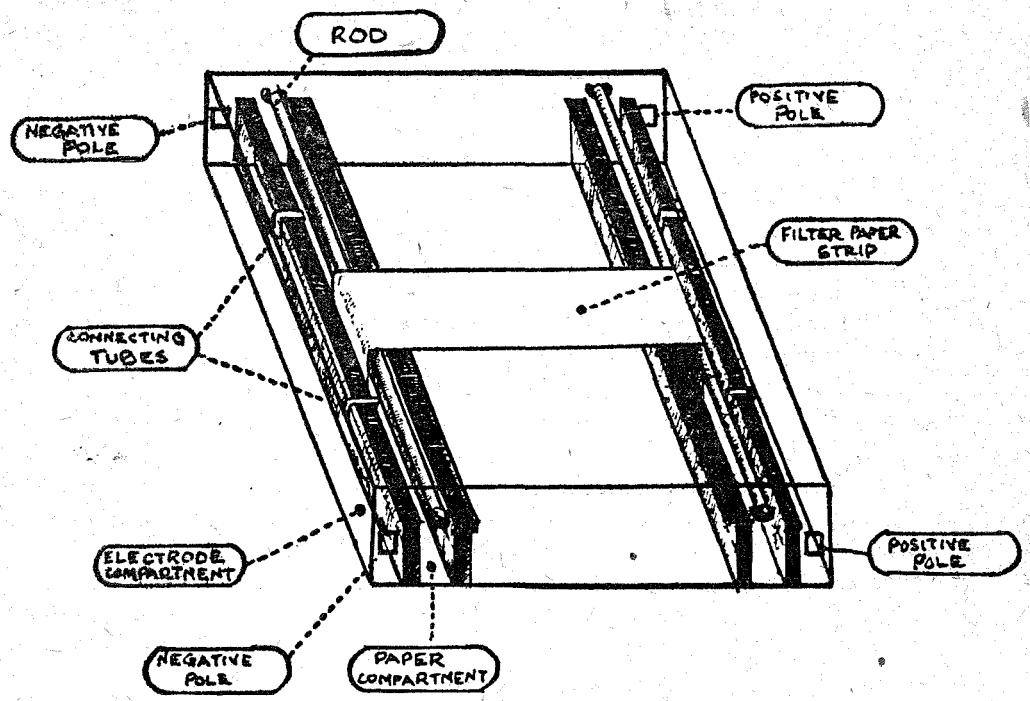

Figure 2. **The 'horizontal' type of ch amber for filter paper electrophoresis.**

THE CHAMBER. — Horizontal, vertical and continuous chambers have been devised. The horizontal chamber in use in this laboratory (Fig. 2) is a rectangular box (27 × 25 × 5.5 cm.) made of thick perspex. Perspex partitions divide the chamber lengthwise into five compartments: two outer electrode compartments, two inner paper compartments and a central larger compartment. Platinum foil electrodes are fitted to either end of the outer compartments. The two electrode and the two paper compartments hold the buffer solution. A couple of bent glass tubes, containing buffer, ride over the partition to connect the electrode with the adjacent paper compartment. Two glass rods on either side of the central compartment support filter paper strips, the ends of the filter paper dipping into the buffer solution in the paper compartment. Sagging of the soaked filter paper is prevented by threading a length of glass tubing through holes punched at both thick glass lid.

THE ELECTRICAL POWER UNIT. — A power unit connected to an A.C. supply gives the constant direct current which is essential. The voltage should be adjusted to 120-150 volts with a current of 0.15-0.2 mA per cm. width of filter paper. More rapid separation can be achieved by raising the voltage. A milliammeter is usually incorporated in the circuit. Platinum provides the best non-polarizable electrodes and makes possible the interchange of the leads after each electrophoresis run.

BUFFER SOLUTION. — Barbiturate buffer is widely used; the strength for protein separation ranges from 0.12M to 0.06 M at pH 8.6 ionic strength 0.05. An adequate volume of buffer solution is required to prevent pH changes.

FILTER PAPER. — Good quality filter paper is required. Texture, electro-endosmosis and adsorption are factors which have to be taken into consideration in the

selection of filter paper. Whatman No. 1 and No. 4 have been found very satisfactory.

THE SOLUTION TO BE ANALYSED.—Serum, urine and haemoglobin solutions are the substances most commonly submitted to electrophoretic analysis in clinical work. These solutions should not contain undissolved matter; serum must be non-haemolysed and free of fibrin strands, and haemoglobin solutions must be cleared of the red-cell stroma. Serum may be applied to the filter paper undiluted; concentrated solutions may require dilution with buffer, while dilute solutions have to be concentrated by dialysis. The solution is best applied to the paper by a micro-pipette.

RUNNING OF THE ELECTROPHORESIS.—The filter paper is allowed to dip into the buffer for an hour to ensure adequate soaking and to achieve buffer equilibrium. The solution under analysis is then applied to the cathode end of the paper; the chamber is sealed and the electric current is switched on. This is allowed to run for a variable interval depending upon the material for analysis: 12 to 16 hours in electrophoresis of serum proteins and 3 to 4½ hours in the running of haemoglobin solutions. The filter paper is then removed from the chamber and dried immediately in an oven. Drying at a temperature of 105°C for 30 minutes coagulates the proteins and fixes them at the sites of their fractionation.

STAINING. — Electrophoretic patterns of haemoglobin do not need any further processing. The different fractions of the separated proteins and lipoids are only made visible after appropriate histochemical staining. The reagents most commonly used for staining proteins are bromphenol blue, azocarmine B, brocresol green and naphthalene black 12B; Sudan III and Sudan black are stains specific for lipoids. When staining with bromphenol blue, the paper strip is placed for ten minutes in a bath containing a 1% solution of the dye in ethyl alcohol saturated with mercuric chloride. The strip is then washed in changes of 5% acetic acid until the background is clear. The prominent green bands of the distinct protein fractions contrast with the white unstained background. The green bands will appear blue after treatment with a weak ammonia solution. The filter paper strip is then dried at room temperature.

SCANNING. — The intensity of the colour of each band is related to the quantity of protein in that fraction. Quantitative estimations of the separate components can be carried out by a photo-electric scanner or by an elution technique. The photo-electric scanner converts the density of the separate bands into a series of readings which when plotted give a series of waves the peak of each wave representing a band. In the more laborious elution technique the separately cut bands of the electrophoretogram are introduced in ammonia solution and the concentration of the extracted dye is then estimated colorimetrically. Provided the technique is properly standardised, visual examination of the electrophoretogram and expression of the result in semi-quantitative terms usually satisfies ordinary diagnostic requirements.

Electrophoresis of Serum Proteins

The electrophoretic patterns of normal serum and plasma, and of serum in some pathological conditions, are reproduced in Figure 3. Electrophoresis of normal serum displays five component bands: albumin, alpha 1-, alpha 2-, beta-, and gamma-globulins (Fig. 3, pattern 1). Normal plasma reveals an additional fibrinogen band lying between the beta- and gamma-globulin (Fig. 3, pattern 2). The albumin fraction possesses the highest mobility and moves nearest to the anode. The gamma-globulin component often migrates slightly towards the cathode end, especially if this fraction is increased (Fig. 3, pattern 4). The distinct bands, in the order of their colour intensity, are: albumin, gamma-globulin, beta-globulin, alpha 2-globulin, and alpha 1-globulin. Small deviations, not readily appreciated on visual inspection, may be present in normal

sera; these variations are reproduced in the scanning procedure. Additional bands may appear when the electrophoresis is carried out in a borate buffer (Consden and Powell, 1955) or when a non-ionic fatty alcohol, e.g. lubrol W, is added to the barbiturate buffer (Lloyd and Stewart, 1956). Significant variations in the electrophoretogram are observed in infancy and in pregnancy.

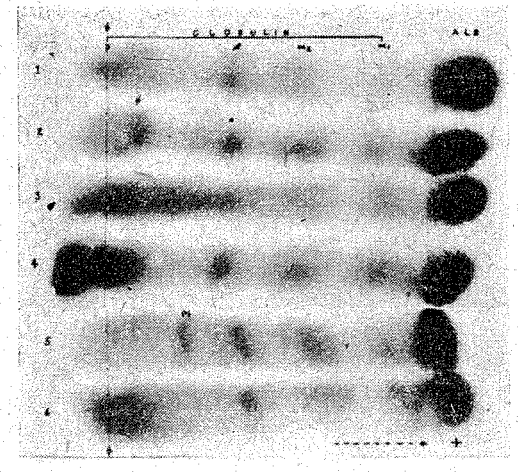

Figure 3. *Pattern 1:* **normal serum, showing from right to left albumin, alpha 1-, alpha 2-, beta and gamma- globulin bands.** *Pattern 2:* **normal plasma showing additional fibrinogen band.** *Pattern 3:* **hepatic cirrhosis with ascites (serum).** *Pattern 4:* **kala-azar (serum).** *Pattern 5:* **myeloma (serum).** *Pattern 6:* **disseminated lupus erythematosus (serum).**

Vertical line on left indicates the point of application of the serum; arrow at bottom right indicates direction of migration towards anode.

THE ELECTROPHORETOGRAM IN DISEASE. Very often deviations from the normal electrophoretic pattern are not diagnostic of any one specific condition. In some pathological conditions however, serum electrophoresis yields patterns which are specific e.g. agammaglobulinaemia, cryoglobulinaemia.

The greatest value of electrophoresis is in myeloma; in this condition electrophoresis of both serum and urine proteins will establish the diagnosis in 95% of cases (Flynn, 1954; Jim, 1957). The diagnostic abnormality in the serum pattern of a case of myeloma is an abnormal 'compact' band (so-called M fraction) lying on or between the gamma- and beta-globulin bands. There is also in the majority of cases an increase in density of the alpha 1- and alpha 2-bands, and decreased serum albumin (Griffiths and Brews, 1953). These features are well shown in Figure 3, pattern 5.

In cirrhosis of the liver the serum pattern is often diagnostic. It shows a considerable diffuse band of gamma-globulin reaching up to the beta-globulin fraction, as well as diminution in the albumin fraction and some increase in the intensity of alpha 1- and alpha 2- bands (Fig. 3, pattern 3).

In chronic infections the classical picture is that of increased gamma-globulin and possibly some increase in the alpha components; these features are illustrated by Figure 3, pattern 4, which reproduces the electrophoretic pattern of serum in Kala-azar.

