

**The Draft CBME Curriculum for PG Paraclinical is being  
Circulated for Comments and Suggestions. The Suggestions  
are to be sent to RGUHS. And to be mailed to  
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## PG CURRICULUM

### MD Microbiology

#### Post-graduate training

This is in addition to the NMC document which mentions about the CBME Post graduate curriculum

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

- Laboratory and Diagnostic skills in Clinical Microbiology
- Teaching Skills
- Research Methodology
- Communication and attitudinal skills

#### Laboratory and Diagnostic skills in Clinical Microbiology

### **I.GENERAL**

1. Historical aspects in bacteriology, virology, parasitology, Mycology & Immunology
2. Morphology of bacteria, Parasites, Viruses and fungi, arthropods of medical importance and identification
3. Microscopes - Various types of microscopes, its principle, application & maintenance
4. Demonstration of bacteria, fungi, Viruses, Parasites
5. Growth of bacteria, fungi, cultivation of viruses and parasites
6. Incubation – aerobic, anaerobic incubation

7. Identification of organisms –

Phenotypic – conventional, automated

Genotypic

8. Antimicrobial agents-

Antibacterial agents– Definition of terms related to Pharmacodynamics, Pharmacokinetics classification of antibiotics, mechanism of action in relation to bacterial cell, choice of drug depending on clinical condition, choice of antibacterial agents in drug resistant strains, combination therapy role of PK, PD in antibiotic in choice and dosing.

Antiviral agents- classification, mechanism of action, choice of drug for the specific viruses

Antifungal agents - classification, mechanism of action, choice of drug for the specific fungi

9. Antibiotic susceptibility testing-

Choosing the antimicrobial agents as per CLSI, EUCAST

Kirby Bauer disk diffusion method, microbroth dilution method (MBC, MIC), Agar dilution method, eTest etc

Antifungal susceptibility testing – Yeast, mold

Antiviral susceptibility testing

Antiparasitic drug testing

10. Antimicrobial resistance

Antibacterial Drug resistance- Mechanism, types, classification, detection, drug Resistance in Gram Positive , gram negative organisms and Mycobacterium

Antifungal drug resistance- Mechanism, types, classification, detection, importance clinically and epidemiologically

Antiviral- Mechanism, types, classification, detection, importance clinically and epidemiologically.

Antiparasitic - Mechanism, types, classification, detection, importance clinically and epidemiologically

11. Genetics – Normal genetic constitution bacterial, viral fungal parasitic organisms.

Gene transfer between different organisms and its importance

Genetic variations - types, mechanisms and its impact on clinical management, epidemiological impact outbreak of diseases emergence and reemergence of diseases

## 12. Equipment & Instruments

In microbiology – Principle, use, operation, maintenance quality assurance

Hospital – OT instruments, Critical care unit instruments

## 12. Sterilization & Disinfection

Definition, classification, mechanism of action, Spaulding classification and application in hospital environment and devices

Disinfectant testing

CSSD – definition, design, functioning maintenance

## **INFECTIOUS DISEASES**

1. Normal flora – various organisms present in different systems its role importance of
  - a. Microbiome – definition, detection methods its importance
2. Environmental organisms – Water, Air, Milk and food
3. Introduction to infectious diseases – source, mode of transmission, virulence factors of pathogens and its role in pathogenesis
4. Host pathogen interaction – antigens of organisms, Immune system structure and function, stimulation of immune system, Immune response, Hypersensitivity, autoimmunity,
5. Systemic Infectious diseases
  - a. Knowledge about the various infectious agents of human importance their source, mode of transmission, pathogenesis, clinical manifestation, laboratory diagnosis therapeutic approach and prevention
  - b. Syndromic approach of Infectious disease system wise - skin and soft tissue infections  
Central Nervous system, Blood-stream, Eye, Ear Nose and Throat, Respiratory tract, Gastrointestinal tract, Reproductive tract, Urinary tract and skeletal system.

