

POSTGRADUATE INSTITUTE OF SCIENCE UNIVERSITY OF PERADENIYA



M.Sc. in Clinical Biochemistry

1. INTRODUCTION

We are in an era, where investigations are being directed towards revealing derangements of biomolecular events that lead to ill-health and disease. We also see that techniques of diagnosis are being sharpened to be a sensitive and specific, made simple and cost-beneficial. Technological developments and innovations originate in the technologically developed world and with time take root in developing countries. It is an undisputed fact that, we in Sri Lanka, depend solely on foreign technology in diagnostic Clinical Biochemistry, despite us having an enormous potential for developing our own technology to suit our setting.

In the field of Clinical Biochemistry, which is an important discipline in Diagnostic Laboratory Medicine, there is a phenomenal expansion of inputs which cannot be realistically absorbed in to the local health-care delivery system as it exists today. If we were to absorb the new developments into our health care delivery system, we will need to have appropriately educated personnel armed with proper training, to look out for newer innovations, evaluate the feasibility of adopting them in our country setting and be capable of convincing the decision makers about their relevance. Without a challenge or a contest, we should agree that our laboratory-based diagnostic services can be further improved and must be improved to face a new era of health care.

Our universities put out graduates who have the potential for developing the desired skills and attitudes for developing our laboratory-based Diagnostic Services, provided, they are given the education and direction they are expected to possess. The education and training should focus on developing Clinical Biochemists with evaluative, innovative, creative capabilities, in addition to arming them with relevant knowledge. We must ensure that the proposed MSc is not another degree certificate but it means capabilities.

2. OBJECTIVES OF THE PROGRAMME

The expected outcomes of a person with MSc in Clinical Biochemistry are the duties, responsibilities, skills and commitments at a desirable level for effective and efficient running of the Clinical Biochemistry Laboratory.

A MSc qualified Clinical Biochemist should be able to

- * demonstrate a working knowledge in clinical biochemistry.
- * show the highest level of competency in analytical techniques, methodology, upkeep and use of instruments.
- * ensure maintenance of an efficient and an effective laboratory service.
- * update clinical laboratory technology.

- * make necessary developments and improvements to service facilities when and wherever necessary.
- * function in an administrative, supervisory and an advisory capacity.
- * develop methods for maintaining records, data analysis and retrieval using the latest technology.
- * manage the laboratory in the most effective way.
- * critically review the cost economics of the laboratory investigations and services and advice on cost effective strategies for running the laboratory service.
- * supervise the work of medical laboratory technicians.
- * work as a team member with medical and para medical personnel to deliver better health care.
- * undertake research and disseminate information gathered for the development of diagnostic services in clinical biochemistry.
- * plan and develop educational strategies to provide continuing education to all grades of laboratory staff.
- * demonstrate capabilities of continuing education.
- * take part in undergraduate and post graduate medical education.

3. PROGRAMME ELIGIBILITY

Medical, Veterinary, Dental or science graduates, preferably in biological science with chemistry/ biochemistry/molecular biology as a subject or any other degree acceptable to the board of study. Suitable applicants will be pre-screened by a committee recommended by the Board of Study in Biochemistry and Molecular Biology using a Screening Examination.

4. PROGRAMME FEE

(N.B. The Programme fees given below may be revised.)

	M.Sc. programme fee
local candidates	Rs. 200,000/-
foreign candidates	Rs. 400,000/-

Students registered for the M.Sc. degree shall pay the Programme fee in full or in two (*1/2 at the registration and the balance at the end of the first semester*) or three (*1/3rd at the registration, another 1/3rd after 4 months from the date of registration and the balance after 8 months from the date of registration*) installments. Other payments including registration fee, medical fee, library subscription, examination fee and deposits (science and library) should be paid according to the procedure stipulated by the PGIS. (N.B. The Programme fees given above may be revised as per recommendation of the Board of Management of the PGIS.)

5. THE PROGRAMME STRUCTURE AND DURATION

This is a full-time programme consisting of course work and a research project. Course work will be conducted over a period of two semesters of 15 - weeks each (*during weekends and/or weekdays*) which will involve about 12 months. The entire programme duration will be about 15 - 18 months inclusive of further 3 - 6 months for the research project. Satisfactory completion of a minimum of 24 credits of course work (with a GPA of not less than 3.00) is required for the programme in addition to the 6 credits allocated for the full-time research project (*The student who does not satisfy the above criteria but obtains a GPA in the range 2.75 to 2.99 for course work is eligible for the Diploma in Clinical Biochemistry but not the M.Sc. Degree*). Continuous attendance is compulsory during the period of research work. After successful completion of the research project, the student is eligible for the award of the M.Sc. Degree.

