THE TAMIL NADU Dr. M.G.R. MEDICAL UNIVERSITY, CHENNAI-32

REGULATIONS OF THE UNIVERSITY

In exercise of the powers conferred by Section 44 of the Tamil Nadu Dr.M.G.R.Medical University, Chennai Act 1987 (Tamil Nadu Act 37 of 1987) the Standing Academic Board of the Tamil Nadu Dr.M.G.R.Medical University, Chennai hereby makes the following regulations:-

1 . SHORT TITLE AND COMMENCEMENT:-

These regulations shall be called as "THE REGULATIONS FOR THE MASTER OF SCIENCE (MOLECULAR VIROLOGY) OF THE TAMIL NADU Dr. MGR MEDICAL UNIVERSITY, CHENNAI".

They shall come into force from the academic year 2010-2011 onwards.

The Regulations and the Syllabus framed are subject to modification by the Standing Academic Board from time to time.

2. OBJECTIVES: -

1. To enable the students to have the understanding on the basics of the learning of Virology.
2. To impart the knowledge regarding the diagnostics clinical aspects and related implications of human viral disease and newer emerging viral infections including the viral mutan forms for emerging.
3. The identification is very essential for all the three line managements – primary, secondary and tertiary managements and hence the systematic training course for the graduates at the university level is found to be very essential and urgent need.

3. ELIGIBILITY CRITERIA:

B.Sc. Microbiology or Bio-Technology or B.Sc (life Sciences – viz. B.Sc Zoology, B.Sc Botany and B.Sc Biology) – (Regular Study)

The following Eligibility Criteria will be implemented from Academic 2016 – 2017 onwards.

B.Sc. Microbiology, B.Sc Bio-Chemistry, B.Sc. Botany / B.Sc. Zoology, Bio-Technology, B.Sc (MLT), M.Sc (MLT) and Any Bio Medical Sciences.

4. AGE LIMIT:

No Upper age limit for Admission

5. ELIGIBILITY CERTIFICATE:

Candidates who have passed any qualifying examination, as specified in Regulation No.3 above from any other Universities other than the Tamil Nadu Dr. M.G.R. Medical University before seeking admission to the affiliated institutions shall obtain an Eligibility Certificate from the University by remitting the prescribed fees along with the application form which shall be downloaded from the University website (web.tnmgrmu.ac.in).

6. REGISTRATION:

A Candidate admitted to M.SC MOLECULAR VIROLOGY DEGREE COURSE UNDER ALLIED HEALTH SCIENCES in any one of the affiliated institutions of this University shall Register his / her name with this university by submitting the prescribed application form for registration duly filled along with the prescribed fee and a declaration in the format to the Controller of Examinations of this University through the affiliated institution. The candidates name must be registered in the University within 3 Months from the date of his / her admission. The applications should have the date of admission to the said course.

7. COMMENCEMENT OF THE COURSE:

The course shall commence from 1st September of the academic year. Cut off date for Admission is 30th September every year.

8. MEDIUM OF INSTRUCTION:

English shall be the Medium of Instruction for all the Subjects of study and for examinations of the M..Sc MOLECULAR VIROLOGY DEGREE COURSE UNDER ALLIED HEALTH SCIENCES.

9.. CURRICULUM:

The Curriculum and the syllabus for the course shall be as prescribed in these regulations are subject to modifications by the Standing Academic Board from time to time.

10. DURATION OF THE COURSE:

The duration of certified study for the M..Sc MOLECULAR VIROLOGY DEGREE COURSE UNDER ALLIED HEALTH SCIENCES shall be TWO academic years including period of examination. The admitted candidates should complete the course within double the duration (4 years) from the date of joining the course.

11. CUT-OFF DATES FOR ADMISSION:

30th September of the academic year concerned for Admission.

