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In the interests of uniformity, the following directions should be followed by all contributors to the Journal.

Manuscripts should be typewritten on one side only, of good quality quarto sized paper, be double spaced and with a 1½in margin. They should bear the author's name (male authors give initials, female authors one given name), address, and (if this is different), the address of the laboratory where the work was carried out. The manuscript should take the following form: Introduction; materials and methods; results; discussion and conclusion; summary; acknowledgments; references. Carbon copies are not acceptable. Nothing should be underlined unless it is necessary that it be printed in italics.

ILLUSTRATIONS. Graphs and diagrams are termed 'figures' and should be numbered in the order of their appearance in the text. Figures should be drawn in Indian ink on stout white paper larger than required for the text. Legends to the figures should be typed separately and attached. Illustrations, particularly half tone blocks, should be sparingly used. Half tone blocks are referred to as 'plates' and these again are numbered in sequence and the captions are typed and attached. Elaborate tables should be kept to a minimum but any necessary tables should be typed on separate sheets of paper and numbered in roman numerals.

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1. Steiner, R. F. and Beers, R., "Polynucleotides", Elsevier, 1961, p. 374

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Ribonucleic acid 'core' Hilmoe, R. J., *J. Biol. Chem.*, 1960, **235**, 2117

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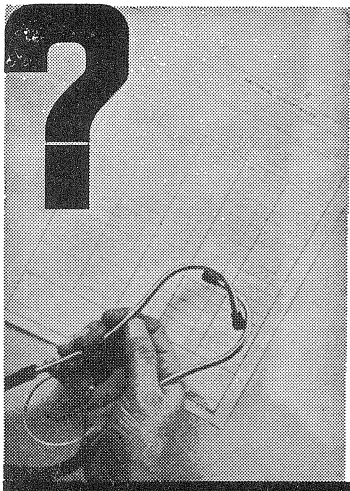

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THE NEW ZEALAND JOURNAL OF MEDICAL LABORATORY TECHNOLOGY

VOLUME 18. No. 2. JULY, 1964.

The Journal is published thrice yearly (in April, July and October) and is distributed without charge to all financial members of the N.Z.I.M.L.T. (Inc.). Subscription to the Journal for non-members is ten shillings per year or four shillings per single issue postage paid.

Communications primarily concerning the Institute should be addressed to the Secretary.

Intending contributors to the Journal should address their communications to the Editor at the Department of Pathology, Medical School, Dunedin. Copy must be in the hands of the Journal Committee by not later than the first of the month preceding the month of publication.

Enquiries regarding advertising rates should be addressed to the Advertising Manager at the Microbiology Department, Medical School, Dunedin.

Contributions to the Journal do not necessarily reflect the views of the Editor, nor the policy of the Council of the Institute.

A Question of Responsibility

In delivering the verdict of a recent inquest, a coroner has focussed attention on the need for the adoption of a flawless system of identifying patients when taking blood samples. If this fact was not apparent to us before, it certainly should be clear enough now. Every one of us who is concerned with the collection of blood specimens or responsible for the training of those who are, is under a solemn obligation to act on the lesson taught by the circumstances of the case in question. Hospital Boards will have received recommendations on this subject from the Department of Health, but how soon will these be acted upon? And for how long afterwards will their effect prevail? The use of identification bracelets may seem like the final answer to the problem. It is not, as anyone who has much experience of them will testify. To restrict their use to surgical wards is to increase their fallibility. What is needed is a simple system of interrogation to be rigidly followed by persons responsible for drawing blood samples. Its terms need to be constantly in sight to prevent the development of any laxity. To this end, a suggested scheme has been included in this issue of the *Journal*. It has been printed on a page that can be torn out without spoiling the journal, and it is hoped that it will be so torn out and placed in a prominent position on the wall of every laboratory.

There is one further lesson to be learnt from the published verdict of the same inquest. It is that if a Hospital Board tries to protect the interests of its employees by safeguarding them from making incriminating statements to the police investigating the death of a patient, it makes itself liable to an accusation of obstruction. It is worthwhile bearing in mind that if a patient dies, either directly or indirectly as the result of an error of omission on the part of a medical laboratory technologist, criminal proceedings may follow. If an unguarded admission should be made to the police who come to search into the facts on behalf of the coroner, it will be faithfully recorded—though not necessarily in context—and will be woven into a web of evidence that may be used to accomplish the public downfall of the hapless technologist. The awful knowledge of having been implicated in the death of a fellow human being, not to mention the possibility of civil litigation, is an exacting punishment without the additional threat of having to face the rigours of the law. Punishment is supposed to be a deterrent to crime, but is an honest mistake, made through ignorance, a crime? And can you deter a person from making such a mistake by brandishing the mailed fist? Each of us must be additionally careful in the future to avoid tragedy.

We must do it because we honour the trust the patient puts in us, not because of the threat of being charged with criminal negligence. A realisation of the ways in which these mistakes occur is the best safeguard against carelessness. Clinical staff and a good many people who ought to know better may think we are unreasonable if we insist on being told Christian names instead of initials, if we implacably reject specimens that are incorrectly or imperfectly labelled, but this is a game in which we simply must play safe. Ignorance is the enemy that has to be overcome — our own and that of others. Tragedy need never strike again if we all play our part, but, if it does, it will be a comfort if we can know that our employers will be as zealous in our protection as was the Hospital Board in the present case.

J.C.

Medical Laboratory Technologists Board

The following communication has been received by the Secretary of the Institute from the Department of Health:—

Further to our previous correspondence on this subject, I am writing to advise that the Minister of Health has now approved of the establishment of a Medical Laboratory Technologists Board to comprise:—

(1) Dr J. P. Kennedy, Deputy Director, Division of Hospitals, as chairman.
(2) The Director of the National Health Institute (Dr J. D. Manning).
(3) Three nominees of the N.Z. Society of Pathologists.
(4) Three nominees of the N.Z. Institute of Medical Laboratory Technology.

As indicated earlier, the Board's function will be to act as an examining and advisory authority to the Director-General of Health in relation to:—

(1) The duration and syllabus of the courses for the Certificate of Proficiency and Intermediate Examinations.
(2) The pre-requisite qualifications of trainees and the supervision of training.
(3) The conduct, time, place and form of these examinations.
(4) The appointment of examiners.
(5) The publication of examination results.
(6) The recognition of equivalent qualifications.
(7) The recognition of training laboratories.

Yours faithfully,
H. B. TURBOTT,
Director-General of Health.

A further communication, dated May 8, 1964, reads:

I am writing to advise that the Medical Laboratory Technologists Board has now been established with the following membership:

Dr J. P. Kennedy (Chairman)	Dr T. H. Pullar
Assoc. Prof. N. P. Markham	Mr H. Bloore
Dr W. S. Alexander	Mr G. McKinley
Dr J. D. Manning	Mr L. Reynolds

These members have been officially advised of their appointment.

Yours faithfully,
J. P. KENNEDY,
for Director-General of Health.

The Determination of Serum Calcium Using the E.E.L. Flame Photometer

B. McLEAN and I. H. SYMONDS, B.Sc., A.N.Z.I.M.L.T.

c/o Drs Lynch, O'Brien and Desmond, Kelvin Chambers, 16 The Terrace, Wellington.

(Received for publication February, 1964)

Introduction

The classical method of serum calcium determination by oxalate precipitation and permanganate titration has the following disadvantages: a large volume of serum is required, permanganate solutions are unstable, and the technique of repeated washing and centrifugation is tedious.

Calcium estimation using the E.E.L. flame photometer according to the method of Powell[2] was found, by us, to be unsatisfactory. Butterworth[1] describes a method with the same instrument using 0.2ml. of serum, in which the calcium oxalate is dissolved with sulphuric acid. In our experience, this is superior to the use of periodic acid as in Powell's method. Butterworth also adds iso-propyl alcohol and uses high air pressure to aid atomisation and combustion.

By using 0.5 ml. of serum and spraying a final volume of 4 ml., we obtained higher readings than Butterworth and, hence, greater accuracy. This minor modification also made the method quite satisfactory for routine use.

Reagents are those described by Butterworth:

1. *Ammonium oxalate*: A saturated solution diluted 1 in 5 with distilled water.
2. *Sulphuric acid 0.5N.* 14 ml. of concentrated sulphuric acid is made up to 1 litre with water.
3. *Iso-propyl alcohol*: 20% v/v in distilled water.
4. *Stock calcium standard*: 250 grams of dried calcium chloride (A.R.) is dissolved in 150 ml. of 0.5N H_2SO_4. Boil to remove carbon dioxide. Cool and transfer to a 500 ml. volumetric flask, washing in with a further 200 ml. of 0.5N H_2SO_4. Add 315 mg. of oxalic acid (A.R.) dissolved in a minimum volume of distilled water, followed by 150 ml. of 0.5N H_2SO_4. Make up to volume with distilled water.
5. *Working calcium standard*: The stock solution is diluted 7 volumes to 100, 10 volumes to 100 and 13 volumes to 100 with 0.5N H_2SO_4. (5.0 ml. of these solutions in a final volume of 8.0 ml. corresponds, respectively, to 7 mg., 10 mg. and 13 mg. per 100 ml. of calcium, where 0.5 ml. of serum is used.)

Method

1. Into a 15 ml. centrifuge tube measure 0.5 ml. serum and 1.0 ml. of ammonium oxalate solution.
2. Allow to stand for at least 1 hour or overnight.
3. Centrifuge at 3,000 r.p.m. for 10 minutes.
4. Pour off supernatant and place tubes upside down on filter paper to drain for five minutes.
5. Wipe out excess fluid from the tubes with filter paper.
6. Add 2.5 ml. 0.5N H_2SO_4 to each tube and place in a boiling waterbath briefly, to dissolve the calcium deposit.
7. Cool and add 1.5 ml. of 20% iso-propyl alcohol to each tube. to give a final volume of 4.0 ml.
8. Prepare final standards as follows:

	7 mg.	10 mg.	13 mg.	Blank
Working standard solutions	5 ml.	5 ml.	5 ml.	Nil
0.5N sulphuric acid	Nil	Nil	Nil	5 ml.
20% isopropyl alcohol	3 ml.	3 ml.	3 ml.	3 ml.

9. The flame photometer is adjusted according to the manufacturer's instructions, except that an air pressure of 16-18 lb per sq. inch is used. The sensitivity control is set to near maximum and the scale set at zero, spraying the blank solution. The 10 mg. standard is sprayed and can be set at a reading of 50 by adjusting gas and air pressures, checking the blank after any alterations. Linearity of response is checked by spraying the 7 mg. and 13 mg. standards. The unknown solutions are then sprayed and the readings noted. Addition of a further 10 scale divisions with glass ink in the region 40-60 gives 20 divisions over this area, making it easy to read to 0.5 of a division.

The 10 mg. standard reads 50, therefore reading of test multiplied by 0.2 gives the calcium level in mg. per 100 ml. The added scale divisions. therefore, make it possible to read to within 0.1 mg. per 100 ml.

Results

Tests have been run in duplicate for several months, and the reproducibility was found to be ± 0.15 mg.

Known standard sera with values of 7, 10 and 12.5 mg. per 100 ml. were treated similarly, a series of 20 giving a reproducibility of ± 0.1 mg. per 100 ml.

A comparison with estimations using a permanganate titration method was not possible on a large scale because of the large volume of serum required, although good agreement was shown in the few run in parallel.

Five recovery experiments were carried out and the average recovery found to be 97% of the calcium added.

Conclusions

The main advantage of the procedure described, over that of Butterworth, is the greater sensitivity produced. In our hands, the method proved more reliable and accurate than the permanganate method. Losses through washings are obviated, and the stability of the reagents is not a factor in the calculation of experimental error.

Errors in the method given may be encountered when the instrument is not functioning perfectly. This will be shown when, on spraying the 10 mg. standard, the galvanometer cannot be set at 50 on the scale. Partial blockage of the atomiser is the usual cause of such trouble.

The method is satisfactory for urinary calcium estimations using the same volumes of reagents and urine as for serum estimations.

Summary

A modification of the method of Butterworth has been described for the determination of serum and urinary calcium by flame photometry, using the E.E.L. flame photometer. Results obtained show a good degree of accuracy and reproducibility. Some potential experimental errors inherent in the potassium permanganate titration method are avoided.

REFERENCES:

1. Butterworth, E. C. (1957), *J. clin. Path.*, **10**, 379.
2. Powell, F. J. N. (1953), *Ibid.*, **6**, 236.

A Survey of Red Cell Indicator Systems for the Staphylococcal Anti-alpha-Haemolysin Test

B. F. DAWKINS, A.N.Z.I.M.L.T.
Central Laboratory, Auckland Hospital.

(Received for publication April 1964)

Introduction

Although rabbit red cells are the most favoured for indicating the presence of staphylococcal anti-alpha-haemolysin in human serum, sheep and human red cells have also been recommended* for use. As the former are difficult to obtain at times in some laboratories, the suitability of any one of these cell systems would be an advantage. Thus, a comparison study was undertaken to correlate their sensitivities.

At the same time, the usual technique using 0.5 ml. quantities (*e.g.*, Lack and Towers, 1962[1]; Towers and Gladstone, 1958[3]; Lack and Wailling, 1954[2]) was modified to employ only five-drop amounts. This was to facilitate the collection of blood samples, as a large number were from young children and sufficient serum was often difficult to obtain. In the 'micro' screen test employed, only 8 drops of serum were required, as opposed to 0.9 ml., or more, when using the 0.5 ml. 'macro' technique. This small amount of serum allows for capillary collection if necessary.

During the survey, agglutination of red cells was noted in the great majority of serum controls—and test dilutions where there had been some neutralisation of toxin. The normal settling pattern of cells, such as one would expect after standing for one hour, was infrequent; and, in addition, agglutination was evident only when sheep or rabbit cells were employed. Thus, an absorption series was also carried out to determine the effect of removing the heterophile antibody from the test serum.

All sera tested were from established or suspected osteomyelitis cases in Middlemore Hospital, Auckland.

Materials

1. *Staphylococcal alpha-haemolysin (Dried)***
   Reconstituted initially by the addition of 10 ml. of sterile peptone water and stored at 4° C. for periods up to two months (provided no bacterial contamination is evident). Immediately before use, a working strength is obtained by diluting the stock in physiological saline to contain 2 units equivalent/ml.

* See directions circular supplied with Staphylococcal *a*-haemolysin (dried) of the Wellcome Research Laboratories, Beckenham, England.
** Wellcome Research Laboratories, Beckenham, England.

2. *Positive control serum* of known staphylococcal anti-α-haemolysin strength. This is inactivated and stored at —20° C. in small quantities.
3. *Red blood cells.*
   Sheep, rabbit and human red cells are collected in Alsever's solution. Alternatively, all cells can be put in a sterile glass bottle and defibrinated.
4. *Patient's serum* is inactivated by heating at 56° C. for 30 minutes.
5. *Pasteur pipettes* calibrated to deliver 30 drops/ml.

Methods

A. *Macro.* Using 100 x 10 mm. test tubes.

Titrate serum in 0.5 ml. quantities in saline, and add 0.5 ml. of staphylococcal α-haemolysin (working dilution). Stand at room temperature for thirty minutes, add 0.1 ml. of freshly prepared 10% red cell suspension, mix and incubate at 37° C. for one hour.

Centrifuge in order to read the end-point, which is the tube showing 50% haemolysis; the unit value being the reciprocal of that dilution.

Positive serum, staphylococcal α-haemolysin, test serum, and red blood cell controls are put up simultaneously.

