

THE TAMIL NADU Dr. M.G.R. MEDICAL UNIVERSITY
No. 69, ANNA SALAI, GUINDY, CHENNAI – 600 032.

M.D. / M.S.
POST GRADUATE DEGREE COURSES



SYLLABUS AND CURRICULUM

2021 - 2022

M.D. MICROBIOLOGY

THE TAMIL NADU Dr. M.G.R MEDICAL UNIVERSITY, CHENNAI

M.D.MICROBIOLOGY

1.GOAL

The aim of this curriculum is to train and equip clinical microbiologist for identification, diagnosis, containment of infectious diseases, autoimmune and immunodeficiency diseases in hospital and community settings and training on planning and execution of applied and fundamental research in the field of microbiology. They will be proficient to apply the wholesome knowledge both for laboratory diagnosis and fundamental / applied research.

2.OBJECTIVES:

To train clinical microbiologist in identification, diagnosis of infectious diseases,auto immune disorders and immunodeficiency diseases.
Use skills for prevention and control of infectious diseases especially to containhospital acquired infections.
To steer and control appropriate use and prevent misuse of anti microbials inclinical treatment settings.
To acquire and update knowledge in vertical programmes / WHO, UN and othernational and international health programs.
To attain the above objectives the following are the essential requirements

3.COMPONENTS OF THE M.D -MICROBIOLOGY POSTGRADUATE CURRICULUM

The post graduate training should include the following components for a holistic approach.

- 3.1 Laboratory and Diagnostic skills in Clinical Microbiology
- 3.2 Teaching Skills
- 3.3. Research Methodology
- 3.4 Communication and attitudinal skills

3.1. LABORATORY AND DIAGNOSTIC SKILLS IN CLINICAL MICROBIOLOGY

Subject specific competencies

Objectives of subject specific competencies based Post graduate M.D. Microbiology training.

A post graduate student upon successfully qualifying in the MD (Microbiology) examination should be able to:

- 1. Demonstrate competence as a clinical microbiologist
- 2. Interact effectively with the allied departments by rendering services in basic as well as advanced laboratory investigations

3. Demonstrate application of microbiology in a variety of clinical settings to solve diagnostic and therapeutic problems along with preventive measures.
4. Play a pivotal role in hospital infection control, including formulation of antibiotic policy and management of biomedical waste.
5. Acquire skills in conducting collaborative research in the field of Microbiology and allied sciences.
6. Conduct such clinical/experimental research as would have significant bearing on human health and patient care
7. Demonstrate effective communication skills required for the practice of clinical microbiology and while teaching undergraduate students
8. Establish good clinical microbiological services in a hospital and in the community in the fields of bacteriology, virology, parasitology, immunology and mycology.
9. Plan, execute and evaluate teaching assignments in Medical Microbiology.
10. Plan, execute, analyze and present the research work in medical microbiology.
11. To acquire various skills for collaborative research.
12. To participate in various workshops/seminars/journal clubs/demonstration in the allied departments
13. Uphold the prestige of the discipline amongst the fraternity of doctors.

A list of Post Graduate experiments pertaining to basic, diagnostic and applied Microbiology should be prepared. Active learning involving all the domains – Knowledge, skill, attitude, ethics and communications should form the mainstay of the postgraduate training.

A. KNOWLEDGE DOMAIN

Good knowledge of various disciplines of micro-biology includes General Bacteriology, Systematic Bacteriology, Virology, Parasitology, Immunology, Mycology and Molecular diagnosis.

The student as Clinical Microbiologist should establish good clinical microbiological services in the hospital and community in the fields of bacteriology, virology, parasitology, immunology, serology, mycology and also get updated with new diagnostic technology.

Interact with allied departments, acquire knowledge of infections in humans, immunoprophylaxis, transplantation immunology, Health care associated infections, Antibiotic stewardship and outbreak investigations, Awareness of National policies like RNTCP, NACO guidelines, NVBDCP, IDSP & Reference Lab network etc.,

Acquire skills in planning, executing and evaluating teaching assignments in medical microbiology and conducting collaborative research both clinical and experimental in the field of microbiology and allied sciences.

Knowledge of laboratory animals and applications in diagnosis, quality assurance , quality control and management for laboratory standardization and accreditation is essential prerequisite of the curriculum.

B. SKILLS (PHYSOCHOMOTOR DOMAIN)

(i) BACTERIOLOGY

- Washing and sterilization of glass wares, Plugging and packing
- Preparation and pouring of basal media, Enriched media, Selective media and Transport media
- Disinfection, sterilization techniques and checking and adjustment of PH of media
- Sterility check (Dry / Moist methods) and disinfectant testing
- Preparation of in house reagents
- Decontamination of cultures
- QC and QA of media, reagents, antibiotic discs
- Safe laboratory practices including bio safety
- Care and maintenance of laboratory equipments (Conventional / Automated)
- Collection and transport of various clinical specimens
- Performance of antibiotic sensitivity test – Kirby Bauer, Stokes method
- Determination of MIC by agar dilution, Broth dilution
- Test for drug resistance including MRSA, VRE, ESBL, AmpC, Metallobetalactamases.
- Environmental sampling including operating Room (OR)
- Identification of Bacteria of Medical importance upto species level by routine and special tests.
- Identification of Anaerobic Bacteria with various techniques of Anaerobiasis .
- Preparation and performance of different stains including Grams, Albert, Capsule, Shaffer Fulton Spore Staining Method , Fontana, Ziehl-Neelsen, Modified Ziehl-Neelsen etc.
- Care and operation of various microscopes viz. light , dark ground, phase contrast , Inverted and fluorescence microscopes.
- Quantitative and semi-quantitative analysis of urine sample / BAL
- Inoculation of clinical specimen on media for isolation, identification of bacteria
- Test for motility, in-vitro toxicity tests
- Bacteriological tests for air, water and milk
- Maintenance and preservation of bacterial cultures.
- Serological grouping of streptococcus
- Antibiotic susceptibility test for mycobacteria
- Molecular methods of detection of drug resistance in bacteria
- Molecular diagnostic methods for bacteria.

