

Guidelines  
for  
Competency Based Training Programme  
in  
**DNB- Microbiology**



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## **INTRODUCTION**

The main aim of this course is to train students in the field of medical Microbiology. Theoretical and practical training is imparted to the candidates in subspecialties viz., Bacteriology, Virology, Parasitology, Immunology and Mycology so that they can participate in good patient care and prevention of infectious diseases in the community. They are introduced to basic research methodology so that they can plan and conduct fundamental and applied research. They are also imparted training in teaching methods in the subject which may enable them to take up teaching assignments in medical colleges/institutes.

They will be trained in basic research methodology including molecular biology so that they are able to conduct fundamental and applied research. They will also be trained in teaching methods so that they can take up teaching assignments

## **COURSE OVERVIEW:**

### **Cognitive domain:**

- A. To have knowledge about the clinical features, etiology, pathogenesis and laboratory diagnosis of communicable diseases caused by micro-organisms and apply that knowledge in the treatment, prevention and control of such diseases.
- B. To know the principles of immune mechanism which help to understand the pathogenesis and laboratory diagnosis of infectious and non-infectious diseases.
- C. To become a competent Microbiologist and to establish diagnostic Microbiology laboratory in hospitals and community for patient care
- D. To have sound knowledge of skills in microbiological laboratory methods
- E. To acquire teaching ability and to handle classes for undergraduates
- F. To prepare the student for fundamental and applied research

**Psychomotor domain:**

- A. To give guidelines for proper collection, transport and processing of clinical specimen
- B. To have a sound knowledge of techniques of sterilization, preparation of media, disposal of biomedical waste and implementation of infection control measures
- C. To learn serological and immunological techniques for diagnosis of infectious diseases

**Affective domain:**

- A. To acquire competency in teaching and diagnostic work
- B. To develop team spirit in organizing academic activities
- C. To follow ethics in routine and research activities

## **PROGRAMME GOAL**

The main goal of this course is to train students of Medicine in the field of Medical Microbiology: The goal of the postgraduate medical education shall be to produce a competent specialist and Medical teacher.

Theoretical as well as practical training is imparted to the candidates in the subspecialties viz. Bacteriology, Virology, Parasitology, Immunology and Mycology so that they can participate in good patient care and prevention of infectious diseases in the community.

They are introduced to basic research methodology so that they can conduct fundamental and applied research.

They are also imparted training in teaching methods in the subject which may enable them to take up teaching assignments in Medical Colleges/Institutes.

## **PROGRAMME OBJECTIVES**

### **Objectives (General)**

1. At the end of the course the students should be able to:
  - Establish good clinical microbiological services in a hospital and in the community in the fields of bacteriology, virology, parasitology, immunology and mycology
  - Plan, execute and evaluate teaching assignments in medical microbiology and
  - Plan, execute, analyses and present the research work in medical microbiology.

- Shall recognize the health needs of the community and carry out professional obligations ethically in keeping with the objectives of the national health policy
  - Shall have mastered most of the competencies, pertaining to Medical diagnostic Microbiology that are required to be practiced at the secondary and the tertiary levels of the health care delivery system;
  - Shall be aware of the contemporary advances and developments in the field of medical and diagnostic Microbiology.
  - Shall have acquired the spirit of scientific inquiry and is oriented to the principles of research methodology and epidemiology
  - Shall have acquired the basic skills of teaching of the medical and paramedical professionals.
  - Establish good "laboratory medicine" in hospital and community in the field of Bacteriology, Virology, Parasitology, Immunology and Mycology.
2. Plan, execute and evaluate teaching assignments of Microbiology in medical college.
  3. Undergo specialization in any of the above subspecialties.
  4. Plan, execute and analyse applied and fundamental research in various branches of microbiology involving other related disciplines for health care
  5. Subject himself/herself to continuing education and constantly update his/her knowledge of recent advances in microbiology and allied subjects
  6. Maintain accurate records of tests and their results for reasonable periods of time so that these may be retrieved as and when necessary
  7. To acquire skills necessary to recognize and manage hospital acquired infections, and be a part of control systems, and management of operative, postoperative and intensive care related illness.
  8. Acquire competence in diagnosis, investigation and management of imported infections with the knowledge to advise in relation to infections acquired through travel
  9. Acquire competence in all aspects of the management of antibiotic use.

10. To be part of training programmes related to advancement in diagnosis and management of Infectious Diseases
11. Make and record observations systematically that is of use of archival purposes and for furthering the knowledge of microbiology.
12. Always adopt ethical principles and maintain proper etiquette in his/her dealings with patients , relatives and other health persone
13. Respect the rights of the patient including the right to information and second opinion
14. Provide leadership and inspire members of the team with whom he/she is involved within the field of microbiology , teaching and research
15. Develop communication skills not only to word reports and professional opinions but also to interact with patients , relatives, peers and paramedical staff
16. Able to supervise and work with subordinates and colleagues in a laboratory

## **Educational Objectives**

### **1. Knowledge**

At the end of the course the students shall be able to:

- State and explain the clinical features, etiology, pathogenesis and methods of laboratory diagnosis of infectious diseases and apply that knowledge in the treatment, prevention and control of communicable diseases caused by microorganisms.
- State and explain the principles of immunity and immunological phenomenon, which help to understand the pathogenesis, laboratory diagnosis of infectious and non-infectious diseases.
- Establish and practice “laboratory medicine” for diagnosis of infectious diseases in hospitals and community in the field of bacteriology, parasitology, virology, mycology, serology and immunology in the light of clinical findings.

- Organize the prevention and control of communicable diseases in the community.
- Understand and practice the principle of prevention and control of health care associated infections and rational antibiotic policy.
- State the recent advances in the field of Medical Microbiology and apply this knowledge in understanding aetiopathogenesis and diagnosis of diseases caused by microorganisms.
- Carry out fundamental or applied research in the branches of medicine involving microbiological work.
- Develop specialization in any of the above subspecialities.
- Undertake teaching assignments in the subject of medical Microbiology

## **2. Skills**

At the end of the course the student shall be able to:

- Plan the laboratory investigations for the diagnosis of infectious diseases.
- Perform laboratory procedures to arrive at the etiological diagnosis of infectious diseases caused by bacteria, fungi, viruses and parasites including the drug sensitivity profile
- Perform and interpret immunological and serological tests
- Operate routine and sophisticated instruments in the laboratory.
- Develop microteaching skills and Pedagogy.
- Successfully implement the chosen research methodology



## **ELIGIBILITY CRITERIA FOR ADMISSIONS TO THE PROGRAMME**

### **(A) DNB Microbiology Course:**

1. Any medical graduate with MBBS qualification , who has qualified the ***Entrance Examination*** conducted by NBE and fulfill the eligibility criteria for admission to DNB Broad Specialty courses at various NBE accredited Medical Colleges/ institutions/Hospitals in India is eligible to participate in the Centralized counseling for allocation of DNB Microbiology seats purely on merit cum choice basis.
2. Admission to 3 years post MBBS DNB Microbiology course is only through Entrance Examination conducted by NBE and Centralized Merit Based Counseling conducted by National Board of Examination as per prescribed guidelines.

