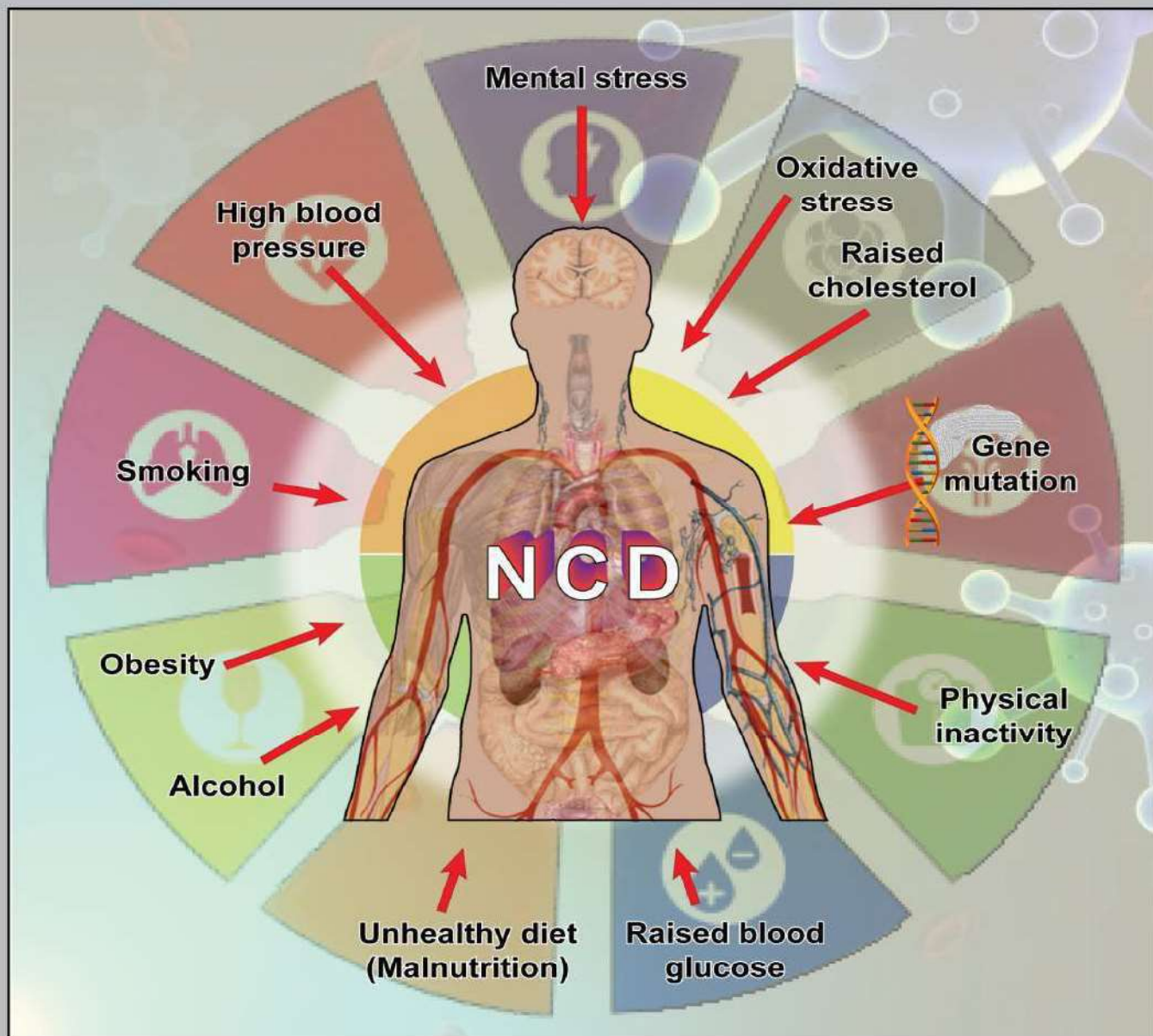


BBCET-145

MOLECULAR BASIS OF NONINFECTIOUS HUMAN DISEASES



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Programme and Course Design Committee

Prof. Bechan Sharma
Dept of Biochemistry
University of Allahabad

Prof. Ranjit K. Mishra
Dept. of Biochemistry
University of Lucknow

Prof. Reena Gupta
Dept. of Biotechnology
H.P. University, Shimla

Prof. V.R. Devaraj
Dept. of Biochemistry
Bangalore University

Prof. Sanjeev Puri
UIET, Panjab University

Prof. Seemi Farhat Basir
Dept. of Bio Sciences
Jamia Milia Islamia

Dr. Sunita Joshi
Dept. of Biochemistry
Daulat Ram College
University of Delhi

Prof. Vijayshri
Former Director
School of Sciences
IGNOU, New Delhi

Faculty Members (IGNOU)