B. *Micro.* Using 75 x 8 mm. test tubes.

(All quantities are expressed in drops.)

Serum dilution	1/2	1/4	1/6	1/8
Physiological saline	5	5	5	5
Inactivated test serum	5	—	1	—
Dilutions 1/2, 1/4 and 1/8 are completed by mixing and progressively transferring in 5 drop quantities; dilution 1/6 by mixing and then discarding 1 drop.				
Staphylococcal α-haemolysin (working dilution)	5	5	5	5
Mix. Stand at room temperature for 30 minutes.				
Red blood cells (10% suspension)	1	1	1	1

Incubate in 37° C. water bath for one hour and then read as for 'macro' method.

Controls	*Test serum*	*Staphylococcal α-haemolysin*	*Red blood cells*
Physiological saline	8	5	10
Inactivated test serum	2	—	—
Staphylococcal α-haemolysin	—	5	—
Red blood cells	1	1	1

The positive serum control is diluted to the appropriate range using 5 drop quantities.

For sera giving titres greater than 8 units, a more complete titration is done with 2-unit increases.

A positive test was considered to be one which showed no more than 50% haemolysis in a dilution of 1/2 or greater.

C. *Absorption.*

Equal quantities of either rabbit or sheep washed, packed red cells were added to inactivated test serum. This mixture was allowed to stand for one hour at 4° C., centrifuged rapidly and the serum removed without delay. The sera were then tested using either rabbit or sheep red cell indicator systems, according to which cells were used for absorption.

Results

Comparison of macro and micro techniques (Rabbit cells)

Table I shows the correlation between the macro and micro techniques using a rabbit cell indicator system. In both positive and negative titres, no significant individual variation was observed between the macro and micro techniques, provided the two were done simultaneously. Small variations were noted when different rabbit cells and/or α-haemolysin were used while testing the same specimen, but not to the extent of altering the interpretation of the result.

Number of Sera Tested	Positive	
	Macro	Micro
130	23%	23%

Table I. Comparison of macro and micro techniques.

Comparison of rabbit cell and sheep cell titrations

Each comparison titre was carried out at the same time, the only variation being the species of red cell employed. Of the 44 (31%) sera found positive by sheep cells, 10 were negative when absorbed serum was substituted (see under 'Absorption Experiments').

The results of the comparison are seen in Table II.

Indicator System	Number of Sera Tested	Positive
Rabbit red cells	140	24%
Sheep red cells	140	31%

Table II. Comparison of rabbit and sheep cells used as an indicator.

Human red cell titrations

As all the above 140 sera tested with human cells were positive, the sera of 100 blood donors were titrated on three occasions for staphylococcal anti-α-haemolysin, using group O

human red cells. Two techniques were employed, one as described in 'Methods,' and the other as given in the directions circular accompanying the *Wellcome* Brand Staphylococcal α-haemolysin (dried).

Haemolysis could not be detected in any serum at a dilution of 1/2 or 1/4, and only partially at 1/6 and 1/8. In addition, the toxin control was slow to haemolyse. The same sera were tested with human red cells collected in acid-citrate-dextrose, and also defibrinated with glass beads, but gave similar results.

Simultaneous testing of the same 100 sera with rabbit and sheep cells gave complete haemolysis in all dilutions.

Absorption Experiments

The following scheme was enacted in order to establish the optimum time and temperature for maximum absorption of species antibodies.

Sheep cell absorption

Thirty blood donor sera were titrated against washed sheep cells in a similar way to the anti-α-haemolysin test. All sera agglutinated to a dilution of 1/8, and approximately 15% of them to at least 1/16.

The absorption was carried out by mixing equal quantities of cells and serum, and standing at 37° C. (waterbath), room temperature, and 4° C. (refrigerator) for periods of 2 hours, 1 hour, 30 minutes and 15 minutes.

The absorbed sera were titrated as above and, after their respective incubations, were checked for agglutination.

Periods of 15 and 30 minutes gave fairly complete absorption at room temperature and 4° C., but 37° C. was not very efficient. After 1 hour, absorption was reasonably complete at all temperatures, and after two hours it was quite complete. The least efficient temperature was 37° C., while room temperature and 4° C. did not produce significantly different absorption.

Rabbit cell absorption

An identical scheme was carried out as above. All sera gave agglutination to at least 1/16. The optimal time periods and temperatures were found to be as for sheep cells.

Absorption Results

In none of the absorbed sera was the presence of species antibody evident by agglutination, as shown when the corresponding non-absorbed serum was tested. As three positive specimens were decreased in titre by more than two units after absorption, an attempt was made to elute the adsorbed antibody from the respective cells. From two of these eluates it was possible to demonstrate the presence of a small amount of anti-α-haemolysin.

Rabbit cell series

With the simultaneous testing of absorbed and non-absorbed sera, 34 (24%) of the non-absorbed sera were positive. Twelve of the 34 were weaker when absorbed (a reduction of two units or more), and six were negative. These six negative sera were all from diagnosed cases of osteomyelitis and had given a titre of 2 units with non-absorbed sera. (See Table III.)

Number of Sera Tested	Positive	
	Non-absorbed sera	Absorbed sera
140	24%	20%

Table III. Comparison of absorbed and non-absorbed sera using rabbit cells.

Sheep cell series

Of the 40 (33%) non-absorbed sera positive, 23 were weaker when absorbed. Fourteen of the 23 which had given a titre of 2 units previously, were negative after absorption; and 10 of them were also negative when tested with rabbit cells. If these ten sera are considered negative, then a total of 30 (25%) non-absorbed sera were positive. See Table IV.

Number of Sera Tested	Positive	
	Non-absorbed sera	Absorbed sera
120	33%	25%

Table IV. Comparison of absorbed and non-absorbed sera using sheep cells.

Comparison of rabbit cell and sheep cell titrations (absorbed sera).

The results are seen in Table V.

Indicator System	Number of Sera Tested	Positive
Rabbit red cells	145	20%
Sheep red cells	145	25%

Table V. Comparison of rabbit and sheep cell titrations on absorbed sera.

As an additional 4% of the sera in the rabbit cell series were positive (2 units) when non-absorbed sera were tested, it could be presumed that the staphylococcal anti-α-haemolysin was absorbed by these cells and thus the two cell systems would correlate.

Conclusions

1. Rabbit red blood cells were found to be the most suitable for the detection of staphylococcal anti-α-haemolysin in human sera when a commercially prepared α-haemolysin

is used. Sheep cells can also be employed, providing the particular batch is suitable, *i.e.,* one in which haemolysis will occur rapidly in the presence of the α-haemolysin (Unsuitability occurred more often than not in this study).

2. Human cells proved to be unsatisfactory in that the α-haemolysin would not haemolyse them efficiently.*
3. Absorption of the serum by the respective cells would have solved the problem posed by naturally-occurring species antibodies, but this was not practicable by the technique tried without also removing some of the anti-α-haemolysin.
4. The transition from a macro to a micro technique met with no problems, as the comparison figures reveal. When a large number of tests are to be performed, it is quite simple to utilise a 1 ml. graduated delivery pipette to deliver the 5 drops of α-haemolysin by marking 0.167 ml. graduations (*i.e.,* 6 volumes/ml.).

Acknowledgments

The author is indebted to Mr A. Fischman, for advice and criticism of the paper; to Mr R. Douglas who gave advice on the absorption and elution techniques; also to Miss Deirdre O'Malley for valuable technical assistance.

REFERENCES:

1. Lack, C. H., and Towers, A. G. (1962). *Brit. med. J.* **ii,** 1227.
2. Lack, C. H., and Waillling, D. G. (1954). *J. Path. Bact.,* **68,** 431.
3. Towers, A. G., and Gladstone, G. P. (1958). *Lancet,* **ii,** 1192.

* *Note.* Since the completion of this paper, Wellcome Research Laboratories have advised (personal communication) that the recommendation of human red cells as an indicator system for the titration of staphylococcal anti-*a*-haemolysin will be withdrawn from their directions circular.

Lithium Sequestrene as an Anticoagulant

JOANNA SENTANCE
Central Laboratory, Auckland Hospital

(Received for publication March, 1964)

Introduction

There are various reasons why it would be desirable to find a universal anticoagulant for use in the laboratory.

It would eliminate confusion in blood sample collecting, created by the different anticoagulants in use for haematological and biochemical tests.

It would enable the clinician, having received haematological results suggestive of abnormal biochemistry, to request chemical analysis without the necessity for the collection of further specimens in other tubes.

The preparation of containers with only one anticoagulant would minimise the work of the solutions unit.

As far as biochemistry is concerned there are many advantages in using plasma as opposed to serum. The chief problem with the latter is that of separating cell-free serum from specimens incompletely clotted before centrifuging. Any pause to allow them to clot completely allows for the passage of some of the substances to be estimated between the cells and the serum. This delay, however small, is particularly undesirable in 'urgent' specimens and, indeed, impairs accuracy in all other tests. Hence the need for a non-sodium, non-potassium, non-ammonium-based anticoagulant.

Lithium sequestrene (E.D.T.A.) was the one decided upon, and the following is a study of its effect on the routine biochemical estimations.

Preparation

A 2.5% w/v solution of lithium sequestrene in distilled water is pipetted, in 0.25 ml. volumes, into 5in x $\frac{5}{8}$in test tubes and dried at not greater than 100°C. This is sufficient anticoagulant for 5 ml. blood.

Methods

The tests being investigated are those as used in the routine section of the Biochemistry Department thus:—

ESTIMATION	METHOD	REFERENCE
Sodium	Flame photometer	*Practical Clinical Biochemistry*, Varley, H. (1954), 1st Edition, p. 338. Whitefriar's Press, London.
Potassium	Flame photometer	*Ibid.*, p. 338.

ESTIMATION	METHOD	REFERENCE
Chloride	Iodimetry	*Microanalysis in Medical Biochemistry*, King, E. J. (1951), 2nd Edition, p. 54. J. and A. Churchill, London.
Glucose	Haslewood and Strookman	*Practical Clinical Biochemistry*, 1st Edition, p. 34.
Urea	Modification of Archer and Robb	*Quart. J. Med.*, **18**, 274.
Uric Acid	Modification of Brown	*Practical Clinical Biochemistry*, 1st Edition, p. 148.
Phosphorus	Gomori	*J. Lab. clin. Med.*, **27**, 955.
Cholesterol	Sackett	*Practical Clinical Biochemistry*, 1st Edition, p. 184.
Carbon Dioxide	Van Slyke	*Quantitative Clinical Chemistry*, Vol. II, Peters, J. P. and Van Slyke, D. D. (1932), 1st Edition, p. 246. Bailliere, Tyndall and Cox, London.
Protein	Biuret	*J. biol. Chem.*, **177**, 751.
Bilirubin	Powell	*Practical Clinical Biochemistry*, 1st Edition, p. 226.
Acid phosphatase	Gutman and Gutman	*Ibid.*, p. 314.
Alkaline phosphatase	King and Armstrong	*Ibid.*, p. 310.
Zinc sulphate turbidity	Kinkel	*Ibid.*, p. 248.
Thymol turbidity	McLagen	*Ibid.*, p. 244.
Calcium	Clark and Collip	*J. biol. Chem.*, **63**, 461.

Results

1. *Sodium, chloride, glucose, urea, cholesterol, potassium, uric acid and phosphorus estimations.*

These estimations were carried out on two random bloods sampled direct and again after being mixed with lithium sequestrene anticoagulant. Each series also included a blank and a standard of known strength.

The differences between the pairs of estimations are recorded in Table I. (The reference to 'machine' methods indicates that these tests were put through the *AutoAnalyser* as well as being performed by the conventional bench method.)

2. *Carbon dioxide, bilirubin, total protein, acid phosphatase and thymol turbidity estimations.*

Owing to the difficulty of preparing pure standards for these estimations, twenty blood samples were taken into plain or potassium oxalate tubes and also into lithium sequestrene tubes. The estimations were then carried out in parallel. The differences are recorded in Tables II, III, IV and V.

3. *Alkaline phosphatase and zinc sulphate turbidity estimations.*

These estimations were also carried out, in parallel, on serum

ESTIMATION	Range of variation in mg. per 100 ml.				Mean error
	0	± 3	± 6	> ± 6	
Sodium	3	1			0.5
Chloride (bench)	1	3			1.5
Chloride (machine)	1	1	2		2.75
Glucose (bench)	3	1			0.75
Glucose (machine)	2		2		2.5
Urea (bench)	2	2			0.5
Urea (machine)	2	2			0.5
Cholesterol	1	1	1	1	3.75

ESTIMATION	0	± 0.2	> ± 0.2		Mean error
Postassium	2	1	1		0.11
Uric acid	2	2			0.05
Phosphorus	2	2			0.05

TABLE I

ESTIMATION	Range of variation in mg. per 100 ml.					Mean error
	0	—4	—8	—12	>—12	
Carbon dioxide		5	6	7	2	8.15

TABLE II

ESTIMATION	Range of variation in mg. per 100 ml.				Mean error
	0	± 0.1	± 0.2	> ± 0.2	
Bilirubin	12	3	4	1	0.1

TABLE III

ESTIMATION	Range of variation in g. per 100 ml.				Mean error
	0	± 0.1	± 0.2	> ± 0.2	
Total protein	8	2	9	1	0.12
Albumin	6	3	9	2	0.14

TABLE IV

ESTIMATION	Range of variation in units				Mean error
	0	± 0.1	± 0.2	> ± 0.2	
Acid phosphatase	11	6	1	2	0.08
Thymol turbidity	11	4	5		0.07

TABLE V

and lithium sequestrene plasma from twenty blood specimens. The differences between the plasma and serum volumes are marked, but without any apparent order about them. The results are recorded in Table VI.

	SERUM	PLASMA
ALKALINE PHOSPHATASE (in units)	19.5	4.0
	15.7	1.8
	11.0	4.0
	5.2	2.0
ZINC SULPHATE TURBIDITY (in units)	15.9	3.4
	10.9	1.0
	5.8	0.1
	3.4	0.7

TABLE VI. Showing examples of the reduced, but inconsistent values for alkaline phosphatase and zinc sulphate turbidity obtained on lithium sequestrene plasma.

Discussion

It is evident from Tables I, III, IV and V that the mean error in most estimations, introduced by the use of lithium sequestrene, is well within the limits of experimental error.

As for carbon dioxide (Table II), all the estimations were found to be considerably lower on lithium sequestrene plasma than with serum, though with a certain degree of consistency. It was also found that by adding 0.2 ml. of 20% sodium hydroxide to the gases evolved in the Van Slyke apparatus, thus converting the carbon dioxide to sodium carbonate, it was the carbon dioxide itself that varied and not the other gases that are involved in the measurement obtained with the Van Slyke apparatus.

Table VI shows that lithium sequestrene has a considerable effect on both alkaline phosphatase and zinc sulphate turbidity estimations. Why this was so required further investigation.

In the case of alkaline phosphatase, it was found that the anticoagulant did not alter the pH of the buffered substrate or interfere with the final Folin-Ciocalteau colour development, so it seemed most likely that it acted as a poison to one or more of the alkaline phosphatase enzymes.

With regard to zinc sulphate tests, the anticoagulant was found to lower, slightly, the pH of the turbidity reagent and, what seemed more important, on addition to an already formed flocculation, it caused a decrease in density, thus indicating that the fine floccules had possibly been aggregated to form fewer, larger clumps.

It was also found that lithium sequestrene did not prevent glycolysis.

