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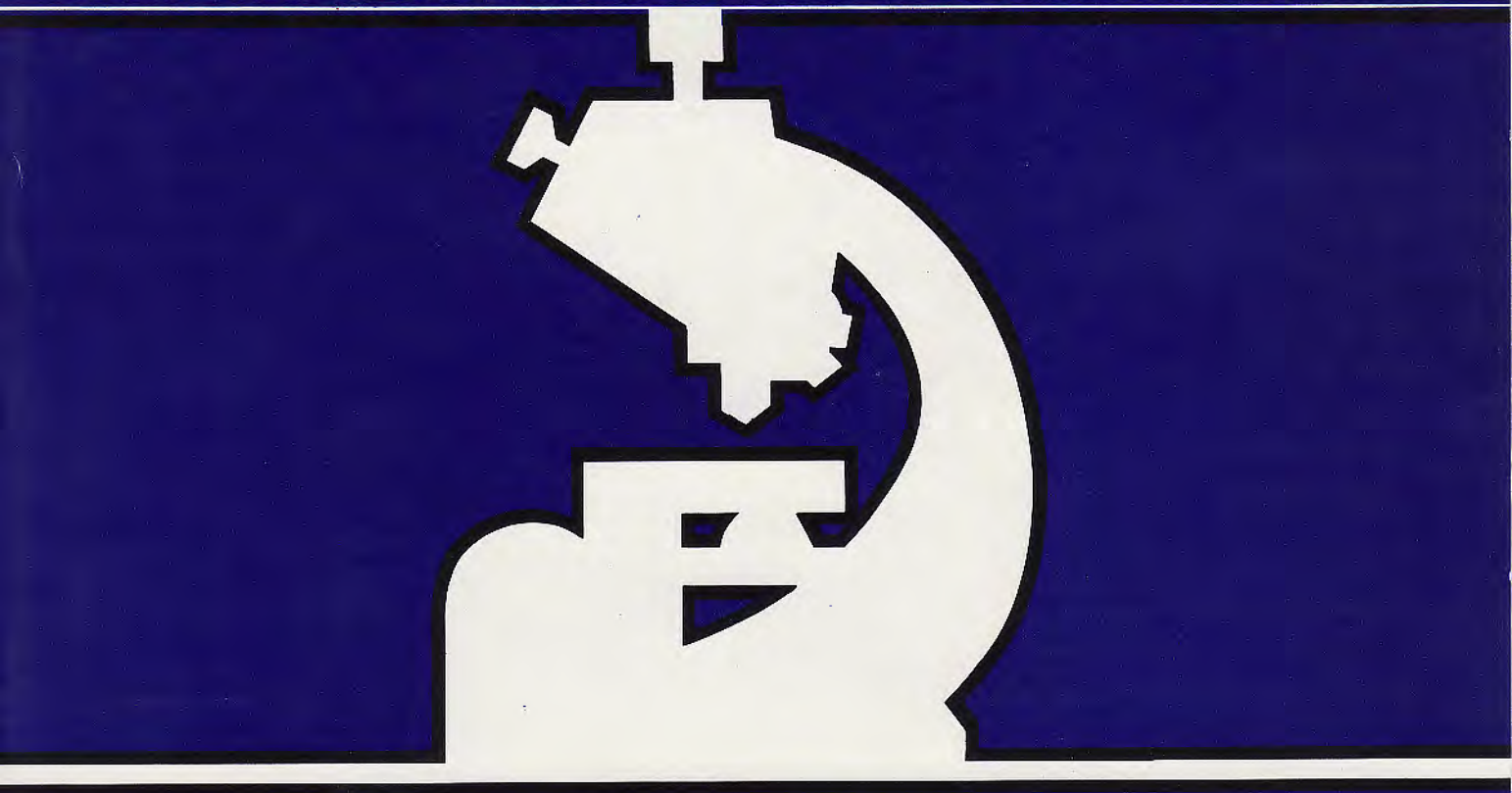

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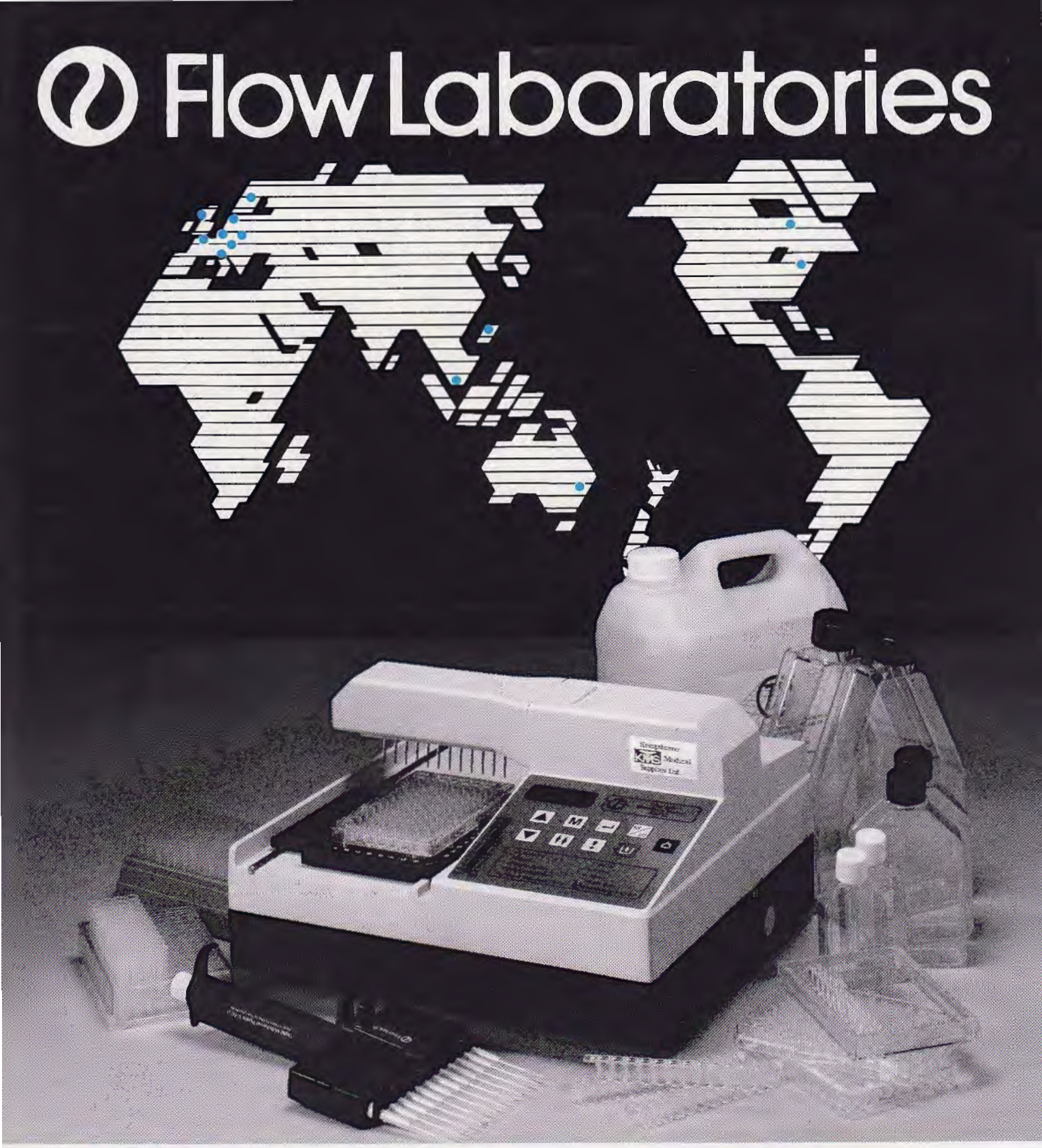

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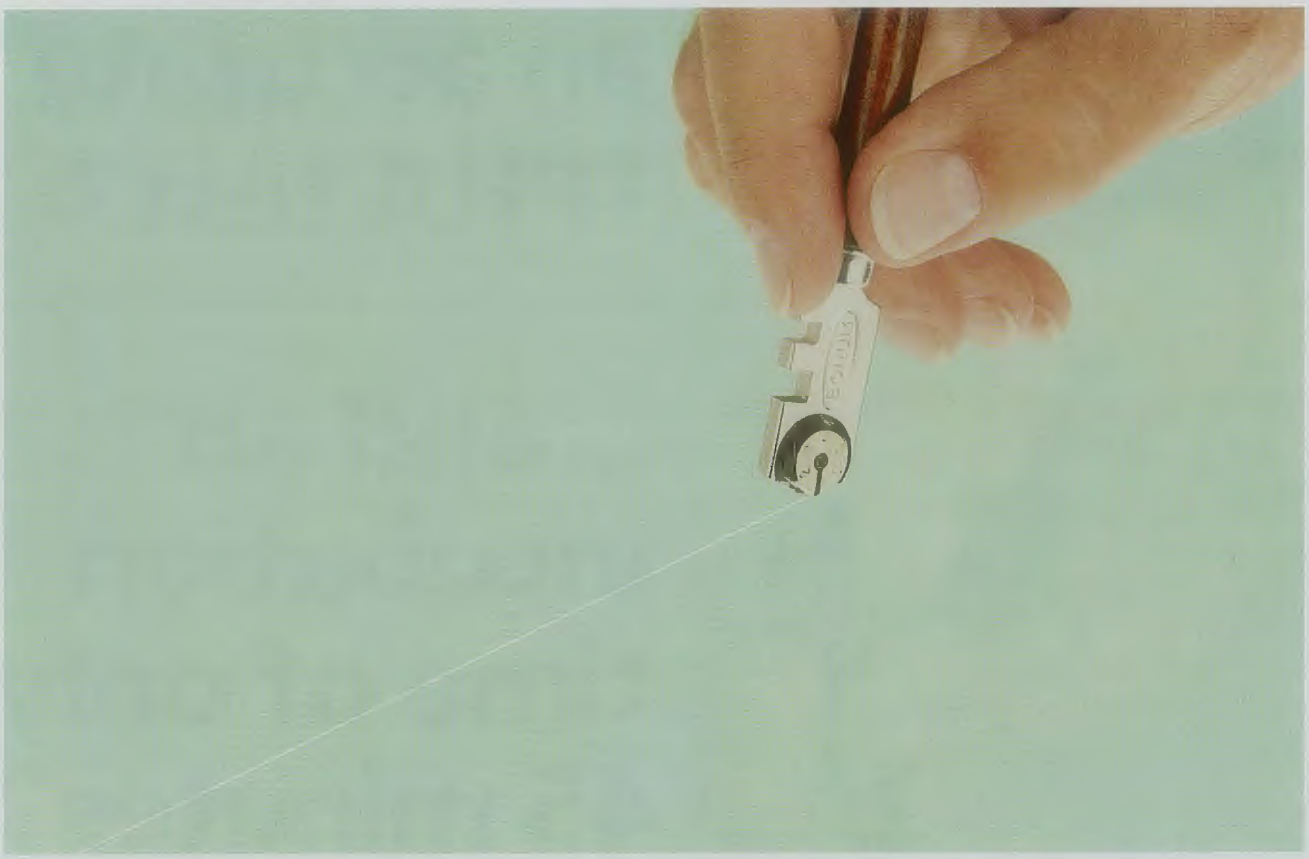

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Management in the Laboratory — Whose Role is it? — A Personal View

A.N. Barker, Chemical Pathologist.
Department of Clinical Chemistry, Auckland Hospital

From a paper presented at the Annual Scientific Meeting, Rotorua, August 1988.

As a pathologist, I am probably expected to defend the "divine right of the pathologists to rule". Although many of my colleagues may support a continuation of the status quo, my personal view is that we must all reconsider our roles in preparation for the implementation of the Area Health Boards next year. There is considerable debate on who will manage laboratories under the new system.

I don't think the pathologist should manage the laboratory, but before you interpret this as admitting defeat, I don't think the principal technologist should necessarily be the manager either.

It is important to realise that all of the previous rules and regulations which defined our roles in the laboratory are about to be declared null and void with the introduciton of the Area Health Boards. In keeping with all other organisational changes introduced in recent years by this Government, the health system is going to be streamlined and laboratories are going to be managed with much more serious intent than previously.

Laboratories will be managed by those who are capable, qualified, and willing to manage them. Those who prove to be incapable will have their right to manage taken away, whatever their present title may be.

The situation will vary from hospital to hospital and from laboratory to laboratory, depending on the personnel employed at each. Each Area Health Board can do as it wishes, so there is no point in the Medical Laboratory Technologists Board, the New Zealand Association of Clinical Biochemists, or the New Zealand Society of Pathologists drawing up regulations to try and resolve this issue in a manner which they hope will be accepted throughout the country. Deregulation is the present trend. The days of job protection by regulation are over.

The pathologist who ignores his technical staff will no longer have the right to call himself the laboratory manager, and by the same token, principal technologists who spend their day in extra-laboratory activities, or in countersigning requisition forms, will also relinquish the right to manage.

We are about to enter a state of chaos, otherwise known as the transition stage. Our existing state of familiar, comfortable roles and a regulated environment, will cease. We will have to learn to accept new roles, new work and an unfamiliar environment. This transition state will be one of changing tasks and demands, unpredictability and apprehension. We are all experiencing that apprehension at present, which I suspect is the reason why there was a session on the topic of management at the NZIMLT Annual Scientific Meeting. This was probably an attempt to try and define our future roles in terms of our present organisation.

The normal reaction in times of uncertainty is for each group to define their role, their boundaries of responsiblity and their chains of command. The more exclusively these are defined, the more secure the group feels. Paradoxically, these attempts to rigidly define each person's job actually increases the probability of redundancy in a changing system.

Laboratory organisation does not lend itself well to rigid segmentation. The areas of overlapping interests are such that wherever you draw the line of demarcation for one group, another group immediately feels that their position is under threat.

It is essential that technologists, scientists, and pathologists "get their act together" and reach a consensus on how they wish the laboratory to be organised and managed. If we fail to reach amicable agreement, the General Managers of our Area Health Boards will appoint Laboratory Managers to organise the system for us.

It is essential that we maintain flexible ideas during this transition stage so that we can respond to unpredictable situations. I would suggest that our various "industrial union" organisations back off at this stage and stop proposing regulations which will hinder the development of a united laboratory team. Such regulations will soon have very little meaning.

Before giving my view of management structure, there is one critical word which I would like to redefine: responsibility. Previously, responsibility in management implied that you had some level of control over the decisions made. Minor decisions were acted on, major decisions were sent further up the management chain, often to be lost forever at Board Office or in the Department of Health. One had no real control over the decision making process and nobody was ever called to account for the outcome. Responsibilities were something you listed on grading applications to give the impression that you actually made responsible management decisions which were acted upon. Therefore the more responsibilities you could claim, the more secure your position.