- c. Infectious diseases in special host – Pregnancy, Pediatric age group, diabetics  
Immunocompromised host- due to HIV, solid organ transplant, Neutropenic patients,  
Implants/Device associated, dialysis, health care workers etc
- d. Infectious diseases as per the source – Blood borne, congenital, vector borne, food  
poisoning, water contamination, bioterrorism agents etc
6. Collection and transport of relevant samples from various systems
7. Various diagnostic methods available to support clinical diagnosis.  
Demonstration of infectious agents-bacteria, Parasite, fungi, viruses  
Culture methods  
Bacteria - culture media, inoculation methods, incubation, growth characteristics,  
identification of organisms  
Fungi-cultivation and identification  
Viruses- cultivation & detection of growth  
Immunological methods and their application in diagnostic microbiology
  - Antigen detection
  - Antibody detection
  - Skin testsMolecular methods and its application in diagnostic microbiology
  - Detection of nucleic acid
  - Amplification methods
  - Typing methods
  - Sequencing methods
8. Therapeutics
  - a. Antimicrobial Agents
    - Antibacterial agents– Choice and dosage of drug depending on clinical condition,  
choice of antibacterial agents in drug resistant strains, combination therapy etc
    - Antiviral agents- choice of drug for the specific viruses. Resistance clinical and  
epidemiological importance
    - Antifungal agents - choice of drug for the specific fungi, Resistance clinical and  
epidemiological importance

- Antiparasitic drugs- choice of drug for the specific parasitic infections. Resistance clinical and epidemiological importance

b. Probiotics

c. Phage therapy

d. Genetherapy

e. Immunotherapy

f. Newer molecules

III. Hospital associated infection Definition, types, source, diagnosis, prevention, surveillance CDC guidelines as per bundle management.

IV. Immunological diseases

- Immunodeficiency diseases
- Hypersensitivity mediated diseases.
- Autoimmune diseases
- Mechanism of autoimmunity, diagnosis treatment
- Transplantation & Tumor

V. Emerging and Reemerging infections- out break management in hospital and community

VI. Prevention of infections

- General prophylaxis –
  - Prophylaxis system wise
  - Prophylaxis source wise
  - Prophylaxis in hospital associated infection.
  - Standard precaution /Transmission specific
- Chemoprophylaxis
- Immunoprophylaxis – Passive immunization-source mechanism

Vaccines – types, mechanism, schedule in - UIP, different age groups children, adults different host like pregnancy, immunocompromised, health care workers travelers, seasonal, outbreak etc

**TEACHING LEARNING METHODS**

- The program needs to be planned depending on the number of students and with equal chances for all without affecting their learning opportunity.
- These are the basic things which need to be fulfilled but additional opportunities can be provided and trained based on the institutional facility.

1. Lecture classes -can attend UG class/separate class may be engaged.
2. Practical classes
3. Topic/slide Seminars
4. Journal clubs
5. Presentation of clinical cases of infectious diseases- twice a month
6. Rotational postings to various sections every year -

#### **First semester& Second semester**

- To know the laboratory layout.
- To know biosafety and biosecurity management
- To know the various equipment used for media preparation & sterilization.
- To know the equipment working principle, usage, operation, maintenance and quality assurance
- To know the various samples collected
- Receiving samples in the laboratory
- Preparation of samples
- To know the flow of processing & record keeping
- Data recording- LIS entry
- To study the preparation of smear, stains, and media
- To know the various biomedical waste management rules and implementation
- Statistical methods
- Research methodology
- Bioethics
- Preparation of synopsis
- Bacterial identification – phenotypic- conventional, automated
- Antibiotic susceptibility testing – detection of various drug resistant strains

- Result entry to WHO net soft ware.
- Learning to maintain bacterial stock culture.
- Fungal identification
- Learn to maintain fungal culture.
- Lesson planning for UG students
- To start dissertation work

Third semester& fourth semester

- Independent reporting under supervision
- Classes for UG
- Diagnosis of tuberculosis
- Rotational postings to various related departments
- HIV-ART
- Virology – Molecular methods
- Hospital Associated infection – critical care units visit involving in surveillance, hospital mortality meet continue dissertation work.
- Community infections- district hospital postings

Fifth & Sixth Semester

The rotational postings in the department with perfect knowledge to implement what they have learnt in peripheral postings

## **I YEAR RESIDENCY**

### **I SEMESTER**

Postings	Period	Skill to acquire	Activity
Cleaning of glass wares, sterilization, Media preparation	1 month	cleaning of glass wares Plugging, packing sterilization and media preparation	SOP for Sterilisation& Media preparation IQC-sterilisation& Media
Phlebotomy/collection	2week	Sample collection for various investigation in microbiology	SOP for sample collection
Data entry	1 week	Importance of details in requisition form	SOP for sample receipt



		time of receipt Turn around time	
Sample preparation	1 week	Sample preparation	SOP for sample preparation Equipment Maintenance calibration etc
Microscopy and staining	1 month	Smear preparation ,microscope handling different types ,Preparation of stains,staining techniques interpretation and reporting Stool microscopy KOH preparation Negative staining	SOP for staining methods IQC-stains & staining methodology & reporting
<b>CULTURE &amp; SENSITIVITY</b> Inoculation of samples & incubation Phenotypic identification of organisms	3 month	Methods of inoculation of samples and for AST Identification of pathogens Selection of antibiotics as per CLSI/EUCAST	SOP for sample processing IQC for antibiotic discs Qc manual Automated AST methods
	6 months		