The pattern in collagen diseases deserves comment. The most outstanding feature in these instances is a considerable increase in gamma-globulin associated with diminished alpha 1- and alpha 2-globulin, and albumin (Fig. 3, pattern 6).

The pattern of the nephrotic syndrome showing a marked reduction of the albumin along with a sharp increase in the alpha 2-component is diagnostic. The urinary protein in this condition shows considerable amounts of globulins and of albumin (Flynn, 1954).

Electrophoresis of Haemoglobin

Filter paper electrophoresis has been widely employed in the detection and study of the abnormal types of haemoglobin. The characteristic electrophoretic behaviour of the various abnormal forms of haemoglobin has enabled the identification of nine distinct types. The haemoglobin of sickle-cell anaemia, Hb-S, was the first abnormal haemoglobin to be discovered, and still remains the only sickling variant known. It was identified by its slow rate of migration when compared with that of both Hb-A (adult haemoglobin) and Hb-F (foetal haemoglobin). Of the Hb types so far recognised Hb-C and Hb-E show the least

mobility; while Hb-D takes up the same position as Hb-S. One distinguishing feature between Hb-S and Hb-D is that the erythrocytes in Hb-D disease do not sickle. Haemoglobin-G has a mobility intermediate between that of Hb-S and that of Hb-F. The other rarer variants, Hb-H, Hb-I, Hb-J and Hb-K, all have mobilities beyond that of Hb-A; Hb-H and Hb-I are the fastest.

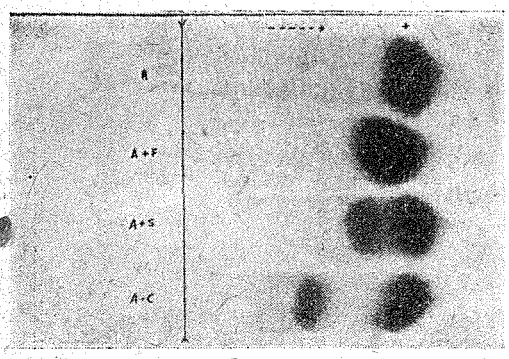

Figure 4. **Electrophotetograms of haemoglobin. A = normal adult Hb; A + F = normal adult and foetal Hb; A + S = normal adult Hb and Hb-S; A + C = normal adult Hb and Hb-C.**
Vertical line indicates point of origin; arrow at top indicates direction of migration towards the anode.

When submitted to electrophoresis at pH 8.6, using barbiturate buffer, the various haemoglobins may be paired according to their rate of migration thus: Hb-C and Hb-E, Hb-S and Hb-D, Hb-F and Hb-A, Hb-J and Hb-K, and lastly Hb-H and Hb-I; Hb-G takes up a position close to Hb-F. Electrophoretic analysis in a cacodylate buffer, pH 6.5, is essential for more exact definition between each member of the separate pairs. Under these conditions Hb-S shows a greater rate of migration than Hb-A.

Conclusion

Filter paper electrophoresis has become established as a routine laboratory procedure. The simplicity of the technique and the possibility of running concomitantly multiple analyses are factors which account for its wide adoption. Once the technique is standardised, the results are reproducible with a satisfactory degree of consistency.

Filter paper electrophoresis is a valuable diagnostic aid in agammaglobulinaemia, myeloma, the nephrotic syndrome and in other conditions. This technical procedure has contributed greatly to our knowledge of the abnormal forms of haemoglobin. It is visualized that the technique of paper electrophoresis will become a greater diagnostic aid in clinical medicine, and that it will find wider application in the field of forensic medicine.

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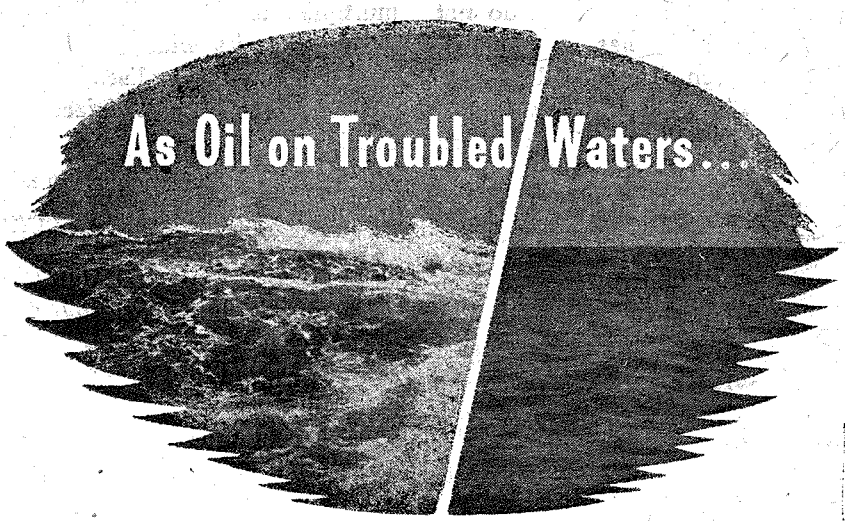

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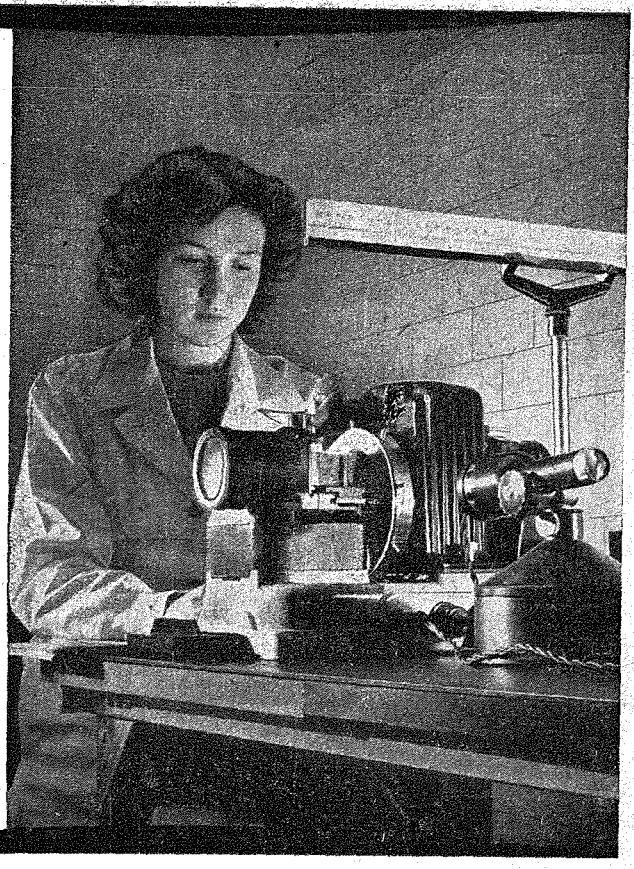

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Practical Aspects of Clinical Bacteriology

Delivered at a B.M.A. meeting by *Dr. E. AGIUS, B.Sc., M.D., D.P.H., D Bact. (Lond.)*

The laboratory is most often called upon to help in the diagnosis of one of the commonest clinical conditions — a pyrexia of unknown origin In Malta this may be due to various causes, but amongst the most frequent are undulant fever and typhoid fever, the former being markedly commoner. To diagnose Brucellosis two investigations can be carried out in practice: the indirect test for agglutinins, and the cultivation of the *Brucella melitensis*. Normally, it is very important, in choosing which investigation to ask for, to consider the time and period of the illness, but in undulant, which is a long-drawn out disease with specific characteristics, it is practically safe to say that by the time the patient has called in the doctor he has already had the fever for days and by then antibodies will have developed. It is, therefore, good practice to ask for an agglutination reaction as early as one suspects undulant. This can be done by the slide method, in which all one is required to send is a capillary tubeful of blood, or by sending about 5 cc. of whole blood, which will allow a titration of the agglutinins to be carried out. The first — what has erroneously become too generically called, locally, the 'blood serum reaction' — is part of the diagnostic service which the Health Dept. offers free to all practitioners. It should be easy enough to procure two or three drops of blood from the ear lobe of a patient, but, speaking from experience it seems that some doctors find difficulty in this, and we are often asked to carry out the test with about half an inch of blood in a thin capillary. This difficulty, especially in private practice, arises from the fact that the doctor has not pricked the patient's ear deeply enough. This should be done with a pin, which should be pushed right in. If the amount of blood is too little — especially if part of it has been cooked in the process of sealing the capillary, then the carrying out of the test will be quite impracticable. Incidentally, may I, in passing, mention how pleasant it is to get the accompanying note on a neat, fair-sized sheet of paper, legibly written. It is irritating to get this on a slip of paper about 3" by 1", scrawled in pencil.

The capillary tubeful method is very useful but cannot be absolutely exact. To get any exactness a titration is desirable, and for this about 5cc. of blood must be sent. The serum is separated from this and dilutions are made. The question which always arises is, 'Which dilution is diagnostic? Does a reaction at 1/80 mean the patient has actually got undulant fever, or has it to be at a higher dilution?' The answer seems to be that the higher the dilution at which a reaction is obtained the more certain it is that one is dealing with an active infection, but it seems to me, from what I have seen, that even a reaction at a low dilution is normally significant and has to be given attention. Undoubtedly, low titre reactions may mean no more than sub-clinical infection. A 1/40 or 1/80 in an afebrile goat-keeper need not cause anxiety, but there always has to be some explanation for it. May I also draw attention to two points: one is the helpfulness of observing a rising titre, an increase, that is, in the dilution at which a reaction is obtained when the tests are carried out at a fair interval — not less than a week — and secondly to the fact that a search for agglutinins is after all an indirect examination and that we can have the paradoxical picture of a patient who is very ill with undulant, but who gives a negative or a very low titre result. This is easy to understand if one realises that a patient may be very ill exactly because he is not producing those antibodies

— the agglutinins — which we are looking for for diagnostic purposes. This situation arises more commonly in the case of typhoid infection — sometimes such cases will give a persistently negative reaction throughout a first phase of the illness, will, in consequence, relapse, and will then, especially if they are about to recover, finally start giving a reaction.