(i) IMMUNOLOGY

- Collection / separation / preservation of blood samples
- Antigen preparation for Widal / Weil-Felix, VDRL
- Serological test including rapid / conventional (LAT, ICT, tube agglutination, slide flocculation)

- Raising of bacterial anti sera in laboratory animals
- Enzyme linked immunosorbent assay / Immunoblotting
- Co- agglutination test

VIROLOGY

- Preparation of Glasswares for tissue culture(washing,sterilization)
- Preparation of media like Hanks, MEM, VTM
- Preparation of clinical specimens for isolation of viruses
- Maintenance of continuous cell lines by subcultures
- Preservation in -70°C & Liquid Nitrogen
- Recognition of CPE & Cytopathogenic viruses
- Serological test- ELISA, Rapid tests for Hepatitis A,B,C,D& E, HIV,Arboviruses & Westernblot for HIV
- Molecular diagnostic methods for viral diagnosis.

(iii) MYCOLOGY

- Collection and transport of specimens
- Direct examination of specimens by KOH, Gram's, Giemsa, LactophenolCotton blue stains and tissue stains.
- Calcofluor staining and examination under fluorescent microscope.
- Examination of histopathology slides for fungal infections
- Isolation and identification of common laboratory contaminants, dermatophytes and other fungi of medical importance (yeast, dematiaceous fungi)
- Special techniques like Wood's lamp examination, hair baiting, hair perforation, paraffin baiting and slide culture
- Molecular diagnostic methods for diagnosis of fungal diseases.

Maintenance of stock cultures

(iv) PARASITOLOGY

- Examination of faeces for parasitic ova and cysts etc. by direct and
- concentration methods (salt floatation and formal-ether methods)
- Egg counting techniques for helminths
- Examination of blood for protozoa and helminths by wet mount and thin and thick stained smears
- Examination of other specimens e.g. urine, CSF, bone marrow etc. for parasites.
- Histopathology sections-examination and identification of parasites
- Performance of stains-JSB, Field's Leishman, Giemsa
- In-vitro culture of parasites like *Entamoeba*, *Leishmania*, etc.
- Preparation of media- NNN, etc.

- Copro-culture of larva of hookworms
- Antigen preparation-viz. *Entamoeba*, filarial, hydatid for serological tests like IHA and skin tests like Casoni's test
- Identification of common arthropods and other vectors viz., mosquito, sandfly, tick, mite, cyclops
- Collection of specimens
- Preservation of parasites- mounting, fixing, staining, etc.
- Peripheral blood smear, QBC for malaria

(V) MOLECULAR BIOLOGY

- Extraction of DNA & RNA, Routine PCR Protocols, Gel Documentation
- Real time PCR
- Gene cloning
- Gene sequencing
- Newer molecular techniques and updates.

(VI) CLINICAL MICROBIOLOGY (APPLIED MICROBIOLOGY)

- At the end of the course, the student should be able to
- Diagnose infectious diseases, correlating the clinical details with laboratory tests as evidence.
- Identify, aid in prevention, control and treatment of common Health care associated infections (HCAI) which includes Catheter associated urinary tract infections(CAUTI), Ventilator associated pneumonia(VAP), Central line associated blood stream infections(CLABSI), Surgical site infections(SSI).
- Alert the treating physician on existing and emerging antimicrobial resistance and follow up.
- Interpret the surveillance indicators of HCAI
- Practice and participate in antimicrobial stewardship program(ASP) with regard to selection of appropriate antimicrobials – dose, duration, dosing interval, & de-escalation, etc.
- Demonstrate knowledge about management of biomedical waste
- Effectively investigate an infectious outbreak in hospital and community
- Effectively use information technology (Computers) in microbiology
- Demonstrate knowledge and applications of Automation in Microbiology
- Demonstrate knowledge in bio safety in laboratory and Laboratory
- Demonstrate the knowledge and skills to perform and interpret the correlates of vaccine induced immunity
- The student should be able to manage emergency laboratory services in Microbiology. He/she should be able to deal with all the emergency investigations in Microbiology.

C. AFFECTIVE DOMAIN :

ATTITUDE INCLUDING COMMUNICATION AND ETHICS

1. Students should develop the art of eliciting clinical history from patients to correlate laboratory reports. And to inform critical parameters to clinicians without undue delay
2. Develop communication skills to word reports and professional opinion as well as to interact with patients, relatives, peers and paramedical staff, and students.
3. Demonstrate effective communication skills required for the practice of clinical microbiology and while teaching undergraduate students
4. .Should be able to function as a part of a team, develop an attitude of cooperation with colleagues, and interact with the patient and the clinician or other colleagues to provide the best possible diagnosis or opinion
5. Must adopt ethical principles and maintain proper etiquette in dealings with patients, relatives and other health personnel and to respect the rights of the patient including the right to information and second opinion.
6. Uphold the prestige of the discipline amongst the fraternity of doctors.

3.2. TEACHING SKILLS

- ☐ The Medical Education Department/Unit of the institution should sensitize the postgraduate students in basic concepts of medical education like domains of learning, teaching skills, teaching - learning methods, learning resource material, evaluation techniques etc.
- ☐ The postgraduate students should attend all undergraduate lectures in the subject of Microbiology and participate actively in the undergraduate teaching programme including tutorials, demonstrations and practicals.

3.3. WRITING THESIS/ RESEARCH ARTICLES

All students will have to carry out a research study and bring out a dissertation (thesis).

Students are encouraged to attend CME's, publish research papers and present posters, or platform presentations at State, National and International Conferences.

3.3.1. TRAINING IN RESEARCH METHODOLOGY MEDICAL ETHICS, BIOETHICS AND MEDICOLEGAL ASPECTS

Students should compulsorily attend the research Methodology workshop conducted by the University within first six months of the M.D course.

Students are encouraged to attend workshops/CME's on Bioethics conducted by the University and other reputed Institutions.