### **Duration of Course : 3 Years**

Every candidate admitted to the training programme shall pursue a regular course of study (on whole time basis) in the concerned recognized institution under the guidance of recognized post graduate teacher for assigned period of the course.

## TEACHING AND TRAINING ACTIVITIES

The fundamental components of the teaching programme should include:

1. Case presentations & discussion- once a week
2. Seminar – Once a week
3. Journal club- Once a week
4. Grand round presentation (by rotation departments and subspecialties)- once a week
5. Faculty lecture teaching- once a month
6. Clinical Audit-Once a Month
7. A poster and have one oral presentation at least once during their training period in a recognized conference.

The rounds should include bedside sessions, file rounds & documentation of case history and examination, progress notes, round discussions, investigations and management plan) interesting and difficult case unit discussions.

The training program would focus on knowledge, skills and attitudes (behavior), all essential components of education. It is being divided into theoretical, clinical and practical in all aspects of the delivery of the rehabilitative care, including methodology of research and teaching.

**Theoretical:** The theoretical knowledge would be imparted to the candidates through discussions, journal clubs, symposia and seminars. The students are exposed to recent advances through discussions in journal clubs. These are considered necessary in view of an inadequate exposure to the subject in the undergraduate curriculum.

**Symposia:** Trainees would be required to present a minimum of 20 topics based on the curriculum in a period of three years to the combined class of teachers and students. A free discussion would be encouraged in these symposia. The topics of the symposia would be given to the trainees with the dates for presentation.

**Clinical:** The trainee would be attached to a faculty member to be able to pick up methods of history taking, examination, prescription writing and management in rehabilitation practice.

**Bedside:** The trainee would work up cases, learn management of cases by discussion with faculty of the department.

**Journal Clubs:** This would be a weekly academic exercise. A list of suggested Journals is given towards the end of this document. The candidate would summarize and discuss the scientific article critically. A faculty member will suggest the article and moderate the discussion, with participation by other faculty members and resident doctors. The contributions made by the article in furtherance of the scientific knowledge and limitations, if any, will be highlighted.

- i) Research:** The student would carry out the research project and write a thesis/ dissertation in accordance with NBE guidelines. He/ she would also be given exposure to partake in the research projects going on in the departments to learn their planning, methodology and execution so as to learn various aspects of research.

# SYLLABUS

## Theory

### MEDICAL MICROBIOLOGY

- **General**
  - History of microbiology Microscopy
  - Bio-safety including universal precautions
  - Physical and biological containment
  - Sterilization and disinfection
  - Morphology of bacteria and other microorganisms
  - Nomenclature and classification of microorganisms
  - Microbiomes & Normal flora of human body
  - Growth & nutrition of bacteria Bacterial metabolism
  - Host-parasite relationship and virulence factors
  - Antibacterial substances and drug resistance
  - Bacterial genetics & bacteriophages
  - Molecular genetics relevant for medical microbiology
- **Immunology**
  - Immunology Components of the immune system
  - Innate and acquired immunity
  - Cells involved in immune response
  - Antigens
  - Immunoglobulins
  - Mucosal immunity
  - Complement Antigen & antibody reactions
  - Hypersensitivity Humoral & Cell mediated immunity
  - Cytokines
  - Immunodeficiency
  - Auto-immunity
  - Immune tolerance
  - MHC complex

- Transplantation immunity
- Tumor immunity
- Vaccines and immunotherapy
- Measurement of immunological parameters
- Immunological techniques
- Immunopotential & immunomodulation
  
- **Systematic bacteriology**
  - Staphylococcus, Micrococcus
  - Streptococcus & Enterococcus
  - Neisseria, Branhamella, Moraxella etc.
  - Coryneform organisms
  - Enterobacteriaceae
  - Vibrios, Aeromonas, Plesiomonas
  - Haemophilus
  - Bordetella
  - Brucella
  - Pseudomonas, Acinetobacter & other non-fermenters
  - Spirochaetes
  - Chlamydiae
  - Mycoplasma
  - Rickettsiae
  - Helicobacter, Campylobacter & Spirillum
  - Actinomyces, Nocardia, Actinobacillus and other actinomycetales,
  - Miscellaneous Bacteria like Gardnerella, Pasturella, Francisella, Erysipelothrix, Listeria, Coxiella, Bartonella, etc.
  - Gram positive bacilli of medical importance including Lactobacillus, Bacillus
  
- **Mycobacteriology**

- History
- Classification
- Identification
  - Conventional
  - Molecular
- Culture techniques
- Anti mycobacterial susceptibility testing
- Mycobacterial Immunology & mycobacterial antigens
- Latent Tuberculosis-Diagnosis & Interpretation
- Histopathology in Tuberculosis
- NTM
- *M. leprae*
- Molecular applications in mycobacteriology
- Recent advances in Mycobacteriology
  
- **Anaerobic bacteriology**
  - Anaerobic Methods
  - Anaerobic cocci & Bacilli including Clostridia, Bacteroides, Fusobacterium, etc.
  
- **Medical Virology**
  - General properties of viruses
    - Classification of viruses
    - Morphology: Virus structure, Virus replication, Isolation & identification of viruses
    - Pathogenesis of viral infections
  - Bacteriophage
  - **DNA viruses**
    - Poxviridae
    - Herpesviridae

- Adenoviridae
- Papova
- Parvo viruses
- Other DNA viruses
- **RNA viruses**
  - Picorna virus
  - Enteroviruses
  - Arboviruses
  - Orthomyxoviruses
  - Paramyxoviruses
  - Reoviridae
  - Rhabdoviridae
  - Retroviridae
  - Filoviruses
  - Coronaviridae
  - Calciviruses
  - Other RNA viruses
- Hepatitis Viruses
- Miscellaneous Viruses
- Oncogenic Viruses
- Slow viruses including prions, Virioids
- Vaccines & anti-viral drugs

- **Medical Parasitology**

- General characters & classification of parasites
- Methods of identification of parasites
- Protozoan parasites
  - Entamoeba,
  - Free living amoebae,

- Giardia
  - Trichomonas,
  - Balantidium
  - Leishmania,
  - Trypanosoma,
  - Plasmodium, Babesia
  - Toxoplasma,
  - Sarcocystis,
  - Cryptosporidium, Microsporidium, Cyclospora. Isospora,
- Helminthology
  - Intestinal Nematodes (Trichiuris, Trichinella, Strongyloides, Ancylostoma, Necator, Ascaris, Toxocara, Enterobius,
  - Tissue Nematodes (Filarial worms, Dracunculus etc.)
  - Cestodes (Diphyllobothrium, Taenia, Echinococcus, Hymenolepis, Dipylidium, Multiceps etc.),
  - Trematodes (Schistosomes, Fasciola, Fasciolopsis, Gastrodiscoides, Paragonimus, Clonorchis, Opisthorchis etc.)
  
