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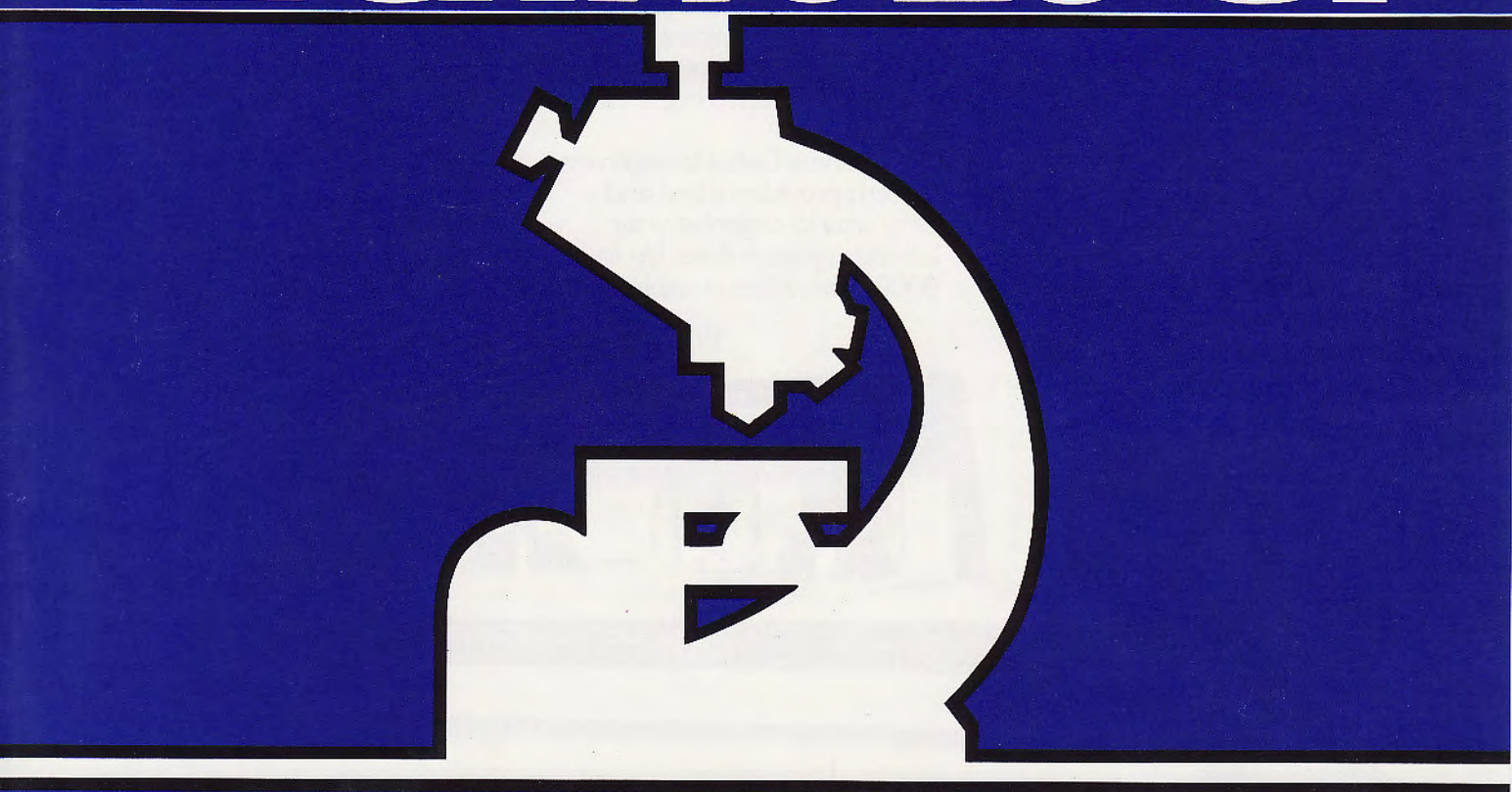

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The Trustees at the official launch with Mr Ross Martin of Link Consultants: (from left) Colvin Campbell, Des Philip (chairman), Ross Martin, John Beattie and Walter Wilson

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The purpose of the Trust is to build up a reserve of money the interest from which can be used to fund medical laboratory scientists with funds for undertaking research, developmental and technical projects.

The Trustees are approaching a number of sources to obtain funds and whilst it is clear that the major amounts will come from manufacturing firms and their agents, it is also true that, as a profession, we need to be seen as willing to help ourselves and not just be dependant on funds from such sources.

To this extent I am asking you to consider in your role **AS A MEDICAL LABORATORY TECHNOLOGIST**, donating to the fund. This can either be a 'one-off' donation or perhaps you may be prepared to promise an amount over say 2-3 years.

Whatever you do, my request to you would be that you demonstrate your commitment to our profession and its ongoing existence and development by making a generous donation to the Trust.

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Desmond J. Philip,
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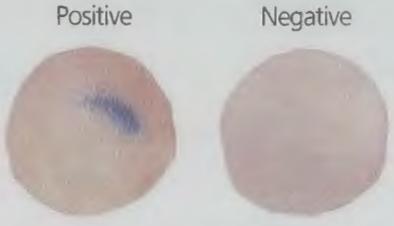


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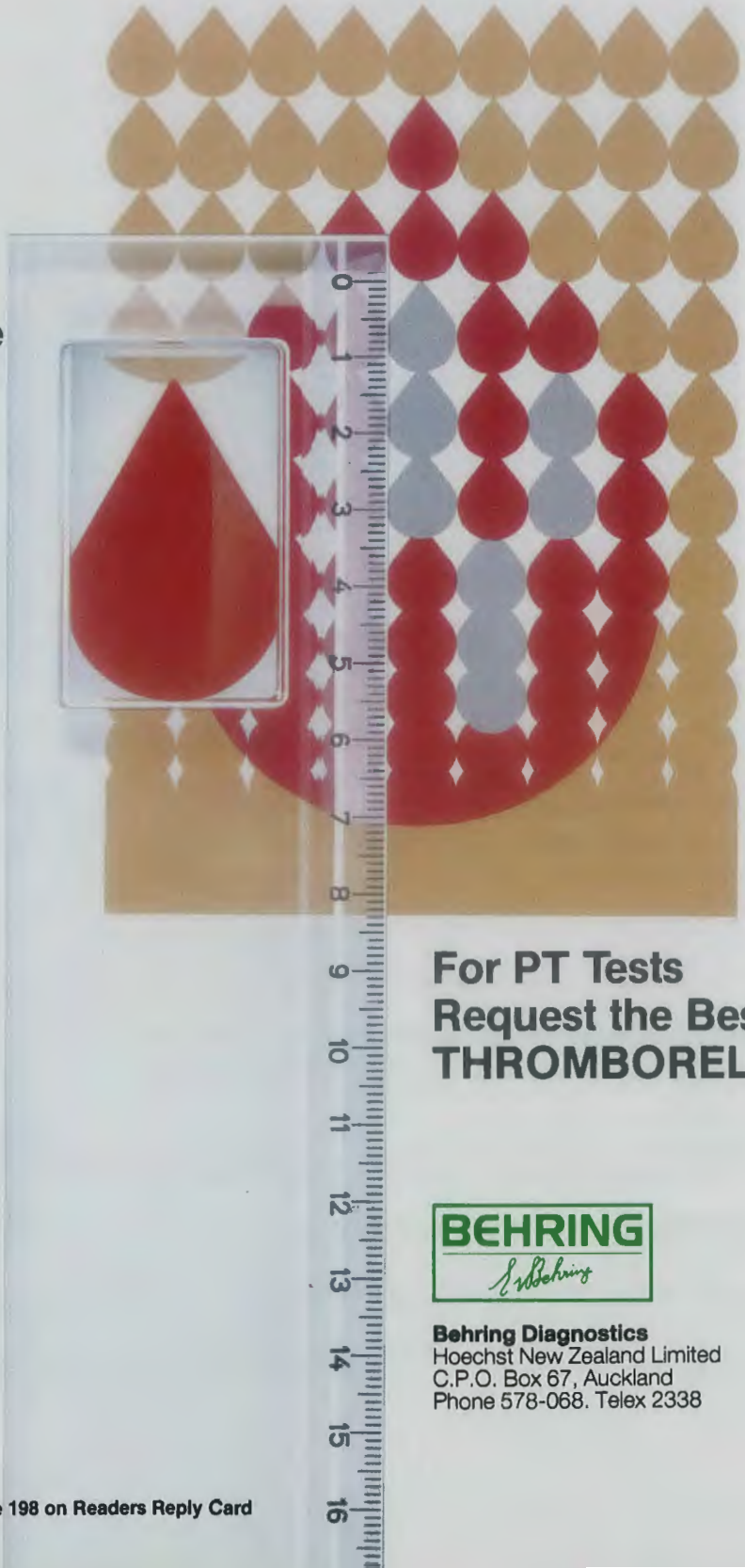

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# T.H. Pullar Address 1987

## A.D. Nixon, ANZIMLT, Department of Haematology, Auckland Hospital

I consider it a great honour to be asked by the Council of our Institute to deliver the T.H. Pullar Memorial Address for 1987.

I must admit to being somewhat overwhelmed when phoned by the secretary asking me to consider the matter, I think my initial reaction could not be considered a truly professional comment.

I also shared the feeling of our colleague who nine years ago presented this address, here, in Nelson — He was sure that this privilege was reserved for, to use his words, "those oldies such as Philip and Hutchings" but he eventually accepted that he was about to become a member of the geriatric club. While I may not be prepared to accept club membership yet, I am encouraged to note the continued survival of those named and many of the others who have presented this keynote address over the last two decades.

It is a real privilege to deliver an address named to perpetuate the memory of Thomas Henry Pullar, a man who had a major influence on the development of medical laboratory technology in New Zealand. Although I did not know Dr Pullar personally, I had only met him once, I am aware that he was respected throughout the country as a man of high principles and a sound clinical pathologist. He was born in 1907 in Auckland and held the appointment as pathologist at Palmerston North Hospital from 1937 to 1963, when because of deteriorating health he moved to Tauranga and for three years, he was engaged in private pathology.

He died in Tauranga in 1966. According to Sir John Staveley, a colleague who had known him for 27 years, he had been intensely concerned and involved in the education and welfare of medical laboratory technologists. While there may not be many here who have personal memories of Thomas Pullar, I am sure we all benefited from his efforts and contributions to our developing profession.

As I recovered slowly from the shock of being asked to deliver this address and started thinking about a suitable topic, I realised that it is 50 years since Dr Pullar's close association with the medical laboratory commenced in 1937. A half century that has seen enormous changes in nearly all aspects of life, not the least of which are those exciting, incredible and sometimes frightening changes in the field of medicine and medical laboratory science. We are also told that in the next 15 to 20 years we will probably see more radical changes in medical laboratory practice than any equivalent period in the past.

I would like to discuss briefly with you today some of the changes which have occurred, and some which are about to occur that will have a profound affect on our profession and our role in the Health Service of New Zealand. I will deal particularly with changes within our profession and some aspects of how we should cope with the changes in the community's attitude to the delivery and funding of health care.

It does not appear to be customary to give a title to this address, but if required one could consider "The Challenges of Change" or "Labcorp (1988) Ltd — Fact or Fantasy".

In considering strategies for coping with the changes around us we should look first at our own profession and changes that have occurred within it over the years. We have seen the development of two professions in the medical laboratory: one, pathology an established speciality within the medical profession and the other, medical laboratory technology, applying scientific principles to medical laboratory practice. Each profession contributes to reaching the primary goal which is to ensure that effective and efficient use is made of all available resources to provide the best possible medical laboratory service for the patients and thus the maximum benefit to the community. Each professional group has its own individual skills and must be considered complementary in providing a complete service.

In the earlier stages of the medical laboratory development, it appeared to be already established that the pathologist was in control of all aspects of the operation. In this address a few years ago, the speaker concluded that he must agree with the statement of the International Society of Clinical Pathology which required that the head of a clinical laboratory devoted to the diagnosis and treatment of human disease must be medically qualified.

Over these years many of those involved in the laboratory as well as those in other specialities in medicine, repeatedly stated that health care delivery must be a team effort involving members of the medical profession together with members of other health service professions. It was interesting to note however, that although not often stated, it was taken for granted that a pre-requisite for the team captain was possession of a MB, ChB. or equivalent. A seminar organised 15 years ago by a branch of this Institute entitled "The Technologist/Pathologist interface; who really runs the show", failed in the eyes of some to provide a clear answer.

Some areas are obviously best dealt with by only one group; for example providing the interface between the laboratory and the clinician is clearly the role for the medical graduate while assessing the relative merits of various laboratory procedures is an appropriate task for the medical laboratory technologist. There are other areas such as general management however which may be equally well handled by either group. A joint venture, to use the terminology of those currently examining us, might be the most suitable approach as we deal with such matters as the apparent change in the community's expectations of the health service. We must make every effort to ensure that sensible cost effective use of the expertise available in either group is made.

The situation which developed across the Tasman last year should not be allowed to develop here. One hopes that we can avoid confrontation in public between pathologists and medical laboratory scientists as we sort out our individual roles in the service. The dispute in Australia arose over who should have administrative and professional control of hospital laboratories. A Government committee of enquiry was set up by the Minister of Health. The first reaction was objection by the pathologists to the terms of reference and the appointment of an independent chairman. They had publicly stated their preference for an eminent pathologist as chairman. The pathologists eventually took industrial action which involved a state wide ban on autopsies and refused to conduct tests at three major public hospitals. Later the medical laboratory scientists reacted to revised terms of reference for the enquiry, by a work to rule campaign. Finally a working party with representatives of all professional groups has been set up to consider all aspects of the provision of pathology services in public hospitals. One can only hope that we can resolve such issues without banner headlines in the daily paper stating — "HOSPITAL POWER STRUGGLE HURTS ONLY THE SUFFERING."

Recently published articles in Britain indicate that they also have management tensions within the laboratory. There appears to be some confusion in defining the roles of the "professional scientists", medical and non-medical, and the medical laboratory scientific officer. Some pathologists have difficulty in coming to terms with the responsibilities of resource management and endeavour to escape what they term a chore and delegate all management tasks to their senior medical laboratory scientific officers. Others have attempted to divide managerial and clinical responsibility as they try to cope with the position of principal medical laboratory scientific officer in the medical laboratory management hierarchy. The Royal College of Pathologists has argued strongly against retaining this officer with laboratory wide responsibilities and claim that the principal unit of management should be the department and not the laboratory. While this policy has some attractions we should consider the implications carefully as we prepare strategic plans for the laboratory. Can we predict the appropriate departmental structuring for the next decade? Will the current boundaries between disciplines be maintained? Will some disciplines survive as we know them now? I think the role of a medical laboratory scientific officer with laboratory wide involvement may be a very important co-ordinating influence as we plan for the future.

We must also realise however, that we have developed as an autonomous profession and there are many other areas of change that we must be prepared to deal with on our own and not await the help and initiative that might have been expected from others in the past. We must be aware of the importance of our professional role in the health service and we must make sure that we convince the groups we interact with and the community at large of the vital part we play. This education or public relation exercise will be an on-going task that must be given high priority. We should not think we can hope to create the correct public awareness of our role if the only time they hear about us is as a result of industrial action.

There can be no doubt that the events of February 1986 demonstrated to everyone including various members of Cabinet, the critical role we play. While I am convinced that the action was the only course available to those seriously concerned with the future of our profession and the future safety of the patients we serve, we must

make every effort to prevent such a situation ever arising again.

$100 million were spent last year on medical laboratory services. The total cost of the country's health services for this year will be about $3,400 million with about two thirds being spent on the public hospital system. Is the public getting value for their money? This question which has been raised many times in the last decade is being asked again as attention is now focussed on the Health Service, one of the few remaining sectors of the State Service that has not yet been investigated and corporatised, privatised or modified in some way.

The continuing spread of commercialism associated with the political and economic convulsions of the eighties may have a major impact on the social services and it is possible that the user-pays approach will become more evident. The political discussions in recent weeks have been confusing although the Prime Minister has been reported as saying user-pays health care could never be justified.

We have all been aware for many years of the increasing cost in our own section of the Health Service, and we are continually considering ways of improving the cost-effectiveness of the laboratory service. We all know of the amazing advances in science and technology which offer almost limitless opportunities for increasing the diagnostic services we can provide. We also know that financial limitations must prevent the application of many of these advances. The financial demands of new treatments will be enormous; the treatment of AIDS, for example, in New York city has been estimated to cost $1 billion by 1991. The City's total health budget is $2.2 billion this year. Our Minister of Health declares that the health service must either offer fewer services or increase its efficiency; otherwise some other service such as education will collapse. A recent report from Organisation for Economic Co-operation and Development (O.E.C.D.) says we must reduce Government spending in some areas such as health and education. It has been estimated that we will spend 7.1% of our gross domestic product on health this year. The OECD average is 7.2%.

We must accept that there is a limit to the percentage of expenditure for Health Serices and that we are at or near that limit. We should therefore increase our efforts and if necessary take the initiative in ensuring that the medical laboratory service is truly cost effective. Our full co-operation with properly planned reviews is mandatory, but it must be emphasised that it is essential that we make sure that the commercial giants that the politicians are unleashing on the Health Service, fully identify and understand the problems before attempting a solution. Some would suggest that health care is somewhat different from the products of the commercial enterprises that they have so successfully re-constructed.

The Hospital and Related Services Task Force is the Government's latest review body. The recent services and staff questionnaire and subsequent interview were my first contact with this group. This contact was brief and did not inspire confidence. It is difficult to envisage how, even such top level consultants as those retained by the Task Force, could in two pages and forty minutes achieve their objectives. I feel a little more time and effort may be necessary if one is to: "assess the level of service which is, and could be provided with the financial resources currently available if improvements were made in the present system", for one of this country's largest hospital laboratory services. In my opinion, some of the questions were so generalised and superficial that the responses could not be helpful and may indeed be misleading. It is important to realise however that there will be changes in the funding and structuring of the laboratory services and we have an important role to play in the development of a cost-effective system which is not overwhelmed by undue commercial emphasis.

I would like to mention briefly some areas which I feel deserve attention as we face these changes.

Firstly, I would like to mention the selection and critical review of new and existing diagnostic procedures used in our laboratories. It is important to use routinely only those tests which have minimum risk in terms of false results, high predictive value and high clinical utility. Test ordering patterns and diagnostic usefulness should be reviewed continually. It is very easy to allow the continued use of obsolete tests thus wasting resources. We should also consider devoting more effect to setting the analytical goals for our procedures. It is possible to lose sight of cost-effectiveness and clinical usefulness as we strive for improvements in accuracy and precision. We should be sure that we fully understand the clinical usefulness of all tests and that the users of our results understand their significance and limitations. Effective communication should be established with the users of the laboratory so that we can continue to provide a relevant service.

The evaluation of performance in its broadest sense, is also a topic for consideration. It is important to be able to demonstrate adequate performance by the laboratory organisation and by the individuals within the laboratory. The former is generally well understood and most laboratories have regular involvement in programmes for monitoring of quality of analytical performance and there is a growing awareness of total quality assurance. The use of a Testing Laboratory Registration Council to provide a voluntary system for peer review of laboratory performance is slowly growing. All medical laboratories should be encouraged to seek registration with this organisation. It is to be hoped that registration can remain voluntary and that the original objectives are retained.

The need for a system for the assessment of individual staff performance has been recognised for some years. Performance appraisal, as it is often known, is an important aspect of personnel management which has not been widely developed in the Health Service. Both the Department of Health and the Health Service Personnel Commission have made a number of recommendations on this subject. Nearly a year ago, a working party produced a report on performance appraisal which the Commission endorsed and commended to Hospital Boards for action. I am not aware of any significant action to date in the laboratory service. I suggest that we, as a profession, should take the initiative and with the co-operation from officers of the Commission and Boards, develop and implement a system. To be successful, a performance appraisal system is best developed with a significant input from those employed in the service concerned rather than using a standard system which may not take into account the special features of the occupational group. Appraisal of performance at all staff levels on a regular basis can be of considerable advantage to staff and will certainly assist in convincing reviewers that we are endeavouring to make the best use of our most expensive resource

Another area in laboratory management requiring further study particularly at this time of review is the development of improved management information systems. Reliable procedures for measuring the work done in a laboratory are essential if the effect of change on work systems is to be assessed. The system of work load units developed in North America has proved to be useful, offering a more precise method for measuring laboratory workload than simple counting of tests or specimens. The Canadian and American versions of the system have been used in this country with some success but unfortunately, have also been misused on a number of occasions to make potentially misleading, simplistic productivity comparisons using only unit totals and staff numbers. It is obvious that these are only two of many factors which must be taken into account when assessing work performance. Because of this type of misuse and doubts about the accuracy with which some record their units, many are now reluctant to use the system. I suggest it is wrong to discard a useful management tool, because uninformed observers and reviewers use it incorrectly. Instead the system should be further developed so that we produce specified productivity measures which truly reflect the work situation and cannot easily be misused. I also suggest that the accuracy of this data should be no more questionable than that of the results of the analytical procedures we perform. It is disappointing that the efforts of our Institute to encourage the adoption of a uniform workload recording system have apparently been unsuccessful.

The final topics which I would like to briefly mention are those which are the subjects of special discussion sessions later today. Education of medical laboratory technologists has been one of the most frequently discussed subjects at meetings of our Institute and has been the theme of this address on a number of occasions. It is an extremely important matter requiring urgent decisions as we attempt to prepare those entering our profession for changing demands the future will bring. Serious consideration also must be given to creating opportunities for groups already in the service such as laboratory assistants, to reach a registrable level. We should remember the role of our profession, and be careful not to over emphasise the clinical aspects of diagnosis at the expense of analytical laboratory science and other relevant areas such as computer literacy and laboratory management. We must make every effort to ensure that the output from our educational system meets the demand both in quality and quantity. The discussions and decisions concerning education that you are about to take part in are likely to be some of the most important in the history of our profession.

Finally, the Institute. Later today, you will consider the structure and function of the New Zealand Institute of Medical Laboratory Technology, your professional organisation. Are changes necessary to

"It is commonplace that we cannot answer for ourselves until we have been tried. But it is not so common a reflection, and surely more consoling, that we usually find ourselves a great deal braver and better than we thought. I believe this is everyone's experience".

In conclusion, as we face an uncertain future together, I am convinced that our need for a strong, vigorous professional body is greater than ever before.

meet the challenges of the future? In the immediate future, we will certainly have to face many changes and be required to make difficult and far reaching decisions. Those who you elect as officers of your Institute require your total support as they act on your behalf. Perhaps, the words of Robert Louis Stevenson are appropriate for all of us as we go forward.

# A Comparison of Concentration Techniques and Selective Media for the Isolation of Legionellae from Water Samples

**William J. Airlie, FIMLS**

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**Abstract**

Contaminated water was prepared and seeded with seven Legionella species to concentrations of $10^6$ cfu/mL, $10^4$ cfu/mL, and $10^2$ cfu/mL. Three concentration techniques and eight selective media were compared for their ability to recover each of the Legionella strains. Two of the concentration methods and three of the selective media proved efficient at $10^2$ cfu/mL concentration of Legionella.

**Key Words**

Legionellae, concentration techniques, selective media.

**Introduction**

There have been several concentration techniques for Legionellae involving centrifugation[1,2], filtration[3], low pH treatment[4], heat treatment[5], and negative enrichment[6], and many media documented for their isolation[7,8,9,10,11] since they first came to medical notice due to an outbreak of respiratory disease amongst members of the American Legion attending a convention at Philadelphia in 1976[12,13]. The purpose of this study was to compare the effectiveness of three concentration techniques and eight selective media in recovering seven Legionella strains from laboratory-prepared contaminated water in an attempt to devise a suitable method for routine examination. The concentration methods studied were (a) filtration, (b) filtration plus centrifugation, and (c) a proven documented method[14]. The Legionella species used were selected because human antibodies to them have been demonstrated in New Zealand[15].

**Methods**

The media tested were as follows: Wadowsky Yee Okuda agar (WYO); Edelstein Finegold agar (EF); colistin cephalothin vancomycin cycloheximide agar (CCVC); buffered cefamandole polymyxin B anisomycin agar (BMPA); and glycine vancomycin polymyxin B agar (GVP) prepared according to the formulae given by Ikedo and Yabuuchi[16]; Greaves' selective horse blood agar (GSHB) as described by Greaves[17]. Yeast extract phosphate haemin agar (YPH+) was based on the medium described by Johnston et al[18]; as YPH is not a selective agar 80 units/mL polymyxin B, 4 $\mu$g/mL cefamandole and 80 $\mu$g/mL, anisomycin was added, as in BMPA. Buffered charcoal yeast extract agar (BCYE) was prepared by the addition of Legionella agar enrichment (Difco) to Legionella agar base (Difco). Modified Wadowsky Yee agar (MWY) was prepared by adding Legionella MWY selective supplement (Oxoid Code SR 118) to BCYE agar.

The Legionella strains used were *L. pneumophila* SG 1 (ATCC 33152); *L. pneumophila* SG 6 (ATCC 33215); *L. micdadei* (CDC BC 17520); *L. sainthelensi* (ATCC 35248); *L. longbeachae* SG1 (ATCC 33462); *L. longbeachae* SG 2 (ATCC 33484); and *L. jordanis* (ATCC 33623). Laboratory cultures of *Escherichia coli, Staphylococcus aureus, Pseudomonas aeruginosa,* and *Candida albicans* were used.

*E. coli* and *P. aeruginosa* were used to represent the gram negative bacilli that can be found in water, *S. aureus* the gram positive cocci, and *C. albicans* to represent moulds and fungi.

With McFarland nephelometer density standards, contaminated water was prepared using *E. coli, S. aureus, P. aeruginosa,* and *C. albicans* to a final concentration of $10^6$ cfu/mL of each organism. The contaminated water was measured into 2 L aliquots and separately seeded with each of the Legionella strains to a concentration of $10^6$ cfu/mL.

This procedure was repeated to obtain 2 L aliquots with final concentrations of $10^4$ cfu/mL and $10^2$ cfu/mL of all contaminants and each Legionella strain.

**Table One**

*Results for L. pneumophila SG 1*

| Media | $10^6$ cfu/mL | | | $10^4$ cfu/mL | | | $10^2$ cfu/mL | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 |
| BMPA | + | + | + | + | + | + | - | + | + |
| CCVC | + | + | + | + | + | + | - | - | - |
| WYO | + | + | + | - | - | + | - | - | + |
| GVP | + | + | + | - | - | - | - | - | - |
| MWY | + | + | + | + | + | + | - | + | + |
| EF | + | + | + | + | + | + | - | + | + |
| GSHB | - | - | - | - | - | - | - | - | - |
| YPH+ | - | - | - | - | - | - | - | - | - |

1, 2, 3 = concentration methods 1, 2, and 3 + = growth - = no growth

*E. coli, S. Aureus* and *P. aeruginosa* did not grow on any of the media.

*C. albicans* grew on GVP which does not contain an antifungal agent and on CCVC which contains the antifungal agent cycloheximide which is inactive against *C. albicans*.

Each water was filtered through a Millipore system using a Millipore membrane type Ha, 45 mm diam., 0.45 $\mu$. The membrane was placed in 50 mL of the unfiltered contaminated water.