Programme Summary

Course Code	Course	Lecture hrs.	Practical hrs.	No. of Credits
Preliminary Courses				
BM 401	Human Biology and Metabolism * ¹	30	-	-
BM 402	Basic Sciences * ²	30	-	-
Semester I				
BM 501	Laboratory Environment and Biological Samples	10	10	1
BM 502	Analytical Techniques in Clinical Biochemistry	30	30	3
BM 503	Biochemical Immunology and Endocrinology	30	30	3
BM 504	Biochemical Haematology	10	10	1
BM 505	Enzymology	10	10	1
BM 506	Functional Tests	30	90	5
Semester II				
BM 516	Human Molecular Genetics*	15	30	2
BM 517	Paediatric Biochemistry and Intensive Care Biochemistry	10	10	1
BM 518	Therapeutic Drug Monitoring and Toxicology	15	30	2
BM 519	Clinical Nutrition*	20	20	2
BM 520	Laboratory Training	10	40	2
BM 521	Statistical Analysis, Quality Control, Computing & Data Handling	15	30	2
BM 522	Clinical Interpretation & Ward Classes ³	75	-	-
BM 599	Research Project (minimum of four months duration)			6

*¹ Compulsory for Science graduates

*² Compulsory for Medical graduates

³ Attendance is compulsory

* Optional courses. Students are required to obtain 3 credits from optional courses

6. PROGRAMME CONTENTS

BM 401: Human Biology and Metabolism

Organisation of tissues in the body, digestive system, circulatory system, cardiovascular system, hepatobiliary system, urinary system, musculoskeletal system, nervous system, reproductive system.

BM 402: Basic Sciences

Physics, Chemistry & Mathematics

BM 501: Laboratory Environment and Biological Samples (1 Credit)

Laboratory Environment (*Lectures - 2h, Practical - 2h*): Laborat. arrangement, Laboratory resources and information.

Safety measures (*Lectures - 4h, Practical - 4h*): Waste disposal, Laboratory management, Administration, Patient care, Ethics.

Biological Samples (*Lectures - 4h, Practicals - 4h*): Collection (labelling, request form, patient & container preparation, processing Transport, Storage, Washing and disposal.

BM 502: Analytical Techniques in Clinical Biochemistry (3 Credits)

Spectrophotometry, enzyme linked immuno sarbant assay (ELIZA), radio immuno assay (RIA), Dry chemistry Chromatography, Electrophoresis, Ionmetry Centrifugation, Microscopy

BM 503: Biochemical Immunology and Endocrinology (3 Credits)

Biochemical Immunology (*Lectures - 20h, Practicals - 20h*): Basic Immunology , Immuno - diagnostic methods, Immunocytochemistry
Endocrinology (*Lectures - 10h, Practicals - 10h*): Biochemical endocrinology, Clinical endocrinology, Diagnostic endocrinology

BM 504: Biochemical Haematology (1 Credit)

Basic haematology, Blood banking, Blood film, WBC/DC

BM 505: Enzymology (1 Credit)

Basic enzymology, Clinical enzymology

BM 506: Functional Tests (5 Credits)

System Based Tests (*Lectures - 25h, Practicals - 80h*): Body fluids, Respiratory, Circulatory, Gastrointestinal, Urinary, Reproductive, Endocrine, Nervous, Musculoskeletal Systems, Tumour Markers.

Awareness of other disciplines (*Lectures - 5h, Practicals - 10h*): Laboratories of Microbiology, Parasitology & Pathology.

BM 516: Human Molecular Genetics (2 Credits)

Human genetics, Polymerase chain reaction and other techniques, Molecular diagnostic methods.

BM 517: Paediatric Biochemistry and Intensive Care Biochemistry (1 Credit)

Paediatric Biochemistry (*Lectures - 4h, Practicals - 4h*): Screening of the genetic disorders in neonates, Special paediatric biochemical tests.