For responsibility, now read accountability. If your management decisions are correct, you keep your job. If they are wrong, and you have claimed them as your responsibility, then you are accountable. If you do not have full control over the outcome of a decision, then you should avoid responsibility for it. Perhaps now is the time to shed some of those responsibilities you may have so glibly claimed in the past, and be wary of anything new which you are not prepared or capable of being accountable for.

Whose role is it to manage the laboratory? The charge technologist is the Laboratory Manager. He is responsible for managing the day to day activities in the laboratory which produce the patient's results. He is responsible for organising the staff, the maintenance of instruments, ordering the reagents, and printing and delivering results. All these tasks are of concern to the pathologist in charge, but it is not his job to organise them. The charge technologist may well delegate these jobs to his graded officers, but he is the one who is accountable to the Head of the Department if they are not performed properly.

Where does the pathologist fit in? He is the Director, and indeed many overseas laboratories give him this title to avoid confusing his role with that of the manager. He is responsible for directing the laboratory so that it achieves both its immediate and long term aims, with regard to meeting appropriate clinical demands.

As the Director, he ascertains: "Is this worth doing?" "Why should it be done?" It is the Manager who determines how it should be done.

It is very difficult to draw a clear dividing line between these two roles, this being largely dependent on the people occupying them. There will obviously be a large overlap of interests. For example, the need to purchase a new item of equipment has to be justified by the Director in terms of meeting the clinical needs of the service. The final selection of the instrument is largely a technical matter, although the Director needs to be assured that the most appropriate item is being purchased. He will be the one who is accountable if large sums of money are wasted.

By all means draw a line between the two, but shade it heavily in grey on both sides. Communication and sharing of ideas is essential.

The role of the principal technologist is much more difficult to define and I expect this will be the main area of contention. There is no doubt about the role of the principal technologist in the smaller laboratory, .where there is perhaps only one pathologist to carry out the clinical duties and act as Director. His role in the large laboratory is less well defined, as is evidenced by the number of principal technologists presently in this position who spend a high proportion of their time involved in projects which have little relevance to the laboratory managers within each of the departments. They now find themselves in conflict with pathologists, as they try to redefine a new role which justifies more seniority than the charge technologists who have displaced them.

Perhaps the most useful function principal technologists can have in the new era of managing laboratories under the Area Health Boards is to become the equivalent of the Company Secretary. To some extent, many of them already fill this role, but in the age of accountability this position could become vital to the survival of the organisation.

There is a need for one person to be responsible for coordinating routine management functions which are common to all departments. There is also a need to gather together the information which will be essential for determining the resources and measuring the output of the laboratory. Such information can then be used to determine whether it is feasible or desirable to make changes to the operation of the laboratory. On the one hand, he will advise the pathologists on the resources available for either maintaining or developing the clinical service, and on the other hand he will advise the charge technologist on how to make use of the resources which are allocated for achieving those aims.

Again, the dividing lines between the roles should be shaded in grey. The laboratory will function efficiently with a team approach. It will almost certainly fail if the team members direct all of their efforts towards defining separate roles.

It has always been customary to draw management models as an hierarchical structure, a sort of "upside down tree" with the single trunk at the top and all the leaves dangling off the bottom. Every branch divides, none cross over, and the leaves, which actually do the work, have no way of pushing information uphill. Upside down trees don't do very well in nature.

Instead we should be thinking of management systems in terms of a pool. Every plant and microorganism in the pool has its function and each is dependent on the other for its continuing existence.

In laboratory management we have a pool of people, each with their special skills, training and experience. The roles of each member, their degree of overlap, and the eventual success of that laboratory as a unit will depend on the degree of flexibility, compromise, and communication shown by each member of the unit.

Each laboratory will have to work out its own system, but it is essential that we avoid conflict in this transitional stage. If we cannot develop a management team ourselves, then someone from outside the laboratory may well be appointed to manage us in a way which none of us will find satisfactory.

Haemolytic Disease of the Newborn Caused by Anti-Di^a

Susan P. Robertson, ANZIMLT, Kevin McLoughlin, ANZIMLT.
Department of Immunohaematology, Christchurch Hospital, Christchurch.

Abstract
A case of haemolytic disease of the newborn (HDN) caused by antibody to the low incidence antigen Di^a has occurred in Christchurch.The presence of the antigen in people of Mongoloid ancestry and the implications of the detection of the antigen in New Zealand are reviewed.

Key Words
Blood group, ethnic, mongoloid

Introduction
Since the initial reports of the Diego blood group system anti Di^a has been implicated in several cases of HDN (1-4). The Di^a antigen is found principally in people of Mongolian descent (1,3,5-11) and has been shown to be genetically independant of all other blood groups systems (3,5,8,12).
We wish to report the first instance of anti-Di^a in New Zealand.

Case Report
A 42 year old Indonesian woman (R.H.) of Chinese descent gave birth to her second child following a normal pregnancy. Antenatal red cell serology had shown no atypical red cell antibodies present in her serum. During routine postnatal laboratory testing her child was found to have a positive direct antiglobulin test (DAT). As both mother and child were Group O Rh(D) Positive, ABO incompatibility was excluded as a possible cause of the positive result and an atypical red cell antibody was suspected.
Initial antibody investigations demonstrated no atypical antibodies in the postnatal maternal serum. Further investigation demonstrated the presence of anti-Di^a in the maternal serum and the presence of the Di^a antigen on the baby's cells and, as expected, on the paternal cells.
Despite developing moderate jaundice post—delivery the baby did not require transfusion.

Materials and Methods
Maternal, paternal and baby red cells and serum.
Red cell antibody identification panel consisting of 10 local donors chosen for their representation of the common red cell antigens (D,C,E,c,e,C^w,M,N,S,s,P1,Le^a,Le^b,K,k, Fy^a,Fy^b,Jk^a,Jk^b) suspended in Low Ionic Strength Solution (L.I.S.S.).

Commercial red cell antibody identification panel Resolve B (Ortho RB618).
Frozen red cell panel consisting of ABO compatible cells selected for the presence of low incidence antigens, thawed rapidly at 37°C and dialyzed in citrate-phosphate recovery solution for one hour, followed by a wash in the recovery solution and a second wash in isotonic saline. Cells supplied by Serum, Cell and Rare Fluid exchange (S.C.A.R.F.).

L.I.S.S.:

Glycine	18 g
Na azide	1 g
0.9% Saline	200 mL
Distilled H_2O to 1 litre	

Citrate-phosphate recovery solution:

Tri-sodium citrate (monohydric)	3.0 g
$NaH_2PO_4.2H_2O$	0.015 g
Dextrose	0.2 g
Distilled water	100 mL

Papain

Table 1

Relation	ABO	RH	MNS	LEWIS	P1	K	DUFFY	KIDD	DIEGO
Mother	O	CDe/cDE	MNss	(a-b-)	+	kk	(a+b-)	(a-b+)	(a-b+)
Father	O	CDe/cDE	MNss	(a-b+)	-	kk	(a+b-)	(a-b+)	(a+b+)
Child*	O	cDE/cDE	MNss	(a-b-)	-	kk	(a+b-)	(a-b+)	(a+b+)

**Child's cells tested post heat elution*

Anti-Di^a (Rooney and Wagner) and anti-Di^a (Saddleback) supplied by S.C.A.R.F.

Standard commercial red cell grouping sera.
Phenotyping was performed according to the manufacturers instructions for the antisera used.

Dithiothreitol (DTT) 0.1M

Antibody identifications were performed using standard immunohaematological methods.

Results
Laboratory investigations performed on the family gave the information shown in Table 1.
All results were confirmed by the Queensland Division of the Australian Red Cross Blood Transfusion Service.
Mrs R.H. was not believed to have had any red cell antibodies during her pregnancy, she delivered a normal baby who demonstrated no anaemia or jaundice at birth. The rare cell panel was selected on the basis of possessing the more 'common' of the low incidence antigens, the Di^a cell was selected purely by chance because it was the only remaining low incidence Group O cell left for which we had confirmatory sera.

Discussion
The Di^a antigen is a useful genetic marker for population demographics. It is found in up to 35% (7,8) of people of Mongolian descent but is present in less than 0.01% of other populations.
Descended from the Huns, (a Central Asian race who lived from the 3rd to the 1st century B.C.) Mongolians comprise one of the principal ethnographic divisions of Asiatic or Oriental peoples.
Central Asia was divided into feudal states until the founding of the Mongolian Empire under Genghis Khan in 1203. Between 1207 and 1215 Genghis Khan moved into Northern China and then into Northern Iran; his sons/grandsons invaded Russia. In 1691 the Mongolian state fell to the Manchurian invasion and it remained under Chinese domination until its re-emergence as the Mongolian Peoples Republic in 1924.
The world's peoples are divided into five main ethnic groups European, African, Asian, American and Pacific (11). Some authorities believe the American group are a sub-group of Asian people who have diversified following a separation some 15,000 years ago. This would appear to be supported by the increased incidence of the Di^a antigen in both these groups. The Eskimo however lack the Di^a antigen yet are still believed to be of Mongoloid origin — no explanation has been found for this as yet.
Immigration today is analogous to earlier historical invasions in its effect on populations. Countries which have remained relatively stable in their racial makeup for decades

and, in some cases, centuries are now changing. Factors such as air travel, refugees from war zones and natural population genetics within mixed populations all contribute to the changing pattern of blood groups. This is as true for New Zealand as it is for any other country in the modern world.

For almost all of its populated life New Zealand has been a bi-racial society and we as serologists have tended to view our work in this light (more so perhaps in the South where multi-racism has been slower to arrive). The discovery of this antibody has brought home the realisation that, as in other areas of the world, caucasian-based red cell panels are no longer quite enough (4). While not advocating immediate changes to current practice, it would appear to be important to take into account the changing ethnic makeup of our country in future planning for both standard screening panels and development of pools of rare red cell donors.

Acknowledgements
The Queensland Division of the Red Cross Blood Transfusion Service — for confirmation of the antibody specificity.

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Resource Utilisation System (RUS) and the Laboratory.

Edwin P.S. Norman, ANZIMLT[1], Ronald W. Ensor, FRCPA[2], Lindsey Lawton, B.A.[3] (Hons), A.C.A.

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From a paper presented at the Annual Scientific Meeting Rotorua, August 1988.

Abstract

Many New Zealand Public Hospitals have, for a long time, suffered from a lack of appropriate and meaningful information on which to base management decisions. The Resource Utilisation System (RUS) provides the basis of one method of ensuring that increasingly scarce resources are utilised to best advantage to ensure quality care.

The basis of the Resource Utilisation System is outlined with particular reference to its potential for use as a management tool in Pathology Laboratories.

It started life as the Management Accounting Performance System (MAPS), briefly changed its identity to the Resource Management System (RMS) and has finally become the Resource Utilisation System (RUS). Irrespective of title its birth evolved from increasing frustration at the realisation that major decisions were required in Health Services, but that appropriate information on which to base these decisions was not available.

The lack of this information is especially relevant in Public Hospitals where the concern for accountability and quality of care is increasing. Conflicts arise when decisions must be made as to which services should receive priority, especially when the ensuing debate becomes public as has recently occurred in relation to heart transplantation. There is also the pressure of growing surgical waiting lists and of the increasing clamour for money for primary health care. This pressure of competition combined with a lack of information can lead to the point where the decision most easily made is to refer or defer or to maintain the status quo.

Too often inertia has resulted from the lack of solid and reliable information about the distribution of resources. The Resource Utilisation System represents the first step in a process which will fill this information vacuum and lead to more rational and sensible decision making.

The two essential activities which combine to use hospital resources are firstly the request by a clinician for a department to perform a service for a particular patient and secondly the response which that department is required to make to the request. Clinicians require diagnostic and treatment information to perform their role. On the other hand Department managers need financial information to ensure that their Department performs its function efficiently. Often it seems that those involved in each activity are not fully aware of either the role or of the resources needed by the other. RUS is a system which is able to help bridge that gap by collecting information about the use and cost of resources and relating this information to procedures which are being carried out for individual patients.

Along with the Dunedin and Waikato Hospitals, Rotorua Hospital was selected as a pilot site for the implementation of RUS. Peat Marwick (Accountants and Consultants) were awarded the tender to set up the project. In May 1987, a team began work in Rotorua Hospital with the first Department being Pathology.

Phase 1 of the project consisted of the definition of the project plan and a review of current information systems in the hospital.

Phase 2 was hard work for the laboratory. Firstly our staff defined all major procedures and then calculated weightings (relative value units) for each procedure for each category of cost. Calculating the weighting based on actual material cost for a procedure such as a gram stain proved to be a time consuming but interesting exercise. Weightings had to be calculated for all other costs associated with each procedure, including both direct salaries for technical staff and indirect salaries for clerical and administrative staff. In practice the workload unit for each procedure was used as a relative value unit to distribute direct salary costs.

At this stage the costings reflected only what was happening within the Pathology Department and it was then necessary to consider the cost of other hospital services which the Pathology Department utilised. These included maintenance, energy, transport, cleaning, general administration and laundry services. All these support costs were also weighted on the basis of an appropriate relative value unit for each procedure.

On completion of phase 2 we had obtained the procedure costs which combined salaries, reagent and materials and overhead expenses. One interesting and significant aspect which emerged from this data was that when direct costs were considered in isolation, the Pathology Department budget comprised 74% for salaries and 26% for reagents and materials. When support costs which were outside the control of the department were included the breakdown became salaries 57%, reagents and materials 20% and support services 23%. The following table details this breakdown of expenses as applied to some of the more commonly carried out laboratory procedures.

Table 1

Test	Reags		Salaries		O/Heads		Total	
	Cost.	%	Cost.	%	Cost.	%	Cost	%
Urea	65c	27	$1.13	48	58c	25	$2.36	100
ESR	59c	17	$1.98	57	92c	26	$3.49	100
ABO	$1.40	15	$4.07	45	$3.63	40	$9.10	100
Rh Group								
HBsAG	$1.84	32	$2.65	46	41.30	22	$5.79	100

Clearly a significant proportion of laboratory expenditure is directed toward ancillary support services and the potential for savings in these areas is as great as it is in the reagent and materials area.

Our calculations currently exclude capital costs because existing cash based accounting systems in Boards do not bring depreciation or acquisition of capital items into the budget. This is a weakness as it is difficult to compare costs when some Departments have purchased equipment outright while others are committed to reagent rental or hire purchase-type deals.

Phase two information similar to that obtained from the Pathology Department has also been obtained from all other treatment related areas in the hospital.

Phase 3 of RUS consists of the combination of procedure data with diagnostic and demographic information all of

which can then be applied to individual patients. This is the patient resource monitoring phase and it provides for the designation of patient groups according to Major Diagnostic Category (MDC), Diagnosis Related Group (DRG), service, attending clincian, diagnosis, procedure or demographic criteria such as age and sex.