- **Medical Entomology:**
  - Common arthropods & other vectors viz. mosquito, sandfly, ticks, mite, cyclops, louse, myasis.
  - Vector control agents
  
- **Medical Mycology**
  - General characteristics & classification of fungi
  - Morphology & reproduction of fungi Isolation & identification of fungi
  - Pathogenesis
  - Tissue reactions to fungi
  - Yeasts and yeast like fungi



- Candida.
    - Cryptococcus,
    - Malassezia, Piedra,
    - Trichosporon, Geotrichum, Saccharomyces etc.
  - Mycelial fungi
    - Dermatophytes
    - Aspergillus,
    - Hyalohyphomycetes
    - Zygomycetes,
    - Dematiaceous hyphomycetes
  - Opportunistic Fungi & Common laboratory contaminants
  - Dimorphic fungi including Histoplasma, Blastomyces, Coccidioides, Paracoccidioides, Sporothrix, Penicillium marneffeii etc.
  - Fungi causing subcutaneous mycosis & mycetoma
  - Pneumocystis carinii infection
  - Mycetismus & mycotoxicosis
- **Antifungal agents & in vitro antifungal susceptibility tests.**
  - **Applied Medical Microbiology**
    - Epidemiology of infectious diseases
    - Approaches to diagnosis and management of infectious disease syndromes
      - Fevers & Pyrexia of unknown origin (PUO)
      - Respiratory tract infections
      - Urinary tract infection
      - Sepsis
      - Intra-abdominal infections
      - Cardio-vascular infections
      - Central Nervous Infections
      - Skin & soft tissue infections

- Gastrointestinal infections & Food poisoning
- Bone & Joint infections
- STIs & RTIs
- Eye infections
- Hepatitis
- AIDS
- Traveler's Diseases
- Emerging and re-emerging infections.
- Biological warfare (Bioterrorism)
- Probiotics
- Microbiology of air, milk and water
- Microbiology of hospital environment
- Hospital acquired infections
- Hospital infection control and management
- Antimicrobial susceptibility testing & therapy
- Rational use of antibiotics and its stewardship
- Biomedical waste management
- Safety and risk management
- Environment management and Engineering controls
- Investigation of an infectious outbreak and epidemiological typing
- Recent advances in diagnostic techniques in infectious diseases
- Infection control in special situations- Blood transfusion, solid organ transplantation and implants.
- Molecular genetics as applicable to Microbiology
- Quality Assurance and Accreditation of laboratories
- Vaccinology : principle, methods of preparation, administration of vaccines and testing
- Information technology (Computers) in microbiology, Bioinformatics, research methodologies
- Automation in Clinical Microbiology

- Statistical analysis of microbiological data and research methodology and ethics
- Care & handling of animals preferably by simulation and ethical considerations
- National infectious disease control, eradication programmes
- Recent Advances in Medical Microbiology

## **Practical**

- **Bacteriology**

- Aseptic practices in laboratory and safety precautions
- Preparation of stains viz. Gram, Albert's, capsules, spores, Ziehl Neelsen (ZN), Silver impregnation stain etc.
- Preparation of media like Nutrient agar, Blood Agar, Mac-conkey agar, Sugars, Serum sugars, Kligler iron agar, Robertson's cooked meat broth, Lowenstein Jensens medium, Sabouraud's dextrose agar etc.
- Preparation of reagents -oxidase, Kovac etc.
- Quality control of media, reagents etc.
- Preparation of antibiotic discs
- Operation of autoclave, hot air oven, distillation plant, filters like Sietz and membrane filters Care and operation of microscopes
- Washing and sterilisation of glassware (plugging and packing)
- Care and maintenance of common laboratory equipments like water bath, centrifuge, refrigerators, incubators etc.
- Sterility tests Identification of bacteria of medical importance upto species level (except anaerobes which could be upto generic level).
- Appropriate and aseptic sample collection techniques specially blood culture

- Collection/transport of representative specimens for microbiological investigations
- Preparation, examination & interpretation of direct smears from clinical specimens after clinical correlation
- Plating of clinical specimens on media for isolation, purification, identification and interpretation after clinical correlation.
- Techniques of incubation for aerobic, microaerophilic and anaerobic organisms
- Tests for Motility: hanging drop, Cragie's tube, dark ground microscopy for spirochaetes
- Special tests-Bile solubility, sheep cell haemolysis, CAMP test, satellitism, catalase, oxidase and serotyping, etc,.
- In-vitro toxigenicity tests- Elek's test, Negler's reaction
- Performance of antimicrobial susceptibility testing, eg. Kirby-Bauer, Stoke's method
- Estimation of Minimal Inhibitory/Bactericidal concentrations by tube/plate dilution methods
- Tests for Beta-lactamase production
- Antimicrobial susceptibility tests for Mycobacteria
- Special staining techniques for Mycoplasma, Treponemes, Gardenerella.
- Knowledge of Inoculation of lab animals by different routes, Bleeding techniques of animals including mice, guinea pig, rabbit and sheep Animal pathogenicity/toxigenicity tests for C.diphtheriae, C.tetani, S.pneumoniae, S.typhimurium, K.pneumoniae etc.
- Care and breeding of laboratory animals viz. mice, rats, guinea pigs, rabbits etc.
- Testing of disinfectants
- Disposal of contaminated materials like cultures & infectious waste
- Bacteriological tests for water, air and milk

- Maintenance & preservation of bacterial cultures
- **Mycobacteriology**
  - Lab Diagnosis & Interpretations
  - Sample collection, skin slit smears
  - Microscopy
    - Z-N Staining
    - Direct Fluorescence Staining
  - Culture techniques & Automations
  - Anti mycobacterial susceptibility testing
  - Histopathology techniques in Tuberculosis & Leprosy
  - Molecular applications in mycobacteriology
  - Latent Tuberculosis- Diagnosis & Interpretations
  - Mantoux testing & Gamma Interferon Assay

### **Skills which are desirable to acquire**

- Isolation of plasmids and Conjugation experiments for transfer of drug resistance.
- Serum antibiotic assays eg. Gentamicin.
- Phage typing for staphylococci, S.typhi etc.
- Bacteriocine typing eg. Pyocine, Proteocin etc
- Disinfectant testing
- **Microbial Immunology**
  - Separation of serum and preservation of serum for short and long periods
  - Performance of serological tests viz. Widal, Brucella tube agglutination, indirect hemagglutination, VDRL/RPR, ASO, Rose Waaler test, IFA and others
  - Enzyme linked immunosorbent assay
  - Latex agglutination tests

- Radial immunodiffusion for estimation of serum Immunoglobulins
- Immunoelectrophoresis
- Crossed immunoelectrophoresis
- Immunoblotting
- Radial immunodiffusion.