Intensive Care Biochemistry (*Lectures - 6h, Practicals - 6h*): Fluid and electrolyte balance, Blood gases, Other critical care tests .

BM 518: Therapeutic Drug Monitoring and Toxicology (2 Credits)

Therapeutic Drug Monitoring (*Lectures - 6h, Practicals - 12h*): Drug metabolism (anti epileptic, aminoglycosides, antiasmatic, cardiacglycosides, etc.), Analysis of drug levels in body fluids.

Toxicology (*Lectures - 6h*): Basic toxicology, Agrochemical poisoning, Plant toxins, Animal toxins

Analytical Toxicology (*Lectures - 3h, Practicals - 18h*)

BM 519: Clinical Nutrition (2 Credits)

Basic Principles of Nutrition, Nutritional deficiencies, Nutritional requirements in disease, Diet therapy, Paediatric nutrition, Geriatric nutrition.

BM 520: Laboratory Training (2 Credits)

Standardisation and use of instruments, Maintenance of equipment, Trouble shooting, Purchasing of laboratory wares, Automation, Laboratory monitoring.

BM 521: Statistical Analysis, Quality Control, Computing & Data Handling (2 Credits)

Statistical Analysis and Quality Control (*Lectures - 10h, Practicals - 10h*): Basic statistics, Normal biochemical values, Statistical analysis of laboratory results, Quality control

Computing and Data Handling (*Lectures - 5h, Practicals - 20h*)

BM 522: Clinical Interpretation & Ward Classes (5 Credits)

Clinical Interpretation of Laboratory Results (*Lectures - 45h*): Case reports; Medicine, Surgery, Gynaecology & Obstetrics, Paediatrics and Psychiatry

Ward Classes (*Lectures - 30h*): Medicine, Surgery, Gynaecology & Obstetrics

BM 599: Research Project (6 Credits)

A research project will be selected on the completion of 3 months of course work and an intensive literature survey will be carried out by each candidate in preparation for the laboratory based research

project to be started a year later. The project will be carried out under the guidance of a supervisor/s and undertaken on a full time basis with a minimum period of three months. An additional month will be given for statistical analysis of laboratory results and the preparation of the dissertation. The candidates are required to present their results in the form of a dissertation and a seminar. A candidate should obtain a pass on the research project for the award of M.Sc degree.

7. PROGRAMME EVALUATION

Programme evaluation will be as stipulated in the PGIS Hand Book .

8. TEACHING PANEL

This programme will be conducted with resource personnel drawn mainly from Faculties of Medicine, University of Peradeniya and Colombo; Faculties of Science, Veterinary Medicine & Animal Science, University of Peradeniya; Teaching Hospitals, Peradeniya and Kandy; National Hospitals of Sri Lanka, Medical Research Institute, and Private Sector Laboratories, Colombo.

Dr. C.K. Abeyssekara, Dept. of Paediatrics, Faculty of Medicine, Univ. of Peradeniya
MBBS (Cey.), DCH (Col.) MRCP (UK)

Dr. D.R.R. Abeysinghe, Dept. of Psychiatry, Faculty of Medicine, Univ. of Peradeniya
MBBS (Cey.), MD (Col.), MRCPsych (UK)

Dr. P. Amarasinghe, Dept. Molecular Biology & Biotechnology, Faculty of Science,
University of Peradeniya *B.Sc. (Cey.), Ph.D. (S.Lan.)*

Prof. W.I. Amarasinghe, Dept. of Obstetrics & Gynaecology, Faculty of Medicine, Univ.
of Peradeniya *MBBS (Cey.), FRCOG (UK)*

Dr. H.A. Aponso (Emeritus Professor), Piachaud Gardens, Kandy
MBBS (Cey.), FRCP (UK)

Dr. S.B.P. Athauda, Dept. of Biochemistry, Faculty of Medicine, University of Peradeniya
B.Sc. (Perad.), M.Sc., Ph.D. (Japan)

Dr. S.D. Athukorala, Microbiologist, General Hospital, Colombo
MBBS (Col.), MRC Path (UK)

Prof. P. Balasuriya, Dept. of Physiology, Faculty of Medicine, University of Peradeniya
MBBS (Cey.), MRCP (UK)

Prof. B.M.R. Bandara, Dept. of Chemistry, Faculty of Science, University of Peradeniya
B.Sc. (S. Lan.), Ph.D. (ANU)

Prof. H.M.N. Bandara, Dept. of Chemistry, Faculty of Science, University of Peradeniya
B.Sc. (Cey.), M.Sc., Ph.D. (Ast.)

