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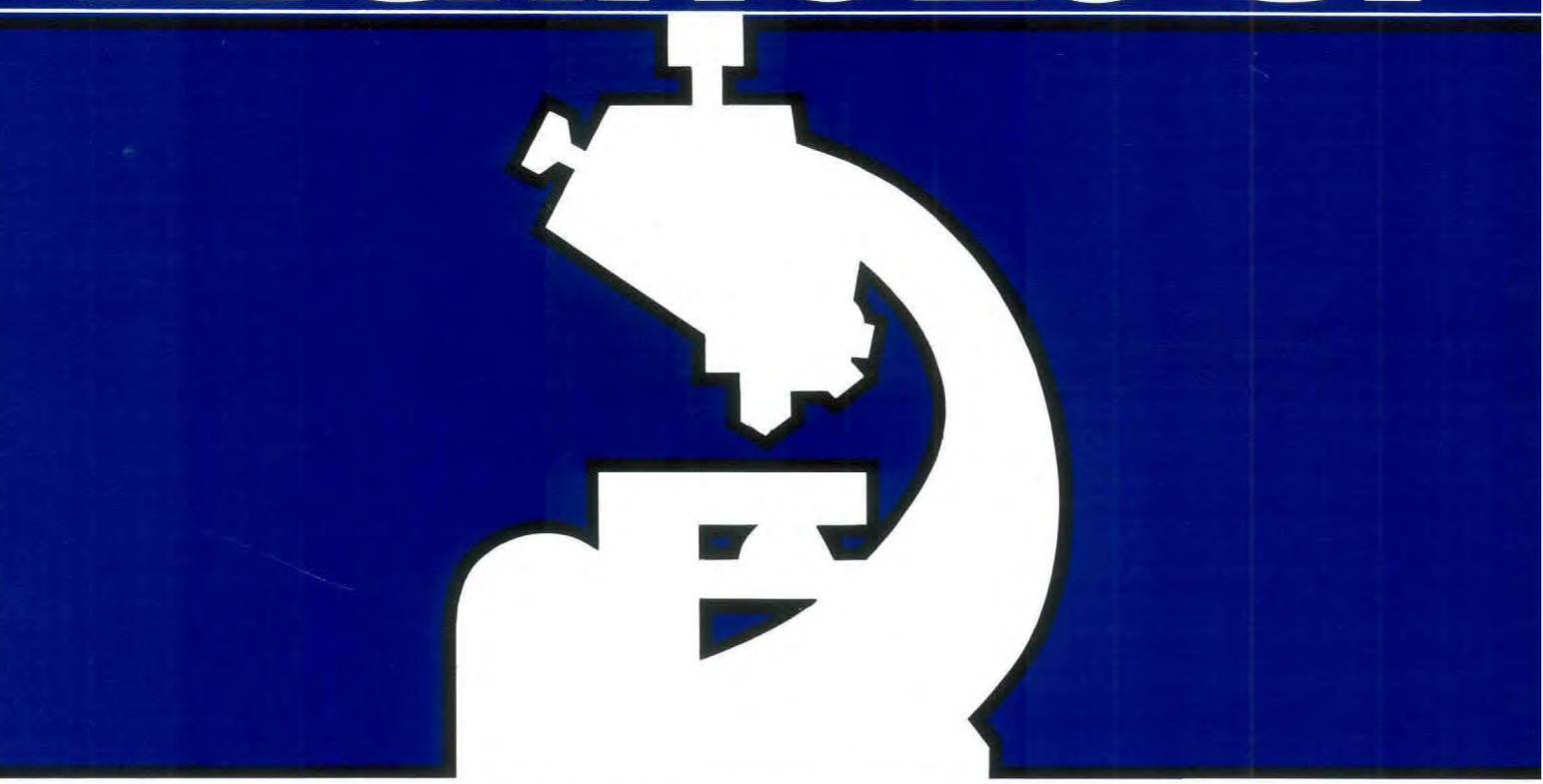

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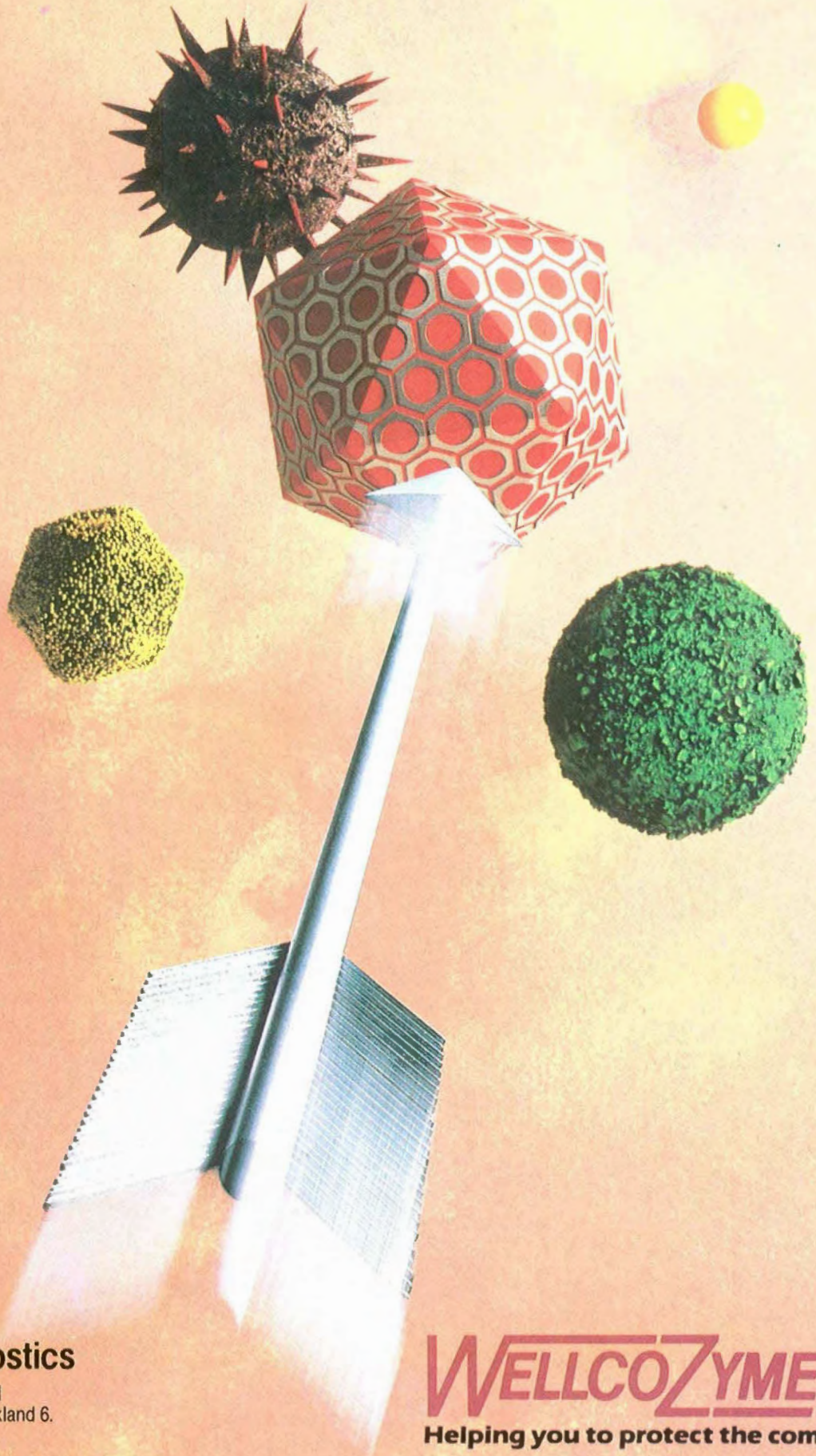

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Sodium and Potassium Transport Across the Erythrocyte Membrane.

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Based on a paper delivered at the 42nd Scientific Meeting of the NZIMLT, August 1987, Nelson.

Abstract

Abnormalities of erythrocyte cation transport mechanisms have been implicated in the pathogenesis of human essential hypertension and may ultimately provide an insight into the mechanisms underlying the development of hypertension. Current cation research in this area is aimed at determining if the identified abnormalities are a primary cause or simply a marker for increased vascular smooth muscle resistance, which characterises the established disorder. This paper discusses the various cation transport mechanisms responsible for erythrocyte sodium and potassium homeostasis, the methodologies in use to assess their activity and content, and the results obtained in studies of cation metabolism in human essential hypertension.

Keywords

Sodium, potassium, erythrocyte, transport mechanisms, hypertension.

Introduction

The elucidation of the putative Na^+ and K^+ transport mechanisms across the human erythrocyte membrane (1, 2, 3) and their similarity to smooth muscle membrane cation transport mechanisms (4) have paved the way to study the mechanisms underlying the genesis of human essential hypertension. It is not possible to study easily membrane cation transport in human vascular smooth muscle and research has thus been directed at accessible cell membranes such as erythrocytes, leucocytes and platelets.

In 1962 Losse et al (5) demonstrated increased erythrocyte Na^+ concentrations in hypertensive individuals. In 1980 Canessa et al (6) and Garay et al (7) described altered erythrocyte cation transport mechanisms in hypertensives. Woods et al (8) demonstrated that these abnormalities were present in normotensive offspring of hypertensive subjects. Subsequently it was shown that either much overlap occurred between normotensives and hypertensives (9, 10) or that no difference could be demonstrated (11, 12). These conflicting results are in part attributable to differences in subject selection (13), race (14), salt intake (12, 15), hormones (16, 17) and anti-hypertensive medication (15, 18).

In this review we discuss the methodological aspects of measurement of intracellular cation transport. The hypotheses are reviewed whereby the identified cell membrane cation transport abnormalities could play a role in the pathogenesis and development of human essential hypertension, together with results obtained from studies of erythrocyte cation transport.

Hypothetical Cation Mechanisms in Hypertension

The application of membrane cation transport abnormalities in the pathogenesis of human essential hypertension is controversial. One of the most attractive hypotheses is that of Bing et al (19) who have postulated that an alteration in cell membrane lipid composition maybe the common factor explaining many of the previously described cation transport abnormalities in hypertension. Dietary manipulation to increase selectively erythrocyte membrane linoleic acid content has been shown to result in increased cation fluxes in the erythrocyte membranes of normal individuals (20). Furthermore, increased erythrocyte membrane linoleic acid concentrations have been demonstrated in hypertensive subjects (21).

Blaustein (22) has postulated that a circulating substance inhibits active Na^+ transport in vascular smooth muscle of hypertensives. The resultant increase in intracellular Na^+ leads to increased cellular free Ca^{2+} through the Na^+ -Ca^{2+} exchange mechanism which leads to an increase in peripheral vascular resistance. De Wardener and MacGregor (23) postulate that a genetic defect in the kidney of hypertensives results in an inability to excrete an excess salt load. The expansion of the extracellular fluid volume leads to the production of a Na^+ pump inhibitor. This inhibitor enables the kidneys to excrete the excess salt load but at the same time causes a rise in arterial cellular Na^+, in turn leading to a rise in free intracellular Ca^{2+} in the arteries and thus increased vascular reactivity. An ouabain like Na^+ -K^+ ATPase inhibitor which binds to the Na-K ATPase receptor has been demonstrated in normotensive subjects and in hypertensive subjects (24, 25). Others (12, 26) have not confirmed these findings.

Postnov and Orlov (4) have suggested that alterations of free intracellular Ca^{2+} concentrations are due to a primary defect of cell membrane Ca^{2+} binding ability and inefficient cell Ca^{2+} pump operation. This might cause damage to the excitation-contraction coupling system in vascular smooth muscle cells. In support of this hypothesis, Ca^{2+} binding, the distribution of the intracellular binding protein Calmodulin and Ca^{2+} transport of erythrocyte membranes has been reported to be altered in hypertensives (57, 28) compared to normotensives.

Intracellular Cation Measurement

Erythrocyte Na^+ and K^+ concentrates are measured by atomic emission or flame photometry after suitable specimen dilution which takes account of the low Na^+ (approx. 7 mmol/L) and high K^+ (approx. 100 mmol/L) intracellular concentrations. Conventional pipetting techniques are unsuitable due to the viscous nature of packed erythrocytes. Frazer et al (29) devised a direct method using a washout pipetter system and used Cobaltous EDTA to correct for Na^+ in the trapped plasma. We have shown that washed and packed erythrocytes can be precisely pipetted with a positive displacement pipette (30), but a correction factor has to be applied for the constant volumetric error, due to the viscosity of the packed cell aliquot. We also apply a correction factor for the amount of trapped wash solution in the packed cell column (31).

Appropriate corrections must be made for total cell numbers, haematocrit or cell haemoglobin when calculating erythrocyte Na^+ and K^+ concentrations in cell suspensions (31, 33, 34). Some methods employ an indirect approach in which whole blood and plasma Na^+ and K^+ concentrations are measured (29, 35). Isosmolar choline or magnesium chloride solutions (36, 37) may be used to wash away extracellular Na^+ and K^+ and which also avoids loss of intracellular Na^+ or K^+ prior to measurement. Atomic absorption spectrophotometry and flame photometry yield equivalent results for the measurement of erythrocyte Na^+ and K^+ concentrations (38).

The genetic and hereditary aspects of erythrocyte cation transport in essential hypertension (39, 40, 41, 42) has stimulated community based studies requiring special methodologies. A mandatory requirement for such studies is the preservation of intracellular electrolytes and their

transport mechanisms. Ostrow et al (43) stored separated and washed erythrocytes for up to five days in a buffered isosmolar KCl solution without loss of Na^+-Li^+ CT rate but with a steady decline in erythrocyte Na^+ concentrations. We have described a buffered and heparinised $MgCl_2$ CT and for 24 hours without a decline in erythrocyte Na^+ and K^+ concentrations (44). No centrifugation or erythrocyte washing procedures are required prior to laboratory analysis and thus large scale epidemiological studies are practical.

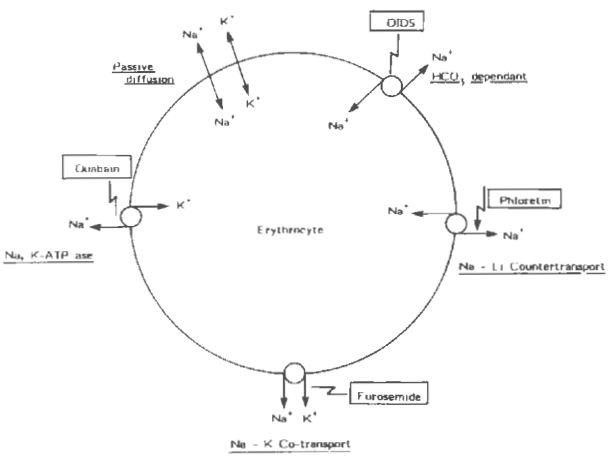
Erythrocyte $Na^+$and K^+ Transport Mechanisms

The pathways for Na^+ and K^+ transport across the human erythrocyte membrane are shown diagrammatically in figure 1 and their main characteristics are summarised in table 1. In human essential hypertension Na^+-K^+ ATPase, Na^+-K^+ cotransport and Na^+-Li^+ countertransport activities are the most frequently studied.