The candidates admitted up to 30th September of the academic year shall be registered to take up the 1st year examination during October of the next year

- **All kinds of admission shall be completed on or before 30th September of the academic year. There shall not be any admission after 30th September even if seats are vacant.**

12. COMMENCEMENT OF THE EXAMINAITONS:

15th October / 15th April

If the date of commencement of examination falls on Saturdays / Sundays or declared Public Holidays, the examination shall begin on the next working day.

13. ATTENDANCE:

(a) No candidate shall be permitted to appear in any one of the parts of M.Sc MOLECULAR VIROLOGY COURSE UNDER ALLIED HEALTH SCIENCES Examinations unless he/she has attended the course in the subject for the prescribed period in an affiliated institution recognized by this University and produce the necessary certificate of study, attendance and satisfactory conduct from the Head of the institution.

(b) **A candidate is required to put in a minimum of 85% of attendance in both theory and practical separately in each subject before admission to the examinations. Term days 270 days, out of which 85% of attendance is mandatory.**

14. MARKS QUALIFYING FOR PASS:

1. **50% of marks in the University Theory Examinations**
2. **50% of marks in the Practical with Viva**
3. **50% of marks in the subject where internal evaluation alone is conducted.**
4. **50% of marks in aggregate in Theory, I.A & Oral taken together.**

15. MIGRATION/TRANSFER OF CANDIDATES

Request for Migration/Transfer of candidates during the course of study from one recognized Institution to another recognized Institution of this University or from other University shall not be granted under any circumstances.

16. REVALUATION / RETOTALLING OF ANSWER PAPERS:

Re - totaling / Revaluation of answer papers is not permitted.

17. RE-ADMISSION AFTER BREAK OF STUDY:

1. The course shall be completed within the period of Double the Duration from the date of admission.

2. The regulations for Re-admission are as per the University 's Common Regulation for Re-admission .

18. MAINTAINENCE OF LOG BOOK:

Every Post-graduate Diploma candidate shall maintain a record of skills he has acquired during the one year training period certified by the various Heads of Departments he has undergone training including outside the institution.

The candidates should also be required to participate in the teaching and training programme of post – graduate and intern-students..

In addition, the Head of the Department shall involve their post-graduateDegree Course candidates in Seminars, Journal Clubs, Group discussions and participation in Clinical.

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The Head of the Department shall scrutinize the Log Book once in every three months

Based on the curriculum, Log Book has to be maintained and presented at the time of discussion during University Examination should be submitted at the time of practical examination for the scrutiny of the Board of Examiners.

19. **CURRICULUM**

FIRST YEAR:

Paper - I	Basic Microbiology, Virology and Immunology
Paper - II	Epidemiology, Biostatistics and Entomology
Paper - III	Basic and Applied Viral Genetics

SECOND YEAR:

Paper - IV	Diagnostic Virology
Paper - V	Applied Epidemiology and Applied Entomology
Paper - VI	Recent Advances in Molecular Virology

Dissertation is to be submitted **THREE** months before the final year examination.

20. SCHEME OF EXAMINATION:

FIRST YEAR

M.Sc., MOLECULAR VIROLOGY (TWO YEARS)

FIRST YEAR	Theory Paper	IA		Theory		Practicals	
		Max	Min	Max	Min	Max	Min
PAPER I	Basic Microbiology, Virology and Immunology	50	25	100	50	100	50
PAPER II	Epidemiology, Biostatistics and Entomology	50	25	100	50	100	50
PAPER III	Basic and Applied Viral Genetics	50	25	100	50	100	50

SECOND YEAR

SECOND YEAR	Theory Paper	IA		Theory		Practicals	
		Max	Min	Max	Min	Max	Min
PAPER I	Diagnostic Virology	50	25	100	50	100	50
PAPER II	Applied Epidemiology and Applied Entomology	50	25	100	50	100	50
PAPER III	Recent Advances in Molecular Virology	50	25	100	50	100	50

Evaluation of Dissertation	200
Viva/Presentation	50
IA	50
Total	300
Passing Minimum	150

It was resolved XXXX111 S.A.B. Dated 19.12.2011.