Medical ethics, Bioethics, moral and legal issues and Medical Audit are part and parcel of our curriculum and syllabus in Medical Microbiology like Lab reports confidentiality, Notification and reports disclosure, Pre and post test counseling. And biomedical ethics related to quarantine and its impact, patient Vector, carrier,

Specimen transport, Bio- terrorism, outbreak and their control, HCAI , BMWM, NABL including quality assurance are very much essential for the Health care setup and teaching institutions.

3.4 COMMUNICATION AND ATTITUDINAL SKILLS

The post graduate student should be able to communicate effectively with patients, their relatives, peers, and consultants for better clinical correlation of laboratory findings as well as research. They should work as an effective team member and leader. They should also demonstrate right kind of attitude while handling clinical material and reports.

4. THEORY SYLLABUS

General Microbiology

- Microbiology- The Historical introduction
- Microscopy
- Biosafety and standard precautions
- Taxonomy and Nomenclature of microorganisms
- Sterilization and disinfection.
- Microbial susceptibility & resistance to chemical and physical agents
- Morphology of bacteria and other microorganisms
- Human microbiota
- Bacterial growth and metabolism.
- Bacterial toxins &, Bacteriocins & Bacteriophages
- Microbiology of hospital environment.
- Microbiology of air
- Microbiology of milk and dairy products
- Microbiology of Food
- Microbiology of water.
- General epidemiology, Transmission, and Therapy
 - ❖ Epidemiology of infectious diseases,
 - ❖ Theory of infectious diseases transmission and control,
 - ❖ emergence and resurgence of infectious diseases,
 - ❖ Healthcare associated infections,
- Host-parasite relationship
- Antibacterial therapy and drug resistance
- Bacterial genetics & Bacterial Typing
- Molecular genetics relevant for Medical Microbiology.
- Molecular techniques in diagnosis of microbial infections
- Automation in Microbiology
- Quality assurance & quality control in Microbiology.
- Accreditation of laboratories

IMMUNOLOGY

- History
- Innate Immunity and Inflammation:

- ✓ Phagocytes: Macrophages, Neutrophils
- ✓ Basophils and eosinophils
- ✓ Natural killer cells
- ✓ Apoptosis
- ✓ Complement
- ✓ Antimicrobial peptides
- ✓ Mediators of Inflammation
- ✓ Acute phase response
- Acquired Immunity
 - ✓ Antibodies and B lymphocytes
 - ✓ The B-cell antigen receptor
 - ✓ Monoclonal antibody therapy
 - ✓ Processing and presentation of antigen – Class II MHC
 - ✓ CD4 lymphocytes and their role in infectious disease
 - ✓ Processing of antigen – Class I MHC
 - ✓ CD8 lymphocytes and their role in infectious diseases, malignancy
 - ✓ TCR
 - ✓ Unconventional T cell
 - ✓ Lymphocyte mediated cytotoxicity
 - ✓ Immunological memory
 - ✓ Lymphocyte homing
 - ✓ Mucosal immune response
 - ✓ Superantigens
 - ✓ Immunogenetics
 - ✓ Transplantation immunity
 - ✓ Tumour Immunology
 - ✓ Vaccines and immunotherapy
 - ✓ Measurement of immunological parameters
 - ✓ Immunological techniques
 - ✓ Immunopotential & immunomodulation
 - ✓ ImmunoHaematology

- Infection and Immunity
 - ✓ Virus & Interference with Host immune response
 - ✓ Bacteria & Evasion of immune response
 - ✓ Parasite evasion
- Immunopathology & Immunodeficiency
 - ✓ Sepsis/ Shock
 - ✓ DTH associated pathology
 - ✓ Airway hypersensitivity
 - ✓ Autoimmunity
 - ✓ Immunocompromised host
 - ✓ Acquired immunodeficiencies
- Vaccines
 - ✓ New approaches to vaccine delivery
 - ✓ New vaccine delivery
 - ✓ Peptide vaccines
 - ✓ Live vaccine carriers
 - ✓ Naked DNA vaccines
 - ✓ Adjuvants and subunit vaccines
 - ✓ Mathematical models of vaccination

Systematic Bacteriology:

- Isolation & identification of bacteria.
- Gram positive cocci of medical importance including Staphylococcus, Micrococcus, Streptococcus species, Streptococcus pneumoniae, Enterococcus, Anaerobic cocci, etc.
- Gram negative cocci of medical importance including Neisseria, Branhamella, Moraxella, etc.
- Corynebacterium and other Coryneform organisms, Bacillus & other Aerobic bacilli, Actinomyces, Nocardia, and other Actinomycetales, Erysipelothrix, Listeria, Clostridia and other spore bearing Anaerobic bacilli, Lactobacillus, etc.

- Gram negative bacilli of medical importance including Vibrios, Aeromonas, Plesiomonas, Haemophilus, HACEK Group, Bordetella, Brucella, Gardnerella, Pseudomonas, Burkholderia, Acinetobacter & other Non-fermenters, Pasteurella, Francisella, Capnocytophaga, Bacteriodes, Fusobacterium, Leptotrichia and other anaerobic gram negative bacilli, etc.
- Helicobacter, Campylobacter & Spirillum, Gardnerella, Legionella
- Enterobacteriaceae- Escherichia, Edwardsiella, Citrobacter, Salmonella, Shigella, Klebsiella, Enterobacter, Hafnia, Serratia, Proteus, Morganella, Providencia, Yersinia & Erwinia
- Mycobacteria
- Mycobacterium tuberculosis complex, Non-Tuberculous Mycobacteria, Mycobacterium leprae
- Microbiology, pathogenesis, transmission, clinical spectrum, laboratory diagnosis – conventional and recently developed point of care, rapid and automated techniques, molecular diagnostic methods, national and WHO guidelines on diagnosis and treatment of Pulmonary and extrapulmonary Tuberculosis in adults and children, drug resistant TB and diagnosis of drug resistance, and treatment of drug resistant TB, prophylaxis – immunoprophylaxis and control and prevention of TB in community and hospitals, national programs on control of tuberculosis.
- Spirochaetes including Treponema, Leptospira, Borrelia etc
- Chlamydiae
- Mycoplasmatales; Mycoplasma, Ureaplasma, Acholeplasma and other
- Mycoplasma
- Rickettsiae, Coxiella, Bartonella, & Orientia etc.
- Ehrlichia, Anaplasma, etc.
- Spirillum minus, Streptobacillus moniliformis
- Antibiotic panels / Guidelines