Na^+-K^+ ATPase

Na^+-K^+ ATPase accounts for more than 90% of membrane Na^+ and K^+ transport. This process translocates Na^+ and K^+ across the membrane in the ratio of 3 Na^+ ions out of every 2 K^+ ions in and thus maintains the high K^+ and low Na^+ concentrations inside the erythrocyte. Na^+-K^+ ATPase activity can be measured through release of inorganic phosphate (45), through a coupled NAD/NADH reaction (25), or by measurement of radioactive Rb^+, Na^+ or K^+ uptake or efflux (9, 46). Receptor binding to the specific Na^+-K^+ ATPase inhibitors ouabain or digoxin (45, 47) provides an indication of the number of active Na-K ATPase pump units per erythrocyte. The use of a wide range of tritiated ouabain or digoxin concentrations allows both the number of Na^+-K^+ ATPase sites per erythrocyte and the apparent affinity (Kd) of Na^+-K^+ ATPase receptor and ligand to be calculated by Scatchard plot analysis (48). Boon et al (49) have described an *in vivo* assay of Na^+-K^+ ATPase activity. Their objective was to provide a physiological assay which would overcome some of the contradictory *in vitro* results. Plasma and erythrocyte Rb^+ concentrations are measured for four hours after the ingestion of an oral rubidium chloride solution. Rubidium, like K^+, is actively transported across the erythrocyte membrane by Na^+-K^+ ATPase.

Ouabain or digoxin binding studies have demonstrated a decrease (58, 59) or no change (12, 50) in Na^+-K^+ pump units in hypertensives and either a decrease, increase or no change in Na^+-K^+ ATPase activity in hypertensive subjects (11, 46, 51). A reduction in Na^+-K^+ ATPase activity in hypertensive subjects (11, 46, 51). A reduction in Na^+-K^+ ATPase activity might be due to increased levels of a postulated circulating Na^+ transport inhibitor (de Wardener and McGregor's hypothesis). Various studies have either demonstrated the presence (24, 25) or lack of an ouabain-like inhibitor (12, 26). Postnov et al (27) have also demonstrated a reduction in erthrocyte Na^+-K^+ ATPase activity in hypertensives by selective alteration of intracellular Ca^{2+}.



Na-K Cotransport

In 1966 Hoffman and Kregenow (52) demonstrated a membrane carrier mechanism that simultaneously transported Na^+ and K^+ into or out of the erythrocyte. Subsequently it was shown that two chloride ions are unidirectionally transferred for each Na^+ and K^+ ion thus retaining electroneutrality of the system (53). Na^+-K^+ cotransport is inhibited by various diuretics, such as furosemide. It may have a K^+ and water extruding function, thus participating in cell volume regulation (54).

The method commonly used to assess Na^+-K^+ cotransport activity was first described by Dagher and Garay (55). Erythrocytes were loaded with Na^+ and depleted of K^+ during a 20 hour incubation in 2,5-p-chloro-mercuribenzenesulphonate (PCMBS). The erythrocytes were then effluxed into a magnesium-sucrose solution both in the presence and absence of furosemide. The increase in Na^+ and K^+ concentration of the supernatant over one hour was expressed as the Na^+-K^+ cotransport activity. However, it has subsequently been shown that membrane alteration and unphysiological erythrocyte Na^+ and K^+ concentrations arise during prolonged PCMBS incubation. More recently Duhm and Gobel (56) have described a simple Rb uptake test in which the Na-K cotransport is the difference in erythrocyte RB^+ uptake in the presence and absence of furosemide. In a variation of this approach Smith et al (57) have characterised Li^+ efflux from Li^+ loaded erythrocytes into a magnesium-sucrose solution, in the presence and absence of furosemide.

In 1980 Garay et al (7) and Cusi et al (51) demonstrated increased activity of Na^+-K^+ cotransport in erythrocytes of hypertensive subjects. Others, employing different methodologies have not confirmed these findings (11,12). Factors such as race (39) and salt intake (12, 15) have been shown to affect Na^+-K^+ cotransport activity. Weder et al (58) demonstrated a correlation between blood pressure and Na^+-K^+ cotransport. Na^+-K^+ cotransport activity has been demonstrated in vascular smooth muscle (59) and it has therefore been suggested that erythrocyte Na^+-K^+ cotransport may be a marker of changed vascular reactivity in hypertensives.

Na^+-Li^+ Countertransport

Na^+-Li^+ countertransport (Na^+-Li^+ CT) is a membrane electroneutral carrier which can perform Na^+ : Na^+, H^+ and Na^+ : Li^+ exchange. Although Li^+ is not normally present *in vitro*, Li^+ behaves similarly to Na^+ in studies of this exchange mechanism. In this system Li^+, Na^+ or H^+ is transported out of the erythrocyte against their electrochemical gradients. The process was first characterised by Duhm et al (2) and Haas et al (60). The transport system is inhibited by phloretin (2, 60) and is stimulated by bicarbonate and extracellular Na^+ (61). Like other membrane cation transport mechanisms it shows marked inter-individual variability (62).

Methodologies to assess Na^+-Li^+ CT rate are based on the method of Canessa et al (6) in which erythrocytes are loaded with Li^+ during a three hour incubation and then effluxed into Na^+-rich and Na^+-poor solutions. Ouabain is added to block Li^+ efflux by the Na^+-K^+ ATPase pathway. The difference in the rate of Li^+ efflux between the Na^+-rich and Na^+-poor solutions represents the Na^+-Li^+ CT rate. Modifications to this method include the use of bicarbonate to shorten the erythrocyte Li^+ loading procedure to 15 min (61), and increasing the quantity of Li^+-loaded erythrocytes during the efflux period to increase precision (63). We have described a method for Na^+-Li^+ CT rate determination (64) which overcornes some of the technical problems inherent

Table 1
Properties of Na^+-K^+ ATPase, Na^+-K^+ Cotransport and NA^+-Li^+ Countertransport

	Na^+-K^+ ATPase	Na^+-K^+-Cotransport	Na^+-Li^+ Countertransport
EFFECT OF INHIBITORS			
Ouabain	Inhibits	Insensitive	Insensitive
Furosemide	Insensitive	Inhibits	Insentive
Phloretin	Insensitive	Insensitive	Inhibits
STOICHIOMETRY OF IN-OUT MOVEMENTS	2 Na^+ out for 3 K^+ in	2 Cl^- out for 1 Na^+ and 1 K^+ in	1:1 (Na^+, Li^+ or H^+)
PHYSIOLOGICAL ROLE	Keeps internal Na^+ low and K^+ high. Maintains negative electrical potential	Water and K extruding mechanism role in cell volume regulation	Uncertain. May be a remnant of Na-H mechanisms during erythropoesis

in Canessa's method. Instead of measuring the increase in Li^+ concentration in the supernatant which necessitates multiple sampling and measurement of the haematocrit of the cell suspensions, the method directly measures the decline in erythrocyte Li^+ concentrations at the start and end of a one hour efflux period. Bicarbonate is used to facilitate erythrocyte Li^+ uptake. Thus the assay has been considerably shortened and the resultant Li^+ concentrations obtained (approx. 3.5 mmol/L) may be measured by flame photometry (68) or atomic absorption spectrophotometry.

Duhm and Gobel (56) used the erythrocyte Li^+ uptakes as a measure of Na^+-Li^+ CT rate, following the principal of their assay for the measurement of Na^+-K^+ cotransport. This approach has been criticised in that the erythrocyte Li^+ concentration used (2 mmol/L) is insufficient to ensure maximal Na^+-Li^+ CT rate (4). An *in vivo* measure of erythrocyte Na-Li CT rate has been developed in our laboratory in which subjects are given an oral dose of 1 g Li_2CO_3 and the Li^+ cell:plasma ratio is determined 24 hours later (65). Erythrocyte Li^+ efflux is 75% dependent on Na^+-Li^+ CT rate. We have described a strong correlation in normotensives but not in hypertensives (65), possibly reflecting a membrane abnormality in hypertensives, as described by others (19).

In 1980 Canessa et al (6) demonstrated a 2-3 fold increase in erythrocyte Na^+-Li^+ CT rate in hypertensives compared to normotensives. This has been confirmed in some studies (40, 41) but not in others (11, 12). Other investigators have found increased Na^+-Li^+ CT rate in hypertensives but showing a great overlap in values with normotensives (10, 17, 46, 66). Factors now known to influence Na^+-Li^+ CT rate are renin (17), race (14), salt intake (12,15), hypokalaemia and oral contraceptives (16). A significant correlation has been demonstrated between raised blood pressure and Na^+-Li^+ CT (42, 58). Increased systemic vascular resistance, which is the haemodynamic hallmark of hypertension has been linked with Na^+-Li^+ CT (58). Weder (67) has demonstrated a correlation between erythrocyte Na^+-Li^+ CT rate and renal Li^+ clearance, the latter being a marker for renal tubular Na^+ re-absorption. This if substantiated, provides a further link between erythrocyte cation abnormalities and the role of the kidney in hypertension.

Conclusions

Intracellular Na^+ and K^+ homeostasis is complex. Results from studies of cation transport in human essential hypertension have been contradictory and confusing. Few studies have tried to link vascular reactivity with changes in smooth muscle cellular cation transport. These studies are urgently needed to explain the molecular basis for hypertensive vascular reactivity. There is a need to resolve the question as to whether cellular cation transport abnormalities are causative or simply markers for an underlying metabolic defect of hypertension. Furthermore it should be borne in mind that human essential hypertension is a heterogenous disease, not a singular entity.

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Ward Glucose Testing — An Update

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Introduction

In August 1986 the Chemical Pathology Laboratory at Dunedin Hospital began a quality control programme for the Ames Glucometers used in ward monitoring of blood glucoses. Results were less than satisfactory (1) and in September 1987 the decision was made to change to Boehringer Mannheim Reflolux II meters. This decision was made without reference to the laboratory although the view was expressed by them that the problems were user rather than machine related. The quality control programme was continued on the Reflolux meters and the laboratory also became involved in the training programme to provide information relating to quality control. An attempt was made to train all nursing staff in the use of the meters with training courses organised on a continuing basis by the Nursing Inservice Education Unit. One meter is located on each floor except the sixth, with additional meters in the Neonatal Unit, Accident and Emergency and Diabetic Outpatients. Meters were also maintained at Cherry Farm and in two wards at Waikari Hospital.

Test Numbers

According to the records kept for each meter during the four-month period from 6.10.87-21.1.88 5,527 glucose sticks were used (see Table 1). Actual usage of sticks for the period as documented by the imprest supply was 16,900 sticks, meaning that 67% of sticks issued to areas with meters cannot be accounted for. A further 5,750 sticks were used by areas without a meter and remain undocumented. Of the sticks where usage is accounted for approximately 40% were used for quality control purposes. Assuming that quality control was not processed in areas where undocumented usage is occurring an estimated 20,400 patient glucoses have been performed in four months. During this period hospital admissions to the hospitals concerned totalled 6,743.

Table 1
Usage of Blycemie Stix 6.10.87 — 9.2.88

Area	Stix Documented as used	Actual Usage	% Accounted For
A	46	150	31
B	246	250	98
C	395	500	79
D	107	150	71
E	195	400	49
F	319	600	53
G	163	1000	16
H	254	1200	21
I	131	600	22
J	21	600	4
K	34	500	7
L	447	950	47
M	53	600	9
N	738	850	87
O	578	2050	28
P	495	1550	32
Q	124	450	28
R	71	350	20
S	281	950	30
T	126	50	100
U	295	1200	25
V	518	1950	27
TOTAL	5527	16900	33%

Table 2
Comparison of Ward and Laboratory Glucose Results

Ward Result (mmol/L)	Laboratory Result (mmol/L)
2.1	5.0
2.2	5.0
1.9	2.5
2.4	3.7

Laboratory Checks

48 patients over 4 months were registered as having a glucose of less than 2.5 mmol/L, of these only four were checked by the laboratory (Table 2). Results not checked included eight of less than 1.5 mmol/L. It was of particular interest that one patient having an insulin stress test was monitored simultaneously by the ward and the laboratory (Table 3). It is necessary for this test to drop the blood glucose below a predetermined level to stimulate the production of growth hormone. The ward results show a degree of variation which would provide a completely misleading picture of the status of the patient. Ten patients over 4 months gave a HI result and only 4 of these were checked by the laboratory despite the fact that HI could mean anything from 27 to 60+ mmol/L.

Quality Control

Quality control material of known value is supplied for use with each meter with instructions that it is to be processed with each test or batch of tests done. This provides a check of operator technique but is subject to operator bias and of little real value as an independent assessment of quality control. Samples of material with a value known to the laboratory but unknown to the operator are processed every two weeks (Table 4). On average only 6 of the 12 wards processed the unknown controls and of the 79 returns made 15 (19%) were unacceptable.

Neonatal Glucoses

Hypoglycaemia in the pre-term infant is a serious disorder which can lead to brain damage. Marks (2) defines hypoglycaemia as being present during the first three days of life when the blood glucose is below 1.1 mmol/L in the underweight infant or 1.6 mmol/L in the normal weight infant. While some authors have advocated the use of glucose test strips as a screening procedure (3) others have questioned the

Table 3
Comparison of Ward and Laboratory Glucose Results for an Insulin Stress Test

Time	Ward Result (mmol/L)	Laboratory Result (mmol/L)
1400	5.0	2.5
1815	1.4	2.7
1930	1.9	3.0
2200	2.0	3.0
2300	1.9	3.7
0300		4.8
0800		4.9
1100	2.2	
1115		3.0
1500	1.3	2.5
1830	0.9	2.4
2200		2.6
0200	1.7	3.3

Table 4: *Results for Unknown Controls*

Site	Expected Glucose Value											
	2.4	16.1	5.1	12.9	3.8	14.7	5.1	13.3	10.6	3.8	3.8	14.7	9.2	5.8
1	2.2	17.0	Not Done		3.2	13.5	No Return		11.2	4.1	Not Done		Not Done	
2	Not Done		5.0	12.0	Not Done		No Return		11.5	3.7	3.7	16.0*	10.7*	5.7
3	Not Done		Not Done		3.6	14.3	—	12.4	No Return		1.3*	14.1	8.9	7.9*
4	Not Done		4.3	12.2	Not Done		Not Done		Not Done		Not Done		10.9	5.6
5	Not participating										4.1	12.5*	Not Done	
6	Not Done		Not Done		—	14.3	3.8*	13.5	10.7	3.9	Not Done		Not Done	
7	2.2	0.9	4.1	13.0	Not Done		4.4	16.0*	10.3	3.5	Not Done		Not Done	
8	2.4	17.6	Not Done		3.1	HI*	Not Done		10.9	4.2	Not Done		Not Done	
9	2.4	16.4	3.7*	11.8	3.4	14.3	4.4	13.0	8.7*	3.0	3.6	15.4	Not Done	
10	Not Done		4.6	13.2	3.4	14.3	4.8	16.4*	9.3	3.7	2.1*	14.9	8.1	4.9
11	Not Done		4.4	14.1	Not Done		14.7	16.0*	11.9*	—	Not Done		Not Done	
12	2.6	15.0	5.1	—	Not Done		Not Done		11.7	—	Not Done		Not Done	

* Unacceptable result

reliability of such measurements (4, 5) and cautioned that results should be confirmed by the laboratory before hypoglycaemia is diagnosed (6).