*Concentration Method 1*

The membrane was agitated in the 50 mL water and the washings used as the inoculum

*Concentration Method 2*

The membrane was agitated in the 50 mL water, removed, and the washings centrifuged at 9000 x g for 1 h at 4°C in a Beckman J2-21 centrifuge. The deposit was resuspended in 5 mL of the supernatant and used as the inoculum

*Concentration Method 3*

The membrane was blended in the 50 mL water using a Waring commercial blender for 10 s at the highest speed, centrifuged at 650 x g for 10 m in a Sorvall GLC-25 centrifuge to remove the membrane particles. The supernatant was then centrifuged at 9000 x g for 1 h at 4°C, the deposit resuspended in 5 mL of the supernatant and used as the inoculum

For each of the concentrates a 0.1 mL sample was dropped onto duplicate plates of each medium (BMPA, CCVC, WYO, GVP, MWY, EF, GSHB and YPH+) and spread evenly over the surface. The plates were incubated at 37°C (humidified) and examined after 3, 5, 7 and 10 days' incubation.

BCYE was inoculated as a control from each concentrate.

The Legionellae were identified by their characteristic colonial appearance under the stereoscopic microscope, morphologically by Gram's stain and by the inability to grow on cystine-deficient media.

**Results**

$10^6$ cfu/mL

All strains of Legionella tested were recovered on BMPA, CCVC, WYO, GVP, MWY and EF by all three concentration methods. No Legionellae were recovered on GSHB and YPH+. BCYE was overgrown by the seeded contaminants.

Full results for *L. pneumophila* SG 1 are shown in Table 1.

$10^4$ cfu/mL

All strains of Legionella were recovered on BMPA, MWY and EF by all three methods.

CCVC did not recover *L. sainthelensi* by concentration methods 1 and 2, *L. longbeachae* SG 2 by method 1, and *L. jordanis* by any of the

**Table Two**
*Results at concentration $10^2$ cfu/mL by concentration methods 2 and 3*

| | | MEDIA | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | BMPA | CCVC | WYO | GVP | MWY | EF | GSHB | YPH+ |
| *L. pneumophila* SG 6 | 2 | + | - | + | - | + | + | - | - |
| | 3 | + | - | + | - | + | + | - | - |
| *L. micdadei* | 2 | + | - | + | + | + | + | - | - |
| | 3 | + | - | + | + | + | + | - | - |
| *L. sainthelensi* | 2 | + | - | - | - | + | + | - | - |
| | 3 | + | - | - | - | + | + | - | - |
| *L. longbeachae* SG 1 | 2 | + | - | - | + | + | + | - | - |
| | 3 | + | - | - | - | + | + | - | - |
| *L. longbeachae* SG 2 | 2 | + | - | + | - | + | + | - | - |
| | 3 | + | - | + | - | + | + | - | - |
| *L. jordanis* | 2 | + | - | + | + | + | + | - | - |
| | 3 | + | - | + | + | + | + | - | - |

2, 3 = concentration methods 2 and 3 + = growth - = no growth

methods. WYO did not recover *L. pneumophila* SG 1 by methods 1 and 2 or *L. sainthelensi* by any of the methods. GVP did not recover *L. pneumophila* SG 1 by all three methods or *L. sainthelensi* by method 1. GSHB and YPH+ did not recover any of the Legionellae. BCYE was overgrown by the seeded contaminants.

$10^2$ cfu/mL

None of the media recovered any of the Legionella strains when concentration method 1 was used. Using concentration methods 2 and 3, BMPA, EF and MWY recovered each of the Legionellae tested and WYO recovered five of the seven strains of Legionella. GVP recovered three of the seven strains of Legionella. GVP recovered three of the seven strains, and CCVC, GSHB and YPH+ did not recover any of the Legionellae (Table 2). BCYE recovered each of the Legionellae but also all of the seeded contaminants. MWY and EF produced a good growth of each of the Legionella strains whereas BMPA gave a poor growth of *L. micdadei*, *L. sainthelensi* and *L. jordanis*.

## Discussion

The concentration techniques studied in this project were filtration alone (method 1), a technique recommended in the literature (method 3), and a compromise between these two methods devised by the author (method 2). Methods 2 and 3 show good correlation but because method 2 is simpler it is better suited to routine examination.

The decontamination techniques[4,5,6] have been shown to give good results, but they add to the complexity of the overall technique and, as the purpose of this study was to establish a simple, reliable technique for routine use, they were omitted from this study.

Concentration methods using centrifugation normally involve centrifuging large volumes of sample which require access to specialised instrumentation; many laboratories do not have this. Most laboratories can cope with filtration but this study has shown that filtration alone is inadequate when Legionella numbers are $10^2$ cfu/mL. The author has been unable to find reference in the literature as to what concentration of Legionellae "in water" is considered significant but $10^2$ cfu/mL of a virulent strain of Legionella may be sufficient concentration in a water supply to constitute a potential hazard.

By this study MWY and EF were excellent recovery media for a variety of Legionellae, while BMPA was slightly less efficient. MWY has the added advantage that, due to the inclusion of bromothymol blue and bromocresol purple in the formula, some provisional identification of species can be achieved by colonial appearance[19].

Keathley and Winn[20] reported that GSHB and YPH produced only sparse growth of *L. pneumophila* after 14 days' incubation. The author observed no growth of seven Legionella strains on GSHB and YPH+ after 10 days.

This study would suggest that a good routine method for the recovery of Legionellae from water samples would be concentration method 2 followed by inoculation onto MWY.

## Acknowledgement

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# Reference Ranges on the Hitachi-Boehringer 737 Derived from Patients' Results

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**Abstract**

In order to rapidly and economically substantiate the manufacturers' suggested reference ranges for twenty-one common biochemical tests, we analysed patient data obtained during the implementation of a new multichannel analyser. Armed with an awareness of likely normal values, we used a combination of graphical and statistical methods to calculate the reference ranges. Whilst our empirical approach failed with urea, glucose and triglycerides, we believe that it gave useful information for the other analytes measured.

**Introduction**

In November 1986 our laboratory installed a Hitachi-Boehringer Mannheim Automatic Analyser 737 as a replacement for ageing Technicon AAI and ChemLab AAII continuous flow equipment and an IL Multistat III centrifugal analyser. At that time those instruments were being used for phosphate, liver function and enzyme tests respectively. It was envisaged that as well as doing these tests, the 737 would perform non-urgent urea, electrolytes, calcium and glucose analyses; tests which were being done on a Beckman Astra 8 analyser and a Beckman Glucose Analyser 2. These changes were designed to improve laboratory efficiency by essentially combining two workstations ("liver function" and "enzymes") into one and to dedicate the Astra to the "Stat-lab" workstation.

Amongst the many problems that inevitably follow the installation of a new analyser in a clinical chemistry laboratory is the one of: what shall we do about our reference ranges? Resolution of this question can be tackled in several ways: (i) continue with existing reference ranges where there is no significant change in methodology, (ii) adopt manufacturers' and/or literature ranges without question, (iii) analyse a small number (say 30) of routine specimens by both the new and old methods and then, where appropriate, calculate a new range from the regression equation and the existing reference range, (iv) using documented ranges as a guide, attempt to deduce and/or confirm reference ranges from the large numbers of test results generated during instrument evaluation, or (v) follow the IFCC-recommended procedure[1]. However, difficulties may occur with all of these approaches. For example, in (i) between-instrument differences (independent of methodology) may arise from differences in calibration materials, in (ii) reference ranges may have been calculated from an inappropriate population base, and in (iv) the cutoff between health and disease is often unclear. Even with the IFCC-recommended approach, there are the problems of gathering data cheaply and speedily from reference subjects free from disease and in sufficient numbers for statistical analysis. Moreover, it can be argued that reference ranges derived from a healthy ambulant population are not necessarily appropriate when applied to hospitalised and, often, predominantly elderly patients[2].

In this paper we describe our efforts in confirming and/or defining reference ranges from the analysis of patients' specimens during the evaluation and implementation of the 737.

**Materials and Methods**

Apart from the exclusion of the Intensive Care ward, patients' specimens were collected without bias from blood sent to the laboratory for routine tests. Heparinised plasma and serum were used without preference, usually on the day of collection but when necessary specimens were stored overnight at 4°C. Specimens were analysed for: sodium, potassium, urea, creatinine (CREAT), calcium, phosphate (PHOS), albumin (ALB), total protein (T.PROT), total bilirubin (T.BILI), alkaline phosphatase (ALP), gamma-glutamyltransferase ($\gamma$-GT), alanine and aspartate aminotransferases (ALT and AST), creatine kinase (CK), $\alpha$-hydroxybutyrate and lactate dehydrogenases (HBD and LDH), amylase (AMYL), glucose (GLUC), uric acid (URIC), cholesterol (CHOL), and triglycerides (TRIG). A total of 181 patients' results (78 males aged 7-88 years, mean 52.8, SD 20.5, median 55; 103 females aged 7-88 years, mean 51.9, SD 22.1, median 55) provided an initial data base. Subsequently, during analysis of routine liver function profiles (ALB, T.PROT, T.BILI, ALP and ALT), other selected analytes (Na, K, urea, CREAT, Ca, PHOS) were measured to provide additional data. The number of results (n) from which each analyte's reference range was calculated is shown in Table 2.

**Table One**

*Key Details of Analytical Methods on the 737*

| Analyte | Method |
|---|---|
| Na and K | dilutional ion-selective electrodes |
| Urea | Urease, glutamate dehydrogenase, 340 nm |
| CREAT | kinetic Jaffé, 505 nm |
| Ca | o-cresolphthalein complexone, 570 nm |
| PHOS | ammonium molybdate, 340 nm |
| ALB | bromcresol green, 600 nm |
| T.PROT | Biuret, 546 nm |
| T.BILI | Jendrassik-Grof, 546 nm |
| ALP | p-nitrophenylphosphate, AMP buffer pH 10.5, 415 nm |
| $\gamma$-GT | $\gamma$-glutamyl-3-carboxy-4-nitroanilide, 415 nm |
| ALT and AST | modified IFCC, without pyridoxal phosphate, 340 nm |
| CK | N-acetylcystein activated, EDTA, 340 nm |
| HBD | $\alpha$-oxobutyrate → $\alpha$-hydroxybutyrate, 340 nm |
| LDH | pyruvate → lactate, 340 nm |
| AMYL | p-nitrophenylmaltoheptaoside, $\alpha$-glucosidase, 415 nm |
| GLUC | glucose oxidase, peroxidase, 505 nm |
| URIC | uricase, peroxidase, 570 nm |
| CHOL | cholesterol esterase/oxidase, peroxidase, 505 nm |
| TRIG | glycerol kinase/phosphate oxidase, peroxidase, 505 nm |

The 737 employs ion-selective electrodes for sodium and potassium and established chemistries for the other analytes. Details of the methods are given briefly in Table 1 and fully elsewhere[3]. The instrument parameters for all analytes were as recommended by the manufacturers and reagents from Boehringer Mannheim were used as supplied. The 737 can be operated at any fixed temperature over the range 25-37°C; 37°C was chosen and thus enzyme activities (U/L) are expressed at this temperature. Single-point calibration with human serum-based Boehringer calibrator 759350 was used for all analytes except sodium and potassium which were calibrated with Boehringer High 646938 and Low 646911 aqueous standards. Precision and quality control were monitored at least five times daily

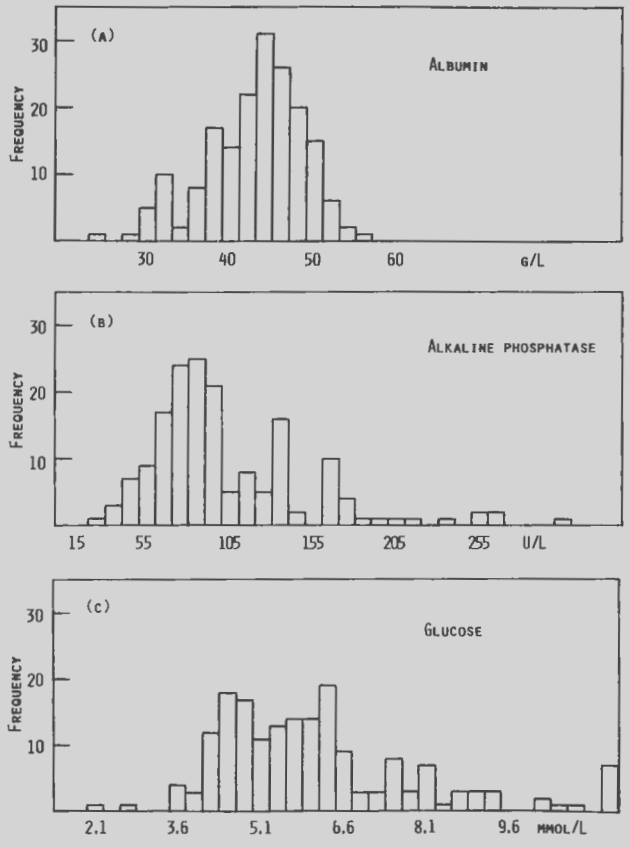


**Figure One**

*Exemplary histograms of the types of distributions (a,b,c) referred to in Results and Discussion.*

with Precinorm U and Precipath U (Boehringer) and Gibcotrol Normal and Abnormal (Gibco NZ).

Histograms were drawn for each analyte with prior segregation of the data for age and/or sex where appropriate (e.g., ALP, URIC). With a knowledge of plausible normal values and using the manufacturers' suggested reference limits as guides, it was possible, with the majority of analytes, to identify the "healthy" values in the histogram. Reference ranges were then calculated from this dissected data using parametric (mean ± 2SD) or nonparametric (percentile) statistics, as appropriate[1].

**Results and Discussion**

The frequency distributions of observed values of analytes measured in this work fell into three categories: (a) those (e.g., Na, K, ALB) with a relatively narrow range and minimum deviation from Gaussian form and where the distinction between health and disease was readily apparent, (b) those (e.g., enzymes, URIC) with a wider range and often skewed distribution but where it was still possible to isolate the "healthy" values, and (c) those (urea, GLUC, TRIG) with widely scattered platykurtotic distributions from which no useful information could be gleaned. Examples of these three distributions are shown as histograms in Figure 1.

Table 2 details the reference ranges derived from patients' results and for comparison the manufacturers' expected values are also listed. While there is good overall agreement between the two data sets some differences are evident. Our comments on some of the analytes are:

*Sodium:* Notably, only 10 values ⩾ 144 mmol/L (8 x 144, 1 x 145, 1 x 146 mmol/L) were observed. This was a surprising finding in view of our laboratory's previous reference range of 133-148 mmol/L. The new range of 134-144 mmol/L was confirmed with the analysis of a further 140 patients' specimens a fortnight later. Clearly, our previous reference range, which was of unknown history, was overly generous.

*Creatinine:* Due to technical difficulties with this channel, no results were available from our original data base. From a subsequent data base of 106 values an upper reference limit about 110-120 μmol/L was indicated. Corresponding urea values were available for 66 of these 106 values and from this subset an upper limit of 110 μmol/L was defined after deleting those results that had associated urea values of ⩾ 8.3 mmol/L.

**Table Two**

*References Ranges on the 737 Compared with Expected Values.*

| Analyte, units | n | Reference Range Derived From Patients' Data | Manufacturers' Expected Values |
|---|---|---|---|
| Na, mmol/L | 181 | 134-144 | none given |
| K, mmol/L | 181 | 3.4-5.0 | none given |
| Urea, mmol/L | 181 | data uninformative | 1.7-8.3 |
| CREAT, μmol/L | 106 | 50-110 | M 53-97 |
| | | | F 44-80 |
| Ca, mmol/L | 112 | 2.03-2.59 | 2.02-2.60 |
| PHOS, mmol/L | 59 | 0.80-1.60 | 0.87-1.45 |
| ALB, g/L | 181 | 30-52 | 38-44 or 39-48 |
| T.PROT, g/L | 181 | 58-80 | 65-80 |
| T.BILI, μmol/L | 181 | 3-14 | < 17 |
| ALP, U/L | 167 | 40-138 | 39-117 |
| γ-GT, U/L | 78 | M 8-45 | M 11-50 |
| | 103 | F 5-35 | F 7-32 |
| ALT, U/L | 181 | 7-35 | M < 41 |
| | | | F < 31 |
| AST, U/L | 181 | 10-35 | M < 37 |
| | | | F < 31 |
| CK, U/L | 78 | M 30-190 | M 24-195 |
| | 103 | F 20-140 | F 24-170 |
| HBD, U/L | 181 | 95-225 | 72-182 |
| LDH, UL | 181 | 240-490 | 230-460 |
| AMYL, U/L | 181 | 60-240 | < 220 |
| GLUC, mmol/L | 181 | data uninformative | 4.2-6.1 |
| URIC, mmol/L | 78 | M 0.23-0.50 | M 0.20-0.42 |
| | 103 | F 0.16-0.42 | F 0.14-0.34 |
| CHOL, mmol/L | 181 | 3.0-8.5 | M 3.6-7.3* |
| | | | F 3.8-8.5* |
| TRIG, mmol/L | 181 | data uninformative | Borderline > 1.70 |
| | | | Elevated > 2.26 |

* Reference ranges for broad age groups are quoted. Ranges are narrower for defined age groups, e.g., M 20-30 yr, 3.6-6.7 mmol/L; F 41-50 yr, 3.9-7.3 mmol/L.

n is number of results used in deriving reference range.

*Urea:* The histogram was platykurtotic with a broad distribution of values 2.6-8.9 mmol/L (median 6.4 mmol/L) and 39/181 values ⩾ 9.0 mmol/L. Moreover, a second data base of 66 values (see *Creatinine* above) had a similar distribution with 17 values > 9.0 mmol/L. These high proportions of abnormal values and the blurred overlap between health and disease prevented our defining an upper reference limit. In retrospect, interference from the ALT chemistry probably contributed to the scattered distribution of urea values (our unpublished observations and personal communication from Boehringer). Both the urea and ALT chemistries have α-oxoglutarate as a substrate and involve the oxidation of NADH to NAD. If urea and ALT use the same reaction cuvette, carryover of reagents could lead to positive interference between these two tests. At the time of this study, they did indeed have a common cuvette. We have since altered the configuration of these channels and concomitantly observed a marked improvement in the quality control of the ureas.

*Albumin:* The 24 values ⩾ 50 g/L (Fig. 1a) probably reflect the inclusion of ambulant outpatients in the data base. It is well known that such patients have higher serum albumin (and total protein) levels than do hospitalised patients. The manufacturers recommend two ranges (38-44 and 39-47 g/L) according to the source of the method sheet (F.R.G. or U.S.A., respectively). We have no information regarding either the narrowness of these ranges or their difference.

*Alkaline phosphatase:* Male and female data were combined but restricted to ⩾ 20 years for males and ⩾ 18 years and non-pregnant or post-natal for females. This reduced the data base to 167 individuals (Fig. 1b). Our upper reference limit of 130 U/L is higher than recommended and is a likely consequence of the age of the patients. Mean ALP activities increase with age in adults of both sexes[4].

*ALT and AST:* Although the manufacturers quote sex related upper reference limits for these enzymes, we could see no advantage in segregating our data. Similar histograms were obtained for both enzymes but interestingly for ALT there were two and a half times as many values (27) > 45 U/L than there were for AST. This supports the

view that whilst these aminotransferases may provide similar information they are not necessarily equivalent in a diagnostic profile.

*Phosphate:* Because of calibration problems with this channel initially, we had a much reduced data base. Despite this, our figures compare well with expected values. To avoid distortions due to age (phosphate levels in children are up to twice those of adults), we deleted those patients ≤ 14 years old.

*Uric acid:* The segregated histograms illustrated the well known sex related differences for this analyte. However, we derived rather higher upper references limits than those suggested by the manufacturers and those current in our laboratory (M 0.24-0.42, F 0.15-0.40 mmol/L). Reference ranges similar to ours have been reported for the Technicon RA-1000[5].

*Cholesterol:* Whilst our figures agree with those of the manufacturers we are appreciative of the effects of age and sex on cholesterol levels. Moreover, for this analyte the concept of a reference range encompassing the central 95% of values observed in an apparently healthy population has to be tempered with what is perceived to be desirable[6]. An upper limit of 6.5 mmol/L has been recommended with an "optimal" plasma cholesterol level of 4.5 mmol/L[6]. In our data 6.5 mmol/L corresponded to the 70th percentile which shows that, in common with other western societies, a disturbingly high proportion of our population has hypercholesterolaemia.

*Glucose and triglycerides:* The platykurtotic distributions that resulted for these two analytes failed to yield useful data. Presumably, this was ascribable to the predominance of non-fasting specimens in the data base rather than a failure of our empirical approach *per se*. Because of our requirement for a large number of specimens to be collected quickly, it was not feasible to select only blood labelled "fasting".

Deriving reference ranges from readily accessible patients' data has been attractive to investigators over many years[4,7-10]. The success of early methods hinged on the prerequisite for Gaussian distribution of the underlying "normal" values within the total patient population[7-9]. More recently, one of these methods[8] has been applied following mathematical transformation of the raw data to Gaussian form[10]. For comparative purposes, we calculated reference ranges for albumin and sodium (two analytes approximating Gaussian form) according to Gindler[8]. The resultant respective reference ranges of 38-53 g/L and 137-144 mmol/L have upper limits compatible with those in Table 2 but significantly higher lower reference limits. Undoubtedly, this is due to the discernible negative skew in those histograms (ALB, Fig. 1a; Na, not shown).

In summary: whilst this empirical approach of deriving reference ranges fundamentally departs from IFCC recommendations, we believe that it can be an economical and efficacious way of validating published reference ranges. However, it may not be sufficiently rigorous in defining reference ranges for new analytes for which guidelines may be unavailable.

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# The Pacific Way

Gilbert Rose, formerly Charge Technologist of the Microbiology Department, Christchurch Hospital, is now in a remote area of Papua New Guinea Highlands where he is employed by the Papua New Guinea Institute of Medical Research to assist in their pneumonia research programme. He tells us something of his situation.

The Tari Basin lies in the Southern Highlands of Papua New Guinea just 6° south of the equator and at altitudes between 1500 and 1800 metres. The climate could be likened to a New Zealand springtime with daily temperatures ranging from 10°C to 28°C. Nights can be cold, with dawn cool and misty, but clearing to give warm sunny mornings then rain and frequently thunderstorms in the late afternoon or early evening. There are about 300 wet days each year and an annual rainfall of over 2500mm. There is said to be a wet and a dry season. But if there is any differentiation it is into a wet and a less wet season, and to me these are not easily discernible.

The people of the Tari Basin are the Huli and constitute one of the largest of the 700 language groups in Papua New Guinea. Most live in bush houses made of pitpit (small bamboo) and roofed with kunai grass. There are no windows, a single door, some may have rooms or partitions and all have a central open fireplace. Everyone has a garden around their house, perhaps another garden some distance from their home and their livelihood depends upon subsistence agriculture. Sweet potato is the staple food supplemented by corn, pumpkins, tomatoes and a variety of both imported and local green vegetables. Any surplus is shared or sold at the market. Trade store goods such as tinned fish, rice, flour and dripping are bought to vary the diet. Pigs and chickens are kept and are another food source. With better road communication, an increase in cash cropping and the exploration for oil, they are rapidly assimilating the cash economy and adapting to Western ways. Traditionally proud and aggressive people I have found

*The Microbiology Laboratory, Tari Hospital.*

the Huli to be generous, helpful and caring, if rather volatile at times.

The Government station was established in 1952 with the building of an airstrip. At that time there were two European members of staff — a patrol officer and a medical assistant. A Roman Catholic Mission was established in 1955, and the Seventh Day Adventist, Methodist (now United Church) and the Asia Pacific Christian Churches soon followed. Contact with areas outside Tari Basin was either by patrol or by aircraft. It was not until late 1980 that a road was opened connecting Tari to Mendi and so to Mt Hagen, Kundiawa, Goroka and Lae by the Highlands Highway. Currently there are about thirty resident Europeans here, principally working with government services, including schools and hospital. We are supplied mainly by four stores which are usually well stocked, but sometimes less so, depending upon when the last truck arrived from Lae. The local market is usually well provided for with a good variety of fresh fruit and vegetables at very reasonable prices, so my repertoire of recipes based on local produce is growing rapidly.

It is now more than 12 months since I came to Tari to set up a bacteriology laboratory for the Institute of Medical Research. The

*Tari Hospital — view from the verandah of the Microbiologist's home.*

Institute is a satutory body of the Papua New Guinea Government established to conduct research into the health problems of the people of Papua New Guinea. Major research programmes in pneumonia, diarrhoea, malaria and malnutrition are directed towards these four health problems. Tari has been the scene of three pneumococcal vaccine trials in the past and my employment is further evidence of the Institute's commitment to their pneumonia programme.

On arriving in Tari I found the laboratory still under construction. The hospital pharmacy had been divided in half leaving benches and cupboards round one long wall and one short wall. Fixed windows were installed along the length of the short wall giving a quiet and naturally lit bench area to do the bacteriology. The long wall allowed incubator, shelving and other equipment to be sited. A vertical electrically heated autoclave was eventually installed. Other plumbing and electrical services completed so that towards the end of June 1986 the laboratory was becoming functional. During my time at the Institute's headquartes in Goroka, equipment, consumables and reagents were ordered from Australia and U.S.A. The laboratory manager at I.M.R. was also able to supply me with all those small bits and pieces that help make a laboratory work more smoothly.

The main object in creating a research laboratory in Tari was to study the bacteriology of moderate and severe pneumonia. Blood cultures are taken from hospitalised patients, together with serum samples, urines and nasal swabs. Serum and urine will be used to compare results of antigen detection methods with routine bacteriology. Nasal swabs are being cultured to compare carriage of *S. pneumoniae* and *H. influenzae* serotypes/biotyes with that in healthy controls.

In addition, with the facilities available in the laboratory I have been able to assist hospital medical and laboratory staff by culturing routine specimens from patients, identifying organisms and reporting on antibiotic sensitivities. Between October and December 1986, I was involved in the investigation of a small outbreak of typhoid in nearby villages, and cases continue to appear from time to time. On one occasion I was asked to culture stools from nineteen inmates of the local prison who had been hospitalised with gastroenteritis — perhaps they were too shy to accommodate me but I never did receive those specimens.

The operation of the research laboratory demands a special relationship with the hospital and its staff. The hospital has 130 beds, offers 24 hour nursing care, X-ray and basic laboratory facilities, pharmacy and operating theatre. Its own laboratory is staffed by four medical laboratory assistants supervised by an American Peace Corp Volunteer Medical Technologist. The range of tests done are mainly basic haematology and basic microbiology. A blood transfusion service is also available. The research laboratory has been able to expand the microbiology facility to the hospital and I think the service has been appreciated.

Life is never dull, on one occasion we were able to stand on the green at the front of the hospital and watch tribal fighting taking place in

the town across the airstrip. Needless to say shops were promptly closed to allow the participants plenty of space to ping arrows at each other, some warding off their opponents shots with sheets of corrugated iron. Admissions to hospital with arrow wounds was the order of the day.

Despite the frustrations of irregular power, unreliable communications and transport, and the occasional earthquake, the lifestyle, environment and seemingly endless possibilities for the laboratory, makes working in the Highlands of Papua New Guinea a special experience.