Dr. N.C. Bandara, Postgraduate Institute of Science, University of Peradeniya
B.Sc. (Perad.), M.Sc. (New Orleans), Ph.D. (New Orleans)

Dr. A.G. Buthpitiya, Dept. of Surgery, Faculty of Medicine, Univ. of Peradeniya
MBBS (Cey.), MS (Col.)

Prof. M.S. Chandrasekara, Dept. of Anatomy, Faculty of Medicine, University of
 Peradeniya *BDS (Cey.), Ph.D. (N'Castle/UK)*

Prof. L. Chandrasena, Dept. of Biochemistry, Faculty of Medicine Ragama, Univ. of
 Kelaniya *B.Sc., M.Phil. (Sheffield), Ph.D.*

Dr. U. Dangahadeniya, Dept. of Pharmacology, Faculty of Medicine, University of
 Peradeniya *MBBS (Perad.), MD (Col.)*

Prof. M.A.K.L. Dissanayake, Dept. of Physics, Faculty of Science, University of Peradeniya
B.Sc. (Cey.), M.S., Ph.D. (Indiana)

Prof. J.S. Edirisinghe, Dept. of Parasitology, Faculty of Medicine, University of
 Peradeniya *MBBS (Cey.), M.Sc., Ph.D. (Lond.), MD (Col.)*

Dr. N. Ekanayake, Haematologist, General Hospital, Kandy
MBBS (Perad.), MD (Cey.)

Dr. P.H.P. Fernando, Dept. of Biochemistry, Faculty of Medicine, University of
 Peradeniya *B.V.Sc. (Perad.), Ph.D. (Kahoshima/Japan)*

Prof. R. Fernando, Dept. of Forensic Medicine, Faculty of Medicine, Univ. of Colombo
MBBS (Col.), MRC Path (UK)

Dr. C.D.A. Goonasekara, Dept. of Anaesthesiology, Faculty of Medicine, Univ. of
 Peradeniya *MBBS, MD (Cey.), FFARCS (IRE), DCH (Lon), MRCP (UK)*

Dr. S.W. Gunasekara, Dept. of Biochemistry, Faculty of Medicine, University of
 Peradeniya *B.Sc. (Cey.), Ph.D. (Surrey)*

Dr. N.U. Horadagoda, Dept. of Para-Clinical Studies, Faculty of Veterinary Medicine and
 Animal Science, University of Peradeniya *B.V.Sc., M.V.Sc.(Cey.), Ph.D. (Liv.)*

Prof. V.L.U. Illangasekara, Dept. of Medicine, Faculty of Medicine, Univ. of Peradeniya
MBBS (Cey.), MD (Cey.), MRCP (UK), Ph.D.

Dr. L. Jayasena, Dept. of Paediatrics, Faculty of Medicine, Univ. of Peradeniya
MBBS (Cey.), FRCP (UK)

Dr. T.K.P. Kaluarachchi, Dept. of Biochemistry, Faculty of Medicine, University of
 Peradeniya *B.D.S (S. Lan.), Ph.D.*

Prof. E. Karunanayake, Dept. of Biochemistry, Faculty of Medicine, Univ. of Colombo
B.Sc. (Cey.), Ph.D. (UK)

Mrs. A.M. Karunaratne, Dept. of Botany, Faculty of Science, University of Peradeniya
B.Sc. (Perad.), M.Sc. (Nebraska)

Prof. S.A. Kulasooriya, Dept. of Botany, Faculty of Science, University of Peradeniya
Vidyanidhi, B.Sc. (Cey.), Ph.D. (Lond.)

Dr. S.A. Leelananda, Dept. of Physics, Faculty of Science, University of Peradeniya
B.Sc. (Cey.), M.Sc. (Lond.), D.I.C., Ph.D. (Calgary)

Mrs. Mahendran, Government Analyst, Colombo
B.Sc. (Col.), M.Sc. (UK)

Prof. P.B.S. Mendis, Dept. of Medicine, Faculty of Medicine, Univ. of Peradeniya
MBBS (Cey.), MD (Perad.), FRCP (UK)

Prof. P.A.J. Perera, Dept of Biochemistry, Faculty of Medicine, University of Peradeniya
B.Sc. (Cey.), Ph.D. (Glas.)

