Lahore University of Management Sciences

BIO517 – Molecular Mechanisms of Pathogenesis

Fall-Semester 2023

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Course URL (if any)	

Course Teaching Methodology (Please mention following details in plain text)

- Teaching Methodology: synchronous or asynchronous or a blend of both –Hybrid
- Lecture details: Percentage of recorded and live interaction lectures-10% recorded 90% live interactions

Course Basics				
Credit Hours	3			
Lecture(s)	Nbr of Lec(s) Per Week	2	Duration	75 min
Recitation/Lab (per week)	Nbr of Lec(s) Per Week		Duration	
Tutorial (per week)	Nbr of Lec(s) Per Week	1	Duration	75

Course Distribution	
Core	
Elective	Elective
Open for Student Category	Seniors, juniors, MS and PhD
Close for Student Category	Sophomores and Freshman

COURSE DESCRIPTION

The course will provide an overview of different mechanisms of pathogenesis used by common pathogens. On completion of the course, student will have a deeper appreciation of the remarkable diversity of mechanisms used by pathogens to cause disease or to merely survive in human host. Selected infectious diseases that causes, emergencies and epidemics will be discussed in this course. More specifically, the course will began with introduction to fundamentals of History and Epidemiology of infectious diseases, this will be followed by a more deeper understanding of infections and disease using examples of most commonly occurring infections. The course will end with current methods in molecular pathogenesis and finally a short discussion on ethical issues associated with studying pathogenesis in human and animal models.. Lectures will be mainly based off of the current literature while basic concepts will be derived from textbooks. Students will be encouraged to read the material provided prior to class to be able to understand the contents better.

COURSE PREREQUISITE(S)

- BIO 314

COURSE OBJECTIVES

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•	To introduce students to fundamentals of Epidemiology of infectious diseases
•	To sensitize students to the remarkable diversity of mechanisms used by pathogen to invade host.
•	To familiarize students with methods for investigating virulence

Learning Outcomes	
•	Students taking this course will able
•	1 Describe methods for surveillance of existing and emerging infections
•	2 Explain mechanisms of host-pathogen interactions
•	3 Describe the burden of infection caused by major pathogens and its economic impact and roles played by public health professional and policy makers to improve methods of infection control
	4 Apply basic knowledge of host-pathogen interactions to answering epidemiologic questions
	5 Identify virulence factors, their structure, localization in cells, role in disease processes their mode of action and their use in epidemiology
	6 Describe the use of virulence factors as epidemiologic tools for investigation of outbreaks
	7 Distinguish between different mechanisms of pathogenesis causing similar illnesses
	8 Develop approaches to outbreak identification, investigation and management
	9 Describe and critically evaluate current research in molecular pathogenesis/epidemiology
	10 Apply knowledge of mechanisms to design strategies to prevent and control infections

Grading break up: Component Details and weightages

Assignment(s): 10%
Home Work: None
Quiz(s): 4 quiz with a total of 20%
Class Participation: 5%
Attendance:
Midterm Examination: 25%
Project:
Final Examination: 40%

(please add plain text)

Examination Detail	
Midterm Exam	Yes/No: Yes Combine Separate: Duration: 3 hours Preferred Date: Exam Specifications: Multiple choice questions short answers and problem solving
Final Exam	Yes/No: YES Combine Separate: Duration: 3 hours Exam Specifications: Multiple choice questions short answers and problem solving

COURSE OVERVIEW

Week/ Lecture/ Module	Topics	Recommended Readings	Objectives/ Application
• **1**	Introduction to pathogenesis and Epidemiology of infectious diseases	Research articles, Brenda Wilson et al Bacterial Pathogenesis: *A molecular approach.* Chapter 1 Chapter 6 Microbes and Disease	• Review of the history of infectious diseases. Epidemiological methods for understanding prevalence and incidence

		Chapter 7 Mechanism of genetic modification Chapter 9 Identification of Virulence factors. Richard Goering et al MIM's Medical Microbiology Chapter 1 The Bacteria	of infection and for understanding transmission of infections among communities and across borders. • Discussion of the course overview • Pathogens and public health • Surveillance systems for pathogens in communities and hospitals • Microbiology—past, present and future • Factors influencing transmission of infections • Emerging and re-emerging infections • Bacterial physiology • Virulence factors • Mechanism of genetic exchange and evolution of virulence factors • Molecular approaches for identification of virulence factors Research in Pathogenesis
• **2**	Host pathogen interaction	Research articles Chapter 2 and 3 Bacterial Pathogenesis	• Mechanisms by with pathogen invade the host and how host protects itself from invaders. Pre-infection • Colonization of host surfaces • Mechanisms of evading host immune responses • Invasion of host cell Cell to cell spread and disease
• **3-7**	Upper-respiratory tract infections. Pneumococcal, Neisseria meningitides, haemophilus and staphylococcal infections	Medical Microbiology 4th Edition Samuel Baron Medical Microbiology 5e Richard Goering Research articles	A series of lectures that will introduce students to epidemiology, and clinical manifestations of infections and mechanisms used by pathogens that most commonly infect the upper respiratory tract. Bacterial virulence factors, common themes in infection strategies and modes of prevention and cure will be discussed. Antimicrobial resistance and their mechanisms will also be presented and finally overview of historic pandemics will also be reviewed
• **8-10**	Gastrointestinal tract infections	Medical Microbiology 4th Edition Samuel Baron Medical Microbiology 5e Richard Goering Research articles	Pakistan is endemic for several gastrointestinal tract infections. These lectures will review most common infections caused by ingestion of contaminated food or

			water. Lectures will also present overviews of how food and water can be prevented from contamination and common cures especially use of antibiotics for GIs will be discussed
• **11-14**	Emerging infections	Research Papers	Emerging and re-emerging infections are posing a significant treat to human health. Environmental conditions and population dynamics responsible for emerging and re-emerging infections will be an important component of discussion.
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Textbook(s)/Supplementary Readings

Brenda Wilson et al, Bacterial pathogenesis: A molecular approach
Samuel Baron 4th Edition Medical Microbiology
J. Keith Struthers et al Clinical Bacteriology Control of infections in hospital and community.