MYCOLOGY

- Historical introduction to fungi
- General characteristics & classification of fungi. Phylogeny and systematic
- Morphology & reproduction of fungi.
- Laboratory diagnosis - Isolation and identification of fungi, Mycology, molecular diagnosis of fungal diseases.
- Tissue reactions to fungi and histopathological diagnosis of fungal infections
- Yeasts and yeast like fungi of medical importance including Candida,
 - Cryptococcus, Malassezia, Trichosporon, Geotrichum, Saccharomyces, etc.

- Mycelial fungi of medical importance including Aspergillus, Zygomycetes,
 - Pseudoallescheria, Fusarium, Piedra, other dematiaceous hyphomycetes and other hyalohyphomycetes, etc.
- Dimorphic fungi including Histoplasma, Blastomyces, Coccidioides,
 - Paracoccidioides, Sporothrix, Penicillium marneffei, etc.
- Dermatophytes
- Fungi causing mycetoma, keratomycosis & otomycosis
- Phythium insidiosum
- Prototheca
- Pneumocystis carinii infection; Pneumocystis jirovecii.
- Rhinosporidium seeberi & Loboa loboi
- Superficial and ocular fungal infections
- Subcutaneous mycoses
- Systemic mycoses due to Dimorphic fungi
- Systemic mycoses due to Opportunistic fungi
- Common laboratory contaminant fungi.
- Mycetism & mycotoxicosis.
- Therapeutic agents and vaccines
 - ❖ Antifungal agents & inVitro antifungal susceptibility tests
 - ❖ Principles of antifungal therapy
 - ❖ Resistance to antifungal agents

VIROLOGY:-

- History of research in virology
- General properties of viruses.
- Classification of viruses.
- Morphology : Viral structure, Bacteriophages.
- Viral replication
- Isolation & identification of viruses.
- Cultivation of viruses.
- Epidemiology and Pathogenesis & Control of viral diseases.
- Genetics of vertebrate viruses.
- Virus host interaction
- DNA viruses of medical importance including Poxviridae, Herpesviridae,
- Adenoviridae, Hepadna virus, Papova and Parvo viruses, etc.
 - RNA viruses of medical importance including Enteroviruses, Picorna virus, Togaviridae, Flaviviruses, Orthomyxoviruses, Paramyxoviruses, Reoviridae, Rhabdoviridae, Arenaviridae, Bunyaviridae, Retroviridae, Filoviruses, Coronaviridae, Calciviruses, etc.
- Human immunodeficiency virus
- Morphology, transmission and prevention, epidemiology, pathogenesis, clinical syndromes, Opportunistic Infections, laboratory diagnostic procedures, National and WHO guidelines on diagnosis and treatment in adults and children, Post exposure prophylaxis, developments in vaccine research

- Morphology, transmission and prevention, epidemiology, pathogenesis, clinical syndromes, laboratory diagnostic procedures, diagnosis and treatment guidelines in adults and children and in high risk patients, and Prophylaxis for diseases caused by hepatitis viruses
- Slow viruses including prions
- Oncogenic & Teratogenic Viruses
- Virioids
- Unclassified viruses
- Syndromes caused by a range of viruses
 - ❖ Infections of central nervous system,
 - ❖ viral infections of the fetus and neonates(congenital)
 - ❖ viral infections of the immunocompromised patients
 - ❖ Principles of diagnosis and control of viral infections
- ❖ Safety in virology laboratory
- ❖ The laboratory diagnosis of viral infections
- ❖ Immunoprophylaxis of viral diseases(Viral Vaccines)
- ❖ Viral vectors for gene therapy
- ❖ Antiviral chemotherapy including emerging resistance to antiviral drugs
- ❖ The emergence and re emergence of viral diseases
- Vaccines, anti-viral drugs & anti-viral agents

PARASITOLOGY:-

- General Parasitology
 - ✓ History
 - ✓ World- wide importance of parasites
 - ✓ Epidemiology
 - ✓ Immunology and Immunopathology of parasitic infections
 - ✓ Control of parasitic diseases
 - ✓ Diagnosis of parasitic infections
 - ✓ Antiparasitic agents
- Protozoa
 - ✓ Cellular organization of parasitic protozoa
 - ✓ Classification
 - ✓ Introduction to parasitic protozoa
 - ✓ Protozoan parasites of medical importance including Entamoeba, Freelifving amoebae, Giardia, Trichomonas, Leishmania, Trypanosoma, Plasmodium, Toxoplasma, Cryptosporidium Sarcocystis, , Cyclospora, Isospora, Babesiosis, Blastocystis Microsporidium, Balantidium, etc.

- Helminths
 - ✓ Helminths of medical importance including those belonging to
 - Cestodes(Diphyllobothrium, Taenia, Echinococcus, Hymenolepis, Dipylidium, Multiceps, etc.),
 - Trematodes (Schistosomes, Fasciola, Fasciolopsis, Gastrodiscoides, Paragonimus, Clonorchis, Opisthorchis, etc.) and
 - Gastrointestinal Nematodes Trichiuris, Ancylostoma, Necator, Ascaris, Enterobius,
 - Trichinella
 - Strongyloides
 - Toxocara,
 - Lymphatic Filarial worms,
 - Oncocerciasis
 - Dracunculus
 - Angiostrongylus
- Entomology: common arthropods & other vectors viz, mosquito, sandfly, ticks, mite, Cyclops, louse, myiasis.