21. SUBMISSION OF PRACTICAL RECORD BOOKS :-

At the time of Practical Examination, each candidate shall submit to the Examiners his / her Practical Record Books duly certified by the Head of the Department as a bonafide record of the work done by the candidate.

The concerned Head of the Department shall evaluate the Practical Record (Internal Assessment) and the Practical Record shall be presented to the Examiner at the time of examinations at the end of each year.

22. QUESTION PAPER PATTERN :-

Theory Essay - 2 x 20 Marks = 40 Marks

Short Notes - 10 x 6 Marks = 60 Marks

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100 Marks

Requirement for pass: 50% in each paper

23. DISSERTATION:

a) All candidates admitted to undergo M.Sc Molecular Virology course shall be assigned a topic for dissertation / Thesis by the head of the concerned Unit and the title of the topics assigned to the candidates be intimated to the Controller

of Examinations of this University by the Head of the Department through the Head of the Institution before the end of 1st year of the course.

.b) The dissertation / thesis shall be a bound volume of a minimum of 50 pages and not exceeding 75 pages of typed matter (Double line spacing and on one side only) excluding certification, acknowledgments, annexure and Bibliography colour of wrapper should be in Light Green

c) 4 copies of dissertation shall be submitted three (3) months prior to the commencement of the theory examinations on the prescribed date to the Controller of Examinations of this University.

d) Two copies are to be submitted as an electronic version of the entire dissertation in a standard C.D. format by mentioning the details and technicalities used in the C.D. Format.

e) **For Dissertation Max Marks 200, Viva-voce on Dissertation / Presentation Marks 50 and IA 50 – Total 300 Minimum mark to pass 150.**

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SYLLABUS - M.Sc MOLECULAR VIROLOGY, FIRST YEAR

Theory

Paper 1: Basic- Microbiology, Virology and Immunology

Basic Microbiology

1. Microbiology
2. Sterilization and disinfection
3. Microscopy principles and applications

Basic Virology

1. Introduction

History and principles of virology, virus taxonomy, introduction to replication strategies.

Virus structure and morphology.

Infrastructure

Principles of bio-safety, contaminant facilities, maintenance and handling of laboratory animals and requirements of virological laboratory.

2. Virological Methods

Cultivation and purification of viruses

In vivo and in vitro systems for virus growth, estimation of yields, methods for purification of viruses with special emphasis on ultracentrifugation methods.

Diagnostic Methods

Immunodiagnosis, haemagglutination and haemagglutination - inbibition tests, Complement Fixation, Neutralisation, Western Blot, RIPA, flowcytometry and immunochemistry.

a) Nucleic acid based diagnosis

Nucleic acid hybridization, polymerase chain reaction, microarray and nucleotide sequencing.

b) Microscopic techniques

Fluorescence, confocal and electron microscopic techniques—principles and applications.

c) Analytical techniques

Electrophoresis, chromatography, membrane filtration, NMR, X-ray Crystallography.

3. Tissue Culture and Cell Biology

Cell structure

Structure and function of cellular organelles, cytoskeleton, cell division, biomembranes, cell adhesion and junctions.

Macromolecules

Structure and function of DNA, RNA, proteins, carbohydrates and lipids.

Molecular Biology

Replication of DNA, transcription and post-transcriptional modifications, protein biosynthesis, post-translational modifications.

Cell signaling

Signal transduction pathways

Tissue Culture methods

In-vitro cultures-primary, diploid and established cell lines, organ culture, cell types in culture. Cell environment- Nutritional requirements, substrates. Cell characterization- Karyotyping, growth rates, isoenzymes and differentiation- normal and transformed cells. Large scale production-suspension cultures, microcarriers, hollow fiber reactors, etc.

Media, MEM, cell line maintenance, cultivation of viruses and interpretation of CPE.

Developmental Biology

Cell growth- Hyperplasia, hypertrophy, development and differentiation-cell lineages, growth and differentiation factors. Stem cells- adult and embryonic.