### **Skills which are desirable to acquire**

- Leucocyte migration inhibition test.
- T-cell rosetting.
- Flow Cytometry
- Immunoelectrophoresis.
- Immunodiffusion in gels, counter immunoelectrophoresis visualization and interpretation of bands.

- **Mycology**

- Collection and transport of specimens
- Processing of samples for microscopy and culture
- Direct examination of specimens by KOH, Gram's, Acid fast, Giemsa, Lactophenol cotton blue, direct fluorescence staining (Calcofluor staining), indirect fluorescence staining (*Pneumocystis jirovecii*) & special fungal stains
- Examination of histopathology slides for fungal infections
- Isolation and identification of medically important fungi & common laboratory contaminants
- Special techniques like Wood's lamp examination, hair baiting, hair perforation, paraffin baiting and slide culture
- Anti fungal susceptibility testing (MICs)
- Maintenance of stock cultures

- Antigen and Antibody detection in candidiasis, aspergillosis, histoplasmosis, blastomycosis, Cryptococcosis, zygomycosis, coccidioidomycosis, cryptococcosis, aspergillosis, candidiasis, etc.
- **Parasitology**
  - Collection and transport of specimens for diagnosis of parasitic diseases
  - Examination of faeces for parasite ova and cysts etc. by direct and concentration methods (salt floatation, formol-ether methods and others)
  - Egg counting techniques for helminthes, micrometry and mounting of slides
  - Preparation & performance of stains -Leishman, Giemsa, Lugol's iodine, modified acid fast stain, etc.
  - Examination of blood for protozoa by thick and thin stained smears, QBC and microfilariae including concentration techniques
  - Examination of other specimens eg. Urine, CSF, Bone marrow etc. for parasites
  - Micrometry Identification of medically important adult worms
  - Immuno & molecular assays in parasitic infections (malaria, cryptosporidium, etc.)
  - Identification of common arthropods and other vectors viz. mosquito, sandfly, ticks, mites, Cyclops, etc.
  - Preservation of parasites-mounting, fixing, staining etc.

#### **Skills which are desirable to acquire**

- In-vitro culture of parasites like entamoeba, leishmania, P.falciparum, etc.
- Maintenance of toxoplasma gondii in mice.
- Preparation of media – NIH, NNN etc.
- Copro-culture for larva of hook worms.

- Antigen preparation viz. Entamoeba, Filarial, Hydatid for serological tests like IHA and skin test like Casoni's.
- Permanent staining techniques like iron haematoxylin
- **Virology**
  - Preparation of glassware for tissue cultures (washing, sterilisation).
  - Preparation of buffers like PBS, Hank's Preparation of clinical specimens for isolation of viruses
  - Collection & transport of specimens
  - Staining for inclusion bodies
  - Serological tests –ELISA & Immunofluorescence for HIV & HBsAg etc
  - Molecular techniques in virology
  - Chick Embryo techniques-inoculation and harvesting
  - Handling of mice, rats and guinea pigs for collection of blood and other samples.

**Skills which are desirable to acquire**

- Preparation of Monkey Kidney Cells (Primary) maintenance of continuous cell lines by subcultures.
- Preservation of cell cultures.
- Recognition of CPE in tissue cultures.
- Performance of haemadsorption, haemagglutination, immunofluorescence, neutralization tests for identification of viruses.

**Other areas in which knowledge is to be acquired:**

- Pyrogen testing
- Biostatistics and clinical epidemiology
- Ethics & Medico legal aspects
- Economics of management of diseases



## Posting Sections/ departments

Section/ Department	Duration
1. Orientation posting	1 month
2. Media room & Sterlization	2 months
3. Bacteriology*	
Pus & Body fluids seat	3 months
Blood seat	3 months
Urine seat	3 months
Enterobactericeae	3 months
4. Parasitology*	3 months
5. Microbial Immunology*	3 months
6. Mycology*	3 months
7. Virology*	3 months
8. Mycobacteriology*	2 months
9. Molecular Laboratory*	2 months
10. Infection Control & Antibiotic Stewardship*	2 months
11. Histopathology/ Cytology	1 month
12. Revision & External posting	2 months
<b>TOTAL</b>	<b>36 months</b>

\* : 12-15 positive cases per year per Post graduate at his/her posting need to be logged in (as a separate log book) with clinical details under supervision of the faculty incharge of the posting.

Note: Case series thus obtained are encouraged for publication. Such case series along with the log book will be part of the internal assessment at the end of the postings.

## **Competencies to Be Acquired by the Candidates**

### **Job Responsibilities**

- Assessment of adequacy of samples for microbiological processing
- During 1st year the resident will work under direct supervision of the consultants /Sr. Resident / 2nd yr & 3rd yr residents and will be responsible for handling and processing of the specimens in their respective sections with an aim of carrying bench to bedside.
- During 2nd yr, they will be responsible for reporting in their respective sections under the supervision.
- During 3rd yr, they should be able to handle all the emergencies in the evening and night.
- All the junior residents should be able to take practical demonstrations of undergraduates.
- Communication of positive samples from critical specimens to the treating units is mandatory.

Time frame for minimum skill acquisition by PG residents of Microbiology department General Microbiology and Bacteriology

### **First year**

- Operation of autoclave, hot air oven
- Washing and sterilization of glass wares for routine & tissue cultures
- Media and reagent preparation
- Laboratory waste management
- Aseptic practices in laboratory and safety precautions
- Care and maintenance of common laboratory equipments
- Care and breeding of laboratory animals
- Bleeding techniques from animals
- Preparation and performance of common bacterial stains

- Collection of specimens for microbiological investigations
- Care and operation of microscopes
- Preparation, examination and interpretation of direct smears from clinical specimens
- Direct examination of specimens by KOH, Gram's, Kinyoun's, Giemsa, Lactophenol cotton blue stains
- Motility testing of bacteria
- Identification of bacteria
- Biochemical tests & agglutination tests
- Serological tests-ELISA for HIV, RPHA for HBsAg, etc.