Feeding of premature neonates at Dunedin Hospital is presently being monitored by the use of capillary glucoses. A glucose of less than 2 mmol/L is taken as an indication that action may be required. However the variation in the sticks as evidenced by the values quoted for the low control (actual value 2.4, acceptable range 1.6 — 3.2) would indicate a range almost as great as that shown by the majority of the babies. By the error of the method alone, excluding the fact that it may be difficult to get a sample giving adequate coverage on the test strip, a baby with a true glucose of 2.4 could register anything from 1.6 to 3.2 mmol/L. The actual range for the quality control material as recorded by staff was 2.0 — 3.9. Bleeding neonates would seem to be a very invasive way to monitor feeding, particularly when it is based on erroneous assumptions about the accuracy of the sticks.

The Neonatal Unit at National Women's Hospital in Auckland indicate that following establishment of early feeding, capillary glucoses are only performed if clinically indicated.Usage of glucose sticks there is of the order of 2-3 bottles per year compared with current projected usage in Dunedin of 90 bottles per year.

Conclusion

A recent study by Flynn (2) on the quality of blood glucose assays outside the laboratory concluded that after one year of a quality control programme 'there is no evidence of improvement' and we would echo his sentiments. The standard of glucoses performed in the wards in this survey does not appear to be improving and it is obvious from the number carried out that their use is not being restricted to the monitoring of insulin dependent and non-insulin dependent diabetes as per the protocol laid down (Appendix 1). Both low and high rates are ignored if they do not fit in with clinical observation reinforcing Flynn's comment that 'medical staff .... did not consider the source of a result when interpreting it. This was particularly apparent with spurious low results.'

The change from one brand of meter to another has had no appreciable effect on the results being produced, confirming that errors tend to be related to technique (3, 4, 5) rather than instrumentation.

The Chemical Pathology Laboratory is unwilling to continue to monitor and document an unsatisfactory system or to condone the proliferation of inaccurate results. The situation is currently under review with the aim of reducing the number of ward tests performed and increasing their quality.

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Appendix 1

Protocol for the use of the BM Test Glycemie — Refloflux II

A. GENERAL

1. Under no circumstances are the BM stix to be used for diagnostic purposes. Their use is restricted to the management of diabetic patients or in emergency situations when the result must be checked by the laboratory.
2. When glucose results with BM stix of less than 2.5 mmol/L and greater than 25 mmol/L are obtained the laboratory must be given a venous serum sample (red top) so a confirmed result can be obtained.
3. For non-insulin dependent Diabetes Mellitus patients in a stable condition daily fasting blood glucose measurement.
4. For insulin dependent Diabetes Mellitus patients the normal monitoring should be four times daily (before each meal and at 2100 hours).
5. Additional measurements to be done only when there is a clear indication. Such circumstances might be 0300 hours measurement if nocturnal hypoglycaemia is suspected, one, two or four hourly monitoring of patients on insulin infusion, other emergency situation.
6. All results *must* be logged on to the work sheets provided.

B. STAFF TRAINING
1. Only nursing staff who have been taught by either the Boehringer Mannheim representative, liaison nurse, NSDU or diabetes educator to perform glucose tests.
2. Re-training will be included with study days organised by the NSDU.
3. Under *no* circumstances are other nursing staff permitted to train new staff.
4. All accredited nursing staff must participate in the Quality Control programme organised by the laboratory.

C. DIABETIC PATIENT EDUCATION
1. Only the ward coordinator is to teach patients how to use the BM stix-Reflolux meters.
2. If you are having problems with blood glucose testing, please seek help from the NSDU, liaison nurse, diabetes educator or Chemical Pathology.

Effect of Cold Storage of Whole Blood on Routine Biochemistry Parameters

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Abstract

Storage of heparinised blood at 4°C for up to two hours prior to plasma separation increased potassium concentration on average by 0.25 mmol/L. No changes in other biochemistry parameters measured on a BM Hitachi 717 were detected. Whole blood may be stored or transported at 4°C for up to two hours prior to routine biochemistry analysis with the exception of plasma potassium.

Keywords

Blood storage, potassium, biochemistry tests.

Introduction

It is conceivable that blood obtained from patients is either kept in the refrigerator or transported cold prior to being processed by the biochemistry laboratory. The erythrocyte contains many of the constituents present in plasma but at different concentrations. For instance, erythrocyte contains twenty times more K^+ than plasma and the intracellular cation concentrations are kept constant through active transport mechanisms [1] which are inactivated at low temperature [2]. Thus there may be leakage of erythrocyte constituents into the plasma if blood is kept at 4°C for a period of time. In this study we determined the effect of cold storage of blood for two hours on plasma biochemistry parameters.

Method

Blood was obtained by venepuncture from six normal laboratory personnel who were not on any medication (three male, three female). Aliquots of blood from each subject were immediately placed into five heparinised Vacutainer™ tubes. One tube from each subject was immediately centrifuged, plasma separated and stored at 4°C. The other four heparinised samples were stored at 4°C for 15, 30, 60 and 120 min respectively prior to plasma separation.

Table 1

Mean results (n=6) of biochemistry parameters on plasma from whole blood stored for two hours at 4°C compared to plasma from unstored blood.

Test	0 hours		2 hours	
	x	S.D.	x	S.D.
Na	143.8	1.2	143.2	1.2
Cl	107.3	1.6	106.7	1.0
$C0_2$	27.7	1.0	27.2	1.8
Urea	4.9	1.0	4.8	1.0
Creatinine	0.106	0.010	0.102	0.009
Urate	0.33	0.04	0.33	0.04
Ca	2.34	0.06	2.32	0.06
$P0_4$	1.17	0.10	1.16	0.10
Amylase	204	59	205	60
T Bilirubin	7.7	5.0	8.2	5.6
ALP	81.2	13.4	81.2	13.1
ALT	21.0	6.8	21.3	7.5
AST	22.7	5.5	22.3	5.2
GGT	15.3	5.1	15.2	5.0
T CK	75.7	27.2	76.3	26.0
T Prot	76.0	3.5	75.5	3.2
Alb	43.2	2.8	43.5	2.5
Chol	5.45	1.26	5.48	1.23
Trigl	1.43	0.70	1.44	0.70
Fe	21.9	3.3	22.2	3.2
Mg	0.87	0.06	0.87	0.06

Table 2

Plasma K^+ (mmol/L) from whole blood stored for varying times at 4°C.

Subject	0 hr	15 min	30 min	1 hr	2 hr
A	4.5	4.6	4.6	4.6	5.2
B	4.4	4.4	4.4	4.4	4.4
C	4.4	4.4	4.3	4.3	4.4
D	4.5	4.5	4.5	4.5	4.7
E	3.8	3.9	3.8	4.0	4.2
F	4.1	4.2	4.2	4.1	4.3
x	4.28	4.33	4.30	4.32	4.53
S.D.	0.28	0.25	0.28	0.23	0.37

The plasma samples were analysed for the constituents listed in Table 1 on a BM Hitachi 717 using Boehringer Mannheim reagent packs for the 717. All the plasma samples were processed within the same analytical batch with appropriate controls.

Results

Apart from an increase in plasma K^+ after 2 hours, no statistically significant changes were detected in the biochemistry constituents of plasma from whole blood stored for varying times at 4°C ($p>0.05$ Student's t test). Table 1 shows the mean results obtained on plasma from unstored and stored (2 hours at 4°C) blood samples.

Plasma K^+ increased on average by 0.25 mmol/L when heparinised blood was kept at 4°C for 2 hours. No statistically or clinically significant increase was observed at 1 hour, the maximum increase being 0.2 mml K^+/L. This is due to cold inhibition of the erythrocyte membrane Na^+-K^+ ATPase which normally maintains the high intracellular K^+ and the low intracellular Na^+ (1, 2). Inhibition of erythrocyte Na^+-K^+ ATPase allows intracellular K^+ to passively diffuse into plasma down its concentration gradient. Table 2 shows the change in plasma K^+ over time from blood stored at 4°C. Individual changes ranged from 0 to 0.7 mmol/L over the 2 hour storage period.

Thus, from our study, we conclude that heparinised blood may be stored or transported at 4°C for up to at least 2 hours without significant change in routine biochemistry parameters apart from the increase in plasma K^+. It should be noted, however, that except for triglyceride values (due to non-fasting state) all other results were within the normal reference range. It is possible that samples with abnormal concentrations of the tested biochemistry constituents could show changes after cold storage of whole blood.

Acknowledgements

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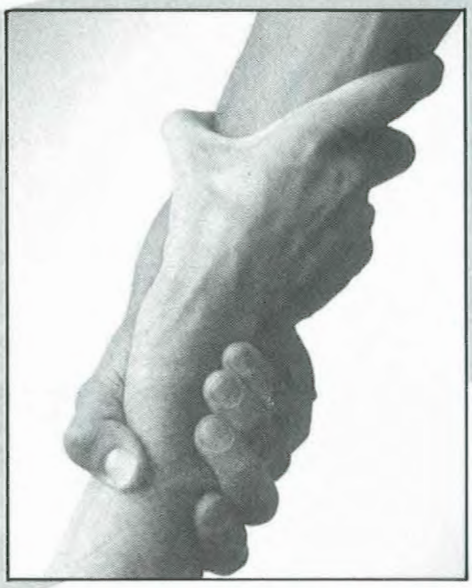

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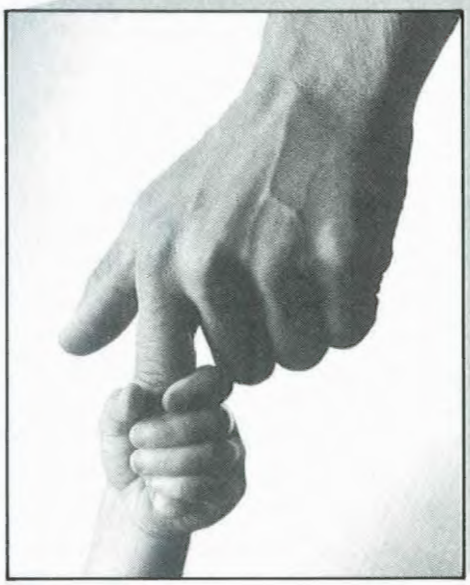

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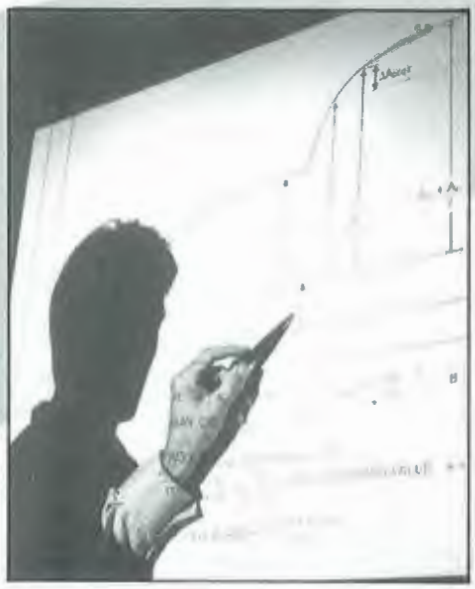

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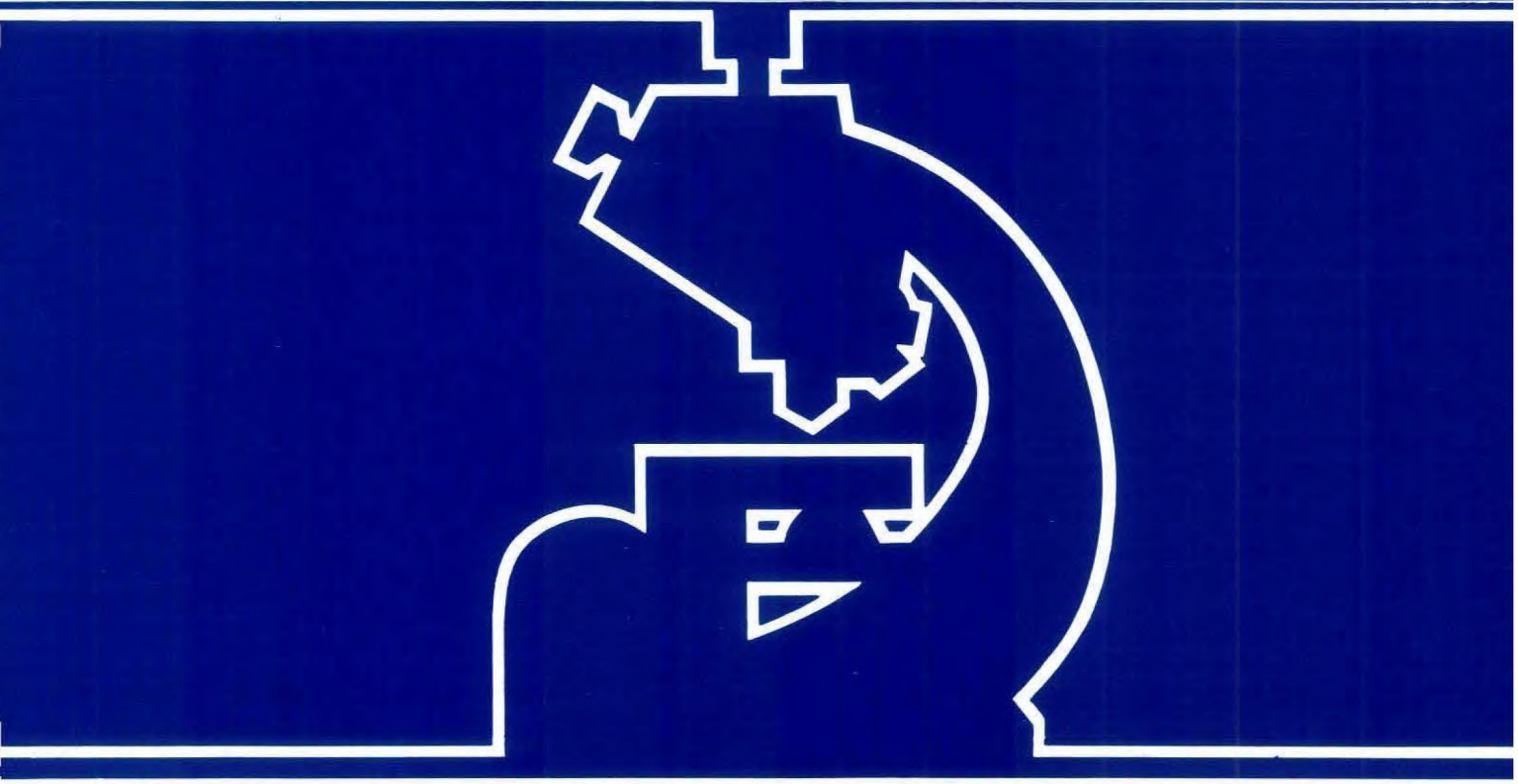

1988 ANNUAL REPORT BALANCE SHEET AND ANNUAL ACCOUNTS

Lift out

TECHNICAL ASSISTANTS EXAMINATION COMMITTEE

Members of the Committee are: B.T. Edwards (Convener), K. McLoughlin, G. Paltridge, J. LeGrice and T. Rollinson.