The cultivation of Brucella from the blood is proof positive and incontrovertible that one is dealing with an active infection. This is relatively easy: one inoculates from 5 to 10 cc. of blood in a liquid medium such as liver broth or tryptose broth with an anticoagulant and incubates it. One point to note is the absolute necessity for guarding against the introduction of contaminants — most common of all, Staphylococci from the patient's skin or the operator's hands. One might overcome this by the additional of Penicillin to the medium but the umbrella of Penicillin should not be an excuse for bad technique. Fortunately once the Brucella has grown it is quite easy to recognise, from its morphology, colonial characters and serological reactions but unfortunately it is a slow grower and I always keep cultures for ten days, at least, before reporting a negative. This implies repeated subculturing, but I have adopted a useful technique for this. It is the use of Castaneda's method which consists in having the liquid medium in a bottle, along the side of which there is a layer of tryptose agar. One has only to slant the bottle to inoculate this agar from the liquid medium and to do so moreover with a very large inoculum. I believe we miss very few cases with this procedure. It is always advisable to take blood during the septicaemic phase, that is during a pyretic attack, and when using 50cc of broth, no less than 5 cc of blood should be taken. Do not forget that the chances of a positive result depend on the chances of there being a microorganism in the actual volume of blood you have picked up. If bacteria are scanty and you submit only a couple of millilitres you may quite easily miss getting them in that volume.

It is also practicable to look for Brucella agglutinins and to cultivate Brucella from the fluid in joint lesions. In that way I have been often able to confirm the diagnosis which had been considered on clinical grounds. Sometimes these tests are of considerable value in differential diagnosis.

The situation with regard to typhoid diagnosis is very similar only here we have to add culture of micro-organisms from the faeces to the agglutinin reaction and blood culture. It is very important in these cases to recall which test is most likely to be useful at a given period of the illness. The percentage of cases showing positive blood cultures declines steadily after the first week. The bacteraemic stage in typhoid is an early stage, so blood culture is most likely to be useful at that time. The frequency of *Salm. typhi* in the faeces rises from the first week to the third and then falls somewhat slowly. The likelihood, therefore, of getting a positive result in faeces culture becomes greater as that of getting a positive blood culture decreases. As for agglutinins to quote Topley and Wilson, "In the first week about 20% of the cases give a positive agglutination test. The curve then rises sharply, crossing the blood-culture curve just before the end of the second week, and still rising attains a value of 90% or more by the fourth week; after which it remains at a high level for several weeks". What I have said about the paradoxical negative in severe cases with regard to undulant fever applies even more in the case of typhoid fever — cases where one only gets a positive in a relapse. The agglutination reaction is interfered with by antibodies which may have followed T.A.B. vaccination. A mere 1/40 or 1/80 in a vaccinated patient means very little. One odd circumstance is that many practitioners do not realise that many young

people do receive T.A.B. vaccination.

To overcome the difficulty arising from agglutinins due to T.A.B. one may carry out tests for Vi antibodies, but in practice, I believe that it is more useful either to carry out a blood culture, or even more to perform two agglutination tests at a week's interval and to look for a rising titre.

One cause of "Pyrexia of unknown origin" which still persists amongst us is murine typhus. It started as an epidemic in 1943 but a few cases still crop up. It was the laboratory which definitely established the existence of that infection in 1943, and it can still be of help through carrying out the Weil-Felix reaction — the search for antibodies which will agglutinate a suspension of the 0 variant of Proteus X 19. We learnt, however, in 1943 that a low titre reaction (1/40 or 1/80 or even higher) could and does occur in quite healthy inhabitants of our island and the necessity for noting a rise in titre is even more important in the case of typhus than it is in undulant and typhoid.

An illness in which the laboratory can play a vitally important part is diphtheria. Between 1938 and 1953 I had to do with the bacteriological control of practically all cases of diphtheria in Malta, and that meant examining something in the region of fifteen thousand swabs. Unlike what happens elsewhere I examined these myself and not, except for very brief intervals, through the help of technicians, so that I feel I can claim a modicum of experience in the matter. The golden rule in the diagnosis of diphtheria seems to be that there is no golden rule. Neither the nature of the membrane nor the presence or absence of high temperature nor any other feature seem to be able to replace the examination of a swab — properly taken. In this connection it should be pointed out that the Medical and Health Department runs a free diagnostic service for this purpose. Some practitioners do not make use of it since they fear that if they send in a swab it means they have to report the case even as a suspected case. Obviously there is not much to be said about that — one has to report the case, but on the other hand if one does not suspect, but wants to exclude the possibility of diphtheria I feel one need not necessarily report the case.

May I emphasise, having said all that, the extreme importance of not letting treatment wait on bacteriological confirmation in dephtheria. No physician is justified in doing that. One other point: more and more I have come to realise the frequency of diphtheria away from the throat and larynx. Do not forget it as a possible cause in chronic inflammation of the nares and in chronic ear suppurations. Diphtheria in the ear may arise as a late complication of pharyngeal diphtheria or appear on its own. I have met several cases in which the *Corynebacterium diphtheriae* was causative and in which specific treatment cured the condition.

With reference to tuberculosis I will mention just one point. Sometimes the patient may be incapable of supplying a suitable sample of sputum, because he is in the habit of swallowing it. In such cases it is advisable to pass a gastric tube and examine the gastric contents — preferably a sample obtained about an hour after the patient has wakened in the morning. This should be examined not later than an hour after it has been taken, otherwise the tubercle bacilli which resist the gastric acids for a time will eventually be killed and cannot be cultivated or used for pathogenicity tests. In this connection I wish to draw attention to an excellent series of articles which appeared in the B.M.J. between October 1953 and July 1954. In connection with the gastric examination, I would remind you that it involves inoculation of guinea pigs, which are far from abundant and will involve waiting for some six weeks — an anxious period for the patient. So do not resort to it needlessly. If the patient can spit out his sputum you should always prefer

that. You should also bear in mind that what we are looking for in these cases is swallowed sputum so it is absolutely useless to examine gastric contents if the patient does not suffer from a cough at all.

One disease, cases of which I have come across within the last year — not in abundance, but disturbing enough in their frequency — is leprosy. The traditional method of diagnosis here consists in examination of scrapings from the nasal mucosa, but I believe a greater number of positives is obtained by examining a smear of the fluid which can be obtained from the skin by making a tiny slit with a sharp bistoury into the nodule or into inflamed skin. This is practically painless, can be done by the ordinary physician and need not alarm the patient. As a precaution the smear, which can be done with the bistoury itself, must always be made on a new slide, to avoid such false positives as can arise from the presence of scratches, etc.

We are frequently called upon to examine cerebro-spinal fluid in cases of meningitis and meningeal irritation. The observation to be made here is that even with purulent fluids diagnosis may be difficult. It often happens in *Neis. meningitidis* infection that the bacteria are extremely few, and it is rarely that the case is met with which provides slides full of polymorphonuclear cells and full of bacteria, the sort of case which could be called a "demonstrator's delight". Much more frequently bacteria are scanty and slides have to be looked at long and closely before microorganisms are seen which one can be convinced are really Neisseria. A common infecting agent, with purulent fluids, is *Strept. pneumoniae*. Perhaps even commoner are cases in which one finds a mixture of bacteria, quite frequently not easily identifiable but including gram positive rods, negative rods and staphylococci. These cases are associated with a perforated membrana tympani and are the result of a passage of bacteria from the outer ear.

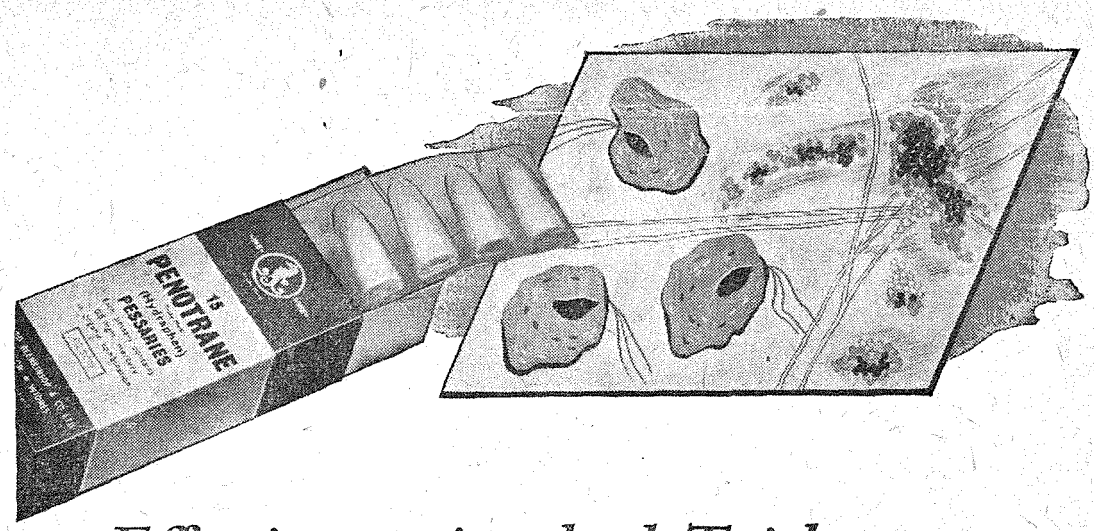
As far as urethral discharge in the male is concerned I think a point of interest is to realise that not all cases of purulent urethritis are in fact due to an infection with *Neis. gonorrhoeae*. Non-specific urethritis is becoming more and more frequent as a diagnosis — a urethritis due to staphylococci, to *Bact. coli* and various other microorganisms. Normally when I get two slides sent to me with a smear, I stain one with Archibald's stain; a mixture of thionin and methylene blue which gives one a general idea what bacteria one is dealing with and then carry out a Gram. It is surprising how often cases which at first glance might appear to be cases of gonorrhoea turn out to be due to mixed non-specific infections.

In connection with discharges in the female, I wish to draw your attention very earnestly to the frequency with which leucorrhoea is due to the presence of a protozoal parasite the *Trichomonas vaginalis*. This, too, is a diagnosis which venereologists are making with increasing frequency. It seems to be transmitted generally by sexual intercourse. It is quite easy to diagnose provided one performs the examination as it should be done, one examines, that is, a little of the fluid discharge immediately after it is taken from the patient, because Trichomonas is easily identifiable when seen moving, but difficult to stain and to identify once it is motionless against a background of strands of fibrin, etc. Some actually advise having a microscope in the room where patients are examined. The fluid is taken up with a Pasteur pipette and if too dense, it is diluted with a little saline solution. I feel quite convinced that Trichomonas infestation accounts for a large proportion a cases of leucorrhoea; some attribute to it well over 40% of cases primarily complaining of vaginal discharge. It is certainly very common in Malta.