The last to appear on the list of routine biochemical estimations is calcium. The method mentioned above is based on the fact that calcium ions present in serum will combine with ammonium oxalate to form insoluble calcium oxalate; but in the case of plasma, the lithium sequestrene forms a soluble complex with the free calcium ions, rendering them no longer available for combination with the oxalate. Hence, no precipitate is formed for titration by this method.

Conclusion

It has been shown that lithium sequestrene, used as an anticoagulant, introduces no significant error into the estimation of sodium, potassium, uric acid, phosphorus, cholesterol, protein, bilirubin, acid phosphatase, thymol turbidity estimations (by a conventional bench method) and in the estimation of urea, glucose and chloride (by both conventional and automated methods).

Lithium sequestrene plasma may also be suitable for the estimation of carbon dioxide since, although lower values result, these appear to form a consistent pattern.

The only tests, considered in this paper, for which lithium sequestrene is obviously unsatisfactory are alkaline phosphatase, zinc sulphate turbidity and calcium. As these are seldom requested with extreme urgency, and as lithium sequestrene appears to be a satisfactory anticoagulant for use in haematological tests, this fact was not considered a serious disadvantage.

Lithium sequestrene is now in use in the laboratories of the Auckland Hospital Board as the routine anticoagulant. The need for alkaline phosphatase, zinc sulphate turbidity and calcium estimations still to be collected in plain tubes was brought to the attention of all doctors using the laboratory service.

The only workers who seem to have made any report on lithium sequestrene as an anticoagulant are Sacker *et al.* (1959)[1] who came to the conclusion that it was suitable for Haematology and for sodium, potassium, chloride, urea, cholesterol, bilirubin and sugar estimations; also, surprisingly enough, for carbon dioxide estimation (Van Slyke method) and for phosphatases (method not given).

Acknowledgement

I wish to thank Dr Sims for directing the lines on which this investigation was carried out and for his help in the later stages of the work.

REFERENCES:

1. Sacker, L. S., Saunders, K. E., Page, Beryl and Goodfellow, Margaret (1959), *J. clin. Path.*, **12**, 254.

The Rex Aitken Memorial Prize

Owing to the non-receipt of a sufficiently meritorious entry, the donors of the Rex Aitken Memorial Prize, Biological Laboratories Ltd., of Auckland, have decided, on the advice of the judges, to refrain from making the award this year.

The prize money will be set aside to enable this award to be extended for a year beyond its originally intended five-year period.

A Simple Apparatus for the Estimation of Alveolar pCO_2

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(Received for publication December, 1963)

Introduction

The investigation of acid-base disturbances frequently requires estimation of pCO_2, and to those laboratories with no potentiometric equipment for this type of test and, with no Haldane gas analysis apparatus, this can present a problem. A search of the literature produced two methods using simple apparatus, the Fredericia (Poulton 1915) and the Scholander (1942), but neither of these were suitable for our needs, so an apparatus was designed from glassware existing in the laboratory. This is described below.

Apparatus

A gas-sampling tube was used for the original, but a separating funnel fitted with a rubber bung drilled to take a two-way stopcock (from an old burette) would be equally suitable. The apparatus is depicted in Figure 1. The capacity of tube H, from stopcock B to stopcock A must be determined. The stopcock A was removed from the gas-sampling tube and connected in the reverse position with rubber tubing. D is a levelling bulb, with a capacity somewhat larger than that of H, and G is a 25ml. burette.

Method of Use

Alveolar air is collected in a 4-litre rebreathing bag,[1] and allowed to cool to room temperature.

The burette G and the tubing connecting it to H are filled with water, and all air in the tube removed by admitting it to H. Any water that enters H will be removed in the next step when 1% acetic acid is admitted to H. (The dilution of the acid with water is, of course, immaterial.)

With D full of 1% acetic acid (to neutralise any trace of alkali left in H from previous estimation), A is turned to connect D with H, and H is filled with fluid to the top of E. Close B.

The rebreathing bag is connected to E, B is opened, and alveolar air aspirated into H by lowering the reservoir D. Stopcock A is closed when alveolar air has passed through it. The tube H now contains a known volume (in the original 118ml.) of alveolar air.

The rebreathing bag on E is replaced with a 2ml. rubber teat, a small, wide-mouthed jar of 10% KOH is then held under side-tube F, and by manipulating stopcock B and the rubber teat

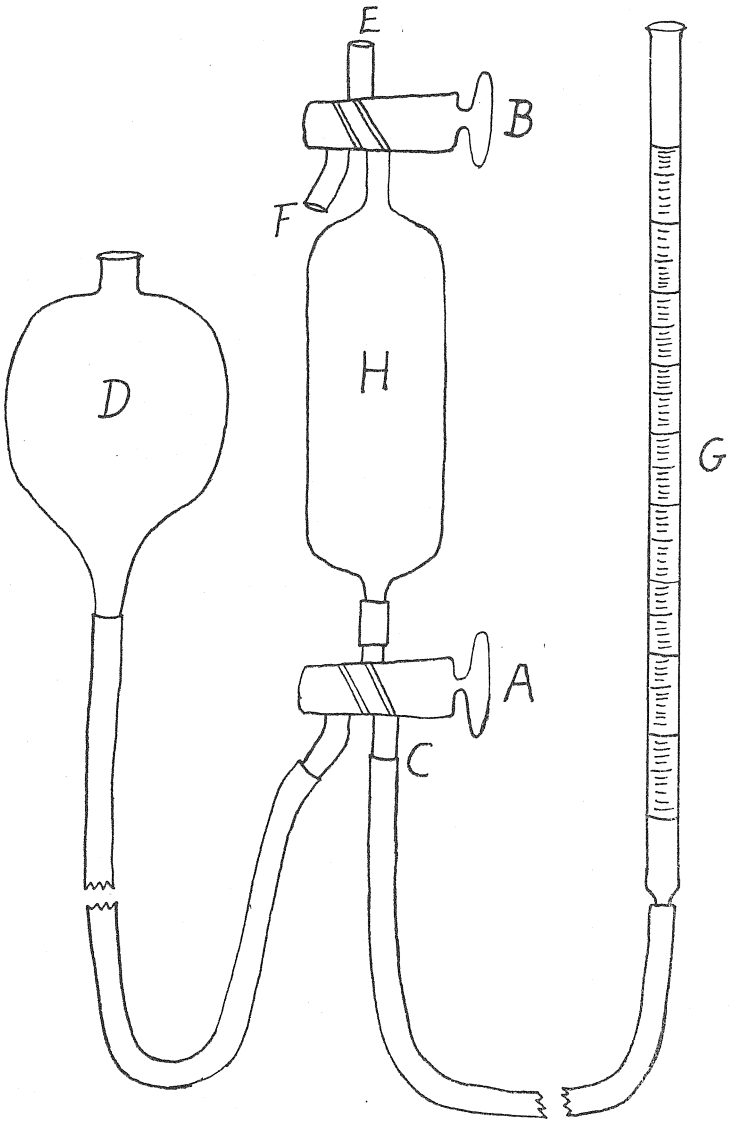

Fig. 1. The apparatus described.

on E, 3-4ml. of 10% KOH is forced into the tube H, care being taken not to admit any air. The tube H is then shaken for a few minutes to spread the KOH around the walls, and enable it to absorb all the CO_2 present.

Stopcock A is now turned to allow the water in burette G to enter tube H, and left open for 2-3 minutes for equilibration to take place. G is then moved down so that the fluid levels in G and H are at the same height, and stopcock A is closed. The reading in ml. of the water remaining in burette G is noted, then stopcock B is opened to E and stopcock A to C, and burette G is lowered until all the fluid, but none of the air in H has passed through A. A is closed.

The increase in water in G is a direct measure of the millilitres of CO_2 absorbed from the alveolar air in tube H.

Calculation

Air in the lungs is saturated with water vapour, which exerts a pressure of 47mm.Hg. The tension of CO_2 derived from its percentage in dry air is required and, therefore, the barometric pressure less the aqueous tension is used in the calculation.

For each rise of 1°C., a gas at a constant pressure expands by 1/273 of its volume at 0°C. We elected to use 37°C. as a standard temperature, and consequently the room temperature at the time of the test enters the calculation.

$$\frac{\text{Volume of water increase in G in ml.}}{100} \times \frac{100}{\text{Capacity of H in ml.}} \times \frac{273 + 37}{273 + \text{room temp in °C.}} \times \text{Barometric pressure, absolute scale} - 47$$

$$= \frac{\text{Vol. of water increase}}{\text{Capacity of H}} \times \frac{310}{273 + \text{room temp. in °C.}} \times (\text{Barometric pressure} - 47)$$

$$= pCO_2 \text{ in mm. Hg.}$$

REFERENCE:

1. Campbell, E. J. M. (1962), *Brit. med. J.*, **ii**, 630.

The Problem of the Collection of the Midstream Urine

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(Received for publication November 1963)

Now that the collection of urine by catheterisation for full bacteriological examination has fallen into disfavour because it was all too frequently the cause of urinary infection, the problem of collecting a 'clean' midstream specimen from females has exercised much time and thought over recent months. After trials ranging from complicated and time-consuming swabbing of the whole area and/or fifteen minute decontamination with a hibitane pad, to the pour-plate technique and measured drop inoculation of the culture medium from an ordinary specimen, we found that, provided the patient does not have to hold the receptacle, a satisfactory midstream specimen can be obtained, without difficulty, free from contamination.

Materials. There is, on the market, a pressed aluminium foil container similar in size to a 'strawberry box' but without holes (CAC 443-30), which retails at approximately £9 per thousand and therefore comes under the heading of disposable. It will stand dry heat sterilisation at 160° C. for 1 hour.

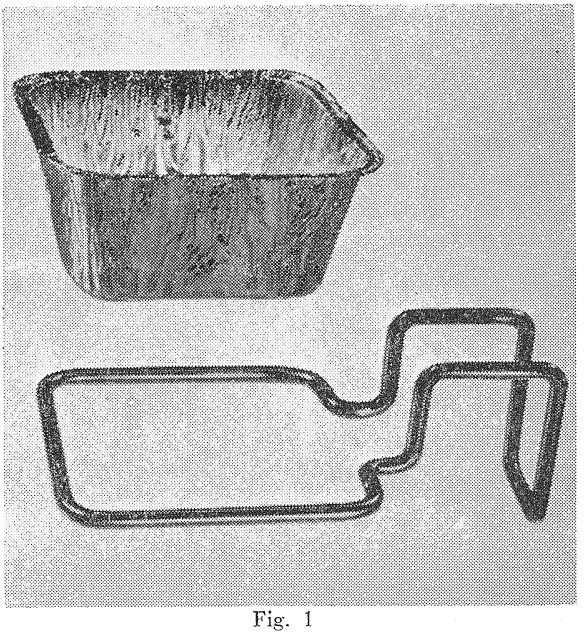


Fig. 1

This fits into a holder made from a heavy gauge stainless steel wire or plastic-covered galvanised steel rod. The holder is shaped to fit over the front edge of any standard lavatory bowl and occupies the front third of the available area of the pan when the seat is down. The aluminium container is retained in position by the lip around its upper edge.

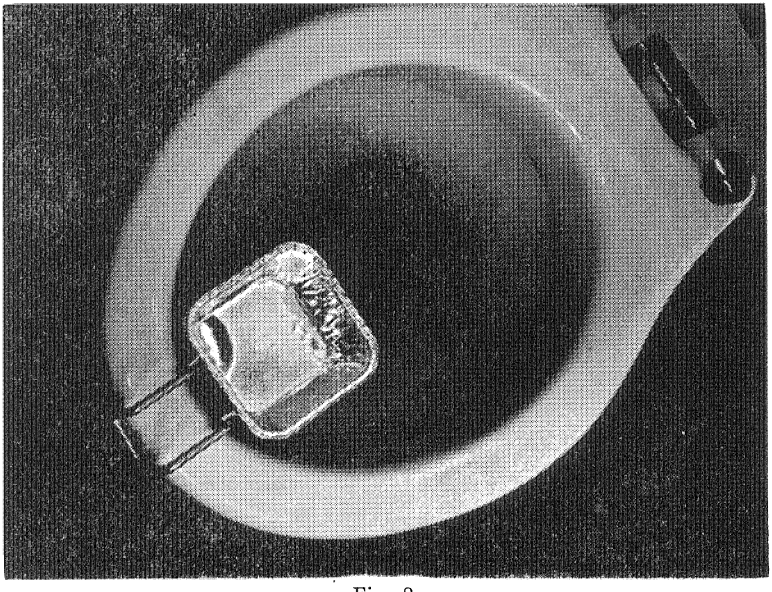


Fig. 2

For sterilising the container, suitable standard tins with hinged lids are available locally, and if the containers are stacked bottom up they will remain sufficiently free from contamination for use over two to three days.

Method of Collection. Immediately prior to collection, a sterilised container is placed in the holder in the lavatory pan, and the patient is instructed to separate the labia using the fingers of both hands. She then voids some urine into the lavatory pan behind the collection container and follows this by moving forward on the seat to collect the midstream specimen. The nurse then pours the specimen directly into a sterile screw cap jar, and both the aluminium receptacle and holder are dropped into a bucket containing 1% lysol. The containers are later destroyed as rubbish.
Discussion. This method has proved highly successful for both young and elderly patients, because it is incorporated in the usual use of a standard lavatory and therefore does not cause abnormal strain which will frequently prevent the patient from urinating.

The specimens obtained very rarely show contamination and usually produce no growth, or the single organism culture associated with true urinary infection. Should contamination occur, repeat specimens will establish the predominant organism, although this is rarely necessary.

Being portable and able to fit (or be made cheaply for) any standard lavatory bowl, the apparatus may be used by anyone wishing to obtain a clean midstream urine anywhere without difficulty or embarrassment to the patient.

Summary. A simple, effective method for the collection of midstream urine from females is discussed.

It is quick and requires no complicated preparation of the patient.

The equipment is portable, standard and locally available at a reasonable cost.

The specimen obtained has proved most satisfactory from the laboratory point of view.

Note. The holder, available in two models together with packs of sterilized containers, can be purchased from *Ethicals Ltd.*, of Auckland.

The Junior Essay Competition

The two five-guinea prizes in the 1964 Junior Essay Competition were awarded as follows:

ESSAY SECTION:

Adrienne Ramsay, of Oamaru

Accuracy and Quality Control in Clinical Chemistry

TECHNICAL SECTION:

A. G. Wilson, of Dunedin

An Improved Colorimetric Method for the Estimation of Lipase in Serum Using Phenyl Laurate as a Substrate

The winning essays will be published in the October 1964 issue of the *Journal.*

Irradiation Plants for Medical Sterilization and Public Health

Disposable medical goods in sealed packs, radiation sterilized, now on the market; irradiation of infected imports.

After more than fifteen years' research into the effects of gamma radiation on different substances, irradiation by means of cobalt^{60} is now being used in several industrial processes: for sterilizing medical equipment; for pasteurising meat and fish; for disinfesting grain; for inhibiting sprouting in vegetables; for catalysing chemical reactions; for improving the properties of plastics and rubber. In addition, irradiation units are used by universities and government and industrial research organisations for chemical, biological and botanical investigations.

In principle, irradiation is very simple: the product is placed near the radio-active source for a predetermined period. In practice, owing to the importance of exactly controlling radiation dosage and ensuring human safety, it is a complicated problem in mechanical handling, which varies according to the material being irradiated. Irradiation plants for several different purposes are made by *Nuclear Chemical Plant Ltd.*, of London. These include continuous plants with automatic conveyers for irradiating packaged goods; smaller batch plants; continuous mono-rail plants for carcasses and goods in sacks; plants for free-flowing solids such as grain; plants for irradiating chemicals. Cobalt^{60} capacity can be up to several megacuries for automatic plants, up to 100,000 curies for batch plants.