## **II SEMESTER**

<b>POSTINGS</b>	<b>PERIOD</b>	<b>SKILL TO ACQUIRE</b>	<b>ACTIVITY</b>
Culture & sensitivity Bacterial/fungal	3 months	should process sample and do phenotypic identification	Record the details with history in log book
Serology /Immunology	2 months	Should perform all available serology tests	SOP for serology
Virology	1 month	Should perform all techniques available in the institute	
	6 months		

## **II YEAR OF RESIDENCY**

**Depending on the number PG the students can be posted to peripheral postings.**

## **IIISEMESTER**

POSTINGS	PERIOD	SKILL TO ACQUIRE	ACTIVITY
Culture & Sensitivity	Rotation in each section	Independently should be able to process Report under supervision	Record in log book

#### **IV SEMESTER**

Mycobacteriology	7 days	DMC – ZN, Fluorescent Reporting as per NTEP	Recorded in log book with patient details
	7 days	Visit to MDR Tb management	Recorded in log book with patient details
Pathology	7 days	To go through the procedures related to infectious disease & Histopathology slides related to microorganisms	Recorded in log book with patient details
Biochemistry	7 days	To go through the procedures related to infectious	Recorded in log book with patient details
Dermatology	7 days	To study clinical diseases related to Fungi, leprosy different manifestation implementation of national program	Recorded in log book with patient details
HIV	7 days	ART postings diagnosis of HIV opportunistic infections, immunological & virological Management	Recorded in log book with patient details
Dialysis	7 days		Recorded in log book with patient details
Blood bank	7 days	Transfusion Transmitted Infections	Recorded in log book with patient details
Critical care ward(Medical)	15 days	HAI – In HAI and ICP: Sterilization and disinfection practices, hand hygiene compliance, care of patients with devices, environmental sampling, Identification of HAI, Calculation of HAI quality indicators etcdetail	Recorded in log book with patient details
NICU & PICU	7 Days	HAI – HAI and ICP: Sterilization and disinfection practices, hand hygiene compliance, care of patients with devices, environmental sampling, Identification of HAI, Calculation of HAI quality indicators etc	Recorded in log book with patient details

OT & SICU	7 days	Sterilization & HAI -In detail	Recorded in log book with patient details
District hospital postings	3 months	Various activities in the district hospital in relation to infectious diseases	Recorded in log book with patient details

### III YEAR RESIDENCY

#### **V & VI SEMESTER**

Students need to be posted in the various sections of Bacteriology, Mycology, Mycobacteriology, Virology and Serology on Rotation basis to develop complete competency to process, interpret and report all the clinical samples from microscopy to molecular methods. Depending on whatever facility available in the institution

#### **FORMATIVE ASSESSMENT**

- The candidate needs to be evaluated at the end of every postings
- The internal assessment in theory to be done as per the NMC draft.

#### **SUMMATIVE ASSESSMENT-as per NMC guidelines**

There should be four theory papers:

Paper I: General Microbiology and Immunology

Paper II: Systematic Bacteriology

Paper III: Virology Parasitology and Mycology

Paper IV: Applied Microbiology and Recent advances

The question paper will have 10 questions which carry equal marks **but at least 50% should be case scenario based and application-based questions. Which can assess all domains by integrating multiple components such as knowledge, skills, values, and attitude.**

### M D Microbiology examination pattern (RGUHS)

#### **OBJECTIVE**

- To assess whether the candidate is able to perform the basic skills
- Interpret and Report the various diagnostic tests done in different branches of microbiology
- Give opinion in the management of outbreak of infections in community / hospital
- Implementation of hospital infection control which is part of Antimicrobial stewardship programme (AMSP)

The above objectives can be achieved by conducting the examination for two days in the following structured manner