APPLIED MICROBIOLOGY :-

- General Ecosystem:
 - ✓ Human microbiota
 - ✓ Airborne bacteria
 - ✓ Bacteriology of water
 - ✓ Bacteriology of food
 - ✓ Bacteriology of Milk and milk products
- Infectious Diseases:
 - ✓ Epidemiology
 - ✓ Theory of infectious diseases transmission and control
 - ✓ Emergence and resurgence of bacterial infectious diseases
- Health care associated infections
- Management of hospital waste.
- Investigation of an infectious outbreak
- Organ and system infections
 - ✓ Blood stream infections and Endocarditis
 - ✓ Meningitis
 - ✓ Other CNS infections
 - ✓ Infections of the eye
 - ✓ Infections of the Upper respiratory tract
 - ✓ Infections of the lower respiratory tract

- ✓ Infections of the genital tract
- ✓ Infections of the Urinary tract
- ✓ Infections of the bones and joints
- ✓ Opportunistic infections

Recent advances in Microbiology & Immunology(diagnosis & management)

- ☐ Quality assurance & quality control in microbiology
- ☐ Accreditation of laboratories
- ☐ Information technology (Computers) in microbiology
- ☐ Automation in Microbiology
- ☐ Statistical analysis of microbiological data and research methodology
- ☐ Animal and human ethics involved in microbiological work.

5. TEACHING LEARNING METHODS

There should be lectures for the postgraduate students (at least 20 per year) along with seminars/symposia/group discussions and journal clubs.

The postgraduate student should also attend a minimum of 20 ward rounds, discuss with the faculty, and maintain a log book for the same.

- Department should encourage e-learning activities when needed.

The following teaching learning methods are recommended.

- Lectures
- Case based discussion
- Bed side clinics
- Teaching on ward rounds
- Symposia
- Seminars
- Journal clubs
- Problem based learning
- Telemedicine (where available)

6. STRUCTURED TRAINING PROGRAM (Theory and Practicals)

Duration of Course – Three years

	<u>Details of Training M.D. (MICROBIOLOGY)</u>		
1.	Collection of Clinical samples in the Central Laboratory	:	2 weeks
2.	Sterilisation & disinfection, Central sterile supplies department (CSSD)	:	2 weeks
3.	Media preparation and sterilization of lab materials	:	1 month.
4.	Bacteriology • Bacteriological techniques – 1 month • Bacterial culture Antibigram and reporting ▪ Blood Culture – 2 Months ▪ Urine & genitor urinary specimens culture – 6 weeks ▪ Exudate – – 6 weeks ▪ Respiratory specimens – 2 months ▪ Sterile Body fluids – 2 month ▪ Stool – 1 Month	:	11months
5.	Serology – Diagnostic Techniques and Reporting	:	2 months.
6.	Special Microscopy and Staining	:	1 month.
7	Preparation for Dissertation Protocol submission	:	1 month.
8.	Mycobacteriology • RNTCP & DOTS clinic – 2 Weeks • Mycobacteriology conventional culture and microscopy - 4 Weeks • MGIT, LPA, Genexpert – 2 weeks	:	2 months.
9.	Anaerobic culture	:	1 month
10.	Mycology	:	2 months
11.	Parasitology	:	2 months.
12.	Virology (Should include tissue culture, molecular diagnosis, viral serology and other viral diagnostic techniques including HIV diagnosis) - 6 weeks Posting at ART centre- 2 weeks	:	2 months.
13.	Immunology (Should include diagnostic techniques in auto immune diseases, transplantation and cancer immunology)	:	2 months.

14.	Preparation of antigens and antisera		1 week
15.	Vaccinology • Vaccine preparation & Biological control- 2weeks • Immunisation Clinic – 2 week	:	1 month
16.	Molecular Biology & Biotechnology & Microbial Genetics	:	1 month
17.	Medical Statistics (Research Methodology) & Epidemiology –	:	1 week.
18.	Dermato-Venereology including Leprology	:	1 week
19	Pathology	:	1 week.
20.	Clinical diagnosis of infectious diseases, HAI Surveillance , Antibiotic Stewardship • posting to medical and pediatric wards-3 months • posting to ICU's- IMCU, ISCU, PICU / NICU-1 Month	:	4 Months
21.	Within the gamut of the course the dissertation must be completed by the students as an ongoing process, within the stipulated time as deemed fit by the guides.		
	TOTAL		35 Months

During IInd year, the Students are encouraged to undergo special postings for learning new advanced techniques / procedure / skills in institutions of higher repute where the requisite facilities are available without affecting the duties of the parent department.

Skills training : Timeline and Log

During the training programme, patient safety is of paramount importance, therefore, skills are to be learnt initially on the models, later to be performed under supervision followed by performing independently

1 st year residency-skills list					
Area	Sr. no.	Procedure	Observed no.	Assisted no./ practice on dummy	Performed independently no. (under supervision)
General microbiology	1.	Microscopy for unstained preparations/ wet mount	5	5	10
	2.	Microscopy for stained preparation	5	5	10
	3.	Preparation of direct smears from clinical specimens	5	5	10
	4.	Hanging drop preparation	5	5	10
	5.	Washing, sterilization and packing of glassware	10 sessions	-	-
	6.	Infection control activities- environmental sampling	10	10	-
	7	Identification of HAI	5	5	--
	8	Calculation of HAI quality indicators	5	5	--
	9	Bacteriology of water	5	5	-
	10	Bacteriology of air	5	5	-
	11	Antibiotic disc preparation	-	-	-
	12	Handling of laboratory animal	-	-	-
	13	Methods for preservation of bacteria	10	-	-
	14	Maintenance of stock cultures	10	-	-
Staining	1	Gram staining	10	20	30
	2	Acid fast staining (Ziehl- Neelsen method)	10	20	30
	3	Albert staining	5	10	10

