

Department of Medical Biochemistry
Faculty of Basic Medical Sciences
University of Nigeria Enugu Campus (UNEC)

MSc and PhD Degree Programmes

Philosophy

Biochemical concepts have all been explained at molecular level. Medical Biochemistry employs these concepts in the elucidation of the molecular basis of Medicine. Research activities in the Department of Medical Biochemistry, UNEC, in the past and present are directed at the achievement of this aim. Research themes in the Department cut across areas of relevance to community needs, and include Biochemical and molecular parasitology, Enzymology, Micronutrients and molecular toxicology, Molecular nutrition and food research, and Clinical Biochemistry. Research in these areas is carried out by staff of the Department in collaboration with staff in other Departments of the University of Nigeria, and in other Universities in Nigeria and outside the Country.

Objectives

In line with the philosophy of the University of Nigeria, the postgraduate programmes of the Department of Medical Biochemistry are designed to produce graduates who will be research leaders within the country and all around the world. Our postgraduate students may carry out research and thereafter specialize in any of the afore-mentioned areas of specialization. After graduation, they are therefore qualified to be employed as Lecturers, Researchers in research institutes, Heads of research and Development in Companies, Medical scientist in diagnostic laboratories, etc.

Entry requirements

- Candidates for admission into the Master's degree programme of the Department of Medical Biochemistry, UNEC, must hold a BSc degree in Biochemistry or Medical Biochemistry, with CGPA of at least 2.50 on a 5-point scale. Combined Biological Science (Biochemistry/Microbiology) graduates, with CGPA of at least 2.50 on a 5-point scale, may be required by the Departmental Academic Board to do some remedial courses before proceeding with the MSc programme. Medical graduates (holders of MBBS or BDS) must have passed Medical Biochemistry at **one** sitting in the First MBBS/BDS Professional Examination to qualify for admission into the MSc programme in Medical Biochemistry.
- Candidates for admission into the PhD programme of the Department of Medical Biochemistry, UNEC, must hold an MSc in Biochemistry or Medical Biochemistry with a CGPA of at least 4.0 on a 5-point scale.
- Holders of a First class honours degree in Biochemistry or Medical Biochemistry may be admitted into the Master's/Doctoral degree programme of the Department of Medical Biochemistry, UNEC. Candidates admitted into the Master's/Doctoral degree

programme of the Department of Medical Biochemistry could be allowed to proceed with the PhD programme on completion of the MSc coursework if the candidate attains a CGPA of 4 and above in the MSc coursework.

Duration of study

The maximum and minimum durations for the MSc programme of the Department of Medical Biochemistry are as follows:

- Full time: A minimum of 3 semesters (18 months)
A maximum of 5 semesters (2 years and 6 months)
- Part time: A minimum of 4 semesters (2 years)
A maximum of 6 semesters (3 years)

The duration for Master's/Doctoral studies in the Department of Medical Biochemistry, UNEC, are as follows:

- Full time: A minimum of 8 semesters (4 years)
A maximum of 12 semesters (6 years)
- Part time: A minimum of 10 semesters (5 years)
A maximum of 14 semesters (7 years)

The duration for Doctoral programme (after MSc) in the Department of Medical Biochemistry, UNEC, are as follows:

- Full time: A minimum of 6 semesters (3 years)
A maximum of 10 semesters (5 years)
- Part time: A minimum of 8 semesters (4 years)
A maximum of 12 semesters (6 years)

The first two semesters of either the Doctoral or the Master's shall be devoted to course work and written examinations; the remaining semesters of the Doctoral programme shall be for research, preparation of thesis and oral examination, while the remaining semesters of the MSc programme shall be used for research, preparation of project report and oral examination.