Day	Sl.no	Topic	Activity	Modification	Marks
<b>Day 1</b>	1	Pure culture	Prelims	No change	10
	2	Mixed culture	Prelims	No change	10
	3	Mycology	Prelim (yeast)/ Identification(filamentous)	<b>One fungus can be given (earlier 2 given)</b>	20
	4	Serology & Immunology	Long and rapid( any one)	<b>Immunology to be combined</b>	20 20
	5	Parasitology	<b>Any one</b> Stool or malarial parasite any other related test depending on available facility		20
<b>Day 2</b>	1	Pure culture	Final report	No change	20
	2	Mixed culture	Reporting	<b>Change required**</b>	10
	3	Virology	<b>Any one</b> Rapid test or interpretation of cell culture/ ELISA/ molecular test depending on available facility	No change	20
	4	Mycology& serology	<b>Reporting if any</b>		
	5	Slides	10 slides	No change	20

	6	Dissertation evaluation		Not present as separate exercise earlier	10
	7	AMSP-clinical microbiology		Not present as separate exercise earlier	20
			<b>TOTAL MARKS</b>		<b>200</b>
	1	Pedagogy			20
	2	Grand viva			80
			<b>TOTAL MARKS</b>		<b>100</b>

\*\* Only preliminary identification. The organism(s) need not be processed further as this skill is already evaluated in the pure culture. So extensive clinical microbiology discussion can be done to assess the **clinical microbiology knowledge and reporting skills [pathogen in the mixed can be given as pure culture (optional)]**

All the exercises to be provided with the clinical history so that in dept discussion can be done right from sample collection to reporting, management etc.

## **LOGBOOKFORMAT**

### **General instructions**

- The logbook should have university logo in the first page with the degree to which candidate has enrolled like the first page of dissertation.
- Certificate with details of institution, student, duration and certified by guide and HOD.
- Rules and regulations related to the course.
- The logbook should follow the following format addition may be made according as per the institutional requirement.
- All skill details given in the NMC curriculum observed/assisted/performed should be included in the logbook.
- Attended or conducted classes/journals/seminars/case presentation etc details to be written and number may be mentioned in the index.
- Peripheral postings details of the cases seen, and activity performed to be noted.
- District hospital postings infections of community importance and national programs its objective and implementation to be noted.
- Research activity to be written briefly.
- Paper presented should have details of name of the article, place date of presentation etc
- Publications also should have all details.
- Center of excellence visit- details to be recorded.
- Certification by the staff to be included in each of the activity.

SL NO	CONTENT	NO OF ACTIVITY	PAGE NO
<b>I</b>	Index		
<b>II</b>	STUDENT PARTICULARS		
<b>III</b>	LOGBOOK CERTIFICATE		
<b>IV</b>	GENERAL INSTRUCTIONS		
<b>V</b>	SUMMARY OF ATTENDANCE TERM WISE		
<b>VI</b>	CLASSES ATTENDED		
<b>VII</b>	CLASSES ENGAGED-LESSON PLANNING		
<b>VIII</b>	SEMINAR ATTENDED		
<b>IX</b>	SEMIANAR PRESENTED		
<b>X</b>	JOURNAL CLUB ATTENDED		
<b>XI</b>	JOURNAL ARTICLE PRESENTED		
<b>XII</b>	CULURE SEMIANR/CASE ATTENDED		
<b>XIII</b>	CULTURE SEMINAR/CASE PRESENTED		
<b>XIV</b>	I YEAR SKILL AS PER NMC		
<b>XV</b>	II YEAR SKILL AS PER NMC		
<b>XVI</b>	III YEAR SKILL AS PER NMC		
<b>XVII</b>	ROTATIONAL POSTINGS		
<b>XVIII</b>	PERIPHERAL POSTINGS		
<b>XIX</b>	DISTRICT HOSPITAL POSTINGS		
<b>XX</b>	CONFERENCES/CME ATTENDED/WEBINARS		
<b>XXI</b>	RESEARCH ACTIVITY		
<b>XXII</b>	PAPER PRESENTED ORAL/POSTER		
<b>XXIII</b>	PUBLICATIONS		
<b>XXIV</b>	EDUCATIONAL VISIT TO ANY OTHER CENTER OF EXCELLENCE		
<b>XXV</b>	ANY ADDITIONAL ACTIVITY COMPLETING THE COURSE		
<b>XXVI</b>	ACHIEVEMENTS/ AWARDS		
<b>XXVII</b>	EXTRACURRICULAR ACTIVITIES		

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