<u>Basic Immunology</u>

1. Introduction to Immunology

Introduction and history of immunology, primary and secondary organs of immune system, cells of the immune system.

Innate immunity

Innate immune response, complement system.

Immunoglobulins

Antibody structure and function, Immunoglobulin classes.

Antigen recognition

Antibody diversity, major histocompatibility complex, ontogeny, positive and negative selection.

Acquired immune response

Antigen presenting cells, T cell stimulation, hypersensitivity.

Antiviral Immune response and hybridoma technology

Immune responses in various viral infections, generation of monoclonal antibodies- principles and applications.

2. Advanced Immunology ,Antigen Presentation

Secondary signaling, co-stimulation, cell signaling in immune response. DC activation, B cells as APC, experimental models in APC.

Molecular Immunology

Peptide epitopes T cell B cell antigenic properties, prediction of T and B cell epitopes, chimeric peptides, polytype vaccines Major Histocompatibility complex-1, polymorphism.

Effectors Mechanisms

Mucosal immunity, peyer's patches, gut barriers oral immunization oral tolerance cytotoxic response, ADCC, NK cells, CTL, Th, T reg, immunoregulation, anergy, tolerance, anti idiotype, mechanisms of antiviral innate immune response, mechanisms of antiviral immune response, persistent infection (EBV, LCMV), experimental models in immuno-pathogenesis.

Immunological Diseases

Autoimmunity-mechanisms, altered antigens, systemic lupus erythematosus, Graves disease, rheumatoid arthritis,, myasthenia gravis, multiple sclerosis, animal models of autoimmunity, transplantation immunology, GvH, immunodeficiency: phagocytic, humoral, CMI, combined HLA association with disease.

Paper 2: Epidemiology, Biostatistics and Entomology

Basic Epidemiology and Statistics

Introduction

Historical aspects and evolution of epidemiology, definitions and concepts in Epidemiology.

Approaches in Epidemiology

Descriptive and analytical epidemiology, disease burden, natural history of disease and measure of risk and death.

Study design and sampling

Sample size estimation and introduction to study design in epidemiological investigations.

Fundamentals in Biostatistics

Introduction, types of data, tabular and graphical presentation of data.

Measures of location, dispersion and correlation

Measures of central tendency. Mean, mode, median, GM, HM, quartiles. Measures of Dispersion- range, standard deviation, variance, coefficient of variation.

Probability and Statistical Interference

Concept and probability distribution. Normal distribution- density curves, applications and statistical tables. Concept of significance tests, parametric and non- parametric tests, standard error and confidence intervals.

Medical Entomology

Insect Morphology, Collection and Preservation

Introduction to general entomology, insect morphology and classification of insects and other arthropods of medical importance and their structures and functions.

Methods of collecting these insects and arthropods, their preservation, maintenance and transportation.

Biology and ecology of mosquitoes

Biology and life history of Aedes, Culex, and Anopheles, their behavior and ecology with special reference to Dengue, Chikungunya, Japanese Encephalitis, and West Nile.

Biology and ecology of other blood sucking insects, Ticks, Mites

Biology, morphology and disease relationship of sandflies (Sandfly fever and Chandipura).
Biology and morphology of Fleas, Lice, Culicoides.
Biology, ecology, life history of ticks with special reference to Kyasanur Forest Diease (KFD).
Biology and morphology of mites.

Paper 3: Basic and Applied Viral Genetics

<u>Gene Regulation and Recombinant DNA based technology</u>

Prokaryotic gene expression
Polymerase- promoter interactions, control of transcription initiation and termination

Eukaryotic gene expression
Chromosomes, chromatin structure, regulatory elements, splicing and RNA processing.

<u>Virus Replication</u>

RNA Viruses:
General strategies, replication of plus stranded RNA virus (polio), negative strand RNA viruses (VSV and Influenza)

Other RNA Viruses
Replication of double stranded RNA virus (Rota), ambisense RNA (LCM) and retroviruses (HIV and HTLV).