A word with regard to examination of faeces in general and specially with reference to the search for *Entamoeba histolytica*. My teacher in semeiotics used to

insist very strongly that the first examination consists in just looking at the sample —an undignified, and repulsive but necessary part of a doctor's work. Again and again I get samples sent which purport to come from dysenteric patients which look quite normal. Of course, one may get the encysted form in these cases, but one should at least make sure that there have been diarrhoeic periods, and moreover it is much easier and somehow more convincing to find the vegetative amoeba. If the patient is not in a diarrhoeic phase one has to wait for it and if there is not and never has been such a phase then one would be looking for what has probably never been there. Then there is the method of submission: amoebae, as is very well known, die out fairly soon and unless one sees an amoeba moving it is very difficult to be certain of its nature. The best way to get a sample is to get the patient into hospital and examine stools soon after passage. Very often this is just the thing which the private practitioner and the patient do not want to do. There is resort to the device of keeping the sample warm in a thermos flask. This would solve the difficulty, if the patient can carry out instructions accurately. The habit has come in of putting warm water in the flask holding the tubeful of faeces. The trouble here is that most often patients (or sometimes nurses, or even doctors) put in water at well over 50°C. which, of course kills the amoebae which have been saved from dying of cold to be killed by over-heating. This is due to the fact that thermometers, apart from the clinical variety, are uncommon in homes so that patients and nurses rely on their idea of an adequate temperature, which does not happen to match that of the amoeba's. It might be better to use no water at all — although it should be simple enough to get suitable thermometers — at least in hospital wards and to teach staff to use them properly. I wish also to point out the possibility that, especially severe diarrhoeas may be due to bacillary dysentery — Sh. shigae, Sh. sonnei, Sh. flexneri, Schmitz's bacillus are met with, the Sh. shigae being especially violent.

In conclusion I wish to make a plea for the proper use of the laboratory. I have already mentioned en passant certain points which must be noted with regard to the submission of samples. To overlook these is to be doing things in such a way that neither the doctor nor the patient will be getting the benefits otherwise attainable. It is worse than useless to submit samples haphazardly in the hope that the laboratory people might find something in it somehow. Nobody can find anything which is not in the material submitted. Then there is the question of examining material as part of a routine. Apart from the fact that this leads to blunting and atrophy of the clinical sense, there is the plain truth that the staff available in most laboratories is limited and if they are made to use up all their time (I beg you to note that I do not say 'waste their time') on inessentials then they will have much less time and energy available for really useful investigations. Doubtless things ought to be different; staffs should be large enough to do more work but, there is a huge lag between things as they are and as they should be. I am afraid we have to carry on under the conditions which prevail. I always feel that the laboratory should be used as one would use a razor blade provided he only has one. One would keep it for shaving where a sharp edge is really necessary and not blunt it by sharpening pencils. With these provisos the laboratory is always ready and eager to be of use, it is pleased when it serves its purpose and ready to correct and improve its shortcomings, presuming that at the other end there are understanding clinicians gifted with a sense of science and an appreciation of things as they are in actual fact.



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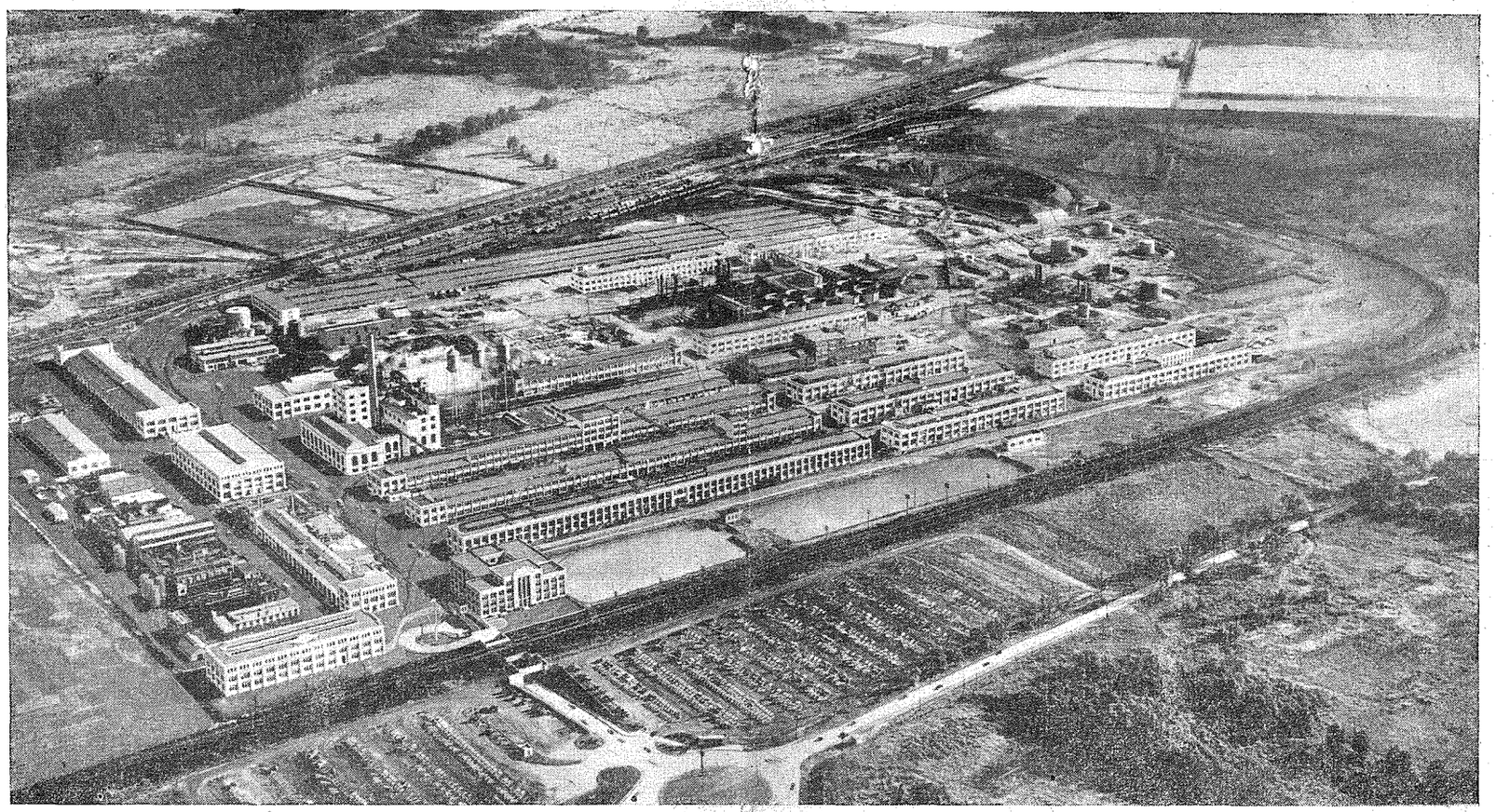

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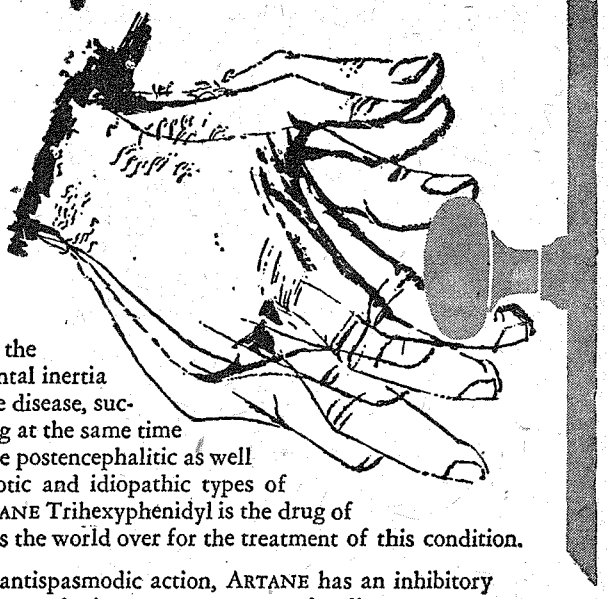

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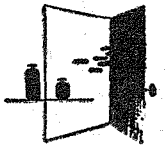

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SPLENOMEGALY
CAUSES AND INVESTIGATIONS

by VICTOR CAPTUR M.D., B.Sc.
Demonstrator in Medicine, Royal University of Malta. Consultant in Cardiology, (King George V Hospital, Consultant to the Victoria Hospital, Gozo.)

The causes of splenic enlargement may be grouped as follows:—

INFECTION:
- Undulant fever.
- Typhoid fever.
- Typhus fever.
- Kala-azar.
- Acute malaria.
- Glandular fever.
- Miliary tuberculosis.
- Bacterial endocarditis.
- Congenital syphilis.
- Septicaemia.
- Splenic abscess or infarction.

BLODD DYSCRASIAS:
- Acute myeloid and lymphatic leukaemia.
- Chronic myeloid and lymphatic leukaemia.
- Pernicious anaemia.
- Polycythemia vera.
- Cooley's anaemia.
- Haemolytic anaemia.
- Hodgkin's disease.
- Acholuric jaundice.
- Thrombocytopenic purpura.
- Splenic anaemia (Portal hypertension).
- Sickle-cell anaemia.
- Osteosclerotic anaemia (marble-bone disease, myelosclerosis) Rare.

DISORDERS OF LIPID METABOLISM:
- Niemann-Pick's disease.
- Gaucher's disease.
- Hans-Christian — Schuller disease.
- Xanthomatosis.

INTERFERENCE WITH CIRCULATION (Congestive splenomegaly)
- Portal vein thrombosis.
- Splenic vein thrombosis.

METABOLIC DISTURBANCE:
- Rickets and other deficiency states of childhood.

DIAGNOSTIC PROCEDURE IN THE INFECTIVE GROUP, USUALLY ACUTE ONSET WITH FEVER.

1 History: Present and past, family. Racial origin. ? Chorea; ? Rheumatic fever. ? Malaria. ? Drinking raw goat's milk.
2 Onset of disease: Acute? Insidious?
3 Appearance of pt: Compare typhoid and undulant. ? Rose spots. ? Petechiae. ? Cardiac murmurs.
4 Study type of fever. Search for enlarged glands.
5 White cell count is important — compare undulant, typhoid and endocarditis.
6 Blood smear — diagnostic in Glandular fever showing atypical lymphocytes — and in malaria.
7 B.S.R. and Paul-Bunnell test (Glandular fever).
8 Blood culture is valuable in Undulant, typhoid and endocarditis.
9 Splenic puncture or bone marrow puncture to exclude or confirm Kala Azar.

