

COURSE CODE: MLS 211

COURSE TITLE: INTRODUCTION TO MEDICAL LABORATORY SCIENCE

NUMBER OF UNITS: 2 UNITS

COURSE DURATION: TWO HOURS PER WEEK

MODULE 1: INTRODUCTION TO MEDICAL MICROBIOLOGY

COURSE LECTURER: **BANKOLE HENRY OLADEINDE**

## **INTENDED LEARNING OUTCOMES**

At the end of this class, students should be able to:

1. Define Medical Laboratory Science and explain its relevance as a discipline.
2. Define Medical Microbiology and list its sub- specialties.
3. Define micro-organism and highlight the differences between Prokaryotes and Eukaryotes.
4. Differentiate between infection and infectious disease.
5. List and explain the modes of transmission of infectious agents.
6. List and explain the different methods of diagnosis of infectious diseases

## **COURSE DETAILS:**

**Week 1-3:** *General introduction to Medical Laboratory Science (Medical Microbiology, Clinical Chemistry, Haemtology and Blood Transfusion Science, , Histopathology and Immunology)*

**Week 4-5:** *Specimen collection procedure; specimen collection bottles; reception and registration of specimen; storage and disposal of specimen*

**Week 6-7:** *Safety precautions in pathology laboratories against chemical, biological, electrical, materials and irradiation hazards.*

**Week 8-9:** *Techniques and principles of chemical sterilization and physical methods*

**Week 10-11:** *glassware cleaning, care and maintenance; breeding of laboratory animals*

**Week 12:** *Revision*

## **RESOURCES**

### **• Lecturer's Office Hours:**

• Mr. Henry Bankole Oladeinde: Wednesdays: 1:00-2:00pm.

### **• Course lecture Notes:**



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• **Books:**

*Jawetz, Melnick and Adelbergs Medical Microbiology 26<sup>th</sup> Edition by Brooks JF, Morse SA, Carroll KC, Mietzner TA, Butel JSMcgraw Hill 2013 ISBN: 978-0-07-181578-9*

*Sherris Medical Microbiology 4<sup>th</sup> Edition by Kenneth J. Ryan and George C. Ray Mcgraw Hill 2004. ISBN: 0-07-150238-6*

**Journal**

*Oladeinde BH, Ekejindu IM, Omoregie, Aguh OD. (2015). Awareness and knowledge of ergonomics among medical laboratory scientists in Nigeria. Annals of Medical and Health Science Research 5(6): 423-427.*

**Project:**

• Homeworks + Project: ~ 30% of final grade.

• **Exams:**

• Final, comprehensive (according to university schedule): ~ 70% of final grade

**Assignments & Grading**

• **Academic Honesty:** All classwork should be done independently, unless explicitly stated otherwise on the assignment handout.

• You may discuss general solution strategies, but must write up the solutions yourself.

• If you discuss any problem with anyone else, you must write their name at the top of your assignment, labeling them “collaborators”.

• **NO LATE HOMEWORKS ACCEPTED**

• Turn in what you have at the time it’s due.

• All homeworks are due at the start of class.

• If you will be away, turn in the homework early.

• Late Assignments (projects) will not be accepted, but penalized according to the percentages given on the syllabus.

**PREAMBLE:**

A major threat to the existence of mankind is disease. Disease outcome can be fatal, leading to death in many cases. Man over the years has sought different ways to combating this threat, recording successes in many areas. However, one element that is relevant in the fight against a disease is the knowledge of the cause of the disease, as one can hardly contend with what is unknown.

Medical Laboratory Science is concerned with the analysis of clinical specimen (urine, blood, stool, peritoneal fluid, synovial fluid e.t.c) with the aim of identifying the cause/s of disease conditions. It is pivotal to the effective management of diseases as reports shows that over 60 percent of decision relating to hospital admissions, prescribed medicals and discharge of patients depends on

laboratory data. Medical laboratory science as a discipline is thus a fulcrum for practice of modern day medicine. One trained to perform the function above is regarded as a Medical Laboratory Scientist or a Clinical Laboratory Scientist.

Medical Laboratory Science has many specialties. They include Medical Microbiology, Chemical Pathology, Hematology and Blood transfusion, Histopathology and Immunology. Different specialists work together providing valuable data for management of patient.

