

GUIDELINES FOR COMPETENCY BASED POSTGRADUATE TRAINING PROGRAMME FOR DM IN VIROLOGY

Preamble

The discipline of virology has evolved from the initial description of a virus as ‘contagium vivum fluidum’ in the 19th century, to the concept of the virome in the 21st century. The field is a fascinating and rapidly evolving branch of medicine with immense relevance to humanity and modern medicine.

Viral diseases are an important contributor to morbidity and mortality to the infectious disease burden in the country, but are often under diagnosed and hence go undetected. Many of the new, emerging and re-emerging pathogens are viruses. Despite the felt need, services for viral diagnosis are still rudimentary at state level colleges in the country, owing to lack of both infrastructure and trained professionals in the discipline. Only a few tertiary care hospitals in the country have the set up of a clinical virology laboratory. There is strong emphasis on building capacity for viral diagnosis and research, with the Indian Council of Medical Research setting up a multi-tier network of virology laboratories across the country. This D.M. programme in virology will also help in enhancing specialized human resources for this activity.

Much of the progress in virology has been technology and expertise driven, and huge strides were made in the discipline with the advent of cell culture, monoclonal antibodies by hybridoma technology and, finally, nucleic acid-based tests. These have truly changed the face of medical virology, particularly in medicine. It is essential to take this discipline ahead in India, with a super-speciality program in this field.

SUBJECT SPECIFIC OBJECTIVES

The **primary objective** of the program is to produce a cadre of specialized medical virologists who would help establish clinical diagnostic services in various hospitals/centres in the country and provide training and knowledge dissemination in this super-speciality.

The **secondary objectives** of the program are manifold. The trainee is expected to acquire adequate understanding of processes involved in the **pre-analytical, analytical and post-analytical phases** of the **clinical diagnostic laboratory testing for viral infections**, as detailed below.

At the end of the course, the trainee is expected to be able to:

- Organise sample collection, transportation, processing and storage in an appropriate manner
- Perform/supervise the basic principles of viral assays/techniques
- Perform and interpret the results of assays /techniques and their clinical significance
- Troubleshoot all problems related to the assays/techniques, after proper root cause analysis
- Discuss results with treating clinicians and advise further investigations

- Assure quality of the assays/techniques concerned
- Plan, write and implement research projects in virology, analyze their results and publish these in peer-reviewed journals
- Coordinate with concerned agencies regarding viral diseases and their outbreaks
- Plan and execute epidemiological studies and provide advice in relation to viral diseases

SUBJECT SPECIFIC COMPETENCIES

A. Cognitive domain (Knowledge domain)

At the end of the course, the student should be able to understand and describe the following, in the context of the medically important viruses listed in the syllabus below:

1. The morphology and genomic organization of the virus
2. The epidemiology of the viral infection
3. The clinical presentation of the viral illness
4. The immune-pathogenesis of the infection
5. The laboratory diagnosis of the virus, including conventional and molecular approaches
6. Prophylaxis and treatment of infection

B. Affective domain (attitudes including communication and professionalism)

At the end of the course, the trainee should be able to understand and apply effectively the principles and practices pertaining to the following issues:

- Human ethics (including confidentiality, written informed consent, etc.)
- Animal ethics
- Counselling (pre- and post-test)
- Communication with patients and clinicians
- Professionalism and integrity

In view of this, the post graduate student should:

1. 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.
2. Always 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.
3. Develop communication skills to word reports and professional opinion as well as to interact with patients, relatives, peers and paramedical staff, and for effective teaching.

C. Psychomotor domain

At the end of the course, the student should acquire following skills and be able to do the following:

1. **Virological techniques:** At the end of the course the student should be able to perform independently, interpret, validate, provide troubleshooting and assure quality, for the following practical techniques:

- Isolation of viruses - Cell (tissue) culture;
 - Embryonated hen's egg inoculation (various routes)
 - Animal inoculation
- Staining and microscopy for viral inclusion bodies
- Electron microscopy
- Immunofluorescence
- Enzyme immunoassay/ ELISA
- Immunochromatographic tests (ICT) and other point-of-care (PoC) tests
- Immunoblotting/ Western blot assay
- Hemagglutination and haemadsorption
- Conventional serological assays (optional): Complement fixation test (CFT), hemagglutination inhibition, etc.
- Neutralization assay
- Nucleic acid extraction
- Nucleic acid amplification techniques (target amplification, e.g., PCR, real-time PCR, etc.; signal amplification)
- Amplicon detection techniques – Gel electrophoresis, hybridization, etc.
- Nucleic acid sequencing and sequence analysis

Syllabus

Course contents:

A. General Virology

- Principles of viral structure
- Viral taxonomy
- Replication of DNA and RNA viruses
- Innate responses to viral infections
- Adaptive immune response to viral agents
- Pathogenesis of viral infections
- Viral evolution
- Epidemiology of viral infections
- Bacteriophages
- Antiviral agents - mechanisms of action, PK/PD, clinical indications
- Antiviral resistance testing