The 1987 examinations were conducted on 12 and 13 May. There were 102 candidates for the examination with 92 gaining the Certificate of Qualified Assistant. The pass rate was 90% compared with 89% the prevous year.

Breakdown of figures are:

	1987		1986	
	Sat	Passed	Sat	Passed
Clinical Biochemistry	16	15	10	8
General Certificate	10	8	6	6
Haematology	13	9	17	17
Histological Technique	10	9	6	4
Medical Cytology	5	5	2	2
Medical Microbiology	26	25	16	13
Mortuary Hygiene & Technique	1	1	2	2
Radioisotope & Radioassay Technique	1	1	0	0
Immunohaematology	10	9	8	7
Immunology (Microbiology)	8	8	3	3
Special Certificates	2	2	7	7
	102	92	77	69

OVERSEAS AID COMMITTEE

Members of the Committee are E. Norman (Convener), M. Eales and J. Elliott.

Support for the Pacific Paramedical Training Centre was considered to be the most appropriate role for this sub-committee in the 1987-88 year.

The predominant support from the Institute has taken the form of funding to assist with the setting up of a Quality Assurance Programme for Pacific Island Laboratories. Surveys in Haematology, Microbiology and Biochemistry have been completed or are under way and are being well accepted.

The centre has received a number of donations of equipment and text books during the year and is grateful for them and happy to accept more.

Trainees who have completed the Haematology and Microbiology Courses have even been presented with an appropriate text book. These books are donated by the N.Z.I.M.L.T.

The Trustees are especially grateful to all Wellington Laboratory Staff members who have given freely of their time and expertise to support Mike Lynch and the School and have thus contributed so much to the success of this venture.

As N.Z.I.M.L.T. representative on the Board of Trustees Marilyn Eales has maintained close contact with the centr.e Marilyn also makes a very valuable contribution with the Pacific Way Section of the Journal and the fact that it is always informative, interesting and topical is a tribute to her.

SAFETY COMMITTEE

Members of the Committee are J. Parker (Convener) and B. Cornere.

Safety Registers have been prepared and are to be issued to all Medical Laboratories for documentation of work related accidents. The Code of Practice for Health and Safety Committees requires that all laboratories keep a record of accidents occurring in the work area. Statistics will be collected by the Safety Committee on an annual basis for collation and review. A set of guidelines has been established relating to specimens labelling and worker liability when discarding/processing unlabelled specimens.

AWARDS COMMITTEE

J. Parker (Convener)

The Institute would once again like to extend thanks to the sponsors of the various awards for their continuing support. The donors were:

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The Institute itself is responsible for the following:
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NZIMLT Examination Prizes for QTA.

EDUCATION COMMITTEE

Members of the Committee are: J. Parker (Convener), B.T. Edwards, W. Wilson, S. Gainsford and J. Le Grice.

The Institute is re-examining Fellowship requirements in light of the decsion of the MLT Board to cease offering the Part III examination after 1988.

The Working Party for a degree course at Otago University has been meeting throughout 1987. Medical Faculty Board will consider the proposal in April/May and report back to Senate in June/July. If the proposal is approved in principle it will go to the University Grants Committee who will call for submissions from other universities and consider the proposal on academic and financial grounds. It will then be passed to the University Council and the open agenda and if supported will go forward to be considered in the 1989 Quinquennium.

PUBLICATIONS COMMITTEE

Members of the Committee are: D. Dixon-McIver (Convener). D. Reilly, W. Wilson and P. Reilly (Advertising Manager).

There were 14 papers proffered for publication (4 Auckland, 3 Dunedin, 2 Wellington and 2 National Health Institute, 1 Dunedin/New Plymouth, 1 Palmerston North and 1 Blenheim) of which 13 have been accepted for publication and published. This compares with 13 in 1986, 28 in 1985 and 26 in 1984.

It is most disappointing that despite pleas at the Annual General Meeting and sending personal letters to all those who gave papers at the Annual Scientific Meeting only two people produced material for the journal. The journal needs the support of members if it is to survive.

The editor wishes to record his thanks to Trish Reilly for looking after the advertising so well, Maurice Sheppard of Institute Press and the staff of the Royal New Zealand Foundation for the Blind for their assistance and help, and to all those who provided material for publication.

MEMBERSHIP COMMITTEE

Members of the Committee are D. Pees (Convener) and D. Dixon-McIver.

Total membership of the Institute has begun to rise again over the past few months. However the total is still a little down on last year at the corresponding time.

Many present members, and almost all new applicants, have taken advantage of the automatic salary deduction available to pay their annual subscriptions. If any members currently being invoiced wish to change for the 1989-90 year, please forward a signed authorisation to the Membership Convener.

During the past year 35 members became Associates upon passing their Diploma examinations and 79 Complimentary Members became Members. This leaves 45 Complimentary Members for this year only as there will be no new additions to this category in the future.

Our Honorary Member numbers have swelled due to several principal technologists retiring and being elected to this position by Council along with other persons who have given much to our profession and the Institute over the years. Many of these people were Fellows of the Institute. Hopefully membership in this category will grow again in the coming years.

The same old problem of people moving and not notifying us of their change of address is probably the biggest cause of membership loss through 'gone no address'.

Again we ask existing members to encourage their colleagues who are not members to join the fold and work towards a stronger, more united profession.

	1987/88	1986/87	1985/86	1984/85
Membership	1,536	1,792	1,352	1,369
less deletions	340	454	58	190
	1,196	1,338	1,294	1,179
plus applications	269	198	498	173
Membership as at 31 March	1,465	1,536	1,792	1,352
Membership Composition:				
Life Members	16	14	15	15
Fellows	30	39	42	40
Associates	752	785	732	610
Members	759	625	956	595
Non-Practising	58	55	32	77
Honorary	30	18	15	15

FELLOWSHIP COMMITTEE

Members of the Committee are K. McLoughlin (Convener), H. Potter and J. Le Grice.

Two members were awarded Fellowship this year, both by exemption. The first was Mrs Helen Hattersley, an expatriate Kiwi now working in Australia. The second, an unanimously popular choice, was Sandy Milne in recognition of his world renowned work on Hepatitis B infection expecially among the Maori population in the middle of the North Island.

The possible changes to the Medical Laboratory Technologists' Board's registration requirements for technologists has led to a re-assessment of the NZIMLT Fellowship qualification. The Fellowship regulations were last revised in 1984 and contain references to the Specialist qualification which may not exist by the end of 1988. Because of this the Fellowship Committee has been almost forced into another revision to meet the demands of the changing educational scene. This task has highlighted a split amongst Council and Committee members. There are those who wish to retain the present high status and those who wish to see the level set somewhere just above the Specialist level. The Committee has agonised over the desire to keep the Fellowship level equal to or above that of similar overseas qualifications but recognises the need to try to fill the gap created by the loss of the Board's Specialist examination. Rather than present any changes as a fait accompli, members will be given a chance to have their say in response to a discussion document to be presented at the AGM.

NEGOTIATIONS COMMITTEE

Members of the Committee are P. McLeod (Convener), W. Wilson, D. Dixon-McIver, R. Perkins (Industrial Adviser).

The 1987 wage round was virtually a repeat of the 1986 wage round. In 1986 we saw the CSU take the initiative and settle with the State Services Commission on behalf of all state servants. In 1987, the health sector groups combined and settled the wage round on behalf of all health groups. The result was a 7% salary movement across the board. In addition, the Institute was given the opportunity to negotiate further changes to the Mortuary Technicians scale and the Laboratory Assistant and Trainee scales.

Numerous other activities occurred as a result of the wage round. Talks were held by a representative committee of all those workers covered under the H.S. 48 conditions of employment on the two topics of redundancy and maternity leave.

The outcome was that H.S. 48 will have a clause included which states that the appropriate employee organisation must be informed of an impending redundancy one month prior to the effected employee(s) being informed. This will allow the union an opportunity to settle a redundancy deal. The committee decided for various reasons to maintain the status quo and leave the Maternity Leave provisions as they are in H.S. 48 rather than accept the conditions as set down in the Parental Leave Act.

The State Sector Act and the Labour Relations Act

These two Acts of Parliament have this year dominated the activities of the negotiations committee. The State Sector Bill and when the Bill was returned to the House, we felt that these had been addressed by the Select Committee.

At the time of writing this report, the State Sector Bill has just been passed into law.

The Labour Relations Act now covers laboratory workers and indeed all workers in the country. This Act replaces the State Services Conditions of employment Act and consequently changes all the rules under which we are now employed.

Under this Act, the N.Z.I.M.L.T. is deemed to be a union and we now have to alter our rules to comply with the law. Alternatively, we can form a separate union with or without links to the Institute, or hand over all our negotiation rights to another union. These are issues which we have to face this year and the negotiations committee will be working hard to put all the details to the membership during 1988 so that you can make an informed decision.

Numerous other issues require our immediate attention. The committee has to draw up an award to replace H.S. 19 and H.S. 48 by June 30th, 1988. At this stage it is not clear whether or not this will be an automatic process or one requiring a full negotiation round.

Another issue which will no doubt require considerable time of the committee will be the situation where we may end up in a contestability wrangle with another union for representation rights to those employed in private Medical laboratories. Information newsletters and questionnaires have been sent out to all the laboratories in question and it has been indicated that there is strong support for representation by the N.Z.I.M.L.T. rather than another union. A letter requesting union coverage of these workers has been sent to the Registrar of

Trade Unions with the exception of some laboratories in the north of the North Island. This matter is now in the hands of the Registrar.

Each year the Negotiations Committee faces changes and new challenges. However, 1987 and 1988 must surely be a time for unprecedented legislative change. Last year at our A.G.M. you were told to prepare for change. The new rules are now in place and equally the Institute must now make the hard decisions and make the required rule changes. In addition to these changes, we will this year learn of the specific changes to the way health care is delivered to the citizens of this country. No doubt these changes will also involve the committee in some more work.

I would like to thank all the members of the committee for their support during the year and also the N.Z.I.M.L.T. Council for their guidance. Equally, I thank all the members for their support and those who have ensured responses to the various questionnaires sent out.

NEW ZEALAND INSTITUTE OF MEDICAL LABORATORY TECHNOLOGY INC. STATEMENT OF FINANCIAL POSITION AS AT 31 MARCH 1988

	1988 $	1987 $
ACCUMULATED FUNDS		
Balance 1 April 1987	35,422	61,856
Deficit for the year	(37,956)	(26,434)
Balance at 31 March 1988	(2,534)	35,422
Clinical Laboratory Special Fund	641	641
TOTAL FUNDS AS AT 31 MARCH 1988	$(1,893)	$36,063
Represented by:		
CURRENT ASSETS		
Cash at bank	2,852	2,300
Stock on hand	920	1,658
Air New Zealand Bulkair Deposit Account	—	—
Sundry debtors	11,875	10,850
Subscriptions outstanding	2,007	276
TOTAL CURRENT ASSETS	17,654	15,084
LESS CURRENT LIABILITIES		
Sundry creditors	36,741	12,747
Subscriptions in advance	6,660	1,296
Examination fees in advance	2,272	1,750
GST	(4,593)	638
TOTAL CURRENT LIABILITIES	41,080	16,431
NET CURRENT ASSETS (LIABILITIES)	(23,426)	(1,347)
INVESTMENTS (Note 2)	20,000	35,000
FIXED ASSETS (at cost less depreciation)		
Typewriters (2)	1,533	2,410
	$(1,893)	$36,063

Treasurer — D.M. Reilly

President — W. Wilson

The attached notes form part of this Statement.

NEW ZEALAND INSTITUTE OF MEDICAL LABORATORY TECHNOLOGY INC. STATEMENT OF INCOME AND EXPENDITURE FOR THE YEAR ENDED 31 MARCH 1988

	1988 $	1987 $
INCOME FOR THE YEAR WAS DERIVED FROM:		
Conference surplus (as per statement)	4,288	—
Examination surplus	521	382
Interest received	6,119	5,621
Miscellaneous income	2,695	5,234
Subscriptions and levy	51,186	41,632
TOTAL INCOME	64,809	52,869
FROM THIS INCOME THE FOLLOWING EXPENDITURE WAS MET:		
Accommodation, etc.	9,715	7,985
Accountancy and audit fee	1,652	1,510
Computer services	8,404	13,661
Fees — C.S.U., LAMLT and NCCLS	3,453	4,170
Honoraria, gratuities and prizes	2,200	2,008
Journal cost (as per statement)	3,560	13,431
Legal expenses	2,250	1,439
Post Graduate Education and Pacific Training	2,551	2,394
Postage and tolls	5,759	5,643
Printing, stationery and typing	8,811	3,959
Sundry expenses	4,349	1,900
Travelling expenses	22,513	20,515
	75,217	78,615
Consultancy Fees	26,671	—
Depreciation of typewriters	877	688
TOTAL EXPENDITURE FOR YEAR	102,765	79,303
Which leaves an excess of expenditure over income for the year	$(37,956)	$(26,434)

The attached notes form part of this Statement.

NEW ZEALAND INSTITUTE OF MEDICAL LABORATORY TECHNOLOGY INC. CONFERENCE ACCOUNT FOR THE YEAR ENDED 31 MARCH 1988

INCOME FOR THE YEAR WAS DERIVED FROM:	1988 $	1987 $
Registration	8,957	—
Trade rentals and advertising	17,158	—
Donations	3,325	—
Social functions	7,483	—
Lunches	2,665	—
Bank interest and other income	35	—
Accommodation	3,845	—
TOTAL INCOME	43,468	—
FROM THIS INCOME THE FOLLOWING EXPENDITURE WAS MET:		
Travel	1,912	—
Accommodation, meals and travel costs	27,372	—
Social function costs	3,833	—
Rentals	494	—
Postage, stationery, and administration	3,889	—
Other expenditure	1,680	—
TOTAL EXPENDITURE	39,180	—
Which leaves an excess of income over expenditure transferred to the Statement of Income and Expenditure	$4,288	$NIL

The attached notes form part of this Statement.

NEW ZEALAND INSTITUTE OF MEDICAL LABORATORY TECHNOLOGY INC. JOURNAL ACCOUNT FOR THE YEAR ENDED 31 MARCH 1988

INCOME FOR THE YEAR WAS DERIVED FROM:	1988 $	1987 $
Advertising revenue	40,381	30,832
Subscriptions	1,426	2,208
TOTAL INCOME	41,807	33,040
FROM THIS INCOME THE FOLLOWING EXPENDITURE WAS MET:		
Printing — journal and newsletter	40,515	44,506
Postage and stationery	3,722	1,314
Sundry expenses	1,130	651
TOTAL EXPENDITURE	45,367	46,471
Which leaves an excess of expenditure over income transferred to the Statement of Income and Expenditure	$3,560	$13,431

The attached notes form part of this Statement.

NEW ZEALAND INSTITUTE OF MEDICAL LABORATORY TECHNOLOGY INC. NOTES TO THE 1988 FINANCIAL STATEMENTS

1. STATEMENT OF ACCOUNTING POLICIES

The historical cost basis of accounting has been used in the preparation of the financial statements. Reliance is placed on the fact that the Institute is a going concern. Accrual accounting is used to match expenses and revenues.