### **Second & Third year**

- Quality control of media and reagents
- Quantitative and semi-quantitative analysis of urine
- Tests for identification of bacteria of medical importance up to species level
- Isolation and identification of common laboratory contaminants, dermatophytes and other fungi of medical importance (yeast, dematiaceous fungi)
- Techniques of anaerobiosis
- Skin tests
- Preparation of antibiotic discs
- Detection of drug resistance mechanisms (beta lactamases, MRSA, NDM etc.)
- Estimation of MIC, MBC, etc.
- Separation of serum and preservation of serum for short and long periods
- Preparation of antigens from bacteria or tissues like Widal, VDRL, etc and their
- Standardization Latex and Staphylococcal Co-agglutination tests

- Performance of serological tests viz. Widal, Brucella tube agglutination, WeilFelix, Cold agglutination, VDRL, Paul-Bunnell, Rose-Waaler, IF, etc.
- Raising of antisera in laboratory animals
- Radial immunodiffusion for estimation of serum immunoglobulins
- Immuno & molecular assays
- Maintenance of stock cultures
- Maintenance of continuous cell lines by subcultures.
- Handling of mice, rat, guinea pigs for collection of blood, pathogenicity tests, etc.
- Inoculation of infective material
- by different routes in the animals
- Immunoelectrophoresis
- Histopathology sections-examination and identification of parasites
- Identification of common arthropods and other vectors viz., mosquito, sandfly,tick, mite, Cyclops
- Permanent staining techniques like iron haematoxylin
- Recognition of CPE producing viruses
- Identification tests on tissue cultures and supernatants by performance of viz. haemadsorption, Haemagglutination, Immunofluorescence, Neutralization,etc.

### **General acquaintance**

- Light microscopy
- Fluorescent microscopy
- Dark ground microscopy
- Tissue culture
- Microslide culture for fungus
- Immuno and molecular assays
- CD4 count estimation
- Medical statistics

- Quality control
- Waste disposal
- Molecular biology
- Information retrieval, computer, internet in medicine

## THESIS PROTOCOL & THESIS

The candidates are required to submit a thesis at the end of three years of training as per the rules and regulations of NBE.

### **Guidelines for Submission of Thesis Protocol & Thesis by candidates**

Research shall form an integral part of the education programme of all candidates registered for DNB degrees of NBE. The Basic aim of requiring the candidates to write a thesis protocol & thesis/dissertation is to familiarize him/her with research methodology. The members of the faculty guiding the thesis/dissertation work for the candidate shall ensure that the subject matter selected for the thesis/dissertation is **feasible, economical and original**.

### **Guidelines for Thesis Protocol**

The protocol for a research proposal (including thesis) is a study plan, designed to describe the background, research question, aim and objectives, and detailed methodology of the study. In other words, the protocol is the 'operating manual' to refer to while conducting a particular study.

The candidate should refer to the NBE Guidelines for preparation and submission of Thesis Protocol before the writing phase commences. The minimum writing requirements are that the language should be clear, concise, precise and consistent without excessive adjectives or adverbs and long sentences. There should not be any redundancy in the presentation.

The development or preparation of the Thesis Protocol by the candidate will help her/him in understanding the ongoing activities in the proposed area of research. Further it helps in creating practical exposure to research and hence it bridges the connectivity between clinical practice and biomedical research. Such research exposure will be helpful in improving problem solving capacity, getting updated with ongoing research and implementing these findings in clinical practice.

Research Ethics: Ethical conduct during the conduct and publication of research is an essential requirement for all candidates and guides, with the primary responsibility of ensuring such conduct being on the thesis guide. Issues like Plagiarism, not maintaining the confidentiality of data, or any other distortion of the research process will be viewed seriously. The readers may refer to standard documents for the purpose.

The NBE reserves the right to check the submitted protocol for plagiarism, and will reject those having substantial duplication with published literature.

## PROTOCOL REQUIREMENTS

1. All of the following will have to be entered in the online template. The thesis protocol should be restricted to the following word limits.
  - Title : 120 characters (with spacing) page
  - Synopsis [structured] : 250-300
  - Introduction : 300-500
  - Review of literature : 800-1000
  - Aim and Objectives : Up to 200
  - Material and Methods : 1200-1600
  - 10-25 References [ICMJE style]
2. It is mandatory to have ethics committee approval before initiation of the research work. The researcher should submit an appropriate application to the ethics committee in the prescribed format of the ethics committee concerned.

## Guidelines for Thesis

1. The proposed study must be approved by the institutional ethics committee and the protocol of thesis should have been approved by NBE.
2. The thesis should be restricted to the size of 80 pages (maximum). This includes the text, figures, references, annexures, and certificates etc. It should be printed on both sides of the paper; and every page has to be numbered. Do not leave any page blank. To achieve this, following points may be kept in view:
  - a. The thesis should be typed in 1.5 space using Times New Roman/Arial/ Garamond size 12 font, 1” margins should be left on all four sides. Major sections viz., Introduction, Review of Literature, Aim & Objectives, Material and Methods, Results, Discussion, References, and Appendices should start from a new page. Study proforma (Case record form), informed consent form, and patient information sheet may be printed in single space.
  - b. Only contemporary and relevant literature may be reviewed. Restrict the introduction to 2 pages, Review of literature to 10-12 pages, and Discussion to 8-10 pages.
  - c. The techniques may not be described in detail unless any modification/innovations of the standard techniques are used and reference(s) may be given.
  - d. Illustrative material may be restricted. It should be printed on paper only. There is no need to paste photographs separately.

3. Since most of the difficulties faced by the residents relate to the work in clinical subject or clinically-oriented laboratory subjects, the following steps are suggested:
  - a. The number of cases should be such that adequate material, judged from the hospital attendance/records, will be available and the candidate will be able to collect case material within the period of data collection, i.e., around 6-12 months so that he/she is in a position to complete the work within the stipulated time.
  - b. The aim and objectives of the study should be well defined.
  - c. As far as possible, only clinical/laboratory data of investigations of patients or such other material easily accessible in the existing facilities should be used for the study.
  - d. Technical assistance, wherever necessary, may be provided by the department concerned. The resident of one specialty taking up some problem related to some other specialty should have some basic knowledge about the subject and he/she should be able to perform the investigations independently, wherever some specialized laboratory investigations are required a co-guide may be co-opted from the concerned investigative department, the quantum of laboratory work to be carried out by the candidate should be decided by the guide & co-guide by mutual consultation.
4. The clinical residents are not ordinarily expected to undertake experimental work or clinical work involving new techniques, not hitherto perfected OR the use of chemicals or radioisotopes not readily available. They should; however, be free to enlarge the scope of their studies or undertake experimental work on their own initiative but all such studies should be feasible within the existing facilities.
5. The DNB residents should be able to freely use the surgical pathology/autopsy data if it is restricted to diagnosis only, if however, detailed historic data are required the resident will have to study the cases himself with the help of the guide/co-guide. The same will apply in case of clinical data.
6. Statistical methods used for analysis should be described specifically for each objective, and name of the statistical program used mentioned.