For research purposes, smaller irradiation plants are available. These include built-in indoor installations with large irradiation space, which can give a high or low dose rate as required; self contained units for radiation chemistry, giving a high dose rate in a small irradiation space; and open-air agricultural units for irradiating many growing plants at a low dosage rate.

Applications in Medicine and Public Health

A radiation dose of 2.5 megarads has been found to give complete sterilization of medical equipment; no micro-organism has been found to survive this dose, and comparative tests have shown irradiation to give more reliable sterilization than steam, dry heat or ethylene oxide. Radiation-sterilized equipment now on the market includes surgical sutures and ligatures; disposable plastic syringes; tranfusion kits; catheters; surgeons' gloves; blades for razors and scalpels. The world's first cobalt^{60} plant for sterilizing sutures, designed and built by *Nuclear Chemical Plant Ltd.*, was opened last year by *Ethicon Ltd.*, of Edinburgh. With a cobalt capacity of 100,000 curies it can sterilize up to

Towards Greater Safety in Blood Transfusion

1. REQUISITION FORMS for blood, or for blood gro uping, should be so designed as to permit the fullest identifying particulars of the patient to be given. The surname, given names IN FULL, hospital admission or unit number and date of birth should be included. Hospital Boards whose laboratory requisition forms do not fulfil these requirements are running a grave risk, for certain indentification of patients is not possible without them.
2. PERSONS RESPONSIBLE FOR COLLECTING BLOOD SAMPLES should check the details of full name and date of birth by interrogation of the patient before collecting the sample. This interrogation should be conducted in such a way as to avoid misunderstanding. Ask ' WHAT IS YOUR NAME ? ' rather than ' Are you Mr . . . . ? ' Ask ' WHAT ARE YOUR GIVEN NAMES ? ' and do not be content with initials. Check the hospital number against the irremovable tag or bracelet which the patient ought, ideally, to be wearing. This is the ONLY means of identification where the patient is unconscious, and if such a system is not in operation, patients unable to respond to questions should be identified by a senior member of the nursing staff, who should be prepared to come to the bedside for this purpose.
3. LABEL THE SPECIMEN CONTAINER after identifying the patient, but before withdrawing the blood specimen. Include all the essential identifying particulars from the requisition form and add the time and date.

   Any unlabelled specimen should be discarded and a fresh, correctly labelled one obtained.
4. IN THE LABORATORY, develop the habit of checking the label on the sample before transferring any of it to a tube for the separation of cells and serum. All tubes used for centrifuging samples should be clearly and unequivocally labelled.

   If performing blood grouping tests on a row of specimens, safeguard against error by taking up each tube in the same motion as placing down the preceding one. Work in rows of TEN tubes rather than twelve.

   Always set up proper controls and, where crossmatching by the indirect antiglobulin technique, control the activity of the antiglobulin serum not merely by a single control but by adding a drop of weakly sensitized control cells to each tube or to each mixture on a tile after interpretation as negative, and only be content with the result if agglutination now appears in all tubes (or tile mixtures).

   Use the crossmatching technique recommended by the Department of Health, making no attempt to differentiate between so-called ' safe ' and ' potentially unsafe ' recipients for purposes of deciding the

form of procedure to be employed. Wherever possible include tests between the patient's serum and his own cells, to serve as a negative control and to aid the recognition of autoagglutination and rouleaux.

Do your crossmatching tests in SALINE AT ROOM TEMPERATURE (to detect naturally-occurring antibodies), by the INDIRECT ANTIGLOBULIN TECHNIQUE at 37°C. (to detect immune antibodies) and, preferably, also include an ALBUMIN or ENZYME test at 37°C. (to detect immune antibodies that may have been missed by the antiglobulin test).

From patients receiving SEVERAL TRANSFUSIONS, ensure that a FRESH SAMPLE of blood is obtained for crossmatching at suitably frequent intervals. Once a patient has received blood, do not make the mistake of assuming that other blood, crossmatched before the transfusion, will remain compatible beyond forty-eight hours at the most.

When crossmatching blood for INFANTS UNDER SIX MONTHS, use the MOTHER'S SERUM for the tests.

Carry out a blood grouping test on every patient for whom blood is to be matched, no matter how many times they have been grouped previously.

When performing rhesus typing with ENZYME- or ALBUMIN-REACTING sera, always safeguard against false positive results by the use of an inert serum plus enzyme (or albumin) against the cells of each patient tested. Use WASHED cells. If uncertain about the result of a rhesus grouping on a PATIENT, treat him as Rh NEGATIVE. If uncertain about the rhesus grouping on a DONOR, treat him as Rh POSITIVE.

Keep permanent RECORDS of all blood grouping tests on a worksheet or laboratory protocol. Record results by signifying differing degrees of agglutination, not as interpretations into groups. Record the batch numbers of all typing sera on the worksheet.

5. COMPATIBILITY LABELS should be written out legibly and should carry the same particulars as the requisition form, without the abbreviation of given names to initials. It should also bear the bottle number, the date of the crossmatch, the group of the patient and the signature of the person who carried out the test. The use of the DONOR'S NAME could lead to confusion and possible tragedy; its appearance on the bottle label should be discouraged.
6. COLLECTION OF CROSSMATCHED BLOOD from the laboratory should be subject to certain rules. Ideally, the person coming from the ward should have the patient's details in writing in order to safeguard against the possibility of taking blood matched for someone else.
7. CHECK REFRIGERATOR TEMPERATURES frequently, and discard any blood that may not have been stored constantly at the correct temperature, even though it may look all right.

3,000lbs of goods each day. All goods are irradiated in sealed containers of plastics or aluminium foil to prevent re-contamination between sterilization and eventual use, which may be many months later.

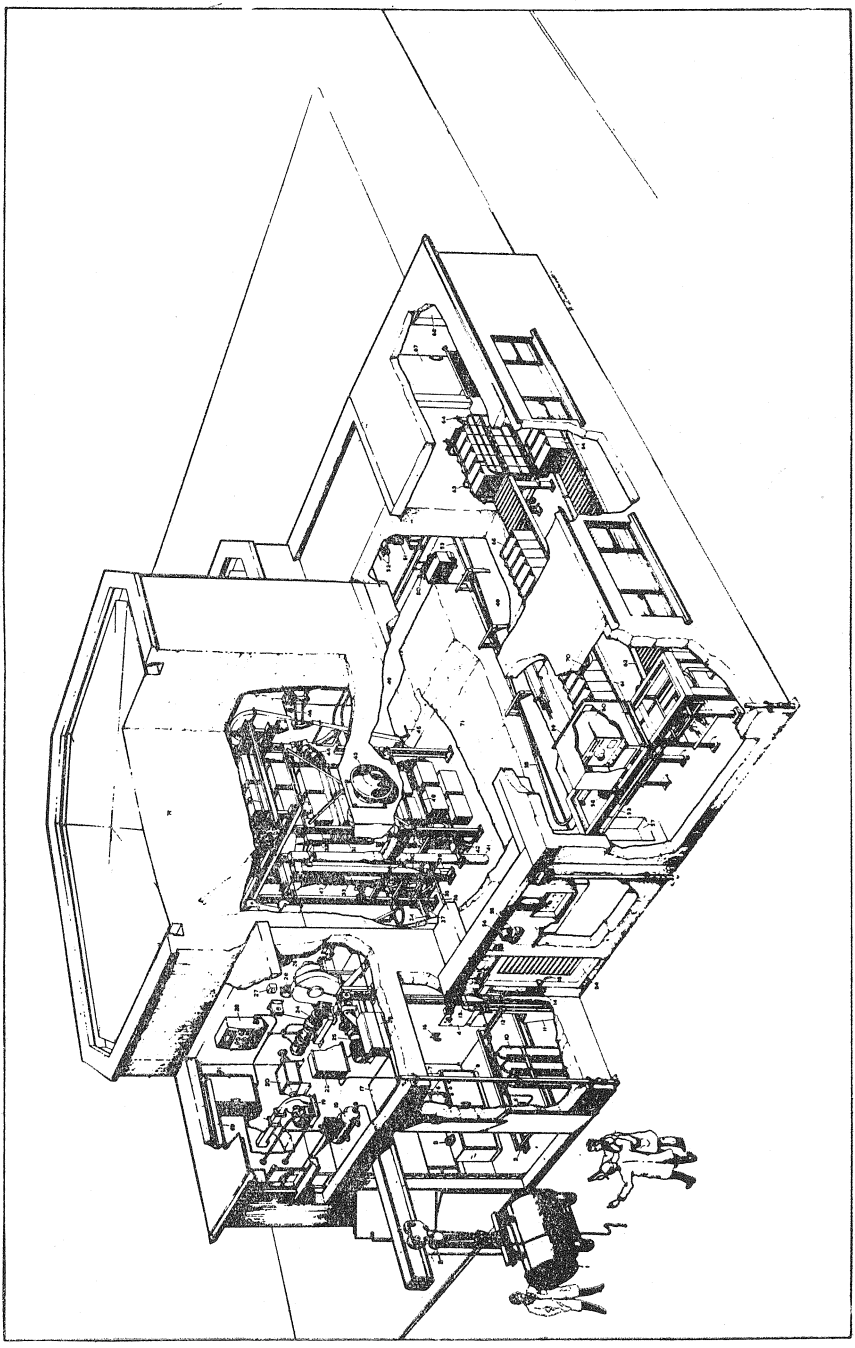
Other irradiated medical and pharmaceutical products are available in small quantities in Britain and America to test the market for clinical trials. The British army is using radiation-sterilized hospital dressings; and gamma-irradiated food is being given to patients whose resistance has been deliberately lowered to permit acceptance of grafted foreign tissue. In the field of public health, gamma irradiation is being used in Australia to sterilize imported Afghan goat hair contaminated by anthrax; and irradiation of imported foodstuffs — mainly horsemeat and frozen egg—as a precaution against salmonella poisoning is under consideration in several countries.

Continuous Conveyor Plants

A continuous plant for irradiating solid materials comprises three main sections: the irradiation cell itself, a conveyer loading room and a control room. The cell has typical internal dimensions of 12′ x 24′ x 12′ high, and is surrounded by concrete walls from 5′ 9″ to 6′ 6″ thick which keep internal radiation below 0.5 milliroentgen/hour. Material for irradiation is loaded by hand into containers, which are placed on a storage conveyor in the loading room. Containers are automatically transferred to the main conveyor as required, and are carried through a labyrinth into the cell, where they are transferred to an elevator. Each item is then traversed round one end of the source, before being transferred across the elevator for a similar cycle round the other end. This method ensures that all parts of the material are irradiated equally. Dense materials require a four-pass cycle; less dense materials a cycle of eight or more passes.

The radioactive source consists of tubes of cobalt^{60} mounted in a framework. These remain exposed in the cell as long as the conveyor is moving; but if it stops for any reason the source immediately drops into a lead-lined pit in the floor or wall of the cell, and the cell can then be safely entered. The source returns to its pit under gravity, with a hydraulic cylinder to cushion its fall, so the plant fails safe—even in the case of complete power failure.

The source continues to emit radiation whether or not the radiation is used. For economic reasons, therefore, it is important that an irradiation plant should operate continuously. Accordingly the plant, once started, needs no supervision and continues to operate for as long as loaded containers are ready on the storage conveyor; this is electrically driven through an infinitely variable reduction gearbox which provides a possible speed variation up to 100:1.



Cobalt^{60} has a half-life of 5.3 years, and 12.5% of the initial Cobalt^{60} activity is therefore added each year to keep the intensity of radiation effectively constant. Tubes are supplied and removed in a lead-lined transport container, which is locked to a mating plate in the wall of the control room for transfer operations. At all other times an interlock mechanism prevents removal of the tubes.

Other interlocks ensure the safe operation of the plant. One stops the conveyor and drops the source if there is no material

Fig. 1. (Left) Continuous irradiation plant, similar to that built by Nuclear Chemical Plant Ltd. for Ethicon Ltd., which is used to sterilize medical goods. On the right is the loading room, connected by a labyrinth corridor (49) with the irradiation cell (centre), which contains the source (31) and the elevator. On the left is the control room, and above this the machinery room. Important features: (61) feed conveyor with unsterilized goods (63, 65); (62) discharge conveyor with sterilized goods (66), (53) overhead conveyor; (71) concrete shielding; (44) television camera; (6, 60) television monitor screens; (11) control panel; (1) transport container for source tubes; (4) plate through which source tubes are transferred between container and cell.

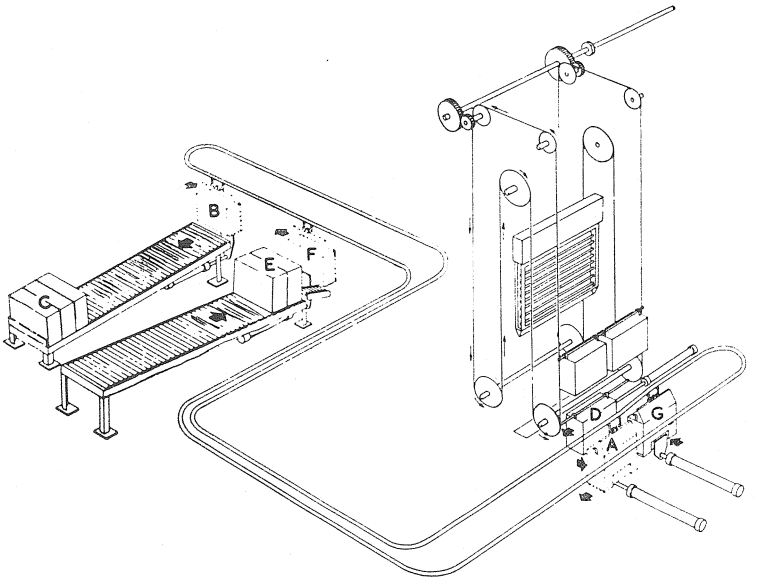


Fig. 2. (Above) Diagram of the same continuous irradiation plant, showing conveyor system elevator, and the hydraulic rams that effect the transfer operations.

to be irradiated, if the unloading conveyor is full or if any transport operation takes longer than 45 seconds; another prevents opening of the cell door unless the source is fully retracted into its pit; a third, combined with a time delay switch, ensures that all personnel have left the cell before the plant can be restarted. Warning lamps and hooters come on if a fault causes the plant to shut down or if radiation in the cell, while the source is retracted, reaches a dangerous level. Closed-circuit television can be supplied for viewing the interior of the cell.

Other Plants

Mono-rail plants, used for irradiating animal carcasses and goods in sacks, differ from conveyor plants in that the goods are carried on the monorail throughout irradiation instead of being transferred to an elevator. The mono-rail follows a tortuous path round the source to ensure even dosage.

Batch plants, for comparatively small-scale processes, consist of a concrete-shielded cell containing an elevator which is loaded by hand—the cell door, together with the elevator, being withdrawn on rails for this purpose. An interlock mechanism ensures that the cell is completely re-assembled before the source is exposed.

For irradiating free-flowing solids, another type of plant has been developed. The material is fed into a hopper at the top of the plant and flows down past a vertical source through five concentric annular channels. Flow through each channel is independently controlled to ensure that all materials receive a minimum radiation dosage and that there is a variation of only 1.5:1 between maximum and minimum dosage. A typical plant for grain would stand 110′ high, have an overall diameter of 16′ and have a maximum cobalt capacity of 720,000 curies. It could give a minimum dose of 16,000 rads to 125 tons of grain per hour.