In Phase 4 each of these groups can then be examined in terms of resource utilisation, cost, demographic profile or outcome. This Service Resource Monitoring phase brings together procedure costs and patient information to provide the service level usage and cost information thus tracing the usage of resources for particular diagnostic groups or types of patient. Services to which RUS information will be applied include Dental, Geriatric, Psychiatric, Intellectual Handicap, Obstetric/Neonatal, Medicine, Surgery, Primary Health, Health Promotion and Health Protection.

Taken overall RUS has the capacity to provide useful information at many different levels. Each department has a complete breakdown of running costs and is able to plan the allocation of people and materials in a much more rational fashion. Areas of low productivity can be identified and reviewed. Department Managers will be much more acutely aware of overhead costs and while they will not have direct control they will certainly attempt to exert some influence in the areas which appear to be excessive or uncontrolled. At an overall administrative level RUS provides information on service utilisation by patient group or clinician, patient cost by service or by major diagnostic category, the demographic distribution of various services,a clinical profile of Diagnosis Related Groups (DRG) and patient outcome by DRG or clinician. Comparisons between different institutions can and will be made and will be useful provided they serve the purpose of identifying efficiency rather than as a form of one upmanship. Our experience with RUS at department level has shown that if it is to be applied accurately and properly the volume of information to be collected is beyond the resources of manual methods. Computerisation will be needed to simplify the counting processes and will be vital to a successful outcome.

Finally the success of RUS will depend very significantly on Department Managers being given the power and authority to effect improvements where indicated. Without this the process becomes nothing more than another instance of the mere collection of statistical data and will only provide yet another tier of unprofitable bureaucracy.

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Low Urinary Bacterial Counts in Symptomatic Patients

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[1]Charge Technologist, [2] Microbiologist in Charge, Department of Clinical Microbiology, Auckland Hospital.

Abstract

The bacterial colony counts on 531 routine urine samples were tested by the Blotting Paper Strip and Standard Calibrated Loop methods to establish the reliability of the former to recognise the presence of low numbers of bacteria in symptomatic patients, and its ability to categorise urine counts based on the parameters published by Kass (1). A calibrated loop method was used as a standard. Results showed that the strip method was reliable in categorising bacterial counts on the basis of Kass's work, with a negative predictive value for counts of less than 10^7 per litre of 97.8%. The number of false negative results for patients with counts less than 10^7 per litre was 0.1%, showing that the strip method was able to reliably indicate the presence of organisms in low numbers. No specimen, from a symptomatic patient, which grew a recognised pathogen on the plates produced a negative strip count. It was evident that adequate clinical particulars together with the presence of pyuria were necessary to give significance to low counts.

Key Words:

Urinary Tract Infections, Bacterial Counts

Introduction

Since Kass (1-2) published his work on bacteriuria and pyelonephritis in women, most clinical laboratories have accepted that bacterial counts of greater than 10^8 per litre are consistent with a urinary tract infection and that counts of less than 10^7 per litre are probable urethral contamination and have applied these parameters to all urines, irrespective of the condition of the patient. Stamm (3) re-emphasised that in symptomatic patients these figures may not apply and that in fact counts as low as 10^5 per litre of coliform organisms may be significant, provided that other factors are considered, i.e. the patient's symptoms and a raised leucocyte count (10×10^6 per litre).

For a number of years this laboratory has used the blotting paper strip method of Leigh and Williams (4) for bacterial counts on urines and has found it a simple, cheap and reliable method for categorising specimens according to Kass's criteria. However, it was decided to reassess this method in the light of Stamm's findings to establish if low but significant coliform counts were being overlooked and at the same time to re-establish the reliability of the strip method in the original context.

Materials and Methods

Paper Strip Method:

Urine "dip strips" (Alpha Biologicals Ltd, Auckland) were used as described by Leigh and Williams. Two strips of blotting paper (Ford 428, Wiggins Teape) were introduced to a well mixed urine sample up to the 12.5mm line and withdrawn. Excess urine was allowed to soak into the strip which was then placed on the surface of cystine lactose electrolyte deficient (CLED) agar plates so that the 6 x 12.5mm rectangular innoculum area was in complete contact. The strips were left in place for approximately 30 seconds, then removed and discarded. Plates were incubated overnight at 36°C.

Table I: Paper Strip Method (Leigh & Williams) — Interpretation

Colonies per strip		
Cocci	Bacilli	Organisms per litre
0-5	0-8	$<10^7$
5-25	8-30	10^7 - 10^8
25	30	$>10^8$

Standard Loop:

A 10 μl calibrated loop was inserted vertically into a well mixed sample to a depth of 10 mm and withdrawn vertically to minimise error [Hoeprich (5)]. A CLED agar plate was innoculated across the centre with the urine contained in the loop, and was then spread across the entire surface to produce a lawn plate. Plates were incubated overnight at 36°C.

Results of the strip counts were recorded as no growth, less than 10^7, 10^7 - 10^8, greater than 10^8 bacteria per litre according to the number of colonies counted (Table 1). Results of the loop count were recorded as the number of colonies grown up to 100. When more than 100 colonies were counted the result was recorded as >100. Each colony counted represented 10^5 organisms per litre. In addition, microscopy was performed on each urine using unspun urine in a Fuchs-Rosenthal counting chamber. The number of red cells, white cells and squamous epithelial cells was recorded as cells x 10^6 per litre. The presence of bacteria was recorded as nil, 1+, 2+ and 3+. Specimens with greater than 10×10^6 white cells per litre or in which bacteria were observed, were streaked onto MacConkey agar without crystal violet and Columbia horse blood agar. Each urine was tested for the presence of antibacterial activity by soaking a sterile 0.6 cm paper disc in the sample and placing it on the surface of the Mueller-Hinton agar plate, surface streaked with *E. coli*(ATCC259922). Any zone of inhibition was recorded as antibacterial activity positive.

Table II: Comparison of Bacterial Counts Produced by Both Methods

Bacterial Count per litre	Number of Samples Paper Strip	Loop
Nil	136	124
$<10^7$	100	138
10^7 — 10^8	75	269
$<10^8$	220	

Results

Results from both culture methods are set out in Table II. These figures were analysed using 10^7 organisms per litre as a cut off point, to test the ability of the strip method to accurately predict counts of less than that number. Results were, sensitivity 97.7%, specificity 88%, positive predictive value 89.4%, negative predictive value 97.8% using the method described by Galen and Gambina (6). There were 109 specimens which produced counts of less than 10^7 per litre by either method. 95 were identified by both methods, 1 by the strip method only and 13 by the loop method only. The clinical history, cell counts and the culture results of these 109 cases were studied to see if symptomatic patients with low counts were included in this group. Only 30 had clinical histories which indicated that symptoms of urinary tract

infection were present and of these 9 grew nothing, 10 grew light growths of mixed Gram positive bacteria of no significance, four grew mixed populations including Gram negative bacteria which because of an increased number of squamous epithelial cells were reported as probable contaminants. Results from the remaining seven specimens were considered to be significant (Table III). They all had increased leucocyte counts and with the exception of No. 6, grew a pure growth of recognised urinary tract pathogens. No. 6 was included because of the predominant presence of *Proteus mirabilis* on the MacConkey plate and the significantly high leucocyte count. All seven produced a count in the less than 10^7 per litre category by the strip test.

Results from 122 specimens which were negative by both methods were similarly studied to see if any significant culture results were produced in spite of the negative bacterial count, indicating a failure of the methods to identify significant bacteriuria in symptomatic patients or those who have undergone surgery to or some manipulation of the urinary tract. No positive cultures were produced in this group. A small number of specimens had greatly raised leucocyte counts but in each case the anti-bacterial activity test was positive indicating the presence of antimicrobials in the specimen.

Table III: Specimens with Counts 10^7 per litre and Significant Isolates

History	WBC x 10^6/1	ABA	Bacterial Count per litre Strip	Loop	Culture
1. Frequency, dementia	>100	Pos	$<10^7$	$>10^7$	*E. coli*
2. Retention, Post TURP	35	Pos	$<10^7$	$<10^7$	Enterobacter sp.
3. ? U.T.I.	>1000	Pos	$<10^7$	$<10^7$	*S. faecalis*
4. ? U.T.I.	90	Pos	$<10^7$	$>10^7$	*E. coli*
5. ? U.T.I.	>1000	Neg	$<10^7$	$>10^7$	*E. coli*
6. ? U.T.I.	305	Neg	$<10^7$		*P. mirabilis* and Gram positive flora
7. Distal urethotomy, TURP	1000	Neg	$<10^7$	$>10^7$	*S. faecalis*

Discussion

Up until the mid 1950s, the examination of urine bacterial cultures was haphazard in its methodology and erratic in its value as a diagnostic tool. The publication by Kass on the value of quantitative bacterial counts in urine from women with pyelonephritis in the mid 1950s firmly established the quantitative bacterial count as a reliable method for confirming urinary tract infection in these patients. Most laboratories adopted his parameters and applied them without discrimination to urines from all clinical situations. In 1982 Stamm pointed out that Kass's work was done on a restricted and special group of both symptomatic and asymptomatic patients who were not representative of the majority of cases of urinary tract infection presenting to clinicians. In most cases, patients presented with signs and symptoms of lower urinary tract infection and Stamm showed that in a proportion of these cases, bacterial counts of coliform organisms that were equal to or greater than 10^5 per litre had a high positive predictive value. In the light of these findings it has become important that diagnostic clinical laboratories are able to clearly identify these cases.

This laboratory uses the method for bacterial counts by Leigh and Williams (4) and employs a sterile blotting paper strip of standard dimensions to transfer urine onto the surface of an agar plate. Over the years this method, the interpretation of which was based upon Kass's findings, has served us well. Results of this survey have confirmed its ability to differentiate specimens into the two significant categories of less than 10^7 and greater than 10^8 bacteria per litre with reasonable precision. The high degree of correlation between it and the standard loop technique is evidenced by the fact that only 5% false positives and 0.1% false negatives were recorded. This study shows that identifying the significant isolates from symptomatic patients with low counts is not easily achieved by either of the methods used. The bacterial count alone is not enough and several other factors must be considered. An increased leucocyte count, the absence of squamous epithelial cells and a pure growth of a recognised urinary pathogen are very important factors. The presence or absence of antibacterial activity can be highly significant as well. In complicated cases where surgical procedures and/or foreign bodies are involved the problem is even greater, as mixed infections are not uncommon in this situation. In this study the paper strip method for doing bacterial counts always produced bacterial growth from symptomatic patients with low colony counts ($<10^7$ per litre) and on no occasion did this method fail to detect bacteria under these circumstances. Consequently it can be used with confidence.

It is also important that urines with bacterial counts of less than 10^7 per litre are not disregarded when testing symptomatic patients for urinary tract infection. However, it is also clear that the bacterial count in itself is not sufficient to identify urinary tract infections in these patients. The patient's clinical history and the leucocyte count should be carefully noted together with the type of growth produced on a culture plate, and in this group of patients the identity of the organism should be reported.

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Extra-Analytical Considerations in the Assurance of Quality Blood Gas Results

Robert F. Moran

"Blood gas and pH analysis has more immediacy and potential impact on patient care than any other laboratory determination" (3). Shapiro (7) notes that in a study involving thousands of patients, more than five percent of the individually collected specimens were questionable based on preanalytical error and, indeed, more than 15% of the specimens received from the emergency room were associated with significant pre-analytical error! Based on these points and in order to assure total quality results, it is evident that the medical technologist must be aware of the impact of not only analytical error but also pre-analytical considerations in the assessment of the reliability of results to be reported. Further, a pro-active role on the part of the medical technologist in educating those outside the Clinical Laboratory who are involved in the "Cycle of Quality Assurance" (Fig 1) for blood gases, will minimize the chances that preanalytical error will significantly impact patient care.

Pre-Analytical Considerations

Of major impact on the utility of blood gas results are 1) the physiologic stability of the patient, 2) the effects of blood metabolism and collection/transport conditions on the analytes measured, and 3) the timeliness of the collection and reporting results.

A comprehensive review of various aspects of blood gas analysis is found in a document prepared by the U.S.A.-based National Committee for Clinical Laboratory Standards (NCCLS) (3). This report concentrates on certain key points of that document as well as developing some additional information.

Physiologic Stability

The ventilatory process is a key consideration affecting blood gas values. Patient postural changes affect ventilatory rate and depth thus causing real changes in blood gas values, especially in the $_pCO_2$(aB), but also in the $_pO_2$(aB). Circulatory compromise, such as that seen in arrested patients during resuscitative efforts, can cause samples to be non-representative of whole body conditions. The effects of these types of conditions could either be recognized by the clinician or the changed results assumed to be "lab error", thus masking a need for intervention on bringing about inappropriate intervention. Patients on controlled ventilation or supplemental oxygen ideally should be assessed only after new settings have been in effect for at least 20 minutes. In other cases, especially when "weaning" a patient from mechanical ventilation (PEEP, CPAP, IMV) or supplemental oxygen, a result may be urgently required five to ten minutes after each change.

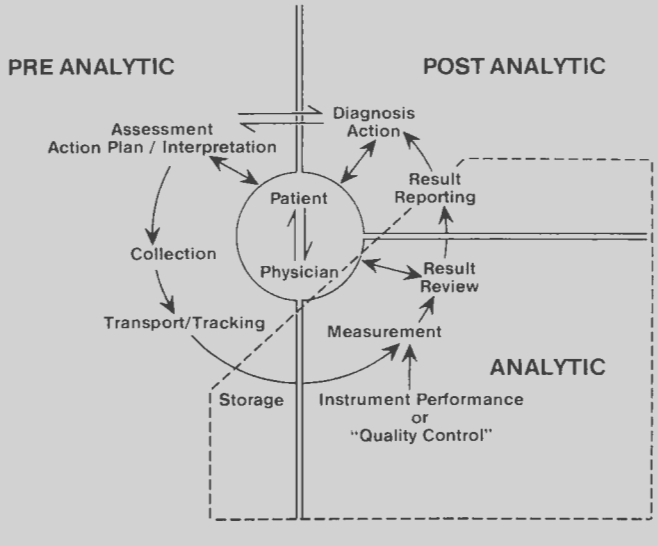

FIGURE 1. The cycle of quality assurance in blood gas measurement.
The dashed line encloses the area that is typically the clinical laboratory's responsibility.

Collection and Transport Conditions

The collection process itself, being potentially painful, may bring on an apprehensive hyperventilation by the patient, causing an immediate effect on $_pCO_2$(aB), lowering the value.

Collection devices are also subject to limitation. The ideal system incorporates a collection device (syringe) that minimizes or eliminates exposure to air, includes the correct extent of heparin anticoagulation (20-50 u/mL of blood) and enables identification of the collection site as being arterial, (by responsiveness to arterial pressure).

Exposure of the sample to air has the obvious affects on both $_pO_2$ and $_pCO_2$ due to potential differences in the tensions of the gases in air versus the sample. An unrecognized cause of error is the common practice of "flicking" the syringe to ride it of air bubbles prior to measurement, since this excessive agitation can cause formation of tiny air bubbles which will equilibrate with the sample more readily than the large bubble.