	4	Modified ZN staining for <i>M. leprae</i>	5	5	5
	5	Modified ZN staining for <i>Nocardia</i>	5	5	5
	6	IQC-staining	5	5	5
Media preparation	1	Preparation of stains	4	4	4
	2	Preparation of reagents	10	10	10
	3	Preparation, plugging, pouring	20	20	30
		& Quality Control (QC) of culture media			
	4	Operation & maintenance of autoclave	10	10	20
Bacteriology	1	Specimen collection for Blood Culture	5	5	5
	2	Inoculation of liquid & solid media	20	20	30
	3	Identification test	20	20	30
	4	Antimicrobial sensitivity testing- modified Kirby-bauer technique	10	20	30
	5	IQC- Antibiotic disc potency	5	5	-
	6	Operation of BacT/ALERT	5	10	20
	7	Operation of Vitek 2 compact	5	10	20
	8	Petroff's concentration technique	10	10	20
	9	AFB culture & sensitivity	5	10	20
Mycology	1	KOH Wet mount	5	10	20
	2	Germ tube test	5	10	20
	3	Slide culture	5	10	20
	4	Negative staining for fungus	5	5	5
	5	LPCB mount	10	10	10
Parasitology	1	Giemsa staining for thick & thin peripheral blood smear	5	-	-
	2	Stool wet mount for R/M	10	20	30
	3	Stool concentration techniques	5	10	5

	4	Modified ZN staining for C. parvum	2	2	2
Serology/ Immunology	1	Phlebotomy & separation of serum	10	10	5
	2	Operation & maintenance of mini-VIDAS	5	10	20
	3	Operation & maintenance of ELISA reader & washer	5	10	--
		Performance of serological tests			
	1	Latex agglutination test (RA, ASO)	10	20	30
	2	RPR card test	10	20	30
	3	Tube agglutination test	10	20	30
	4	Gold conjugate Rapid card test	10	20	30
	5	ANA by IF	5	5	--
	6	ANA by Immunoblot	5	5	--
	7	IQC-serology	5	5	5

2 nd year residency-skill list					
Area	Sr. no.	Procedure	Observed no.	Assisted no./ practice on dummy	Performed independently no. (under supervision)
General microbiology	1.	Microscopy for unstained preparations/ wet mount	---	- -	--
	2.	Microscopy for stained preparation	--	- -	--
	3.	Preparation of direct smears from clinical specimens	--	- -	--
	4.	Preparation of slit skin smear for lepra bacilli	5	5	5
	5.	Hanging drop preparation	--	- -	10
	6.	Washing, sterilization and packing of glassware	05 sessions	-	-
	7	Infection control activities- environmental sampling	--	1 0	10
	8	Identification of HAI	--	5	5
	9	Calculation of HAI quality indicators	--	5	5

	10	Bacteriology of water	--	5	5
	11	Bacteriology of air	--	5	5
	12	Antibiotic disc preparation	05 lots	-	-
	13	Handling of laboratory animal	-	-	-
	14	Methods for preservation of bacteria	--	0 5	10
	15	Maintenance of stock cultures	--	0 5	10
Staining	1	Gram staining	--	- -	30
	2	Acid fast staining (Ziehl-Neelsen method)	--	- -	30
	3	Albert staining	--	- -	05
	4	Modified ZN staining for <i>M. leprae</i>	--	- -	5
	5	Modified ZN staining for <i>Nocardia</i>	--	- -	5
	6	IQC-staining	--	- -	5
Media preparation	1	Preparation of stains	--	- -	5
	2	Preparation of reagents	--	- -	15
	3	Preparation, plugging, pouring & Quality Control (QC) of culture media	--	- -	50
	4	Operation & maintenance of autoclave	--	- -	20
Bacteriology	1	Specimen collection for Blood Culture	--	- -	5
	2	Inoculation of liquid & solid media	--	- -	30
	3	Identification test	--	- -	30
	4	Antimicrobial sensitivity testing- modified Kirby-bauer technique	--	- -	30
	5	IQC- Antibiotic disc potency	--	5	5
	6	Operation of BacT/ALERT	--	- -	20
	7	Operation of Vitek 2 compact	--	- -	20
	8	Petroff's concentration technique	--	- -	20
	9	AFB culture & sensitivity	--	- -	20
Mycology	1	KOH Wet mount	--	-	20

3 rd year residency-skill list					
Area	Sr. no.	Procedure	Observed no.	Assisted no./ practice on dummy	Performed independently no. (under supervision)
General microbiology	1.	Microscopy for unstained preparations/ wet mount	---	--	--
	2.	Microscopy for stained preparation	--	--	--
	3.	Preparation of slit skin smear for lepra bacilli	--	--	--
	4.	Hanging drop preparation	--	--	--
	5.	Washing, sterilization and packing of glassware	05 sessions	-	-
	6.	Infection control activities-environmental sampling	--	--	10
	7	Identification of HAI	--	--	5
	8	Calculation of HAI quality indicators	--	--	5
	9	Bacteriology of water	-	-	5
	10	Bacteriology of air	-	-	5
	11	Antibiotic disc preparation	-	5 lots	2 lots
	12	Handling of laboratory animal	-	-	10
	13	Methods for preservation of bacteria	-	-	10
	14	Maintenance of stock cultures	-	-	10
Staining	1	Gram staining	--	--	30
	2	Acid fast staining (Ziehl-Neelsen method)	--	--	30
	3	Albert staining	--	--	05

	4	Modified ZN staining for M. leprae	--	--	5
	5	Modified ZN staining for Nocardia	--	--	5
	6	IQC-staining	--	--	5
Media preparation	1	Preparation of stains	--	--	10
	2	Preparation of reagents	--	--	15
	3	Preparation, pouring & Quality Control (QC) of culture media	--	--	50
	4	Operation & maintenance of autoclave	--	--	20
Bacteriology	1	Specimen collection for Blood Culture	--	--	5
	2	Inoculation of liquid & solid media	--	--	30
	3	Identification test	--	--	30
	4	Antimicrobial sensitivity testing- modified Kirby-bauer technique	--	--	30
	5	IQC- Antibiotic disc potency	--	--	5
	6	Operation of BacT/ALERT	--	--	20
	7	Operation of Vitek 2 compact	--	--	20
	8	Petroff's concentration technique	--	--	20
	9	AFB culture & sensitivity	--	--	20
Mycology	1	KOH Wet mount	--	--	20
	2	Germ tube test	--	--	20
	3	Slide culture	---	---	20
	4	Negative staining for fungus	--	--	5