- Immunization against viral diseases
- Diagnostic virology

B. Systemic Virology

(i) DNA viruses

- *Poxviridae* - Variola, Vaccinia, Molluscum contagiosum etc.
- *Herpesviridae* – HSV-1 and -2, HCMV, VZV, EBV etc.
- *Adenoviridae*
- *Papillomaviridae*
- *Polyomaviridae* - JCPyV, BKPyV etc.
- *Parvoviridae* - Parvovirus B19,
- *Hepadnaviridae* - HBV

(ii) RNA viruses

- *Picornaviridae* - Enterovirus (Poliovirus, Coxsackievirus etc.), Rhinovirus
- *Orthomyxoviridae* - Influenza
- *Paramyxoviridae* – Parainfluenza, Measles, Mumps, RSV, HPMV etc.
- *Reoviridae* - Rotavirus etc.
- *Caliciviridae* - Norovirus, Sapovirus etc.
- *Astroviridae*
- *Coronaviridae* – incl. SARSCoV, MERS CoV etc.
- *Rhabdoviridae* – Rabies, Chandipura virus etc.
- *Flaviviridae* - DENV, JE virus, KFD, Zika etc.
- *Togaviridae* - Chikungunya virus, Rubella virus
- *Bunyaviridae* - CCHF, Hanta etc.
- *Arenaviridae*
- *Filoviridae* - Marburg, Ebola virus etc.
- *Retroviridae* - HIV, HTLV 1&2

C. Clinical virology

- Viral infections of the skin - including pediatric exanthems and enanthems
- Viral respiratory infections - rhinitis, pharyngitis, croup, bronchiolitis, pneumonia etc.
- Viral CNS infections - encephalitis, meningitis, acute flaccid paralysis, etc.
- Viral gastroenteritis - viruses causing diarrhoea
- Viral hepatitis – e.g., due to HAV, HBV, HCV, HDV, HEV etc.

- Viral infections in the immunocompromised – e.g., in transplant recipients
- Congenital viral infections – e.g., due to HCMV, rubella, VZV, HIV etc.
- Sexually transmitted viral infections
- Ocular viral infections
- Oncogenic viral infections
- HIV/AIDS
- Prion diseases

D. Viral epidemiology

- Viral outbreak preparedness, investigation, prevention and control
- Emerging and re-emerging viruses
- Conventional and molecular epidemiology of viral infections
- Biosafety, containment and biosecurity for viruses (including standard precautions, use for personal protective equipment, hospital infection control and biomedical waste management)
- Vectors of viral diseases and their control

E. Viral immunology

- Immune responses to viral infections
- Immunopathogenesis of viral diseases
- Viral vaccines and vectors

F. Virological methods

- Techniques for viral diagnosis (as listed under the psychomotor domain)
- Principles of calibration and preventive maintenance of equipments

G. Research methodology

- As a part of the common training of all post-graduates

Psychomotor domain

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2. **Teaching skills/ Pedagogy:** At the end of the course, the trainee should be able to teach and train undergraduates, post-graduates and technical staff, the theoretical and practical aspects of clinical virology

TEACHING AND LEARNING METHODS

Formal Teaching:

1. **Journal Club:** 1 hour duration - Paper presentation/discussion - once per week.
2. **Seminar:** One seminar every week of one hour duration (afternoon)
3. **Lecture/discussion:** Lectures on newer topics by faculty, in place of seminar as per need.
4. **Case presentation:** Presentation of clinical cases/ case scenarios of viral infection. The post graduate students will present a clinical case for discussion before a faculty and discussion made pertaining to its laboratory infection and management.
5. **Combined Round/Grand Round:** These exercises are to be done for the hospital once every 2-3 months involving presentation of unusual or difficult cases of viral infections. Presentation of cases in clinical combined / grand rounds and clinical series/ research data for the benefit of all clinicians and other related disciplines
6. **Practical (laboratory bench-side) learning-teaching activities:** During the laboratory postings, this will be ongoing, where the postgraduate student will learn from senior colleagues and peers, as well as teach virology to the microbiology post-graduate students
7. **Microbiology undergraduate and post-graduate teaching programmes:** The postgraduate student will participate in conducting these programmes (theory classes and practical exercises)
8. **CMEs/Workshops:** The postgraduate student should attend at least 2 of these during their posting.
9. A postgraduate student of a postgraduate degree course in broad specialities/super specialities 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.

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11. **LOG BOOK**

The Postgraduate students shall maintain a log book of the work carried out by them and the training programme undergone during the period of training including details of laboratory exercises and work done independently by the D.M. trainees. The log book shall be checked and assessed periodically by the faculty members imparting the training, including the clinical and external postings (described below).

12. **Postings: Recommended schedule for three years training:**

The postgraduate student is required to work full time in the Virology Department, and participate in the patient care-related and academic and research activities as described below. The orientation during the first year at the institution would include participation in the undergraduate teaching programmes, during all activities pertaining to virology. The postgraduate student should also participate in all postgraduate (M.D. Microbiology) academic activities pertaining to virology throughout their tenure. These may be arranged in collaboration with another local institution running these courses with MCI approval, if they are not available within the same institution.