DNA viruses
Replication of double stranded DNA viruses (SV40, Pox), ssDNA Virus (AAV)

Miscellaneous
Prion proteins

SYLLABUS - M.Sc MOLECULAR & DIAGNOSTIC VIROLOGY, SECOND YEAR

Theory

Paper 4: Diagnostic Virology

Perspectives of Viral Diarrhoea

Clinical course, disease burden, risk factors, epidemiology, prevention, and treatment. Rotavirus diversity, emerging strains, immunopathogenesis and vaccines under development.
Other viruses associated with diarrhea and gastroenteritis: Adenoviruses, Astroviruses, Norwalk and Sapporo-like viruses and Enteroviruses. Other Enteroviral diseases.

Viral Cancers

Role of papilloma HIV, Epstein Barr virus, HTLV and herpes in pathogenesis of cancers, diagnosis, prevention

Recommended books

1. Fields virology, 4thEd, Vol 2 Ed by David M Knipe, and Peter M Howley Chapters: 24, 28, 34,54,55,67 and 68.
2. Gastroenteritis viruses, Vol.238.Novartis Foundation Symposium, Mary Estes, Latest edition/Pub.Date:June 2001
3. Viral Infections of the Gastrointestinal Tract,Vol.10.Albert Z.Kalpikian,Z.KalpikianA.2nded.,rev.and expanded.Latest edition/Pub.Date:March 1994
4. Human Enterovirus Infections, HarleyA.Rotbart (Editor),American Society Microbiology,January,1995
5. Viral Gastroenteritis, Edited by U.Desselberger,J.Gray.Elsevier. Perspectives in Medical Virology. Series Editor:ArieJ.Zuckerman, UK Isa K.Mushahwar.2003

6. Human Papilloma Viruses. Edited by D.J.McCance. Elsevier Perspectives in Medical Virology. Series editor:ArieJ.Zuckerman, UK Isa K.Mushahwar.2002
7. Viruses and Liver cancer. Edited by E.Tabor.Elsevier Perspectives in Medical Virology. Series Editor:ArieJ.Zuckerman, UK Isa K.Mushahwar.2002
8. Viruses, Cell Transformation, and Cancer. Edited by J.A.Grand. Elsevier Perspectives in Medical Virology. Series Editor:ArieJ.Zuckerman, UK Isa K.Mushahwar.2001

Respiratory diseases of Viral Etiology

Origin and evolution of viral respiratory diseases

History, clinical features, epidemiology of influenza, RSV and other respiratory diseases

Biology of respiratory viruses

Biology and pathogenesis of SARS, human rhino virus and Corona virus etc,

Diagnostics

Differential diagnosis of different respiratory diseases.

Vaccines: Vaccines against different viral respiratory diseases

Recommended Books

1. Viral Infections of Respiratory tract by Raphael Dolin and Peter Wright. Mercel Dekker
2. Clinical Virology Manual Ed:Specter,RLHodinka, SA Young.,ASM Press
3. Influenza. Edited by C.W.Potter .Elsevier Perspectives In Medical Virology.Series Editor:ArieJ.Zuckerman, UK Isa K.Mushahwar.2002

Exanthematous Diseases of Viral Aetiology

Measles and SSPE

Clinical features, disease burden, case definition and associated risk factor, strategies for prevention and treatment, biology and immunopathogenesis

Rubella, CRS, Mumps and Poxviruses

Clinical features, disease burden of Rubella, CRS and mumps, case definition and risk factors. Preventive and therapeutic modalities. Pathogenesis of disease. Clinical aspects of Parvovirus B-19

Pox diseases

Common features of viral pox diseases and case definitions. Paraspecific immunity due to pox vaccination, eradication and control programs

Recommended Books

1. Krugman's infectious diseases of children by Saul Krugman
2. Immunization Safety Review: Vaccines and Austim Immunization Safety Review Committee (Editor) the National Academies Press, USA.
3. Measles and Rubella. Alvin Silverstein,ViginiaB.Silverstein,Virginia Silverstein. July 1997
4. Immunization Safety Review: Measles-Mumps-Rubella Vaccine and Autism.KathleenR.Stratton,Alicia R.Gable,Padma Shetty. June 2001

Viral Haemorrhagic Fevers

Clinical course of viral infections

Common clinical features of haemorrhagic fevers, History and Disease Burden, risk factors and geographical distribution of viruses associated with haemorrhagic fevers and their impact on global health.