### New Zealand Microbiological Society Fund for Pacific Islanders (sponsored by Parke-Davis Pty Ltd)

A generous donation from Parke-Davis Pty Ltd has enabled the New Zealand Microbiological Society (NZMS) to establish a fund to provide financial support for microbiologists from the South Pacific Islands to attend the annual NZMS conference. Initially this support will be offered to one microbiologist biennally. The basic expenses of return air-fare, conference registration, and hostel accommodation and meals during the conference, will be provided from the fund.

The next NZMS conference will be held in Dunedin 16-20 May 1988. Applications to attend the Dunedin conference should reach the **Secretary, NZMS, National Health Institute, P.O. Box 50-348, Porirua, New Zealand,** before **31 December 1987.** Applicants should include details of their field of work and position held.

The NZMS would welcome members from the South Pacific Islands. The subsciption rate is currently $NZ25 p.a. and application for membership should be made to the Secretary.

# GLAXO Microbiology Meeting

A meeting of medical microbiologists, sponsored by Glaxo New Zealand Limited, was held on November 21st 1986 at the Portage, Marlborough Sounds. A total of twelve presentations were concentrated into a full day's programme during which the harmonics of Bellbirds and Tuis provided a constant musical background. Professor David Blackmore and Dr Mark Jones each chaired a session of general papers. Dr Rod Ellis-Pegler chaired a third session which was exclusively devoted to methicillin-resistant *Staphylococcus aureus* (MRSA), strains of which have recently caused outbreaks of infection in three New Zealand hospitals.

The guest speakers from overseas were Dr Noel Bennett (Consultant Physician and Advisor in Infectious Diseases to the Health Department, Victoria, Australia) and Ms Annette Hicks (Infection Control Nurse, Heidelberg, Melbourne, Australia). Both speakers had been invited to summarise their experience of MRSA in Australia and to comment on the likely impact of this organism on New Zealand hospitals. Dr Bennett's principal concern was that microbiologists and infectious disease physicians are in danger of 'over-reacting' to an organism which may be considerably less virulent than other antibiotic-sensitive strains of staphylococci. He concluded that MRSA and patients can co-exist in relative harmony and that intensive attempts aimed at eradicating the organism may be unnecessary. The various views on the clinical relevance of MRSA provoked a great deal of discussion.

Dr Ellis-Pegler provided a summary of interesting topics from the Interscience Conference on Antimicrobial Agents and Chemotherapy (ICAAC) which was recently held in the United States. The remaining papers presented at the conference are summarised below:

## Methicillin-Resistant *Staphylococcus Aureus* in New Zealand

**Dr Diana Martin, Senior Scientist, National Health Institute**

Isolates of methicillin-resistant *Staphylococcus aureus* (MRSA) were first referred to the National Health Institute (NHI) in 1975. Whilst there is no guarantee that all MRSA encountered in New Zealand are referred to the Institute, it is considered that most are. Thus, this paper presents a review of MRSA in New Zealand from January 1975 until 31 October 1986.

During the ten years 1975-1984 small fluctuations occurred in the numbers of persons found hosting MRSA, with a maximum in any one year of 13 persons (fig. 1). The introduction into Wellington Hospital in March 1985 of a strain, apparently from Australia, created a rapid increase in the number of MRSA-positive individuals. During 1986 the 'Wellington' strain has continued to be identified, particularly in Wellington and Nelson Hospitals. The dramatic increase in numbers of persons identified with MRSA during 1986 is explained by an epidemic of infections and colonisations occurring at Palmerston North Hospital. Thus, for the first ten months of 1986 MRSA isolates have been

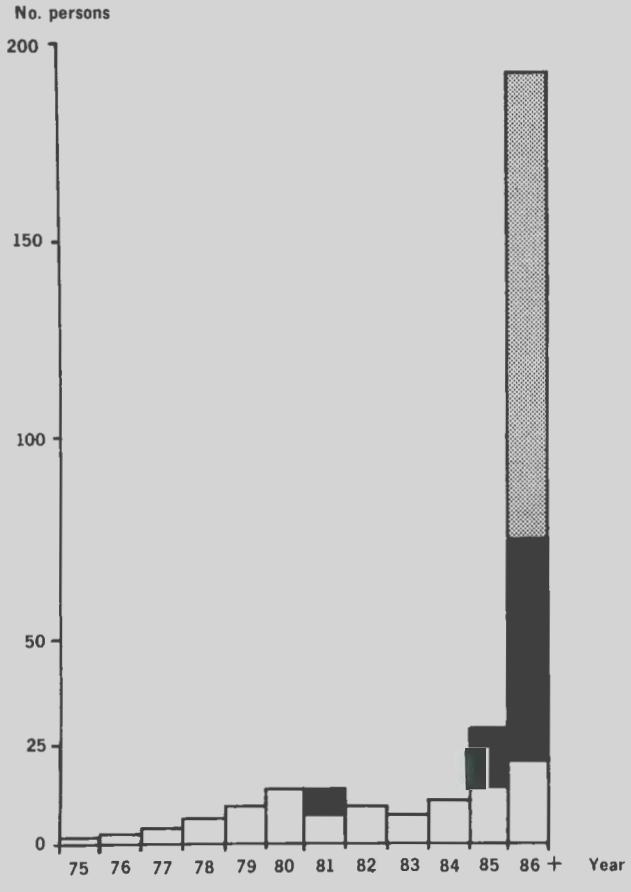


**Figure One**

*Number of persons identified with epidemic or other distinct strains (1975-1986)*

Strains: 'Middlemore'; 'Palmerston'; 'Wellington'; Other distinct; + Jan-Oct only

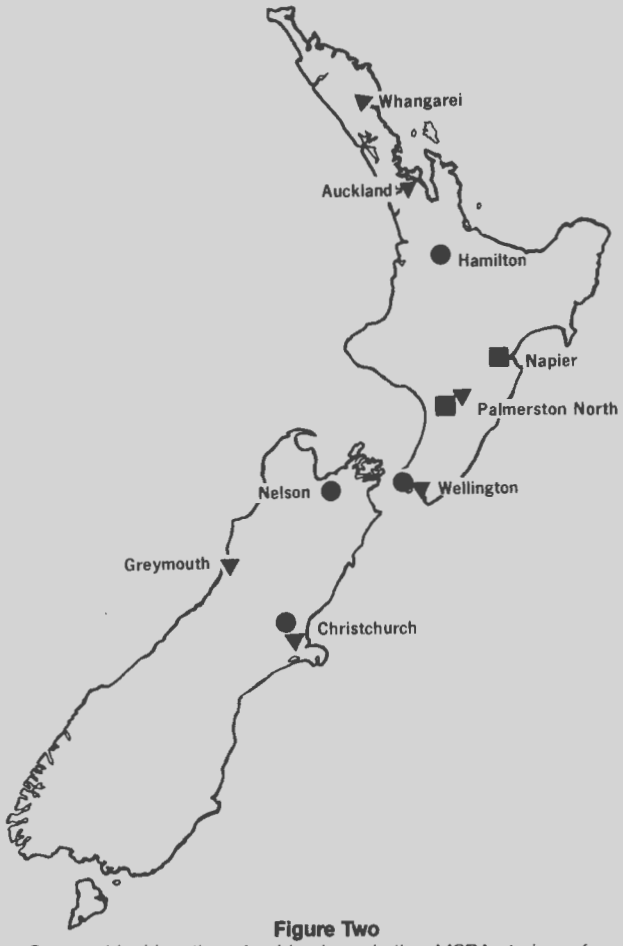


**Figure Two**

*Geographical location of epidemic and other MSRA strains referred Jan-Oct 1986*

Strains: O 'Wellington'; 'Palmerston'; ▼ Other

referred from a total of 185 persons, of whom 114 have had the 'Palmerston' strain, and 51 the 'Wellington' strain (fig. 1).

Isolates of MRSA are bacteriophage-typed in the Nosocomial Infections Unit, NHI, using the international set of 23 *S. aureus* bacteriophages (typing at 100 x routine test dilution). Distinct strains are identified by examination of phage typing patterns and consideration of available epidemiological information. A strain is defined as an isolate or a group of isolates which has a distinct phage pattern and which is unrelated to other strains by factors of time, event, or geographical location. A small upward trend in numbers of distinct MRSA strains has occurred during the last few years, with 20 being recognised so far during 1986, compared with 14 in 1985 and 10 in 1984. Unique phage reactions displayed consistently by isolates in both the Wellington and Palmerston North situations have allowed us to confidently indicate that in each case only one MRSA strain was responsible for the epidemic occurring. Until 1985 the only previous event in which one strain involved more than three patients occurred in 1981 in the Spinal Unit, Middlemore Hospital, when six patients were infected. Since March 1985 the 'Wellington' strain has involved a total of 64 persons in six different hospitals: Wellington, Kenepuru, Hutt, Waikato, Nelson, and Christchurch (fig. 2). Spread has occurred by patient transfer and, except in Nelson Hospital, has been limited to the transferred patient and few others. Although the 'Palmerston' strain has affected 114 persons, only two isolates have been identified in another hospital (Napier) and relate to a patient previously admitted to Palmerston North Hospital.

**Characterisation of strains by phage reactions**

Isolates from both epidemics have been untypable by routine phage typing. However, isolates of the 'Wellington' strain display a recognisable pattern of inhibition with phages 6, 47, 54, 75 and 84. Heat shocking of cultures (55°C for 3 min) immediately prior to phage-typing renders isolates sensitive to phage typing and the strain is characterised with the following phage pattern: 29, 81, 6, 42E, 47, 53, 54, 75, 83A, and 84. Isolates of the 'Palmerston' strain do not show inhibition patterns with phages in routine typing and remain untypable after heat shock. However isolates all carry a prophage which when tested on a selection of reference propagating strains and of wild strains, has a recognisable pattern of lysis. This method of typing is referred to as reverse phage typing. Two isolates from Palmerston North Hospital have been shown to have a prophage with a different lytic pattern and are regarded as distinct. Both also show different antimicrobial resistance patterns when compared with the 'Palmerston' strain.

Since 1983 the Antimicrobial Susceptibility Laboratory,NHI, has determined patterns of sensitivity and resistance on MRSA. All isolates have demonstrated uniform sensitivity to fusidic acid and vancomycin, and resistance to methicillin and penicillin. Strains differ in their sensitivity or resistance to chloramphenicol, erythromycin, gentamicin, kanamycin, and cotrimoxazole. Among the isolates of the 'Wellington' strain, variable resistance to gentamicin and kanamycin is associated with the presence or absence in the isolate of an 18 megadalton plasmid carrying resistances to these two antibiotics. Even within the same patient variability in plasmid carriage can be demonstrated depending on the population of cells selected for testing.

In concluding this review attention is drawn to the fact that in eight of the twelve years reviewed at least one strain per year has been introduced into New Zealand, either on an individual gaining an infection whilst abroad, or on an individual being referred for treatment. From the information available, three such isolates have been recorded this year. This emphasises the need for vigilance since the potential for the spread of MRSA within New Zealand has already been demonstrated.

# An Outbreak of Methicillin-Resistant *Staphylococcus aureus* Infection at Palmerston North Hospital

**Dr Gordon Scrimgeour, Clinical Microbiologist, Palmerston North**

An outbreak of infection with methicillin-resistant *Staphylococcus aureus* (MRSA) began in Palmerston North Hospital in late January of 1986. To date (November 1986), 110 patients and 11 staff carriers have been affected.

**The Outbreak**

Initially the units most frequently affected were the Intensive Care Unit (ICU) and a general surgical ward. The surgical ward was under considerable strain since a second ward normally allocated for general surgical patients was being occupied by medical patients. These had been displaced by the closure of a medical ward for removal of asbestos-containing ceiling material. Despite control measures (see below) the number of patients acquiring the organism in the surgical ward and ICU increased rapidly. Both wards were closed in April to stop the flow of patients and to allow for thorough cleaning. Thereafter the number of isolates of MRSA gradually declined until the end of August when a further increase occurred, possibly as a result of the inadvertent admission of a known carrier to an open ward. The number of isolates again declined until the middle of November. Overall, most isolates were from patients in general surgical and urological wards but occasional isolates were obtained from patients in medical and other units.

**Control Measures**

All patients who were identified as being colonised or infected with MRSA were moved to the Infectious Diseases Unit (IDU) or discharged home. Staff and patients in proximity to MRSA-positive patients were investigated for carriage of the organism. Initially, only nasal swabs were taken but soon after the beginning of the outbreak perineal swabs were also cultured. Most of the wards involved contained single, four- and five-bedded rooms. Originally, only patients in a room where a MRSA-positive patient was found were screened. Later it became obvious that it was necessary to screen the entire ward when a single isolate was obtained. Further isolates were often made from patients remote from the original case identified. Patients requiring treatment for MRSA infection received Vancomycin. Patients not requiring antibiotic treatment (including staff carriers) were given Biocil detergent for washing and Biocil cream for nasal treatment. Recently Bactroban (Mupirocin) ointment has become available and use of this proved to be much more effective than Biocil in clearing MRSA carriage on skin and in the nose.

No patient was retained in hospital on the basis that they were carrying MRSA except on occasions where placement became a problem, eg., in nursing homes. Rooms previously occupied by MRSA-positive patients were thoroughly cleaned and the curtains changed before new patients were admitted. Investigation of ward and theatre practices was made and environmental swabs taken. A problem with contamination of ventilator equipment in ICU was discovered and resolved. Within wards MRSA was cultured from toilet seats, a comode chair, staff clothing and a roll-mop, but not from settle plates around an infected patient's bed, nor directly from dusts.

**Infections**

Infection of respiratory tract, urinary tract and skin (eg., pressure sores, surgical wounds, venous access sites) was discovered. Isolation from sputum ceased with attention to ventilator decontamination.

In a high proportion of patients (25%), diarrhoea was the sole indication of infection. The diarrhoea was explosive, lasted 24-48 hours, and was a typical bright green colour — an almost pathognomonic feature easily recognised by nursing staff. MRSA could be isolated from the stools in these cases but was not present in such large numbers that a Gram-stained smear was a useful investigation. Serious infection requiring Vancomycin treatment was limited to six cases, two of whom had septicaemia. No deaths were attributed to MRSA infection.

Of the initial 55 patients from whom MRSA was isolated, 46 (84%) were regarded as infected. In the second cohort of 55 cases, only 21 (38%) were regarded as infected. This may simply indicate that more carriers were identified by more vigorous screening procedures. Eleven staff carriers were identified of whom one was thought to be responsible for the transport of the organism from one ward to another.

Otherwise no clearly-defined association was found between carrier and transmission of the organism.

**The organism**

The organism is slow-growing and after overnight incubation on blood agar resembles a diphtheroid in colonial morphology rather than a staphylococcus. It grows on some mannitol salt agar (MSA) media but not on others (MSA with 5 G/mL of methicillin is used for screening specimens). On some routine isolation media this organism exhibits satellitism and, therefore, is probably a nutritional variant.

All isolates show homogenous resistance to methicillin at 37°C and are sensitive to Vancomycin, Fusidic acid, Rifampicin and Chloramphenicol.

All isolates have been submitted to National Health Institute for phage typing and antibiotic sensitivity testing. These proved to be non-typable by conventional methods, but produce a typical and consistent pattern on reverse phage typing.

**Present situation**

The notes of all patients from whom MRSA had been isolated are now identified with an appropriate sticker, and are entered in the computerised patient management system to identify them. By this means it is hoped that no previous "MRSA-patient" will be readmitted to the hospital without staff being fore-warned. These patients are admitted to standard isolation cubicles and screened for MRSA carriage before being transferred to open wards. Precautions are taken with patients attending out-patient clinics and those being looked after by district nurses in order to minimise the possibility of spread to others.

All staff joining the hospital from other institutions are screened for MRSA carriage. Prior to the occurrence of the outbreak, staff appointed from overseas had been screened for some six months but none were found to be carrying MRSA.

**Comment**

This outbreak of MRSA has proved to be difficult to control despite vigorous measures taken, including the utilisation of a 17-bed isolation ward. It is not possible now to say where the organism came from and whether the organism was indeed prevalent before the first isolations were made. The small number of serious infections and absence of attributed deaths tend to make some staff show a lack of concern for its presence. At this stage there could be a risk of the Infection Control staff adopting a similar attitude and accepting the organism as being endemic and relatively harmless. This might involve showing interest in clinical infections only, thereby disregarding carriers amongst staff and patients. In turn this would inevitably result in spread of the organism beyond Palmerston North to produce a large increase countrywide in the number of infections many of which might be serious. We feel that we have not reached this point yet and we are prepared to continue to apply the present high level of control measures.

# An Outbreak of Methicillin-Resistant *Staphylococcus aureus* in Wellington Hospital

**Dr Mark R. Jones, Clinical Microbiologist, Wellington Hospital**

Outbreaks of infection due to methicillin-resistant *Staphylococcus aureus* (MRSA) are being reported with increasing frequency in recent years. Outbreaks due to single strains have occurred in many hospitals throughout the United Kingdom, Europe, USA, S. Africa and Australia. Until 1985, large outbreaks had not occurred in New Zealand but this has recently changed, for example Dr Scrimgeour (this journal) has described an outbreak involving over 100 patients at Palmerston North Hospital. In addition, Wellington Hospital and Nelson Hospital have both experienced outbreaks due to the same strain of MRSA (but different from that affecting Palmerston North) and over 60 patients have been infected. In these three hospitals over 20 members of staff have become carriers of the epidemic strain and their management in particular has caused profound administrative problems.

Despite an enormous number of publications on the biology and epidemiology of MRSA, the organism remains an enigma. Are strains of MRSA more virulent than their antibiotic-sensitive counterparts? Should serious attempts be made to control the organism? Do staff carriers constitute a threat to patients in hospitals? Does MRSA spread outside hospitals?

For all of these questions there is no clearly-defining answer and in the midst of such controversy it is not surprising that MRSA continues to flourish in hospitals and the medical press.


**Figure 1**

*Cumulative totals of MRSA isolations from patients and staff. Wellington Hospital, March 1985 — November 1986*

↑ suspension of staff carriers

**The Wellington Epidemic**

Details of this outbreak have been submitted for publication elsewhere and, therefore, are not reproduced here. In summary, 30 patients were infected or colonised with MRSA, including two patients who died with MRSA septicaemia. The outbreak originated in the Intensive Care Unit and two nurses were found to be carriers. One nurse with acute eczema was very extensively colonised at all body sites, and was known to have carried MRSA whilst working in an Australian hospital some months previously. It is possible that the Wellington strain was this same Australian strain of MRSA, but there is no conclusive proof for this assumption. The two staff carriers were suspended from duty for treatment at home and cross-infection within the ICU ceased abruptly.

Further isolates were obtained from patients who had been admitted to an orthopaedic ward and screening of staff on this ward revealed a further two carriers. Suspension from duty of these individuals abolished further cross-infections and from that moment the entire outbreak was terminated. (Fig. 1).

Well over 200 staff members were screened for carriage of MRSA (nasal and perineal swabs) and removal of the four known carriers from the hospital environment, together with other control methods such as the isolation of infected or colonised patients, saw the conclusion of a successful control programme. On the basis of this evidence (some would say 'coincidence') it would appear that staff who permanently carry MRSA do indeed constitute a risk for spreading the organism, and in the outbreak at Wellington approximately half of the affected patients appear to have been colonised by this means. The remainder, presumably, were cross-infected by staff following a period of transient carriage. Environmental sources of MRSA (clothing, curtains, dust etc) were not found despite an intensive search thereby implicating a more direct spread from patient to patient.

# Cephalosporin Susceptibility of Methicillin-Resistant Coagulase-negative Staphylococci

**Rosalie Menzies, Brian Cornere and Donald MacCulloch, Department of Microbiology, Green Lane Hospital, Auckland**

In recent years infections caused by coagulase-negative staphylococci (CNS) have increased and the susceptibility of them to antibiotics has become an important issue. Many CNS show *in vitro* resistance to methicillin but appear sensitive to cephalosporins when tested by routine laboratory methods. At Green Lane Hospital we have studied the antibiotic susceptibility of CNS to methicillin and to four cephalosporins.

The minimum inhibitory concentration of 62 isolates of CNS to methicillin was measured by the micro-broth dilution method of McDougal and Thornsberry. There were 36 isolates sensitive to methicillin and these were all sensitive to cephradine, ceftriaxone, cephalothin and cefamandole. There were 26 isolates resistant to methicillin. They were all resistant to cephradine. There were 18 resistant to ceftriaxone, 2 resistant to cephalothin and 1 resistant to cefamandole.

The isolates of special interest were those that showed resistance to methicillin but appeared sensitive to the cephalosporins. A standard inoculum prepared from a 24h agar plate culture of each of the methicillin resistant and cephalosporin sensitive organisms was sub-cultured onto two culture plates. One plate contained no antibiotic, the other contained 128 $\mu$g/mL of methicillin and both plates were incubated at 35°C. This allowed calculation of the frequency of resistance which is the number of methicillin resistant cells divided by the total number. For our isolates this varied from total (ie. all cells resistant) to one per million resistant. As expected, the isolates with a high proportion of methicillin resistant cells had high M.I.C's and were the ones most resistant to cephalosporins. The isolates with a low proportion of methicillin resistant cells were the ones that appeared to be susceptible to cephalosporins. However, resistance to the cephalosporins could be detected when cells that expressed resistance to 128 $\mu$g/mL methicillin were tested.

All the methicillin resistant isolates contained at least some cells resistant to 128 $\mu$g/mL of methicillin. These methicillin resistant cells all demonstrated resistance to cephradine and ceftriaxone, and with the exception of one isolate, resistance to cephalothin. Of the 25 isolates originally showing sensitivity to cefamandole, only 12 remained sensitive when cells resistant to 128 $\mu$g/mL methicillin were tested. When the methicillin sensitive isolates were cultured on plates containing 16 $\mu$g/mL methicillin-resistant cells were not detected.

### In Summary

For CNS we found that sensitivity to methicillin indicated sensitivity to the cephalosporins tested and there was no evidence that methicillin-sensitive cultures were heterogeneous. For methicillin resistant CNS we found differences in sensitivity to the cephalosporins. All methicillin-resistant isolates showed resistance to cephradine. When methicillin-resistant cells were separated and tested, it was shown that 25 out of 26 isolates expressed resistance to cephalothin and all were resistant to ceftriaxone. However for cefamandole, 12 of 25 isolates originally designated sensitive, remained sensitive. Our study indicated that it is the methicillin resistant cells that express cephalosporin resistance.

# Induction of Resistance in Gram-negative Bacilli by Cefoxitin and Imipenem to nine Beta-Lactam Antiobiotics, and Correlation with Mutation to Resistance

**Michael Cutten, Sally Roberts and Selwyn Lang, Department of Microbiology, Middlemore Hospital, Auckland.**

### Summary

Most clinical isolates of *Enterobacter* spp., *Pseudomonas aeruginosa* and indole positive "Proteus" produce inducible beta-lactamase. Imipenem is a more potent inducer than cefoxitin. Beta-lactam antiobiotics differ according to the frequency with which they are antagonised and their ranking varies with the test organism. There is a strong correlation between inducible beta-lactamase production and mutation to resistance.

### Introduction

The development of resistance of non-fastidious Gram-negative bacilli to broad spectrum beta-lactam antibiotics is a clinical problem of particular importance since it commonly involves cross-resistance to many of these agents. Such resistance is usually seen in bacteria which possess chromosomally-mediated beta-lactamases of Richmond and Sykes type I, which may be reversibly induced by a variety of beta-lactam antibiotics, or undergo stable derepression probably as the result of point mutation with a frequency of approximately $10^{-7}$[1,2]. Cefoxitin-induced antagonism has been particularly well defined and forms the basis of a two disc test to detect a potential for resistance which would not be revealed by standard susceptibility testing. In addition a simple test in which an antibiotic impregnated paper strip is laid at right angles to a heavy streak of test organism has been used to detect resistant mutants and in the case of cefotaxime has been used to detect resistant mutants and in the case of cefotaxime versus apparently susceptible Gram-negative bacilli this test has shown 98 per cent agreement with cefoxitin induced antagonism[3].

We wished to compare the beta-lactamase inducing activity of imipenem with that of cefoxitin and to determine the frequency and relationship of inducible resistance, and mutation to resistance, by Gram negative bacilli to a range of beta-lactam antibiotics.

### Materials and Methods

Bacterial strains were consecutive clinical isolates from the Middlemore Hospital Microbiology Laboratory of genera known to show inducible resistance. There were 35 *Enterobacter* spp. 33 *Pseudomonas aeruginosa,* 20 indole positive "Proteus" spp., 10 *Acinetobacter* spp., 9 *Citrobacter* spp., and 6 *Serratia* spp

Antibiotic powder was supplied by the manufacturers or purchased from the hospital pharmacy. We prepared 30 $\mu$g discs of carumonam and RO 19-5247 and used commercially prepared discs (Difco) of piperacillin (100 $\mu$g), ticarcillin (75 $\mu$g), ceftriaxone, ceftazidime, cefotaxime, cefuroxime, cefoxitin and aztreonam (30$\mu$g), norfloxacin, gentamicin and imipenem (10 $\mu$g) and trimethoprim (1.25 $\mu$g).

For the beta-lactamase induction test Mueller Hinton agar plates were inoculated as recommended by the National Committee for Clinical Laboratory Standards[4]. A 30 $\mu$g cefoxitin disc or 10 $\mu$g imipenem disc was placed on the centre of each plate as an inducer and discs of the antibiotic under test were placed next to it at a distance equal to the sum of the zones of inhibition as previously determined for each disc tested separately. In general this allowed three test discs to be placed around each inducing disc. The test was regarded as negative when after overnight incubation in air at 37°C the zone of inhibition remained symmetrical and positive when there was a reduction of 3mm or more on the side of the disc adjacent to the inducer. Lesser reductions in the radius of inhibition were regarded as doubtful.

For the paper strip test to detect resistant mutants heavy suspensions of approximately $1 \times 10^{10}$ bacilli per mL were prepared in normal saline from overnight colonies. Sterile cotton swabs were used to inoculate Mueller Hinton agar plates with up to six different strains in parallel streaks. A Whatman filter paper No. 54 strip was dipped in a solution of 1000 $\mu$g per mL of antibiotic prepared according to the manufacturers recommendations, drained and placed at right angles across the streaks. After overnight incubation in air at 37°C negative tests showed clear zones of inhibition and positive tests showed well developed colonies within the zones of inhibition. These colonies were subcultured and retested by the Kirby-Bauer method to confirm their resistance.