DIAGNOSTIC PROCEDURES IN THE CHRONIC FORMS OF SPLENOMEGALY

A. 1. Adult with enlarged spleen and a vivid red colour think of polycythaemia and confirm by blood count.
2. Pale clay colour with enlarged spleen and past history of living in malaria districts together with febrile episodes think of malaria.

3. Dirty yellow colour of skin especially around nose and eyes in a patient who since infancy had splenomegaly think of Gaucher's disease.
4. Mongolian aspect with pale yellow colour of skin and big head in a patient with chronic splenomegaly and of Mediterranean origin think of Cooley's anaemia.
5. An aspect characterised by cranial malformation with sub-icteric tinge of the skin in an individual with moderate splenomegaly makes one suspect haemolytic jaundice.

B. *Age of patient.*
This may have an important bearing in the diagnosis especially for those splenomegalies that occur only in childhood e.g. Cooley's anaemia, Niemann-Pick disease, Gaucher's disease.

C. *Fever.*
This is of more importance in the acute types of splenomegalies. It does, however, help much in the diagnosis of chronic splenomegalies:—
a) Episodes of fever with crisis of haemolysis points to haemolytic anaemia.
b) Fel-Ebstein type, suggests Hodgkin's disease.
c) Febrile episodes which coincide with fleeting icterus and ascitic manifestations in an individual with chronic splenomegaly makes one suspect splenothrombophlebitis.
d) Malarial type of fever with rigors think of chronic malaria.
e) The presence of fever excludes such diseases as Osler-Vaquez; chronic myeloid and lymphatic leukaemia; Cooley's anaemia; Gaucher's disease, Niemann-Pick's disease.

D. *Gastro-Intestinal haemorrhages.*
Haematemesis and malaria point to hepatic cirrhosis, congestive splenomegalies and Banti's syndrome.

E. *Jaundice.*
The presence of jaundice would point to a diagnosis of Hanot's cirrhosis or haemolytic jaundice.

F. *Ascites.*
If permanent think of Laennec's cirrhosis; Banti's syndrome. If transient think of Splenothrombophlebitis.

G. *Liver.*
With enlargement of liver think of syphilis, TB, Malaria.

H. *Enlarged glands.*
Suspect lymphatic leukaemia or Hodgkin's disease.

I. *Blood picture.*
This is diagnostic. It is most important in Leukaemias, pernicious anaemia, polycythaemia, and sickle cell anaemia.

J. *Splenic puncture.*
May furnish typical findings in Gaucher's disease.

K. *Bone marrow biopsy.*

L. *Urinalysis.*
This may reveal RBC's or Urobilinogen. It is important in the haemolytic anaemias.

M. *RBC Fragility.*
Important in haemolytic anaemia.

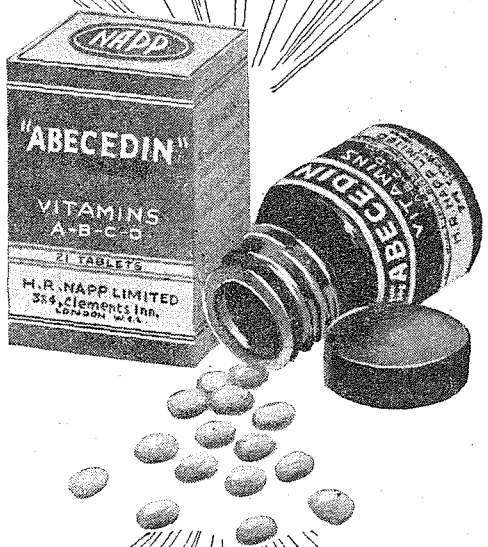
N. *Bleeding and clotting time.*

O. *Lymph-node biopsy.*

P. *X-Ray evidence.*
May reveal the bone lesions in Cooley's anaemia; multiple myelomas and Gaucher's disease.

Q. *Thorium splenography.*

"ABECEDIN"



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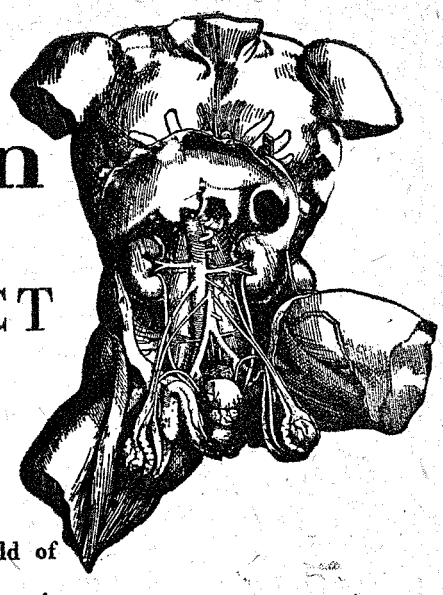

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(1) *B.M.J.* (Nov. 25), 1950.
(2) *Ann. New York Academy Sc.* (Sept. 15), 1950.

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HERNIA

Lecture given to the Malta Branch of the British Medical Association
on
24 January 1957.
by

Professor P. P. Debono O.B.E., M.D., F.R.C.S. (Eng.) D.P.H., (Camb.)

Hernia appears to be very frequent amongst our population Whether it is more frequent than it is in other countries I am unable to say, and I do not think that the congenital factors which cause hernia occur more often here. The only factors I can think of, which, perhaps are more often met with amongst us, are the habit of many of the labouring classes to wear a sash or "terha" round their waist, and the tendency to adiposity. The sash prevents the bulging forward of the abdominal wall on bending forwards and causes a rise in abdominal pressure which is directed to the lower part of the abdomen and the inguinal regions. Adiposity interferes with the defences of the inguinal canal as will be discussed later.

In order to repair hernia efficiently an appreciation of the causation and anatomy are absolutely necessary.

CAUSATION. In order that a hernia may develop, two factors must concur viz., intrabdominal pressure and weakness of the abdominal walls. These factors are complementary, but both must be present in some degree; and, in point of fact, even in normal conditions they are; since the intrabdominal pressure is always plus and the passage of the processus infundibuliformis and the testis and cord in the male, and the round ligament in the female, create a breach in the walls of the abdomen. That a hernia does not occur more often is due to the fact that the breach is adequately defended.

THE DEFENCES OF THE INGUINAL CANAL. The first line of defence is the *obliquity* of the inguinal canal. The internal and external rings do not lie opposite each other, but are separated by the length of the inguinal canal so that, whenever there is an increase in the intrabdominal pressure, the posterior wall is closely applied to the anterior and the canal is blocked. This valve-like action depends on the aponeuroses, that of the external oblique in front and the transversalis or endo-abdominal fascia behind. The muscles interpose a shutter of actively contracting tissue especially at the external and internal rings when one or the other of the fasciae is deficient. The muscles also support the middle part of the canal between the two rings. During contraction the arch of the internal oblique and transversalis above the canal is flattened and these muscles come down to the inguinal ligament. The interposition of actively contracting muscle between the aponeurotic walls of the inguinal canal affords most important support since fascia, though resistant, is inelastic and if overstretched is unable to return to its former position, whereas muscle allows itself to be stretched, but immediately recoils as soon as the stretching force ceases to act.

The cremaster muscle by its contraction pulls up the cord and is able to counteract any downward thrust transmitted through the cord. The defences of the inguinal canal, therefore, can be summarized as a valve like action of the aponeurotic walls and a sphincter like action of the muscles.

LYTLOE (1945) has described a sort of fascial sling which, during contraction of the abdominal muscles, pulls the internal ring upward and outward, under cover of the internal oblique and transversus muscles. I have not been able to make out this sling; transverse fibres do thicken the endoabdominal fascia on the medial and superior parts of the internal ring, but they seem to be deficient below and laterally; moreover observation during opera-

tions under local anaesthesia, show that it is the muscles that move down and cover the ring; the fascia on the medial side of the ring appears to be too taut to allow any outward and upward movement.

A breakdown in the defences of the inguinal canal is likely to be followed by the formation of an inguinal hernia.

By far the commonest cause of weakness of the inguinal region is the imperfect obliteration or non-obliteration of the processus infundibuliformis. The presence of a preformed sac interferes with the valve-like action of the aponeuroses which sooner or later are wedged apart by omentum or bowel within the sac. A lobule of fat which is often found in the canal also acts in this manner and frequently is a cause of hernia. This lobule of fat is not derived from the subperitoneal fat, and lies outside the internal spermatic fascia; it seems to be derived from fat along the lower border of the internal oblique or transversus muscles to which its pedicle is attached.

Maldevelopment of the Internal oblique and Transversus muscles deprives the medial part of the fascial posterior wall of the inguinal canal of its muscular support. The wall gives way resulting in the usual type of direct hernia which begins as a diffuse bulge forward of that part of the posterior wall of the inguinal canal between the internal ring and the public spine.

In such cases the internal oblique and transversalis muscles arch high up over the cord, the conjoint tendon is ill-developed or may be absent, the muscles being inserted in the linea semilunaris. The lower borders of the muscles are thin, and mainly aponeurotic. It appears that the posterior wall begins to give way at the extreme lower border just at the attachment of the transversus fascia to the inguinal ligament and the pelvic fascia. When, at operation, the coverings split transversely to form an upper and a lower flap, the upper flap is thick and consistent, with many bundles of fibres running transversely, while the lower flap is thin, flimsy and transparent. Between this covering and the peritoneal sac, there is usually a more or less abundant layer of fat which in obese subjects is of considerable thickness, and in cases of some duration may contain on its medial side part of the bladder wall.

It is remarkable that this type of opening never merges with the internal abdominal ring even when the latter, as is not uncommon, gives passage to a small processus infundibuliformis; but the two are always separated by a septum of fascia. With time, the bulge may develop a diverticulum where the external abdominal ring leaves it unsupported, this diverticulum protrudes through the ring and may even find its way to the scrotum.

There is a different and much rarer type of direct hernia of which the genesis is altogether different. It has been called "Funicular hernia" by Ogilvie and others. In this type the protrusion occurs through an opening, more or less circular, in the transversus fascia forming the posterior wall of the inguinal canal usually in its medial half. The opening is surrounded by a circular ring of fibrous tissue. This hernia is formed by the protrusion of a lobule of subperitoneal fat through a congenital hiatus in the fascia, the protrusion becomes larger, widens the opening and then pulls behind it a small diverticulum of peritoneum which becomes the sac.

OPERATIVE TREATMENT OF HERNIA. Many attempts to treat hernia by operation have been made, but a really effective treatment dates from the time of Bassini, Marey, Halsted.