Particular accounting policies:

(a) Fixed assets and depreciation
Depreciation is calculated on a straight line basis to write off the typewriters over their estimated useful lives of 5 years.

(b) Stock is valued at actual cost.

There have been no changes in accounting policies. All policies have been applied on bases consistent with those used in previous years.

2. INVESTMENTS

(a) Debenture stock
General Finance Ltd $20,000 @ 16.5% matures on 21/08/90.

3. STOCK

	1988 $	1987 $
Examination stationery	—	50
Journal paper	—	—
Ties/badges, etc.	920	1,608
	$920	$1,658

The 1987/88 financial year has ended with an excess of expenditure over income of $37,956.

The establishment of the Science Trust has required an advance of $23,426, which proved to be considerably higher than the trustees had first envisaged. The Institute has donated $10,000 to the trust, the balance of $13,426 will eventually be repaid.

The Travel and Accommodation expenses have increased due to frequent industrial meetings. Also printing costs have increased.

D.M. REILLY,
HON. TREASURER.

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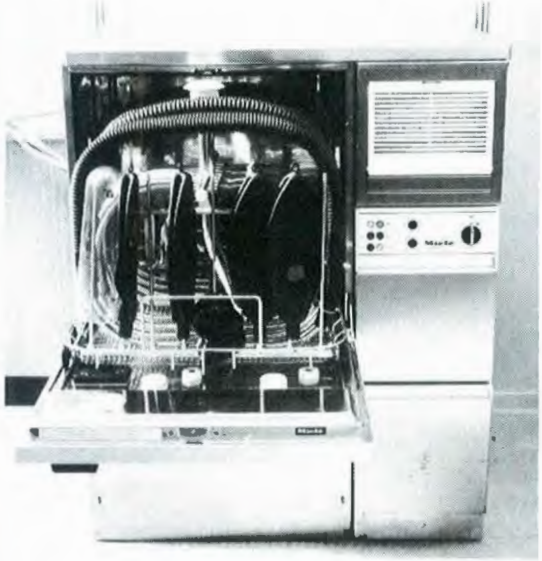

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Laboratory Biosafety Guidelines

June, 1988

Adopted from the Australian AIDS Task Force Guidelines, January 1987

These guidelines remind laboratory staff of the need to follow standard safety practices when dealing with reagents of human origin and all biological specimens including those contaminated with the human immunodeficiency virus (HIV). The procedures recommended should be read in conjunction with other documents on standard safety practices (1-7).

AIDS is a disease that damages the immune system of the body. This results in susceptibility to a variety of infective agents and some unusual forms of cancer. The emergence of AIDS as a significant transmissible disease in New Zealand has implications for all laboratory workers. The human immunodeficiency virus may be transmitted by the percutaneous inoculation of blood. There have, however, been only three cases reported to date among health care workers in whom the antibody test to the HIV has become positive as a result of needle-stick or mucous membrane exposure with treating patients with AIDS. The antibody status of 666 such workers has been followed in five separate studies of 1498 health care workers (8-9). No case of Category A AIDS attributable to occupational exposure has been reported among pathologists, mortuary or laboratory staff, other health care workers, or allied professionals (10-14).

Although the occurrence of AIDS has drawn the matter of laboratory safety to the attention of staff there are also many other infectious diseases that may be transmitted by specimens handled in laboratories performing diagnostic tests. Bacterial, fungal and viral agents may cause infections with tuberculosis, hepatitis, enteric disease, brucellosis and Q fever being the best documented. The major routes of acquisition of laboratory infection include aerosol, mucous membrane (including enteric) and percutaneous. Many of the standard laboratory safety practices can minimise such exposure.

Whereas it would be foolish to assume that there is no risk of infection with HIV occurring in the laboratory, evidence suggests that the risk is low, when compared with agents such as hepatitis B virus and *Mycobacterium tuberculosis*, and that staff can be protected by standard safety practices.

Laboratory safety procedures

Extraordinary precautions of containment and accommodation are not required to protect the staff of pathology or research laboratories against infection, unless one is dealing with pathogens classified as belonging to Hazard Group 4 (15). In general, HIV is not such an agent. The only circumstances in which special containment and accommodation are required are when attempts are being made to grow the virus, when large volumes of viral culture are being processed or with work involving the inoculation of experimental animals.

Special procedures should not need to be introduced for handling blood and other specimens from patients who are known to be infected with HIV nor should they be separated from other specimens being handled in the laboratory. The practice of "flagging" specimens only from patients who are known to be infected with either HIV or hepatitis B, as performed in most hospitals, may be potentially dangerous in that it may lead to a lowering of standards when other specimens are tested. This is particularly hazardous when dealing with an agent such as HIV in which there is a high rate of subclinical infection. The most effective method of preventing infection of staff is to assume that **all** specimens are potentially infectious.

The key elements in maintaining a safe laboratory are:

* adequate training;
* good emergency procedures;
* appropriate accommodation including use of biological safety cabinets where recommended;
* avoidance of risks from aerosols by use of appropriate equipment;
* wearing protective clothing and when necessary gloves and masks;
* effective hand washing;
* appropriate staff health programme;
* safe transport of specimens and instruments;
* decontamination of work surfaces, specimens and instruments;
* safe disposal of infected waste;
* safe use and disposal of sharp instruments or needles;
* avoidance of eating, drinking, smoking or mouth pipetting in the laboratory.

Training

The laboratory safety officer should ensure that staff members receive adequate instruction, that the safety aspects of new practices have been considered and that standard practices are being followed. Such instruction includes safe measures for dealing with the following hazardous procedures:

* inhalation risks due to aerosol production from centrifuging, opening cultures, pipetting, washing or preparing culture plates;
* risks of ingestion in handling specimens, cultures and smears;
* skin puncture injuries, including needle-stick;
* disposal of infectious and potentially infectious material.

Poor laboratory practice and human error can negate all safety standards and render good equipment dangerous. Continuous on-the-job training in safety measures is essential. Supervisors should ensure that their staff are safety conscious, properly trained and that safety and emergency procedures are written down and properly displayed. A copy should be given to each staff member.

Emergency procedures

The supervisor of each laboratory should prepare an emergency plan in consultation with staff and the safety officer. The emergency plan should be displayed prominently at critical places and cover the following:

* location of emergency equipment;
* phone numbers of emergency services;
* fire and other natural hazards;
* malicious damage;
* accidental swallowing of potentially hazardous material;
* accidental skin puncture or cut;
* breakages and leakages.

Where staff could be splashed or contaminated with hazardous materials, emergency showers should be provided to allow for immediate removal of contamination. Elbow/foot operated wash basins and an eye wash fountain should be provided.

If a staff member has a parenteral exposure, for example needle-stick or cut, or mucous membrane exposure to blood or other body fluids, the following procedures should be implemented:

* Administer first aid.
* Treat puncture wound or cut by liberal washing with soap

and water and/or dilute hypochlorite solution.

* If the face is splashed with blood, then the eyes and mouth which present exposed mucous membranes should be rinsed gently with water to minimise the risk of infection.

Implement the following procedures:

* Determine the likely type of infection from laboratory records.
* As soon as possible, refer injured staff for clinical assessment including a programme of testing for antibiotics to any likely infective agent such as hepatitis B or HIV.

Complete an accident report:

* Document the incident. There should be a central location in each institution where such records are maintained.

Accommodation

All benches and surfaces should be non-porous and capable of ready and regular disinfection. Doors should have clear glass panels so that occupants can be seen from the outside. Access to laboratories should be restricted to operating staff only.

It is not practical to require special accommodation for biochemical and haematological tests on specimens from patients who have or who are suspected of having viral or bacterial infections. These specimens may be handled in the ordinary laboratory provided the precautions in reference 7 are observed.

Microbiological work including antigen and antibody testing, however, should where possible be conducted in a laboratory room dedicated for that purpose and having its own negative pressure air system. In the absence of a dedicated room, approved biological safety cabinets should be used.

Office work should not be done in dirty areas or areas where potentially infectious material is handled. Clean areas should be set aside for day books, forms and reports. Hand washing before commencing office work is essential.

Aerosol containment

BIOLOGICAL SAFETY CABINETS

Biological safety cabinets Class 1 should be used for all procedures likely to produce aerosols. Such procedures may include vigorous mixing as in treatment of sputums and washing of specimens for micro ELISA tests. Vacuum pumps used to aspirate ELISA wash liquors should be housed within the safety cabinets or alternative arrangements made to avoid chronic exposure of laboratory workers to aerosols. The cabinets must be tested and serviced at intervals of not more than one year, by NATA approved testing authority, to ensure that they are operating to specification.

CENTRIFUGES

Sealed centrifuges should be used for any spinning of materials and operators should ensure that the rotor has completely stopped turning before opening the lid. Sealed buckets with transparent lids have the advantage that they may be easily carried to a biological safety cabinet and opened there and allow operators to see if there are any breakages. In the event of breakages the whole bucket should be capable of being autoclaved and the lid not removed until the spill has been decontaminated.

PROTECTIVE CLOTHING

Protective clothing should be mandatory for all laboratory staff. Gowns with no front openings and which protect the operators' clothes are preferable to laboratory coats. Gowns should be discarded when they become soiled and removed each time staff leave the laboratory, such as to go to the toilet or at meal breaks.

Disposable gloves should be worn when handling blood specimens, blood-soiled items, body fluids, excretions and secretions, as well as surfaces, materials, and objects exposed to them. Gloves should be removed on completion of laboratory tasks, when using a telephone or when performing any other office work.

Hand washing

Hands should be washed thoroughly with soap and water after removing gown and gloves and immediately if they become contaminated with blood, or other body fluids.

Staff health programme

Baseline serum specimens should be collected from and stored for all staff. Additional serum specimens may be collected periodically.

The administration of hepatitis B vaccine is recommended for all staff handling blood or other potentially infectious specimens.

Specimen collection and transport

All specimens for microbiological testing should be sealed properly in an appropriate container. The containers should then be transported in waterproof plastic bags. Request forms should be placed outside the plastic bag.

For transport between institutions, specimens should be placed in an inner container surrounded by absorbent padding and a durable, for example metal, sealed outer container. Note that packaging and labelling of infectious or potentially infectious material should comply with the carrier's conditions, government and postal regulations and International Air Transport Association (IATA) Dangerous Goods Regulations where appropriate.

Decontamination

SPECIMEN CONTAINERS

If the request form is soiled the information should be transferred to a clean form and the original one discarded.

Following receipt of specimen containers that are contaminated on the external surface, decontaminate with 0.2% sodium hypochlorite. Notify the sender.

DIRTY SPILLS

Sprinkle with a chlorine based powder, i.e. Biozorb, Diversol, to soak up spill. Leave for 10-20 minutes then clean up and wipe over with 1.0% (10,000ppm) of hypochlorite.

ROUTINE DISINFECTION

Clean all surfaces with 0.2% hypochlorite (2,000ppm) (11).

INSTRUMENTS

When tests are completed, automated systems used in chemical pathology and haematology may be washed through with distilled water to dilute any potentially infective agents, followed by 0.05% sodium hypochlorite or 1% glutaraldehyde, then washed again with distilled water.

Instruments and devices that come into contact with body fluids should be treated in accordance with the disinfection and sterilisation procedures in the Infection Control Guidelines (16).

Centrifuge buckets should be disinfected at the end of the day whether or not breakages have occurred. Manufacturer's instructions should be followed as some disinfectants are corrosive.

Products of human origin used as reagents and controls

Many laboratories prepare reagents and controls from products of human origin for their own use. The risk of transmission of infective agents from pooled products is likely to be greater than from a patient specimen given the number of times such products are used, and the likelihood

that their source could be forgotten over time.

The following procedures are recommended:

* Reagents prepared from a small number of individuals should be tested separately for hepatitis B and HIV antibody. Positive reactants should be destroyed.
* Reagents prepared from large pools should be tested in the final product.
* Reagents prepared from units of blood donated at Blood Transfusion Centres are screened there and should not be tested further unless they are circulated to other laboratories.
* All reagents prepared from products of human origin should be handled as potentially infectious. If for no other reason, there is a risk of transmission of Non-A, Non-B hepatitis even when heat treatment has been implemented (17).
* Heat treatment of reagents from pooled or single specimens should be a matter for decision by each laboratory.
* Each product should have an identification number so that its source can be traced if necessary.

AIDS Task Force Bulletin 14/85 — use of human blood products in laboratories, refers to commercial products. Current import procedures should ensure that there is little risk from hepatitis B or human immunodeficiency virus in such products. It is expected that products of human origin manufactured in Australasia should comply with the import procedures. Nevertheless, as no screening test or heat treatment is completely effective against all infective agents, the products should be regarded as potentially infectious.

Waste disposal

GLASSWARE

Glassware such as screw capped bottles, vials and centrifuge tubes should be discarded into lidded buckets that are autoclaved prior to discarding the contents.

SHARP INSTRUMENTS AND NEEDLES

Sharp instruments which are to be destroyed should be placed in a rigid walled, puncture resistant container, that is autoclaved and then incinerated.

A needle guard must be used when resheafing used needles.

INFECTIOUS MATERIAL

Infectious or potentially infectious material should not leave the laboratory until autoclaved. Bags for disposal should be sealed by laboratory staff and not left open at the end of the day, nor left lying in laboratories where they can be inadvertently removed by cleaning staff. The bags should be removed to a safe, secure spot, before autoclaving. Material, once autoclaved, should then be placed in a secure, easily identified container for removal to an incinerator (1200-1300°C). Infectious or potentially infectious material must not be disposed of in domestic waste.

Instrument repair and transport

Before any equipment of instrument is serviced in a laboratory or is sent for repair, it should be decontaminated in accordance with the manufacturer's recommendations. Equipment design may preclude corrosive chemicals, water or alcohol. Where available decontamination labels supplied by manufacturers should be fixed to the instruments. Note, however, that some inaccessible parts of complex instruments may be difficult to treat and manufacturers should be advised accordingly. All liquid waste containers should be emptied, blood rinsed from inside and the equipment and the outside cleaned with a suitable disinfectant.

Failure to follow these simple procedures could place repair staff at risk and cause delays and contaminate other goods being transported by the carrier.

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16. Infection Control Guidelines — AIDS and Related Conditions. AIDS Task Force 1986. Canberra, Australian Government Publishing Service.
17. "Non-A, non-B Hepatitis associated with a Factor IX complex infused during cardiovascular surgery — Arizona". CDC, *MMWR*, **35**: 391-99, 1986.

Note

NCCLS Document M29-P Vol 7 No 9, 1987. "Protection of Laboratory Workers from Infectious Disease Transmitted by Blood and Tissue".

This proposed guideline is now available from NCCLS, 771 East Lancaster Avenue, Villanova, PA, 19085, USA ($15.00 USA).

The Pacific Way

Pacific Paramedical Training Centre

Haematology/Blood Bank Course, February — April, 1988

1988 February — April Haematology/Blood Bank P.P.T.C. Course.
Back row: Bennie Otoa (PNG), Foliake Sosane (Tuvalu), Stewart Dixon (Tutor), Dr Ron McKenzie (Co-Chairman, P.P.T.C.), Mohammed Iqbal (Fiji).
Front row: Tala Mauala (Western Samoa), Mike Lynch (Tutor Co-ordinator), Peia Ben (Rarotonga).