**Table One**

*Induction of increased resistance to beta-lactam antibiotics by cefoxitin and imipenem.*

| Genus: | Enterobacter | | Pseudomonas | | Indole positive "Proteus" | | Citrobacter | | Serratia | |
|---|---|---|---|---|---|---|---|---|---|---|
| number of strains: | 35 | | 33 | | 20 | | 9 | | 6 | |
| Inducer: | cefoxitin | imipenem | cefoxitin | imipenem | cefoxitin | imipenem | cefoxitin | imipenem | cefoxitin | imipenem |
| Test antibiotic: | | | | | | | | | | |
| ceftazidime | 16 | 25 | 7 | 31 | 7 | 11 | 1 | 1 | 0 | 2 |
| cefotaxime | 29 | 29 | — | — | 15 | 19 | 3 | 3 | 2 | 3 |
| ceftriaxone | 26 | 31 | 17 | 23(10) | 9 | 13 | 1 | 3 | 1 | 2 |
| RO195247 | 16 | 27 | — | — | 13 | 16 | 0 | 2 | 1 | 3 |
| cefuroxime | 25 | 27(5) | — | — | 4 | 4(9) | 2 | 2(1) | 1 | 2 |
| ticarcillin | 18 | 23(5) | 5 | 22(1) | 8 | 14 | 2 | 2 | 1 | 2 |
| piperacillin | 10 | 23(1) | 16 | 27 | 13 | 17 | 2 | 3 | 1 | 1 |
| aztreonam | 24 | 31 | 6 | 18 | 14 | 12 | 2 | 3 | 1 | 2 |
| carumonam | 22 | 28 | 15 | 27 | 7 | 10 | 1 | 3 | 0 | 0 |

( ) = number not tested for induced resistance because already resistant to test antibiotic.

## Results

Table 1 compares the ability of imipenem and cefoxitin to elicit increased resistance to nine other beta-lactam antibiotics. The test organisms were 113 isolates of Gram-negative bacilli representing 6 genera which commonly produce inducible beta-lactamase. None of 10 isolates of *Acinetobacter* spp. showed inducible resistance and are therefore omitted from Table 1. We also tested three non beta-lactam antibiotics, gentamicin, trimethoprim and norfloxacin and these as expected were never antagonised. The frequency with which antagonism was detected, and its degree, varied according to the inducer, the bacterial genus and the test antibiotic. Imipenem was a consistently more effective inducer than cefoxitin. Increased resistance to one or more beta-lactam antibiotic was induced respectively by imipenem and cefoxitin in 31 and 29 *Enterobacter* spp. 31 and 13 *P. aeruginosa*, 19 and 15 indole positive "Proteus" spp. and 3 and 2 *Serratia* spp. Both showed antagonism with other beta-lactam antibiotics against 3 *Citrobacter* spp. but imipenem produced greater reductions in zone size.

Induced resistance of *Enterobacter* spp. was most commonly to ceftriaxone and to aztreonam (31 isolates) and least commonly to piperacillin and ticarcillin (23 isolates), that of *P. aeruginosa* most often to ceftazidime (31 isolates) and least often to cefotaxime (18 isolates) and that of indole positive "Proteus" most often to cefotaxime (19 isolates) and least often to cefuroxime (4 isolates).

Table 2 shows the relationship between the two disc test for inducible resistance and the paper strip test for mutation to resistance. The 27 isolates of Gram negative bacilli tested showed concordant results by the two disc test regardless whether cefoxitin or imipenem was used as inducer. There was generally good correlation between the two tests, for the four species and four indicator antibiotics tested. The greatest discrepancy was with bacilli which showed inducible resistance to the monobactams by the two disc test but which did not mutate to resistance. When results of the tests concurred carumonam provided the least number of positive and the greatest number of negative results.

The validity of the two disc test, as a predictor of mutational resistance was further tested using pour plates containing 64 $\mu$g/mL of cefotaxime or cefuroxime, inoculated with $10^8$ — $10^9$ colony forming units of four *Enterobacter* isolates, two of which were inducible and two of which were not. Whereas the non-inducible strains produced no resistant colonies, the inducible strains mutated to resistance with a frequency of $10^{-6}$-$10^{-7}$.

**Table Two**

*The two disc test for antagonism compared with the paper strip test for detecting resistant mutants using 27 Gram negative bacilli* [1].

| Paper strip test[2] | | cefotaxime +ve | cefotaxime -ve | cefuroxime[4] +ve | cefuroxime[4] -ve | aztreonam +ve | aztreonam -ve | carumonam +ve | carumonam -ve |
|---|---|---|---|---|---|---|---|---|---|
| Two disc test using cefoxitin or imipenem as inducer[3] | +ve | 16 | 3 | 12 | 1 | 10 | 7 | 7 | 6 |
| | -ve | 2 | 6 | 3 | 8 | 2 | 8 | 2 | 12 |

1. Enterobacter (15) "Proteus" (6) Citrobacter (3) Serratia (3).
2. +ve = resistant mutants present.
3. +ve = $\geq$ 3mm blunting of zone of inhibition.
4. 24 strains tested as 3 were resistant.

## Discussion

From a clinical point of view stably derepressed hyper-producers of beta-lactamase are more likely to be important than strains producing reversibly inducible beta-lactamase enzymes. However, the ability to produce beta-lactamase as shown by a two disc induction test implies the potential for stable derepression and a need for caution in the clinical setting.

Our findings confirm that imipenem is a stronger inducer of beta-lactamase activity than cefoxitin. Imipenem induced relative resistance of more bacterial strains to each of the beta-lactam antibiotics tested than does cefoxitin, and the degree of antagonism for any particular strain was greater with imipenem than with cefoxitin.

The ranking of beta-lactam antibiotics according to whether they are antagonised depended on the bacterial genus tested. This would be readily explained if imipenem and cefoxitin induce a variety of beta-lactamases with differing affinities. Unfortunately our study was insufficiently sophisticated to define the nature of the beta-lactamase(s) induced, and we could not exclude the possibility that other mechanisms of antagonism were operating or that the frequency of antagonism was in some way related to other interaction of the various bacteria and the test antibiotics.

We used the two disc test to detect the least, but reproducible, reduction in susceptibility which we defined as three millimetres or more blunting of the zone of inhibition. Although the reduced zone was generally greater than that which would indicate 'in vitro' resistance to the test antibiotic it nevertheless correlated with the ability to mutate to resistance. That this correlation was incomplete might be explained by the crude nature of the tests; however, mutation to resistance with a negative induction test might be explained by poor induction of the particular beta-lactamase or by a different mechanism of resistance, and failure to mutate to resistance with a positive induction test could be explained by a low frequency of mutation or mutation to a low level of stable derepression.

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# Update on *Campylobacter pyloridis*

**Dr Arthur Morris, Microbiology Registrar, Auckland Hospital.**

Since last year's review of *Campylobacter pyloridis*[1] there have been two international gastroenterology meetings which have had sessions devoted to this organism. Reviewed here are new data from these meetings as well as the results of local research.

### New Zealand Scene

The incidence of *C. pyloridis* infection amongst New Zealand gastric clinic patients is 25-47%[2,3]. Serological evidence of infection is common and increases with age[4] with Pacific Islanders having a high prevalence of serological evidence of infection[4]. Nursing and medical staff working in gastroenterology clinics do not have serological evidence of an increased prevalence of infection but positive serology is associated with dyspepsic symptoms[5].

### Rapid Diagnosis of Infection

For those wishing to enter infected patients into thereapeutic trials, the three to four days it takes to culture the organism is a handicap. Even the Gram stain, although quite sensitive, takes several hours to become available and patients have usually already left the hospital. The need for a rapid diagnostic method has been met by the CLO-test, which involves the insertion of a gastric biopsy into a small agar cup[6,7]. The presence of urease is detected after urea degradation has been detected by the pH inductor. The light yellow agar becomes bright pink in most positive tests. Occasionally a dark orange discolouration is observed and experience has shown that this colour change also indicates infection.

Our experience in diagnosing *C. pyloridis* in 138 infected patients is shown in Table 1. The urea broth test involves the insertion of macerated biopsy material into urea broth after the Gram stain smear has been made and the selective agar has been inoculated[6]. Patients were defined as being infected if the organism was cultured or if the Gram stain of the biopsy smear or Warthin-Starry silver stain of histological sections showed characteristic curved bacilli. The results show that culture is a sensitive method of detecting infection and that the CLO-test detects almost 70% of infected patients within an hour of endoscopy and 84% by 3 hours.

If sedation is used on patients, necessitating a 2-3 hour stay after the procedure, then simply inoculating a macerated biopsy into a Christensen's urea broth detects the majority of infected patients before they leave the hospital[8] (and at a fraction of the cost of the CLO-test which at present is $5.50 Australian a test).

### Noninvasive test to detect infection

Until recently the diagnosis of *C. pyloridis* infection required gastroendoscopy and the taking of gastric biopsies. A new and promising noninvasive method has been described which uses the high endogenous levels of urease produced by *C. pyloridis* to detect infection[9]. Patients ingest a $^{13}C$ labelled urea solution following a liquid meal to slow gastric emptying. The urease degrades the urea releasing $^{13}C$ labelled $CO_2$ which is absorbed and detected in the patients breath[9]. Although the method has the drawback of needing expensive equipment to detect the $CO_2$ it does hold the attraction of allowing patients to be followed for prolonged periods without the need for repeated endoscopy procedures.

### Therapy

Although sensitive to a number of antibiotics *in vitro*, many have experienced problems in eradicating *C. pyloridis* by antibiotic therapy alone: erythromycin ethylsuccinate[10], tetracycline and spiramycin[11] and doxycycline (Morris, Nicholson, Rose: unpublished observations) have all failed. Bismuth compounds [10-15] however do eradicate infection and improve the histological gastritis. Nevertheless there may be a high relapse rate (about 50%) suggesting that even bismuth compounds merely suppress infection but do not eradicate it[11]. There is still a great deal to be sorted out as far as choice of agent(s), length of therapy and followup in the treatment of this agent.

### Is *C. pyloridis* important?

Surveys of volunteers have confirmed that *C. pyloridis* infection is found in 21-25% of asymptomatic persons[16,17]. Dutch workers have documented infection in patients for over 2 years[11] and work at Auckland Hospital has also shown that infection with continuing active gastritis persists for prolonged periods. Both of these findings suggest that infection is unlikely to be the primary cause of peptic ulceration but rather that it may be one of the cofactors involved in the pathogenesis of this condition.

**Table One**

*Diagnosis of Campylobacter pyloridis* infection in 138 infected patients.

| Test | Number | % positive |
|---|---|---|
| Culture | 130 | (94%) |
| Gram stain | 120 | (87%) |
| Warthin-Starry silver stain | 119 | (87%) |
| Urea broth | 115 | (83%) |
| CLO-test | | |
| 15 minutes | 90 | (65%) |
| 1 hour | 95 | (69%) |
| 3 hours | 116 | (84%) |
| 24 hours | 130 | (94%) |

Workers from Hong Kong[18] have suggested that because gastric ulcers heal in the presence of continuing *C. pyloridis* infection that this agent is unlikely to play a significant pathogenic role in gastric ulceration. However, others have shown that for patients with duodenal ulceration better healing and lower relapse rates are obtained when the organism is eradicated [12,13]. It could well be that the organism may have quite different implications for patients with ulcers at different anatomical sites.

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## "Same Day Service"?

**Stephen M. Thomas and Margaret C. Croxson, Virus Laboratory, Auckland Hospital, Auckland**

With the advent of specific antiviral chemotherapy, there is an increasing demand for faster results from the virus diagnostic laboratory. Techniques involving culture of the infecting virus are slow, being limited by the time taken for viral replication. Such culture techniques are not candidates for rapid diagnostic procedures. Alternative methods centre largely on direct demonstration of specific viral antigens or "markers" in the clinical specimen. Since however, the amount of virus in a clinical specimen is usually very small, direct methods must be very sensitive, and in order to be credible they must also be very specific.

This requirement for specificity may be met immunologically using detection systems based on monoclonal antibodies to specific viral epitopes. More recently, non-immunological systems have been developed. Most promising are nucleic acid hybridization techniques, which take advantage of the genetic uniqueness of living organisms.

These methods have been available in research laboratories for a number of years. However, there is inevitably a delay before routine laboratories acquire new technology. In an attempt to hasten this process, our own laboratory has recently become involved in nucleic acid hybridization procedures, and in generating diagnostic reagents relevant to modern requirements for rapid detection of viruses.

We have initially concentrated on cytomegalovirus for a number of reasons:—

(1) This virus can cause significant disease in the immuno-incompetent, eg. babies in utero, transplant recipients, cancer patients, AIDS patients — the list grows daily.
(2) Because of this disease potential, CMV is highly targeted for the development of specific antivirals, and already chemotherapeutic agents active against CMV are available on a limited basis.
(3) CMV is a very slow growing virus, with a replication time of some 72 hours, so culture techniques are particularly unsatisfactory.
(4) Clinical specimens containing CMV are relatively readily obtained, so it is not difficult to find material with which to evaluate nucleic acid probes.
(5) Cloned fragments of the CMV genome are available and the nucleic acid sequence of some of these has been published: this provides the opportunity for selected regions of the genome to be synthesized using conventional oligonucleotide synthesizing techniques.

Our progress to date has involved the preparation of a hybridization probe by synthesis and cloning of a selected 30 base sequence of the CMV genome. Initial hybridization studies using a terminally labelled probe indicates good specificity for dot blotted DNA from cultures of CMV, with no cross-hybridization to similar preparations of human fibroblasts, HSV and EBV.

We are currently exploring ways in which the signal obtained may be amplified, in order to enhance the sensitivity of the assay. Subsequently, we intend to evaluate the use of this probe on clinical diagnostic material.

## "Warts and All"

**Dr P.J. Say, Venereologist In Charge, Auckland Hospital.**

To date 46 types of human papilloma virus (papilla = nipple; oma = tumour) have been described. Twelve are found in the genital tract[1]. Until recently the epidemiology of this double-stranded D.N.A. virus was little understood because of the technological difficulties in culturing it. Human papilloma virus (H.P.V.) types 1, 2, 3 and 4 had already been shown to be serologically different. The explosion in numbers of different types is thanks to the D.N.A. hybridisation techniques. If 50% or less of the nucleotide pairings are different from other types then a new type is designated. The common types causing Condyloma accuminata (genital warts) H.P.V. 6 and H.P.V. 11 have 82% homology and may be defined as a single type in the future[1].

Ciuffo in 1907 defined H.P.V. as a virus infection by showing it to be present in cell-free filtrates. In 1933, Shope described the papillomatosis of rabbits and Rous in 1935 showed that malignancy could ensue with the presence of co-factors. In 1976, Meisels and Fortin described cervical intra epithelial neoplasia (CIN) tissue containing changes typically caused by the presence of human papilloma virus infection and in 1981 Ferenczy described the koilocyte. McNab in 1983[3], amongst others, has shown that human papilloma virus, particularly type 16 and 18, can be extracted from cancer of the cervix tissue.

The incidence of genital warts has increased dramatically in the developed world since the 70's. 300% increase in attendances for treatment was described in a C.D.C. report and the U.K. figures are matched by those seen in New Zealand showing a steady upward 45% increase over the years in both male and female patients. Human papilloma virus has been known for many years to be a sexually transmitted disease. It has an incubation period on average of 3-4 months but lasting sometimes up to 18 months.

Little is known of its immunology although C.F.T. and R.I.A. antibodies have been shown along with increased lymphocyte activity in patients with regressing warts. Ablative therapy, chemical, cryotherapy, cautery or laser, is in many forms as none are ideal. The diagnosis and therapy of H.P.V. infection accounts for a substantial portion of S.T.D. Clinic time throughout New Zealand. The increasing incidence here may be related to the non-use of contraceptive barrier techniques and the numbers recorded in local S.T.D. clinic statistic returns may include those diagnosed on Papanicolaou smear. In 1983, 4% of women of all ethnic groups were diagnosed with cervical H.P.V. at the Auckland Regional S.T.D. Service. The incidence has doubled yearly, and in 1985 16% are positive[4]. If colposcopy with biopsy and gene probe diagnosis was available, the true incidence would probably be 25% i.e. similar to the incidence of *Chlamydia trachomatis* infections. Even with all methods now available perhaps 5% will be missed as the gene probe may only be positive with replicating virus.

In a recent study, R. McCance et al.[5], 50 males with genital warts were taken and their 58 female contacts examined. Forty (69%) already were positive H.P.V., 35 had abnormal smears and 10 showed gross abnormality; 48% of these women had H.P.V. 16 and 36% H.P.V. 6.

Dr Reid presented an overview at the recent Obstetric and Gynaecology Conference in Auckland[6] and estimated that 5% of the sexually active population in the developed world are probably carrying the virus. In one study he described, it was shown that even with adequate Pap smears 25-33% of severe dysplasia of the cervix was missed without biopsy.

There is an association with mild atypia and CIN 1 with the genital wart type 6 and 11; but moderate atypia, CIN 2 and 3 with wart types H.P.V. 16, H.P.V. 18 and H.P.V. 31. 72% of mild atypia in one study of 216 patients regressed, 10% persisted and the rest progressed — 13% of them on to CIN 2 and 3. Of 462 women with just H.P.V. infection of the cervix, 51% regressed, 30% persisted and 18% progressed over a period of study from 4-22 months.

Is there any chance that this virus could be controlled by contact tracing? Unfortunately, he pointed out that more than one type of virus, even up to 4 types, have been described as causing genital infection in the same patient. The virus may be causing sub-clinical infection and is usually multi-focal. Treatment of visible warts may activate replication of latent virus in adjacent tissue. As Professor Bonham emphasised at the same conference, barrier contraception and public education may be the only weapons we have to control this infection in the community.

There are other developments on the horizon, the introduction of

gene probe techniques as a routine diagnostic test for delineating patients who need careful cytological and colposcopic follow-up. There are early encouraging trials of the use of interferons, particularly interferon alpha as therapy for Condyloma accuminata and also for laryngeal papillomatosis. The association of H.P.V. 16, 18 and 31 with genital cancer both in males and females needs further investigation particularly in regard to co-factors e.g. smoking. If the most pessimistic pundits are correct, unless we make every effort in diagnosing and treating genital transformation zones infected with wart virus, we may be in line for a major epidemic in the next few decades of what is possibly a preventable cancer.

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## *Letter to the Editor*

**An open letter to the Council of Medical Laboratory Technology and to all its members, with reference to the grading of technical staff. In particular, highlighting the plight of lowly graded persons in the smaller disciplines and to promote a new staff structure.**

Dear Members of the Council and members of the N.Z.I.M.L.T.

It is my personal opinion that particular attention needs to be given to the small rural laboratory and to the laboratories which are involved in the disciplines of Cytology, Cytogenetics, Virology, Histopathology, Immunohaematology and Tissue Typing.

In general (except for some personal grading) main criteria for higher grades have tended to concentrate on specimen numbers, staff numbers and administrative duties. With this, has come considerable injustice and major anomalies especially in connection with the disciplines previously mentioned. In these subjects, the technical expertise is equally demanding in content albeit less in overall volume and those technologists involved in providing a service should not be penalised because a population requires more haemoglobin estimations in a day than the requests for diagnosis of cervical carcinoma or Downs Syndrome. It would appear on occasions to be the old, old story of everyone wanting the expert to perform the job but no one is willing to provide the grade/money needed to retain that experienced individual.

I have already pointed out to Mr Colvin Campbell the abhorrent state of staffing levels and grades existing in Cytogenetics laboratories around the country and the great exploitation of trained technologists employed in laboratory assistant positions (positions which should not be laboratory assistant positions but technical or scientific). The same situation exists in Cytology and Histopathology laboratories. Something must be done to stop this erosion of our professional standards which is in a great decline in some disciplines because of the way hospital boards accept a second rate service, which I *know to be* detrimental to the public.

Because of these gross anomalies I would like to propose that the present grading system be scrapped and replaced by an entirely new package. I believe that this will help to correct numerous injustices and greater still help to retain trained staff, particularly in smaller disciplines.

The proposal is as follows:

(a) There would be only 3 staff designations:
  (i) Laboratory Supervisor.
  (ii) Medical Technologist/Medical Laboratory Scientist (Name to be decided).
  (iii) Trainee.

(b) A laboratory supervisor would be one who is (i) *in overall charge* of a small rural laboratory or (ii) in charge of a single discipline, ie. microbiology, within a larger service laboratory. They would be paid (according to the present) $40,660 — $50,150 per annum. There would be approximately 8-10 annual increments. Annual increments to be double if a higher degree or other work of merit is achieved.

(c) A medical technologists or medical laboratory scientist would be one who has:
  (i) passed a 3 year training course (BS at Otago or NZCS or the overseas equivalent from approved countries).
  (ii) has gone on to complete passes in certificate and specialist levels in a discipline of their choice or have overseas equivalents from approved countries. These examinations would cover a two year period, (minimum) as they do now for the successful candidates.

  They would be paid on a salary scale $25,000 — $40,660 (approximately 8-10 increments). *There would be a bar at $30,000* if no certificate level passes are obtained, *and a bar at $32,000* if no specialist levels are obtained.

  Passes of certificate and specialist level examinations would be rewarded with double increments, so that it would be possible to obtain $30,000 per annum after a total time of 5-6 years in the laboratory (approximate age 23 years). Double increments would also be awarded for obtaining a higher degree or other work of merit. From the time of training to the highest point of salary on the scale ($40,660) a person would have spent 11-15 years in service (approximate age 29-33 years).

  To cover the anomaly of those technologists who are "in charge of benches" (greater responsibility) a responsibility award would be given ($3,000 per annum) *after reaching the top of the scale* ($40,660). Those individuals would be paid a total of $43,660 per annum. This would apply to every laboratory across the country.

(d) Trainees would be paid on a similar scale as now exists.

Technologists should not view the scrapping of grades as a loss of status. Their status is in their qualifications, experience and monetary gain. Grades are enormously restrictive to the achiever and to the person of initiative. They actually at present *prevent a realistic career salary.*

These technologists with "in charge of benches" responsibility will note that their eventual salary will actually overlap the lower incremental level of the laboratory supervisor, showing again that this proposal rewards excellence. This proposal too highlights the need for a *career salary* and I believe that at present this ought to be at the $40,660 level for a person of 33 years or so.

This proposal maintains and retains what we all should be interested in promoting — a service second to none for the public of New Zealand. It is also of my opinion that council members of the Institute should be willing to examine and promote such a provision to the Health Services Personnel Commission.

There appears to be, in my opinion, a massive reluctance on the part of hospital boards and the Department of Health to accept us as a *professional* body. This could well be our own historical fault when one examines closely for example the enormous increase in laboratory assistants *performing technologists* work and the drying up of trainee technologists positions.

The Institute must get "fire in its belly" to more than *just draw to the attention* of the health department and hospital boards the seriousness of the decay in our profession. Rightly or wrongly the Institute is viewed by many as impotent, lacking professional clout and short sighted in allowing particularly the increase of laboratory assistant positions to the detriment of technical posts.

I personally do not believe from speaking to different Council members that this is entirely true but I would venture to say that it appears that no one listens to us as a body. We have no media coverage of worth, no public relations of worth, and an annual conference with a lame duck image. It should be our obligation to be in the public eye, to promote the role we play in medicine — or perhaps you don't think we are worth it!

Let the debate begin!

Yours sincerely,
D.R. Romain,
Charge Cytogeneticist,
*Wellington Public Hospital.*

NEW ZEALAND INSTITUTE OF

# MEDICAL LABORATORY TECHNOLOGY

## *CERTIFICATE OF QUALIFIED TECHNICAL ASSISTANT*

**Q.T.A. Regulations**
**Q.T.A. Examination Application Form**
**N.Z.I.M.L.T. Membership Application Form**

The New Zealand Institute of Medical Laboratory Technology offers to laboratory assistants the qualification known as the Certificate of Qualified Technical Assistant (QTA). The Department of Health has given official recognition to this qualification and laboratory assistants who pass the examination and are employed by Hospital Boards are entitled to a salary increment.

The Technical Assistants Examination Committee is based in Christchurch and all correspondence should be addressed to:—

**The Secretary**
**Technical Assistants Examination Committee**
**Haematology Department**
**Christchurch Hospital**
**Private Bag**
**CHRISTCHURCH**

## EXAMINATION SUBJECTS

The examination is offered in the following:—

Clinical Biochemistry
Cytogenetics
General Certificate (see prerequisite 2)
Haematology
Histological Technique
Medical Cytology
Medical Microbiology
Mortuary Hygiene & Technique
Radioisotopes & Radioassay Technique
Immunohaematology
Immunology (Microbiology)

## PREREQUISITES

1. Candidates for the examination must be employed as laboratory assistants in an approved laboratory and have worked continuously in the subject since 30 June two years previously or accumulated not less than two years practical experience in the examination subject.
2. Small laboratories which require their laboratory assistants to work in more than one subject can apply to the Committee for students to train for the General Certificate Examination.
3. A laboratory which requires a laboratory assistant to work in a narrow field may apply to the Committee for the student to train for a Special Certificate Examination (Note syllabus requirements).
4. Candidates for the Immunohaematology Examination must have completed not less than 320 hours and candidates for the General Certificate Examination not less than 160 hours in practical cross-matching of blood for clinical use.

## SYLLABUS

1. The syllabuses for all subjects (except Special Certificates) are available from the Secretary, Technical Assistants Examination Committee.
2. Laboratory assistants intending to train for a Special Certificate Examination must have a detailed syllabus prepared by the charge technologist and forwarded to the Committee for approval at least 6 months before the examination.

## EXAMINATIONS

1. The examinations will be held annually during the month of May.
2. Candidates must complete an examination application form and forward this, together with the appropriate examination fee, to the Secretary before the closing date.
   **(NOTE: LATE APPLICATIONS WILL NOT BE ACCEPTED)**
3. The examination will consist of two written papers, each of two hours duration.
4. The candidate must obtain an overall mark of 50% to pass the examination. Candidates for the General Certificate Examination must obtain a minimum of 40% in each of the four sections and 50% overall to pass the examination.
5. The results of the examinations will be announced by the New Zealand Institute of Medical Laboratory Technology. Successful candidates who are financial members of the Institute at the time of the examination will be awarded the QTA badge and certificate.
6. Tne candidate's script will be returned upon receipt of a written application by the candidate. No copy will be retained and no correspondence relating to the marking of the script will be entered into.

## NEW ZEALAND INSTITUTE OF MEDICAL LABORATORY TECHNOLOGY

**What is the Institute?**

The NZIMLT is an organisation of people who work in medical laboratories and who have united to carry out certain functions for the profession, which cannot be performed by the individual alone.

Included in those eligible for membership are all people who work in this profession — laboratory assistants, medical laboratory technologists and science graduates. All have a moral obligation to support the organisation by becoming interested financial members.

**What does the NZIMLT do for its Members?**

1. It is the only organisation which negotiates, directly or indirectly, for improvement in salaries and conditions of employment for technologists and laboratory assistants employed by the Health Department, and thus, by spinoff, for other Government departments and private sector employees.
2. It initiates and negotiates changes in education and training. A continuing and involving process.
3. It publishes a scientific journal which is distributed free to all members and operates a free audio-visual training library.
4. It supports the organisation of an annual scientific meeting, workshops and one day seminars (at local branch level) thus providing a unique opportunity for further colleagueship and friendship within the profession.
5. It conducts examinations for Fellowship and the Certificate of Qualified Technical Assistant. Although laboratory assistants who are not members of the Institute are eligible to sit the QTA examination, it is only members who will receive the qualifying badge and certificate.
6. It provides availability and access to study and travel awards and prizes.
7. It allows members who are employed by Hospital Boards or Government departments to have access to the Public Service Investment Society.

**Membership of the NZIMLT**

During the first year of employment membership is complimentary but a subscription must be paid in subsequent years. A laboratory asssistant who has worked for more than a year before making application for membership will have to forward the current subscription with the application.