#### **General Layout of a DNB Thesis:**

- **Title-** A good title should be brief, clear, and focus on the central theme of the topic; it should avoid abbreviations. The Title should effectively summarize the proposed research and should contain the PICO elements.



- **Introduction-** It should be focused on the research question and should be directly relevant to the objectives of your study.
- **Review of Literature** - The Review should include a description of the most relevant and recent studies published on the subject.
- **Aim and Objectives** - The 'Aim' refers to what would be broadly achieved by this study or how this study would address a bigger question / issue. The 'Objectives' of the research stem from the research question formulated and should at least include participants, intervention, evaluation, design.
- **Material and Methods-** This section should include the following 10 elements: Study setting (area), Study duration; Study design (descriptive, case-control, cohort, diagnostic accuracy, experimental (randomized/non-randomized)); Study sample (inclusion/exclusion criteria, method of selection), Intervention, if any, Data collection, Outcome measures (primary and secondary), Sample size, Data management and Statistical analysis, and Ethical issues (Ethical clearance, Informed consent, trial registration).
- **Results-** Results should be organized in readily identifiable sections having correct analysis of data and presented in appropriate charts, tables, graphs and diagram etc.
- **Discussion**—It should start by summarizing the results for primary and secondary objectives in text form (without giving data). This should be followed by a comparison of your results on the outcome variables (both primary and secondary) with those of earlier research studies.
- **Summary and Conclusion-** This should be a précis of the findings of the thesis, arranged in four paragraphs: (a) background and objectives; (b) methods; (c) results; and (d) conclusions. The conclusions should strictly pertain to the findings of the thesis and not outside its domain.
- **References-** Relevant References should be cited in the text of the protocol (in superscripts).
- **Appendices** -The tools used for data collection such as questionnaire, interview schedules, observation checklists, informed consent form (ICF), and participant information sheet (PIS) should be attached as appendices. Do not attach the master chart.

## **Thesis Protocol Submission to NBE**

1. DNB candidates are required to submit their thesis protocol within 90 days of their joining DNB training.
2. Enclosures to be submitted along with protocol submission form:
  - a) Form for Thesis Protocol Submission properly filled.
  - b) Thesis Protocol duly signed.
  - c) Approval letter of institutional Ethical committee. (*Mandatory, non receivable of any one is liable for rejection*)

## **Thesis Submission to NBE**

1. As per NBE norms, writing a thesis is essential for all DNB candidates towards partial fulfillment of eligibility for award of DNB degree.
2. DNB candidates are required to submit the thesis before the cut-off date which shall be 30th June of the same year for candidates appearing for their scheduled December final theory examination. Similarly, candidates who are appearing in their scheduled June DNB final examination shall be required to submit their thesis by 31st December of preceding year.
3. Candidates who fail to submit their thesis by the prescribed cutoff date shall NOT be allowed to appear in DNB final examination.
4. Fee to be submitted for assessment (In INR): 3500/-
5. Fee can be deposited ONLY through pay-in-slip/challan at any of the Indian bank branch across India. The challan can be downloaded from NBE website [www.natboard.edu.in](http://www.natboard.edu.in)
6. Thesis should be bound and the front cover page should be printed in the standard format. A bound thesis should be accompanied with:
  - a. A Synopsis of thesis.
  - b. Form for submission of thesis, duly completed
  - c. NBE copy of challan (in original) towards payment of fee as may be applicable.
  - d. Soft copy of thesis in a CD duly labeled.
  - e. Copy of letter of registration with NBE.
7. A declaration of thesis work being bonafide in nature and done by the candidate himself/herself at the institute of DNB training need to be submitted bound with thesis. It must be signed by the candidate himself/herself, the thesis guide and head of the institution, failing which thesis shall not be considered.

## ***The detailed guidelines and forms for submission of Thesis***

***Protocol & Thesis are available at***

***[www.natboard.edu.in.thesis.php](http://www.natboard.edu.in.thesis.php)***

## **LOG BOOK**

A candidate shall maintain a log book of operations (assisted / performed) during the training period, certified by the concerned post graduate teacher / Head of the department / senior consultant.

This log book shall be made available to the board of examiners for their perusal at the time of the final examination.

The log book should show evidence that the before mentioned subjects were covered (with dates and the name of teacher(s)) The candidate will maintain the record of all academic activities undertaken by him/her in log book .

1. Personal profile of the candidate
2. Educational qualification/Professional data
3. Record of case histories
4. Procedures learnt
5. Record of case Demonstration/Presentations
6. Every candidate, at the time of practical examination, will be required to produce performance record (log book) containing details of the work done by him/her during the entire period of training as per requirements of the log book. It should be duly certified by the supervisor as work done by the candidate and countersigned by the administrative Head of the Institution.
7. In the absence of production of log book, the result will not be declared.

## Leave Rules

1. DNB Trainees are entitled to leave during the course of DNB training as per the Leave Rules prescribed by NBE.
2. A DNB candidate can avail a maximum of 20 days of leave in a year excluding regular duty off/ Gazetted holidays as per hospital/institute calendar/policy.
3. MATERNITYLEAVE:
  - a. A female candidate is permitted a maternity leave of 90 days once during the entire duration of DNB course.
  - b. The expected date of delivery (EDD) should fall within the duration of maternity leave.
  - c. Extension of maternity leave is permissible only for genuine medical reasons and after prior approval of NBE. The supporting medical documents have to be certified by the Head of the Institute/hospital where the candidate is undergoing DNB training. NBE reserves its rights to take a final decision in such matters.
  - d. The training of the candidate shall be extended accordingly in case of any extension of maternity leave being granted to the candidate.
  - e. Candidate shall be paid stipend during the period of maternity leave. No stipend shall be paid for the period of extension of leave.
4. Male DNB candidates are entitled for paternity leave of maximum of one week during the entire period of DNB training.
5. No kind of study leave is permissible to DNB candidates. However, candidates may be allowed an academic leave as under across the entire duration of training program to attend the conferences/CMEs/Academic programs/Examination purposes.