Finally, there are plants for irradiating chemicals. These consist of a reaction vessel set in concrete with four sources stored in the floor. When the reagents are admitted to the reaction vessel, the sources are raised by a mechanism above the shielding. The product of the reaction is continuously drawn off and unaltered reagents are recirculated. Where exothermic reactions are concerned a recirculatory cooling system can be provided to keep the reaction vessel at constant temperature.

Further information on sterilization by irradiation can be obtained from: Nuclear Chemical Plant Ltd., Chematon House, St. James Avenue, West Ealing, London, W.1; or from their New Zealand agents: John Thompson (Aust.) Pty. Ltd., Hamilton.

Selected Abstracts

Contributors to this issue: R. D. Allan, J. Case, E. K. Fletcher, B. Glynn-Jones, H. C. W. Shott, D. Tingle.

BLOOD BANKING

Studies on the Wright Blood Group System. Metaxas, M.N. and Metaxas-Buhler, M. (1963), *Vox Sang. (Basel)*, **8**, 707.

A severe haemolytic transfusion reaction, characterised by jaundice and oliguria lasting over 16 days and necessitating three courses of haemodialysis, was traceable to incompatibility due to the antibody anti-Wr^a. This relatively common natural antibody has only once previously been implicated in complications following transfusion, but it is worthy of note that it very frequently behaves in the fashion of an immune antibody, showing 'incomplete' characteristics in that it reacts best by the indirect antiglobulin or by enzyme techniques rather than in saline at lower temperatures.

Simplified Complement Fixation Test for the Detection of Platelet Antibodies in Human Serum. Aster, R. H., Cooper, H. E., and Singer, Dorothy L. (1964). *J. Lab. clin. Med.*, **63**, 161.

A very simple complement fixation technique is described for the detection of platelet antibodies. The test requires one drop each of serum, complement and a platelet antigen, to which sensitized sheep cells are added as an indicator. The platelet antigen is reasonably stable, and reliable results were obtained in a series of sera studied.

Hemolytic Transfusion Reactions. Stuckey, Margaret A., Osoba, D., and Thomas, J. W. (1964), *Canad. med. Ass. J.*, **90**, 739.

Three cases of haemolytic transfusion reaction are described, in all of which no incompatibility was detected by the crossmatching procedure. Two of the cases were subsequently shown to be due to anti-E. Repeat compatibility tests in these two cases showed that in one no antibody was detectable, by any technique, in the pretransfusion sample (this was a case in which the manifestations of incompatibility only became clinically apparent a week after transfusion). In the second case (where the reaction developed during the administration of the first unit of blood) anti-E was found to be weakly detectable by the indirect anti-globulin technique against cells representing a double dose of the antigen. The albumin technique is not routinely employed in crossmatching, except in a screening procedure performed on all sera against pooled group 0 cells representing all the major antigens. [It is worthwhile bearing in mind that anti-E is one immune antibody that is well known for its occasional failure to react by the anti-globulin technique.]

The Serologic Diagnosis of ABO Hemolytic Disease of the Newborn. Yunis, E., and Bridges, R. (1964), *Amer. J. clin. Path.*, **41**, 1.

This paper describes the serological findings in 19 cases of ABO haemolytic disease. The results are compared with those obtained in 19 pregnancies with unaffected infants.

The conclusion reached is that the best serological evidence of haemolytic disease is the elution of the antibody from the infant's red cells. The demonstration of an incompatible isoagglutinin in the cord serum and a positive direct antiglobulin test on the cord cells are presumptive evidence of the condition, but the demonstration of maternal immune anti-A and anti-B are only suggestive.

The Determination of Haemoglobin in Blood Banks. Pirofsky, B. and Nelson, Helen M. (1964), *Transfusion, Philad.*, **4**, 45.

This investigation into the accuracy of the copper sulphate method for determining the haemoglobin level of blood donors reveals that, in the hands of the large nursing staff carrying out the procedure, detailed

instructions as to technique and pitfalls were ineffectual in preventing too many donors being rejected, whose haemoglobins were within acceptable limits by the cyanmethaemoglobin method.

Rapid Test for Fibrinolysis *in Vivo*. Ferreira, H. C., Murat, L. G. and Ferri, R. G. (1964), *Transfusion, Philad.*, **4**, 21.

This is a flocculation test, based on the principle that fibrinolysis-fibrinogenolysis results in the release of degraded products which retain some of the immunological specificity of the fibrinogen molecule. A rabbit anti-human fibrin serum is used in its detection.

CHEMICAL PATHOLOGY

Inherited Enzyme Defects — A Review. Hargreaves, T. (1963), *J. clin. Path.*, **16**, 293.

Covers amino acids, carbohydrates, pigments, endocrine and purine metabolic disorders in a very thorough manner. R.D.A.

Estimation of Bilirubin Using Acetamide. Boutwell, S. H. (1964), *Clin. Chem.*, **10**, 197.

Acetamide-sucrose mixture is used to accelerate coupling of free unconjugated bilirubin and to act as a clarifier of turbidity. Optimum pH is also considered. R.D.A.

Studies on the Determination of Bile Pigments. Stevenson, G. W., Jacobs, S. L., and Henry, R. G. (1964), *Clin. Chem.*, **10**, 95.

Total bilirubin is measured at 450 mμ in acetic acid ethylene glycol. Free bilirubin is measured at 450 mμ in a chloroform extract. Readings are corrected for haemoglobin interference by subtracting the reading at 520 mμ. Only 0.1 ml. of serum is required. The totals compare well with Malloy Evelyn, but higher conjugated levels, found by difference, occur with the direct spectrophotometric method. It is pointed out that the mechanism of the diazo reaction with conjugated bilirubin has never been resolved with certainty. R.D.A.

The Precision, Accuracy and Inherent Error of Automatic Continuous Flow Methods. Theirs, R. F. and Oglesley, K. H. (1964), *Clin. Chem.*, **10**, 246.

Correction techniques to improve the accuracy of autoanalytical processes are described. Three causes of inaccuracy are cited: instrument drift, interaction between samples and depth of sample in the cups.

Percentage interaction tables can be daily calculated and correction applied. Drift correction curves parallel to basic standard curve can be drawn from the increased height of a standard repeated at intervals. R.D.A.

Daily Variation in the Concentration of Iron in Serum. Bowie, E. J. W., Tauxe, W. N., Sjoberg, W. E. and Yanaguchi, M. Y. (1963), *Amer. J. clin. Path.*, **40**, 491.

Although diurnal variation of serum iron is recognised, this study attempts to determine the time at which day-to-day variation would show least fluctuation. Blood was withdrawn from five men and six women four times daily for four days. The method for serum iron estimation using dipyridil acetate buffer and a sodium sulphite solution is described. Results showed that values varied considerably at the same time on different days and no consistent pattern was evident with any one subject. Serum iron values fluctuated, also, in one subject who fasted for three days. E.K.F.

A Rapid Combination Method for Determining Amounts of Blood Glucose and Urea Nitrogen. Goulanger, J. P. and Williams, Marjorie, F. (1963), *Amer. J. clin. Path.*, **40**, 560.

Blood glucose and urea nitrogen are estimated with aliquots from the same protein-free supernatant in a laboratory where 60% of the glucose determination orders are accompanied by simultaneous requests for urea nitrogen estimation. 0.5 ml. of serum and a mixed standard are incubated

with a urease-water suspension at 56° C. for 5 minutes and protein precipitation carried out with barium hydroxide and zinc sulphate. One aliquot of supernatant is processed by a modified Nelson-Somogyi technique for glucose, whilst a further aliquot is treated with Nessler's reagent for urea nitrogen. E.K.F.

Bilirubin Assay in Neonatal Jaundice. Riding, Isabelle M. and Ellis, D. (1963), *Clin. chim. Acta,* 8, 884.

The King and Coxon and a simple modification of the Malloy and Evelyn methods are compared. The latter technique is adopted for assay of 'direct' and total bilirubin in neonatal jaundice. Conclusions resulting from a study, report that, (a) it is necessary to assay 'direct' as well as total bilirubin in all jaundiced newborn babies, (b) in haemolytic disease of the newborn, the exact rate of rise of 'indirect' bilirubin concentration is a useful guide in deciding treatment with exchange transfusion. E.K.F.

Ethanol Fractionation of Human Serum Alkaline Phosphatase. Peacock, A. C., Reed, R. A. and Highsmith, E. M. (1963), *Clin. chim. Acta,* 8, 914.

Serum alkaline phosphatase in patients with liver disease differs from that found in Paget's disease with respect to solubility in ethanol. At 20% ethanol only small amounts of activity are precipitated from Paget's disease serum. Under the same conditions, substantial amounts of activity are precipitated from liver disease serum.

Approximately 150 sera were studied to evaluate the diagnostic utility of the above property. Seven cases of bone disease studied had values of less than 1.0 unit while in five of seven cases of liver disease the values were substantially greater than 1.0 unit.

Some of the limitations of this method of differential diagnosis are the inability to arrive at any conclusion in a number of intermediate cases and the inability of the method to detect the simultaneous occurrence of liver and bone disease. E.K.F.

CYTOLOGY

A One-Step Filtration Technic for Recovery of Tumor Cells from Blood. West, J. T., Hume, Roxane and Kindburys, Aldona (1964), *Amer. J. clin. Path.,* **41,** 27.

This method is based on the fact that there is a size differential between malignant and non-malignant cells. Using a polyvinyl chloride filter with a particle retention size of 11μ, cytological preparations can be made that compare very favourably with those made by other methods designed for the purpose. The recovery rates of malignant cells suspended in blood exceed 95%, so it seems the method is satisfactory for quantitative studies of cancer cells in blood or blood-stained body fluids.

HAEMATOLOGY

Reticulocyte Count Methods. Abrahamsen, A. F. (1963), *Scand. J. clin. Lab. Invest.,* **15,** 559.

In this paper, three methods are compared and that using 1% brilliant cresyl blue in saline, followed by incubation for 20 minutes and preparation of a film, is reported as giving the most satisfactory results. The technique using 0.05% brilliant cresyl blue, mixing on a slide and making the film almost at once, gives poor contrast. Bjorkman's direct method, using new methylene blue and enumeration of reticulocytes in a counting chamber, is considered less satisfactory because the magnification is insufficient to ensure the recognition of the most mature reticulocytes.

A Method for the Assay of Factor V. Blomback, B. and Blomback, Margaretta (1963), *Scand. J. clin. Lab. Invest.,* **15,** 639.

This paper describes a three-stage system for the specific assay of factor V. The principle is that factor V is incubated with an excess of factor VIII, serum factors and lipid to form prothrombin activator

which is used to convert partially purified prothrombin (obtained from factor IX deficient plasma) into thrombin. The initial speed of thrombin production is directly proportional to the amount of factor V present.

Rapid Adhesive Platelet Count in Whole Blood. Eastham, R. D. (1964), *J. clin. Path.*, **17**, 45.

A proportion of the platelets in blood become adhesive when treated with adenosine diphosphate. After these have adhered to the walls of a polystyrene container, E.D.T.A. can be added and a count made of the remaining platelets, by subtraction from the total platelet count, the number of adhesive platelets can be calculated.

Survey of Resistant Cell Hemoglobin Phenomenon. Burke, Mary L. (1964), *Amer. J. med. Technol.*, **30**, 65.

Occasional blood samples, when diluted with cyanmethaemoglobin reagent, exhibit resistance to lysis by the diluent. This results in a turbid solution which, if centrifuged, can be clarified and read in a colorimeter to determine the non-resistant cell haemoglobin content. The total haemoglobin can then be determined by returning the sample to the original tube, adding 5 ml. of distilled water, inverting several times to accomplish complete haemolysis, and reading again in the colorimeter, multiplying the answer by two to compensate for the extra dilution. The content of resistant cell haemoglobin can be calculated by subtraction.

The value of this calculation seems questionable since the same information can be derived from an osmotic fragility test, but it is worthwhile bearing in mind that this phenomenon could cause inaccurate results in bloods from cases where there are increased numbers of 'target' cells, resulting in increased osmotic resistance.

A Micromethod for Estimating Osmotic Fragility of Erythrocytes. Butterworth, S. T. G. (1964), *J. clin. Path.*, **17**, 96.

Using 0.1 ml. of blood, this method shows an acceptable degree of accuracy and is suitable for the measurement of osmotic fragility on children.

Haematoxylin Bodies in S.L.E. Preparations. Arterbury, J. D., Drexler, Elizabeth and Dubois, E. L. (1964), *J. Amer. med. Ass.*, **187**, 389.

This paper discusses the significance of the extracellular haematoxylin bodies occasionally seen in examining L.E. preparations, which resemble L.E. cell bodies except for their extracellular location.

Disposable Polystyrene Blood Clotting Tubes. Matchett, Myrtle O. (1964), *J. med. Lab. Technol.*, **21**, 29.

Disposable test tubes, made from polystyrene, were used in a variety of coagulation tests in order to determine their suitablity for this purpose. Clotting times proved to be the same as in glass tubes, the only disadvantage being that owing to the lower heat conductivity of the polystyrene, tubes need to be placed in the water bath for about twice as long as glass tubes. Because the material will not withstand boiling to remove absorbed thrombin, polystyrene tubes cannot be cleaned for re-use.

A Laboratory Method for the Description and Evaluation of the LE Phenomena in Peripheral Blood. Hammer, Gudrun (1964), *Scand. J. clin. Lab. Invest.*, **16**, 61.

The author describes a method of semi-quantitative evaluation of the L.E. phenomenon in peripheral blood, and gives details of the conditions necessary for correct interpretation. The paper is illustrated with an excellent series of coloured photomicrographs.

HISTOPATHOLOGY

An Electrically Controlled Drive with a Slow-cutting, Fast-return Cycle for Rotary Microtomes. Elbers, P. F. (1963), *Stain Tech.*, **38**, 173-178.

This article describes the construction of a vibration-free microtome

drive with a slow cutting speed and a fast return to the cutting position. The different speeds are obtained by alternately coupling a high and low speed drive to the final drive shaft through a magnetic clutch and a specially designed pawl clutch. Being vibration free the drive can be used with an ultramicrotome. D.T.

Tannic Acid, Iron Haematoxylin, Alcian Blue and Basic Fuchsin for Staining Islets and Reticular Fibres of the Pancreas. Monroe, C. W. and Spector, B. (1963), *Stain Tech.*, **38**, 187-192.

A fairly rapid technique (approximately half an hour) is presented in which alpha cells and collagenous acinar cells stain orange to grey, beta cells grey, granules and ducts bluish grey; the fixative of choice being Bouin's fluid. D.T.

Floating-out Techniques for Rapid Placement of Ribbons of Serial Sections on Slides. Sack, O. W. (1963), *Stain Tech.*, **38**, 315-320.

Two methods of floating out ribbons of sections on a water bath are given which are both simple and timesaving. It is recommended that albumin-glycerol be added to the water to facilitate control of the sections. D.T.

A General Purpose Silver Technique for Peripheral Nerve Fibres in Frozen Sections. Fitzgerald, M. J. T. (1963), *Stain Tech.*, **38**, 321-327.

Frozen sections of tissue, fixed in Richardson's fixative (formula given), are treated with saturated boric acid then placed in 10% silver nitrate for 20-25 minutes at 37°C., after which they are passed through four changes of 10% formaldehyde then developed in a diamino-silver solution for 10-30 minutes. After being fixed in hypo and toned in gold chloride the sections are dehydrated, cleared and mounted in Canada balsam. Nerve fibres are black. Most of the stock solutions are stable with the exception of silver nitrate (3 weeks) and the silver amino-carbonate (2-3 months). D.T.