Prof. Parvesh Bubber
Biochemistry, SOS

Dr. M. Abdul Kareem
Biochemistry, SOS

Dr. Arvind K. Shakya
Biochemistry, SOS

Dr. Maneesha Pandey
Biochemistry, SOS

Dr. Seema Kalra
Biochemistry, SOS

Course Preparation Team

Course Writers

Dr. Arvind K. Shakya
Assistant Professor, Biochemistry,
SOS, IGNOU, New Delhi-110068
(Units- 2,3, 5, 9,11 & 12)

Dr. Sheel Sharma (Retd.)
Dept. of Food Science & Nutrition
(Home science) Banasthali University,
Banasthali Vidyapith-304022
(Unit 1 & 4)

Dr. Satish Ganta
Associate Professor
Department of Zoology
Zakir Husain Delhi College
New Delhi (Unit 6)

Dr. Madhu Yashpal
Assistant Professor
Department of Zoology
Gargi College
University of Delhi (Unit 7)

Dr. Anannya Bandyopadhyay
Assistant Professor
Department of Zoology,
University of Delhi, Delhi
(Units 10)

Dr. Kameswara Sharma YVR
Assistant Professor
Department of Biochemistry
Sri Venkateswara College
University of Delhi (Unit 8)

Course Coordinator	:	Dr. Arvind Kumar Shakya
Artwork and cover page inputs		(arvind.kumar@ignou.ac.in)

Course Editor	:	Block 1-2	Block 3-4
		Prof. V.R. Devaraj	Dr. Poonam Sharma
		Dept. of Biochemistry,	Associate Professor,
		Central College Campus,	Department of Zoology
		Bengaluru City University	Gargi College, University
		Bengaluru-560001	of Delhi, New Delhi, 110019

Print Production :

Sh. Rajiv Girdhar, MPDD

Sh. Hemant Kumar, SO(P), MPDD, IGNOU

Acknowledgement: Mr. Sumit Verma for CRC and word processing and Mr. Ajit Kumar for graphic work and cover design.

September, 2022

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ISBN: 978-93-5568-651-0

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Printed and published on behalf of Indira Gandhi National Open University, New Delhi by MPDD, IGNOU.

Printed at Chandu Press.

MOLECULAR BASIS OF NON-INFECTIOUS HUMAN DISEASES

Dear Learners, Molecular Basis of Non-infectious Human Diseases (BBCET-145) is one of the fifth-semester Discipline Specific Elective course of the B.Sc. (Hons.) Biochemistry programme (BSCBCH). The theory course of Molecular Basis of Non-infectious Human Diseases has a 4-credit weightage and its laboratory course (BBCEL-146) is of 2 credits. This course deals with non-infectious human diseases. Non-infectious diseases do not spread from person to person, hence they are referred to as non-communicable diseases (NCD). They are caused by inherited gene mutation (enzyme deficiency), oxidative stress or an unhealthy lifestyle/malnutrition. In this course, you will learn the genetic and biochemical basis of non-infectious metabolic disorders. You will also learn the causes, symptoms and physiological effects of lifestyle disorders. By studying this course, you will learn how to manage lifestyle disorders such as obesity, diabetes, hypertension etc. which are more common in young people/children.

Therefore, this course comprises of 4 blocks which contain 12 Units.

Block 1 is about the “**Nutritional Disorders**”. Its first unit begins with the balanced diet. The recommended dietary allowances, major and minor nutrients are discussed with their biological importance. Healthy diet and Unhealthy diet are explained in the unit 1. In unit 2, Nutritional deficiency disorders of water-soluble vitamins - beriberi, pellagra, pernicious anaemia, scurvy are discussed with their biochemical roles, clinical symptoms and treatment. Marasmus and Kwashiorkor, the most common nutritional disorders are also described. The next unit 3 talks about the biochemical mechanism, symptoms of fat-soluble vitamin deficiency disorders such as night blindness, xerophthalmia (Vitamin A deficiency), rickets and osteomalacia (vitamin D deficiency), haemorrhage (Vitamin K deficiency).

Block 2 deals with the **Metabolic Lifestyle Diseases** wherein you will learn about obesity and eating disorders (Anorexia nervosa and Bulimia). You will also study about lifestyle disorders such as diabetes mellitus, hypertension, obesity, hypothyroidism and stress in Unit 4. The unit 5 is the heart disorders in which the pathogenesis, symptoms, causative factors of atherosclerosis are described in detail. In unit 6, the causative factors of metabolic syndrome, relationship with lifestyle diseases, irritable bowel syndrome and the prevention and management of Lifestyle disorders are described.

Block 3 is on the **Multifactorial Disorders**. Unit 7 deals with the multifactorial disorders, polygenic diseases and their inter-relationship with environmental factors. You will learn about causes, stages, biochemical mechanism of cancer and the role of Proto-oncogenes and tumor suppressor genes in cancer and its treatment strategy in unit 8. Unit 9 discusses about brain disorders.