On Friday, April 29th, 1988 Mr Alan Oaisa, High Commissioner for Papua New Guinea, presented certificates to five students who had completed the course. (See photograph). The group was congratulated on the high standard they had achieved.

New Course

Each year the P.P.T.C. introduces one new course to its repertoire of appropriate technology courses. This year it is "Sexually Transmitted Diseases (including AIDS), plus Hepatitis B Serology". The New Zealand Health Department fully supports the P.P.T.C. in conducting this course which is to run from 30th May to 22nd July. Dr Karen Poutasi, Deputy Director of Health, formerly Medical Superintendent at Middlemore Hospital, has been liaising with the Course Planners in an advisory capacity.

Philip Anaroai at the Haematology/Blood Bank certification presentation course at P.P.T.C., August, 1985.

Progress Report

It was pleasing to note that in a recently published book "Laboratory Guide for Rural Health Centres in Papua New Guinea" by Joan Brabec and Peter Barss, the name of Philip Anaroai amongst the acknowledgements — "Philip Anaroai for his assistance and encouragement".

Philip is a former student of the P.P.T.C. He attended the Haematology/Blood Bank course during May — August, 1985. Philip, formerly an instructor of medical laboratory assistants, is now the Senior Laboratory Technician at Alotau Hospital in the Milne Bay Province.

Purpose — Honesty — Responsibility

The following is an extract from the Laboratory Guide mentioned above. Its simplicity speaks volumes. It should be posted on the front of all laboratory manuals.

"The purpose of the laboratory is to serve the sick in the community by assisting the Health Centre staff in the diagnosis of their patients. Our main concern must be the welfare of each patient. We must be aware that each report we send out has a direct effect on the decision of the Health Centre staff to treat or not treat a patient. This means we must be very careful to report accurate results for the right patient. We are responsible for a patient's improved health and eventual return to normal life or for a patient's further illness and even death. We must always keep this in mind when doing our work, and be as careful as we can to give out only correct reports".

Teaching Aids at Low Cost (T.A.L.C.)

T.A.L.C. sends out 40,000 low cost books and one third of a million teaching transparencies each year. Flannel graphs, oral rehydration spoons, arm circumference tapes and weight charts which fit the T.A.L.C. direct recording scales are also available. For lists of the material available, contact Barbara Harvey, T.A.L.C., P.O. Box 49, St Albans, AL1 4AX, United Kingdom.

Recommended Texts

The following is a list of text books recommended for laboratory workers contemplating working in laboratories in the Pacific area.

Cheesbrough, M and McArthur, J. (1980): A Laboratory Manual for Rural Tropical Hospitals. Edinburgh, Churchill Livingstone.

King, M. (1973): A Medical Laboratory for Developing Countries. London, Oxford University Press.

World Health Organisation (1980): Manual of Basic Techniques for a Health Laboratory. Geneva, Switzerland.

Brabec, Joan and Barss, Peter (1986): Laboratory Guide for Rural Health Centres in Papua New Guinea. Published by Summer Institute of Linguistics Press, Ukarumpa, Eastern Highlands Province, Papua New Guinea.

Books available from T.A.L.C.

Wearner, David. "Where there is no doctor".
A must for those developing village programmes.

Elford, J. "How to look after a refrigerator".
Gives step by step instructions for the care and maintenance of kerosene, gas and electric refrigerators.

Browne, S.G. "The diagnosis and management of early leprosy".
Excellently illustrated.

"How to choose and make a cold box".
Most appropriate cold boxes for vaccine transport in the area of those working in immunisation programmes.

Sanders, David. "Struggle for Health".
Suggesting that improvement in health comes through practical change rather than pills and injections.

Winblad, Kilama. "Sanitation without water".
Practical information on how to design, build and operate compost and improved pit latrines.

Abbatt, Fred and McMahon Rosemary. "Teaching Health Care Workers".
A simply written, well illustrated detailed guide for the teachers of Health Care Workers.

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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, 1988 are:

For Fellows — $104.00 GST inclusive

For Associates — $104.00 GST inclusive

For Members — $52.00 GST inclusive

For Non-practising Members — $33.00 GST inclusive

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

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

Membership Sub-Committee Report — March 1988

Since our November meeting there have been the following changes:

	16.3.88	19.11.87	22.9.87	18.8.87
Membership:	1506	1534	1524	1512
less resignations	21	10	6	13
less G.N.A.	32	28	—	10
less deletions	163	—	—	—
less deceased	—	—	—	—
	1290	1496	1518	1489
plus applications	173	10	15	31
plus reinstatements	2	—	1	4
	1465	1506	1534	1524

Applications for Membership
Mr A. Suntharalingam, Zambia; Miss J.M. McDonald, Hamilton; Miss M.M. Brienne, Auckland; Mr W.M. Kertell, Auckland; Mr T.S. Lakshman, Wellington, Ms T. Stroud, Auckland; Mr W.J. Boswell, Wanganui; Miss P.M. Rowden, Wanganui; Miss J.A. Jaquiery, Wanganui; Miss C.J. Roberts, Auckland; Miss M.J. Lawson, Auckland; Miss S.S. Kong, Auckland; Miss L.C. Fitzgerald, Auckland; Miss S.J. Harry, Auckland; Miss S. Sargis, Auckland; Miss S.A. Cook, Auckland; Miss C.S. Lauder, Auckland; Miss J.E. Kwak, Auckland; Miss L.C. Giles, Auckland; Miss V.C. Harrison, Auckland; Mrs W.D. Hamerton, Hawera; Miss J.J. Brown, Wellington; Miss T.L. Frame, Auckland; Miss V.A. Chandler, Auckland; Miss R.J. Greenwood, Auckland; Miss L.J. Hynds, Auckland; Miss M. Thorpe, Auckland; Miss R.L. Eastabrook, Auckland; Miss M. Huizer, Auckland; Miss S.T. Turfrey, Auckland; Miss M. Glassey, Auckland; Miss V.C.J. Thomson, Hamilton; Miss J.L. Sturmer, Hamilton; Mr S.B. Jack, Dunedin; Miss J.C. Russell, Auckland; Miss M.J. Cornell, Auckland; Ms J.R. Preston, Auckland; Miss S.M. Fleming, Auckland; Miss M.L. Gould, Dunedin; Miss F.C. Rogers, Auckland; Mr S.L. Randle, Dunedin, Miss F.E. Hutchison, Hamilton; Mr S.T. Story, Palmerston North; Miss P.C. Fleming, Auckland; Mrs S.L. Alsleben, Hastings; Miss H.J. Cos, Auckland, Miss J.M. Overweel, Auckland; Mr G.J. Elliot, New Plymouth; Mrs S.C. Polaschek, Invercargill; Miss M. Oughton, Wellington; Mr G.M. Fry, Lower Hutt; Miss R.S. Macky, Hamilton; Miss K.M. Norton, Hamilton; Miss T.M. Hasler, Hamilton; Miss T.L. Robinson, Greymouth; Mrs J.A. Willson, Gisborne; Miss J.K. Woollaston, Greymouth; Mrs M.J. Harris, Christchurch; Miss P.E. Sheffield, Thames; Mrs D.S. Simonsen, Masterton; Miss R.C. Fanning, Palmerston North; Miss V.K. Burdett, Auckland; Miss A.K. Cheyne, Christchurch; Miss C.V. Franks, Christchurch; Miss D.M. Duggan, Christchurch; Miss R.S. Whittle, Christchurch, Miss S.C. Pickett, Auckland; Miss E.I. McMurtrie, Nelson; Miss P.M. Newth, Palmerston North; Miss M.T. Southee, Porirua; Miss J. Tricker, Auckland; Miss A.J. Collier, Christchurch; Miss L.C. van Heusen, Auckland; Mrs V.M. Armitage, Christchurch; Miss R. Horder, Christchurch; Miss L.M. Waller, Dunedin; Miss K.J. Bowmer, Auckland; Miss A.L. Wightman, Auckland; Miss M.J. Bray, Christchurch; Miss E.L. Cox, Lower Hutt; Miss R.V. Jack, Christchurch; Mrs H.F.L. Marwick, Nelson; Miss T. Scott, Palmerston North; Miss S. Hargraves, Christchurch; Miss K.L. Bruton, Hamilton; Mr R.J. Horn, Christchurch; Mrs S.S. Elbourne, Fiji; Miss N.G. Chant, Christchurch; Miss G.L. Smith, Christchurch; Miss J.L. Mitchell, Palmerston North; Miss M.L. Hieatt, Auckland; Miss P.C. Turtle, Auckland; Miss R.K. Best, Nelson; Mr E.J. Russell, Auckland;

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N.Z.I.M.L.T. N.Z.A.C.B.

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Reinstatements

Mr D.A. Robertson, Christchurch; Mrs J.M. O'Brien, Auckland.

Resignations

Miss H.J. McGregor, Auckland; Miss J.A. Fournier, Auckland; Miss W.P. Duffin, Auckland; Mrs T.A. Williams, Gisborne; Mrs M.A. Jeffries, Wellington; Mrs K.C. Belton, Whangarei; Mrs R.A. McAnulty, Christchurch; Miss N.M. Chevis, Auckland; Ms M. Pot, Auckland; Miss H.J. Baird, Wellington; Mr K.W. Wright, Invercargill; Mrs Y. Roberts, Upper Hutt; Miss B.M. Hogan, Invercargill; Miss H.C. Pearman, Hastings; Mrs S.L. Baxter, Christchurch; Mrs R.D. Crawford, Upper Hutt; Mr P.T. Ludwig, Auckland; Mrs M.J. Webster, Auckland; Miss A.M. Gough, Auckland; Miss S.J. Baird, Invercargill; Mrs C.J. Thompson.

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Membership Sub-Committee Report — May 1988

Since our March meeting there have been the following changes:

	27.5.88	16.3.88	19.11.87	22.9.87
Membership:	1465	1506	1534	1524
less resignations	21	21	10	6
less G.N.A.	10	32	28	—
less deletions	—	163	—	—
less deceased	—	—	—	—
	1434	1290	1496	1518
plus applications	65	173	10	15
plus reinstatements	—	2	—	—
	1499	1465	1506	1534

Applications for Membership

Mr K. Drysdale, Palmerston North; Miss C.J. Papango, Philippines; Miss S.C. Morris, Christchurch; Mr P.R. Johns, Wanganui; Ms J.A.B. Blank, Christchurch; Mrs S.J. Timpany, Invercargill; Miss B.A. Moroney, Christchurch, Mr A.R. Das, Auckland; Miss M.J. Nisbet, Auckland; Mr K.W. Wright, Invercargill; Mrs D.N. Chinn, Dunedin; Miss L.A. Smallwood, Lower Hutt; Miss A.C. Riosa, Auckland; Mrs S.M. Stewart, Dunedin; Mrs J.K. Jones, Auckland; Miss L.A. Gaseltine, Auckland; Miss J.M. Baker, Invercargill; Mrs L.K. Barclay, Invercargill; Mr M.R. Bickers, Christchurch; Ms J.A. Lamplugh, Christchurch; Miss S.M. Tooman, Hamilton; Mrs S.C. Cowan, Wanganui; Mr C.D. Rowland, Hastings; Mrs J.K. Clifford, Christchurch; Mrs J.S. Walters, Auckland; Mr D.V. Welch, Auckland; Mrs J.M. Murphy, Christchurch; Miss T. Lush, Hamilton; Mrs P.F. Freeman, Auckland; Miss N.A. Johnson, Nelson; Mr C.M. Calder, Invercargill; Mr A.H. James, Auckland; Miss E.J. MacArthur, Auckland; Mr F.E. Harris, Auckland; Miss J.E. Hinde, Christchurch; Miss A.V. Knight, Auckland; Miss A.H. Baker, Auckland; Mrs C.A. Collins, Dunedin; Mrs A.L. Nilson, Christchurch; Mrs D.V. Larson, Christchurch; Miss H. Deane-Smith, Lower Hutt; Ms D.S. Nassenstein, Lower Hutt; Mrs F.C. Thomson, Christchurch; Miss P. Drummond, Auckland; Mrs J.L. Chamberlain, Wellington; Miss S.E. Neill, Nelson; Mrs E.A. Allan, Nelson; Mrs H.M. Murray, Christchurch.

Applications for Associateship

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Resignations

Miss E. Twentyman, Hamilton; Dr J. McIntosh, Hamilton; Mr B. White, Auckland; Mr D. McArthur, Auckland; Mr I. Breed, Auckland; Mr B. Bodger, Australia; Mrs A. Brounts, Auckland; Mr B. Dawkins, Australia; Miss C. Smith, New Plymouth; Ms M. Carman, Hamilton; Miss S. Harry, Auckland; Mr J. Hurst, Timaru; Mr G. Chambers, Australia; Mr B. Glynn-Jones, Dunedin; Ms I. Te Wiata, Auckland; Mrs H. McMullan, Gisborne; Mrs J. Gempton, Auckland; Mrs M. Lewis, Dargaville; Ms G. Morley, Tauranga; Mr N. Paine, Wellington; Mr D. Ford, Australia.

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OBITUARY

The death occurred in Tauranga on 1 May, 1988, of Mr SAMUEL OSWALD JARRATT, a long-standing member of the Institute and whose name would be well-known to the more senior members.

Mr Jarratt, or 'Os' as he was affectionately known by his friends and colleagues, was born in 1911 in Otago. His secondary education was completed at Otago Boys' High School, Dunedin, and he entered the Otago Medical School as a 'Bacteriology Trainee' in 1934, gaining his Certificate of Proficiency in 1939.

In July, 1941, Os was appointed Assistant Bacteriologist at the Palmerston North Hospital, subsequently attaining the title of Senior Bacteriologist. He remained in the employ of the Palmerston North Hospital Board until 31 May, 1955, when he resigned in order to commence private practice in that city.

Clinical Laboratories was one of the earlier private medical laboratories to be set up in New Zealand and Os was joined by the late Dr K. Uttley in an enterprise that provided the medical practitioners and public of Palmerston North with a high standard of medical laboratory technology. This was maintained until 1975 when the medical laboratory work ceased and Clinical Laboratories continued to provide laboratory services to industrial customers.

Electing to take up 'formal' retirement in 1980 Os remained in Palmerston North pursuing his many interests until the time of his death. His Institute involvement included serving as Secretary/treasurer in 1946-47, as Secretary in 1948-49 and as a Council member in 1950-52. He continued to hold a lively interest in the profession of Medical Laboratory Technology even though his business commitments precluded his taking a more active role.

Those of us who were privileged to be involved with Os Jarratt over the years will remember him particularly as a man of unflagging enthusiasm for his life and work. His vitality and kindly interest in all people associated with him made him a well-known and respected figure in Palmerston North. He had many interests and when time permitted he pursued these with the same zeal that characterised his working life. In latter years he took up gold as a recreation and developed an interest in wine-making. However, his over-riding interest was always his family and he was a much-loved husband and father.

Os Jarratt will be remembered as a natural gentleman who showed enthusiasm, kindness and unfailing courtesy always in his dealings with those around him. He is survived by his wife, Gwen, and a daughter and four sons, to whom we extend our sympathy at this time.

JCM

POETS CORNER

The Midnight Call Girl

To start at the beginning
We must let you explore
The secret of the X-Match
Until you know some more.