Course Outline for Master's Degree Programme

Course No.	Title	Unit
BIC 701	Enzymes, Enzyme kinetics and mechanism of enzyme action	3
BIC 711	Biochemical Thermodynamics (Bioenergetics) and biological oxidation	3
BIC 721	Protein synthesis and Biochemical genetics	3
BIC 722	Metabolic and genetic diseases	3
BIC 731	Hormones and Hormone action	3
BIC 733	Metabolic regulations and interrelationships	3
BIC 734	Metabolism of foreign compounds	3
BIC 741	Modern nutrition concepts and nutritional diseases	3

BIC 742	Applied nutrition	3
BIC 751	Basic neurochemistry	3
BIC 752	Advanced neurochemistry	3
BIC 761	Biological buffers	3
BIC 762	Clinical Biochemistry	3
BIC 771	Immunochemistry (Elective)	3
BIC 772	Biochemical instrumentation & techniques	3
PGC 601	Research Methodology and Application of ICT in Research	3
BIC 780	Seminars	3
BIC 790	Research projects – MSc Project	6

Total Credit for Master's degree programme in Medical Biochemistry

Course Outline for Doctoral Degree Programme

Course No.	Title	Unit
BIC 811	Review/Seminar	3
BIC 821	Immunochemical and Radioisotope Techniques	3
BIC 832	Molecular Biology, Proteomics and Biotechnology	3
BIC 841	Environmental Biochemistry	3
BIC 852	Advanced Topics in Medical Biochemistry	3
BIC 862	Computational Biochemistry	3
PGC 701	Research Grant Writing and Synopsis writing	3
BIC 871	Advanced Seminar in Biochemistry	3
BIC 890	PhD Thesis	12
Total Credit for Doctoral degree programme in Medical Biochemistry		36

Course Description (M.Sc. Degree programme)

BIC 701: Enzymes, Enzyme Kinetics and Mechanisms of Enzyme action

Regulation of enzyme synthesis and activity; metabolic pathways as integrated enzymatic reactions; enzyme structure and reactions; nature and mechanisms of enzyme catalysis. Quantitative analyses of enzyme kinetics from concentration and reaction velocities; kinetic analysis of enzyme inhibition; clinically important enzymes; enzyme inhibitors and their modes of action.

BIC 711: Biochemical Thermodynamics (Bioenergetics) & Biological oxidation

Laws of thermodynamics as applied to biochemical systems; concepts of free energy and entropy of a system; equilibrium and standard free energy changes; coupling of exo- and endo-thermic reactions; oxidative phosphorylation and other energy transduction processes; the role of ATP and other high energy compounds in the biological system. Biochemical nature and mode of action of biological oxidation systems; biological oxidations and conservation of energy; use of uncouplers and inhibitors in the study of biological oxidations.

BIC 721: Protein synthesis and Biochemical genetics

A detailed analysis of the nature and properties of the genetic material; mechanism underlying gene replication, repair and recombination; protein synthesis and its control and regulation theories.

BIC 722: Metabolic and Genetic Diseases

Human genetics; molecular features of infective disease. Investigation of the molecular basis of diseases. Survey of some common metabolic and genetic diseases (in-born errors) associated with metabolism of carbohydrates, proteins/amino acids, lipids and nucleic acids; basic tools of molecular analysis; modern molecular methods in human diseases; prospects of gene therapy.

BIC 731: Hormones and Hormone action.

Endocrine glands, hormones and target tissues; hormonal secretion and regulation, postulated mechanism of hormone action; chemistry, mechanism of action, metabolic effects and regulation in respect of the following: the peptide hormones and amino acid-derived hormones; the steroid hormones – corticosteroids; gonadal hormones; the gastro-intestinal hormones.

BIC 733: Metabolic Regulations and Inter-Relationships.

General aspects of biochemical control mechanism; discussion on the type of control mechanisms such as genetic; structural, enzymic, feedback, and pace-maker mediated; regulation and control of specific metabolic processes such as those of carbohydrates, lipids, proteins and nucleic acids; control and regulation of energy metabolism; metabolic inter-relationships among the various cellular components and metabolites.

BIC 734: Metabolism of Foreign Compounds.

Definition of enzyme systems involved; mechanism of intoxication and detoxification; structure-activity relationship; factors affecting metabolism of foreign compounds.

BIC 741: Modern Nutrition Concepts and Nutritional diseases.