Restoration of Rust-Stained Formalin-Preserved Gross Specimens. Haviland, T. N. (1963), *Amer. J. clin. Path.*, **29**, 364.

The restoration of a priceless museum specimen, which had been unfortunately stored in a rusty container, is described. Careful treatment with 5% hydrochloric acid for 1 to 5 hours followed by washing and colour restoration produced good results. B.G-J.

Improved Tissue-Freezing Apparatus for Cryotomes. Freeman, G. W. (1963), *Amer. J. clin. Path.*, **39**, 324.

A device is described which enables carbon dioxide to be used to give extremely rapid freezing of tissue. The equipment is more convenient than the acetone bath with solid carbon dioxide normally used, and produces less cellular distortion. B.G-J.

Sponge-Biopsy Technique in Early Diagnosis of Carcinoma of the Cervix. Faulds, J. S. (1964), *Lancet*, **i**, 655.

A piece of Ramer baby sponge 1 x 0.75 x 0.5 cm. is rubbed over the mucocutaneous junction of the cervix, then fixed in 10% formalin and embedded in wax, using xylene as clearing agent. Sections of the sponge show fragments of tissue which are easier to interpret than the often bizarre cells of a normal smear. B.G-J.

The Alcian Dyes Applied to Gastric Mucosa. Maxwell, A. (1963), *Stain Tech.*, **38**, 286.

Demonstration of the mucous cells of the stomach using Alcian Green 2 GX, Alcian Yellow GXS or Alcian Blue 8GX300 is described. The method is applicable to routine fixed tissues and can be expanded to give a differential picture of oxyntic, peptic and mucous cells by using Methanol fast blue (C.I.74360), Pyronin and Alcian Yellow. B.G-J.

MICROBIOLOGY

Cultivation of Acid-fast Organisms from Tuberculous Patients after Prolonged and Intensive Treatment. Darzins, E. and Pukite, A. (1964), *Amer. Rev. resp. Dis.*, **89**, 277.

Evidently the addition of ribonucleic acid to Lowenstein-Jensen medium greatly enhances the growth and recovery of *M. tuberculosis*, especially strains present in resected pulmonary tissues. If the addition of small amounts of nucleic acid does in fact act as a potent growth stimulant of tubercle bacilli, such a modified medium may well be used to advantage in the routine diagnostic laboratory. H.C.W.S.

Antibiotic Sensitivity of *Proteus* Species. Barber, Mary and Waterworth, Pamela M. (1964), *J. clin. Path.*, **17**, 69.

A study has been made of the antibiotic sensitivity pattern of 96 strains of *Proteus* isolated from clinical material and a further 29 strains taken as a random sample. The results have been analysed in relation to different species. The affect of electrolytes on the penicillin sensitivity of *Proteus* species has also been examined. H.C.W.S.

Differentiation of Rapidly Growing *M. balaei, M. fortuitum* and Saprophytic Mycobacteria by Means of a Three-Day Phenolphthalein Sulphatase Test. Tarshis, M. S. (1964), *Dis. Chest*, **45**, 288.

Apart from a comparative study of solid and fluid media, the phenolphthalein sulphatase test is claimed to provide a rapid and useful screening tool for the differentiation of three groups of mycobacteria. Such information may well provide a further means of classifying the 'anonymous mycobacteria.' *H.*C.W.S.

Influence of Daily Penicillin, Tetracycline, Erythromycin and Sulphmethoxypyridine on Exacerbations of Bronchitis. Francis, R. S. and Spicer, C. C. (1964), *Brit. med. J.*, **i**, 728.

Although this review article is mainly of clinical value, the bacteriological findings should prove of particular interest to the technologist. So often the interpretation of cultures relating to the patient suffering from bronchitis remains a problem to the clinician and bacteriologist alike. This survey provides a reasonable answer to at least a few of the major questions; however, 'That the bacteriological findings are essentially in agreement with the clinical ones' seems almost too good to be true.

H.C.W.S.

An Improved Method of Isolating Salmonellae from Contaminated Coconut. Iveson, J. B., Kovacs, N. and Laurie, W. (1964), *J. clin. Path.*, **17**, 75.

A report is given on results obtained in the examination of desiccated coconut from Ceylon and the Philippines, using three media in parallel, the aim being to investigate the efficacy of the enrichment medium introduced by Rappaport, Konforti and Navon, who made earlier experiments in this field. Although the claims of Rappaport *et al.* related only to the examination of faeces, the Rappaport enrichment medium has been found to give higher recovery rates of salmonella from desiccated coconut than the selenite and tetrathionate media. The differences are so striking as to justify an expansion of this work.

H.C.W.S.

SEROLOGY

Serologic Diagnosis of Infectious Mononucleosis. Davidsohn, I. and Lee, C. L. (1964), *Amer. J. clin. Path.*, **41**, 115.

This study compares the results of five serological tests for infectious mononucleosis on 241 samples from 130 patients suffering from infectious mononucleosis, and 37 samples from patients with elevated anti-sheep cell agglutinin titres but diagnosed as not having infectious mononucleosis. The conclusions drawn were several, and may be of assistance in the interpretation of equivocal results in the Paul Bunnell test.

The Health Department Examinations

INTERMEDIATE (2nd and 24th March, 1964)

Written Paper 1. (Bacteriology and Haematology)

Answer all questions, which carry equal marks. Time allowed, 2 hours.

1. Outline a method for the isolation and exact identification of *H. influenzae* from sputum. How do you differentiate this organism from others in this group?

2. In which culture media are each of the following found? Bile salt; malachite green; urea; peptone; sodium acid selenite; asparagine; paraffin; resazurin; liquoid; Andrade's indicator.

Give the particular function of each substance in its own medium, and the use of that medium in medical bacteriology.

3. Nominate one of the Romanowsky stains and describe its preparation in the laboratory, commencing with the prepared powder. How would you use this stain on a blood film from a normal patient, noting carefully the precautions you would take to ensure that the films were correctly stained. Give a short description of the formed elements seen in such a film using a microscope fitted with an oil immersion lens.

Written Paper 2. (Biochemistry and General)

Answer all questions, which carry equal marks. Time allowed, 2 hours.

1. Using diagrams to illustrate your answer, explain the workings of an analytical balance familiar to you. How would you use this to weigh out the amount of salt required to prepare a litre of exactly 0.85% sodium chloride solution? Outline *in a few words* a method for checking the accuracy of your prepared solution.

2. (a) Commencing with the preparation of the 'test meal' in a gastric analysis test, explain how the patient is prepared, how the test meal is given, how samples are obtained and how the analysis is carried out, giving the reasons for the various procedures employed. Of what do the free and total acid consist, and how is the result of the titration expressed?

(b) If 2.5 ml. of gastric juice requires 3.5 ml. of N/20 sodium hydroxide to neutralise the free acid, and the total sample is 30 ml., calculate the free acid in mEq./sample.

3. Give brief answers to the following questions: (a) How would you check the calibration of a haemoglobin pipette? (b) How would you use a Lovibond comparator to check the pH of tap water? (c) What is Beer's Law? (d) Why do we use angle head centrifuges? (e) Why is group AB blood called 'universal recipient'?

4. Discuss the protein precipitants used in a medical laboratory, giving the section of the laboratory in which they are used, their use in that place, their mode of action, and the advantages and disadvantages which accrue from their use.

Practical Paper.

Answer all 30 questions in the three hours, moving from question to question each six minutes. Treat them in ascending order, returning to question 1 after completing question 30 and again ascending until all questions have been answered. Where possible, illustrate your answer by rough diagrams and, wherever calculation is required, show this in your answer.

1. State the important features of the three sterilisation controls shown and the method of use. (Browne control; striping tape; stearothermophilus spore strip.)

2. What is this, how is it used and what is the principle of its construction? (Thermostat.)

3. What is this, what do the markings indicate and how is it used? (Litre measuring flask.)

4. Give the composition of Neisser stain. (Neisser 1 and 2.)
5. What are these, how are they prepared and used? (Antibiotic discs.)
6. Write notes on the organisms found in the two bacteriology slides A and B. Give a tentative indentification.
7. Given that the red cell count is 4.25 million per cmm. and the haematocrit reading 42%, what is the M.C.V.?
8. Read the three blood groups from the preparations provided. (AB, O, A)
9. List the important points in the performance of the sedimentation test of blood.
10. Examine the faeces provided for occult blood. (Weak positive.)
11. Identify the organism provided from the cultures. It is a gram-positive coccus. *(Staphylococcus aureus.)*
12. Write notes on the two blood films C and D.
13. What organisms would give the sugar reactions of these preparations? How would you examine the organisms further? *(S. typhi* and *B. proteus.)*
14. How would you prepare the mixture in the bottle? (Acid digestion mixture.)
15. How is this solution used? (Brilliant cresyl blue.)
16. How are these solutions used and what is the essential difference between them? (Benedicts qualitative and quantitative reagents.)
17. What do the letters S.V.R. mean and how is the substance used in the medical laboratory?
18. How is this reagent made and how is it used in the laboratory? (Fouchet's reagent.)
19. Describe briefly how Coombs' reagent is made, and how it is used in the laboratory.
20. Read the three verniers E, F and G and note the results.
21. How would you dispose of a specimen of faeces from a typhoid patient?
22. What is this instrument? Explain its construction and use by means of a diagram. (Angle head centrifuge.)
23. What is this and how is it used? (Berkefeld filter.)
24. What is this piece of equipment? Explain its construction and use in the laboratory. (Meker burner.)
25. List briefly the steps you would take to set up Kohler illumination in the laboratory microscope.
26. Test the specimen of urine H for albumin and note your result. (Definite positive.)
27. What is this, why is it constructed as it is, and how is it used? (Prefocussed bulb.)
28. Write down the values of all the weights you would find in a box of weights for an analytical balance capable of weighing 70.123 grams.
29. Draw a sectional diagram of a colorimeter in such a way that the working of the instrument is clearly shown. (Visual colorimeter.)
30. How would you prepare Hayem's solution?

Successful Candidates

Alexander, E. B.
Allen, Miss P. S.
Armour, Miss P. J.
Badham, Miss D. J.
Bain, Miss K. W.
Bateman, K. J.
Beech, M. J.
Bluck, Miss J. R.
Bone, Miss A. K.
Bremner, Miss G. F.
Brenton-Rule, Miss H. M.
Brooke, Miss J. M.
Burroughs, Miss B. J.
Campbell, C. H.
Cantwell, L. Mc.
Carman, Miss M. G.

Clayton, Miss B. M.
Courtney, W. J.
Cresswell, B. C. L.
Curtis, Miss A. A.
Davidson, Mrs M. J.
Davy, Mrs E. M.
Day, B. R.
Eathorne, B. J.
Evans, Mrs B. F.
Gardner, Miss G. K.
Gray, A.
Hampson, M. H.
Hannah, Miss H. M.
Hayes, Miss L.
Heath, Miss L. J.
Hills, Miss M. E.
Holloway, R. J.
Horrocks, Miss D. J.
Hughes, Miss M. D.
Hughes, Miss R. S.
Kean, Miss S. M.
Kirkham, B. M.
Loader, A. E.
Lumsden, Miss N. R.
MacDonald, R. J.
MacDuff, D. A.
MacFarlane, K.
MacGibbon, N. A.
McKay, E. J.
McLoughlin, K.
Marr, J.
Martin, Miss B. E.
Meldrum, N. M.
Norman, E. P. S.
Orchard, I. R.
Paice, Miss L. A.
Penman, Miss G. L.
Pittman, Mrs P. E.
Potter, Miss J. M.
Prior, Miss J. N.
Scoggins, K. S.
Shaw, Miss M. A.
Shooter, Miss G. R.
Smyth, Miss N. A.
Sorensen, C.
Strickett, Miss M.
Thorne, C. H. F.
Tong, Miss K. D.
Turley, Miss N. M.
Van Voorthuizen, J. P.
Wadams, Miss V. A.
Watt, G. W.
Wheelhouse, Miss J.
Willis, Miss E.
Wilson, A. G.
Wilson, T. M.
Wilson, W. J.
Wrightson, Miss M. L.

There were 84 entrants, of whom 74 were successful.

FINAL — CERTIFICATE OF PROFICIENCY (APRIL, 1964)

Written Paper (Bacteriology)

Answer all questions, each carries equal marks. Time allowed 3 hours.

1. Describe the laboratory procedures for the diagnosis of human leptospiral infection.

2. (a) Name three intestinal helminths of man that occur in New Zealand. (b) Describe the life cycle and the methods of diagnosis of one of these.

3. What bacteriological, serological or immunological methods will indicate present or past infection with a beta-haemolytic streptococcus? For each method describe the results that are accepted as being indicative of such an infection.

4. Name three micro-organisms which may commonly contaminate food and cause disease. Describe briefly the procedures necessary to prove that a suspected food sample is contaminated.

5. Write brief notes on the following: Tuberculin; Vi antigen; Complement fixation; Catalase; Mycoplasma; Vaccine lymph; Logarithmic period; Wood's glass; Nagler reaction; Phenol Co-efficient.

Written Paper (Chemical Pathology)

Attempt all questions. Descriptions and discussions should be brief and relevant. Candidates are advised not to exceed the time allotted for each question. (20 marks = 36 minutes; 15 marks = 27 minutes)

1. Write a list of the common accidents involving workers in chemical pathology departments, and describe briefly the principles of first aid measures which should be taken. *(15 marks)*

2. Describe the methods familiar to you, for the estimation of the serum proteins and their fractionation. Discuss the experimental errors and limitations of the methods. *(20 marks)*

3. (a) During a histamine test meal, the basal secretion had a volume of 25 ml. and a total acidity of 20 ml. N/10 NaOH per 100 ml. The samples aspirated from the stomach after half and one hour (volumes 35 and 42 ml.) had total acidities of 40 and 45 ml. of NaOH per 100 ml. Express these results as total milli-equivalents of acid produced in each sample. *(10 marks)*

(b) Describe briefly how you would calibrate a 5 ml. pipette which you suspect is inaccurate. *(10 marks)*

4. Give an account of a method for the estimation of fat in faeces. Comment on the experimental problems associated with the measurement, and on the implication of the result.

5. (a) Outline the principles of a renal function test, giving brief notes on the laboratory determinations involved.

(b) Describe a method for the detection of blood in faeces. *(15 marks)*

6. Discuss, in detail, the experimental errors involved in the estimation of serum calcium concentration, giving a figure for the probable error of the result by the method you describe. *(15 marks)*

Written Paper (Haematology and Blood Transfusion)

All questions to be attempted, each carries equal marks.

Time allowed 3 hours.

Section 1 Haematology

1. Discuss the Paul Bunnell test and its refinements in relation to the diagnosis of infectious mononucleosis.

2. Give an account of the laboratory tests concerned with the diagnosis of haemolytic anaemia. Indicate the way in which such tests can help in determining the type of haemolytic anaemia.

3. Write brief notes on: (a) Checking the calibration of pipettes; (b) Demonstration of L.E. cells; (c) Siderocytes; (d) The laboratory conditions required for an accurate determination of the whole blood clotting time of Lee and White.

Section 2 Blood Transfusion

1. Discuss the changes which occur in blood when stored for up to three weeks in ACD mixture under accepted temperature conditions.

2. Discuss the sources of error which most frequently result in incompatible transfusion. State your recommendations as to how maximum safety can be achieved in blood transfusion.