	5	LPCB mount	--	--	10
Parasitology	1	Giemsa staining for thick& thin peripheral blood smear	--	--	-
	2	Stool wet mount for R/M	--	--	30
	3	Stool concentration techniques	--	--	5
	4	Modified ZN staining for C. parvum	--	--	2
Serology/ Immunology	1	Phlebotomy & separation of serum	--	--	5
	2	Operation & maintenance of mini-VIDAS	--	--	20
	3	Operation & maintenance of ELISA reader & washer	--	--	20
		Performance of serological tests			
	1	Latex agglutination test (RA, ASO, CRP)	--	--	30
	2	RPR card test	--	--	30
	3	Tube agglutination test	--	--	30
	4	Gold conjugate rapid card test	--	--	30
	5	ANA by IF	--	--	10
	6	ANA by Immunoblot	--	--	10
	7	IQC-serology	--	--	5

7. Dissertation and University Journal of Medical Sciences:

As per the 49th SAB Resolution under Point No. 2 and in the 52nd SAB it was reiterated regarding the topic for dissertation

The topic for the dissertation should be registered and sent to the University after Ethics Committee approval before 31st of December of the first Post Graduate Year. Only one change of topic with proper justification from the Head of the Department is permitted before 31st March of the first Post Graduate Year. The change of dissertation title will not be permitted after 31st March of the First Post Graduate Year. This modification in regulation will be scrupulously followed from the academic year 2015-16 admission onwards.

As per Medical Council of India Post Graduate Medical Education Regulations 2000 (amended upto 10th August 2016) clause 13.9 A Postgraduate student of a Postgraduate degree Course in broad specialties/Super Specialties would be required to present one poster presentation to read one paper at a National/State conference and to present one Research paper which should be published/accepted for publication/sent for publication during the period of his Postgraduate studies so as to make him eligible to appear at the Postgraduate Degree Examination.

As per MCI Clause 14 (4)(a), thesis shall be submitted atleast 6 Months before the Theory and Clinical/Practical Examination.

A candidate shall be allowed to appear for the Theory and Practical/Clinical Examination only after the acceptance of the Thesis by the Examiners.

The periodical evaluation of dissertation/log book should be done by the guide / HOD once in every six months. The HOD should ensure about the submission of dissertation within the stipulated time.

Regarding submission of articles to the University Journal of Medical Sciences for all the PG Degree/Diploma courses, it is mandatory that the students have to submit at-least one research paper. Case Reports are not considered as Research Paper

8. LOG BOOK:

The Post Graduates students shall maintain a record (Log) book of the work carried out by them and the training Programs undergone during the period of training. The postgraduate student should also attend a minimum of 20 ward rounds, discuss with the faculty, and maintain a log book for the same.

Periodic review of Log book and Dissertation have to be done in the Department by guide/HOD once in every 6 months

A detailed log book should be maintained for the entire duration of the course. It should contain the following details.

1. Procedures performed
2. Journal clubs
3. Seminars
4. Important cases discussed/ presented

1. COMPETENCY ASSESSMENT:

Evaluation of the candidates in both theory and practical aspects will help the candidate in improvement of his/her knowledge, skills and attitude.

9.1. FORMATIVE ASSESSMENT- competencies assessed

Quarterly assessment during the MD programme should be based on:

1. Journal based / recent advances learning
2. Patient based /Laboratory or Skill based learning
3. Self directed learning and teaching
4. Departmental and interdepartmental learning activity
5. External and Outreach Activities / CMEs

1. OVERALL:

a) Communication / commitment / Contribution /
Compassion towards patients and Innovation - 5 Marks

b) Implementation of newly learnt techniques/skills

2. Number of cases presented in Clinical Meetings/
Journal clubs/seminars - 5 marks

3. Number of Posters/Papers presented in Conferences/
Publications and Research Projects - 5 marks

4. No. of Medals / Certificates won in the conference /
Quiz competitions and other academic meetings with details. - 5 marks

COMPETENCY ASSESSMENT- Total 20 Marks

ASSESSMENT SCHEDULE IS AS FOLLOWS Formative competency assessment

Year of study	Period				Total Max.20 marks
I year	Upto Dec	10 marks	Upto June	10 marks	20 Marks
II year	Upto Dec	10 marks	Upto June	10 marks	20 Marks
III year	Upto Oct	10 marks	Upto Feb	10 marks	20 Marks
	AVERAGE				20 Marks

9.2. SUMMATIVE- THEORY EXAMINATION -

Paper –I	General Microbiology and Immunology
Paper-II	Systematic Bacteriology
Paper-III	Virology , Parasitology and Mycology
Paper-IV	Applied Microbiology and Recent Advances

Distribution of Marks - PAPER I, II, III & IV

Structured Essay	-	2 x 15	Marks	=	30 Marks
Short Notes	-	10 x 5	Marks	=	50 Marks
Reasoning out	-	4 x 5	Marks	=	20 Marks

100 Marks

9.3. PRACTICAL EXAMINATION- SUMMATIVE

Reframed practical scheme for 2 days duration

	Division	Exercises	Marks
1	Bacteriology	A) Preliminary sample processing & report – 15marks B) Clinical Sample processing (Simulated Sample with Case scenario) – 35 marks C) Bacterial Techniques – Pure Culture Identification & Antimicrobial Susceptibilitytesting – 30 Marks	80
2	Mycology	One slant / slide culture (Contaminant , Pathogenic fungi)	20
3	Virology	PCR / CPE / Western Blot / ELISA	20
4	Immunoserology	Bacteriology (Widal / VDRL / Weil-felix / SAT for Brucellosis / ASO / CRP / RA. etc) rapid test for Viral infections - Point of care tests	20
5	Parasitology	laboratory diagnosis of parasitic infections in stool/blood / sputum- Concentration Techniques	20
6	OSPE Exercises-Including Case scenario – discussion (2X10)		20
7	Microscopy Including histopathology Slides - Discussion		20
8	Pedagogy		40