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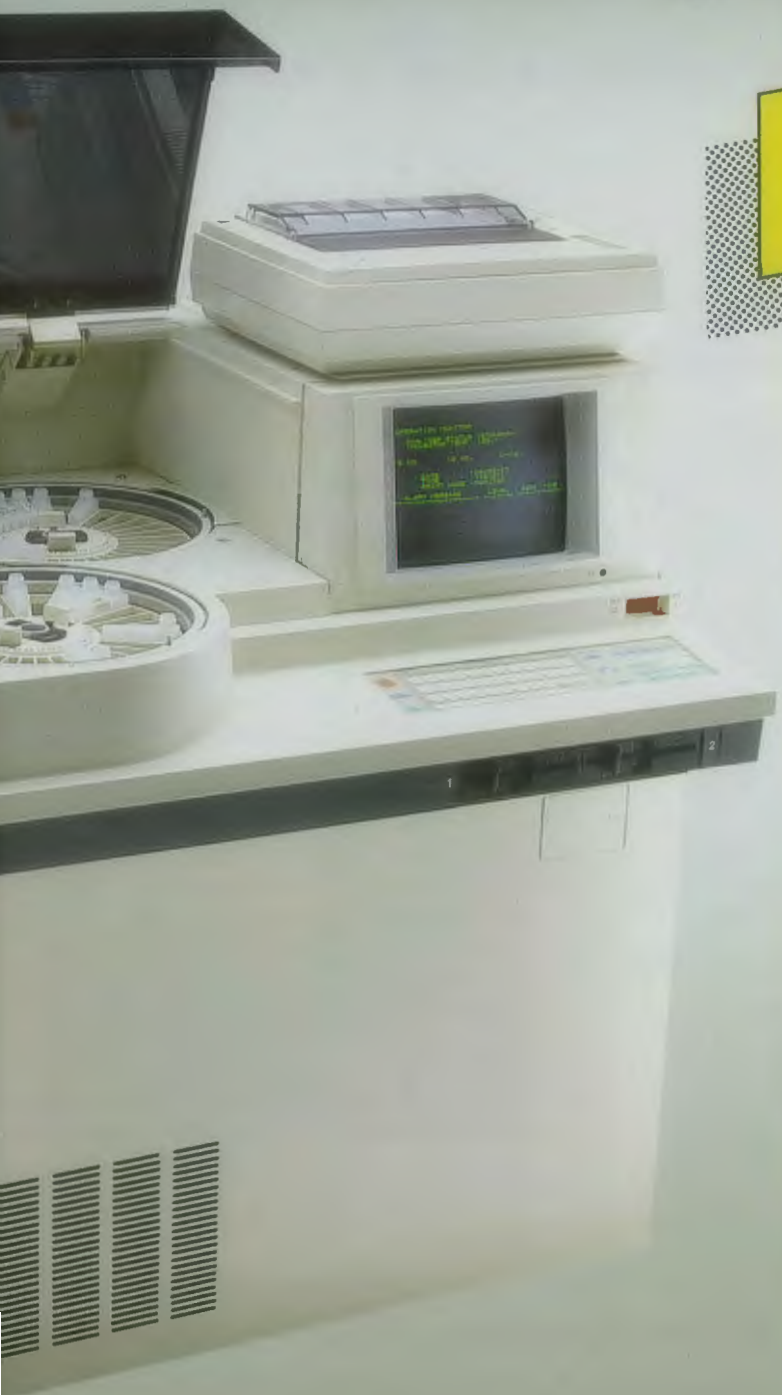

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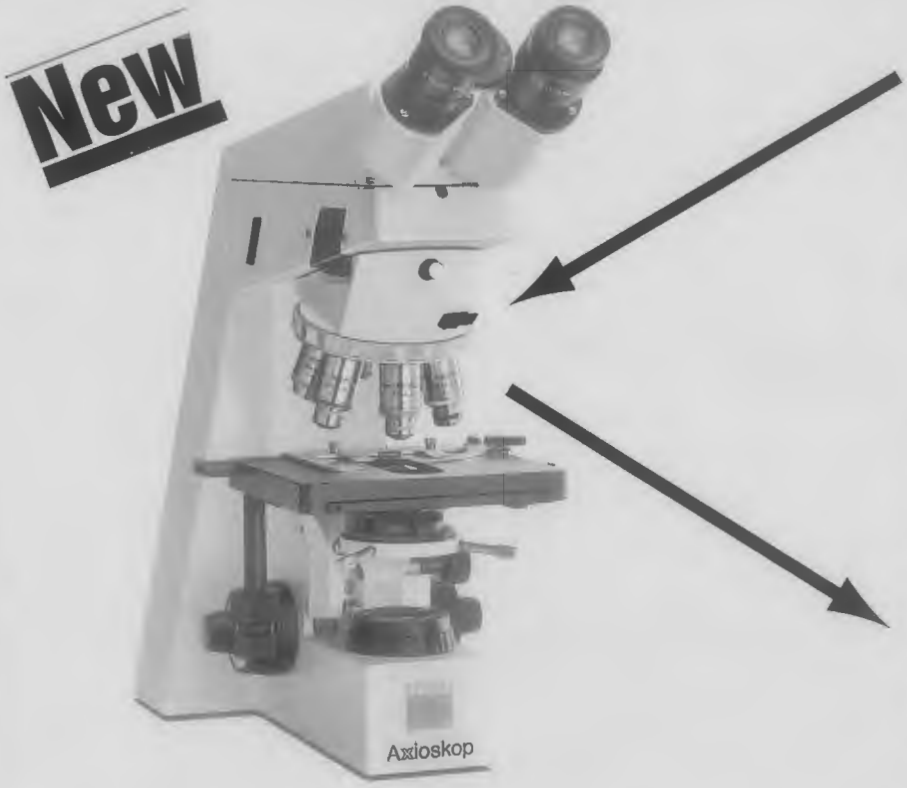


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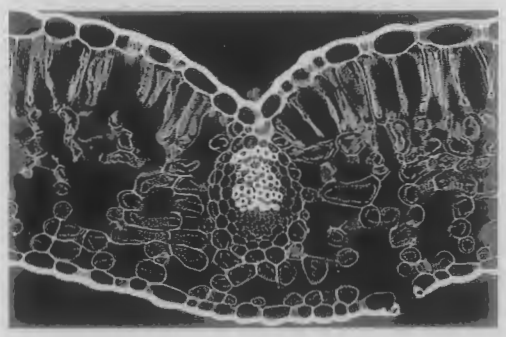

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# NEW ZEALAND INSTITUTE OF MEDICAL LABORATORY TECHNOLOGY

## Application to Sit the Examination of Qualified Technical Assistant
## 10 and 11 May, 1988

**SECTION A — TO BE COMPLETED BY THE CANDIDATE**

Name: Mr / Mrs / Miss ..... (Surname) (Christian Names)

Laboratory .....

Lab. Address .....

.....

Subject (Haematology, Microbiology, etc.) .....

Are you a member of the NZIMLT YES/NO

Application for membership may be made on the reverse side of this form. If the application for membership accompanies this form then the reduced examination fee applies.

EXAMINATION FEE $77.00 (GST inc.) reducible to $27.50 (GST inc.) if currently a financial member of the N.Z.I.M.L.T.

FEE ENCLOSED $ ..... DATE ..... SIGNATURE .....

**SECTION B — TO BE COMPLETED BY THE PATHOLOGIST OR CHARGE TECHNOLOGIST**

Date Candidate commenced work in examination subject .....

"I certify that the above candidate meets the requirements of the Q.T.A. Regulations"

Signed .....

Designation .....

Please state the name and address of the person responsible for receiving the papers and supervising the Examination in your laboratory or centre

Name .....

Address .....

.....

.....

**Office use only**

**APPLICATIONS CLOSE FRIDAY 26 FEBRUARY, 1988**

**Please forward application forms accompanied by fees to: Mr B. T. Edwards, Secretary, Technical Assistants Examination Committee, Haematology Department, Christchurch Hospital, Christchurch 1.**

**LATE APPLICATIONS WILL NOT BE ACCEPTED**

# THE NEW ZEALAND INSTITUTE OF MEDICAL LABORATORY TECHNOLOGY (INC.)

## Application for Membership (For use with Q.T.A. Examinations only).

(Please Print Clearly and Tick Appropriate Box)

I,

SURNAME

MR, MRS, MS, MISS

INITIAL(S)

FIRST NAME(S)

MAIDEN NAME

OF,

WORK ADDRESS

HOME ADDRESS

Hereby apply for membership of the New Zealand Institute of Medical Laboratory Technology in the category of:

☐ Associate ☐ Member ☐ Non-Practising Member

☐ Complimentary Member (Date Commenced Work: _____)

AND Certify That I Have:

☐ Not Previously Been a Member ☐ Previously Been a Member (State Category: _____)

☐ Resigned (Date: _____) ☐ Did Not Resign

I am employed as: _____

in the Speciality Department of: _____

Highest Professional Qualification: _____ Year Obtained: _____

Applicants Signature: _____ Date: _____

Nominated by: _____

(Current Financial Member N.Z.I.M.L.T.)

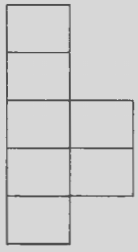
Enclosed with Application $45.00 Subscription $4.50 G.S.T. $49.50 Total Paid

**FOR USE WITH Q.T.A. EXAMINATIONS ONLY**

Please Forward Completed Application Form to: **Membership N.Z.I.M.L.T.**
**P.O. Box 29115**
**Greenwoods Corner**
**Auckland New Zealand**

(Please Leave Blank)

| | | |
|---|---|---|
| Received | _____ | L |
| Acknowledged | _____ | R |
| Council | _____ | S |
| Notified | _____ | E |
| Convenor | _____ | M |



# Minutes of the 43rd Annual General Meeting of the New Zealand Institute of Medical Laboratory Technology held in Nelson on 20 August 1987 commencing at 3.15 pm.

**Present**
The President (Mr C. Campbell) presided over an attendance of approximately 100 members.

**Apologies**
It was resolved that apologies be accepted for M. Young, C.S. Shepherd, G. Erickson, M. Eales, G. Davies, H. Stunzner, D. Henwood and K. Boddy. D. Pees/D. Dixon-McIver

**Proxies**
A list of 38 proxy holders representing 217 proxies was circulated to the meeting.

**Minutes**
It was resolved that the Minutes of the 42nd Annual General Meeting as circulated be taken as read and confirmed. W Wilson/D. Reilly

**Annual Report**
It was resolved that the Annual Report be received
B. Edwards/K. McLoughlin

Speakers on the Annual Report included P. McLeod, B. Main, B. Edwards, D. Dixon-McIver and E. Norman.

It was resolved that the Annual Report be adopted.
A.D. Nixon/I. Buxton

**Financial Report**
It was resolved that the Treasurer's and Financial Report be received.
D. Reilly/K. McLoughlin

D. Reilly spoke on the Financial Report.

It was resolved that the Financial Report be adopted.
D. Reilly/R. Martin

**Election of Officers**
The following members of Council were elected unopposed:-

SECRETARY: Mr B.T. Edwards
TREASURER: Mr D. Reilly
DUNEDIN REGIONAL REPRESENTATIVE: Mrs J. Parker

The following are the results of elections:—
PRESIDENT:
W. Wilson ..... 441
K. McLoughlin ..... 139
Invalid ..... 0
Declared elected was W Wilson

VICE-PRESIDENTS (two required):
P. McLeod ..... 487
D Dixon-McIver ..... 369
K. McLoughlin ..... 254
Invalid ..... 1
Declared elected were P McLeod and D. Dixon-McIver

AUCKLAND REGIONAL REPRESENTATIVE:
D.C Pees ..... 105
G. Rimmer ..... 88
Invalid ..... 1
Declared elected was D C. Pees.

CENTRAL NORTH ISLAND REGIONAL REPRESENTATIVE:
M Young ..... 17
E Norman ..... 71
Invalid ..... 4
Declared elected was E Norman

WELLINGTON REGIONAL REPRESENTATIVE
G. Day ..... 40
S. Gainsford ..... 71
W. Shearman ..... 13
D. Wilson ..... 12
Invalid ..... 4
Declared elected was S Gainsford.

CHRISTCHURCH REGIONAL REPRESENTATIVE:
T. Rollinson ..... 46
J. LeGrice ..... 56
Invalid ..... 0
Declared elected was J. LeGrice.

It was also resolved that the voting papers be destroyed
J Elliot/D Reilly

**Presentation of Awards**
The following award winners were announced and the awards presented by the President:—

**Certificate Examination Awards:**

| | |
|---|---|
| Clinical Biochemistry | — Stella Darragh |
| Haematology | — Karen Taylor |
| Microbiology | — Anne-Marie Hickling |
| Immunohaematology | — Karen McLeish |
| Immunology | — Russell Cook |
| Virology | — Susan Billington |
| Histology | — Lynda McPhee |
| Cytogenetics | — Barbara Silvester |

**Specialist Certificate Examination Awards:**

| | |
|---|---|
| Clinical Biochemistry | — Helen Coates |
| Haematology | — Elizabeth Thompson |
| Microbiology | — Claire Ebbett |
| Immunohaematology | — Tracey Mellelieu |
| Immunology | — Pamela English |

**Qualified Technical Assistant Awards:**

| | |
|---|---|
| Immunohaematology | — Rosemary Barnett |
| Clinical Biochemistry | — Angela Smith |
| Haematology | — Rosemary Edlin |
| General Certificate | — Robyn Waller |
| Medical Microbiology | — Yvonne Wuthrich |
| Histological Technique | — Sandra Lorimer |
| Medical Cytology | — Timothy Bradley |
| Immunology | — Vicky Richardson |

**Journal Awards:**
Roche Products Microbiology Award — Shirley Gainsford and Elizabeth Frater.

Hilder Memorial Award — Stephen Henry

**NZIMLT Scholarship:**
Jan Nelson.

**Wellcome Award:**
The President then invited Bob Williamson, General Manager of Wellcome (NZ) Limited to present the Wellcome International Travel Award to Marilyn Eales

**Life Membership**
The President announced that Council had bestowed Life Membership on Rodney Kennedy and Barrie Edwards

**Honoraria**
It was resolved that no honoraria be paid
B. Main/A.D. Nixon

**Auditor**
It was resolved that Deloitte, Haskins and Sells be elected as Institute Auditors.
D. Reilly/P. McLeod

**1989 Annual Scientific Meeting**
R. Austin addressed the meeting and extended an invitation on behalf of the New Plymouth laboratories to conduct the 1989 Annual Scientific Meeting.

The announcement was met with acclamation.

There being no further business the meeting closed at 3.55 p.m.

C. Campbell
President

# Minutes of the Special General Meeting of The New Zealand Institute of Medical Laboratory Technology Held in Nelson on the 20 August 1987 commencing at 3.55 pm.

**Chairman**
Mr C. Campbell.

**Minutes**
It was resolved that the Minutes of the Special General Meeting held on 26 June 1986 be taken as read and approved.

D. Pees/B. Main

**Business Arising**
The President and B. Main reported on the outcome of negotiations involving a name change of Grade Laboratory Officer and Laboratory Assistant.

**Remits**

1. It was moved W. Wilson, seconded D. Dixon-McIver "THAT from 1st April 1988 the Rules be amended as follows:

   THAT Rule 6(d) be amended to read 'as Members — any person engaged in Medical Laboratory Technology who is not eligible for any other class of membership'.

   THAT Rule 6(e) be deleted.

   THAT Rules 6(f), 6(g), 6(h) be re-numbered 6(e), 6(f), 6(g).

   THAT Rule 9(c) be re-numbered Rule 9(c)(i) and that the first sentence be amended to read 'Any member who has elected subscription payment in one annual amount whose subscription is unpaid after the expiration of three (3) calendar months from the date fixed for the payment of subscriptions shall cease to be a financial member of the Institute and shall cease to receive the publications of the Institute' . . . .

   THAT Rule 9(c)(ii) be added and read 'Any member who has elected subscription by direct credit and from whom no payment is received shall after a period of six (6) calendar months be struck off the Roll by the Council provided that in the absolute discretion of the Council such member's name may be returned to the Roll at any time upon payment of all arrears due by such member at the time of restoration'.

   THAT Rule 22(b) and Rule 22(c) be deleted and the following substituted:

   22(b) Subscriptions may be paid at the members direction either in one annual amount or by direct credit in equal amounts at regular intervals by automatic payment from salary deduction or bank account. The weekly amount payable shall be 1/52 of the appropriate annual rate of subscription.

   22(c)(i) Subscriptions for new and reinstated members elected prior to 30th September and who elect subscription payment in one annual amount shall be at the annual rate. The member shall be deemed financial for the current year on payment of the subscription. Subscriptions for new or reinstated members elected after 30th September and who elect subscription payment in one annual amount shall be at one half the annual rate. The member shall be deemed financial for the current year on payment of the subscription.

   22(c)(ii) Members electing subscription payment by direct credit shall be deemed financial for the current year up to the period covered by the paid subscription and a further period equal to one calendar month after the date of receipt of the last payment'."

   The motion was carried unanimously on a show of hands.

2. It was moved D. Reilly seconded J. Parker "THAT the following rates of subscriptions operate from and including the year commencing 1st April 1988:

   | | |
   |---|---|
   | For Fellows and Associates | — $104 (GST inclusive) |
   | For Members | — $52 (GST inclusive) |
   | For Non-Practising Members | — $33 (GST inclusive) |

   The motion was carried unanimously on a show of hands.

3. It was moved D. Dixon-McIver seconded D. Dorman "THAT Policy Decision Number 3 be reaffirmed."

   The motion was carried unanimously on a show of hands.

   Policy Decision No. 3 (1972): Council will make and administer awards to members of the Institute, the details of each award will be recorded and may be amended from time to time by resolution of Council. The summary of these details shall be published annually in the Newsletter.

4. It was moved D. Pees seconded B. Edwards "THAT Policy Decision Number 5 be reaffirmed."

   The motion was carried unanimously on a show of hands.

   Policy Decision No. 5 (1978): That medical supply companies should not be approached to aid in the finance of Branch meetings; companies may be invited to Regional Seminars and although donations may be accepted money is not to be solicited.

**General Business**

It was moved W. Wilson seconded B. Edwards "THAT Council bring forward to the next Special General Meeting of the Institute Notices of Motion to amend the appropriate rules to give effect to the following:

1. That the name of the Institute be changed to the New Zealand Institute of Medical Laboratory Scientists.
2. That the composition of Council be:
   (a) A President
   (b) A Vice President
   (c) Seven Regional Representatives
   (d) An Executive Officer
3. That the country be divided into seven regions as defined in the Discussion Paper.
4. That the memberships categories be:

   | | |
   |---|---|
   | Life | (by Order of Council) |
   | Fellow | (by meeting Fellowship requirements) |
   | Member | (by meeting Registration requirements) |
   | Associate | (other members)" |

It was moved P. McLeod seconded D. Pees that the word "Scientists" be amended to read "Sciences".

The amendment was put to the meeting and carried on a show of hands.

The amended motion was put to the meeting and carried on a show of hands.

It was moved E. Norman seconded T. Mulvey "THAT the appropriate amendments be made to the Medical Laboratory Technologists Regulations to ensure that only Registered Medical Laboratory Technologists or staff under their supervision be permitted to perform medical laboratory testing."

After discussion the motion was put to the meeting and declared carried on a show of hands by 27 votes to 18.

It was moved E. Norman seconded J. Parker "THAT Council approach the Minister of Health recommending alterations to legislation to allow Registered Medical Laboratory Technologists to claim from the Social Security fund for performing medical laboratory testing in private practice."

After discussion the motion was put to the meeting and declared carried on a show of hands.

It was moved D. Smith seconded D. Pees "THAT Council discuss the possibility of holding an election one year before the end of the President's period of office to choose a President elect. This would give the incoming President a year to prepare for his term of office."

After discussion the motion was put to the meeting and declared carried on a show of hands.

It was moved J. Aitken seconded A. Johns "THAT this meeting support moves by the NZIMLT and the MLTB to explore alternative means of education of Medical Laboratory Technologists including a Degree qualification."

After discussion the motion was put to the meeting and declared carried on a show of hands.

It was moved W. Wilson seconded J. Parker "THAT this meeting confirm to the Medical Laboratory Technologists' Board that it sees the minimum qualification to be at the Certificate level."

After considerable discussion the motion was put to the meeting and declared lost on a show of hands.

Mr G. Beattie then addressed the meeting and asked that at the conclusion of each scientific session that it be announced by the Chairperson that since the trades displays have helped contain the costs of the conference that delegates be encouraged to support the displays.

It was moved A.D. Nixon seconded B. Currie "THAT the MLTB discontinue offering the Special Certificate examination as a course to registration."

After discussion the motion was put to the meeting and declared lost on a show of hands.

It was moved T. Rollinson seconded H. Bloore "THAT Council be instructed to investigate and circulate proposals regarding minimum registration requirements prior to the next Special General Meeting."

The motion was declared carried on a show of hands.

It was moved W. Wilson seconded D. Dixon-McIver "THAT a vote of thanks be recorded to C. Campbell and other retiring Council members."

The motion was declared carried with acclamation.

There being no further business the meeting closed at 5.07 pm.

C. Campbell
President

## New Zealand Institute of Medical Laboratory Technology 1987 Technical Assistant's Examination Results

**Q.T.A. in Clinical Biochemistry**
ARAHILL Bridget Mary, BAILLIE Annamarie, BOOTH Maree, CALEY Kirsten Julie, DOUGLAS Wendy Anne, HIGHAM Jane Louise, MARINUS Caroline, PLIM Evelyn Brenda, PRIESTLEY Christine Kathleen, REECE Joanne Elizabeth, SAMUELS Tania Marie, SMITH Angela Maree Walton, TIPLER Ann Maree, WESTON Andrea Evelyn Joyce, WILLIAMS Stephanie Alice.

**Q.T.A. by General Certificate**
ALLNUTT Nadine Lee, FINLAYSON Megan Rhoda, HAGENSON Jacqueline Anne, MAVOR Kirsten Hazel, OLIVER Jane Elizabeth, POOL Michelle Lee, TAYLOR Susanne Florence Irene, WALLER Robyn Jane.

**Q.T.A. in Haematology**
BARRAR Gail Frances, BLOORE Lisa Stephanie, EDLIN Rosemary Janice, HART Ngaire, KERRIDGE Jane Patricia, LONGMAN Jeni Marion, MOSS Charmaine Mary, PYE Vikki Julia, TAYLOR Kenneth Charles.

**Q.T.A. in Histological Technique**
ALLISON Louise Joan, COSGROVE Jane Lois, EASTON Susanne Elizabeth, EGERTON Helen Mary, GALLAGHER Karen Linda, HOPE Caroline Paula, LORIMER Sandra, McPHERSON Deborah Jane, SMIALOWSKA Ewa Barbara.

**Q.T.A. in Medical Cytology**
BRADLEY Timothy John, CHEN Waltraud Hannelore, LESTER Joanne Margaret, PEACOCK Julie Francis, SMITH Pamela Joy

**Q.T.A. in Medical Microbiology**
BERTAUT Tina Joanne, BLOOR Rhonda Melissa, CRAIG Debra, EDWARDS Trudy Jane, EYRES Stephanie, FROST Louise Patricia, HALE Lauren Diane, HURLEY Christine Ann, KINNEAR Dinah Kaye, KIRK Eileen, LEGG Fiona Jane, LEGGOTT Fiona Mary, MAKAN Geeta, McHAFFIE Deborah Anne, OADES Heather Ann, PEEL Kathryn Louise, PRITCHARD Jan Maree, QUINN Margot Louise, ROBINSON Sharon Lee, SHERMAN Diane Beverley, STEVENSON Gael Marie, SUTHERLAND Michelle Dawn, WARD-ALLEN Maria Anne, WIMSETT Davina Kathryn, WUTHRICH Yvonne Lucy.

**Q.T.A. in Mortuary Hygiene and Technique**
SMITH Rodney John.

**Q.T.A. in Radioisotope and Radioassay Technique**
SMITH Shona Jane.

**Q.T.A. in Immunology (Immunohaematology)**
ASH Sonia Margaret, BARNETT Rosemary Anne, DMITRIEFF Ekaterina Stepanavna, HENDERSON Coralie, HICKMOTT Leeanne Meryl, LE LIEVRE Monique Rawhiti, MORIARTY Helen Mary, THOMASON Heather Jean, WIGMORE Marina Joan

**Q.T.A. in Immunology (Microbiology)**
COOK Helen Noreen, HOLDEN Linda Karen, HORNE Janet Elizabeth, HUTCHINS Jan Tanya, KILPATRICK Robin Denise, O'CONNOR Katherine Anne, RICHARDSON Vicky Lee, RIDDLE Susan Alice.

**Q.T.A. by Special Certificate — Mycology**
BLAYNEY Wendy Patricia

**Q.T.A. by Special Certificate — Blood Products**
SCHAEF Tonia Leigh

### N.Z.I.M.L.T. Technical Assistants Examination Committee — 1987 Technical Assistants Exam Result Summary

| Examination | No Enrol | No Sat | No with each grade A | B | C | D | E | % Pass | Av Mark |
|---|---|---|---|---|---|---|---|---|---|
| Q.T.A. in Clinical Biochemistry | 18 | 16 | 3 | 5 | 7 | 0 | 1 | 93.7 | 63.7 |
| Q.T.A. by General Certificate | 10 | 10 | 4 | 2 | 2 | 1 | 1 | 80.0 | 65.9 |
| Q.T.A. in Haematology | 14 | 13 | 0 | 3 | 6 | 2 | 2 | 69.2 | 55.7 |
| Q.T.A. in Histological Technique | 11 | 10 | 5 | 3 | 1 | 1 | 0 | 90.0 | 71.1 |
| Q.T.A. in Medical Cytology | 5 | 5 | 0 | 3 | 2 | 0 | 0 | 100.0 | 64.9 |
| Q.T.A. in Medical Microbiology | 27 | 26 | 3 | 14 | 8 | 0 | 1 | 96.2 | 65.9 |
| Q.T.A. in Mortuary Hygiene and Technique | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 100.0 | 84.5 |
| Q.T.A. in Radioisotope and Radioassay Technique | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 100.0 | 52.5 |
| Q.T.A. in Immunology (Immunohaematology) | 10 | 10 | 1 | 2 | 6 | 0 | 1 | 90.0 | 61.1 |
| Q.T.A. in Immunology (Microbiology) | 8 | 8 | 3 | 4 | 1 | 0 | 0 | 100.0 | 72.8 |
| Q.T.A. by Special Certificate — Immunology | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 |
| Q.T.A. by Special Certificate — Mycology | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 100.0 | 84.5 |
| Q.T.A. by Special Certificate — Blood Products | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 100.0 | 87.0 |
| **Total** | 108 | 102 | 22 | 36 | 34 | 4 | 6 | 90.2 | 65.2 |

# INSTITUTE BUSINESS

## Office-Bearers of the N.Z.I.M.L.T. 1987-88

**President**
W.J. Wilson
Auckland Regional Blood Centre

**Past-President**
C. Campbell

**Vice-Presidents**
D. Dixon-McIver
P. McLeod

**Secretary**
B.T. Edwards
Haematology, Christchurch Hospital

**Treasurer**
D.M. Reilly
Diagnostic Laboratory, Auckland

**Council**
E. Norman, D. Pees, S. Gainsford, J. Parker, J. Le Grice.

**Editor**
D. Dixon-McIver
Biochemistry Dept., National Women's Hospital, Auckland.
or the Editor, P.O. Box 35-276, Auckland, 10.