Clinical samples required, choice of laboratory diagnostic tests and their interpretation for differential diagnosis.

Dengue and DHF

Virus replication strategy, Pathogenesis, Prevention and treatment of Dengue
Role of humoral and cell mediated immunity and viral factors in development of DHF, differential diagnosis of DF and DHF on the basis of clinical symptoms.

Haemorrhagic manifestations caused by other viruses

Virus replication strategy, Pathogenesis, Prevention and treatment of Yellow fever, KFD, Chikungunya and Ebola. Development of killed KFD vaccine

Recommended Books

1. CRC Handbook of Viral and Rickettsial Haemorrhagic fever by James H.S.Gear
2. Viral Haemorrhagic fevers by C.R.Howard.Elsevier. Perspectives in Medical Virology.Series Editor:ArieJ.Zuckerman,UK Isa K.Mushahwar.2004
3. Dengue and Dengue Haemorrhagic Fever, D.J.Gubler(Editor),G.Kuno(Editor), Latest Edition/Pub.Date: January 1998
4. Bioterrorism Haemorrhagic viruses Manual: For Healthcare Workers and Public Latest edition/Pub.Date: April 2004.

HIV/AIDS

Natural history of AIDS

Global epidemiology of HIV, epidemiology of HIV in India. Sexually transmitted diseases and their relation with HIV, opportunistic infections in HIV infected individuals. Social and behavioral aspects of prevention and control. Natural history.

Biology of HIV and its detection

Structure and replication of HIV, immunopathogenesis of infection, laboratory diagnosis of HIV infection, HIV isolation, characterization and viral estimation.

Preventive and therapeutic approaches

Recommended Books

1. HIV and AIDS by Michael A.Palladino, David Wessner. Latest edition/Pub.Date:March2005 Publisher: Benjamin Cummings
2. HIV Libman, Harvey J.Makadon. Royal Society of Medicine Press Ltd.2006
3. Textbook of AIDS Medicine. Thomas C.Merigan, John G.Bartlett (Editor), Dani Bolognesi (Editor). Latest edition/Pub.Date: September 1998. Publisher: Lippincott Williams & Wilkins.
4. AIDS Therapy. Raphael Dolin, Henry Masur (Editor), MichaelS.Saag (Editor).Latest edition/Pub. Date: November 2002.
5. API Textbook Chapter by DA Gadkari

Viral Encephalitis

Overview

Viral Encephalitis, encephalopathy and meningitis clinical symptoms and causative agents, treatment modalities, transmission, spread of the outbreak in relation to causative agent.
Laboratory diagnosis of viral encephalitic agents, basic principles, preferred methods and problems

JE, WN CHP

Japanese encephalitis and West Nile viral infections, endemic areas, disease burden, seasonality, role of non human hosts, genotypes vaccines Chandipura encephalitis, endemic areas, disease burden, seasonality, role of non human hosts, genotypes, other rhabdoviral neurotropic agent

Other viruses

Encephalitis/encephalopathy caused by measles virus.

Pathogenesis

Routes and modalities of infections of the nervous tissue, blood brain barrier, factors affecting the neurovirulence, Animal models and vaccine potency testing.

Recommended Books

1. Viral Encephalitis in Humans. John Booss (Editor), Margaret M. Esin, Margaret Esiri (Editor). Latest Edition / Pub Date: June 2003. Publisher: ASM Press.
2. Encephalitis Protection. Quingshan Liang. Latest Edition/ Pub Date: January 2004. Publisher Cozy Graphics Corporation

Viral Hepatitis

Clinical presentation & epidemiology of viral hepatitis

Physiology of Jaundice, clinical features and differential diagnosis, presentations of hepatitis caused by different hepatitis viruses.