9	Viva voce including Competency Assessment	60
TOTAL		300
	DAYWISE DISTRIBUTION OF EXERCISES	
	DAY 1	DAY 2
	1. Bacteriology- A,B,C	1.Bacteriology- B & C
	2. Mycology	5. Parasitology
	3. Virology	7. Microscopy
	4. Immunoserology	8. Pedagogy
	6. OSPE including Case Scenario	
	9. Viva voce	

9.4. VIVA (UNIVERSITY EXAM) including Competency formative Assessment

VIVA including Competency formative Assessment - 60 Marks (40 + 20)

9.5. PEDAGOGY

Pedagogy Assessment (8 minutes Presentation and 2 Minutes Q & Ans.)

Demeanour	-	10
Audio Visual Aids usage, Voice modulation and Attitude	-	10
Subject Content	-	10
Q & Ans.	-	10
Total		40

2. OSPE (Objective Structural Practical Examination)- suggested stations.

The following are suggested stations for the OSCE. Any 4 can be chosen at the discretion of the examiners. All the 4 stations should be common to all candidates appearing on that day.

1. Special Staining - Spore staining
Negative staining
RNTCP grading
Fontana staining
2. Media preparation & Checking of PH wherever applicable
 - * Alkaline peptone water
 - * Blood Agar Plate
 - * Chocolate Agar Plate
 - * Triple sugar Iron Agar/ Simmons Citrate Agar
 - * Sabouraud's dextrose Agar

3. Sputum concentration /stool / concentration techniques
4. E-Test
5. Modified Hodge test
6. Dalmau Plate culture for candida
7. Rapid tests (serology)
8. Bio Medical waste management & infection control

3. REFERENCE BOOKS

List of Books:

MICROBIOLOGY

1. Jawetz Melnick & Adelbergs Medical Microbiology
2. Topley & Wilson's Microbiology
3. Murray Rosenthal pfaller Medical Microbiology
4. Mandell, Douglas, and Bennett's Principles and Practice of Infectious Diseases
5. Greenwood Medical Microbiology- David *Greenwood*, Mike Barer, RichardSlack, and Will Irving
6. Bailey & Scott's Diagnostic Microbiology
7. Collee J.G.Mackie and MC cartney practical Medical Microbiology
8. Koneman's Colour Atlas & Textbook of Diagnostic Microbiology
9. Prescott's Microbiology
10. Harrison's Principles and Practice of Medicine
11. Manson's Tropical Diseases

VIROLOGY

1. Fields Virology (5th edition)

MYCOLOGY

1. Text book of Medical Mycology – Jagdish Chander
2. Essentials of Clinical Mycology –Carol A Kauffmann, Peter G Pppas
3. Clinical Mycology –Elias J Anaistic ,Michal R Mc Ginnis
4. Medical Mycology –Current Trents & Future Prospects- Mehdi Razzaghi
5. Textbook of mycology –Gopinath Hait
6. Fundamentals of Diagnostic Mycology-Fisher & Cook

PARASITOLOGY

1. Diagnostic Medical Parasitology - Garcia
2. Parasitology- An Integrated Approach
3. K.D.Chatterjee - Parasitology

4. Human Parasitology – Fatik Baran Mandal
5. Textbook of Medical Parasitology - Subhash Chandra Parija
6. Microbiology & Parasitology K Rajeshniar Reddy
7. Human Parasitology Fatik Baran Mandal

Infection Control

1. Infection Control in Clinical Practice –Jennie Wilson
2. Clinical Infectious Disease –David Schlossderg
3. Manual of Infection prevention and Control- Damani

IMMUNOLOGY

1. Kuby Immunology
2. Medical Immunology – Daniel Stites
3. Roitts Immunology
4. Sander's Immunology
5. Basic And Clinical Immunology- Peakman
6. Lipincott's Immunology

** Note : The editions are as applicable and the latest editions shall be the part of the syllabi

17. JOURNALS

General and clinical / Medical Microbiology

1. Journal of Clinical Microbiology
2. Journal of Infectious Diseases
3. European Journal of Clinical Microbiology & Infectious Diseases
4. American Journal Of Bacteriology
5. PLOS Pathogen
6. Indian Journal of Medical Microbiology
7. Indian Journal of Pathology & Microbiology
8. Indian journal of Medical Microbiology
9. International journal of Medical Microbiology
10. International Journal of Antimicrobial Agents

VIROLOGY

1. Viruses
2. Annual Review of Virology
3. Journal Virology
4. Journal of Clinical Virology
5. Journal of General Virology
6. Virology and Antivirus research
7. Virus Disease(Indian journal of Virology)
8. Journal of Antivirus and Antiretrovirals

IMMUNOLOGY

1. Journal of Clinical; & Cellular Immunology
2. Journal of Immunological Technique & Infectious Diseases
3. Indian Journal of Allergy Asthma & Immunity
4. Journal of Rheumatology Current Research
5. Journal of Clinical Immunology

MYCOLOGY

1. Journal on Studies in Mycology
2. Journal of Medical Mycology
3. Journal of Fungal Diversity
4. Journal of Mycological Research
5. Journal of fungal genetic and Biology
6. An International Journal on Fungal Biology
7. Journal of Infection Disease and therapy
8. American Journal of Infection Control
9. International Journal of Infection Control

PARASITOLOGY

1. Journal of Vector Borne Disease
2. Journal of Bacteriology I & Parasitology
3. International Journal for Parasitology
4. Parasitology International
5. Comparative Parasitology
6. Tropical Parasitology