**Membership Convenor**
David Pees
P.O. Box 29-115, Greenwoods Cnr, Auckland.

**Membership Fees and Enquiries**

Membership fees for the year beginning April 1, 1987 are:

For Fellows — $60.50 GST inclusive

For Associates — $60.50 GST inclusive

For Members — $49.50 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.

# Presidential Address

## Colvin Campbell

TIME FOR CHANGE

The past year has seen major changes in the very fabric of New Zealand society. The Government has introduced GST, State-owned enterprises and corporatisation, contracting out by the State and the need for many traditional areas of State to run profitably are now a fact; to a greater or lesser extent these have affected us all.

Recently it was suggested that only those very close to retirement (like 3-6 months) can be guaranteed security of tenure in their present employment. Redundancy can happen to anyone as recent events have shown and working for the Government no longer can be regarded as security for the duration of one's working life.

The possibilities of contracting out, corporatisation, regional health authorities or more private involvement in providing health care is causing some nervousness among senior and middle management in hospitals. This nervousness is justified as any of the potential options could involve job losses in the name of efficiency throughout the service.

But what of Medical Technologists you ask, "we will always need them". Will we? Bigger, faster more expensive analysers and computer systems are being introduced along with more specific sensitive tests. In many cases these decrease the need for highly trained and skilled technologists to perform repetitive and mundane tasks. The need is for effective managers to operate and integrate these systems efficiently and cost effectively.

The analytical role will lessen as these systems provide extensive methodologies, are fully automated, have built in quality control and in fact monitor their own performance and status. It was suggested in a recent editorial in Clinical Chemistry "that the consultant role of the technologist will be enhanced because knowledgeable and trained individuals will be needed to understand the new technologies and communicate with the medical profession". This will be especially true as services may move to satellite laboratories or group medical practices.

Workloads in large laboratories are such that efficiency and cost effective management require similar management skills to those required of a moderately large company. The point I am making is that changing technology and the need to provide cost effective service requires similar skills to those in business management — CHANGE IS NEEDED.

Historians suggest there are always valuable lessons to be learnt from the past. Jeanne Grimmard writing in the Canadian Journal of Medical Technology recently made some very pertinent comments on the history and current status of the profession in that country. Not surprisingly many of the concepts introduced in the article apply equally to us here in the nuclear free non-French speaking antipodes. He makes the point that we are indeed fortunate to be able to perform an autopsy on the profession before it is dead — more a laparotomy I guess.

Let us look back thirty years to the 1950's; a small test repertoire, few technologists, *no laboratory assistants* with all tests being performed manually and technical staff doing all the work from collection to reporting.

Then came semi-automation, then automation of the 60's and 70's. As technologists the age of technology has arrived — we were enthusiastic — we became real experts — we employed ever greater numbers of *laboratory assistants* to feed the voracious analysers. We were good — everything was perfect. In New Zealand a booming agricultural economy supplied the money to build new and bigger laboratories, with more staff and better equipment and more *laboratory assistants* to do the work.

The picture in training and education was not as good; I venture to suggest we continued to train able seamen and master mariners in the age of jets and space rockets. However this Institute has continued to provide its own extensive examination system for *laboratory assistants*.

The theme must be starting to come through loud and clear. There is not much future for the Medical Technologists of 1987 as she or he is trained — the field has changed, is changing and will change dramatically in the immediate future. When a species becomes endangered the world wild life fund, conservationists and the general public create a hue and cry and generate pressure to save the dying species *but* when a profession such as ours is faced with possible extinction no one expresses concern — not even us.

Not true you say — we do care. Then you must take the place you and your predecessors have earnt and deserve in the system — the cry in 1986 was lab staff deserve more or better — the cry in 1987 should be "lab staff are ready for change and will meet the challenges of the future".

We *will* provide services 24 hours a day because that is our job and not let others do the testing because its inconvenient outside the hours of 8-5 Monday through Friday. These functions of our profession will not be taken from us unless *we* give them away. Professionals other than Medical Technologists will perform these tests in satellite labs

while we stay in our corner, mind our own business and let others take our place.

If you do not take your fate into your own hands this profession will die and it may happen sooner than you think. We have been proud of the achievements of the past — we must have pride in the future of this profession. Changes in the past two years have indicated very strongly to me that we cannot afford to wallow in a false sense of job security. If we are not needed, or don't contribute, we can just as easily be cast on the job scrap heap as those in railways and forestry have been in the past year.

Despite the criticism of some of the members I think that Council can look back at the past year with some sense of achievement. Major changes in direction have been initiated by Council to cope with changes taking place in the State Services and the Health Care Industry.

As I come to the end of my third and last year as your president — I am asked will I miss it all. Well I suppose I will miss the pleasant majority — those dedicated Council members with whom it has been my pleasure to work, those members of the Institute who have appreciated my humble efforts. But I am sure there will be compensations. I look forward to getting to know better the lady I meet occasionally, who keeps house for me, who I'm proud to call my wife and the mother of my children.

The future, my friends, is now with you.

## CORRESPONDENCE

Mr P. McLeod,
NZ Institute of Medical Laboratory Technology (Inc.)
C/- Nelson Hospital, NELSON.

### LABORATORY WORKER LIABILITY ON SPECIMEN HANDLING

We have now considered your queries concerning the legal consequences for technical staff where the death of a patient can be attributed to incorrect labelling or the absence of labelling on specimens.

Your question presupposes that the laboratory worker has acted "in good faith" and we have interpreted that phrase to mean "without malice."

Legal liability for the death of a patient by medical misadventure might formerly have arisen under two headings: civil liability and criminal liability.

As to civil liability, the position was altered in 1972 with the passing of the Accident Compensation Act. That Act was repealed with effect from 1 April 1983 by the Accident Compensation Act 1982. Section 27 of the current Act provides that:

> "Where any person suffers personal injury by accident in New Zealand or dies as a result of personal injury so suffered...no proceedings for damages arising directly or indirectly out of the injury or death shall be brought in any Court in New Zealand independently of this Act...."

"Personal injury by accident" is defined to include "medical, surgical, dental, or first-aid misadventure."

In our view, therefore, no civil liability for damages could attach to a laboratory worker who undertook testing on incorrectly labelled or unlabelled specimens.

We turn to consider criminal liability. As indicated above, we have not considered the criminal liability of a laboratory worker who acts maliciously in the circumstances described in the letter, but have included the position of a worker who, because of labelling deficiencies, deliberately refuses to undertake an analysis.

The starting point in our consideration is that **a laboratory worker is under a legal duty to exercise reasonable care and skill in the execution of his or her duties**. This duty is owed both to the worker's employer (arising from the contract of service) and to the patient (arising from a duty of care owed to any person who might reasonably be expected to be affected by the worker's acts).

Section 160 of the Crimes Act 1961 provides that **homocide** (the killing of a human being by another, directly or indirectly, by any means whatsoever) **is culpable when it consists in the killing of any person by an omission without lawful excuse to perform or observe any legal duty**. By virtue of other provisions of the Crimes Act, the death of a person in such circumstances could amount to manslaughter. In the case of the negligent failure to observe the duty of care mentioned above, it is unlikely that anything other than gross negligence would result in a manslaughter prosecution and conviction.

In its simplest terms, the test would be a determination of the

reasonableness of the worker's actions so that consideration would have to be given to the particular facts of each case and to elements such as:

1. The degree of inaccuracy of the labelling;
2. Whether any inaccuracy is likely to mislead the technologist as to the true source of the specimen;
3. Whether the true position was readily ascertainable without significant delay;
4. The urgency of the particular situation;
5. Whether, on balance, there was a greater risk to the patient in not analysing the sample than in providing an analysis which might be proved to be incorrect.

The above list is not exhaustive but highlights the difficulty in providing a blanket opinion which covers all cases.

We also mention Section 157 of the Crimes Act which provides:

"Every one who undertakes to do any act the omission to do which is or may be dangerous to life is under a legal duty to do that act, and is criminally responsible for the consequences of omitting without lawful excuse to discharge that duty."

This section may apply. If so, we think that similar considerations to those mentioned above would be relevant and that, in the end, the real test would be the reasonableness or otherwise of the worker's actions.

We ask you to note that the considerations we mentioned above in relation to a charge of manslaughter would apply in the case of a patient who was caused actual bodily harm as a result of the incorrect analysis or report even though death did not ensue (Section 190).

"We turn now to the problems raised and note that the letter poses four possible scenarios:

1. Specimens unlabelled — tests completed and reported (with or without qualification).
2. Specimens unlabelled — laboratory worker insists no work be undertaken until correctly-labelled sample received.
3. Specimens incompletely or inaccurately labelled — tests completed and results reported (with or without qualification).
4. Specimens incompletely or inaccurately labelled — laboratory worker insists no work be undertaken until correctly-labelled sample received.

**As to scenarios 1 and 2**, we think a laboratory worker would be justified in analysing an unlabelled specimen and reporting on the results only in circumstances where there was other reliable evidence as to the source of the specimen such as an oral assurance from the taker of the specimen or some person present when the specimen was taken. If in weighing up the circumstances, a laboratory worker reasonably refused to provide test results on the grounds of uncertainty as to the source, the subsequent death of a patient might more reasonably be expected to result from the negligent failure of the person taking the sample to label it. Where, on balance, a laboratory worker elects to test and report on an unlabelled specimen the report should contain a qualification as to the source of identification of the specimen so that the ultimate responsibility for the use or otherwise of the test results would rest with the person relying on them.

**As to scenarios 3 and 4**, the degree of inaccuracy or incompleteness is particularly relevant and, again, we would expect reasonably prudent technical staff to make whatever enquiries were available to ascertain the true source of the specimen. The same balancing exercise would have to be undertaken having regard to the potential risks to the patient and, in our view, a qualified report would place the responsibility upon the shoulders of persons relying upon it.

In respect of all of the possible scenarios discussed, **we think that a reasonable set of rules prescribing the procedure to be followed in the case of unlabelled or incorrectly or incompletely labelled specimens should be prescribed. In our view, adherence to such rules would preclude any technical staff from liability.** Such rules should include a requirement for qualified reports in circumstances where the technical staff considers there to be some doubt as to the source of the specimen.

We trust our comments have answered your queries. We would be happy to assist with the drafting of any rules of procedure which might be submitted to hospitals for consideration.

Yours faithfully,
KENSINGTON SWANN
C.H. Toogood

***Council is presently drawing up a set of guidelines which will be circulated as soon as possible.***

## NZIMLT Annual Staffing Survey
### 1 April, 1987.

**Medical Laboratory Technologists**

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

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

**Medical Laboratory Assistants**

| *Currently Employed* | 1983 | 1984 | 1985 | 1986 | 1987 |
|---|---|---|---|---|---|
| Clinical Biochemistry | 188 | 188 | 193 | 183 | 169 |
| Microbiology | 170 | 165 | 186 | 168 | 152 |
| Haematology | 142 | 142 | 145 | 143 | 117 |
| Immunohaematology | 101 | 101 | 118 | 118 | 114 |
| Histology | 80 | 78 | 77 | 85 | 76 |
| Cytology | 39 | 40 | 32 | 36 | 40 |
| Nuclear Medicine | 8.0 | 16.0 | 12.5 | 16.8 | 11 |
| Immunology | 40 | 41 | 32 | 42 | 31 |
| Cytogenetics | 7.0 | 5.0 | 4.0 | 7.5 | 5.5 |
| Virology | 5.5 | 5.6 | 7.0 | 7.0 | 8.0 |
| Blood Collection | 88 | 87 | 96 | 91 | 91 |
| On rotation | 59 | 56 | 44 | 51 | 56 |
| Other | 28 | 24 | 31 | 44 | 49 |
| TOTAL | 955.5 | 948.6 | 977.5 | 992.3 | 919.5 |

| *Current Vacancies* | 1983 | 1984 | 1985 | 1986 | 1987 |
|---|---|---|---|---|---|
| Clinical Biochemistry | 3.5 | 5.5 | 5.5 | 7.0 | 11.0 |
| Microbiology | 2.0 | 3.9 | 4.8 | 8.4 | 5.4 |
| Haematology | 1.5 | 1.7 | 4.3 | 5.8 | 4.1 |
| Immunohaematology | 4.2 | 2.1 | 1.0 | 2.5 | 4.6 |
| Histology | | 0.5 | 3.0 | 2.0 | 4.5 |
| Cytology | | | 1.0 | 1.0 | 1.0 |
| Nuclear Medicine | | | 1.0 | | |
| Immunology | | | 1.0 | | 2.4 |
| Cytogenetics | | | | | |
| Virology | | | | | |
| Blood Collection | 1.6 | | 1.0 | 4.0 | 3.0 |
| On rotation | | 2.0 | 2.7 | 2.7 | 0.4 |
| Other | | | 1.0 | | 0.5 |
| TOTAL | 12.8 | 15.7 | 26.3 | 33.4 | 36.9 |

**Medical Laboratory Technology Trainees**

*Trainee Numbers*

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

*NZCS Trainees*

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

*Certificate Trainees*

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

*Specialist Certificate Trainees*

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

## Membership Sub-Committee Report — August 1987

Since our May meeting there have been the following changes.

| | 18.8.87 | 27.5.87 | 11.3.87 | 12.11.86 |
|---|---|---|---|---|
| **Membership** | 1511 | 1536 | 1717 | 1724 |
| Less Resignations | 13 | 35 | 24 | 10 |
| Less G.N.A. | 10 | 23 | 9 | 13 |
| Less deletions | — | — | 251 | — |
| Less deceased | — | — | 1 | — |
| | 1488 | 1478 | 1432 | 1701 |
| Plus applications | 31 | 31 | 103 | 14 |
| Plus reinstatements | 4 | 2 | 1 | 2 |
| | 1523 | 1511 | 1536 | 1717 |

**Applications For Membership**

Miss Frances NICHOLLS, Auckland; Mr Denis WEIR, Australia; Miss Angela TAYLOR, Auckland; Mrs Robin ORAM, Wellington; Mr Paul RICE, New Plymouth; Miss Zandra BAYLISS, New Plymouth; Miss Linda HIBELL, New Plymouth; Miss Erin WILSON, Auckland; Mrs Elaine MULLINS, New Plymouth; Mrs Anna LLOYD, Auckland; Mr Marcel PRONK, Hastings; Mrs Aneeta CHAND, Fiji; Miss Wendy THORBURN, Whangarei; Mrs Raewyn OLDERSHAW, Auckland; Miss Philippa BALL, Auckland; Miss Helen McGREGOR, Auckland; Mr Amon JOHNSON, Auckland; Miss Gir DEVI, Auckland; Miss Noella WRIGHT, Auckland; Mrs Margaret STANISIC, Auckland; Miss Wendy GRIMSHAW, Auckland; Mrs Janet EDWARDS, Auckland; Miss Phillipa GILVRAY, Dannevirke; Miss Siteri DRIU, Fiji; Mrs Janice BARNES, Auckland; Mrs Sharon EADE, Hamilton.

**Applications for Associateship**

Mrs Marilyn COCKBURN, Stratford; Mrs Margaret DICKINSON, Auckland; Miss Madhu PARBHU, Auckland; Mrs Julia McLACHLAN, Auckland; Mrs Colleen CRUICKSHANK, Rotorua.

**Reinstatement**

Mrs H. NABNEY, Tokoroa.

**Elected Honorary Members**

Miss N. DAVIES, Hamilton; Sr M. McKEEVER, Auckland; Mr C. FELMINGHAM, Greymouth; Mr J. HOLLAND, Hamilton; Sir John STAVELEY, Auckland; Mr G. MEADS, New Plymouth.

**Resignations**

Mrs D. WAKEFIELD, Auckland; Miss L. SUTHERLAND, Dannevirke; Mrs K. RUDDOCK, Thames; Mrs A. McMAHON, Invercargill; Mrs C. Clarke, WHANGAREI; Miss C. HENSMAN, Palmerston North; Mrs D. SKIDMORE, Christchurch; Mrs A. WILSON, Dunedin; Mr A. WILLIAMS, Wellington; Mrs I. WILSON, Dunedin; Miss K. REYNISH, Hawera; Mrs A. HALL, Dargaville; Mrs J. CLARKE, Invercargill.

**Gone No Address**

Miss N. BROWN, Auckland; Miss D. HOEY, Auckland; Miss K. BARK, Auckland; Miss T. HENTON, Auckland; Mrs P. McCOMB, Auckland; Miss R. KEBBY, Lower Hutt; Mr C. NIPPER, Auckland; Mrs B. SHEPPARD, Auckland; Miss E. LEE, Auckland; Mr B. CALLAGHAN, Auckland.

**Deceased**

Mr Gordon GEORGE, Rotorua.

## Medical Laboratory Technologists form Trust

*Des Philip, Chairman, New Zealand Medical Laboratory Science Trust*

A trust has been formed to support medical laboratory technology in this country, thereby enhancing the standards of testing and analysis.

The New Zealand Medical Laboratory Science Trust will seek corporate and individual sponsorship to aid research, education, equipment purchase, scientific publication and overseas study.

"Medicine depends on laboratory tests to uncover health problems such as AIDS and hepatitis," says Des Philip, chairman of the New Zealand Institute of Medical Laboratory Technology.

"This largely hidden work of testing and analysis plays a crucial part in the ongoing effort to keep New Zealanders fit and active. In fact no patient passes through a hospital without requiring some form of laboratory investigation.

"It is this work which deserves the support of all individuals and organisations which have connections with the profession of Medical Laboratory Technology," Mr Philip says. A trust target figure of $250,000 has been set.

The Trust is being underwritten in the early stages by the New Zealand Institute of Medical Laboratory Technology. Supporters of the Trust will receive visible recognition of their contributions in forms such as Principal and Major Sponsor status; naming rights for grants, fellowships and travel awards; wall plaques and donor seals; and preferential booking of trade space at exhibitions. The New Zealand Medical Laboratory Science Trust is an approved charity and all contributions are tax-exempt.

The Trust was officially launched at the annual conference of the Institute in Nelson on August 19, 1987. Mr Philip says the Trust provides a chance for individuals and organisations to make an extremely worthwhile contribution to Medical Laboratory Technology, while at the same time achieving a higher profile.

# In use where they count: Blood Gas and ISE Electrolyte Systems from AVL.

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## ISE Electrolyte Systems


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### AVL 983 $Na^+/K^+/Cl^-$

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of the AVL 982 combined with
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**or Circle 206 on Readers Reply Card**

# HS19 Lab Workers — Amending Determination — HSPC Circular No. 1987/53

1. The effect of Health Service Amending Determination No 2332 attached is to remedy defects in HS19.

2. *Entry to Senior Laboratory Assistants' Scale*
Clause 2(4) has been reworded to better reflect the original intention of the former clause. The effect of this rewording is to separate out two criteria for determining entry to the scale. Fulfilling either one of these criteria is sufficient justification for entry.

3. *Increments for Gaining QTA*
The reference to the Certificate of Qualified Technical Officer in subclause 2(5)(e) has been deleted. Since the qualification has not been issued since 1981, reference to it has made the clause difficult to interpret.

4. *Meal Periods and Rest Breaks*
This clause has been amended to just cite HS48. The additional wording in the previous clause is contained within HS48.

5. *Lab Assistants Employed at 10 November 1985*
The Commission has recently concluded negotiations with the New Zealand Institute of Medical Laboratory Technology over the application of clause 2(5)(e). This clause deals with the granting of additional increments for gaining the Certificate of Qualified Technical Assistant.
This clause was amended after negotiations in the 1985/86 wage round with the effect that laboratory assistants who gain their first QTA after 10 November 1985 receive two increments instead of the previous one. At that time no provision was made for laboratory assistants who had already gained a QTA. Hence laboratory assistants who qualified since 10 November 1985 were more advantaged than previously qualified lab assistants. It was agreed that the lack of a transitional provision to cover these staff was a mutual oversight and that action should be taken to remedy this as soon as possible.
Boards are therefore advised to grant all laboratory assistants who were employed at 10 November 1985 and who held a QTA at that time, one additional increment to take effect from 10 November 1985. The increment dates of each individual should remain unchaged.
NB: It has been agreed that subclause 2(5)(e) does not apply to senior laboratory assistants so no additional increments should be granted to anyone employed as such at 10 November 1985

6. *Employees Who Have Resigned*
Employees who have resigned since 10 November 1985 should, on application to the Board, be paid any arrears due

Yours faithfully,
T.J. Neilson
for Chief Executive.

# HEALTH SERVICE AMENDING DETERMINATION NO. 2332 HS19 LABORATORY WORKERS OCCUPATIONAL CLASS

Pursuant to section 24(1)(a) of the State Services Conditions of Employment Act 1977, the Health Service Personnel Commission hereby makes the following amending determination.

## APPLICATION OF AMENDING DETERMINATION

1. Health Service Determination No. HS19 as amended from time to time is further amended as follows.

2. The First Schedule, Part A is amended by:
(1) replacing "Entry to the senior laboratory assistants scale . . . automatic annual increment" from subclause 2(4) with "Entry to the senior laboratory assistants' scale shall be restricted by the Health Service Personnel Commission to:
(1) laboratory assistants who hold an appropriate qualification and who have achieved a satisfactory level of competence; or
(2) laboratory assistants who have achieved an exceptional level of competence in a developmental or specialised service.
Progression within the grade shall be by automatic annual increment."
(2) deleting "(and/or the "Certificate of Qualified Technical Officer" prior to 1981)" from subclause 2(5)(e).

3. The Second Schedule is amended by deleting "provided that any lab worker . . . meal break can be taken" from the Meal Periods and Rest Breaks clause.

4. Replacement pages incorporating the amendments prescribed in paragraphs 2 and 3 above are attached.

Dated this 31st day of July 1987.

J.R. Martin, Chairman.
M.C. Bazley, Member.
D.R. Fraser, Member.



| | |
|---|---|
| 20,495 | 21,930 |
| 19,909 | 21,303 |

Entry to the senior laboratory assistants scale shall be restricted by the Health Service Personnel Commission to:
(1) laboratory assistants who hold an appropriate qualification and who have achieved a satisfactory level of competence; or
(2) laboratory assistants who have achieved an exceptional level of competence in a developmental or specialised service.

Progression within the grade shall be by automatic annual increment.



## SECOND SCHEDULE — CONDITIONS OF EMPLOYMENT (Continued)

| | |
|---|---|
| Meal Periods and Rest Breaks | Standard HS48 |
| Damage to Personal Clothing | A laboratory worker may at the board's discretion be compensated for damage to personal clothing worn on duty, or reimbursed dry cleaning charges for excessive soiling to personal clothing worn on duty, provided the damage or soiling did not occur as a result of the employee's negligence or failure to wear the protective clothing provided. |



(e) a laboratory assistant who obtains the "Certificate of Qualified Technical Assistant" issued by the New Zealand Institute of Medical Laboratory Technology shall be granted a double salary increment for the first qualification, and a single salary increment for every additional qualification on the first day of the month immediately following the date on which he/she completed the examination and his/her incremental date will not be changed.

(6) *Graduate Technologist*
Note: This scale is only applicable to graduate technologists appointed before 1.9.78

*No further appointments to this scale shall be made.* A graduate technologist employed before 1.9.78 shall be paid one of the following rates:

| | *10.11.85* $ | *15.01.87* $ |
|---|---|---|
| (i) | 30,047 | 32,150 |
| | 28,162 | 30,133 |
| | 26,339 | 28,183 |
| | 24,521 | 26,237 |
| | 23,612 | 25,265 |
| (ii) | 22,706 | 24,295 |
| | 21,800 | 23,326 |
| | 20,879 | 22,341 |
| | 20,057 | 21,461 |
| | 19,252 | 20,600 |
| | 18,643 | 19,948 |
| | 17,803 | 19,049 |

Provided that:

on the recommendation of the board and subject to the prior approval of the Health Service Personnel Commission, accelerated advancement may be granted within either scale (i) or (ii), regard being had to special merit or special responsibilities, special academic qualifications, or such other special factors as may be recognised by the Health Service Personnel Commission.

## N:Z.I.M.L.T. CALENDAR

| | |
|---|---|
| 18-19 November, 1987 | Council Meeting — Auckland. |
| 3-4 December, 1987 | MLTB Meeting — Wellington. |
| 26 February, 1988 | Applications close for QTA & Fellowship Exams. |
| 16-17 March, 1988 | Council Meeting (provisional). |
| 8 April, 1988 | Committee accounts to be with the Treasurer. |
| 29 April, 1988 | Committee Annual Reports to be with the Secretary. |
| 10-11 May, 1988 | QTA Examinations. |
| 31 May, 1988 | Proposed Rule changes and Remits to be with the Secretary. |
| 1-2 June, 1988 | Council Meeting (provisional). |
| 2 July, 1988 | Nomination forms for the election of Officers and Remits to be with the membership (60 days prior to AGM). |
| 5-7 July, 1988 | Fellowship examinations. |
| 23 July, 1988 | Nominations close for the election of Officers (40 days prior to AGM). |
| 11 August, 1988 | Ballot papers to be with the membership (21 days prior to AGM). |
| 18 August, 1988 | Annual Report and Balance Sheet to be with the membership (14 days prior to AGM). |
| 25 August, 1988 | Ballot papers and proxies to be with the Secretary (7 days prior to AGM). |
| 29-30 August, 1988 | Council Meeting — Rotorua. |
| 31 August/ 2 September, 1988 | Annual Scientific Meeting — Rotorua. |
| 1 September, 1988 | AGM & SGM — Rotorua. |

**OTHER MEETINGS:**

| | |
|---|---|
| 17-22 July, 1988 | IAMLT Congress — Kobe, Japan. |
| 11-16 September, 1988 | AIMLS ASM — Melbourne. |
| 16-20 July, 1989 | ASEAN Conference MLT — Singapore. |

**43rd ANNUAL SCIENTIFIC MEETING**
**ROTORUA**
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# 42nd Annual Scientific Meeting
## Abstracts

**The Hazardous Autopsy**

Dr J.H. MAYNARD, Dandenong and District Hospital, Dandenong, Victoria, Australia.

All autopsies are hazardous and special care should be taken with high risk cases. General points to be noted were listed and specific diseases including AIDS, Creutzfeld Jakob Disease and Hepatitis were discussed in detail with regard to autopsy and tissue precautions.

Results of quality assurance program with regard to tissue handling and staff protection were presented also and discussed.

**Experience using High Sensitivity TSH as a Frontline Test in Thyroid Function Screening.**

Gerard R. VERKAAIK, Wairau Hospital, Blenheim.

With the advent of very sensitive assays for TSH, a number of recent journal articles have suggested the practicability of using this test in the first instance for thyroid screening.

In order to test the validity of this suggestion under frontline laboratory conditions, duplicate hTSH assays were performed on 432 consecutive patient samples (and one dog). Free $T_4$ was measured also concurrently, this being the existing first line test.

Retrospective clinical evaluation of thyroid status was sought on all patients with abnormal or discordant results.

Correlation between hTSH and clinical thyroid illness was excellent, confirming the superiority of hTSH over $FT_4$ as the first line test. However, a substantial pool of 40 equivocal results remained, notably in patients over 60 years old. There is obviously a significant amount of subclinical or compensated thyroid dysfunction within the community. This requires careful clinical assessment before diagnosing thyroid disease per se, on the basis of laboratory findings, particularly in the elderly.