General survey of nutritional aspects and roles of major food constituents-protein, lipid, Carbohydrates, Vitamins and Minerals and trace elements. Food and nutrition security. Concept of nutrition through the life cycle: infancy to elderly nutrition requirements; energy content of food and requirements; Breast milk and exclusive breast feeding, benefits; multinutrient malnutrition – kwashiorkor, marasmus and micronutrient deficiencies (“Hidden hunger”), obesity – indices and management. Vegetarianism – advantages and disadvantages. Barkers Hypothesis (IUGR and Adult diseases), concept of “1000 – days window of opportunity”; diet and genetic basis of diabetes, atherosclerosis and CVD. Food fortification and nutraceuticals.

BIC 742: Applied Nutrition.

Focus will be placed on pre-natal and post-natal nutritional requirements; infant feeding, adolescent feeding, role of diet in the pathogenesis and management of cancer and the degenerative diseases; measurement of nutritional status – anthropometry. Dietary diversification, protein complementation and food fortification and nutraceuticals; functional foods, role of probiotics and prebiotics.

BIC 751: Basic Neurochemistry.

Survey of membrane biochemistry, transport mechanisms across the membrane - active transport (Properties of Na^+/K^+ ATPases). Functions of neuronal membranes, axonic and synaptic transmissions and neuromuscular junctions. Resting and action potentials; definition and classification of neurotransmitters. Metabolism of the neurotransmitters (excitatory and inhibitory) –The GABA shunt. G-protein linked receptors and the concept and mechanism of action of second messengers such as phosphatidylinositols; other relevant disciplines of neuroscience. Function of neural membranes, Synaptic function, brain metabolism, neuro-endocrinology; biochemistry of vision.

BIC 752: Advanced Neurochemistry.

General overview of neurosciences; neuroanatomy; neurophysiology; and neurobiochemistry. Brief explanation and neuropharmacology of axonal and synaptic transmission. Definition, classification and synthesis of neurotransmitters and their action. Biochemistry of agonists and antagonists and their medical importance. The concept of structure and function of classical receptors (muscarinic and nicotinic receptors) and their medical significance. Modern approaches to the study of receptors, neurotransmitters and neurotransmitter enzymes, neuropharmacology, neuroendocrinology; The biochemistry of neurological and psychiatric disorders such as Parkinson's disease, epilepsy, depression schizophrenia etc.

BIC 761: Biological Buffers.

General concepts of pH, buffers, buffer capacity; Significance of acid-base balance in the living system; buffer systems of tissue and body fluids; roles of tissues and organs such as RBC, lungs and kidneys in maintaining and regulating the activity of the body fluids and tissues; water and electrolyte metabolism.

BIC 762: Clinical Biochemistry

Blood: Composition and functions; urine: formation and composition, normal and abnormal constituents of urine and metabolism of major urinary excretory products; function tests: Renal, hepatic, gastric and thyroid function tests and their use (and interpretation), evaluation of the dysfunction of these organs; composition and characteristics of faeces – clinical and diagnostic significance. Water and electrolyte balance and imbalance; cerebrospinal fluid – their chemistry and clinical significance; Radioactivity, its hazard and protective mechanisms, diagnostic and therapeutic uses in medicine.

BIC 771: Immunochemistry (Elective)

Structure and function of immunoglobulins; antigen – antibody interactions; molecular basis of immune reactions; immunological tests and their clinical relevance and immunological basis of immunizations, including seroepidemiology tests applicable to communicable diseases.

BIC 772: Biochemical Instrumentation and Techniques

Isotopic techniques, chromatographic techniques; the use of the amino acid analyser, spectrophotometric techniques, radio-Immunoassay techniques, radio-Immunoassay procedures, micro-analytical and diffusion techniques, ultracentrifugation and electrophoresis, etc

PGC 601: Research Methodology and Application of ICT in Research

In-depth research work aimed at acquiring full knowledge and presentations in scholarly writing of the concepts, issues, trends in the definition and development of the study area from African and Western perspectives. Major steps in research: selection of problem, literature review, design, data collection, analysis and interpretation, conclusions. Study of various research designs, historical, case studies, surveys, descriptive, cross sectional, experimental, etc. Analysis, surveys and synthesis of conceptual and philosophical foundations of different disciplines. Identification of research problems and development of research questions and/or hypotheses. Detailed treatment of methods of collecting relevant research data and the format for presenting research results (from designing the table of contents to referencing, bibliography and appendix). Data analysis and result presentation in different disciplines using appropriate analytical tools. Methods of project/dissertation writing. Application of appropriate advanced ICT tools relevant in every discipline for data gathering, analysis and result presentation. Essentials of spreadsheets, internet technology, and internet search engines. All registered Master's degree students must attend a solution-based interactive workshop to be organized by the School of Postgraduate Studies for a practical demonstration and application of the knowledge acquired from the course, conducted by selected experts.