<b>DNB COURSE</b>	<b>NO. OF ACADEMIC LEAVE</b>
DNB 3 years Course (Broad & Super Specialty)	14 Days
DNB 2 years Course (Post Diploma)	10 Days
DNB Direct 6 years Course	28 days

6. Under normal circumstances leave of one year should not be carried forward to the next year. However, in exceptional cases such as prolonged illness the leave across the DNB training program may be clubbed together with prior approval of NBE.
7. Any other leave which is beyond the above stated leave is not permissible and shall lead to extension/cancellation of DNB course.
8. Any extension of DNB training for more than 2 months beyond the scheduled completion date of training is permissible only under extraordinary circumstances with prior approval of NBE. Such extension is neither automatic nor shall be granted as a matter of routine. NBE shall consider such requests on merit provided the seat is not carried over and compromise with training of existing trainees in the Department.
9. Unauthorized absence from DNB training for more than 7 days may lead to cancellation of registration and discontinuation of the DNB training and rejoining shall not be permitted.

#### 10. Medical Leave

- a. Leave on medical grounds is permissible only for genuine medical reasons and NBE should be informed by the concerned institute/hospital about the same immediately after the candidate proceeds on leave on medical grounds.
- b. The supporting medical documents have to be certified by the Head of the Institute/hospital where the candidate is undergoing DNB training and have to be sent to NBE.
- c. The medical treatment should be taken from the institute/ hospital where the candidate is undergoing DNB training. Any deviation from this shall be supported with valid grounds and documentation.
- d. In case of medical treatment being sought from some other institute/hospital, the medical documents have to be certified by the Head of the institute/hospital where the candidate is undergoing DNB training.

- e. NBE reserves its rights to verify the authenticity of the documents furnished by the candidate and the institute/hospital regarding Medical illness of the candidate and to take a final decision in such matters.

11.

- a. Total leave period which can be availed by DNB candidates is  $120+28 = 148$  days for 6 years course,  $60+14=74$  days for 3 years course and  $40+10 = 50$  days for 2 years course. This includes all kinds of eligible leave including academic leave. Maternity / Paternity leave can be availed separately by eligible candidates. Any kind of leave including medical leave exceeding the aforementioned limit shall lead to extension of DNB training. It is clarified that prior approval of NBE is necessary for availing any such leave.
- b. The eligibility for DNB Final Examination shall be determined strictly in accordance with the criteria prescribed in the respective information bulletin.

# EXAMINATION

## FORMATIVE ASSESSMENT

Formative assessment includes various formal and informal assessment procedures by which evaluation of student's learning, comprehension, and academic progress is done by the teachers/ faculty to improve student attainment. Formative assessment test (FAT) is called as "Formative" as it informs the in process teaching and learning modifications. FAT is an integral part of the effective teaching. The goal of the FAT is to collect information which can be used to improve the student learning process.

Formative assessment is essentially positive in intent, directed towards promoting learning; it is therefore part of teaching. Validity and usefulness are paramount in formative assessment and should take precedence over concerns for reliability. The assessment scheme consists of Three Parts which has to be essentially completed by the candidates.

The scheme includes:-

Part I:- Conduction of theory examination

Part-II :- Feedback session on the theory performance

Part-III :- Work place based clinical assessment

### Scheme of Formative assessment

<b>PART – I</b>	<b>CONDUCT OF THEORY EXAMINATION</b>	Candidate has to appear for Theory Exam and it will be held for One day.
<b>PART – II</b>	<b>FEEDBACK SESSION ON THE THEORY PERFORMANCE</b>	Candidate has to appear for his/her Theory Exam Assessment Workshop.
<b>PART – III</b>	<b>WORK PLACE BASED CLINICAL ASSESSMENT</b>	After Theory Examination, Candidate has to appear for Clinical Assessment.

The performance of the resident during the training period should be monitored throughout the course and duly recorded in the log books as evidence of the ability and daily work of the student

#### 1. Personal attributes:

- **Behavior and Emotional Stability:** Dependable, disciplined, dedicated, stable in emergency situations, shows positive approach.
- **Motivation and Initiative:** Takes on responsibility, innovative, enterprising, does not shirk duties or leave any work pending.

- **Honesty and Integrity:** Truthful, admits mistakes, does not cook up information, has ethical conduct, exhibits good moral values, loyal to the institution.
- **Interpersonal Skills and Leadership Quality:** Has compassionate attitude towards patients and attendants, gets on well with colleagues and paramedical staff, is respectful to seniors, has good communication skills.

## 2. Clinical Work:

- **Availability:** Punctual, available continuously on duty, responds promptly on calls and takes proper permission for leave.
- **Diligence:** Dedicated, hardworking, does not shirk duties, leaves no work pending, does not sit idle, competent in clinical case work up and management.
- **Academic ability:** Intelligent, shows sound knowledge and skills, participates adequately in academic activities, and performs well in oral presentation and departmental tests.
- **Clinical Performance:** Proficient in clinical presentations and case discussion during rounds and OPD work up. Preparing Documents of the case history/examination and progress notes in the file (daily notes, round discussion, investigations and management) Skill of performing bed side procedures and handling emergencies.

**3. Academic Activity:** Performance during presentation at Journal club/ Seminar/ Case discussion/Stat meeting and other academic sessions. Proficiency in skills as mentioned in job responsibilities.

## FINAL EXAMINATION

The summative assessment of competence will be done in the form of DNB Final Examination leading to the award of the degree of Diplomate of National Board in Microbiology. The DNB final is a two-stage examination comprising the theory and practical part. An eligible candidate who has qualified the theory exam is permitted to appear in the practical examination.

### Theory Examination

1. The theory examination comprises of **Four** papers, maximum marks 100 each.
2. There are 10 short notes of 10 marks each, in each of the papers. The number of short notes and their respective marks weightage may vary in some subjects/some papers.
3. Maximum time permitted is 3 hours.
4. Candidate must score at least 50% in the aggregate of **Four** papers to qualify the theory examination.



5. Candidates who have qualified the theory examination are permitted to take up the practical examination.
6. The paper wise distribution of the Theory Examination shall be as follows:

**Paper I:**

- Basic sciences as applied to Microbiology
- General Microbiology, including USP, BMW, HAIs, Bacterial Genetics, Drug Resistance in bacteria and Antibiotic classes & their mechanism of action
- Immunology, including Molecular methods Like PCR, RFLP, PFGE, NASBA, Ribotyping, etc.
- Research Methodology.

**Paper II:**

- Systemic Bacteriology, including Rickettsia, Chlamydia and Mycoplasma.
- Mycology, including Antifungal therapy, Mycotoxicosis and Mycetism.