One of the more significant sources of unrecognized error in the $_pCO_2$ and total hemoglobin (tHb) measurements is the use of too great a volume of liquid heparin relative to the amount of blood collected (underfilling a syringe), which leads to a falsely low value for both analytes. The pH may be lowered as well but only when the underfilling is severe. With the advent of blood gas analyzers designed to measure ionized calcium in addition to the more traditional values, the binding of calcium by excess heparin, whether present in liquid or dried form, can cause lower ionized calcium values. When combined with variable filling of the collection device, this binding phenomenon can cause artifactual changes in ionized calcium values reported. Use of a "universal" anticoagulant — the so-called "balanced" or "titrated" heparin, especially in dried form, should eliminate all of these as significant issues.

The use of "arterialized" capillary blood for the measurement of $_pO_2$ should be recognized as a last resort only. While acceptable for pH and $_pCO_2$, the results are a reliable estimate of arterial values only at oxygen tensions less than 60mmHg. Above that level, the opposing effects of tissue metabolism and air contamination during collection effect a large potential uncertainty in results at oxygen tensions where accuracy and precision are paramount. (Ex., at or near 100mmHg, the point at which oxygen therapy levels are most critical in neonates).

Vacuum tubes are suitable collection devices only for venous blood and acid base/electrolyte measurement since they reduce the ability to assess placement of the needle in an artery and the gas bubble in the tube can change sample results. When used, the report should be labelled as to source, and the appropriate symbol used [e.g., pH(vB), $_pCO_2$(vB)].

Due to frequency of multiple blood gas analyses on the same patient over short time intervals, recording of the exact collection time on each specimen is necessary.

The immediate impact that blood gas results can have on clinical management and decisions affecting morbidity and

mortality emphasizes the need for strict adherence to proper identification of the patient, patient conditions and the sample while at the same time treating the sample as expeditiously as possible.

Metabolic Effects

Once collected, the specimen should be analyzed in a few minutes (less than five) or placed in an ice water slurry. Use of crushed ice alone will cause uneven cooling and artificial coolants may cause freezing of the blood sample. The effects of this slurry are the reduction of cellular metabolism which minimizes the utilization of oxygen and production of carbon dioxide by this "living tissue" sample. A combination of immediate icing and analysis as soon as possible may be required with known severe leucocytosis or reticulocytosis, since the increased numbers of those metabolically active cells can cause rapid changes in the gases, especially oxygen.

Turnaround Time

While post collection intervals as long as two hours may not invalidate the measurement of pH, $_pO_2$ and $_pCO_2$ in a properly iced sample, most clinical needs are for a much shorter duration (15 to 30 minutes turnaround times) (9).

Analysis

Complete mixing of the sample prior to analysis by a combination of rolling and inversion is important to ensure satisfactory results in the measurement of pH, $_pCO_2$ and $_pO_2$. If hemoglobin (hematocrit) measurement is to be included on the same sample as the bood gas, complete mixing becomes critical. Measurements of hemoglobin on an incompletely mixed specimen will be unreliable. Once a part of an inadequately mixed sample has been removed, the sample is no longer reliable for hemoglobin analysis even if the remaining sample is thoroughly mixed.

Reporting Results

After analysis, results for each analyte should be compared with the history, patient temperature, past results, ventilatory/supplemental oxygen conditions at the time of collection, and with the other "blood gas" values to see if they are compatible. An excellent check for within-sample result consistent is application of the "alveolar air equation", which follows in its abbreviated form:

$$_pO_2(A)^* = F_IO_2[_pAtm-47]-1.25\ [_pCO_2(aB)] \quad \text{(Eq 1)}$$

* (A) refers to alveolar gas.

By substitution of the (F_IO_2), the atmospheric pressure ($_p$Atm) and the measured $_pCO_2$(aB), the alveolar partial pressure of oxygen can be estimated and compared with the arterial value as measured. Given the expected difference between alveolar and arterial $_pO_2$, [a-aDO_2], an assessment of "mistakes" in the measurement can be made before reporting the results.

The usual precautions hold true in reporting blood gas results by whatever means (verbal, written or automatic), but again, as with patient and specimen identification, the immediate and critical impact of the blood gas results serves to emphasize the no exceptions to standard protocol can be tolerated.

Temperature "Correction" Of Blood Gas Values

The values for pH and gas tensions unquestionably vary with respect to temperature. As a result, many laboratories report blood gas values "corrected" or "adjusted" to the temperature of the patient. Indeed, at least one state in the USA mandates that temperature corrected values be reported.

The clinical application of the physiological facts may not be quite so clear as expected. First, there is the issue of reference values for each analyte at each temperature. While some clinicians may have practical experience and "know" what to expect at temperatures other than 37 degrees Celsius, there are no widely accepted reference values at different temperatures. Next, is the issue of what to do with the "adjusted" values obtained. For example, does one try to regulate the patient's pH and $_pCO_2$ to 7.40 and 40 mmHg respectively? Finally, what algorithms does once choose to use?

From the perspective of the blood gas laboratory, the first two issues are most reasonably addressed by accepting the recommendations of Ashwood, et al(1). For the acid-base values (pH and $_pCO_2$) and calculated quantities such as actual bicarbonate, $cHCO_3$, report values at the measuring temperature of 37°C. For $_pCO_2$ and $_pO_2$ used in assessing gas exchange and possibly compared with expired gases, report temperature "adjusted" values. On a practical basis, this means that the carbon dioxide at least and probably oxygen tension values should be reported at both temperatures, while other values should be reported only for 37°C. The report itself should clearly distinguish between the two.

The last issue is easiest to address, since, for most blood gas laboratories, the algorithm used is that chosen by the manufacturer of the analyzer. NCCLS doument C-12T2(2), a frame of reference accepted by many, states that its standard is met if the algorithm used to make the "correction" gives results that are quantitatively similar to those specifically documented in the standard. Algorithms chosen by the three major blood gas manufacturers meet those criteria.

Assessment Of Measuring System Performance: Quality Control

The requirements and complications of quality control protocols for a blood gas analyzer are substantially different from other analyses performed in the clinical laboratory environment. This is due substantially to the combination of turnaround time requirements for the patient sample plus the fact that the patient sample is fresh whole blood — that is— living tissue.

The optimum technique for establishing the inaccuracy and imprecision of an individual blood gas analyzer is the use of whole blood tonometry (4), using fresh anticoagulated whole blood, carefully equilibrated with a known standard mixture of oxygen, carbon dioxide and nitrogen at 37°C. Properly done, this technique enables determination of the performance of the analyzer when measuring blood at the partial pressures of the tonometry gas mixtures. In essence, tonometry more closely resembles a primary standard in a true sample matrix, not merely a control material. The technical and economic advantages of whole blood tonometry must be balanced by hazard potential and labor intensive nature of the process.

The alternative to whole blood tonometry is the use of commercially available pre-packaged materials, each type having its own "mix" of advantages. There are currently three major types of commercially available controls used for blood gas quality control each of which is gas-equilibrated; aqueous buffer solutions, blood-based (hemoglobin-containing) materials, and perfluorocarbon/oil emulsions. Their effectiveness varies and is dependent on the particular analyte and the physical and chemical characteristics of the material itself.

The fundamental issue with respect to the controls is that their physical and chemical properties do not, in many respects, match those of whole blood. As a result, they may not detect certain problems or they may signal problems that are not there. The former situation can result in clinical problems; the latter creates financial issues due to the cost of repeat controls, labour and possibly unnecessary service calls.

Selection of a particular type of control must be based on evaluation of its technical and other merits in the context of a

complete blood gas quality control program. In that context, the pre-packaged controls can serve a primary role in assessing blood gas analyzer performance, while remembering that when a true performance issue arises, (with respect to the reliability of patient results) only whole blood tonometry can settle it satisfactorily (5).

Duplicate analysis of the same blood sample can be a useful tools but should not be used as the sole method for assessing instrument performance. Duplicates measured on two different analyzers are most useful in detecting individual sample errors due to the improbability of similar errors occurring simultaneously on two different instruments. Certain types of pH system malfunction (reference circuit) can only be reliably detected using whole blood. In an emergency situation where analytical reliability and turnaround time are equally important, duplicate analysis of this type may be a requirement. Bear in mind, however, that duplicate analysis on the same instrument has a marginal usefulness at best, and at worst, provides a false sense of security.

Descriptions of available blood gas control materials (5,6) and detailed protocols for their use (3,5,6) may assist in choosing the quality control program that meets the requirement of the particular institution.

Summary

As indicated at the outset of this report, the critical nature of the clinical requirements when blood gas testing is indicated, coupled with the labile nature of the sample and rapidly changing patient conditions, makes it imperative that the analyst be aware of more than just the analysis itself. Knowledge by the analyst of the effects of the changing patient environment and the manner in which the sample is treated in the few short minutes from collection to reporting are equally important if one is to assure timely and clinically meaningful results.

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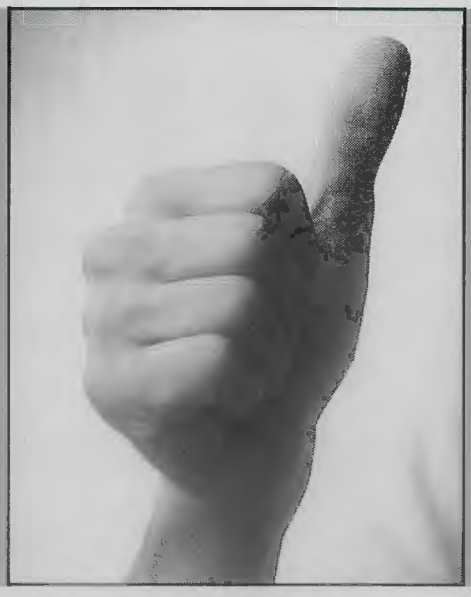

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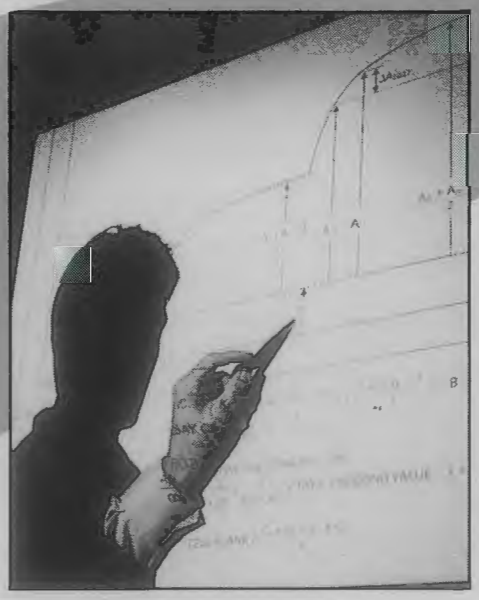

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The Pacific Way

Here and There in the Pacific

TUVALU

Tuvalu, formerly part of Britain's colonial empire, was known as the Ellice Islands and constituted part of the Gilbert and Ellice group. On October 1st, 1975, the Ellice Islands separated from the Gilberts and exactly three years later achieved their independence from Britain. Tuvalu has remained with the Commonwealth as an independent sovereign state.

The tiny, isolated nation is made up of nine widely dispersed islands with only about 24 square kilometers of land in total, approximately 8,500 people and few natural resources. A decade of political independence is a landmark for those involved in the pursuit of self-determination and self-sufficiency for Tuvalu.

The standard of living has been greatly enhanced since independence. Health services have expanded and the Princess Margaret Hospital in Funafuti, opened in 1978, boasts 5 local doctors in addition to a U.N. appointed surgeon and two local dentists. A programme to build new dispensaries on all islands in Tuvalu was begun in 1985, the same year a National Family Planning Programme was launched. The Mosquito Eradication Scheme has also created much healthier conditions on some islands.

Education is expanding; there are 13 pre-schools on Funafuti alone. Each island now has its own primary school and the Tuvalu Government has taken over Motufoa Secondary School on Vaitupu from the church.

A new University of the South Pacific Centre was opened in 1988 and the Tuvalu Maritime School trains young men to work as seaman for foreign shipping companies. Community education programmes via radio, workshops and inservice training are also on the increase and the government is creating more scholarships and opportunities for young men and women to study abroad.

A recent report from the bulletin of the Unviersity of the South Pacific, Suva, states "Tuvalu Centre is entering the age of technology with determination. Centre Director Margaret Pearson reports that the computer is working well.... It took a long time but we finally got there.... Now the Centre is waiting for required papers in order to have its telephone equipment installed — and to acquire a bicycle".

NAURU

This tiny island nation has some of the worlds richest people who are slowly eating themselves to death. They are thereby answering a question no laboratory research worker would be allowed to find out using live subjects — what happens when people spend their entire lives living on canned junk food. The answer is simple; they end up with one of the worlds highest rates of diabetes and one of the lowest life expectancies anywhere on the planet.

Providing the grim answer are the 5,000 inhabitants of Nauru, which this century has exported 75 million tons of phosphate to Australia and New Zealand. Income from the phosphate has given Nauruans one of the worlds highest per capita gross national products. A report from Melbourne's Diabetes Institute has spelt out the cost; 1 in 4 suffer from the disease.

Nauruan men have a life expectancy of only 54 years, women have 63. They are also prone to gout, high blood pressure and cancer. Many are blind and most families have members with amputated limbs.

Despite having only one 16 kilometre long road on the island, road deaths are the second biggest killer of males in Nauru. Alcohol is almost always a factor.

Dr. Garry Dowse from the Melbourne Diabetes Institute says the reason for the island's plight is obvious. "They have embraced all the worst aspects of Western culture, and none of the good. Air Nauru and shipping companies keep the island supplied with canned foods, beer, cordial and junk foods. They get virtually nothing that is fresh. They grow nothing of their own, and no Nauruan knows how to fish". A year ago he was examining school children and was puzzled by the pink stains most had on their fingers and nails. It turned out to be jelly crystals, which the children were eating for lunch.

In human terms the cost of a diet of junk is excessive; it is made worse by Nauruans' unwillingness to modify their diets, take tablets or use insulin. Blindness as a consequence is common, as are heart attacks and renal failure: the hospital in Nauru has two dialysis machines, a phenomenonal number for such a small population. Nauru, which is now economically stretched, has no co-ordinated plan to handle the steadily growing crisis.

VILLAGE MEDICINE — FIJI

Dr. Ted Reeve and his wife report from the village of Nausau in the Bua Province at the western tip of Vanua Levu. "Nausau is about 30 kilometers from the main road linking the ferry wharf at Nabouwalu with the sugar town of Lambasa. Villagers make occasional excursions outward but receive very few visitors; the Taiwanese Sandalwood buyer is the most frequent. We are the only tourists to appear in a long time. Everything happens of the floor, which is covered with clean grass mats (despite our best efforts, we continually bring in mud, which clings to us much more than to anyone else) and meals are a communal effort.