BIC 780: Seminars:- To be arranged.

BIC 790: Research Project – M.Sc. Project.

Course Description (PhD Degree programme)

BIC 811: Review/Seminar

BIC 821: Immunochemical and Radioisotope Techniques

Radioimmunoassay (RIA), enzyme-linked immunosorbent assay (ELISA), fluorescent immunoassay (FIA), acidin-biotin mediated Immunoassay and particle counting immunoassay

(PACIA). Nature and measurement of radioactivity. Application of radioisotopes in biochemical research; autoradiography.

BIC 832: Molecular Biology, Proteomics and Biotechnology

Isolation and characterization of nucleic acids. Sequencing of DNA, isolation of specific DNA sequences-polymerase chain reaction (PCR). Enzymes in genetic manipulation, cloning vectors. Introduction, tools of proteomics, mining, protein expression, profiling protein networking and mapping of protein modifications.

BIC 841: Environmental Biochemistry

Pollution – toxic wastes and radiation hazards. Bioremediation; management and disposal of radioactive and toxic wastes.

BIC 852: Advanced Topics in Medical Biochemistry

Contemporary issues in Medical Biochemistry, drug metabolism and advanced human nutrition.

BIC 862: Computational Biochemistry

Introduction, data bases of nucleic acids, proteins and others, molecular graphics, proteomic analyses, phylogenetic analyses.

PGC 701: Research Grant Writing and Synopsis writing

Identification of types and nature of grant and grant writing; mining of grants application class on the internet. Determining appropriate strategy for each grant application. Study of various grant application structures and contents and writing of concept notes, detailed project description, budgeting and budget defense. Study of sample grant writings in various forms and writing of mock research and other grants. Identification of University of Nigeria synopsis structure and requirements, (Introduction, Methodology and Results). Determining the content of each sub-unit of the synopsis. Steps in writing of synopsis from the Dissertation/Thesis document. Structural and language issues. Common errors in synopsis writing and strategies for avoiding them. The roles of the student and the supervisor in the production of a synopsis. Writing of mock synopsis. All registered Ph.D. students must attend a solution-based interactive workshop to be organized by the School of Postgraduate Studies for a practical demonstration and application of the knowledge acquired from the course, conducted by selected experts.

BIC 871: Advanced Seminar in Biochemistry

BIC 890: PhD Thesis

List of Approved/Available Supervisors

Staff	Specialty
<ul style="list-style-type: none">• Prof. I E Ezeagu BSc (Hons), MSc, MPhil, PhD (Ibadan).	Public Health Nutrition and Food Research, Diet, Chronic disease Prevention, Nutrition
<ul style="list-style-type: none">• Prof. F E Ejezie BSc (Hons), MSc (Nig.), PhD (Awka).	Micronutrients and Molecular Toxicology
<ul style="list-style-type: none">• Dr (Mrs). J E Ikekpezazu BSc (Hons; Benin), MSc, PhD (Nig.), PGDE, AIMLS.	Genomics, Clinical Biochemistry and Molecular diagnostics
<ul style="list-style-type: none">• Dr. A A Eze BSc (Hons; Nig.), MSc (Port Harcourt), PhD (Glasgow).	Genomics and Biochemical Parasitology; Clinical Enzymology and immunology
<ul style="list-style-type: none">• Dr. M D Ibegbu BSc (Hons), MSc (Ibadan), PhD (Portsmouth).	Biochemical toxicology and Nano-Drug delivery
<ul style="list-style-type: none">• Dr. C O Ezeh BSc (Hons; Nig.), MSc, PhD (Port Harcourt).	Genomics and Proteomics; Clinical Enzymology; and Biochemical toxicology,