In addition to the above, during the tenure, the following learning activities should be completed:

- Core curriculum of research methodology, biostatistics, ethics and principles of epidemiology: 1 month
- **Viral diagnostic techniques** (3 modules of 6 months each/ year, as follows)
 - Viral serology: 2 months
 - Viral culture and identification (including cell culture): 2 months
 - Molecular diagnostic tests in virology: 2 months
- **Pathology posting:** Histopathology of viral infections: 1 month
- **Clinical virology postings** (total duration 6 months; during 2nd or 3rd year): During this period the postgraduate students would spend the mornings in the concerned wards and the afternoons in the virology laboratory (processing and following up the clinical samples collected/ received). In the wards, they should assist in ward rounds with senior colleagues in these specialities, attend calls/consultations and participate in the bedside clinical teaching sessions related to cases with suspected viral infections.
 - Medicine (1 month)
 - Pediatrics (especially for congenital infections, viral respiratory infections and gastroenteritis, exanthems, etc.) (1 month)

- Neurology (2 weeks to 1 month)
 - Transplant Medicine/ Nephrology (for opportunistic viral infections) (2 weeks to 1 month)
 - Oncology/ Haematology (for opportunistic viral infections) (2 weeks to 1 month)
 - Gastroenterology (especially for viral hepatitis) (2 weeks to 1 month)
 - HIV facilities: Counselling, ICTC, PPTCT and ART clinic (2 weeks)
 - Ophthalmology (ocular viral infections) (2 weeks)
 - Dermatology (2 weeks)
- External postings (arrangements must be formalized by the institution): 3rd year, first quarter with recognized national/international institutes in the concerned discipline.

13. The department should encourage e-learning activities

ASSESSMENT

FORMATIVE ASSESSMENT, ie., during the training

Formative assessment should be continual and should assess medical knowledge, patient care, procedural & academic skills, interpersonal skills, professionalism, self directed learning and ability to practice in the system.

Quarterly assessment during the DM training 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

The student to be assessed periodically as per categories listed in postgraduate student appraisal form (Annexure I).

SUMMATIVE ASSESSMENT, at the end of the course

The summative examination would be carried out as per the Rules given in **POSTGRADUATE MEDICAL EDUCATION REGULATIONS, 2000.**

The summative assessment examination shall include two heads:

- A. Theory examination.
- B. Practical, Clinical examination and Viva-voce.

Theory examination and Practical/Clinical, Viva-voce shall be separate heads of passing.

Theory examination shall comprise of four papers. Passing percentage shall be cumulatively 50% with minimum of 40% marks in each theory paper.

Practical /Clinical examination consisting of at least one long case, three short cases and viva-voce. Passing percentage shall be 50%.

Passing shall be separate for each head and failing shall be common, meaning thereby that clearance at theory and failure at practical / clinical shall amount to failure at Summative examination and vice versa.

The D.M. examination shall include: -

1. Outbreak investigation: The report of any one outbreak investigated, in coordination with the Department of Community Medicine, during the course is to be brought by each trainee at the time of the practical examination and to be assessed along with the practical skills.

2. Theory Examination:

There shall be four theory papers as follows:

Paper I: Basic sciences, as applied to the subject

Paper II: Subject specific (theoretical knowledge)

Paper III: Subject specific (application based)

Paper IV: Recent advances in the subject

3. Clinical / Practical and Oral: Practical examination shall consist of carrying out special investigative techniques for diagnosis and therapy. Oral examination shall be comprehensive enough to test the trainee's overall knowledge of the subject.

The practical examination should consist of the following and should be spread over three days.

1. Three practical exercises, based on clinical case scenarios, leading to one test each from viral serology, culture and molecular assays, respectively. This would cover all aspects of the test, from clinical differential diagnosis to actual performance of the test, its interpretation and quality assurance.
2. Short exercises/ objectively structured practical examination (OSPE) exercises/ slides/ spots from various sections of the subject, related to applied aspects.

Oral Examination: To be conducted at the end of the practical examination

Recommended Reading:

Books (latest edition):

- Reviews of Medical Microbiology by Jawetz
- Lennette's Laboratory Diagnosis of Viral Infections
- Clinical Virology Manual (ASM)
- Medical Virology by White and Fenner
- Mandell, Douglas and Bennett's Principles and Practice of Infectious Diseases
- Field's Virology
- Virology by Topley and Wilson

Journals

3-5 International and two national (indexed) journals.

**Postgraduate Student Appraisal Form
Para-Clinical Disciplines**

Name of the Department/Unit :

Name of the PG Student :

Period of Training : FROM.....TO.....

Sr. No.	PARTICULARS	Not Satisfactory			Satisfactory			More Than Satisfactory			Remarks
		1	2	3	4	5	6	7	8	9	
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										
6.	Thesis / Research work										
7.	Log Book Maintenance										

Publications Yes/ No

Remarks* _____

***REMARKS:** Any significant positive or negative attributes of a postgraduate student to be mentioned. For score less than 4 in any category, remediation must be suggested. Individual feedback to postgraduate student is strongly recommended.

SIGNATURE OF ASSESSEE

SIGNATURE OF CONSULTANT

SIGNATURE OF HOD