**Paper III:**

- Virology, including Prion diseases and antiviral therapy.
- Parasitology, including Protozoology and Helminthology, Prevention of parasitic diseases and Drugs used against parasites.

**Paper IV:**

- Applied Microbiology
- Diagnostic Methods in Clinical Microbiology
- Recent advances in Microbiology, e.g. Vaccines against malaria, vaccines against HIV infection, Edible vaccines, etc.; Biowarfare agents; Automation in Microbiology; Laboratory Biosafety; Bacterial Typing methods; Nanotechnology; Gene therapy; etc.

**a) Practical Examination:**

1. Maximum Marks: 300.
2. Comprises of Clinical Examination and Viva.
3. Candidate must obtain a minimum of 50% marks in the Clinical Examination (including Viva) to qualify for the Practical Examination.
4. There are a maximum of three attempts that can be availed by a candidate for Practical Examination.
5. First attempt is the practical examination following immediately after the declaration of theory results.
6. Second and Third attempt in practical examination shall be permitted out of the next three sessions of practical examinations placed alongwith the next three successive theory examination sessions; after payment of full examination fees as may be prescribed by NBE.
7. Absentation from Practical Examination is counted as an attempt.
8. Appearance in first practical examination is compulsory;

9. Requests for Change in center of examination are not entertained, as the same is not permissible.
10. Candidates are required not to canvass with NBE for above.

### **Declaration of DNB Final Results**

1. DNB final is a qualifying examination.
2. Results of DNB final examinations (theory & practical) are declared as PASS/FAIL.
3. DNB degree is awarded to a DNB trainee in the convocation of NBE.

## RECOMMENDED TEXT BOOKS AND JOURNALS

- Ananthanarayan & Paniker's Textbook of Microbiology, Orient Longman,
- Anaissie Elias J. Clinical Mycology, Churchill Livingstone
- Bailey and Scott's Diagnostic Microbiology. CV Mosby, St. Louis, Brooks, Geo F Jawetz
- Medical Microbiology McGraw Hill Collier, Leslie Topley and Wilsons
- Microbiology and microbial infections Vol 1, 2, 3, 4, 5, 6, Collee J G Mackie and McCartney
- Practical Medical Microbiology, Koneman EW, Allen SD, Schreckenbach PC, Winn WC (Eds):
- Atlas and Textbook of Diagnostic Microbiology. JB Lippincott, Philadelphia,
- Manual of Clinical Microbiology. 6th ed. American Society for Microbiology, Washington, DC
- Parija SC. Textbook of Medical Parasitology
- Parija SC. Textbook of Practical Microbiology
- Roitt Ivan M, Immunology Blackwell Science
- Stites Immunology McGraw Hill
- Woods GL, Washington JA: The Clinician and the Microbiology Laboratory.
- Mandell GL, Bennett JE, Dolin R (Eds): Principles and Practice of Infectious Diseases.
- Bailey and Scott's Diagnostic Microbiology.
- Textbook of Parasitology. Chatterjee K.D.
- Mycology – Rippon.
- Essentials of Immunology- Roitt.
- Gradwohl's Clinical Laboratory Methods and Diagnosis.
- Biochemical tests for the Identification of Medical Bacteria- MacFaddin JF.
- Manual of Clinical Microbiology- ASM press

### **Reference books (Please refer the most recent edition)**

- Topley and Wilson's Microbiology and Microbial infections.
- Color Atlas and Textbook of Diagnostic Microbiology: Elmer W Koneman
- Mandell, Douglas and Bennett's Principles and Practice of Infectious Diseases
- Microbiology and Clinical Practice: Shanson
- Immunology: Janis Kuby
- Basic Clinical Immunology. Fudenburg, Stites, Caldwell, Weils.
- Control of Hospital Infection- A practical handbook
- Microbiology in Clinical Practice. Shanson D.C.
- Beaver's Parasitology Textbook.
- Virology- Clinical Virology by Rich.

### **Journals**

- Indian Journal of Medical Microbiology
- Journal of Medical Mycology
- Clinical Microbiology Reviews.
- Journal of Clinical Microbiology.
- Journal of Medical Microbiology.
- Journal of AIDS.
- Journal of Hospital Infection.
- Indian Journal of Tuberculosis and Lung Diseases.
- Indian Journal of Medical Research.
- JAAC.
- Parasitology Today.
- Infection Control and Hospital Epidemiology.
- Lancet-Infectious Diseases.
- New England Journal of Medicine- online.
- Scandinavian Journal of Infectious Diseases.

- Annual reviews of microbiology
- AIDS Research & Review
- Tubercle
- Journal of American Medical Association
- Paediatric infectious diseases
- Indian Journal of Leprosy
- International Journal of Leprosy
- Immunology
- American journal of Epidemiology
- Indian Journal of Medical microbiology
- Clinical Microbiology Reviews.
- Journal of Clinical Microbiology.
- Journal of Medical Microbiology.
- Journal of AIDs.
- Journal of Hospital Infection.
- Indian Journal of Tuberculosis and Lung Diseases.
- Indian Joournal of Medical Research.
- JAAC
- Parasitology Today.
- Journal of Infection.
- Infection Control and Hospital Epidemiology.
- Indian Journal of Tuberculosis.
- Journal of Associations of Physicians of India.
- Lancet-infectious Disease.
- Emerging Infectious Diseases-online.
- New England Journal of Medicine-online.
- British Medical Journal.
- Scandinvian Joournal of Infectious Diseases.
- ICMR Bulletin.
- AIDS Research & Review.

- MMWR
- Tubercle.
- WHO Bulletin
- Journal of American Medical Association
- Paediatric infectious diseases.
- Indian Journal of Leprosy.
- International Journal of Leprosy.
- Immunology
- American Journal of Epidemiology

### **Important Websites**

- Center for Disease Control -[www.cdc.gov](http://www.cdc.gov).
- World Health Organization- [www.who.int](http://www.who.int).
- Infectious Disease Society of America- [www.idsociety.org](http://www.idsociety.org).
- United Nations Program on HIV/ AIDS- [www.unaids.org](http://www.unaids.org).
- Johns Hopkins Infectious Diseases- [www.hopkins-id.edu](http://www.hopkins-id.edu).
- National Library of medicine- [www.pubmed.com](http://www.pubmed.com).
- MD Consult- [www.mdconsult.com](http://www.mdconsult.com).
- Global Infectious Disease epidemiology network-[www.gideononline.com](http://www.gideononline.com).
- National AIDS Control Organization- [www.nacoindia.org](http://www.nacoindia.org).
- Tuberculosis Research Centre- [www.trc-chennai.org](http://www.trc-chennai.org)

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