Though a Public Health Nurse lives nearby, a young boy comes with furrowed brow to seek advice from us; his father is suffering from a headache, so severe it is affecting his entire body. Unsure that our Canadian Medical Training can cope with the case, Ted cautiously dispenses two aspirin. As it turns out, his prescription may be essential in fortifying the patient to withstand a more elaborate cure provided by his village; while he lies beneath his mosquito net, a file of visitors drinks his health in Yaqona, sing hymns and offer sonorous prayers for his recovery. The treatment continues through the night, but at last the patient is asleep — and it is we who are taking the aspirin!

The villages chainsaw and outboard motor are useful tools, but they are only tools and can be laid aside. Most important to Nausau life are the ties of family and fellowship, the babies to be hugged, the Yaqona to be shared, the songs to be sung. In every part of the village the prevalent sound is the ring of peal after peal of laughter."

NEW REGIONAL DIRECTOR OF W.H.O. FOR WESTERN PACIFIC

Dr. Sang Tae Han (Republic of Korea) has been nominated as Regional Director of W.H.O. for the Western Pacific by the W.H.O. Regional Committee. Dr. Han is presently the special representative of the W.H.O. Director-General for the Western Pacific.

The nomination will be sent to the W.H.O. Executive Board which will make the appointment during its meeting in

Geneva in January, 1989. Born in Seoul in 1928, Dr. Han gained his Doctor of Medicine from Seoul National University in 1955. A Master of Public Health from the University of Minnesota in 1985, and a PhD in Medicine Science from Seoul National University in 1966.

LEPROSY RESEARCH

A study of leprosy in the Islands was begun by a medical officer who is listed simply as Corney, in 1881. He calculated in 1907 that about 0.8% of Fijian deaths were caused by leprosy. He also records complaints by some Fijians that leprosy was increasing as a result of the government prohibiting the destruction of lepers.

By 1899 the problem of leprosy was sufficient for the government to enact "The Lepers Ordinance" under which a "leper asylum" was established on the island of Bega, south of Suva. In 1912 it was moved to the island of Makogai and became the centre for treatment of leprosy in the South Pacific. The New Zealand government used Makogai's facilities to treat Samoan patients from 1922 and Cook Islanders from 1926. In 1925 twenty patients were transferred to Makogai from the quarantine station on Quail Island in Lyttleton Harbour — three of them New Zealanders and the rest from various Pacific Islands.

Great progress is being made in the fight against lerosy in the South Pacific. Drugs have been developed to cure leprosy, but their effectiveness is reduced if cases are not diagnosed early and it requires a big commitment in health services to ensure the disease is detected in the early stages. Development of an effective vaccine that will prevent leprosy is still some way off but it is important that funding for research is maintained. An important workshop on the Immunology of Leprosy is to be held in Anandaban in Nepal in March of this year. Research workers from many countries will be attending this workshop masterminded by Prof. James Watson of the Auckland Medical School.

Vaccilep Workshop On The Immunology of Leprosy — March 29-31st, 1989 Nepal

The aim of this workshop is to create a forum to discuss research directed towards understanding protective immunity to *Mycobacterium leprae* for new vaccine development, and to enhance future co-operation between scientists and research groups. The problems of leprosy are old and many but the workshop is not to merely summarise these. The participants each have a different range of experiences and skills. These are important in the effort to find ways of using current knowledge to bring new approaches to disease control. It is hoped that all participants will discuss their ideas, the difficulties they deal with, both in the laboratory and clinics, and the effort to determine what constitutes protective immunity to leprosy.

Each day has been focused toward different issues:

Day 1: Current research that relates to the regulation of immune responses and immunological unresponsiveness to the antigens of *M. leprae.*

Day 2: Questions underlying the new vaccine development and the modulation of immune responses with lymphocyte regulators.

Day 3: Future directions and needs in diagnostic procedures, in the search for new antigens and an understanding of the immunology of leprosy.

35 people will be attending, ranging from laboratory research workers from Ethiopia, Pakistan, India etc., and other experts from fields which are important to the research work itself. These include a scientist working on a vaccine for malaria, top genetic engineers and scientists who have experience with testing various vaccines that have been developed for other diseases.

REPORT ON THE XXII CONGRESS OF THE INTERNATIONAL SOCIETY OF HAEMATOLOGY MILAN, ITALY, 28 AUGUST — 2 SEPTEMBER 1999.

Jan Nelson, Haematology Department Auckland Hospital.
Winner of the 1987 NZIMLT Scholarship

The Congress of the International Society of Haematology is held every two years and in 1988 was held at the State University of Milan.

Education Programme

This was a one day series of lectures on a variety to topics and served as a review of the current knowledge in a number of fields.

Topics of particular interest to me were:

1. Oncogenes and relevance to Haematology.
2. Stem cells and haemopoetic growth factors.
3. Acute leukaemia.

The paper on oncogenes by R. Dalla-Favera (New York) was an excellent review of the role of oncogenes in haematological disorders and current knowledge about oncogenes. This was a useful introduction for the numerous papers on this subject which were to follow in the scientific programme.

G. Rovera (Philadelphia) reviewed the current knowledge of haematological growth factors and included some of the therapeutic applications of the recombinant factors.

C. Bloomfield (Minneapolis) discussed the advances in the biology and treatment of acute leukaemia. This most notable advances being in the treatment of acute myeloid leukaemia with a quoted 25% now appearing to be cured. The role of both chemotherapy and bone marrow transplantation in acute leukaemia was discussed.

Other topics included in the programme were Molecular Aspects of Coagulation Factors and Thalassaemia, Platelet disorders and von Willebrands disease.

Scientific Programme

This consisted of 5 days of plenary lectures, symposia and concurrent oral presentations on all aspects of Haematology with a significant number of presentations on genetic and molecular aspects of Haematology highlighting the expansion of these fields.

The following is a brief review of some of the papers of particular interest to me.

1. *Clinical Significance of Cellular Markers in Adult Acute Leukaemia.*
   C.D. Bloomfield, University of Minnesota, Minneapolis.
   This reviewed the findings of a large study (CALGB 1988) of adult acute leukaemia and concentrated on the parameters such as immunophenotype and cytogenetics which may contribute prognostic information and also influence selection of therapy. Clonal chromosomal abnormalities are detected in 50-85% of patients with acute leukaemia and in both acute lymphoblastic leukaemia (ALL) and acute myeloid leukaemia (AML) karyotype is found to be an independent prognostic factor. Immunophenotyping with a broad panel of monoclonal antibodies is required in all patients with ALL to identify important risk factors. The value of large ongoing prospective studies was stressed.

2. *Chronic Lymphoid Leukaemias.*
   D. Catovsky (MRC Leukaemia Unit, Hammersmith, London).
   This was a review of the classification of the chronic leukaemias based on:
   (i) Morphology.
   (ii) Membrane markers.
   (iii) Histology of affected tissue.
   The immunophenotype of the 4 types of chronic B cell leukaemia and 4 types of chronic T cell leukaemia were discussed in detail.
   The precise diagnosis and classification of these leukaemias is thought to have positive implications and patient management.

3. *Functionally important markers of normal and malignant lymphoid cells.*
   S. Hollan, National Institute of Haematology and Blood Transfusion, Budapest.
   This plenary lecture discussed the functionally important characteristics of lymphoid cells such as receptors involved in immune function, signal transduction, and functional markers of malignant cells. Also noted was the striking association between the two highly sophisticated information systems ie the lymphoid system and the nervous system.
   The importance of the cellular phenotype of malignant cells was stressed including the use of molecular probes for clonality. This provides both an accurate diagnosis and a means of detecting residual leukaemic cells post therapy.
   The speaker strongly recommended that phenotyping be concentrated in only a few diagnostic centres in a country and "these expensive multiparameter studies should never be status symbols". She emphasised the importance of standardised techniques to allow multinational comparison of results and the need for continuing storage of leukaemia cells for future studies.

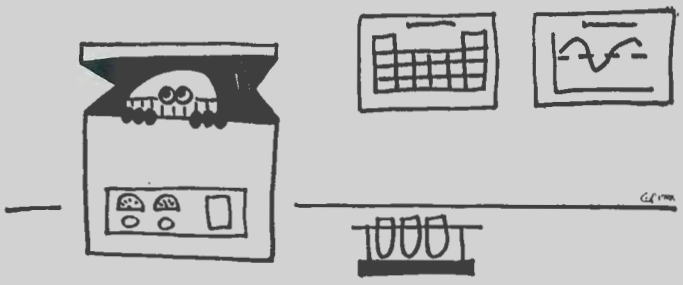
4. *Utility of transmission and scanning electron microscopy in the diagnosis of leukaemia.*
   A. Polliak, Jerusalem, Israel.
   The speaker presented a concise review of the present role of electron microscopy (EM) in haematological malignancies based on the findings from over 200 cases of leukaemia. Although EM studies maybe limited for routine use due to processing time, they provide useful additional information in some cases eg AML-M7, unclassifiable acute leukaemia, minimally differentiated AML, hairy cell leukaemia and Sezary syndrome.

5. *Human retroviruses: They cause various diseases of blood cells and the CNS.*
   R.C. Gallo, NIH, Bethesda.
   This was a fascinating review of the present knowledge of retroviruses by an excellent speaker. Features of the HIV and HTLV groups were discussed and some of the disease manifestations. Evidence for HIV being the causative agent of AIDS (challenged recently by one scientist) was briefly discussed and also some proposals for therapy.

The Congress was preceded by an orientation tour of the city of Milan to see a number of the city's famous art treasures including the "Last Supper" and a Michelangelo "Pieta" and to visit La Scala Opera House. During the week a concert was held in the spectacular Milan Cathedral (Duomo) and a farewell party in the historic Castle Sforza.

The University was surrounded by numerous inexpensive cafes making lunch breaks a daily gastronomic delight.

I would like to thank the NZIMLT for awarding me the 1987 NZIMLT Scholarship which contributed towards the cost of my attending the International Congress. Attendance at such a conference was a valuable experience and is essential for maintaining an updated perspective of rapidly developing fields.



Spooky: A Freak Laboratory Accident

On the afternoon of Friday 21st October, 1988 a loud bang like a champagne cork popping out of a bottle was heard in the Haematology laboratory at Middlemore Hospital, two minutes after a centrifuge with a lock lid safety device had been turned on.

Simultaneously with the bang the locked lid of the centrifuge sprung open, shot out a safety cap from the top of one of the buckets inside and immediately slammed shut and locked again.

The flying safety cap narrowly missed slamming into staff standing nearby the centrifuge.

It was spooky!!!

MOST LIKELY CAUSE OF ACCIDENT

It is presumed that the safety cap was not screwed firmly onto the bucket inside the centrifuge. When the centrifuge reached a high speed the cap worked loose and was flung against the inside wall of the front of the centrifuge at the precise point behind which the safety lock device is housed. The force with which the safety cap hit the wall was sufficient to loosen the safety lock and cause the lid to spring open. The safety cap shot out with the momentum and the lid was forced down again by the suction created by the spinning rotor inside the centrifuge.

The centrifuge was a Heraeus Christ Labofuge GL, which had given reliable service for over two years. The agents for this centrifuge, Salmond Smith Biolab, were immediately notified because of the potential safety hazard this accident revealed.

Mr Peter Bailey, Manager of Scientific Product Division of Salmond Smith Biolab, took a responsible attitude and informed the Hereaus Christ manufacturers in Germany of the accident. The report from the manufacturers and Peter Bailey's comments are outlined below.

Marilyn M. Eales,
Charge Technologist

Centrifuge Incident with a Labofuge GL

Marilyn Eales from the Department of Haematology, Middlemore Hospital reported to us an incident with one of our Centrifuges.

This was a Labofuge GL, the grey and cream coloured model, which was superceded by the blue and cream models in 1986. I am of course referring here to the colour scheme.

Marilyn's explanation of the incident was forwarded to Heraeus Sepatech at the same time our serviceman checked the cartridge. He found no fault at all in the lid lock, motor or engine mounts.

Heraeus Sepatech confirmed that Marilyn's explanation was correct. They also stated that no problems had been reported elsewhere with this type of incident.

Heraeus Sepatech recommended the following:

1. *That the customer should always do a safety check before the centrifuge is spun. In this case the buckets should be swung through an arc to ensure they sit on the trunions correctly.*
   If a lid on a sealed bucket is not screwed down correctly it will jam when swinging. This is a simple way to check them.
   The rotor should then be spun by hand just to ensure the buckets are in place.
2. *If required, our Service Department could do a check on the lid lock systems of the Labofuge GL models in question. The lid lock on the grey and cream models are hinged. This has now been changed on the blue and cream models and it cannot be opened in the same way.*

I feel it is important to stress here that the incident relates to a model of the Labofuge GL with sealed buckets. More specifically it relates to a sealed lid.

I have never experienced in ten years of selling Labofuge GL's anything ever being ejected from the centrifuge itself. I believe it was a freak occurrence.

The quesiton was asked of Heraeus of the feasability to fit new lid locks for customers with this model and sealed buckets.

It is not a feasible proposition. The cost is far too restrictive as it requires a whole new lid.

My recommendation is that as in all centrifuge runs a check should be made for the correct loading of tubes, buckets and that the lids are securely fastened.

I would like to offer the services of my representative force to any customer with this model GL with sealed buckets who would like to discuss with their staff their operation.

Peter Bailey
Salmond Smith Biolab

Book Review

Dictionary of Medical Laboratory Sciences. Edited by A.D. Farr. Published by Blackwell Scientific in association with the IMLS. Price £15.95.

After having browsed through the Dictionary of Medical Laboratory Sciences one is left with the question "Why has it taken so long?" This new publication fills a void in texts relating to the Medical Laboratory Sciences that has existed for far too long.

Covering everything from an Abbe Condensor to a Zymosan, this 318 page dictionary gives clear explanations of all manner of terms relating to the Medical Laboratory Sciences — Bacteria, clinical conditions or terms, abbreviations, techniques, equipment, chemical substances to name just a few.

This text is a must for all laboratories that partake in training programmes for technologists or medical laboratory assistants and would be of great assistance to medical secretaries in the course of their work.

DDM.

NOTE: This publication is available through the Institute at a reduced price. To take advantage of this we need to order in a bulk lot. If you are interested send your orders to the Editor by the 10th April 1989.

Medical Laboratory Science Trust News

The following people have donated their 1988 examiners fees to the Medical Laboratory Science Trust who would like to acknowledge this gesture.