**Sodium and its Transport Mechanisms Across the RBC Membrane**

R.W.L. SIEBERS, T.J.B. MALING, Department of Medicine, Wellington School of Medicine.

Sodium is held at low levels in the RBC (± 8 mmol/L) mainly through the action of Na-K ATPase. There are various other $Na^+$ transport mechanisms present on the RBC membrane which help fine tune intracellular $Na^+$ concentration. Methods and technical problems associated with measurement of RBC $Na^+$ and its various transport mechanisms will be presented and discussed.

An association between increased RBC $Na^+$ and alterations in $Na^+$ transport mechanisms in human essential hypertension has been highlighted in recent years and may provide an insight into the underlying causes of hypertension. Results from our unit were presented to answer the following questions:

1. Do mild untreated hypertensive subjects with a positive family history of hypertension have abnormal RBC $Na^+$ and $Na^+$ transport mechanisms as compared to normotensive subjects?
2. Does excess salt intake modify these parameters?
3. Is there a Na-K ATPase inhibitor present in hypertensive subjects linked to enhance salt intake?

**Quality Assurance in Anatomical Pathology Organisational Aspects**

Dr J.H. MAYNARD, Dandenong and District Hospital, Dandenong, Victoria, Australia.

The history and aims of quality assurance were discussed. The methods adopted by the Royal College of Pathologists of Australasia in organising the program which includes the diagnostic skills of pathologists, range of materials, sources of suitable test material, stability of material, transport and packing, assessment of technical proficiency, and criteria used in that assessment were discussed.

The method of reporting to participants and maintenance of participant interest, confidentiality, action sheets and improvement of performance monitoring was discussed.

**Technical Aspects in Anatomical Pathology — Results**

Mrs Karen RADOK, Dandenong and District Hospital, Dandenong, Victoria, Australia.

The RCPA Anatomical Pathology QAP Survey has endeavoured to assess the ability of its participants to produce both excellent Haematoxylin and Eosin stained sections and sections stained for the following elements:

Haemosiderin, Gram Positive Organisms, Amyloid, Acid Fast

Bacilli, Neuroglial fibres, Muscle striations, Fungi, Connective tissue, Fat in frozen sections, Elastic fibres.

Wet tissue has also been sent on a number of occasions to test for general sectioning ability of the participants.

Questions are answered on aspects relating to staining and statistics are compiled from these.

The final results are compiled and returned to each participant in the hope that the comments written and the statistics presented will help to reinforce good laboratory practices and erase unacceptable practices in the laboratory.

**Laboratory Practice Aspects in Anatomical Pathology — Results**

Dr J.H. MAYNARD, Dandenong and District Hospital, Dandenong, Victoria, Australia.

Many practices in anatomical and surgical pathology are developed and become routine because they produce the best results. Many of these routines are implemented and are learned in an apprentice-like manner by the laboratory staff.

Practices vary considerably and an attempt will be made to survey and correlate these, together with some collected references that are available. The practice which provides the best quality should be the one recommended and examples were taken from survey results to illustrate these points.

**Laboratory Practice Aspects from a Technical Viewpoint**

Ms Karen RADOK, Dandenong and District Hospital, Dandenong, Victoria, Australia.

During the time that we have been organising the RCPA QAP Survey, we have attempted to compile information on general laboratory practices and procedures.

By distributing statistics on how many laboratories do or do not follow certain practices, we have endeavoured to highlight acceptable and non-acceptable techniques. The questions have been asked in such a manner as to hint at what often *should* be done in every laboratory; by seeing whether they are the exception in certain cases may prompt some participants to consider alternative methods.

The final aim is one of improved standards and excellence.

**Phenotyping IgG Sensitised Red Cell using Fab Anti-IgG.**

S.M. HENRY, Department of Transfusion Medicine, Auckland Regional Blood Centre.

An IgG molecule contains three main structural regions; one Fragment crystalline (Fc) region and two Fragment antigen binding (Fab) regions. Limited proteolysis of the IgG antibody with papain splits the molecule into one Fc and two separate Fab fragments. These Fab fragments are compact, molecular units with the same combining affinity for antigen as those of untreated antibody. They are, however, not capable of supporting agglutination and it is this property which makes Fab fragments of anti-IgG a suitable IgG neutralising reagent.

We have utilised Fab anti-IgG to neutralise red cell bound IgG. Fab anti-IgG acts by blockade of the anti-globulin binding sites of the cell bound IgG, thus avoiding the problems involved with achieving dissociation. After blockade with Fab anti-IgG alone or in conjunction with mild chloroquine diphosphate treatment, cells were then phenotyped with antisera by the indirect antiglobulin test.

Fab anti-IgG was able to block cell bound IgG in 61 of 67 (91%) in vivo sensitised samples. The expected antigen frequency for $Jk^a$, $Jk^b$ and $Fy^a$ were found when 25 in vivo sensitised samples were phenotyped. In vitro sensitised blood samples could likewise be neutralised and accurately phenotyped although some samples required additional chloroquine treatment to permit full phenotyping.

Fab anti-IgG is a simple convenient technique for neutralising cell bound IgG. The red cell membrane remains intact without being subject to stress from either chemicals or heat, leaving the red cell antigens unaffected. The method is a variation on established principles and can be introduced into routine work. Development work also shows that Fab anti-IgG can be used in ELISA assays.

**Fibrinolysis: New Laboratory Horizons**

A.S. JOHNS, FNZIMLT, Haemostasis Laboratory, Department of Haematology, Auckland Hospital.

The physiological regulation of plasmin formation in plasma depends upon a number of interrelated proteins present as zymogens in the blood and endothelium. A number of inhibitors act to regulate the fibrinolytic response and physiological clot dissolution depends upon the delicate balance of these factors. Pathological fibrin (ogen) olysis occurs when the fibrinolytic system becomes imbalanced with one or more of these proteins or inhibitors demonstrating decreased or increased activity. Historically the coagulation laboratory has been hampered by inadequate and insensitive tests to measure the fibrinolytic factors, but, with the development of both Enzyme Linked Immunosorbant Assays (ELISA) and chromogenic assays a new impetus has developed in this area and the laboratory now has the tools to investigate the fibrinolytic response in much greater detail.

With the increasing use of thrombolytic therapy in both venous and arterial thrombosis and the development of new thrombolytic drugs such as recombinant Tissue Plasminogen Activator (r-tPA) which selectively lyses clot-bound fibrin, a whole new era in fibrinolysis has arrived.

This paper reviewed the fibrinolytic system and the laboratory tests used to define hypo-and hyperfibrinolysis and finally the new tests available in the laboratory to investigate the fibrinolytic response.

**INR versus PR Reporting in a Cardiology Unit**

Vivienne MUFTY, Coagulation Unit, Haematology Department, Greenlane Hospital.

Two thromboplastins, THROMBOREL-S and DIAGEN, with International Sensitivities of 1.15 and 1.4 respectively were compared in an exercise involving over 70 patients not stable on oral anticoagulants.

The progress of the patients through Coronary Bypass Surgery and subsequent oral anticoagulant therapy was followed in an attempt to assess the clinical impact of reporting International Normalised Ratios in an unstable anticoagulant situation. The results of the exercise were discussed retrospectively with the medical teams involved with the patients. The feasibility of reporting all results as INR's was looked at in an attempt to simplify a very confusing situation in a Cardiac Hospital.

**Safety in The Laboratory — The Director's Role**

Dr J.H. MAYNARD, Dandenong and District Hospital, Dandenong, Victoria, Australia.

The general and specific requirements for safety in the laboratory were indicated and the results of the survey and the level of safety in laboratories in Australia and New Zealand were presented.

Disposal of waste, safety equipment, safety manuals, safety officers, and design features have all been surveyed.

The Director is responsible for the safety policy and must formulate a definite plan and document it.

An example of a photographic survey of safety and hazards was used.

**Safety in The Histology Laboratory — The Laboratory Scientist's Role**

Ms Karen RADOK, Dandenong and District Hospital, Dandenong, Victoria, Australia.

Many safety practices may seem very basic and purely a matter of common sense. However, common sense is often forgotten in the day to day running of the laboratory.

A series of slides have been taken around our own histology laboratory in an effort to highlight problem areas and often neglected practices. A number of the situations have been contrived but others have not.

We are currently in the process of greatly improving our cytology preparation area in terms of personnel safety and staff protection.

It was anticipated that this presentation would prompt others to view their familiar laboratory surroundings with a renewed outlook in respect to safety standards.

**Semi-automatic Donor Typing using the Kontron Mini-groupamatic**

David WILSON, Immunohaematology, Palmerston North Hospital.

This instrument was installed in the department two years ago, and has since then processed 30,000 donor samples.

At a rate of 120 samples per hour this instrument gives a "no group determination rate" of 1.2% before editing.

Tests performed on this instrument at present include ABO and Rh (D) Typing, ABO Haemolysins, Rh Genotyping, Antibody Screening, Identification and Titres.

**Thromboplastin — A Comparative Study**

A.S. JOHNS, FNZIMLT, Haemostasis Laboratory, Department of Haematology, Auckland Hospital.

With the discovery of the Human Immunodeficiency Virus (HIV) and its potential infectivity of health workers thromboplastin prepared from human brain has become a less acceptable reagent. Thromboplastin prepared from animal sources have generally yielded reagents with a

lesser sensitivity to the PIVKA effect (Proteins Induced by Vitamin K absence or Antagonists). Various methods of standardisation of these reagents to reference preparations have been postulated, including the International Sensitivity Index (ISI) currently recommended for use in reporting of results from patients on oral anticoagulant therapy. Standardisation of a thromboplastin to ease comparison of results of one reagent to those obtained with a reference preparation may result in a thromboplastin with altered sensitivity to other factors such as liver disease or factor deficiencies. With increased ISI values, as seen with most animal thromboplastins, there is a non-linear narrowing of the therapeutic range and the prolongation of therapeutic from normal values progressively diminishes.

COAGULON (ICP) is a locally produced rabbit brain thromboplastin with an ISI of 1.05. Evaluation of this thromboplastin together with a locally produced human brain thromboplastin, a commercial rabbit brain thromboplastin (Diagen) and a commercial human placental thromboplastin (Thromborel S. Behring) was performed. This paper discussed the comparative sensitivities of these thromboplastins to PIVKA, factor deficiencies, heparin, liver disease and Vitamin K deficiency.

**Many Reasons for Sailing Away?**

Brian CURRIE, Pathology Department, Palmerston North Hospital.

Methicillin Resistant *Staphylococcus Aureus* (MRSA) has been endemic in hospitals world-wide for many years. Until recently New Zealand hospitals had experienced only isolated incidences of MRSA. This paper presented an overview of a major outbreak of MRSA in a New Zealand provincial hospital, covering the course of the outbreak, the organism, and the impact of such an out-break on the resources of a Microbiology Laboratory. The paper suggested that present infection control methods may not be sufficient to contain further outbreaks by an organism with similar properties.

**Unclassified Coryneform Organisms associated with Urinary Tract Infection**

John M. AITKEN, The Princess Margaret Hospital, Christchurch.

Unclassified coryneform organisms (UCO's) are catalase negative small gram variable rods. They occur commonly in vaginal specimens from women with and without vaginitis. UCO's were repeatedly isolated from the urine of two patients with symptoms of urinary tract infection. Urine samples were inoculated onto sheep blood agar, using the calibrated loop technique, and incubated at 37°C in 5% $CO_2$ for 48 hours. Cell counts performed on consecutive samples repeatedly demonstrated 1000 x $10^6$/L leucocytes and bacterial counts on the same specimens grew 100 x $10^6$/L colony forming units (cfu) and UCO's. A bladder puncture taken from one patient grew a pure culture of 100 x $10^6$/L of UCO's after aerobic and anaerobic culture. Both patients responded to appropriate directed antimicrobial therapy. UCO's should be considered as possible agents in urinary tract infection.

**"Reinventing The Wheel"**

Ian GUILD, Microbiology Department, Green Lane Hospital.

Microbiology, Green Lane Hospital, had the opportunity of developing a computer system specifically tailored for our needs. Together with Intergrated Computer Systems we succeeded in our aim of a working microbiology system.

This presentation discussed the history, development and some of the problems we encountered.

**"Reinventing The Wheel" — A Laypersons View**

Karen SALTER, Infection Control Nurse, Microbiology Department, Greenlane Hospital.

This paper outlined a laypersons use of a Microbiology Computer System to assist with infection control management.

**Apolipoprotein E Polymorphism and Lipoprotein Metabolism**

Susan GRANT, Mark WARDELL and Edward JANUS, Biochemistry Unit, The Princess Margaret Hospital.

Measurement of specific apoproteins is becoming increasingly important in the assessment of hyperlipidaemia. Apoprotein E mediates the catabolism of binding to the B/E receptor and variants of this protein are a cause of type III hyperlipidaemia. We have studied the conversion of VLDL to LDL in seven patients with type III hyperlipidaemia and six normal controls. The FCR was decreased in the patients (0.094± 0.023) compared with normal (0.301± 0.084), but increased after clofibrate treatment (0.150± 0.040). In seven cases apo E was isolated and protein sequencing performed. Six patients had the usual mutation (158 cys-arg) but one patient was heterozygous for a new variant apo E (145 arg-ser).

**Life with the B-M Hitachi 704**

Ian G. GREEN, Ian P. MacKAY, Dept. of Clinical Chemistry, Auckland Hospital.

This laboratory purchased a BM Hitachi 704 analyzer with reagent cooling and ISE's in November 1986, as a partial replacement for ageing SMA alanyzers.

The analyzer was the first one installed in a New Zealand laboratory with the new ISE module. It has now been running routinely for six months, doing up to 20 chemistries sixteen hours per day, seven days per week.

The general impression of the analyzer has been very favourable, and we have found it ideal for use over weekends and nightshifts. Although its' theoretical throughput is below that of an SMA 12/60, at times of low numbers of requests/specimens, it has distinct advantages. The "walk-away" capability suits us well at low staffing times, and it has been very well accepted by laboratory staff.

Considerable interest has surrounded the introduction of the completely redesigned ISE unit. This paper discussed the trials and tribulations associated with this unit, together with a look at the analyzers' ease of operation, precision and overall performance.

**Some Thromboplastin Idiosyncrasies**

H.T. MORIARTY, P.R.L. LAM-PO-TANG and N. ANASTAS, Thromboplastin Unit, Prince of Wales Hospital, Randwick, N.S.W., Australia.

In 1984 the World Health Organisation recommended that the Prothrombin Time test of patients receiving Warfarin therapy be reported as International Normalised Ratios (INR). An INR is a prothrombin ratio obtained for any plasma using the primary international reference thromboplastin (IRP 67/40) as the test reagent. This reagent is a human brain thromboplastin and has been arbitrarily assigned an International Sensitivity Index (ISI) of 1.00. The sensitivity (ISI) of all other thromboplastin reagents can be estimated from this primary reference reagent. International Normalised Ratios are calculated by using the formula: INR = Prothrombin Ratio $^{ISI}$.

The ISI's of various thromboplastins were estimated at the Prince of Wales Hospital, Sydney, and they ranged from 0.92 to 2.29. It was observed that as the ISI became higher less reliable International Normalised Ratios were obtained. When the ISI of a reagent was close to 2.00 it became impossible to distinguish between plasmas at the top of the therapeutic range and plasmas above that range, leading to a risk of over-anticoagulation. Another finding was the increased scatter of results obtained with some thromboplastins of human or non human origin when the ISI's were greater than 1.2. This increase in scatter was also apparent with other reagents of non human origin despite the fact that the ISI's were close to 1 00

**IIb or not IIb?**

Christine HICKTON, Haematology Department, Christchurch Hospital. Brent BISHOP, Haematology Department, Dunedin Hospital.

Von Willebrands disease (vWd) is the commonest of the congenital bleeding disorders. The chief manifestations of this disorder, which varies greatly in its severity, are an increased tendency to bleed, characteristically from mucosal sites, and easy bruising. vWd comprises a variety of different disorders that have in common the presence of quantitative (Type I vWd) and/or qualitative (Type II) abnormalities of plasma von Willebrands factor (vWf).

Patients have been described with a clinically similar disorder, but where the primary abnormality is an intrinsic platelet defect involving the platelet -vWf interaction[1]. This has been termed "Pseudo" or "Platelet type" vWd. This disorder shares a number of features with the vWd variant type IIb.

Recently a patient, previously diagnosed as having v Wd, presented at Christchurch Hospital. Initial laboratory findings indicated either IIb variant vWd or Pseudo von Willebrands disease. The classification of vWd and the further laboratory investigations which supported a diagnosis of pseudo vWd in this patient was presented.

1. Jonathon L. Miller, *Clin Lab Med* 1894; Vol4 No2: 319-331.

**"I Have a Small Laboratory, So There!"**

John M. AITKEN, The Princess Margaret Hospital, Christchurch.

Technologists in charge of smaller microbiology departments often feel they are the inadequate "younger brothers" of their counterparts in the larger laboratories. The structure of the two systems differs, and

there are options available to the staff of the smaller laboratories as a means to regain self-respect and, at the same time, provide a managerial model for the larger microbiology departments. Equipment needs also differ, and "smart machines" such as the Quantum BID may be useful in the more flexible small microbiology unit.

**Streptococcus Claytoniae**

Ben HARRIS, Microbiology Dept, Christchurch Hospital.

*Kingella kingae* was isolated from the blood cultures of a patient presenting with spiking fever and endocarditis. Initial microscopic, biochemical and colonial examination was suggestive of a B haem Streptococcus — "confirmation" of which was obtained by latex agglutination. Subsequent testing showed the latex reagent had auto-agglutinated which was probably due to gross bacterial contamination by the manufacturer.

Contaminated laboratory reagents and its serious potential implications should be considered more.

**"What Did You Do At Work Today, Dear?"**

John M. AITKEN, the Princess Margaret Hospital, Christchurch.

The emergence of AIDS has resulted in an increased interest in infection by the lay-person. Technologists in microbiology may be asked to speak to service and para-medical groups on the subject of infection, as part of the increased profile of the profession. To do this, without scaring the audience to death, requires careful planning and a cool nerve. The rest of us, lacking these prerequisites, may be able to avoid some of the pitfalls waiting for the unwary scientific public speaker.

**The Detection of Rare Blood Groups by the Autogrouper 16C**

Y.D. JOE, Auckland Regional Blood Services, Auckland.

The detection of rare blood groups in the ABO, Rh and Kell systems by the Autographer 16C was described. The results from 72,713 blood donors showed the impartiality of a fully automated blood grouping system.

**Blood Group Serology by Manual Microplate Method**

Roger AUSTIN, Immunohaematology Department, Taranaki Base Hospital.

Microplates have been in use for many years for haemaglutination techniques. This presentation outlined the way in which microplates have reduced the costs of routine blood grouping in a medium sized provincial centre. Savings of 95% in the costs of some reagents, a similar saving in disposables and a reduction in staff time requirements have resulted. This video presentation was also an example of the use of this medium as the method for disseminating information on simple technical operations that would be unwieldy by other means.

**Appropriateness of Urine Testing Outside The Laboratory**

Tom MULVEY, North Shore Hospital.

This paper looked at some studies on the uses of urinalysis by dip sticks. It covers the clinical relevance of measuring each parameter available. Consideration was given to the appropriateness and effectiveness of multi-parameter testing by non-laboratory staff.

The conclusions reached are that there are only a few tests worth performing routinely. Staff carrying out the tests should be trained by laboratory personnel. Equipment should be calibrated and serviced by laboratory staff. Chemistries utilised should be end point and the sticks should be plastic coated. Laboratory staff should also provide a quality control scheme to monitor the effectiveness of the whole system.

A strategy was offered for implementing such a scheme.

**Alanine Aminotransferase (ALT) Levels in Christchurch Blood Donors**

K. McLOUGHLIN, Blood Bank, Christchurch Hospital, J. LeGRICE, Biochemistry, Pearson Laboratory, T. ROLLINSON, Biochemistry, Christchurch Hospital.

The American Association of Blood Banks requires its member institutions to test all blood donors for ALT and hepatitis B core antibody. This is done in an attempt to reduce the incidence of post-transfusion non-A, non-B (NANB) hepatitis. Because the extent of the NANB hepatitis problem in New Zealand transfusion recipients is not known, a study such as this is useful in providing indirect evidence of the potential problem.

Two groups of random donors were tested, one group in April 1985, and the other in May 1987. Each group contained more than 900 individuals an although two different methodologies were used, results were comparable. A distinct sex difference was noted in mean levels and findings suggest that an inappropriate upper limit of normal may be in current use in some biochemistry laboratories. The study showed that there is a significant proportion of abnormally high ALT levels in asymptomatic blood donors but does not resolve the clinical question — is there a post-transfusion NANB problem?

**Rationale For and Development Of a Total Data Management System for Smaller Laboratories, using Networked Micro-computers.**

Gerard R. VERKAAIK, Peter K. O'HANLON, Laboratory, Wairau Hospital.

I Computerisation of smaller general purpose laboratories poses a range of problems that are not currently met by available software systems. The relatively small volume of data from a broad range of analyses, coupled with limited available finance for capital outlay, compounds the decision-making process of balancing the advantages and disadvantages of electronic data management. There is an inverse ratio between data volume and benefits of EDM.

The problem had been tackled at Wairau Hospital over the last three years; the outcome of which is a very versatile, highly competitive DMS based on Revelation software (a fourth generation language) operating on networked AT-PCs. The system stands alone, is fully IBM compatible and patient results can be downloaded onto mainframe or minicomputer. Modular design allows for staged introduction with an increasing array of interfaced analysers as required.

II *Inappropriate Computerisation:* A look at the lighter side of the computer scene in laboratories.

**Hospital Computing — The Gisborne Experience**

Geoff JOYCE, Pathology Department, Gisborne Hospital.

Gisborne Hospital is currently implementing a computer system based on an Adds Mentor M6000 minicomputer. The software packages which are currently in operation cover the laboratory, pharmacy, dietary and nursing areas, and are able to interact with each other. For example, wards may access laboratory results directly through their terminals. The system is also linked to the Departments mainframe allowing registration of patients using the nationwide system.

An overview of the development of the Gisborne Hospital system was given, some of the problems encountered, and how we came to choose the system that we did. The main features of the laboratory system was discussed.

## NEW PRODUCTS AND SERVICES

BECKMAN INTRODUCES NEXT ANALYSER IN SYNCHRON SERIES

The Beckman SYNCHRON™ CX™5 Clinical Analyser is a flexible clinical chemistry system, capable of analysing most general, electrolyte, protein and drug chemistries at a rate in excess of 500 tests per hour in either STAT, panel or profile mode. Users in hospitals, private and public clinics are provided with an operator interface in a choice of five languages which are German, French, Italian, Spanish and English. The CX5 incorporates the latest software logic thereby setting new standards in ease-of-operation.

THE SYNCHRON CX5 can hold up to 24 on-board chemistry, protein or drug tests plus four electrolyte tests for sodium, potassium, chloride and $CO_2$. Adding to the versatility of the CX5 System, the CX5 allows the creation and storage of up to 100 user-defined methodologies. Beckman's electrolyte analysis capability has been proven worldwide for accuracy and reliability.

At the time of first product shipment, a menu of approximately 35 tests will be available. These are provided in barcode-labelled cartridges which control instrument setup and simplify inventory management. Savings in terms of both time and reagent wastage are significant.

Samples for analysis are loaded continuously by an automatic 'Autoloader' which maximises the throughput of the system. STAT samples can be introduced at any time.

On-board refrigeration provides a 30-day reagent stability and the instrument's modular design provides easy access to customer serviceable areas.

Beckman's reagent technology provides accurate methodologies with long periods of calibration stability. In addition, the use of multi-analyte calibrators reduces the number of required on-board calibration materials

An advanced operator interface mades the CX5 simple to learn and easy to operate. A host of advanced software features such as on-line QC, result formatting, and flexible patient demographics entry provides SYNCHRON CX5 suitability for all testing environments. Moreover, extensive software-driven diagnostics and limited maintenance requirements reduce down-time to an absolute minimum.

Other Beckman SYNCHRON Systems now available include the AS™4 and AS™8, the CX™3 and CX™4, and INTERLINK™.

For further information contact Sonatec Systems, P.O. Box 78-096, Auckland or **circle 179 on readers reply card.**

BOOTS CELLTECH PRODUCTS

We are pleased to announce the appointment of Kempthorne Medical Supplies as exclusive distributors of the Boots-Celltech Diagnostics Ltd range of products in New Zealand

Boots-Celltech use state-of-the-art technology to produce quality monoclonal antibody-based diagnostic products. They have led the world with such innovations as the first truly ultra-sensitive Thyroid Stimulating Hormone (TSH) assay that reliably differentiated thyrotoxics from euthyroids. In microbiology, direct antigen tests for Chlamydia and Respiratory Syncytial Virus (RSV) have now been complemented with the first direct immunofluorescence test for Influenza A + B and very recently the first true direct antigen ELISA for Herpes Simplex Virus (HSV) detection.

E I A TEST FOR CHLAMYDIA FROM BOOTS-CELLTECH

For the detection of Chlamydia Trachomatis Boots-Celltech Diagnostics Ltd have introduced a high sensitivity test with monoclonal antibody specificity. Designed for the rapid testing of both large and small numbers of male and female urogenital specimens, the IDEIA CHLAMYDIA test has been associated with excellent results in clinical practice.

A recent clinical trial (312 specimens — 212 women, 100 men) compared the IDEIA CHLAMYDIA test with tissue culture. The results showed the IDEIA CHLAMYDIA test to yield a specificity of 99% and a sensitivity of 92%.

Use of microplate reader ensures a high level of accuracy.

The Boots-Celltech range of products is distributed in New Zealand by Kempthorne Medical Supplies Ltd, 79 Carlton Gore Road, Newmarket, Auckland. Telephone 775-289 or **Circle 180 on readers reply card.**

DIRECT IMMUNOFLUORESCENT TEST FOR CHLAMYDIA

Recent clinical evidence has confirmed the sensitivity and specificity of the IMAGEN CHLAMYDIA Test from Boots-Celltech.In an independent evaluation, 250 specimens were obtained from a random selection of patients attending STD Clinics. Each specimen was tested by IMAGEN CHLAMYDIA Test and by McCoy cell culture. There was 96% agreement between IMAGEN CHLAMYDIA Test and McCoy cell culture

The IMAGEN CHLAMYDIA Test is a direct immunofluorescent test containing a fluorescein isothiocyanate conjugated monoclonal antibody. The monoclonal antibody will detect elementary bodies from all 15 known serovars of chlamydia trachomatis, in urethral or cervical smears. The liquid, ready-to-use reagents and simple six-step procedure allow direct detection of chlamydia trachomatis, within 30 minutes.