For some reason or other it was the Bassini operation that attracted most followers and a time came when Bassini became synonymous with operation for hernia.

Eduardo Bassini was born in Pavia in 1844. His parents were well to do, and he qualified from the University of his native town in 1866 when he was twenty two

years old. Soon after he qualified he joined Garibaldi's army as a combatant soldier and was wounded and taken prisoner at the battle of Villa Gloria during the assault on Rome which was defended by French troops. He was freed at the end of the war and returned to Pavia. But his wound, a bayonet wound of the abdomen that had given rise to a faecal fistula, still gave him trouble and it was two years before it finally healed. He then entered the Clinic of Porta who was the chief surgeon, at Pavia, and also attended the Institute of Pathology where he came under the influence of the famous Golgi.

In 1873 he undertook a tour of study in foreign clinics during which he visited the clinic of Bilroth in Vienna, that of Langenbeck in Berlin and that of Nussbaum in Münich; he then went to London to the clinics of Lister and Spencer Wells. Back from London he was appointed surgeon to the hospital in Spezia whence he went to Padova as Professor of Surgery and substituted Vanzetti in the Chair of Clinical Surgery. During this period he introduced Listerian principles and was one of the first to practice antisepsis in Italy.

In 1888, at the age of forty four years he became Professor of Clinical Surgery in the University of his native town of Pavia. In 1919, on reaching the age limit of 65 years, he retired and he died of angina pectoris on the 20th July 1924.

It was during the period between his return from abroad and his appointment to the Chair at Pavia that Bassini worked out the technique of his operation for hernia, which he published in the Archives fur Klin., Chirurgie (1890, Vol. 40 p. 429), then the leading surgical periodical in the world.

The operation attracted immediate attention and Bassini's Clinic in Pavia become the Mecca of Surgeons both from Italy and abroad who came to witness the operation at the hands of the master. Quickly it spread throughout Europe.

Bassini's operation has recently been strongly criticised because in many cases it has been found wanting. Much of this criticism is undeserved. It is the surgeons who carried it out in unsuitable cases, where it was bound to fail, who should be criticised or, perhaps, even more those surgeons who ignored a fundamental principle introduced by Bassini himself, and for which he deserves great credit; that in operative Surgery the tissues should be cleanly dissected and sutured layer by layer. In the operation for hernia, Bassini insisted that the sutures between the lower border of the Int. Oblique and Transversalis and the inguinal ligament should include the transversalis fascia, because as he pointed out, unless the sutures include the fascia, they cut out and the hernia recurs.

Since the publication of Bassini's and Halstead's papers numerous new operations have been proposed differing from the standard operations of Bassini and Halstead mainly in points of detail and the bibliography of hernia has grown enormously.

Most of these proposed methods have already fallen into oblivion, but from time to time important new principles have been introduced to meet special conditions. Harold Edwards (1943) in his masterly review gives a list which he calls "The Hernia Calendar".

The most important modifications which have been introduced since Bassini and Halsted's papers, fall into three groups:

Group I: *In which autogenous fascia used.*

a) Mc Arthur (1904) uses pedicled strips from the aponeurosis of the External Oblique.

b) Gallie and Le Mesurier (1924) use free strips cut from the fascia lata.

c) Flaps of fascia, free or pedicled, as patches.

Group II: *In which foreign bodies are introduced.*

Mc Gavin (1909) and Cole

use silver filigree.
Maingot sutures with floss silk.
Tantalum gauze.
Mair uses a free strip of skin.

Group III: *Which involve the complete closure by suture of the inguinal canal and the transplantation of the cord elsewhere.* Andrews transplants the cord between flaps of the External Oblique into the subcutaneous tissue and Schmieden pushes the testes and cord through the muscular part of the internal oblique and transversalis and closes the canal completely.

In planning the operative procedure for a hernia, it should be borne in mind that hernias differ from one another. It has already been pointed out that hernia is the result of the concurrences of two sets of factors, the anatomical and the mechanical. Surgery has no direct control over the mechanical factor; its role is the correction of the anatomical factor, in other words of the restoration of the defences of the inguinal canal. The aim of the surgeon in dealing with a particular hernia is to find out in what way the anatomy of the region has departed from normal and to apply the appropriate remedy. It follows, therefore, that there can be no set operation for hernia to be used indiscriminately, but each particular hernia is to be treated by the appropriate procedure. It follows also that many of the statistical tables published which purport to give the results of a proposed operation are of little value unless accompanied by a detailed statement of the type of cases on which it has been carried out.

OPERATION TECHNIQUE

With the exception of special types of hernia only occasionally met with, ordinary hernias can be classified into a) **OBLIQUE** and b) **DIRECT.** These require quite a different operation.

OPERATION FOR OBLIQUE HERNIA

The anatomical defect in the great majority of oblique hernias is the preformed sac and therefore, its complete removal is the first step of the operation, a step which is common to all types.

The second step is to ascertain if the internal inguinal ring has been widened, and to what extent. Three degrees may be recognised. The ring may be widened only slightly, such as occurs in recent hernias in infants and young persons. When the hernia has been of long standing the ring is widened towards the medial side, the fascial floor of the inguinal canal becomes lax and bulges forward giving rise, in extreme cases, to what has been described as an indirect direct hernia. This may be called the second degree. In the third degree which is met with in old standing hernias both the internal and the external rings are widened so that they overlap in part or completely. Such a condition is usually accompanied by some degree of pressure atrophy of the muscles and the inguinal canal has lost all its defences.

The second step of the operation should be the repair of the gap in the endoabdominal fascia caused by the widened internal abdominal ring.

When the ring has been only slightly widened it will be found that the fascia is adherent to the neck especially on its superior and medial aspect, and when the sac is pulled up prior to ligature, a sort of funnel of fascia is pulled up with it. If the transfixing suture is passed through this part, the ligature of the sac will also close the widened part of the ring, and effectively repair the fascia. When the muscles are in good condition and the stump of the sac retreats behind the muscles this is all that is necessary. The external oblique aponeurosis is sutured and the

operation is concluded.

In widening of the second degree the fascia requires closing separately. There are various ways of closing the gap. The most efficient way is by a stitch which may be called the purse string Usuture. The borders of the widened Internal ring are defined, picked up in forceps and a purse string suture is passed through the medial and upper borders. The ends of this suture are passed under the fascia and muscles on the lateral side and brought out through the muscles about one inch from the ring, pulled taut and tied. This ligature takes up the slack so that the fascial floor of the inguinal canal again becomes taut, at the same time the opening through which the cord passes is pulled up under cover of the muscles. If the muscles are in good condition again this is all that is necessary, but in most cases the muscles have undergone some pressure atrophy and in such cases it is well to make use of the cremaster muscle and fascia and to pull them up under the border of the internal oblique by one or two U sutures and then to suture the lower border of the internal oblique to the inguinal ligament so as to extend downwards and inwards its origin from this structure as in the original method of Halsted. In this way adhesion will occur between the superficial layer of the cremasteric fascia and the fascia covering the internal oblique.

In the third degree of dilation where the internal and external rings come to lie almost one on the other, the posterior wall has to be reconstructed in order to restore the obliquity of the canal.

These cases require the original Bassini procedure namely suture of the conjoint tendons and muscles, together with the Transversus Fascia, to the Inguinal ligament deep to the cord with the following additions.

1. The Cremasteric fascia and what remains of the transversus fascia on the lower side of the opening are imbricated under the superior flap of muscles and fascia as in the Halsted operation.

2. The upper flap, consisting of what remains of the conjoint tendon, internal oblique and transversus muscle with the transversalis fascia, are sutured to the inguinal ligament deep to the cord by means of linen or silk sutures and of a strip of fascia from the external oblique as in the Mc Arthur procedure.

3. If, owing to atrophy the upper structures cannot be approximated to the inguinal ligament; a relaxation incision through the anterior layer of the rectus sheath prolonged outward as necessary according to the procedure of Scot and Tanner (1942), is added so as to relieve tension.

4. In extreme cases strips of fascia lata are used but since the relaxation incision has been practised the use of fascia lata strips has become very infrequent.

The imbrication of the cremasteric fascia under the upper flap serves two purposes. First, it provides broad surfaces for union and secondly, by interposing a continuous layer of fascia, it prevents the subperitoneal fat from insinuating itself between the fascia sutures and starting a recurrence. Ordinary sutures are used in addition to the fascial sutures since fascia is slippery and apt to slide in the first four days. The stay sutures take the strain and prevent this sliding until the fascial strips heal. In cases of large hernias in elderly people it is of advantage to remove the testicle and cord and to obliterate the canal completely.

DIRECT HERNIA

The anatomical factor which, usually, is responsible for a direct hernia is a maldevelopment of the Internal oblique and transversus muscles which, in their lower edge, are aponeurotic rather than muscular and inserted in the outer border of the rectus sheath. The conjoint tendon is poorly developed or even non existent; and the fascial posterior wall of the inguinal canal, between the internal ring and the pubic spine its deprived of its muscular support

and bulges out. As already pointed out the giving way occurs at the extreme lower border just bove the inguinal ligament.

The surgical problem in such cases is to reattach the lower border of the fascia. Experience shows that simple suturing fails in many cases and something more is necessary to make the re-attachment permanent.

The following procedure has been adopted and has given satisfactory results:

OPERATION FOR DIRECT HERNIA

When the external oblique aponeurosis has been split and the cord retracted down, the protrusion is defined and held up by two Allis forceps. The fundus is split in the direction of the inguinal canal so as to fashion two flaps; an upper (cephalad) and a lower (caudad).

The peritoneal sac, which usually is covered by a considerable amount of fat and which often has the bladder on its medial side, is lifted up and unless it is small, is removed with the fat that covers it, the bladder having been previously separated. The opening is closed by a purse string suture introduced previous to the excision. The lower flap, usually thin and flimsy, is imbricated under the upper flap by mattress sutures. The upper flap, after trimming when necessary, is then sutured to the lower edge of the inguinal ligament by silk or linen sutures and also by fascia according to the McArthur or the Gallie technique. In this manner the lower flap which often is so thin that it will not hold sutures is used to cover the gap with a continuous layer of fascia, which effectually prevents the subperitoneal fat from insinuating itself between the sutures and starting a recurrence; at the same time providing broad fascial surfaces for union as pointed out in describing the operation for large oblique herniae.