3. (1) Antibodies of the P and Lewis blood group systems are frequent causes of agglutination in cross-matching blood. Discuss their significance in blood transfusion; (2) What are the reactions of anti-H with A_1 and A_2 red cells?; (3) What preparation would you favour for transfusion of a factor IX (Christmas) deficiency during a haemorrhagic episode? Give your reasons.

Practical Paper (Bacteriology)

All questions are to be attempted, all practical work must be completed at this session. No further time will be available. Marks will be given for accurate records involving the macroscopic and microscopic examination of materials provided, and for brief notes indicating what further examinations you would suggest to confirm any observations that you have made.

1. A. An Indian arrives by air in New Zealand and is immediately admitted to hospital with acute gastro-enteritis. A smear is made from the fluid rectal discharge and stained by Gram's method. Examine the smear and indicate how you would confirm the identity of the organism present.

B. The laboratory guinea pig colony is subject to a chronic disease causing progressive emaciation and death in about 2-3 weeks. At autopsy, nodular lesions are present in the liver and spleen which yield a thick creamy pus. You are provided with a pure culture of the organism isolated aerobically, for examination.

2. Examine the two slides provided for evidence of parasitic infection.
   C. Aspirated fluid removed from a cyst.
   D. Faecal preparation from a patient with eosinophilia.
3. Two cultures of fungi are provided.
   E. Isolated from the sputum of a case of bronchiectasis.
   F. Culture of hairs which showed fluorescence under ultra-violet light.
4. Indicate the probable identity of the two organisms provided.
   G. Culture is a four-day isolation on Lowenstein medium from the deposit of a twenty-four hour urine specimen.
   H. Aerobic culture obtained from a swab taken from a lung abscess.
5. You are provided with a series of culture media which have been inoculated with a pure culture of an organism isolated from a case of bacillary dysentery. Identify the organism.

Practical Paper (Chemical Pathology)

All questions to be attempted. *Time allowed 3 hours.*

1. Estimate the uric acid content of the serum sample A. *(20 marks)*
2. Determine the calcium concentration of the serum sample B. *(20 marks)*
3. Measure the urea concentration of serum sample C. *(20 marks)*
4. Test the urine sample D for protein, bilirubin, urobilin, ketones. *(15 marks)*
5. Write brief notes on the five spot tests provided. (Oxyhaemoglobin in urine; porphyrins in urine; methaemoglobin in blood; glass and reference electrodes for pH determination; a didymium filter.)

Practical Paper (Haematology and Blood Transfusion)

All questions to be attempted, each carrying equal marks.
Time allowed 3 hours.

1. Blood specimen A. Estimate the haemoglobin and haematocrit. Calculate the M.C.H.C.
2. Blood films 1 to 15. Examine and report on the morphology of the cells in each of those films. Do not give diagnoses.
3. Blood specimens 1 to 20. (Cells and serum separated.) These are 20 blood donors. ABO and D type them. Specimen X is serum from a patient of group O Rh (D) positive. Which donors would be compatible for transfusion to patient X ?

Succesful Candidates

Bardsley, I. J. ..... Wellington
Bond, Miss H. M. J. ... Wellington
Buchanan, Miss M. ... New Plym'th
Cameron, C. W. ..... Christchurch
Coates, A. R. ..... Christchurch
Garner, Miss J. G. ..... Lower Hutt
Kitto, J. B. ..... Dunedin
Lowry, G. F. ..... Christchurch
Martin, Miss L. R. ... Lower Hutt
McLachlan, J. H. ..... Auckland
Ogle, W. D. ..... Invercargill
Rustbatch, Miss R. L. ... Dunedin
Worley, Mrs E. A. ... Christchurch

There were twenty-one candidates for the examination, of whom thirteen passed, five gained partial passes, two failed and one did not complete the examination owing to illness.

Branch Reports

DUNEDIN

(Secretary: E. K. Fletcher, Pathology Department, Medical School, Dn.)

The Branch's activities for the year began in March with a short meeting followed by films.

On April 4, twenty-five members travelled to Timaru, where several presented topics at a seminar for South Island members. The day proved to be most educational, while enjoyment was to the fore at the social evening. Thanks were due to Mr Tanner and his helpers, of the Christchurch Branch, for the organisation of the seminar; and to the Timaru members who acted as host.

At the May meeting, remits for the Annual Conference were discussed; after which there was a visit to the Wellcome Research Institute, where the medical staff acted as guides in a tour of the building. Current research and experiments were outlined, and proved to be of great interest. The cardiac electronics laboratory, electron microscopy of the kidney, cell pharmacology and physiology, rheumatology and biochemistry of the catecholamines were but a few of the subjects featured. The Branch is indebted to Professor Sir H. Smirk for his kind permission for the visit, and to his staff for devoting their time to explaining their work.

The Branch will be hosts to members of the Association of Science Technicians at a meeting in July, when much of the work of the medical laboratory technologist will be displayed and demonstrated. E.K.F.

WELLINGTON

(Secretary: M. J. Lynch, c/o Drs Lynch, O'Brien and Desmond, Kelvin Chambers, 16 The Terrace, Wellington.)

The five meetings held during the past year have followed the form of previous years, with a short business session followed by an address by a member of the branch or a guest speaker. Meetings planned for the coming year include an evening made up of contributions by junior members only.

Titles of addresses delivered to date include:

Calcium Estimation Using the E.E.L. Flame Photometer. Mr B. McLean.

Tissue Culture. Dr L. Fastier.

Thrombotest and the Quick One-Stage Test. Mr A. L. Schwass.

A Recent Trip to the Tokelau Islands. Dr M. Neave.

Experiences of a Laboratory Technologist in South Vietnam. Mr R. McKenzie.

The branch held another very successful cocktail party at Christmas. It was pleasing to welcome two members of the Dunedin branch at this function.

At the Annual General Meeting in April, the following executive was installed for the ensuing twelve months:

Chairman	Mr I. H. Symonds
Secretary	Mr M. J. Lynch
Committee	Miss V. M. Toms
	Mr W. Aldridge

M.J.L.

One-Day Seminar Held At Timaru

A very successful one-day seminar was held at the Nurses' Lecture Hall, Timaru Hospital, on Saturday, April 4, 1964.

This was attended by some sixty-five technologists, representing nearly every medical laboratory in the South Island.

The day's proceedings opened with a short address by Dr L. A. Faigan, Pathologist, Timaru Hospital, and continued according to the programme:

Incubation of Mycobacterium tuberculosis *in* CO_2 *Incubator.* C. Felmingham.

Antibiotic Sensitivity Testing and Titering. H. C. W. Shott.

Choice of Suitable Antibiotics for Resistant Organisms. H. C. W. Shott.

Fluorescent Antibody Techniques. T. E. Tanner.

A.S.T.O. Titres and Significant Levels Thereof. Miss L. Matheson.

Choice and Use of Selective Media. Miss J. Gray.

'Thrombotest' v. Quick's One Stage Prothrombin Method. C. Felmingham.

Haemagglutination Pregnancy Tests. B. Main.

Leucocyte Alkaline Phosphatase. T. E. Tanner.

An Acquired Blood Group Antigen. D. S. Ford.

Evaluation of Clotting Tests and Protocol for Investigation of Clotting and Bleeding Disorders. Miss M. Eales.

Antinuclear Factor Tests. J. Rees.

Protein-Bound Iodine Estimations. T. E. Brown.

Autoanalysis. R. D. Allan.

T.N.P.N. and B.U.N. in Evaluation of Renal Function. M. Abernethy.

I.C.D. and S.G.P.T. as Index of Hepatocellular Damage. J. Walker.

Electrophoresis. Miss D. Bryant.

Evaluation of Cholesterol Methods. K. Fletcher.

Quality Control. C. Cameron.

Brief run-down on current Institute affairs by the Honorary Secretary, N.Z.I.M.L.T. (Inc.).

Each item on the programme was introduced briefly by the speaker for 5—10 minutes and general discussion followed, guided by a chairman in the appropriate speciality.

The chairmen were Messrs G. R. Rose, J. Case and J. Walker, who chaired the bacteriology, haematology/serology and biochemistry sessions respectively.

The South Canterbury Hospital Board very kindly supplied an excellent lunch and afternoon tea.

Messrs F. Wharton, B. Hildreth and D. Johnson, representing Watson Victor Ltd., G. W. Wilton and Co. Ltd. and Townson and Mercer (N.Z.) Ltd., were responsible for interesting trade displays.

The day concluded with a buffet meal and fluid refreshments at a reserved lounge in the Crown Hotel.

It was agreed by those present that this is in danger of becoming an annual event!

T.E.T.

A Suggestion for the Future Training of Medical Laboratory Technologists

Arising from a meeting last December between Messrs H. G. Bloore and H. E. Hutchings (representing the N.Z.I.M.L.T.) and Mr Wild, Chairman of the Technicians Certification Authority, and Mr Hills, Principal of the Central Institute of Technology, the broad outline of a rough scheme for the training and examination of medical laboratory technologists was drawn up. This scheme was on the agenda for the Council meeting on June 17, and was also discussed in some detail at the Annual Conference.

The substance of the scheme is as follows:—

The Central Institute of Technology would be prepared to equip a

laboratory for the instruction of trainees and for the holding of examinations. The funds could be obtained through the Education Department without difficulty. Examiners and the majority of the tutors would probably be drawn from among senior technologists, who would be paid for their services.

Trainees in the larger centres would attend evening classes at their own local college or school of technology for a prescribed course of lectures. Trainees in smaller towns or cities would be instructed by means of a correspondence course, supplemented by an attendance for a two or three weeks' annual practical course at the Central Institute, necessary for the teaching of the more sophisticated techniques. The Central Institute of Technology is situated, at present, in Petone.

Syllabus

This would follow the new syllabus recently adopted, and would be supplemented by material from the syllabuses already available from the Central Institute—particularly in basic subjects, as well as in Microbiology and Biochemistry. The syllabus would have to be split up as necessary to achieve the desired standard. Science graduates would be exempted from those subjects covered during their degree course. A special general course could be devised for these people to ground them in basic laboratory work, thus making them more useful more quickly.

Schedule of Training

Pre-requisite scholastic attainment to be University Entrance to include some of the following: Chemistry, Mathematics, Biology, Physics.

First Year

All trainees to take a short (say, 3-4 weeks) course in basic techniques at the Central Institute. Their salaries paid by their own Hospital Board.

Trainees select one subject (Haematology, Microbiology, Biochemistry or Blood Group Serology), study it for the whole year and then sit an examination in that subject at the Central Institute. The standard to be, say, that of the new Intermediate examination.

Second Year

Trainees select a second subject and do the same as in the first year.

Third Year

The same again, in a third subject.

Fourth and Fifth Years

Specialisation in one subject for the two years, leading to an examination at the standard of the new Final syllabus. This would confer Associateship.

Sixth and Seventh Years

Specialisation in a second subject, leading to another examination to gain Fellowship.

The entire scheme is very similar to that operating in England, where moves are afoot, at the present time, to bring in more formal training in institutes of technology. Provision could be made for an even higher qualification, perhaps involving the necessity to carry out some original research.

Thoughts on how the scheme might operate

There seems no reason why such a scheme could not work well in both large and small laboratories alike. Trainees would find it easier to prepare themselves for the examinations, since they would be required to study only one subject at a time. One imagines that the Auckland Hospital Board's present training programme could very easily be integrated into the new scheme, although it remains to be seen by what means this could be achieved. Trainees receiving the correspondence tuition would be assisted by their own charge technologists, and lecturers and examiners would, no doubt, continue to be drawn from among the senior technologists at present performing that very function.

Three examinations could be held annually, and one in each of the three main subjects could be held at the Central Institute of Technology. It is possible that the examinations would be conducted by the Department of Education on behalf of the Department of Health, who would still be the issuing authority for the Certificate. It would probably be better to accept an arrangement along these lines than to aim, at the present time, for complete autonomy to conduct our own examinations.

In the discussion during the forum on education at the 1964 Annual Conference, this scheme was met with scant enthusiasm. It may be that it received less favourable approval than it deserved, for there can be no doubt that some sort of formal teaching in fundamentals would be beneficial to our trainees. Also, recalling the words of Mr K. H. Melvin at the 1963 Conference, a certain 'respectability' may be hoped to be derived from an association with an established educational institution.

However, the enlistment of the help of technical colleges in providing training programmes for medical laboratory technologists was not as simple as it sounded. Although, in general, these institutions were not only willing, but obviously eager to extend their scope in our direction, they were incomplete in their understanding of our requirements. A member of the staff of the Science Department at Wellington Polytechnic had taken the trouble to draw up a curriculum, but the transformation of this into a practical schedule of training was something that would seem to present difficulties. Apart from the limitations of the programme itself, which would not be impossible to overcome, there was the fact that the technical colleges had not the highly specialised equipment necessary to conduct classes on their own premises. This could, no doubt, be acquired eventually, but meantime it would probably be necessary to hold the classes under their aegis, but at the hospitals.

The availability of correspondence tuition through the Central Institute of Technology was something that offered hope for trainees at smaller centres, but such courses were no complete substitute for live lectures. Correspondence tuition is already available to trainees in the Auckland region, through the Auckland Hospital Board's training scheme, but this tackles the problem only on a local scale.

There remains disagreement on the desirability of specialisation after the Intermediate Examination, mainly on the grounds that the needs of smaller laboratories are not met by a qualifying examination not of broad general scope. In defence of specialist qualifying examinations it must be said that these require more than a superficial knowledge of the particular subject and that, generally, a very much higher standard of marking is possible when the candidate has been able to devote his studying time to one single subject. One would expect that in the event of the adoption of such a system of certification, applicants for sole charge positions would be expected to have passed an examination in two specialist subjects. This works well overseas, and would seem to have something to commend it even here. Provided the standard of the Intermediate Examination could be maintained at a reasonable level, charge technologists at smaller hospitals would be better equipped for their positions than is provided for in the present system, where the growing complexity of medical laboratory technology makes examination to a high standard impossible.

The standard of marking in the C.o.P. examination came in for some criticism. It was generally agreed that the present situation, where some 90% of entrants were successful, was not satisfactory. The tendency on the part of examiners to pass borderline cases on the least excuse resulted in a lowering of standards. With the implementation of the new syllabuses (probably in time for the 1966 examinations) it may be more

easy to set a high standard, since the extent of knowledge required is given in much greater detail than in the old syllabuses.

One obvious weakness in the new C.o.P. syllabus is in the section relating to Blood Group Serology. This reflects, possibly, the absence of a specialist in haematology on the Examination Board, and is regrettable since it leaves a gap in the knowledge of the qualified technologist that would have been better avoided.

A suggestion that the Intermediate Examination should be regarded as a qualifying examination in its own right was not favourably received. While it can be argued that there may be some advantages to be gained, a general lowering of standards may be the end result.

The practicability of holding practical examinations at Intermediate level is something that is causing growing concern. The fact that there were some 51 candidates at the recent Intermediate at Auckland had dictated the form of that particular examination, and the problem was one that threatened to get worse as time progressed. A suggestion that the practical examination should be replaced by a system of certification of competence by someone senior in the candidate's laboratory was not regarded with favour. This is a difficulty that will have to be faced very soon; the only solutions at present being examinations at more frequent intervals, or examinations held at Dunedin where facilities exist for larger numbers.

The forum resulted in no firm decisions, but served the purpose of permitting an exchange of views for the guidance of the Institute's representatives on the Medical Technologists Board. Further discussion, over a wider section of the Institute's membership, is possible through the medium of the *Journal*. Letters pertinent to the question of training and examinations will be published in a section devoted to the subject, and are invited from anyone who has constructive suggestions to offer.