Block 4 is on **Protein Disorders**. In this block, unit 10 discusses the protein disorders due to misfolding proteins. Unit 11 gives an overview of **monogenic diseases I** and inborn errors of metabolic diseases in which causes and symptoms of protein metabolic diseases are discussed. Unit 12 **Monogenic diseases II** discusses the genetic cause, metabolic effect, symptoms and treatment of cystic fibrosis, Long QT syndrome, familial hypercholesterolemia, achondroplasia, hemoglobinopathies and clotting disorders.

We assume that by this stage our learners would have already acquired basic knowledge of biochemistry, metabolism, human physiology, concept in genetics and biochemical tools and

techniques having gone through the most of the course units from the first to fourth semester. The structural outline in the beginning of each unit is a road map to the unit. The mentioned expected learning outcomes reflect the teaching and learning approaches. The running text describes and illustrates basics and concepts in a concise, learner friendly and interesting manner. It is supported by suitable figures, and tables to enrich the concept of the unit. The key features and concepts have been highlighted. A variety of teaching and learning approaches such as an inbuilt self-assessment exercises and terminal questions along with answers provided at the end of each unit will support the learners to evaluate and meet the expected learning outcomes of the given self-learning material. You are expected to spend a total of about 120 hours for completing this course. This is the average time which is to be spent by a learner for studying the course material, doing self assessment questions, assignments, watching the audio-video programmes and participation in IRC/teleconferencing sessions related to this course.

Objective:

After studying this course, you should be able to:

- define balanced diet, recommended dietary allowances and their importance in life;
- discuss the nutritional disorders of water-soluble and fat-soluble vitamins;
- explain marasmus and kwashiorkor and their effect on child's growth;
- describe causative factors and symptoms of metabolic lifestyle diseases;
- use management plan for prevention of lifestyle disorders;
- explain molecular basis of multifactorial complex disorders;
- discuss the protein misfolding disorders;
- describe genetic and biochemical basis of monogenic disorders;
- identify genetic cause and enzyme deficiency of inherited protein metabolic disorders;
- discuss hemoglobinopathies and clotting disorders;
- enlist the characteristics and biochemical impact of metabolic disorders on human health.

Our best wishes!

Block

3

Multifactorial Disorders

UNIT 7

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Introduction to the Cancer	125
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UNIT 9

Brain Disorders	145
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BLOCK 3: MULTIFACTORIAL DISORDERS

Multiple factors contribute to multifactorial disorders. The key contributing variables to cause of multifactorial illnesses are genes (mutation) and environmental factors. Neurological illnesses, hormone imbalance, polycystic syndrome, and cancer are examples of complex disorders which are difficult to diagnose in early stage. Therefore, in this block, you will learn about biochemical and molecular basis of Multifactorial disorders.

Block 3 contains three units (7-9):

Unit 7 Multifactorial Complex Disorders deals with the study of multifactorial diseases and their causative components, as well as the distinctions between monogenic and polygenic disorders. This unit describes the genetic basis of various multifactorial conditions such as diabetes and Alzheimer's disease. The unit also talk about the hypothyroidism and polycystic ovarian syndrome.

Unit 8 is on the Introduction to Cancer. This unit discusses stages and causative agents of cancer. The metastasis, neoplastic development, proto-oncogenes, tumour viruses, the molecular mechanism of cancer, and its therapy are also discussed.

Unit 9 is the brain disorders in which you will study about mood disorders and anxiety disorders. There are descriptions of neurological illnesses such as schizophrenia, dementia, Parkinson's, and amyotrophic lateral sclerosis (ALS).

Expected Learning Outcomes:

After studying this block, you should be able to:

- identify multifactorial complex illnesses;
- explain monogenic and polygenic diseases;
- discuss cancer stages and metastasis;
- describe proto-oncogenes;
- examine the molecular basis of cancer and treatment possibilities;
- explain mood and anxiety problems
- explore the many forms of brain diseases; and
- enlist neurological disorder symptoms and their causative factors.

UNIT 8

INTRODUCTION TO THE CANCER

Structure

8.1 Introduction	8.7 Cancer Causing Mutations
Expected Learning Outcomes	8.8 Tumor Viruses
8.2 Characteristics of Transformed Cell	8.9 Biochemical Analysis of Cancer
8.3 Causes and Stages of Cancer	8.10 Molecular Approaches to Cancer Treatment
8.4 Molecular Basis for Neoplastic Growth	8.11 Summary
8.5 Metastasis	8.12 Terminal Questions
8.6 Proto-Oncogenes and Tumor Suppressor Genes	8.13 Answers

8.1 INTRODUCTION

This unit deals with cancer. Cancer is a group of diseases marked by the accumulation of uncontrolled and progressive mutations in a cell's genome. These modifications can occur in special genes, called proto-oncogenes, which are inactive in normal cells. When activated, proto-oncogenes are converted into oncogenes, and responsible for the malignancy of normal cells, called cancer cells. The combination of the host's metabolic state, nutritional aspects, physical activity and other environmental exposures throughout life are factors involved in the protection or susceptibility to the onset of cancer.