Dr H. Angus, Pathology Services, Christchurch Hospital
Miss M. Gillies, Princess Mary Laboratory
Mr K. McGrath, National Women's Hospital
Mr A Johns, Auckland Hospital
Dr K Smidt, Palmerston North Hospital
Mr G Mills, Ashburton Hospital
Teck Lok Wong, Pathology Services, Christchurch Hospital
Mr T Walmsley, Pathology Services, Christchurch Hospital
Mrs D Phillips, Pearson Laboratory, Christchurch
Mr R Davies, Pearson Laboratory, Christchurch
Mrs D Willis, Pathology Services, Christchurch Hospital

LETTERS TO THE EDITOR

Practical Examinations

Dear Sir,

A group of trainees at Auckland Hospital have got together to express our views regarding the Haematology Certificate Practical examination.

The enclosed letter has been sent to the Medical Laboratory Technologist's Board. We are very concerned about the setting and running of these examinations and for the benefit of future trainees we think it is about time that something was done to improve the whole training scheme.

We would appreciate it if you could publish the letter so that it might generate some discussion and comments amongst medical laboratory workers.

Yours sincerely,
Catherine Whorwood,
Jan Preston,
Raewyn McLean
Trainee Technologists, Auckland Hospital.

Here is their letter:

4 January 1989

The Chairman,
Medical Laboratory Technologists' Board,

Dear Sir/Madam,

We are writing to you regarding the haematology certificate practical exam. Firstly, we would like to comment on the format of the exam which we feel was inappropriate. In a true laboratory situation we are usually supplied with more relevant information concerning the type of tests to be performed. The specialist level exam had a more direct approach to each question — was this not feasible for the certificate level exam?

There were a number of inherent problems in the exam which concern us sufficiently to warrant writing to the Medical Laboratory Technologists' Board. We believe these concerns can be divided into three categories:

(i) the content of the exam
(ii) examination procedure
(iii) partial passes

(i) ***Content of the Exam***

For ease we shall list the problems encountered:

— *Slides being unstained meant there was no opportunity for adequate quality control e.g. problems with haemolysis, determining if microfilaria were present in each film.*

— *Providing five additional sheets of instructions/information made handling the examination paper unnecessarily confusing.*

— *Being provided with bloods which were 24 hours old made them inadequate for special tests we were required to perform.*

— *In the future it might be preferable to be given an automated printout on a fresh blood.*

— *Question Three concerning an unstable haemoglobin. Although unstable haemoglobins are a part of our syllabus we feel it was beyond the scope of a four hour practical exam. In normal circumstances it is very unlikely that we would encounter an unstable haemoglobin. To our knowledge there has only been one unstable haemoglobin in a one year period at Auckland Hospital.*

— *In our laboratory we would never examine a blood in isolation and be expected to perform a definitive test, rather a haemoglobinopathy screen (i.e. Hb H stain, levels of Hb F and Hb A_2, isopropanol test and Hb electrophoresis), would be performed and possible diagnoses considered after the results of these tests had been determined.*

— *To produce an answer for Question Three the candidate must have begun the procedure very early on in the exam, however at Auckland Hospital parts of the exam were sat in two different buildings which made performing tests simultaneously very difficult.*

(ii) ***Examination Procedure***

We believe more detailed information should be made available to the invigilators specifying very clearly what "assistance" they are entitled to give the candidate.

After speaking to a candidate who sat her practical exam at another hospital it was revealed that reagents not routinely used there were placed on the bench, enabling the candidate to discern which tests were to be performed. The situation was not limited to one laboratory and this lack of standardisation puts other candidates at an unfair advantage. We have been told it is difficult to correct these practices unless an official complaint is lodged.

However, we feel this is an unrealistic expectation — who would make the official complaint; the invigilator' — unlikely, the candidate? — once again unlikely, especially as in most cases the guilty party i.e. invigilator, is more often than not their superior in the laboratory.

(iii) ***Partial Passes***

Very little documentation was made available to us concerning the abolishing of partial passes, we were only aware of the fact the day we received our results. If we had been made aware of this earlier the Board would have received many more letters questioning their decision.

We were under the impression that internal assessment would soon be in progress in which case partial passes would not be necessary. Therefore, as internal assessment has been delayed the abolition of partial passes should also be delayed.

The Board considers the certificate one examination, which we have recently discovered was the major reason for abolishing partial passes. Why then, are the results of both the theory and practical exams not treated as an average mark?

We consider resitting the theory exam we have already passed a waste of our time and the Area Health Board's money, which could be channelled into preparing special exams early in the New Year, as other forward moving educational institutions do.

Internal assessment will supposedly be in operation in 1990, hence only a small number of people will be affected by this policy change. Therefore, would it not be preferable at this stage of the proceedings to maintain the status quo i.e. partial passes.

We believe the time has come for some action to be taken concerning the above mentioned problem areas. In light of the inability to recruit and retain staff we need to have a reasonable body administrating exams in the fairest possible way, incorporating flexibility, action on complaints, encouraging feedback, breakdown of examination results and identification of problem areas.

In conclusion, we are concerned about our profession in which we all wish to pursue careers. We look forward to future communication you may have with us.

Yours faithfully,
Catherine Whorwood,
Trainee Technologist

Jan Preston,
Trainee Technologist

Raewyn McLean,
Trainee Technologist

Standardisation of Enzyme Units: Thames Units

Dear Sir,

Enzyme Biochemistry has been made more complicated in my opinion, by the multiplicity of variations in the reporting of specific units. Most enzymes are capable of quantitation by several methods of which each provides its own brand of units. We have Shinowara-Jones-Reinhart units, Somogi units, Babson units, King Armstrong units, Bowers and McComb units, and Bessey-Lowry-Brock to mention a few. As we all know Enzyme concentrations are measured in terms of activity units present in a convenient volume or mass of specimen. The unit of activity is the measure of the rate at which the reaction proceeds, e.g. the quantity of substrate consumed or product formed in an arbitrary or convenient unit of time. The quantity of reacted substrate may be given in any convenient unit, mg, micro moles, change in abosrbance, change in viscosity, or microlitres of gas formed, time may be expressed in seconds, minutes or hours.

Since the rate of reaction will depend on experimental parameters such as pH, type of buffer, temperature, nature of substrate, ionic strength, concentration of activators and other variables, these must be specified in the definition of the unit. In the course of many decades multiplicity of units of enzyme activity have been introduced. Even for the same or similar enzymes, each investigator defined his unit in terms of quantities analytically or otherwise convenient to him at the time. A classic example of encountered in the types of units used in measuring phosphatase activity.

Bodansky defined his unit as the amount of enzyme that will split one milligram of phosphate-phosphorus from B-glycerophosphate at pH 8.6 in 60 minutes at 37°C.

In their alkaline phosphatase method King and Armstrong employed phenol-phosphate as a substrate, and defined their unit as the quantity of enzyme that would liberate one milligram of phenol at pH 9.6 in 30 minutes at 37°C. Their unit for ACID phosphatase (pH 4.9) was, however, defined in terms of an hours reaction time. The Bessey-Lowry-Brock unit of alkaline or acid phosphatase activity is expressed in terms of one millimole of substrate (p-nitrophenyl phosphate) hydrolysed in 60 minutes. Thus, if a given phosphatase preparation hydrolyses one millimole of each of the above mentioned substrates per minute, the following numerical values in terms of the individual units defined above would be obtained:

BODANSKY	pH 8.6	: 31mg phosphorus/mmol x 60 min = 186 units
KING-ARMSTRONG	pH 9.6	: 94mg phenol/mmol x 30min = 2820 units.
BESSEY-LOWRIE-BOCK	pH 10.2	: 1mmol x 60 min = 60 units.

The concentration of enzymes is often expressed in terms of activity units per volume or mass of specimen i.e. per mg of specimen (wet liver tissue), per mg protein, or mg of fat-free protein nitrogen in the specimen.

In clinical work, the concentration is generally reported in terms of some convenient units of volume, such as activity per 100 mL of serum of 1.0 mL of packed erythrocytes.

Just as a multiplicity of units for reporting activity developed a similar multiplicity of units of volume evolved. The Commission on Enzymes proposed that the "unit of enzyme activity" be defined as that quantity of enzyme that will catalyse the reaction of one micromole (umol) of substrate per minute, and that this unit be called the International Unit "U". Concentration is to be expressed in terms of U/mL or mU/mL (U/L); which ever gives the more convenient numerical value.

The use of I.U. rather than U has been commonplace clearly to differentiate the International Unit from other (conventional) units of activity.

Although the proposals of the International Commission have been accepted by many scientists working with enzymes, it is not likely that laboratories using well established enzyme procedures will cease to report enzyme values in terms of the older empirical units to which they have become accustomed. But as new methods are devised, it is anticipated that the activity units will be established in accordance with the recommendations of the Commission.

The purpose of this letter is not to argue about what constitutes an enzyme activity unit but to inform you of what has been happening in Thames laboratory for over ten years to overcome the confusion created by the multiplicity of normal ranges and units used in reporting enzymes.

Simply we decided on the advice of Dr. Mike Gill to standardise all our enzyme normal ranges at 100 maximum by the following formula:-

100 ÷ Upper range of normal method used.

This factor was then used to multiply the results obtained by the particular method e.g.
AST. Normal range = 10 — 40 Sigma Units

$\therefore$ FACTOR = $\frac{100}{40}$ i.e. 2.5

Therefore a result of 40 SIGMA UNITS BECOMES 100.

Clinically only raised enzyme results are significant. With our method of reporting all results under 100 are in the normal range, all results over 100 consequently are abnormal.

The ease of interpretation for the clinical staff has been much appreciated, and we do not have the number of queries regarding the significance of results.

Our Cobas Bio Analyser is programmed to each enzyme's factor and our results are produced directly in "Thames Units".

The acceptance by the Medical Staff including "the rotating House Surgeons" from Auckland, lends weight to the practicality of our system.

I know that Biochemistry purists will argue that the "Thames Unit" is not a unit in the true sense of the term, my answer is, "Well lets call it a Clayton's."

A. Johnston F.I.M.L.S.
Principal Technologist
Thames Hospital

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Membership Convenor
Geoff Rimmer
P.O. Box 29-115, Greenwoods Cnr, Auckland.

Membership Fees and Enquiries

Membership fees for the year beginning April 1, 1989 are:

For Fellows — $104.00 GST inclusive

For Associates — $104.00 GST inclusive

For Members — $52.00 GST inclusive

For Non-practising Members — $33.00 GST inclusive

All membership fees, changes of address or particulars, applications for membership or changes in status should be sent to the Membership Convenor at the address given above.

Members wishing to receive their publications by airmail should contact the Editor to make the necessary arrangement.

Membership Sub-Committee Report — October 1988

Since the August meeting there has been the following changes:

	12.10.88	31.8.88	27.5.88	16.3.88
Membership:	1553	1499	1465	1506
less resignations	3	8	21	21
less G.N.A.	-	14	10	32
less deletions	-	-	-	163
less deceased	-	1	-	-
	1550	1476	1434	1290
plus applications	73	77	65	173
plus reinstatements	-	2	2	
	1623	1553	1499	1465

Applications of Associateship

Margaret Jean SMITH, Auckland; Barabara Dale WALTON, Auckland; Nicola Anne CRONIN, Auckland; Andrea McKee GARDNER, Auckland; Marjet POT, Auckland; David George CHAPMAN, Auckland; Mervyn Leonard HARRIS, Auckland; Carole Irene WATSON, Auckland; Barbara Francesca Louisa SMITH, Auckland; Susan Henderson PERRY, Wellington; Patricia Lucille JOHNSON, Timaru.

Applications for Membership

Wendy Evana OVERY, Auckland; Catherine Helen MUIR, Auckland; Margrit FULLEMAN, Auckland; Megan Joy TURNER, Auckland; Wendy Ann HOOPER, Auckland; Mary Elizabeth HALL, Auckland; Lynley Margarita HENDERSON, Auckland; Timothy Martin MILNE, Auckland; Jennie Suk-Ching LOO, Auckland; Vicki Christine RENDEL, Auckland; Julie Ann ADAMS, Auckland; Janet Gibson ROOK, Auckland; Carol Ruth GARDINER, Auckland; Susy KIRWAN, Auckland; Janice Bessie KARAKA, Auckland; Maria WATENE, Auckland; Frances Caroline TE AMO, Auckland; Lisa Jayne HESLIN, Auckland; Joy Adri STEENSON, Dargaville; Beth COOKSON, Kawakawa; Wendelina Johanna SINCLAIR, Kawakawa; Robyn Margaret CHEYNE, Gisborne; Rosemary Janice DUNN, Thames; Tina Louise LUSHER, Wanganui; Leonie Ann BELL, Wanganui; Grant Bruce TUNBRIDGE, Wanganui; Fiona Marie YOUNG, Wanganui; Lesley SWALES, Wanganui; Trudi Denise SMITH, Dannevirke, Ruth ANDERSON, Dannevirke; Maureen June CROWE, Stratford; Jane HIGHAM, Stratford; Leesa PORTEOUS, Stratford; Ann THORNTON, Wellington; Catherine May RASMUSSEN, Palmerston North; Katherine BROWN, Palmerston North; Wendy OWEN, Palmerston North; Shelley Ann KNYN, Palmerston North; Shirley Elizabeth THOMPSON, Palmerston North; Marianne ROELFS, Palmeston North; Lisa Catherine GROOM, Christchurch; Lee Robyn HARRISON, Timaru; Patricia Marie O'DRISCOLL, Timaru; Heather Margaret LAIRD, Christchurch; Jennifer Marion DOBIER, Christchurch; Barbara Jean TILY, Christchurch; Judith Garde WILSON, Christchurch; Alison Dawn DIXON, Christchurch; Lynda Margaret MURPHY, Christchurch; Rosemarie MAXTED, Nelson; Alan David SHAW, Greymouth; Bernadette Louise HULSBOSCH, Invercargill; Jayne Maree AFFLECK, Invercargill; Alan Ivan STUART, Dunedin; Patricia Ann RAFFILLS, Dunedin; Majorie Doreen ILLINGWORTH, Dunedin; Dorothy Joan RIACH, Dunedin; Manjula Devi RAJ, Fiji.

Resignations

L.R. ANDREWS, Auckland; Cassandra HANSEN, Waipukurau; David CATHCART, Wellington.

Correspondence

Dear Mr Wilson

I am replying to your letter of 4 October concerning the Laboratory Services Advisory Committee.

The LSAC has been in existence since 1957 initially as a sub-committee of the Medical Services Advisory Committee and in more recent years as an advisory committee in its own right.

The terms of reference of the committee are to advise the Minister on the administration of benefits payable under the

Social Security (Laboratory Diagnostic Services) Regulations 1981; to recommend on additions or deletions of tests available as laboratory benefits; and to consider applications from doctors for recognition as private pathologists.

The future of Ministerial Advisory Committees related to specific health benefits such as laboratory, diagnostic imaging, physiotherapy and medical services will be considered during the devolution of the management of these benefits to area health boards. Your letter is most timely because the Department forsees a considerable amount of consultation during the devolution process the consultation will have to be broad to take place right across the spectrum from consumer groups to providers of service so that the perceived advantages of local management, (particularly efficiency and integration of services) can be achieved.