Dr. A.A.J. Rajaratne, Dept. of Physiology, Faculty of Medicine, Univ. of Peradeniya
BVSc (S.Lan.), Ph.D. (Lond.)

Dr. J.G.S. Ranasinghe, Dept of Biochemistry, Faculty of Medicine, University of Peradeniya
B.VSc. (Perad.), M.Phil., Ph.D.

Prof. P.C.A. Ratnatunga, Dept. of Surgery, Faculty of Medicine, Univ. of Peradeniya
MBBS (Cey.), FRCS (UK)

Prof. N.V.I. Ratnatunga, Dept. of Pathology, Faculty of Medicine, Univ. of Peradeniya
MBBS (Cey.), Dpath (Col.), MD (Col.), Ph.D. (Perad.)

Dr. E.K. Rodrigo, Dept. of Psychiatry, Faculty of Medicine, Univ. of Peradeniya
MBBS (Cey.), MD (Cey.), MRCP (UK)

Dr. E. Samarakoon, Dept. of Obstetrics & Gynaecology, Faculty of Medicine, Univ. of Peradeniya
MBBS (Col.), MS (Col.), MRCOG (UK)

Dr. P Samaraweera, Dept. of Molecular Biology and Biotechnology, Faculty of Science, Univ. of Peradeniya.
B.Sc.(Perad.), Ph.D. (Arizona)

Dr. S.M.N.A. Senanayake, Dept. of Statistics & Computer Science, Faculty of Science, Univ. of Peradeniya
M.Sc. Eng (Havana), Ph.D. (Linz.)

Prof. H.H.G. Seneviratne Dept. of Mathematics, Faculty of Science, Univ. of Peradeniya
B.Sc. (Cey.), Ph.D. (Lond.)

Prof. A.M.A.N.K. Senanayake, Dept. of Medicine, Faculty of Medicine, University of Peradeniya
MBBS (Cey.), MD (Cey.), MRCP (UK), FRCP (Lon.), FRCP (Edin.)

Prof. H.H.G. Seneviratne, Dept. of Mathematics, Faculty of Science, University of Peradeniya
B.Sc. (Cey.), Ph.D. (Lond.)

Dr. S. Siriwardana, General Hospital, Colombo
MBBS (Col.), MD (Cey.), MRC Path (UK)

Prof. R. Sivakanesan, Dept of Biochemistry, Faculty of Medicine, University of Peradeniya
BVSc (Cey.), Ph.D. (Hull)

Prof. D. T. B. Tennekoon, Dept. of Chemistry, Faculty of Science, University of Peradeniya
B.Sc. (Cey.), Ph.D. (Wales)

Dr. V. Thevanesan, Dept. of Microbiology, Faculty of Medicine, Univ. of Peradeniya
MBBS (Cey.), MRC Path (UK), Ph.D. (Cey.)

Mrs. P. Uluwita, Medical Research Institute, Colombo
B.Sc. (Col.), M.Sc. (UK)

Dr. V.S. Weerasinghe, Dept. of Physiology, Faculty of Medicine, Univ. of Peradeniya
BDS (Perad.), Ph.D. (Southampton)

Mr. Weerawarna, Biochemist, General Hospital, Colombo
B.Sc. (Col.), M.Sc. (UK)

Dr. A.S.B. Wijekoon, Dept. of Paediatrics, Faculty of Medicine, Univ. of Peradeniya
MBBS (Cey.), MD (Col.), DCH (Lond.), MRCP (UK)

9. RECOMMENDED TEXTS AND JOURNALS

Texts:

Clinical Biochemistry Gaw et al. (1995) Churchill Livingstone ISBN 0-443-04481-3

Biochemistry: Molecules, Cells & the Body Dow, Jocelyn (1995) Addison - Wesley ISBN 0-201-63187-3

Illustrated Text Book of Clinical Biochemistry Marshall, William J.(1995) Mosby, Wolfe ISBN 0-723421900

Biochemistry for the Medical Science, An Integrated Case Approach Higgins, S.J.(1994) Longman Current Affairs ISBN 0-582-10129-8