In comes the blood and orange card
"Oh no" you say, "Not me"
But alas you are the only one
The others are at tea.

You start to check the details
To see they are the same
Then you say "Ah ha, what's this?
They've both got different names.

You finally get it sorted out
The bloods put in to spin
You really start to wonder
About this job you're in.

First we do the rapid group
The Anti A and B
And then the only tricky bit
The bloody Anti D.

"Yes" you say "A Negative"
But its getting clumped
It might be a positive
This bits got me stumped.

The units are picked out now
The tubes are in their row
You separate the segments
And put them where they go.

The you start the washing
And making up in liss
Now there is the dropping out
Heaven help you if you miss.

The room temps — they are easy
Just stick them on a slide
Put them under the microscope
Let the auto be your guide.

In front are the enzymes
For which we use papain
Then there are the Coombs'
Which we wash four times again.

There didn't seem to be much wrong
But how much did you see?
Do you think you missed the
Incompatibility.

A X-Match is a X-Match
You will soon be made aware
And when you get a midnight call
How do you think you'll fare?

Jane Higham, Stratford Hospital Laboratory

NEW PRODUCTS AND SERVICES

HUMAN M-CSF UNIQUE TO KOCH-LIGHT

A completely new product, Macrophage Colony Stimulating Factor (M-CSF) — is now uniquely available from Koch-Light, as part of an expanding range of colony stimulating factors produced by Genzyme.

Recombinant M-CSF is produced in yeast using a plasmid expression vector which contains a truncated version of the gene originally cloned from a human pancreatic tumour cell line and has applications in research into leukaemia, rheumatoid arthritis, auto-immunue diseases and transplants.

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Koch-Light offers M-CSF purified by ion exchange and reverse phase HPLC with activity of greater than 1 x 10^8 CFU per mg. A data sheet is available from Koch-Light, or our New Zealand Agent: Labsupply Pierce (NZ) Ltd, ph (09) 419-2551 or **circle 134 on readers reply card.**

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Now a Complete Range from Becton Dickinson

Eight microtainers now make up the range with additions of flo-coat EDTA and an amber tube for tests affected by UV light. All come with the shute "Flowtop" collector which allows droplets to flow freer and faster, providing a more reliable specimen.

When in use the plug can be removed from the top of the tube and attached to the bottom. This ensures that it won't be misplaced during collection. Microsamples, whether from a premature infant's heel or a geriatric or oncology patient's finger, require special handling. Microtainers are efficient and make the job a little easier. Contact Salmond Smith Biolab Ltd or **circle 136 on readers reply card.**

BECKMAN OFFERS NEW CLINICAL CENTRIFUGES SERIES

Four versatile clinical centrifuges that spin blood bags and more sample at higher speeds and forces than other general purpose models are now offered by Beckman Instruments. In addition, the Series features a unique Beckman Aerosol® Canister with an Aerosolve® tube rack. The canister protects user and sample in case of a broken tube when spinning infectious materials that could aerosol into the laboratory environment.

The GP Series Centrifuges are available with or without refrigeration in tabletop models (GP and GPR), and in portable floor models (GPK and GPKR) that can be stored in the "kneewell" of a workbench and moved easily from laboratory to laboratory.

With a four-bucket horizontal rotor GP centrifuges spin up to three litres at 3750 rpm/3200 g. They are the first compact centrifuges able to spin four 250 mL conical-tip tissue culture bottles per run. In addition to blood bags, the centrifuges also spin up to eight 96-well microplates, and large numbers of tubes in modular disk adapters, for example, as many as 148 RIA, 76 serum separator, or 565 15 mL tubes. The two available 35° fixed angle rotors are rated at 6400 rpm/5642 g.

The GP Series features a Beckman-designed direct drive that tolerates considerable rotor imbalance, automatic "soft-start" and a two-stage disk brake for rapid but gentle acceleration and deceleration. The Series has a 7-year rotor warranty.

Contact Sonatec (09) 764-533 or **circle 133 on readers reply card.**

NEW RANGE OF DISPOSABLE GLASSWARE

Newly available in New Zealand is the Chase Instruments range of disposable glassware including:

Dispens-A-Pak disposable RTU Culture tubes in borosilicate and flint glass. Common sizes available include: 10 x 75mm, 12 x 75mm, 13 x 100mm, 16 x 100mm, 16 x 125mm and 16 x 150mm.

Micro-Haematocrit tubes — These tubes are available either plain or heparinised in convenient plastic vial sizes of 100 or 200. The tube tips are colour coded for instant identification. Natelson tubes and Caraway tubes are also available.

Cover Slips — Chase cover glasses are manufactured from superior quality pre-cleaned borosilicate glass, and are non-corrosive and non-fogging. Available in No 1, 1½ and 2 thicknesses in all the commonly requested sizes, they are packaged in a molded, compartmented, reclosable plastic box to ensure cleanliness and maximum protection.

All Chase products are manufactured to conform to rigid specifications and are suitable for use in blood banks, haematology, bacteriology as well as general laboratory applications. Contact Salmond Smith Biolab Ltd or **circle 135 on readers reply card.**

NEW ASSAYED CHEMISTRY CONTROL, FROM BIO-RAD BROADENS UTILITY OF LYPHOCHEK LINE.

February 1988 — Bio-Rad Laboratories recently introduced an Assayed Chemistry Control, which joins their line of Unassayed Chemistry Controls, to provide an improved means for assessing both accuracy and precision.

LYPHOCHEK® Assayed Chemistry Control is human serum-based, and backed with a full three year interlab comparison. Assayed for over sixty methodologies, this new control includes the latest automated instrument methods and reference methods. Featured are values supplied by I.N.S.T.A.N.D. (German Institute for Standardization and Documentation in the Medical Laboratory), which broaden the control's worldwide acceptance.

Both LYPHOCHEK Assayed Chemistry Control and Unassayed Chemistry Control are bi-level controls that eliminate the separate diluent. This conserves up to 50% of the laboratory refrigerator's space, removes diluent-induced value fluctuations, and reduces shipping charges. Bi-level utility for more than 50 constituents ensure that virtually all of the laboratory's control requirements for both accuracy and precision can be met with these two LYPHOCHEK chemistry control products.

LYPHOCHEK Assayed Chemistry Control is offered in 12 x 5mL packaging, while LYPHOCHEK Unassayed Chemistry Control, human or bovine-based, is available in 50 x 10mL packaging.

The human serum control material in both Chemistry Control products was tested and found negative for HIV by ELISA.

LYPHOCHEK Chemistry Control users can take advantage of the LYPHOCHEK Quality Control Program and LYPH-LINE™ on-line QC software.

Contact Salmond Smith Biolab or **circle 137 on readers reply card.**

LUPUS ANTICOAGULANT TESTING SIMPLIFIED

Bio Data Corporation has introduced a new reagent, Platelet Extract Reagent to simply testing for the Lupus autocoagulant in plasma. Using this reagent all laboratories currently performing (APTT) Activated Partial Thromboplastin Time testing can now test for the Lupus anticoagulant. Platelet Extract Reagent provides the platelet phospholipid required to perform the Platelet Neutralisation Procedure, a simple modification of APTT. Platelet Extract Reagent has a reconstituted stability of 30 days at 2-8°C and is packaged as five 1.0ml vials per box (50 determinations). The platelet neutralisation procedure can be performed on any coagulation instrument. Sole New Zealand agents for the Bio Data range is the Wiltons Instruments Division of Salmond Smith Biolab Ltd, P.O. Box 31044 Lower Hutt, Phone (04) 697-099. **Circle 138 on readers reply card.**

ISOSTAT

Du Pont's "Isostat" microbial tube processing system has proven to be a safe and efficient method of isolating micro-organisms in the blood that attack AIDS patients.

Once blood is drawn, "Isostat" eliminates the further use of needles and syringes — and with it the possibility of accidental needle sticks — for processing Du Pont "Isolator" 10 microbial tubes.

"Isostat" permits rapid processing without the cost of automated instrumentation and helps standardise and simplify processing of Isolator tubes for all laboratory personnel. The "Isostat" system components include a small, hand-operated press, a ten-place rack, sterile, disposable plastic caps, supernatant pipets and concentrate pipets.

The "Isostat" system is easy to use. After centrifugation, Isolator tubes are placed in the "Isostat" rack. Each tube's stopper is disinfected. A sterile "Isostat" cap is placed atop each tube. Each in turn is positioned under the "Isostat" press head. When the press handle is pulled, the cap penetrates the stopper and permits access to the tube's contents.

Supernatant is removed by inserting the "Isostat" supernatant pipet through the membrane in the cap. After vortexing, the microbial concentrate is removed with the "Isostat" concentrate pipet in a similar fashion. Then the concentrate is plated directly on to agar media for isolation and subsequent identification of microorganisms.

Please contact DU PONT (NEW ZEALAND) LTD Phone 277-8080 or **circle 139 on readers reply card.**

DU PONT INTRODUCES AUTOMATED SAMPLE PREPARATION SYSTEM.

The Du Pont Company's Blood Processing Systems Division has introduced an automated sample preparation system with productivity far exceeding manual methjods.

Designed for use in blood banks, the "Summit" automated sample preparation system provides the highest sample throughput available and offers multiple assay preparation in either a microplate or well-tray format.

"Summit" has custom-designed software that makes the system easy to learn and run, yet is advanced enough to make pace with the accelerating demands for more effective collection, storage and reporting of confidential test data and quality control monitoring.

The system incorporates all the generic functions involved in loading samples from primary specimen tubes to microplates or trays, and has the capability of aspirating and dispensing selectively from up to 12 microwell samples simultaneously.

An important feature of "Summit" is a disposable and reusable pipet tip. Samples and diluents are aspirated and dispensed through the positive displacement tip mechanism. The tips are loaded onto the pipetting head which allows tips to shuttle between sample tube and microplates. Tips are reusable up to 40 cycles, and the customised software monitors cycle numbers and changes tips automatically.

Automated sample loading is accomplished by transfers between two racks; a primary rack holds the donor samples, and a secondary rack holds up to four microplates. Positive sample and plate identification is provided automatically through separate plate and sample tube scanners. After the sample is withdrawn from the tubes in the primary rack, a bar code reader scans each tube up to 10 times and verifies with three consecutive identical readings. Mircoplates are also scanned for bar codes which identify the microplate by test type and sequence throughout the entire process.

"Summit" fully integrates Du Pont's family of AIDS related products which control functions into the existing software system to gain the efficiency of a complete automated system.

Please contact DU PONT (NEW ZEALAND) LTD Phone 277-8080 or **circle 140 on readers reply card.**

MAJOR BREAKTHROUGH IN VIRUS CONTROL

The first and only disinfectant proven effective against all 17 virus families affecting man and animals has been developed by Antec International of Sudbury, England.

This discovery comes at a time when there is increasing public anxiety over killer viruses such as AIDS and hepatitis and new viruses like the so called "Yuppie Flu". There is concern in hospitals, clinics and dental surgeries amongst staff and patients over the spread of these diseases. Until now there has been no single means available for safe, effective prevention of transfer of all these viruses in the environment.

Virkon is a significant innovation in disinfectant technology and is effective against such viruses as AIDS, hepatitis B, herpes, polio, viral enteritis and lassa fever.

Virkon's remarkable spectrum of activity against all virus families has been established in independent tests in prominent UK research laboratories such as the Public Health Laboratory Service at Colindale, the Institute of Cancer Research, The London School of Hygiene and Tropical Medicine and the Universities of Liverpool and Cambridge. Independent tests in the UK, Holland and France have also established Virkon's excellent effect against bacteria, fungi, yeasts and moulds.

Virkon is a powder which is readily soluble in water and exceptionally safe to use as it is virtually odourless, non-corrosive, non-tainting, of extremely low toxicity and leaves no harmful residues in the environment — in fact so safe it can be used to disinfect contaminated drinking water.

Another advantage of Virkon is that it can clean and disinfect in one operation and it passes the American AOAC test for detergent sanitisers.

Virkon can now be used to control the spread of infection, particularly from viruses in Health Care establishments such as hospitals, clinics, doctors' and dentists' surgeries and acupuncturists. Virkon is also ideal for protection of public health in factories, hotels and laboratories and specifically to control transfer of blood borne viruses such as AIDS and hepatitis B in tattooing, ear piercing, hairdressing and so on.

Virkon's inventor is Ralph Auchincloss, a chemist by profession and Chairman of Antec International. He is a previous Chairman of the British Standards Institute committee on disinfectants and the British Disinfectant Manufacturers Association and has over 30 years experience in the health and hygiene industry.

Virkon is manufactured in a plant recently installed in Antec's modern, well equipped factory in Sudbury, England, and is patented in 21 countries worldwide.

Virkon is available now in sachets and bulk packs. A technical leaflet detailing Virkon's applications and technical properties is available from: InterMed Scientific Limited, Box 33-268, Takapuna, Auckland. Ph: 444-2586 or **circle 141 on readers reply card.**

NEW SFC GRADIENT SOLVENT DELIVERY SYSTEM

This supercritical fluid solvent delivery system combines a proven 10,000 psi syringe pump and new computer-based SFC density gradient controller. It provides an affordable way to adapt almost any gas chromatograph for SFC analysis of difficult samples not suitable for LC or GC. Isco's patent-pending pump mechanism gives outstanding pressure stability and virtually undetectable flow noise at flow rates from 0.2 to 600 ul/min. Pump refill and repressurisation takes just minutes. Menu driven software provides three gradient modes: linear pressure, linear density-specified, and curved (asymptotic) density-specified. Software includes density-to-pressure conversion files for some common SFC solvents such as $C0_2$, NH_3 and alkanes. It's easy to set up other solvents and conditions for density programming. The SFC pump controller interface installs easily in an IBM-PC or compatible computer.

For further information contact the Wilton Instruments

Division of Salmond Smith Biolab Limited, P.O. Box 31-044, Lower Hutt or **circle 142 on readers reply card.**

COMPANY NEWS

In recent months two of Australia's major laboratory plasticware manufacturers have been combined with the acquisition of Bunzl Medical & Laboratory Products, by Disposable Products Pty Ltd. By selecting the best designs and tooling of the two companies, the emerging product range from the amalgamation will be second to none.

Historic trading names which form the basis of product sold with the Disposable Products' label include — Filtrona, Kayline, Bunzl.

A catalogue covering the new product range from Disposable Products is available from their New Zealand distributors — InterMed Scientific Limited, Box 33-268, Takapuna or **circle 143 on readers reply card.**

PRODUCT SPOTLIGHT NALGENE CYROWARE

Nalge has recently released a completely new line of products: Nalgene Cryoware. This is a total labware system designed specifically for use in the cryogenic storage of cell cultures, microbiological cultures, sperm, serum/blood specimens and other biologicals.

Nalgene Cryovials

Innovative vials for cryogenic storage are available in two sizes: 1.2 and 2.0mL. They perform extremely well in mechanical freezers or vapour phase of liquid-nitrogen freezers. The unique deep-skirted screw closure minimises sample contamination and facilitates single-handed aseptic technique. An external thread on the vial minimises sample contamination and material hang-up. A conical bottom allows the complete retrieval of the sample, and vials are self-standing without a holder. Vials are also radiation-sterilised, non-cytotoxic, and non-pryogenic.