Medical Microbiology is the study of micro-organisms, the diseases they cause and host response to these diseases. It is a branch of medical sciences that deals with the etiology, pathogenesis, laboratory diagnosis, treatment and control of infection. Micro-organisms are small (microscopic) organism that may exist in single or multicellular form. They are very small organism that cannot be seen with the naked eyes except with the use of magnifying equipment such as a Microscope. Micro-organisms are ubiquitous and can be found everywhere and anywhere. They can be found in the air, soil, water, animals, and man. Many micro-organisms are known to cause disease conditions in man. Micro-organisms that can cause diseases are termed pathogens.

## **CLASSIFICATION OF MICRO-ORGANISMS**

Based on cellular structure, all cells are divided into two groups, namely prokaryotes and eukaryotes. Micro-organisms are living cells and are also grouped into one of these classes. There are several differences between a prokaryotic and eukaryotic cell. These differences are related to a number of features including size, nature of genetic materials, ribosomes, organelles, presence of introns etc. There are different types of micro-organisms, namely bacteria, viruses, fungi and protozoa.

## **SUB- SPECIALTIES OF MEDICAL MICROBIOLOGY**

There are four other sub-specialties in the field of Medical Microbiology that are related to the study of specific micro-organism that causes diseases in man. These sub-specialties are:

1. **Medical Virology**: Focuses on the study of viruses and the diseases they cause in man.

2. **Medical Bacteriology:** Focuses on the study of bacteria and the diseases they cause in man

3. **Medical Mycology:** This focuses on the study of fungi that causes disease in man.

4. **Medical Parasitology:** Focuses on the study of parasitic diseases in man

A fifth sub-specialty is Immunology and this is concerned with the study of host response to infectious diseases

## **INFECTION AND INFECTIOUS DISEASE**

Infection is the invasion of a tissue by micro-organisms (bacteria, viruses, fungi etc). An infectious disease is a disorder resulting from the invasion and colonization of tissue by micro-organism (bacteria, fungi, viruses etc). One with an infectious disease typically presents with signs and symptoms of illness. Not all infection leads to infectious disease.

Based on place of acquisition, infection can be classified as

**1. Nosocomial infection.** This is sometimes called Health-care associated infection. This is an infection that is acquired in a hospital or any other health care facility such as clinics, maternity homes, rehabilitation homes etc. Infection can be spread to a susceptible host in a clinical setting through contaminated equipment, beddings, health care staff, another patient, or even in some cases from the patient's own microbiota, particularly after surgery.

**2. Community acquired infection:** This is any infection acquired outside a health care facility. It is also an infection present at the time of admission into a health care facility.

## **MODE OF TRANSMISSION OF INFECTIOUS AGENTS**

There are a number of ways through which infectious agents can be transmitted to cause disease. These are;

1. **Human to human contact:** This involves direct body contact with that of an infected person leading to transfer of infective agent.
2. **Feacal oral route:** This involves the ingestion of materials (food, water) that have been contaminated with infective micro-organisms.

3. Vertical transmission: This refers to placenta transfer of infectious agents from mother to child.
4. Aerosol: Transmission can be through infective airborne droplets. Droplets are formed from infected persons during actions like coughing, sneezing and talking. Inhalation of these droplets that contain infective micro-organism by susceptible host can cause infection.
5. Vector borne transmission: This occurs when certain vectors such as mosquitoes, rats, fly etc, transmit infective micro-organism to susceptible host.

## **DIAGNOSIS OF INFECTIOUS DISEASES**

Effective management of infectious diseases depends largely on the timely and accurate diagnosis of its etiologic agents. This can be achieved by the use of one or a combination of the following laboratory methods

**Microscopy:** This involves the use of microscope in viewing clinical specimen in order to reveal the presence of inherent micro-organism that may be the cause of disease.

**Serological Technique:** This relates to procedures that detect specific antigens or antibodies of pathogens in clinical specimens of patients.

**Cultural method:** This employs the use of appropriate culture media in growing and identifying the pathogen in the laboratory.

**Biochemical tests:** These are tests used to confirm the identity of pathogens in the Laboratory. Common biochemical tests used in the laboratory include citrate utilization test, coagulase, catalase, indole tests, urease test, oxidase tests and Voges-Proskauer tests.

**Nucleic acid detection (Polymerase Chain Reaction):** This is an amplification technique that allows the detection and selective replication of a targeted portion of a genome. Basically, the procedure sets out to amplify small quantity of microbes into several million copies, followed by the detection of nucleic acid on a specialized medium. It is a very sensitive diagnostic method, and often regarded as gold standard for diagnosing several infectious diseases.



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