Lippincott's Illustrated Reviews in Biochemistry Champe Pamela C. (1994) Raven Publ. ISBN 0-397-510918

Harper's Biochemistry Murray, R K. (1996) Appleton & Lange ISBN 08385-36115

Text Book of Biochemistry Devlin, T. M. (1997) Wiley (John) & Sons Ltd ISBN 0-471-15451-2

Tietz Text Book of Clinical Chemistry Burtis, Carl A (1994) WB Saunders Co ISBN 0-7216-4472-4

Clinical Chemistry Kaplan, L. A (1996) Mosby ISBN 0-8151-5243-4

Varley's Practical Clinical Biochemistry Gowenlock, AH (1988) Heinemann Medical Books ISBN 08-493-01564

Methods in Enzymology vol 246 Abelson J.N. (1995) Academic Press Inc.(Lon) Ltd ISBN 0-12-182147-1

Clinical Studies in Medical Biochemistry Glew, R.H. (1997) Oxford Uni.Pres, N.Z. ISBN 0-19-509929-x

Biochemistry & Disease Bridging Basic Sciences & Clinical Practices Cohn, R.M. (1996) Williams & Wilkins, U.S. ISBN 0-683-02049-8

Biochemistry, A Case Oriented Approach Montgomery (1996) Mosby ISBN 0-8151-6483-1

Clinical Biochemistry for Medicine Laker (1995) W.B. Saunders & Co. ISBN 0-7020-1690-x

Clinical Biochemistry: Metabolic and Clinical Aspects Marshall, W.J.(1995) Churchill Livingstone ISBN 0-443-04341-8

Tietz Fundamentals of Clinical Chemistry Burtes C.A. (1995) Saunders (WB) Co Ltd ISBN 0-7216-3763-9

Advances in Clinical Chemistry Vol 31 Spiegel H.E.(1994) Academic Press Inc.(Lond) Ltd. ISBN 0-12-010331-1

Clinical Chemistry in Diagnosis & Treatment Mayne, P (1994) Arnold ISBN 0-340-57647-2

Clinical Chemistry Bishop (1996) Lippincott (JB) Co. U.S. ISBN 0-397-55167-3

Clinical Chemistry, Concepts and Applications Shauna C Anderson Susan Cockayne Saunders Company WB. ISBN 0-7216-3372-2

Clinical Biochemistry in Diagnosis and Treatment (6th edition) Philip D Mayne(1994) Edward Arnold ISBN 0 340 57647 2

Clinical Laboratory Medicine Richard C. Tilton, Albert Balows, David C. Hohnadel (1992) Mosby Year Book, Inc. ISBN 0-8016-5873-X

Techniques in Diagnostic Human Biochemical Genetics (A laboratory manual) Frits A Hommes A John Wiley & Sons ISBN 0-471-56076-6

Human Nutrition and Dietetics R. Passmore & M.A. Eastwood ELBS ISBN 0-443-039194

Practical Clinical Biochemistry (Vol. 1, 2) (5th edition) Harold Varley, Alan H Gowenlock and Maurice Bell (1976)

William Heineman Medical Books ISBN

Nutrition Essentials and Diet Therapy(6th edition) Charlotte M. Poleman and Nancy J Peckenpangh W.B. Saunders Co. ISBN 0-7216-7281-7

Biochemistry, Genetics and Physiology (Volume 3) Geoffrey Zubay (1983) Wm C Brown Publishers ISBN 0-697-14880-7

Clinical Chemistry Principles and Techniques (new edition) Richard J Henry, M.D. (1964) Harper and Row publishers

Methods Recommended for Essential Clinical Chemical and Haematological Tests for Intermediate Hospitals Laboratories: Working Group Assessment of Clinical Technologies (1986) WHO

Journals:

Annual Reviews of Biochemistry	Clinical Chemistry
Annual Reviews of Physiology	British Medical Journal
Annual Reviews of Nutrition	Lancet
Trends in Biological Sciences (TIBS)	Clinics of North America

PROGRAMME COORDINATORS

Prof. R Sivakanesan
 Department of Biochemistry
 Faculty of Medicine
 University of Peradeniya
 Tel.: 081 2396323

Dr. H K I Perera
 Department of Biochemistry
 Faculty of Medicine
 University of Peradeniya
 Tel.: 081 2396329