The passing of the fascial sutures in the Mr. Arthur technique is rendered easy by the use of a special fascia carrier, made for me by Down Bros. of London in 1929. It is a modification of the ordinary ligature carrier, with jaws having the size and shape of a large Gallie needle when closed, serrated at the tip with a catch on the shanks. The point is non-cutting. The instrument is introduced closed, and when through, it is opened just enough to grasp the end of the strip of fascia which is then easily pulled through. The end of the strip is passed under the last stitch, doubled back and fixed with a silk suture. The advantage of using the instrument is that the strip of fascia can be utilised up to the last fraction of an inch. To avoid tension a relaxation incision is used.

The second type of direct hernia which has been called the funicular type and which consists of a protrusion of fat through a hiatus in the fascia transversalis; is treated by isolation of the protruded fat, its ligature and excision. When the stump is reduced the margins of the opening appear. The opening is closed by imbricating the edges on the lines of the Mayo operation for umbilical hernia.

SLIDING HERNIA

Sliding hernia presents a compliplicated problem. The presence of bowel adherent to or incorporated in the wall of the sac is an obstacle to the procedures described. Moreover, the presence of a sliding hernia indicates that the defences of the inguinal canal have broken down completely. The sac can be dealt with in one of two ways. When the segment of gut, incorporated in the wall of the sac is not large, the sac wall is divided a short distance from the bowel on either side, right down to the neck: the two flaps thus formed are sutured behind the bowel so as to cover with peritoneum the raw surface. The bowel is then reduced and the sac dealt with by ligature and excision. The stump is transplanted under the muscles.

If the slide is large the best way of dealing with it is to open the peritoneal cavity by a separate incision through the lower part of the rectus sheath, pull up

the bowel from above, thus everting the sac in the peritonel cavity when it becomes the mesentery of the sliding bowel and fix it to the region of the wound so as to keep it away from the neighbourhood of the ring during healing.

In both instances the canal is reconstructed as in large hernias. These cases require fascial sutures and in elderly people with large hernias it is wise to excise the testicle and cord and close the canal completely.

It is not possible to provide statistical support for the operations described for which no claim for originality is made. They have been in use since 1929. In 1939 when time was ripe for a follow up World War II broke out and in 1940 the siege caused about a scattering and a redistribution of the population which made a later follow up impossible.

The only indication of the efficacy of the procedures described that can be given is the very low recurrence rate. With an average of 400 to 500 operations a year not more than 1 or 2 recur. It may be objected that this is not a reliable index because patients with recurrent hernia may not, and often do not return to the same surgeon. This, however, does not apply to Malta because the Government hospital draws its patients from the poorer section of the community who have nowhere else to go if the hernia recurs.

No originality is claimed for the methods described.

It is emphasized that hernias differ in their anatomy and in the way they are formed and that for each case an appropriate procedure is to be adopted with the ultimate aim of removing the sac and of restoring the defences of the inguinal canal which prevents recurrence.

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Extracts From A Report On The 5th General Assembly Of I.F.M.S.A. In Belgrade

A delegation of the Malta Medical Students' Association attended, for the third time, the General Assembly of the 'International Federation of Medical Students' Association', which was held in Yugoslavia in August 1956. The three delegates representing the M.M.S.A. were Mr. Peter Fenech B. Pharm, President of the Association and leader of the delegation; Mr. John Mangion B.Sc., B. Pharm., Hon. Treasurer, and Mr. Vincent Mansueto, B. Pharm. A big share of the expenses was financed by the Government of Malta, whilst the remainder was chiefly made good by the M.M.S.A. itself.

The Ceremonial Opening took place under the presidentship of Professor Milurin Neskovic, Dean of the Medical Faculty who warmly welcomed all the delegates to Belgrade and wished I.F.M.S.A. much fruitful work. Other speakers were Mr. Moberg, I.F.M.S.A. President and Mr. Katalinic, chief organizer of the Assembly and President of the Medical Students' Section of Belgrade.

After the adoption of the Agenda, the Assembly passed to the election of three members to form the Credentials Committee. The three individuals elected were Mr. E. Goldschmidt (Denmark), Mr. D. Sutherland (Great Britain), and our own Mr. Peter Fenech.

In the discussion which followed on changes in the Constitution, Clause 14 as recommended by the Executive Board Meeting in Berlin last March, was carried by 35 votes in favour and 6 abstentions. With regard to Clause 5, which dealt with the distribution of votes, the Malta delegates spoke at length on the matter, and in the end the recommendation of the Berlin Executive Board Meeting 'that Clause 5 of the Constitution regarding the allocation of votes should not be changed' was adopted by 24 votes in favour, 19 against and 2 abstentions.

The most important work of the I.F.M.S.A. is the exchange of medical students and hence the report prepared by the Subcommittee for Professional Exchange (SCOPE) — Yugoslavia — took quite a lot of discussion. SCOPE publishes yearly a pamphlet called 'HOW TO GO ABROAD' which is distributed to all I.F.M.S.A. member nations. This pamphlet contains a list of all clinical posts available throughout the year, which may be applied for by any medical student. During the past year, the M.M.S.A. has actively participated in this Exchange. Ten foreign students did a clinical clerkship at St. Luke's Hospital, while a number of Maltese medical students underwent clinical clerkships abroad in various European Hospitals. During the long discussion on SCOPE, the Yugoslavs proposed an amalgamation of the functions of SCOPE and SCOP (Standing Committee of Publications). Mr. Mansueto spoke against the proposed fusion, and it was then proposed by Malta, seconded by Holland, that the Working-Programmes of SCOPE and SCOP should not be changed but should remain as outlined in the general regulations. This was carried with 34 votes in favour, 4 against and 2 abstentions.

The report presented by Mr. Fenech about the local Association's activities during the past year, was very well received and everybody congratulated the Maltese delegates on a successful year. It was no surprise, therefore, that on the final day of the Assembly, the M.M.S.A. was unanimously elected to take charge of SCOPE. Mr. Fenech delivered a speech of thanks, and stated that the Malta Association would do its very best to discharge its responsibilities in this most difficult task. It is sincerely hoped that financial considerations will not hinder our work.

It is understood that an International Congress on Student Health is to be held in February 1957 in Paris, and we sincerely hope that the local Health authorities will give careful consideration to any recommendations which will be forthcoming from this Congress.

An extensive European tour will be undertaken by twelve African medical students under the African Study Tour programme organized by the Norwegian Medical Students. These students are expected in Malta in June 1957.

The General Assembly reiterated the decision taken at Rome and Amsterdam to dissociate itself from the International Union of Students and not to recognize or associate with the Medical Faculty Bureau of this body.

The report also pays tribute to the Yugoslav Medical Students' Association for their excellent organization of the Assembly; to the Yugoslav people for the friendliness and courteousness which they displayed at all times; to the Town People's Committee and the Federal Executive Council and the Yugoslav Union of Students. We are sure that our delegates will always cherish the wonderful memories of their visit to Yugoslavia.

In the final analysis it may be said that the sending of a delegation of Medical students from Malta to the I.F.M.S.A. General Assembly has proved to be fruitful in more ways than one: for the great wealth of information obtained; for the relations established with other medical schools; for the innumerable opportunities made available to our medical students to gain hospital experience abroad; and for the way in which Malta took her place in an International gathering. It is evident enough that the Malta Medical Student's Association has made a good impression on the other I.F.M.S.A. members as a whole, otherwise one could not possibly explain the fact that in three years as a member, the M.M.S.A. was first elected to the Executive Board in 1955, and now has been unanimously elected to SCOPE. Wholehearted thanks should go, above all, to the Maltese Government for paying all travelling expenses, and to the M.M.S.A. itself for financing the trip. The help being extended by the Government is a sure sign that the Association deserves the utmost confidence.

This report which bears the signature of Mr. Peter Fenech, B. Pharm, President of the M.M.S.A. was acknowledged with thanks at the Council Meeting held on the 14th September, 1956.

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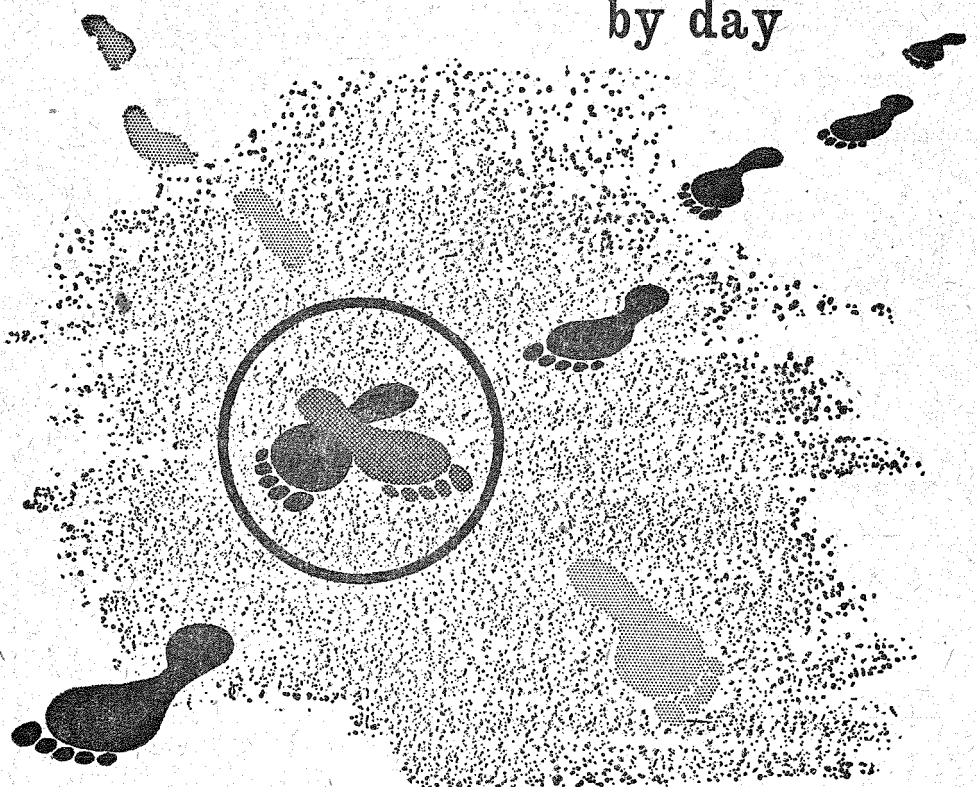

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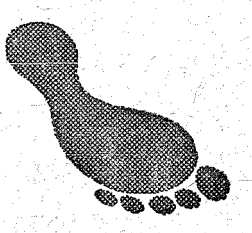