Nalgene Cryovial Holder

This holder has been designed for maximum convenience and single-handed operation. The bottom of each well interlocks with the base of Nalgene Cryovials so the vials will not move during opening or closing. In a 5 x 10 array, numbers and letters are molded into each holder's upper surface for positive vial identification by column and row.

Nalgene Cryoboxes

These boxes are designed for ultra-low temperature storage of Nalgene 1.2 and 2.0mL Cryovials and most other vials of these sizes. They are durable, economical alternatives to flimsy cardboard or expensive stainless steel boxes. Cryoboxes are made of polycarbonate and have a usable temperature range of -196°C to +121°C, and are auto-clavable.

A numerical grid system is molded into the box and printed on the lid to keep track of the cryovial inventory. All sides of the box accept writing with markers designed for ultra-low temperature use.

Also available are: Nalgene Cryobox racks for storage of boxes; Nalgene Cryoware labels for easy identification of inventory; Nalgene Cryoware Marker sets for permanently marking labels, vials, and boxes; Nalgene Face Shields for protection of the neck and face while handling vials; Nalgene Forceps for grasping the closure of a Nalgene Cryovial to remove it from a storage box; and Nalgene Closure Colour Coders.

Contact Watson Victor Ltd or **circle 144 on readers reply card.**

SHANDON VOKAM POWER SUPPLIES

Shandon power supplies for electrophoresis can be selected to cover a wide variety of techniques and applications.

The Vokam 400 can be operated in constant current (0-100milliamps) or constant voltage (0-400 volts) mode and will power two electrophoresis tanks simultaneously. An integral polarity reverse control operates on both output channels. The automatic timer can be set to control electrophoresis separations over a period of 10 minutes to 4 hours. Alternatively, a manual over-ride can be operated to give a continuous supply. An audible signal indicates the end of the electrophoresis run.

For maximum safety, the power output is fully protected against accidental damage and earth leakage is limited to 0.1mA.

The Vokam 500 is a powerful unit providing four outputs each with a polarity reversal switch.

Two modes of operation are available: constant voltage, 0-500V and constant current 0-500mA.

The scales are clearly visible for easy readout of the voltmeter and dual range ammeter.

The Vokam 2kV is a versatile unit with two output channels and is designed for all constant power requirements including IEF and Agarose Gel Electrophoresis.

Three modes of operation are available: constant voltage (0-500 or 0-2000 volts), constant current (10-50 or 0-150mA) and constant power (0-50 or 0-300 watts).

Contact Watson Victor or **circle 145 on readers reply card.**

NEW LITERATURE AVAILABLE

Du Pont

Du Pont have prepared an international guide to the Sorvall range of Centrifuges. Sorvall centrifuges enjoy an outstanding reputation for high quality and reliability among research and clinical laboratories worldwide.

New Brunswick

The ML-4100 is a high-powered Multi-Loop Process Control System for Fermentation and Cell Culture. Full specifications and product information are included in this new brochure.

Schott

We have available from Schott a new leaflet outlining the applications of the KL1500 Cold-Light source. 'Cold-Light source' is the term used to describe a light source in which the thermal component of the energy from the lamp is filtered out and the visible light is passed through a flexible fibre-optic light guide to the area requiring illumination.

Drott

For those customers involved in the manufacture of beer, mineral water, fruit-juice, wine, cider and other beverages, the Drott Haze Meter TMB1 is most suitable for the routine measurement of hazen. We have just received a supply of literature on this new product.

Radiometer

Radiometer have produced a booklet entitled 'The Operational Lifetime of Radiometer Glass and Reference Electrodes', and suggested maintenance. This publication is intended to answer customers' questions about the lifetime of electrodes and the best method of maintaining them.

Contact Watson Victor or **circle 146 on readers reply card.**

TWO NEW AGENCIES FOR WATSON VICTOR

Watson Victor are pleased to announce that they have been appointed sole agents for Malthus Instruments, and Sensititre, both of the U.K.

Malthus Instruments technology is used for the rapid and automatic detection of the presence of a wide range of micro-organisms in the food, dairy, water, cosmetic and allied industries. Testing up to 256 samples simultaneously for the presence of aerobic, microaerophilic and anaerobic micro-organisms, the computer based instrument is designed for continuous automated analysis — 24 hours a day. The

instrument is a highly cost effective alternative to traditional analysis.

The Sensititre automated system utilises advanced fluorescence technology for rapid antibiotic susceptibility and bacterial identification testing. Microtitre plates can be read automatically after as little as five hours incubation, or after overnight incubation.

For further information please contact Watson Victor Ltd, P.O. Box 1180, Wellington, phone (04) 857-699, or fax (04) 844-651 or **circle 147 on readers reply card.**

AVL RELEASE NEW BLOOD GAS SYSTEM

Designed to meet the needs of the most demanding, AVL's new 995 fully automated Blood Gas Analyzer provides the following features:

- ★ pH, PCO_2, PO_2 and 9 calculated values. When electrolytes are required, it may be coupled with an AVL ISE Analyzer of choice (Na+, K+, Cl+, Li+, TCO_2).
- ★ Sturdily-built, patented electrodes which combine optimised sensitivity and time-proven performance.
- ★ An automatic cleaning cycle through which the entire system, from sample port to waste container, is flushed with a decontaminating cleaning solution — protecting the operator against transmission of life-threatening infectious diseases such as hepatitis, AIDS, and others.
- ★ The Standard AVL Data-Link Management System permits coupling the AVL 995 with an AVL ISE Electrolyte Analyzer and any PC, Oximeter, ticket printer, modem and external keyboard, if desired.
- ★ Low cost-per-test because the true AVL micromethod uses substantially less reagent. Furthermore, no cylinders of expensive premixed calibrating gas are required, thanks to the built-in AVL gas mixing system.

The AVL 995 has been logically designed to maximise cost-effectiveness and reliability.

For further information please contact Wilton Instruments Division of Salmond Smith Biolab, P.O. Box 31-044, Lower Hutt or **circle 149 on readers reply card.**

pH MEASUREMENT SIMPLIFIED

Metrohm have recently introduced the 6.0218.000 pH-Pt 100 Electrode which enables temperature compensated pH measurements without the need for two separate sensors.

It consists of a glass combination pH electrode with builit-in platinum resistance sensor.

The new electrode will be of particular interest to persons requiring critical pH measurements due to its sensitivity but more importantly in measurements where the temperature of the sample differs from that of the ambient tempient when combined with a pH meter equipped for temperature compensation, such as Metrohm's Model 654, it is possible to input the isothermal intersection point of the electrode and hence achieve improved accuracy for the temperature compensated pH measurement.

New Zealand agent for Metrohm is the Wilton Instruments Division of Salmond Smith Biolab, P.O. Box 31-044, Lower Hutt or **circle 148 on readers reply card.**

Boots Celltech Diagnostic

The clear advantage in time and performance

• Simple to perform • Accurate and reliable • Rapid results •
• Convenient and economical •

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Chlamydia – "Imagen" (DIF)
Chlamydia – "IDEIA" (EIA)
HSV (Herpes Simplex Virus) – "IDEIA" (EIA)
HSV (Typing test) – "Imagen" (DIF)
Influenza A + B – "Imagen" (DIF)
RSV "Imagen" (DIF)
Adenovirus – "IDEIA" (EIA)
FT4 – "Chemelia" (EIA)
TSH – "Chemelia" (EIA)
Urinary Estrogen and Pregnandiol – "OVEIA" Dual Analyte
TSH – "Coated Tube" (IRMA)
TSH – "Sucrosep" (IRMA)
Prolactin – "Sucrosep" (IRMA)
FSH (Follicle Stimulating Hormone) – "Sucrosep" (IRMA)
HGH (Human Growth Hormone) – "Sucrosep" (IRMA)
AFP (Alpha Fetoprotein) – "Sucrosep" (IRMA)
LH (Luteinising Hormone) – "Sucrosep" (IRMA)
Gamma Inteferon – "Sucrosep" (IRMA)

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MPDK I

A clean cut – precise, rapid and simple RIA-gnost® hTSH coated tube from Behring

The drawing of clean cut divisions is a question of method. The method of choice leading to precise dividing lines in thyroid diagnosis is

RIA-gnost® hTSH

RIA-gnost® hTSH – a new two-site immunoradiometric assay (IRMA) employing monoclonal antibodies and using the coated tube technology – has been proven as a new milestone in the diagnosis of thyroid function.

Technical and Analytical Report

RIA-gnost® hTSH shows technical superiority compared to the hitherto available systems. The assay is rapid and easy to handle thanks to a short 2 hours incubation and to the convenient coated tube technology.

The sensitivity of RIA-gnost® hTSH is below 0.03 μIU TSH/ml because of the very steep slope of the standard curve, and of the low background count of the coated tube technology.

The IRMA method requires only one precision pipetting step, hence the precision within the assay and between assays was reported as excellent: The coefficients of variation are $< 5\,\%$ over practically the entire measuring range.

Clinical Report

The very sensitive detection technique enables measurement of TSH concentrations in the range in which differentiation has hitherto not been possible.

In recent international clinical trials of RIA-gnost® hTSH clear cut-off values between hyper-, eu- and hypothyroidism by basal TSH determinations were demonstrated and led to a correct classification of thyroid status. RIA-gnost® hTSH is of proven value in the introduction of a new strategy for the diagnosis and monitoring of thyroid disorders which has a higher diagnostic accuracy and is more efficient and economical.

BEHRING

Behring Diagnostics
Hoechst New Zealand Limited
C.P.O. Box 67, Auckland
Phone 527-8068. Telex 2338

Kallestad
DIAGNOSTICS

Introducing

Pathfinder Chlamydia EIA

Elisa immunoassay for direct clinical specimens.

This assay features:-

-monoclonal specificity
-room temperature incubation
-coated tube convenience
-easy to use liquid reagents
-<u>one</u> wash step

The *Pathfinder* Chlamydia EIA system includes complete collection and detection kits.

Ordering Information	Description	Cat #
Chlamydia EIA Swab System	100 tests; detection + swab collection	1142
Chlamydia EIA Sample System	25 tests; detection + swab collection	1114
Chlamydia EIA Detection Kit	100 tests; detection	1057
Chlamydia EIA Swab Collection Kit	100 tests; swab collection	1134
Blocking Reagents	2ml blocking antibody 2ml blocking control	1144

Ordering Information	Description	Cat #
Cross-reactivity Panel	2ml each: N. Gonorrhea Acinetobacter calcoaceticus Haemophilus parinfluenzae	1143
Positive Control	3ml	1058
Negative Control	3ml	1059
Stopping Solution	100ml 1N Sulphuric Acid	1115
Patient Brochures	25/pack	1149
Patient Brochure Holder		1150

Marketed by Scientific Products Division
Salmond Smith Biolab Ltd

AUCKLAND
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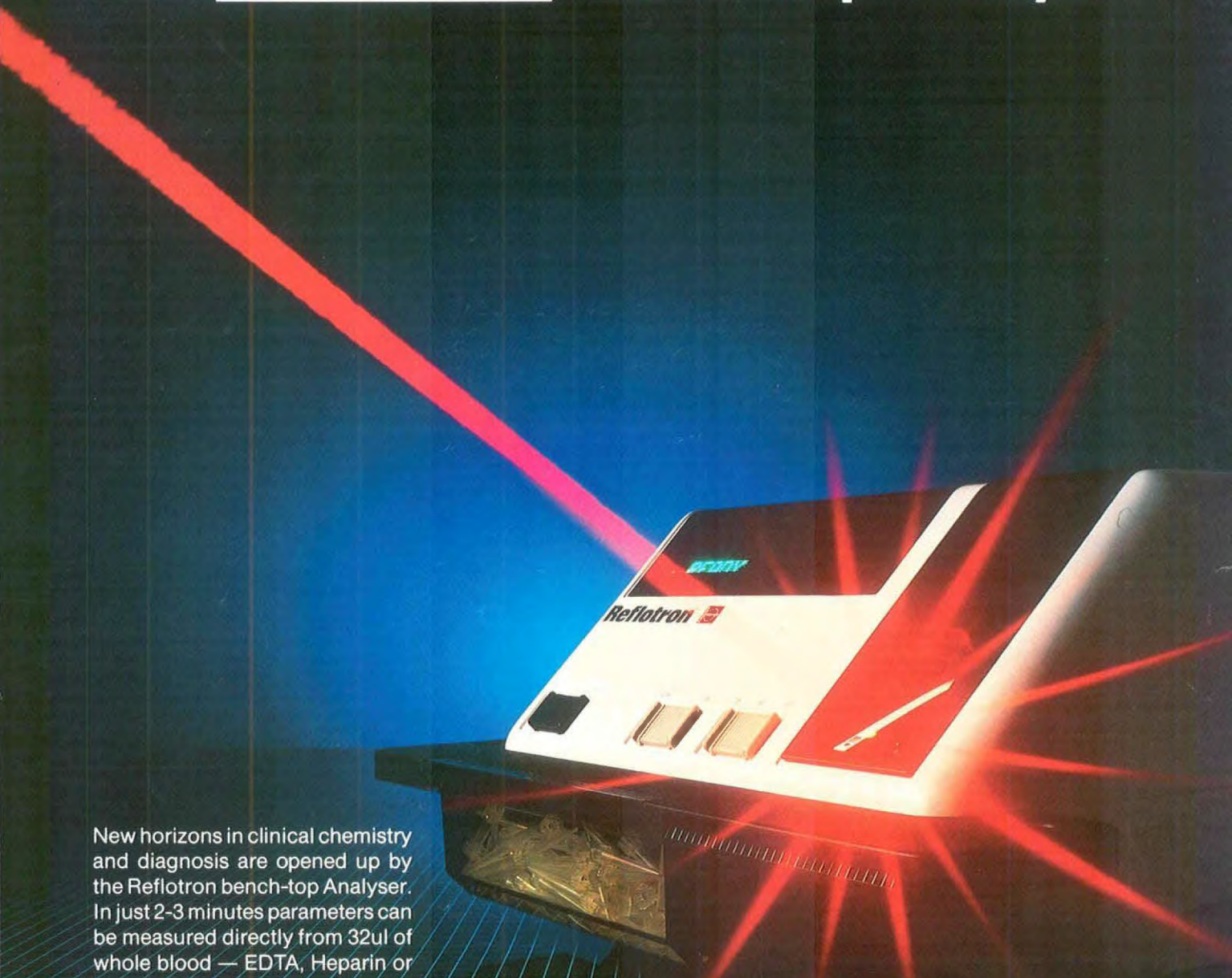
Phone 418-3039

WELLINGTON
PO. Box 31-044
Phone 697-099

CHRISTCHURCH
PO. Box 1813
Phone 63-663

Reflotron®

The innovative* desk-top analyzer



New horizons in clinical chemistry and diagnosis are opened up by the Reflotron bench-top Analyser. In just 2-3 minutes parameters can be measured directly from 32ul of whole blood — EDTA, Heparin or Capillary.

Reflotron's entirely automatic operation coupled with its speed and the complete absence of any hazardous sample preparation makes it ideal for use in a STAT laboratory, with extremely bio-hazardous samples, isolation laboratories, or whereever results are needed on the spot.

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

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

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