Details of this test can be obtained from New Zealand distributors Kempthorne Medical Supplies, 79 Carlton Gore Road, Newmarket, Auckland, telephone 775-289 or **Circle 181 on readers reply card.**

QUALITY ASSURANCE

It may be possible to further enhance the ability of health care professionals to reduce the long term side effects of diabetes mellitus using a new blood glucose monitoring programme

The programme is designed to assist Ames glucometer operators in obtaining more accurate results from blood glucose tests and hence, improve blood glucose control and patient therapy

Based on two programmes already in place in South Australia and Victoria, the Ames Quality Assurance Scheme (AQAS) will provide a mechanism for assessing the accuracy, precision and clinical utility of results obtained by operators using Ames equipment which will allow a patient's diabetes to be managed more effectively

Developed by the Ames Division of Miles Laboratories in consultation with two of Australia's leading biochemists, AQAS is designed to ensure that each operator of an Ames blood glucose monitor is gaining maximum benefit from the equipment and the best possible results

Mr George Bongiovanni, Regional Manager for Ames, said the programme increased the potential for obtaining more clinically accurate results for blood glucose levels which would enable appropriate treatment and management programmes to be prescribed for a patient. This meant that a patient's condition could be stabilised more quickly and the possibility of long term complications reduced.

He said the programme should ideally be established in New Zealand hospitals under the control of the Biochemistry Department, to assess the clinical accuracy of blood glucose results taken by nursing staff caring for hospitalised diabetic patients.

He said a major objective was to standardise the procedures and methodology of Ames' blood glucose monitor operators and maximise the benefit afforded by correct use of the equipment, with the aim of achieving an overall improvement in the management of diabetes.

Mr Bongiovanni said the programme was designed to cover two types of analyses: Internal Quality Assurance and External Quality Assurance. Both operated in tandem with the Ames Hospital Education Programme designed to assist hospital staff to maintain a standard of optimum care for diabetic patients. These relied on the use of Dextro-Chek test-samples for assessment of the performance of the operator and monitor

The Dextro-Chek test-sample solution is applied to a reagent strip using the same technique employed when using blood samples and the results are analysed in exactly the same way that a patient's blood sample would be tested.

Mr Bongiovanni said participation in the Internal Quality Assurance programme was aimed at improving the procedural techniques of individual operators and increasing confidence in obtaining clinically valid patient data when measuring real blood samples at the bedside.

The External Quality Assurance Programme is a special test for the operator set by an external programme organiser, ideally a biochemist working in a Hospital Laboratory.

Participants receive a glucose sample to analyse and their results are sent to the laboratory for monitoring and comparison with laboratory figures. Following analysis, a detailed report is sent to each participant, assessing the precision and accuracy of their results and how they compared with others in the programme. Improvements in technique and performance are collated in six-monthly and annual reports which are compiled by the programme organiser.

Mr Bongiovanni said the programme could successfully operate by Board Area with one large Hospital Laboratory servicing an entire area. He said this was already the case in South Australia where one centre in Adelaide was monitoring results for some 30 hospitals and private groups from around the state

For further information contact G.E. Bongiovanni, Miles Laboratories, Phone (09) 795-540 or **circle 191 on readers reply card.**

AUTOMATIC TRANSITION FROM SEMIMICRO TO THE MACRO RANGE

With the new electronic model R 200 D, Sartorius is introducing a combined semimicro/macro balance (0 42 g/42...205 g; readable to 0.01 and 0.1 mg, respectively) featuring a particular user benefit: the transition from the fine range to the macro range is automatic. Before you start to weigh, there is no way of always knowing whether the capacity of the fine range will be sufficient for the tare and the sample, especially if you are compounding several ingredients of a formula. Whenever the fine range is exceeded, the R 200 D simply lets you continue weighing in, without the inconvenience of having to start the procedure all over again. This eliminates time-consuming backtracking that can also run into quite a bit of money when expensive substances are weighed.

Another feature for frequent weighing up to 30/40 g when macro accuracy is more than sufficient, the balance can be manually switched to the macro range. This lets you utilise the shorter stabilisation time afforded by the macro range.

The new balance is ruggedly built and features vibration filters that would be out of the question in mechanical balances. Moreover, it offers the option of electronic processing of weight data. To put it in a nutshell, the R 200 D is an easy-to-use analytical balance with all-around capabilities for both weighing in and final weighing, determining the weights of small samples in lightweight tare containers with semimicro accuracy and larger samples in heavier tare containers with macro accuracy.

Contact Salmond Smith Biolab or **circle 192 on readers reply card.**

AMYLASE

Clarifying the cause of abdominal pain is the major value of an

amylase assay. An elevated serum amylase value is the cardinal sign of acute pancreatitis. This critical condition creates the need for amylase assays that combine speed, precision, sensitivity and reliability.

Sigma Amylase UV procedure 575 and procedure 576 can be performed manually and have applications for most analyser systems.

Procedure 576 has 14 day stability.

Marketed by Scientific Products Division, Salmond Smith Biolab Ltd.

**Circle 193 on readers reply card.**

HOSPITAL SYSTEMS COMPANY EXPANDS FOR CLIENT

One of New Zealand's largest software houses, which specialises in integrated hospital computer systems, has expanded its base to secure a higher level of client servicing.

ICS recently formed a hardware trading arm — Peripheral Technology Limited — which operates independently in peripherals and printers but gives the founding company more control over hardware, spare parts and servicing.

ICS's managing director Gary Breed said that premium client servicing and on-going support is paramount in his company's specialised field, but until the formation of Peripheral Technology it had been difficult at times to guarantee fast equipment repairs.

"In the past we had to rely on outside suppliers but now we can source, supply and service our own products." The company has its own technical expertise and will supplement this with third party engineering.

Gary Breed feels that long-term commitment from a consulting computer company is a vital factor in securing and keeping business. "It's probably more relevant in the computer industry because decision-makers and purchasers of the systems are often not familiar with the fast changing technology. The field is so competitive it tends to attract short-term operators who are only interested in product sales and not on-going support."

ICS was formed in 1981 with a team of data processing and administrative experts to design a series of application software packages for specific industry groups.

With back-up from medical advisers, it specialised in the design of software systems for New Zealand hospitals because of the growth potential in that field.

The company operates as a consultancy, researching and supplying customers' total computer needs and installing integrated and tailored computer systems to suit. It backs these installations with on-going consultation and advice if clients' needs change, plus on-site training and full systems servicing.

ICS is today a major supplier to New Zealand hospitals with installations in the Auckland Hospital Board at Greenlane, Auckland, North Shore, Middlemore, Carrington and Kingseat hospitals, in the Cook Hospital Board at Gisborne, in the Canterbury Hospital Board, and in Wellington at the National Health Institute. It is the only private company with the Minister of Health's approval to install suites of integrated hospital systems which link with the national health computer system

Almost six years of planning and design went into the software packages which today include InteLAB, a full hospital laboratory system, InteDIET, a hospital catering and nutritional analysis system, IntePHARM, a specialised hospital pharmacy system, InteSTORE, a full stores control and purchasing system with links with the other systems, and the Nursing Care Plan, a comprehensive support, rostering and patient care management system

InteLAB, the company's flagship software package, is the most comprehensive and the one which took the longest to evolve.

It was systematically developed over a number of years from the original concept software which was specifically designed for Green Lane Hospital's biochemistry department. InteLAB's capabilities have been expanded and refined to a level where it can now store and update thousands of patients' files, test results and research data in myriad forms for easy retrieval by many different hospital departments. The system can communicate with central health department systems and can lock into existing systems such as hospital library files or accounting systems. It is also extremely adaptable and can be programmed to suit specific needs of individual hospitals or departments.

Although its software packages are comprehensive, ICS took great pains to ensure that its operating system was straight-forward and could be used by many people without prior computer knowledge or lengthy training.

"We realised that within hospitals many personnel neither had the time nor the skills to learn complicated computer procedures. To be efficient we had to make the system simple and no-nonsense so that as many personnel as possible could access and retrieve the necessary data," said Gary Breed.

The final selection was the PICK operating system which does not need a qualified programmer to operate it, is multi-user and virtually fail-safe. The company runs training courses in the basics for personnel such as pathology, dietary or pharmacy staff to learn how to use the system within a very short period.

Gary Breed stressed that the adaptability of the ICS hospital packages will be a key factor in wider acceptance of the systems if the Government steps up its policy to turn individual hospital departments into independent corporations.

"The ICS systems also tie in well to the overall Health Board and hospital requirements for greater management reporting such as that proposed in the MAPS system," he said.

NEW TOXICOLOGY URINE CONTROL MEETS NEW DEMANDS IN TESTING FOR DRUGS OF ABUSE

Screening for drugs of abuse is expected to geometrically increase over the next year. Bio-Rad, ECS Division, has prepared for the rising demand by introducing a new, toxicology urine control featuring 18 of the most frequently encountered drugs of abuse.

Well-demarcated spot migration by TLC and significant quantitative levels for confirmatory testing are guaranteed without masking of key drugs such as codeine, morphine, and secobarbital. Benzoylecognine and THC are present at ideal levels for the lower detection limits of the latest methodologies.

Featuring 7-day reconstituted stability in convenient 10 x 25mL packaging with a two-year shelf-life, LYPHOCHEK® can easily match your laboratory's drug of abuse testing demands.

Bio-Rad, ECS Division manufacturers chemistry reagent kits and a complete family of controls for Immunoassay, Therapeutic Drug Monitoring, Chemistry, Urine, Haemaglobin $A_1c$, Whole Blood, Anemia, and Spinal Fluid testing under the brand name LYPHOCHEK.

Further information can be obtained from Salmond Smith Biolab or **circle 194 on readers reply card.**

NEW LSA FEATURES INTEGRATED PICO-ATE COMPUTER, HARD DISK, POWERFUL SOFTWARE, COLOUR DISPLAY

Canberra Packard Instrument Company has announced the Tri-Carb 2200CA, a liquid scintillation analyzer designed to provide high performance for busy labs.

Its IBM compatible PICO-ATE computer supports tandem processing of powerful applications programs, commercial software, and even user-written routines, in a multitasking environment: LSC data can be custom formatted in reports or merged with other data Spectrum information is used to correct detected counts into high-precision results, saving time on data reduction

Automatic Instrument Performance Assessment (IPA) and Self-Normalization and Calibration ensure data reliability: they monitor backgrounds, efficiencies, $E^2/B$, and Chi-square values of $^3H$ and $^{14}C$ counting. IPA even reports impending problems, and provides excellent retrospective quality control Many new techniques enhance LSC results: spectral unfolding divides the composite spectrum of dual label samples into a 3-D colour plot, displaying the accurate CPM and DPM calculation of both radionuclides. A patented High-Sensitivity Counting Mode complements the high-efficiency counting features of the system, and optimizes counting conditions as a function of the activity. Three-dimensional spectrum analysis discriminates background radiation from beta decay events, for superior counting performance and low-level sensitivity. Efficiency tracing determines absolute activities without quench correction, and is not sensitive to colour quenching, volume variations, or wall effect. Pattern recognition corrects for counting interferences such as luminescence; while transformed spectral index calculations yield unprecedented counting precision for even the most difficult samples.

The operator can choose from among six DPM calculation methods, including patented DPM which simultaneously calculates DPM in three regions of interest. Various factory-stored quench curves expedite single and dual label counting of $^3H$ and $^{14}C$

The Tri-Carb 2200CA features a Varisette sample changer and holds 408 standard or 720 small vials (no adapters necessary), suitable for overnight counting. A bidirectional cassette changer with an interrupt sample handling feature allows random counting of any sample on the deck. The high-resolution colour CRT continuously displays sample conditions (live spectrum display and live histogram display), provides full-screen conversation menus instead of only one-line prompts, and helps create protocols. An adjustable neck allows

the CRT to be positioned for maximum user convenience. Contact Salmond Smith Biolab or **circle 182 on readers reply card.**

NEW RIA SYSTEM FROM CANBERRA PACKARD FEATURES BUILT-IN COMPUTER

A free 12-page brochure highlights the COBRA 5010, an automatic 10-detector gamma counter that holds 1000 samples. The COBRA incorporates 11 major and many minor technological advances.

The built-in IBM compatible PICO-XTE computer speeds up data reduction and expands processing capabilities to include user-programmable spreadsheets and multitasking RIA. It can support any IBM/PC compatible software, including custom application programs written in any computer language. The entire system can be upgraded by changing a 3½" microdisk. Contact Salmond Smith Biolab or **circle 183 on readers reply card.**

FREE RADIONUCLIDE REFERENCE WALL CHART

Canberra Packard Instrument Company has produced a 24 x 37", full-colour wall chart of the 16 most commonly used radionuclidese and their characteristics. This attractive chart is offered free together with technical articles, applications bulletins and performance notes **Circle 185 on readers reply card.**

NEW PRODUCT RELEASE

It is with great pleasure that Wilton Instruments and Canberra Packard announces the release of the COBRA benchtop Auto-Gamma counter controlled by a built-in IBM compatible computer. The COBRA can count 1000 tubes automatically, five or ten at a time, reduce and evaluate data according to any major curve calculation method selected by the user, and archive QC data of 180 assay runs for each of 60 multiuser protocols. Results of approximately 5000 assays can be obtained in one working day. Eleven major advances expand COBRA capacities beyond those of conventional RIA counters, and its software is disk upgradable to accommodate new developments.

Available with either five (Model 5005) or ten (Model 5010) detectors, the COBRA features a built-in Packard-XTE computer with powerful data reduction and a versatile quality control package. This IBM-PC compatible computer controls processing, manages data, and monitors the system itself to improve RIA processing, save technologist time, and reduce operator errors. RiaSmart multitasking software facilitates all screening and RIA/IRMA data reduction procedures, and simultaneously manages data without interruption to automatic sample processing. SpeedPro multiuser protocol clips allow up to 60 assay protocols to be recalled from memory, for fast and flexible multiuser sample processing.

Exclusive SpectraMatic counting continuously calibrates all detectors during analysis to ensure counting accuracy and stability. Automatic Instrument Performance Assessment (IPA) continuously monitors instrument performance parameters, checking detector resolution, background counts, detector counting efficiency, and calibration accuracy. Chi-Square performance is evaluated at the touch of a button. Faulty detectors can be inactivated individually, without disabling the entire counting block.

The Expert-QC program evaluates potential sample errors and predicts out-of-control conditions. This warns the user of impending failures, and suggests appropriate corrective actions to avoid costly re-runs or downtime.

A unique zigzag detector configuration virtually eliminates crosstalk for higher energy radionuclides, such as $^{51}Cr$, and reduces backgrounds to levels even lower than those expected of specially shielded detectors (30CPM for $^{125}I$). Two simultaneous counting regions with individual half-time correction and spillover compensation allow fast and accurate dual label RIA/IRMA processing.

The advanced automatic data reduction includes fitting algorithms which allow users to select the best curve fitting method for any assay. It also includes curve templates, overlays, and editing, and a patient database that allows archival of assay data and results, including dilution corrections. Data can be merged with Lotus 123, word processing programs, other commercial software packages, or custom application programs in any computer language. An internal spreadsheet capability permits more complex data reduction, and provides the flexibility to accommodate future assay developments. User-determined print formatting allows printouts to be customised to any laboratory specifications.

Canberra Packard also offers the powerful CRYSTAL a 12 or 24 detector manual multi-well system with advanced RIA data reduction.

For more information on the COBRA or CRYSTAL Gamma Counters, contact Salmond Smith Biolab or **circle 186 on the readers reply card.**

NEW SOLE AGENCY

Med-Bio Enterprises are pleased to announce that they have been appointed by Cambridge Life Sciences as their exclusive distributor for their CLS 961 and CLS 962 plate readers.

The CLS 961 is an inexpensive microtitre plate reader, which has interchangeable wavelengths. It is portable, either mains or battery operated, (rechargeable), compact, easy to use, accurate and reliable.

The CLS 962 microtitre plate reader retains the same features of the 961 instrument, but the maximum absorbance limit has been increased to 2.999. This reader has an optional thermal printer available, and a standard data interface for connection to a computer.

Both readers have been designed to accommodate all flat-bottomed 96 well plates and strip carriers. Med-Bio Enterprises believe that smaller laboratories will now be able to perform ELISA assays, because Cambridge Life Sciences have now brought the price of plate readers down to the level that these laboratories can afford.

For further information, please contact Med-Bio Enterprises, or circle **187 on readers reply card.**

BECKMAN'S NEW ISE-TECHNOLOGY-BASED ELECTROLYTE ANALYSERS ARE VERSATILE WITH WIDE APPLICATIONS

Beckman introduces four new electrolyte analysers that offer versatility using the preferred non-flame ISE technology for a wide range of applications. The Beckman Lablyte™ 800 $Na^+K^+$, the Beckman Lablyte™ 810 $Na^+K^+Cl$, the Beckman Lablyte™ 820 $Na^+K^+Ca^{++}$, and the Beckman Lablyte™ 830 $Na^+K^+Li^+$ electrolyte analysers are designed for manual or automatic operation with ion selective electrodes which are virtually maintenance-free. Proven ISE technology offers significant advantages over flame photometry and produces results that show excellent correlation with reference methods.

The compact Beckman Lablyte analysers fit even the smallest bench space. They are easy to operate and maintain. For convenience, the technologist can run whole blood samples without centrifugation in addition to analysing serum, plasma or urine. A sample volume of only 100 to 120 microlitres is sufficient to produce a 3-chemistry-result profile. The analysers are particularly suitable for paediatric or geriatric applications. In addition, the Beckman Lablyte series of analysers will find applications in emergency and STAT labs, private laboratories as well as many specialised areas of routine health care and research.

With the addition of the Lablyte instruments, Beckman now provides electrolyte analysers for the complete range of clinical laboratory needs from the smallest to the largest user.

For further information contact Sonatec or **circle 188 on readers reply card.**

AXIOSKOP — THE MORE-THAN-ROUTINE MICROSCOPE

Versatility, advanced optics, a beautiful design, are some characteristic points of the new Axioskop. This more-than-routine microscope is the newest member of the "Pyramid" series.

The Axioskop provides the essential advantages of the larger Axioplan and Axiophot microscopes but in a compact version. It offers infinity tube length ICS optics, and in addition to Plan Neofluar and Planapochromats a new Achrostigmat objective has been developed which delivers crisp flatfield and glare-free images over a consistent 20 mm field of view.

Axioskop is specially geared to the requirement of higher level routine microscopy. Its system-integrated design allows rapid changes between different microscopic methods without compromising image quality or field of view and without having to purchase otherwise costly add-ons.

For more information please contact Carl Zeiss NZ Ltd, Mayfair House, The Terrace, Wellington, Tel: 724-860, Telex: 31487 or **circle 189 on readers reply card.**

DIVERSOL 2000 PLUS

Instant known concentration of chlorine where you want it when you want it. Now available in New Zealand DIVERSOL 2000 Plus, provides an instant source of known concentration of available chlorine as and when it is required. It is this safety factor and convenience that has led to its rapid acceptance in Australia since the product launch there. Directions for use are printed on the sachets which are packed in cartons of 25 and 100.

Freshly poured at a concentration of one sachet to four litres of clean

water, the white powder is readily miscible to produce a pink solution, the colour being an indicator that it is freshly made and uncontaminated. At that concentration the solution produces 2000 p.p.m. available chlorine. For high risk contaminated areas, five sachets in four litres of water produces 10,000 p.p.m. available chlorine as recommended by the Australian A.I.D.S. Task Force.

Diversol 2000 Plus is packed in a foil laminate sachet to give an indefinite shelf storage life.

Areas Of Use

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★ In fact anywhere a powerful convenient disinfectant is required.

For further information contact Kempthorne Medical Supplies Ltd or **circle 190 on readers reply card.**

FLOPPY DISK CALCULATION PROGRAM FOR THE DETERMINATION OF PLASMA FREE TESTOSTERONE — A DIAGNOSTIC TOOL IN HIRSUTISM AND OTHER ANDROGEN DISORDERS.

The biological active fraction of testosterone in plasma is the free or unbound fraction which only represents 1-2% of the total testosterone concentration. Total plasma testosterone (bound plus free) is often normal in hirsute women. This is explained by a concomitant decrease in SHBG (sex hormone binding globulin), yielding an elevation of free testosterone (the bioavailable fraction) to approximately twice normal.

Based on the IBM PC/XT/AT or equivalent, this software calculates the concentration of PLASMA FREE TESTOSTERONE at 37°C. The program is based on equilibrium binding equations derived from the law of mass action with testosterone association constants determined at 37°C with an equilibrium technique.

The computer is fed with laboratory obtained values of total plasma testosterone, SHBG (sex hormone binding globulin) and albumin from which the program calculates the PLASMA FREE TESTOSTERONE.

The program also offers the possibility to include estradiol or other hormones/drugs that under certain conditions can interfere with the testosterone — SHBG binding.

**The Floppy Disk Plasma Free Testosterone costs only 800 US$ and can be ordered from Equilibrium Assay, P.O. Box 10077, S-900 10 Umea, Sweden.**

A NEW FLEXIBLE SYSTEM — BM/HITACHI 717.

Since 1978, five different selective analysers have been successfully marketed worldwide by Boehringer Mannheim and Hitachi. The design of each new analyser is a joint venture project by both companies. The expertise in reagent research and development offered by BM, combined with Hitachi's electronic capabilities, results in the effective utilisation of resources. It is not an exaggeration to say that a new generation of selective analysers have been created by BM and Hitachi.

Thanks to the new concept of the selective analyser, one can definitely say that a milestone has been reached in the history of Clinical Chemistry. The range of patient orientated analysis is now available to the small and medium sized laboratories and not just the domain of the large laboratories.

The concept of the BM/Hitachi 737 and 704 was based on the considerable success of the Hitachi 705 in Europe.

When designing a new analyser, the question is always asked "Do you stay with a system that is well proven and reliable, or should you look to new technologies". Does the success of new technologies depend on the advantages offered to laboratories or the financial capability of a particular market.

It is a known fact that the medical sector and in particular the diagnostic field, is facing growing difficulties when it comes to the investment in clinical chemistry analysers.

The substantial investment in clinical chemistry analysers represent an investment in the needs of a laboratory over the life of the analyser. As the demands on a laboratory change, so should the capabilities of a particular analyser change as well, otherwise like the dinosaurs, an inflexible system will lead to extinction.

In developing the BM/Hitachi 717, the main consideration was flexibility. Opinions were sought internationally on methodology changes, areas of research and development and the ongoing debate between "open" and "closed" systems. After consideration of market trends, the wishes of European and Japanese laboratories and the best features found in the Hitachi 737 and 704, the BM/Hitachi 717 was born.

BM/Hitachi opted for the *only* system that would enable laboratories to adapt to change in emphasis or requirements. To provide an ongoing flexible system with the major emphasis on reliability, easy maintenance and *proven* technology.

The BM/Hitachi 717 is the most modern compact analyser in its class and it was "tailor made" to fulfil the needs of its users.

So what are the features of the 717? Well, why don't you contact us to find out.

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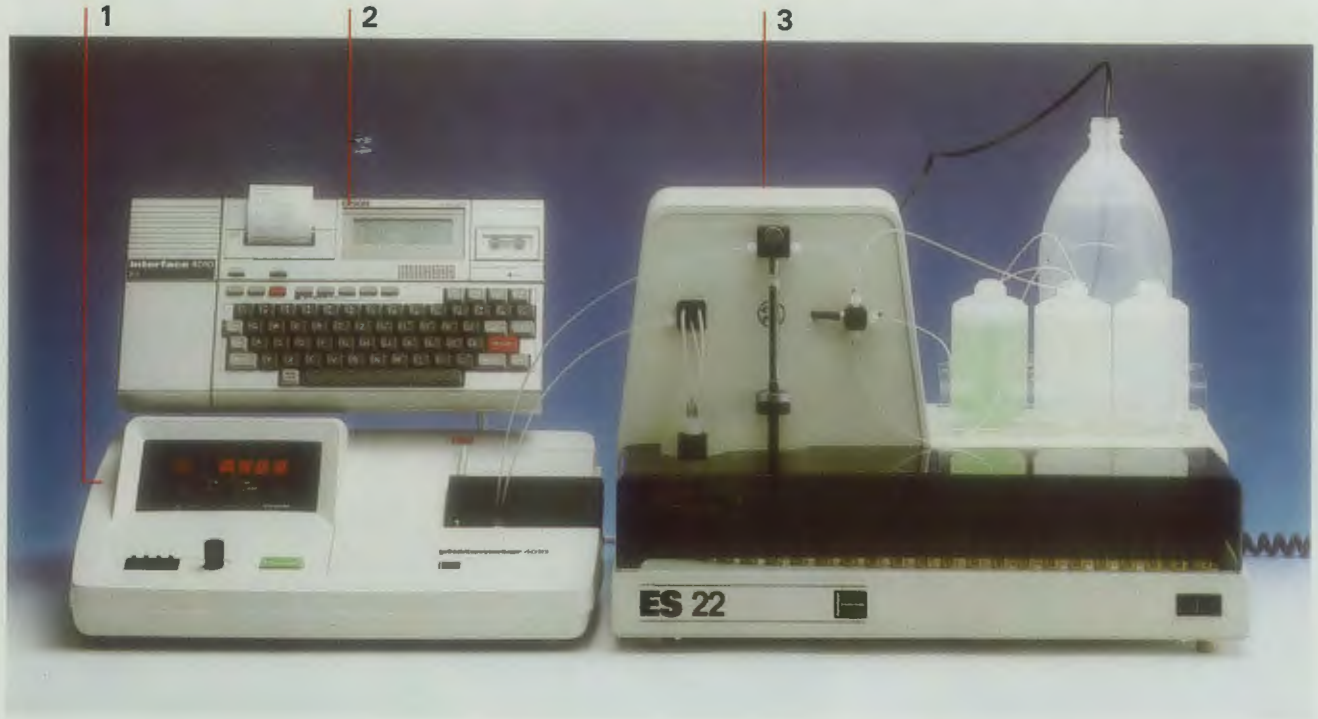
# Enzymun-Test® System ES 22

**for mechanization of the non-radioactive Enzymun-Test® assays**




**Components:**
**1 Photometer 4010**
**2 Epson HX 20 micro-computer with interface 4010**
**3 Wash and pipetting station**

The ES 22 system consists of a modularly constructed batch analyzer for the semi-mechanized performance of all Enzymun-Test® assays

- Automatic implementation of Enzymun-Test® assays after the manual pipetting of serum and incubation buffer
- Automatic aspiration and washing of the coated tubes
- Automatic dispensing of the reagents
- Regulation of the incubation times
- Automatic measurement in the photometer and print-out of absorbance protocol
- Calculation and print-out of the calibration curve and the values obtained from the samples
- Print-out of a complete measurement protocol

**Technical Data:**

- **Photometer 4010**
- Filter photometer suitable for all enzyme and substrate measurements
- Routinely used filters: 340 nm, 405 nm, 546 nm, 578 nm
- Flow-through cuvette, 5 mm light path
- **Epson HX 20 micro-computer**
- Personal computer with 32 KB RAM, LCD and integrated printer for regulating the pipetting and wash station and for calculation and documentation of the results
- **Wash and pipetting station**
- For the mechanized processing of Enzymun-Test® tubes
- Time cycle: 12 sec
- Max. chain length: 150 tubes
- Reagents: 2 reagents distilled water wash water
- Reagent volumes: 1 ml
- Washing steps: 1–3 (regulated by the program)
- **Power supply**
- 220 V, 50/60 Hz, or 110 V, 50/60 Hz
- **Installation requirements**
- None
- **Space required**
- Approx. 110 x 60 cm

**BOEHRINGER MANNHEIM NZ LIMITED**

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