Members of the Institute will have to ensure that their voice is heard at a local level, and also centrally, as the Minister's plans for devolution are put in train, because I am sure that their contribution could be most helpful.

Yours sincerely,
George Salmond,
Director General of Health

Dear Mr Edwards,

I refer to your letter of 7 December about protocols for blood testing for infectious diseases.

I apologise for the delay in replying to your letter. I have been waiting for information from our legal advisors and the National Health Institute.

Where a blood specimen is being tested for infectious diseases because of an accidental self-inoculation by a laboratory worker, the informed consent of the patient must be obtained first. Where blood is used for inter-laboratory comparison and is tested for infectious diseases, it is considered that prior consent should again be obtained. However, if the sample comes from a person who has already given consent for his blood to be tested eg, a blood donor, testing for the same infectious agents at a later date on the sample does not require a second, separate consent.

Your sincerely,
E R Dowden
Acting Manager
Hospital Specialist Services Programme
Department of Health

Dear Mr Edwards,
AIDS

Thank you for your letter of 13 May. Hepatitis B is not strictly regarded as a work related disease for laboratory workers. It is possible for laboratory workers to contract it elsewhere. What is recognised is that laboratory workers are a greater risk of contracting Hepatitis B, because of the nature of the work, than the general public. Accordingly when a laboratory worker contracts Hepatitis B one can start with a presumption that the source was the work environment.

The linkage betweeen the contraction of AIDS and the work environment is not as strong as that for Hepatitis B but certainly the risk is there. As with any other claim, including those for Hepatitis B, each case will be treated on its individual merits.

Yours sincerely
J.T. Chapman
Managing Director
Accident Compensation
Corporation

Institute Calendar

24 Feb 1989	Applications close for QTA & Fellowship Exams.
15/16 Mar 1989	Council Meeting (provisional)
7 Apr 1989	Committee accounts to be with the Treasurer.
28 Apr 1989	Committee Annual Reports to be with the Secretary.
9/10 May 1989	QTA Examinations
24/25 May 1989	Council Meeting (provisional)
31 May 1989	Proposed Rule changes & Remits to be with the Secretary.
1 July 1989	Nomination forms for the election of Officers and Remits to be with the membership (60 days prior to AGM)
4-6 July 1989	Fellowship examinations
21 July 1989	Nominations close for the election of Officers (40 days prior to AGM)
9 Aug 1989	Ballot papers to be with the membership (21 days prior to AGM)
16 Aug 1989	Annual Report and Balance Sheet to be with the memberhsip (14 days prior to AGM)
28/29 Aug 1989	Council Meeting — New Plymouth
30 Aug - 1 Sep	Annual Scientific Meeting — New Plymouth
30 Aug 1989	AGM & SGM — New Plymouth
OTHER MEETINGS:	
16-20 July	ASEAN Conference MLT — Singapore

ANNUAL STAFFING SURVEY
APRIL 1988

MEDICAL LABORATORY TECHNOLOGISTS

Currently Employed

	1983	1984	1985	1986	1987	1988
Clinical Biochemistry	175	174	187	186	187	187
Microbiology	155	164	168	172	176	186
Haematology	145	160	160	163	168	176
Immunohaematology	84	86	90	92	97	102
Histology	25	22	24	24	24	28
Cytology	6.5	6.0	5.2	7.2	5.7	7.8
Nuclear Medicine	4.2	6.2	8.5	8.0	5.8	9.0
Immunology	23	23	22	28	22	21
Cytogenetics	10	5.5	7.5	6.5	7.5	8.0
Virology	2.0	1.0	2.0	6.0	4.5	6.5
Administration (full time)	30	37	34	39	34	33
On rotation	47	46	41	55	41	44
Other	6.0	4.5	7.3	2.4	3.0	11
TOTAL	712.7	735.2	756.5	789.1	775.5	819.3

Private Laboratories (1988):148.2 (18.1%)

Current Vacancies

	1983	1984	1985	1986	1987	1988
Clinical Biochemistry	6.0	9.0	8.5	15.3	11.5	14.0
Microbiology	5.0	1.5	4.0	12.5	10.0	9.6
Haematology	4.5	4.5	4.0	11.0	9.8	11.0
Immunohaematology	5.0	6.0	4.0	6.5	7.3	6.3
Histology	3.0	3.0	5.0	3.0	5.0	5.0
Cytology					2.0	2.0
Nuclear Medicine				1.0	1.0	1.0
Immunology	1.0	1.0		2.0	2.0	5.0
Cytogenetics	1.0					
Administration (full time)	1.0			1.0	1.0	
On rotation		1.0	3.8	6.5	3.1	3.6
Other	1.0					
TOTAL	28.5	26.0	29.3	58.8	54.2	58.0

MEDICAL LABORATORY ASSISTANTS

Currently Employed

	1983	1984	1985	1986	1987	1988
Clinical Biochemistry	188	188	193	183	169	174
Microbiology	170	165	186	168	152	188
Haematology	142	142	145	143	117	112
Immunohaematology	101	101	118	118	114	112
Histology	80	78	77	85	76	96
Cytology	39	40	32	36	40	35
Nuclear Medicine	8.0	16.0	12.5	16.8	11	13
Immunology	40	41	32	42	31	48
Cytogenetics	7.0	5.0	4.0	7.5	5.5	13
Virology	5.5	5.6	7.0	7.0	8.0	6.5
Administration (full time)	88	87	96	91	91	75
On rotation	59	56	44	51	56	67
Other	28	24	31	44	49	49
TOTAL	955.5	948.6	977.5	992.3	919.5	998.5

Private Laboratories (1988) = 334.7 (33.9%)

Current Vacancies

	1983	1984	1985	1986	1987	1988
Clinical Biochemistry	3.5	5.5	5.5	7.0	11.0	5.3
Microbiology	2.0	3.9	4.8	8.4	5.4	1.9
Haematology	1.5	1.7	4.3	5.8	4.1	5.6
Immunohaematology	4.2	2.1	1.0	2.5	4.6	10.9
Histology		0.5	3.0	2.0	4.5	3.8
Cytology			1.0	1.0	1.0	
Nuclear Medicine			1.0			1.0
Immunology			1.0		2.4	
Cytogenetics						2.0
Administration (full time)	1.6		1.0	4.0	3.0	
On rotation		2.0	2.7	2.7	0.4	1.0
Other			1.0		0.5	5.5
TOTAL	12.8	15.7	26.3	33.4	36.9	37.0

MEDICAL LABORATORY TECHNOLOGY TRAINEES

Trainees Numbers

	1983	1984	1985	1986	1987	1988
Total Trainees	415	381	334	341	349	371
NZCS Trainees	219	185	173	173	175	175
Graduate Trainees	18	22	15	39	55	63
Certificate Trainees	156	162	133	139	145	158
Specialist Certificate Trainees	40	34	29	29	29	38
Trainee Vacancies	2	6	21	11	7	8

Trainees in Private Laboratories (1988) = 37 (10%)

NZCS Trainees

	1983	1984	1985	1986	1987	1988
First Year	67	50	65	61	67	67
Second Year	61	65	48	61	49	58
Third year	91	70	60	51	59	50

Certificate Trainees

	1983	1984	1985	1986	1987	1988
Clinical Biochemistry	33	45	39	42	46	44
Microbiology	50	41	35	33	41	49
Haematology	42	38	37	32	31	38
Immunohaematology	19	25	15	18	13	12
Histology	3	5	4	4	6	4
Cytology	3	2		2	3	2
Nuclear Medicine	1				1	
Immunology	2	2		3	1	5
Cytogenetics	3	2	1	2	1	2
Virology		2	2	3	2	2

Specialist Certificate Trainees

	1983	1984	1985	1986	1987	1988	
Clinical Biochemistry		10	8	9	8	8	6
Microbiology		15	5	6	9	6	10
Haematology		7	9	5	4	5	7
Immunohaematology		4	3	4	5	3	6
Histology		1	2	2	1	3	4
Cytology			1	1			1
Nuclear Medicine		2	5				
Immunology	1		1				
Cytogenetics		1	1		2	2	3
Virology				1		2	1

Technical Staffing 1988

	Tech	L.A.	Trainee	Total
Hospital	671.1	653.8	334	1,659 (76%)
Private	148.2	334.7	37	520 (24%)
TOTAL	319.3	988.9	371	2,179

NEW PRODUCTS AND SERVICES

AGGREGOMETRY USED TO STUDY INFLAMMATORY DISEASES

The study of white cell function and physiology has been of interest to workers in pathology and immunology for many years. Many laboratories engaged in the study of white blood cells have introduced leukocyte aggregation as a new investigative tool with the use of Bio/Data Corporation four channel Platelet Aggregation Profiler TM, PAP-4.

Leukocytes play a fundamental role in inflammation. The migratory properties of polymorphonuclear neutrophils and monocytes have been shown to be an important diagnostic consideration in patients with inflammatory disorders. Leukocyte aggregation has emerged as an in-vitro method to assess the inflammatory process as a marker of the role of white cell aggregation and subsequent blood vessel wall adherence.

In the treatment of patients, aggregometry is used to monitor anti-inflammatory drug effectiveness by measuring quantitative changes in total percent aggregation and slope values. In the clinical setting, patients with acute respiratory distress syndrome (ARDS) or chronic granulomatous disease (CGD) are evaluated for in-vitro drug effectiveness. Leukocyte aggregation is measured in some patients with kidney disease, diabetes and variable degrees of liver cirrhosis, each of whom may have acquired defects of neutrophil function. Similarly, in oncology patients, it has been suggested that platelet and leukocyte aggregation studies are valuable in the assessment of chemotherapy in certain malignancies.

The emergence of leukocyte aggregation as a clinical and research technique appears to parallel the similar emergence and growth of platelet aggregation over recent years, both of which may be attributed to the development of sophisticated aggregation instrumentation.

For more information of the Platelet Aggregation Profiler TM, PAP-4, contact the Wilton Instrument Division of Salmond Smith Biolab Ltd, PO Box 31-044 Lower Hutt, phone (04) 697-099.

STOP PRESS

Waikato Hospital has installed the "Vitek Automated Microbiology system" from the McDonnell Douglas Corporation.

This is the second system to be installed into New Zealand. Scientific Products Division, Salmond Smith Biolab Ltd.

HIGH PURITY WATER FOR HUMAN INVITRO FERTILISATION

The success rate of IVF centres is often affected by variables, one of the most important being the purity of water used for these processes.

In IVF Laboratories, ultrapure water is used for several critical steps: media make-up, buffers, reagents, and glassware washing. Water purity can be improved by the use of a Milli Q/UF system from Millipore. This may lead to a greater IVF success rate than previous water treatment technologies.

The Millipore system is direct feed from a pretreated source, allowing ultrapure product water to be produced on demand. This eliminates the degradation of the Ultrapure water during storage and the contamination from bacterial and algal growth within the storage tank if regular sanitisation procedures are not followed.

After deionisation, ultrapure product water is continuously monitored to ensure that it is at 18 megohm. Remaining non-ionic impurities of 10,000 nominal molecular weight and above are removed by the ultrafilter in the last stage of the water purification system.

Sanitisation is one of the biggest problems with any IVF water purification system. By definition, sanitising agents are embryo-toxic and must be used cautiously with complete elimination from the system after sanitisation. Intermittent usage of a system can lead to large bacterial build-up on filters and within the housings. The Millipore IVF water purification system has been designed to allow limited sanitisation of individual components as required. The spiral-wound structure of the ultrafilter cartridge provides a ready environment for bacterial growth. Millipore has overcome this problem by designing a recirculation system for this filter which allows thorough penetration of the sanitising agent. Regular and effective sanitisation of the Millipore water purification system ensures bacterial growth within the system is kept to a minimum and therefore reduces the possibility of small molecular weight bacterial breakdown products and metabolites appearing in the final product water.

Finally, the Millipore system produces large enough quantities of ultrapure water to accommodate all tissue culture and washing up procedures, rather than using less pure alternative sources.

Marketed by Scientific Products Division, Salmond Smith Biolab Ltd.

BECKMAN OFFERS NEW TRIGLYCERIDES REAGENT

Beckman Instruments introduced Dri-STAT® Triglycerides-GPO Reagent, a new formulation that improves the features of most existing triglyceride methods. The new Beckman reagent saves time, increases productivity, and lowers cost by reducing waste, frequent setups and sample reruns.

Beckman's Triglycerides-GPO reagent reduces analysis time to 5 minutes, and after reconstitution remains stable for 14 days at 2-8°C. High linearity to 700mg/dL reduces sample reruns, and improves productivity and economy. The GPO reagent correlates well with the traditional UV reference method for quality results the first time. The reagent is packaged with powder and buffer.

The Beckman Triglycerides-GPO formulation is an important component of the Beckman lipid panel, which also includes Dri-STAT Cholesterol Rate Reagent, HDL-Cholesterol Tablets (precipitant), Triglycerides Calibrator, Elevated Lipid Control Serum, and Cholesterol Reference Serum. Contact Sonatec PO Box 78096, Auckland.

NEW BOOTS THYROID FUNCTION TEST KITS

A new, non-isotopic, sensitive TSH assay

★ Specifically designed for routine use.
★ Easy disposal, long shelf-life and use with standard laboratory equipment
★ Colour end-point interpretation.
★ Simple, rapid protocol with ready-to-use, colour coded reagents.
★ Minimum hands-on-time.

A new, non-isotopic, back-titration assay

★ All the advantages of a non-isotopic assay — easy disposal, long shelf life.
★ Accurate clinical results.
★ Simple protocol, ready-to-use colour-coded reagents.
★ Colour end-point — easy photometric interpretation of results.
★ Uses standard laboratory equipment.

For further information contact Kempthorne Medical Supplies.

CHEMTEXT — THE CHEMICAL WORDPROCESSOR

Chemtext is a chemical word processor designed for chemists and containing the features that chemists need.

ChemText integrates text with chemical structures, reaction diagrams, equations, flowsheets and other images to create presentation-quality reports and documents.

Molecules, reactions, forms and equations are produced in ChemText's powerful drawing editors and included in documents. The extensive set of science and mathematics symbols enable you to rapidly build complex multi-level equations in ChemText documents. Images created in ChemText can also include boxes, lines, arc's circles and arrows of many different styles. This allows you to add accent to chemical structures, create complicated reaction schemes, flow charts, process diagrams and other drawings.

Molecules drawn in ChemTexts molecule editor can be represented stereochemically to show three-dimensionsal bonds. Arrows can be added to single molecules and reactions to show rotation, and dotted lines can be drawn to indicate planes of symmetry.

ChemText is easy to learn and simple to use. You draw naturally with a mouse. To edit text you can use either the mouse or keyboard commands, whichever you prefer. Pull-down menu's take you through ChemText's many functions. You don't have to remember cryptic command lines or abbreviations. If you need help just call up ChemText context-specific HELP screens.