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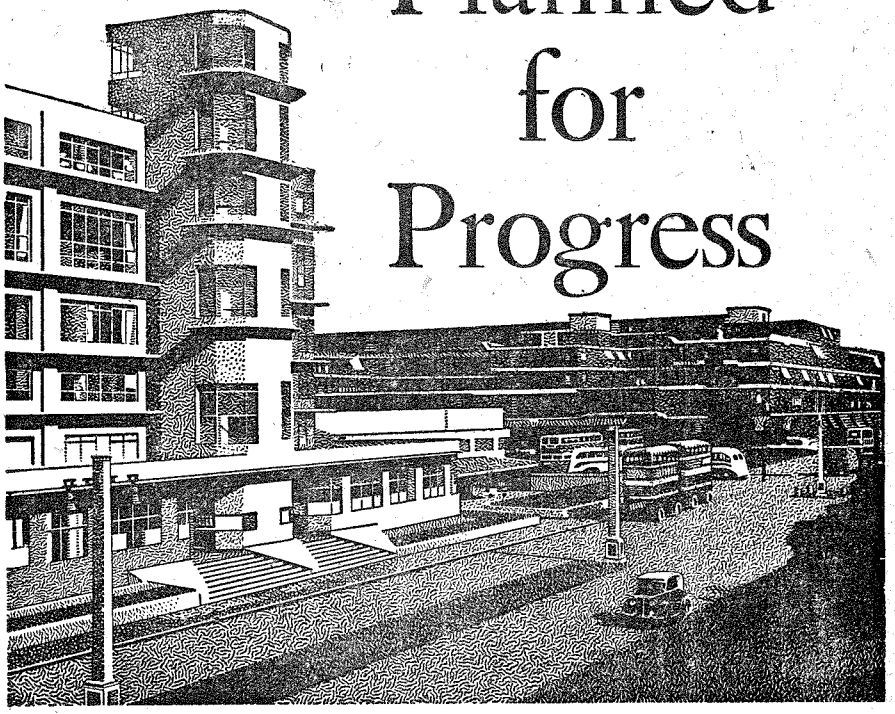

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NOTES ON THE RHESUS FACTOR

by F.T. PULLICINO, M.D.
Blood Transfusion Officer, St. Luke's Hospital.

It had long been suspected that a number of transfusion reactions was due to some specific difference in blood other than the ABO system, for in spite of careful laboratory technique, reactions continued to occur in some cases. Another distinct clinical condition which baffled clinicians was that which affected the infant of parents both of whom were healthy and showed no sign of disease. These two problems were solved when in 1939 LEVINE observed a severe reaction following a transfusion to a woman recently delivered of a macerated foetus. He discovered that the mother's serum agglutinated the cells of only 85% of ABO compatible bloods. It was suggested that the foetus inherited a dominant factor from the father which was absent from the mother, with resulting immunization of the mother to this factor. The factor was designated "the Rhesus factor" since it was similar to that produced by immunization of rabbits with the cells of Rhesus monkeys. Individuals reacting with the serum were designated Rhesus positive, the remainder, Rhesus negative.

Isoimmunization may be defined as the formation of immune anti-bodies by a member of a given species against some antigen absent from its own body but present in that of another member of the same species. In practice it can occur in one of two ways; either by introducing the antigen by transfusion of blood, or by its passage from foetus to mother through the placenta. The fundamental difference between the ABO and Rh systems is that, whereas in the ABO system antibodies are naturally occurring, in the Rhesus system they are only found following immunization.

CLINICAL ASPECTS

I. *BLOOD TRANSFUSION.* Any Rh negative person may form antibodies following the transfusion of Rh positive blood. The response to such a stimulus varies in different individuals, and, whereas some may show no response, others may form antibodies after a single stimulus. One large transfusion may not be a stronger stimulus than several small ones; in fact, spaced transfusions, whether large or small, are more potent stimuli, so that when the antibody production is of sufficient strength, a further transfusion will result in a haemolytic reaction of varying severity ranging from a mild and almost inapparent reaction to the severe ones the features of which include haemoglobinuria, collapse, and renal failure.

II. *PREGNANCY.* Two factors determine the degree of isoimmunization. Firstly, a number of previous pregnancies are usually required before sufficiently potent antibodies can be found in the mother to affect her foetus. It must be remembered that an Rh — ve mother who has had a blood transfusion of Rhesus positive blood may not require these extra stimuli from pregnancy and in her instance a first-born may be affected with haemolytic disease.

Secondly, there is an unknown factor governing the degree of susceptibility of the mother to a stimulus. Some do not react at all, even after many pregnancies, while others respond more quickly so that even a second infant may be affected. Once isoimmunization starts, however, the potency of the antibody increases with each subsequent stimulus and the condition becomes more severe at each pregnancy. Fortunately it is unusual for the first two infants to be affected, although it should

be remembered that abortions are a potential source of stimulation.

The method of forcasting whether a foetus whose mother has anti-bodies in her serum is likely to be affected by haemolytic disease is by titration of the antibodies during pregnancy. When occurring for the first time, antibody is not detected before the fifth month at the earliest; should it be found earlier the inference is that a previous pregnancy or transfusion has stimulated it, and a rising titre or antibody towards the end of the pregnancy would suggest that the foetus is immunizing the mother. Should the titre remain unchanged throughout the pregnancy the probability would be that the foetus, like the mother is Rhesus negative, the father being heterozygous. The importance of routine ante-natal serological tests should not be overlooked.

The effect of sensitization of the mother is shown by damage to the Rhesus positive cells of the foetus. The clinical effect will be either hydrops foetalis usually with intra-uterine death or icterus gravis neonatorum in which the infant is born at term but shows the effects of varying degrees of haemolysis. The main clinical features are enlargement of the spleen and liver, jaundice and anaemia, while the blood smear will show a number of immature cells. Increase in jaundice will lead to kernicterus which if not fatal, will cause irreversible cerebral damage. The final diagnosis is clinched by the Coomb's Test which is specific and establishes whether the infant's cells are coated with antibodies.

The *treatment of haemolytic disease of the newborn* is based on prematurity, strength of Coomb's reaction, presence of immature cells, a history of severe haemolytic disease in a previous sibling and the cord haemoglobin concentration. This last is probably the safest factor to go on, and an infant with a haemoglobin of 16G per 100cc is less likely to require treatment than is one with a haemoglobin of 11G. A sample of cord blood should be taken in all cases in which there is any suspicion that an infant may be affected.

Treatment of choice is Exchange Transfusion in selected cases, the volume of blood given is 60cc per lb. of loosely packed cells.

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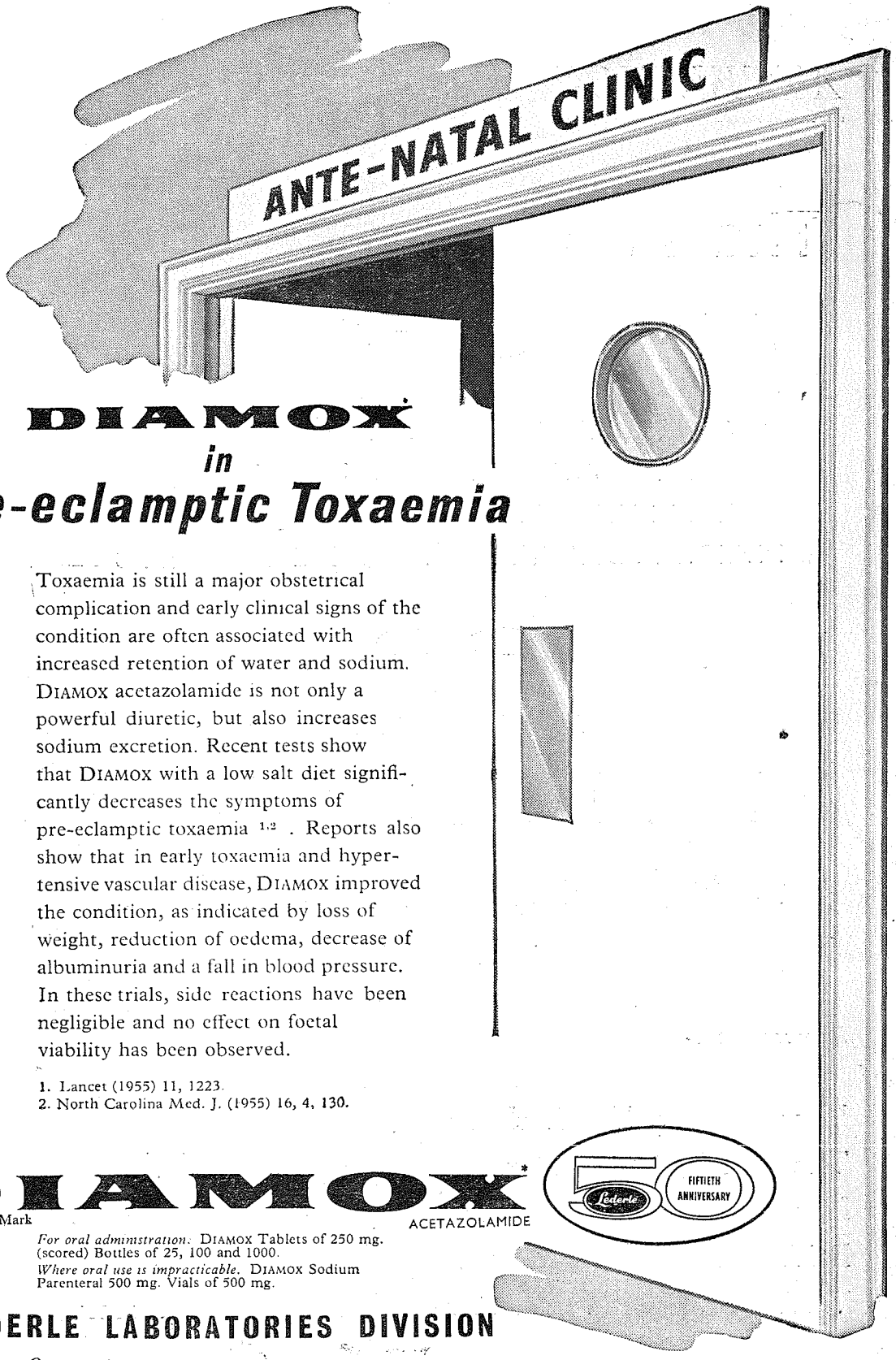

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1. Lancet (1955) 11, 1223.
2. North Carolina Med. J. (1955) 16, 4, 130.

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