Letter To The Editor

EXAMINATIONS

Sir,

The sentiments expressed by Mentor in the last issue of the *Journal* must surely reflect the growing concern of many members of the Institute at the present lack of an adequate system of organised training for laboratory trainees.

Laboratory technology is essentially a practical science and technical proficiency is therefore of paramount importance, but by no stretch of the imagination can the candidates for the recent Intermediate Examination be said to have been permitted to give any indication of their practical ability. The practical part of the examination was virtually replaced by a series of simple, brief, and mostly theoretical questions.

It is farcical to present examinees, many of whom have travelled considerable distances at some inconvenience to themselves and their laboratories, with a 'practical' examination of this calibre, when they have all completed at least three years full-time employment in a recognized training laboratory.

The whole examination structure is long overdue for revision, and a system of training organised on a national basis must be implemented if the New Zealand qualification for medical laboratory technologists is to be accepted overseas. Unless a specialist system of qualification is introduced, there is no hope of reciprocity, and New Zealand trained technicians visiting Britain will find (as many have already found) that their C.o.P. is of no value to them there.

There is no lack of progressive thought among the pathologists, and unless the Examination Board meets to consider the questions set in each examination to ensure a sufficiently high standard, the Institute may be blamed for the decline in the standard of medical laboratory technology that will inevitably result. The Examination Board could also profitably give thought to the adoption of a system whereby trainees will specialise after the Intermediate examination.

B. MITCHERSON G. PEARMAIN
C. SAXBY F. SMITH
J. THOMAS P. A. TURNER
E. WILLIS
Hawkes Bay
25th May, 1964.

New Members

At the Council meeting on June 18, 1964, the following new members were enrolled:—

Adamson, Miss J. R. ..... Rotorua
Aitchison, E. D. ..... Auckland
Armour, Miss P. J. ..... Auckland
Bagnall, Miss H. M. ..... Hamilton
Barnett-Smith, Miss K. A. ... Auck.
Blake, Miss J. H. ..... Hamilton
Bosley, I. S. ..... Auckland
Bradley, P. R. ..... Hastings
Bree, A. D. ..... Auckland
Broad, G. G. ..... Invercargill
Broome, G. H. ..... Wanganui
Brosnan, Miss E. A. ..... Auckland
Brown, P. B. ..... Wellington
Bruce, Miss M. H. ... Christchurch
Butler, Miss R. L. ..... Napier
Charlton, G. J. ..... Hamilton
Cullinane, Miss G. ..... Hastings
Currie, T. B. ..... Auckland
Dakers, Miss L. A. ..... Auckland
Davey, G. P. ..... Dunedin
Davies, J. A. ..... Whangarei
Dixon, S. G. ..... New Plymouth
Doggett, Miss M. I. ..... Rotorua
Douglass, Miss H. L. ... Wellington
Dowrick, I. M. ..... Auckland
Duncan, S. J. ..... Wairoa
Gee, Miss A. R. ..... Dunedin
George, Miss D. E. ... Invercargill
Gibson, B. J. ..... Gisborne
Gibson, Miss M. K. ..... Dunedin
Goble, Miss D. W. ..... Dunedin
Gratten, M. J. ..... Christchurch
Green, B. H. ..... Whangarei
Hanna, Mrs N. M. ..... Hastings
Harger, Miss K. P. ..... Hamilton
Harman, Miss P. B. ... Christchurch
Hazlewood, Miss M. ..... Wanganui
Hockey, Miss C. R. ... Invercargill
Jackways, Miss K. Y. ..... Hamilton
Johns, W. L. ..... Auckland
Jolly, Miss B. L. ..... Auckland
Kerr, Miss H. L. ..... Auckland
Killip, M. ..... Auckland
Kite, Miss Y. L. ..... Waipukurau
Langford, T. G. ..... Hamilton
Leach, D. J. ..... Otahuhu
Lee, Miss J. P. ..... Napier
Leigh, D. ..... Auckland
Lloyd, Miss A. M. ..... Auckland
McMillan, Miss B. A.... Wellington
McQuarrie, Miss A. M. ... Dunedin
Mackrell, Miss S. A. ..... Hamilton
Marshall, Miss K. A. ..... Dunedin
Melrose, W. D. ..... Invercargill
Milburn, M. J. R. ..... Whangarei
Oliver, Miss I. C. ..... New Plym'th
Opie, C. A. ..... Wellington
Pedesen, Miss J. L. ..... Wanganui
Penney, Miss R. J. ..... Hamilton
Pickard, P. E. ..... Auckland
Pybus, J. ..... Auckland
Rasmussen, Miss K. L.... Wanganui
Shaw, Miss E. J. ..... Dunedin
Smythe, Miss P. N. ... Christchurch
Smythe, Miss R. H. ..... Wellington
Speed, J. F. ..... Hamilton
Spelman, Miss E. M. ... Wellington
Stewart, Miss M. ..... Wanganui
Thompson, W. J. ..... Otahuhu
Tracey, R. J. ..... Napier
Uddstrom, Miss D. E. ... Greym'th
Verity, H. A. ..... Timaru
Ward, V. A. ..... Auckland
Wayne Wilson, Miss D. ... Auck.
Weatherby, D. J. ..... Otahuhu
Winders, G. B. ..... Invercargill
Winter, Miss B. J. ..... Auckland
Withers, Miss D. L. ..... Timaru
Wright, D. G. ..... Auckland
Younger, Miss C. A. ..... Auckland

ASSOCIATES ELECTED

Adamson, D. H. ..... Christchurch
Allen, Miss R. E. ..... Wellington
Bardsley, I. ..... Wellington
Barrington, R. W. ..... Hawera
Bell, A. F. ..... Auckland
Bloore, H. G. ..... Blenheim
Boddy, K. H. ..... Oamaru
Bond, Miss H. ..... Wellington
Bridger, R. C. ..... Christchurch
Brown, T. E. ..... Balclutha
Buchanan, Miss M. J. ..... Rotorua
Butcher, Miss A. ..... Dunedin
Buxton, I. R. ..... New Plymouth
Callaghan, J. ..... Auckland
Campbell, Miss M. ... New Plym'th
Carr, Mrs M. I. ..... Wellington
Case, J. ..... Dunedin
Cole, I. ..... Auckland
Crawley, W. ..... Hamilton
Cross, L. ..... Gisborne
Curtis, P. H. ..... Auckland
Davies, J. E. ..... Hamilton
Dawkins, B. F. ..... Auckland
Donnell, M. McL. ..... Takapuna
Dunlop, D. J. ..... Napier
Entwistle, S. W. ..... Dunedin
Fastier, L. B. ..... Upper Hutt
Felmingham, C. E. ..... Greymouth
Fitzgerald, D. W. ..... Timaru
Fletcher, E. K. ..... Dunedin
Ford, D. S. ..... Dunedin
Garnham, F. C. ..... Napier
Gates, Mrs S. ..... Whangarei
George, G. R. ..... Rotorua
Glynn-Jones, B. ..... Dunedin
Grey, Miss M. J. ... New Plymouth
Harper, M. G. ..... Hamilton
Harris, M. L. ..... Dunedin
Henwood, D. ..... Auckland
Horner, J. E. ..... Ashburton
Howell, A. C. ..... Upper Hutt
Hutchings, H. E.... Palmerston Nth
Jenner, Mrs L. ..... Christchurch
Jenner, M. G. ..... Christchurch
Johnston, N. D. ..... Kaitaia
Jones, V. C. ..... Auckland
Kennedy, R. T. ..... Auckland
Kershaw, F. C. ..... Dunedin
Killian, Sr M. ..... Auckland
King, I. C. ..... Auckland
Kuru, G. ..... Wairoa
Law, Mrs J. M. ..... Hamilton
Lewis, T. J. ..... Nelson
Lowry, G. F. ..... Chrischurch
Lynch, M. J. ..... Wellington
Lyon, J. F. ..... Wanganui
McArthur, D. ..... Auckland
McCarthy, M. D. ..... Auckland
McClure, Miss J. M. ... Papatoetoe
McHardy, R. C. ..... Upper Hutt
MacLean, Miss D. ..... Wellington
Main, B. W. ..... Dunedin
Mann, J. C. ..... Palmerston North
Martin, T. ..... Auckland
Mattingley, Miss J. ... Wellington
Meads, G. D. C. ... New Plymouth
Meredith, J. ..... Auckland
Miller, T. E. ..... Auckland
Mitchell, D. F. ..... Dargaville
Mitcherson, B. ..... Hastings
Morgan, J. D. R. ..... Dunedin
Morris, M. R. ..... Clyde
Moss, Mrs L. ..... Christchurch
Nicholas, R. ..... Gisborne
Norris, Miss D. ..... Wellington
Parker, Mrs R. ..... Wellington
Paula, Sr M. ..... Auckland
Pearmain, G. E. ..... Hastings
Peddie, J. J. G. ..... Upper Hutt
Philip, D. J. ..... Auckland
Pridham, Miss A. ..... Tauranga
Ranford, Miss H. ..... Wellington
Rees, J. ..... Dunedin
Reeve, K. G. ..... Gisborne
Reynolds, L. ..... Upper Hutt
Ronald, K. B. ..... Whangarei
Rush-Munro, F. M. ..... Auckland
Saxby, Miss C. ..... Napier
Schwass, A. L. ..... Wellington
Shepherd, C. S. ..... Hamilton
Smail, R. W. ..... Invercargill
Small, C. W. ..... Auckland
Smith, B. N. ..... Timaru
Smith, D. C. ..... Tauranga
Smith, F. ..... Napier
Sowden, A. ..... Auckland
Symonds, I. H. ..... Wellington
Tanner, T. E. ..... Christchurch
Taylor, Mrs J. M. ..... Wellington
Taylor, L. R. ..... Oamaru
Thompson, G. C. ..... Invercargill
Till, D. G. ..... Wellington
Walker, J. A. ..... Christchurch
Whillans, D. ..... Auckland
Whyte, Miss S. G. ..... Napier
Wiggle, W. J. ..... Auckland
Williams, A. H. ... Palmerston Nth

RESIGNATIONS

Dodds, Mrs P. M. ... Christchurch
Garner, Miss J. ..... Lower Hutt
Perry, Miss J. ..... Wellington
Thorburn, D. J. ..... Auckland

The Library

Librarian: J. Rees, Pathology Department, Medical School, Dunedin.

Periodicals currently received:

Amer. J. med. Technol. Volume 30, No. 1. January-February, 1964.

Contents: Accuracy Control of Blood Cell Counts with the Coulter Counter; Observations and Modifications of the I^{131} Labeled Triolein and Oleic Acid Tests; A Correlation of Two Methods for Beta-Lipoprotein Determination; Selection and Evaluation of Students in Medical Technology Degree Programs; Survey of Resistant Cell Hemoglobin Phenomenon.

Volume 30, No. 2. March-April 1964.

Contents: Determination of Serum Iron Using Sulfonated Diphenylphenanthroline; Comparison of the Ox Cell Hemolysin and the Absorbed Heterophile Tests; A Rapid Ultramicro Method for Alkaline Phosphatase; Preparation of a Stable Psittacosis-Lymphogranuloma Venereum Group Complement Fixing Antigen; Experience with and Thoughts on Quality Control; Techniques of Intracorporeal Circulation; The Prothrombin Consumption Test — An Evaluation of Two Methods.

Ann. Med. exp. Biol. Fenn. Volume 41, No. 4. 1963.

Selected contents: Urinary Excretion of Calcium, Magnesium and Phosphorus in Renal Patients; Some Simple Methods of Identifying Non-photochromatogenic Anonymous Mycobacteria (Battey Type); Measurement of Soluble Blood Group Substances Using Lectins.

Volume 41, Suppl. 2. 1963.

Contents: Serologic Studies of the Reactant Partner of the Rheumatoid Factor.

Volume 41, Suppl. 4. 1963.

Contents: Studies of the Metabolism and Antidiuretic Action of 5-Hydroxytryptamine and the Effect of the Mode of Administration.

Aust. J. biol. Sci. Volume 17, No. 1. February 1964.

Canad. J. med. Technol. Volume 26, No. 1. February 1964.

Contents: Appropriate Use of Tissue Cultures in Virology; Les Ultra-Sons en Technique Histologique Premiere Partie; Membrane Filter Technique for the Isolation of Salmonellae; Laboratory Purchasing; Sterilization and Disinfection; A Survey of Methods in the Diagnosis of ABO Haemolytic Disease of the Newborn with Some Results Obtained.

Volume 26, No. 2. April 1964.

Contents: The Complement Fixation Test in Virus Antibody Studies; Les Ultra-sons en Technique Histologique; A Brief Review of the Lewis Blood Group System; A Review of Staining Techniques for Calcium in Tissues; A New Platelet Substitute for the Hicks-Pitney Thromboplastin Screening Test.

Filter. Volume 35, No. 4. December 1963.

Contents: Gel Diffusion and Immunoelectrophoresis of Serum Proteins; An Agglutination Test for Tuberculosis; 'Automation' in the Clinical Chemistry Laboratory.

Volume 36, No. 2. March 1964.

Contents: The Radioactive Techniques in Hematologic Diagnosis; A Rapid Method for the Identification of *Candida Albicans* and other *Candida* species; Sexogens—The Hormones of the Clinical Laboratory; Danger in Our Medical Labs, a Critique.

J. med. Lab. Technol. Volume 21, No. 1. January 1964.

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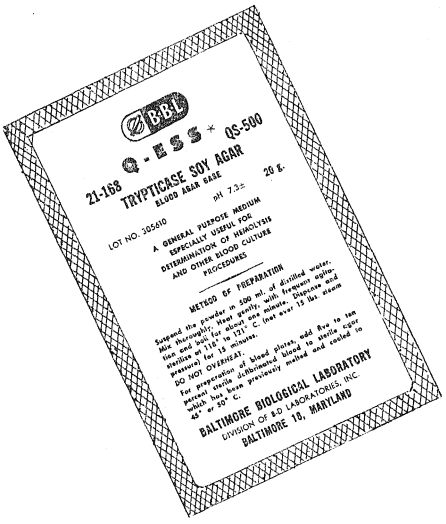

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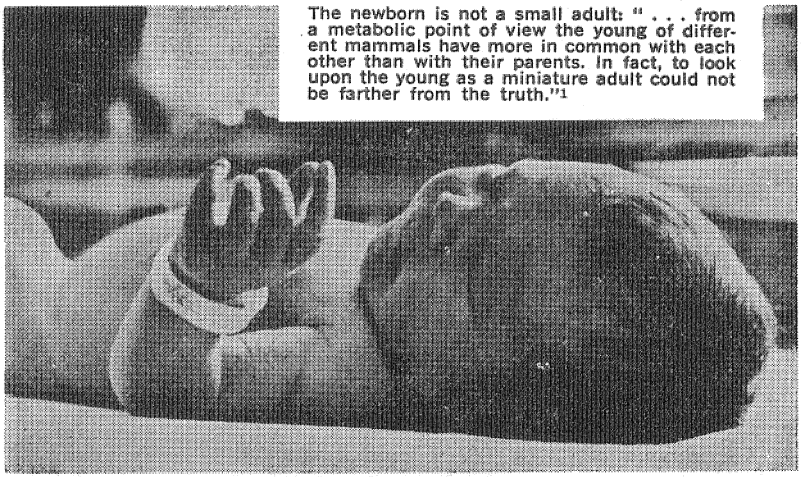

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