ChemText is an integrated program that provides all your image and text processing requirements; scientific manuscripts, research reports, presentation graphics, flow charts, viewgraphs, slides grant applications, proposals, newsletters, meeting notes, teaching material, interoffice memoranda, letters . . .

ChemText runs under the popular MS-DOS operating system which means it will work with IBM Personal Computers and 100% IBM compatibles.

NEW EIA ANTIGEN KIT FOR HERPES

Wellcome Diagnostics has added a rapid and accurate test for the diagnosis of Herpes Simplex Virus Type I and Type II infections to the Wellcozyme range of enzyme immunoassays.

Called Wellcozyme HSV, the test is a direct antigen asasy incorporating a cyclic amplification technique which improves sensitivity over conventional enzyme labelled systems. Faster than other detection methods, the assay yields results in less than three hours as the test sample and conjugate are added and incubated together, and only one wash step is necessary.

The assay is simple: swab samples obtained from a variety of lesions can be transported to the laboratory without the need for special transport media. When used as a first line test, Wellcozyme HSV exhibits 94.4% sensitivity and 99.3% specificity. A simple neutralisation protocol supplied in the

Wellcozyme HSV Confirmatory Test may be used to confirm any doubtful results.

This direct EIA can also be used to confirm the presence of HSV in culture lysates and in extensive clinical trials, confirmation was 100%. Wellcozyme HSV minimises the need for subjective tests such as immunofluorescence or time consuming cell-culture and is designed for use in virology where cell culture may be the standard procedure, as well as in general microbiological laboratories. It can be employed in the early diagnosis of HSV infections of particular importance, for example, in the genito-urinary patient and in immunocompromised individuals. Drug therapy, such as ZOVIRAX, may thus be administered much sooner.

WHEN NOTHING ELSE SEEMS TO WORK

The need for labels to withstand staining, rinsing, or even several years on file, was a poser for Greenlane Hospital's haematology laboratory. Then it heard of Quik Stik International's graphi-print service, a means of overprinting labels.

On every sample the laboratory must carry out a number of analytical tests, and it needs a simple and efficient means of keeping track of them.

When Quik Stik was approached, it devised a way of producing sequentially numbered graphi-printed labels in sets of eight, which could be easily attached to the patient's records, and batch number labels placed on samples for the various tests.

"One of the main problems was producing a label to resist the rigours of the hospital environment. The adhesive must last several years on file, and the label paper must be able to survive staining procedures and retain numeric details," said Ailsa Lloyd, EDP product manager for Quik Stik International Ltd.

Besides sequential numbering, Quik Stik can provide a range of bar-coding and one-off computer labelling jobs, suitable for manufacturers, hospitals, government departments and product identification.

They can be printed onto existing stock or specially designed labels.

"Graphi-print is cost-effective and flexible, producing a superior quality label, which can be customised to suit individual client needs," said Ailsa Lloyd.

"If clients wish to print their own labels, we also offer over-printing systems, which will operate alongside existing hardware or as stand alone units," she added.

DU PONT INTRODUCES IMPROVED HIV p24 CORE ANTIGEN TEST

The Du Pont Company has introduced a highly sensitive HIV p24 Core Antigen ELISA kit that detects and quantitates Human Immunodeficiency Virus (HIV) antigen levels.

The new ELISA routinely detects six picograms of HIV p24 in 200 microlitres of tissue culture supernatant, plasma or serum. The assay is so powerful that threshold positives can be detected without a plate reader, and the threshold tissue culture samples can be detected in just 5 hours.

The p24 Core Antigen ELISA retains all the advantages of the original Du Pont test: ease of use; stability, and comes with a recombinant Interleukin-2 for tissue culture preps. The advantages of the new test are improved sensitivity and less interference from serum factors. The new test also has a confirmatory reagent and sample protocol in every kit to eliminate concerns about false positives.

RAPID, ACCURATE SYPHILIS SCREENING WITH WELLCOSYPH HA

Wellcome Diagnostics has launched a new TPHA assay with an incubation time of only 45 minutes for the diagnosis of syphilis. Called Wellcospyph HA, the kit is a rapid assay for the detection of antibodies to *Treponema pallidum* by indirect haemagglutination.

Wellcosyph HA is convenient and easy to use with excellent specificity and sensitivity. In independent evaluations the assay demonstrated 99.75% specificity with random blood donor samples. With clinical samples, a specificity of 99.4% and sensitivity of 98.7%. This is comparable with TPI and FTA-ABS tests which are frequently used for confirmation.

The preserved test erythrocytes are coated with antigens to *T. pallidum.* Test cells agglutinate in the presence of specific antibodies to *T. pallidum.* Any non-specific reactions can be detected and resolved using the control cells supplied. The test is carried out in microtitration plates and can be used for either qualitative screening or as a quantitative assay using a dilution protocol. With only a 45 minutes incubation time, results are available within 60 minutes.

All reagents are supplied ready to use and are stable at 2 to 8^{0}C, removing the need for reconstitution and reducing wastage.

Each kit contains sufficient reagents to perform either 200 screening tests or 28 quantitative assays.

Other products in Wellcome Diagnostics range for sexually transmitted diseases include Wellcozyme HSV, and EIA for the detection of Herpes Simplex virus types 1 and 2; VDRL Carbon Antigen for use in the visual differentiation of positive and negative syphilis reactions in tube and slide flocculation tests and Syfacard-R a quantitative and qualitative Rapid Plasma Reagin (RPR) Card-Test for syphilis.

For further information contact: Wellcome Diagnostics Limited Telephone: (09) 276-1877.

NEW SPC INTERFACING FOR CAPSULE AND TABLET WEIGHING SYSTEMS

The popular line of MOCON Automatic Balances are now available with Statistical Process Control (SPC) interfacing. These systems allow for the testing of a large number of samples in a short period of time. Each system provides a statistical printout that permits immediate determination of compliance with weight variation controls. This "total system" solution offers on-line manufacturing process control documentation making the job of weighing and sorting capsules or tablets — fast, easy and accurate.

The benefits of SPC interfacing, storage of 10 product parameters, 0.1 mg resolution, and summary reports will help improve QC accuracy and reporting. Ease of operation, automatic zero, sorter options, and RS-232-C connection will provide flexibility not found in other systems.

MOCON designs and manufactures R & D and quality control instrumentation for the food, chemical and pharmeceutical industries. MOCON serves a broad range of foreign and domestic food and pharmaceutical manufacturers, packaging materials manufacturers and converters, research laboratories, educational facilities and government agencies.

To receive more information and complete specifications contact the Wilton Instruments Division of Salmond Smith Biolab Ltd, New Zealand agents for MOCON.

WELLCOME DIAGNOSTICS TRANSFERS CLINICAL CHEMISTRY TECHNOLOGY TO HUMAN GmbH

As part of its continued focus on immunomicrobiology, Wellcome Diagnostics has announced the transfer of its interests in Clinical Chemistry Quality Control Sera production and supply to Human GmbH, a leading independent producer of diagnostics in the European market. The product will be supplied in the UK by their associated company, BIO-STAT Ltd.

The agreement will not affect the operation of the Wellcome International Quality Assessment Programmes which will continue to be supplied to clinical chemists worldwide by Wellcome Diagnostics.

The transfer is seen as beneficial for both companies,

allowing Human to significantly extend its clinical chemistry range and enabling Wellcome Diagnostics to concentrate on its core business.

The technology transfer will ensure the continuation of high quality manufacture. Previously sold under the Wellcontrol trade mark, Human will distribute the sera under the name of Humatrol via distributors in more than 45 countries.

The distributor in New Zealand will be NZ Diagnostics.

For further information contact: Mr Cavin Haines — NZ Diagnostics Limited 73-75 Queens Drive LOWER HUTT or Miss Elizabeth A. Fox — Wellcome New Zealand Limited PO Box 22-258, Otahuhu, Auckland.

NEW AGENCY

Labsupply Pierce (NZ) Limited have been appointed by Schott Gerate their exclusive New Zealand Distributor for its extensive range of pH meters, titrators and electronic burettes.

Schott Gerate are renowned worldwide for their high standards in quality and reliability as well as their innovative technology.

Labsupply Pierce will carry stock in Auckland and Christchurch with national service backup.

NEW BECKMAN ELECTROPHORESIS KIT DETECTS NORMAL, TOTAL ISOENZYME ACTIVITIES

Beckman Instruments offers a new Paragon alkaline phosphatase (AP) electrophoresis kit for superior agarose sensitivity and resolution.

The Beckman Paragon System Isopal Kit provides analysis of AP isoenzymes in bone and liver fractions, intestinal and placental fractions and, with optional complementary reagents, atypical variants.

Highly sensitive, the Beckman ISOPAL method identifies even normal, total activities that are often difficult to differentiate with non-electrophoresis methodologies. Through superior separation of liver and bone fractions and extremely clean and sharp bands, the Beckman ISOPAL Kit enables the clinical laboratorian to identify which fraction causes elevations in isoenzymatic activities. The agarose gel and colorimetric methodology provide a permanent, visible record.

The Paragon ISOPAL method was developed for increased resolution of the electrophoresed isoenzymes. It has overcome earlier procedural limitations, achieving separation of all AP isoenzymes in one easy-to-use, reproducible, high-volume procedure.

The Beckman ISOPAL Kit consists of 10 Paragon SPE gels, ISOPAL equilibration and electrophoresis buffers and substrate, plus templates, blotters, pipettes and instructions.

After soaking the agarose gel in equilibration buffer for 30 minutes, the samples are applied and electrophoresed at 150 volts for 25 minutes. Following electrophoresis, the substrate is applied and the gel is incubated one hour at 45 degrees Celsius. After incubation, the gel is rinsed three times for five minutes in fresh distilled water, dried and then scanned at 600-640 nm.

Optional, complementary reagents are available for use with ISOPAL in determining atypical fractions. They are neuraminidase for enchanced separation between bone and liver fractions, polyclonal rabbit anti-placental antiserum to determine intestinal versus placental fractions, and ficin for the identification of molecular forms and/or immune complexes.

AP determinations of clinical conditions include pregnancy; bone disease such as Paget's, hyperparathyroidism, pernicious anemia, osteosarcoma, osteoblastic metastases and osteolytic activity; liver disease including cholestasis, hepatitis A (hepatitis non A-non B) hepatitis B, chronic hepatitis, cirrhosis, hepatoma, liver metastases and other liver diseases; lung disease; and cancer.

Further information available from Sonatec.

NEW DUAL CONDENSOR TO SPEED PATHOLOGIST'S MICROSCOPY

Carl Zeiss announces the availability of a new condensor which is specifically designed to enhance and simplify low power microscopy in histology. With a numerical aperature of 0.5 this new brightfield condensor covers a range of magnifications from as low as 1.25x to as high as 40x.

Conventional condensors typically cover either only the low powers or only the high powers, but seldom both. This capability ordinarily requires a complete change of condensors, or at best, considerable manipulation.

With the new dual condensor a flip of a switch accomplishes this change and survey photographs of complete tissue sections can be easily made.

The introduction of the new dual condensor in no way compromises the superb performance of either the Axioplan or Axiophot microscopes, both of which feature new ICS optics and SI design. ICS optics provide infinite image distance with all objectives, and deliver glare-free images over a consistently large field of view. SI design allows for components for contrast-enhancing techniques to be integrated into the microscope stand. This permits the user to change between techniques with unprecedented speed and ease, without compromising image quality, resolution, or full field of view.

Further information available from: Carl Zeiss (N.Z.) Ltd., Ground Floor, Mayfair House, Wellington, Ph: 724-860, 724-861.

WORK WANTED

Microbiology/Immunology

British trained FIMLS Bacteriology/Parasitology. Registered to practise in NZ by Technologist's Board.
Full details available from:
H. Bowden,
41 Hamid Sadr Street,
Vali Asr. Ave,
Tehran, IRAN.

Microbiology

British trained AIMLS Bacteriology requires trainee or laboratory assistant position in Microbiology.
Full details available from:
A. Bowden,
41 Hamid Sadr Street,
Vali Asr Ave,
Tehran, IRAN.

Microbiology

A trainee technologist position in Microbiology is sought by Fijiian Technologist with QTA.
Full details available from:
Sala Elbourne,
Pathology Laboratory,
CVM Hospital,
Suva, FUJI

THE NEW ZEALAND JOURNAL OF
MEDICAL LABORATORY TECHNOLOGY

Index to Volume 42, 1988

"Being almost human is quite a touching experience for an instrument."

The RA-XT's control panel is a 'user friendly touch screen' which makes it so easy to use by operators on all three shifts. A mere touch of the finger guides you through system operations from the day's first sample to the day's last report.

The RA-XT is the only random access chemistry instrument which can offer you all the acumen of the RA1000 but it is quicker, more convenient and even more flexible and so human, that it even thinks for itself.

The RA-XT's ability to think for itself means that no matter how many varying tests you have on a sample, simply feed them into the RA-XT and it will automatically organise them and place them into an order that will enable them all to be processed in the shortest possible time. Yes, even tests requiring 5 minutes or more incubation time won't slow down the RA-XT's capabilities, which makes the new, almost human Technicon RA-XT system versatile, comprehensive easy to use and economical.

And, because the RA-XT can think, it can store up to 127 methods in its memory and can use 26 of them at any one time. This means you can perform virtually any combination of tests, including profiles, organ panels and single tests – be they routine analytes, TDM's, drugs of abuse or serum proteins. All from a mere 2ul to 30ul per test.

The new Data Management system provides a fast and easy way to organise your laboratory work flow. Up to 6000 patient files complete with patient's name, identification number, patient location and doctor's name and remarks are entered into the computer by a few simple key strokes.

All in all, the new Technicon RA-XT is quite brilliant – it has a fine future and will quickly gain the highest respect from its colleagues within the medical profession.

For additional information about the RA-XT and how its specialist qualities can enhance your laboratory testing, contact Technicon on any of the following numbers.

SYD. (02) 888 1133 MELB. (03) 882 6009
BRIS. (07) 839 5603 ADEL. (08) 271 9654
PER. (09) 325 3563 AUCK. 646-000
CHR. 79 7968.

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- Digital speed control
- Short acceleration time
- Short braking time

Safety

- Diagnosis and disturbance indicators
- Observation of international safety standards
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- Steel armoured rotor chamber
- Accepts sealed buckets or rotors

Examples of applications

- Serological investigations
- Blood fractionation
- Analysis of the smallest samples (titration)
- Analysis technology (RIA)
- Separation of infectious/toxic suspensions
- Depositing particles from medical and biological fluids onto microscope slides.

Superior performance data:	max. speed	6000 min^{-1}
	max. RCF	6240
	max. capacity	4 x 220 ml

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***Innovative:**
awarded the 1985 German industrial prize for innovation

Current Parameters
Glucose, Urea, Y-GT, Haemoglobin, Cholesterol, Triglycerides, AST, ALT, Uric Acid, Bilirubin, Amylase

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