Structure & genomic organization

Structure & genomic organization, replication, genotypes, serotypes of HAV, HBV, HCV, & HEV. Mutations in hepatitis viruses.

Diagnostics

Serological and molecular diagnosis of different hepatitis viruses.

Immunopathogenesis

Immunopathogenesis of different hepatitis viruses.

Prevention & therapeutic approaches

Historical aspects, types of hepatitis vaccines, vaccines presently used & vaccines of the future. Vaccination as preventive measure in public health. Therapeutic possibilities of the present and future.

Recommended Books

1. Fields Virology, Volume 2, 4th edition : (2001)
2. Clinical Virology, Second edition (Richmans Hayden)
3. Hepatitis Viruses (Japan medical research forum)
4. Viral Hepatitis and liver disease. A.J.Zuckerman

5. Viral infection oh humans (S.Svans& A Kaslow)Viral hepatitis molecular biology diagnosis and control, By Isa Mushahwar. Elsevier Perspectives in medical virology. Series Editor: Arie.J.Zuckerman, Uk Isa K. Mushahwar. 2003

Paper 5: Applied Epidemiology & Applied Entomology

Applied Epidemiology

Public Health Surveillance

Types and methods of public health and infectious disease surveillance, establishing surveillance system.

Analytical Epidemiology

Case control and cohort studies

Outbreak Investigations

Needs and steps to be taken for outbreak investigations, collaboration with state and national health authorities.

Recommended Books

1. Epidemiology: An Introduction. Kenneth J.J.Rothman. Latest Edition/Pub Date: May 2002. Publisher: Oxford University Press.
2. Epidemiology: Leon Gordis, Latest Edition/ Pub Date: November 2004. Publisher: Elsevier Health Sciences.
3. Diseases and Human Evolution: Ethne Barnes. Latest Edition/ Pub Date: March 2005. Publisher: University of New Mexico Press.

4. Epidemiology: Beyond the Basics- F. Javier Nieto, MoysesSzklo. Latest Edition/ Pub Date: November 2003. Publisher: Jones & Bartlett Publishers, Inc.
5. Basic and clinical Biostatistics- Beth Dawson, Robert.G.Trapp, Robert Trapp. Latest Edition/ Pub Date: March 2004.
6. Discovering Statistics using SPSS- Andy Field. Latest Edition/Pub Date: April 2005. Publisher: SAGE Publications.

Applied Entomology

Vector Virus Relationship

Virus dissemination &mechanism of virus transmission in vectors, natural cycle, maintenance of viruses in nature, basis of vector competence, mechanical transmission, virus dissemination, susceptibility- intrinsic and extrinsic factors. Xenodiagnosis- methods and applications.

Epizootiology of Vector Borne Viral Diseases

Formation of natural foci of diseases, spatial structure and geographic variations. Animal movements, host preferences of vectors and their influence, influence of man in natural locality, natural cycles and population biology of vector borne pathogens, GIS in vector borne viral diseases.

Vector Control

Various control strategies and environmental management. Control in urban settings.
Control at aquatic stages, adult population, personal protection and insecticide resistance mechanism and control dynamics.

Molecular Entomology

Mosquito Genetics
Transgenic vectors

Molecular characterization of vectors: Species complexes, molecular approach to Taxonomy, proteins as Taxonomic markers, biochemical and molecular Taxonomy for detection of intra-species variation.

Recommended books

1. GordenRM,LavoipierreMMJ(1962) Entomology for students of Medicine.Blackwell scientific publ.
2. ServicemMW(1996) Medical entomology for students.Chapman and Hall
3. KettleD.S(1984) Medical and veterinary entomology CAB international
4. Richard and DaviesImm's general Text book of Entomology,Vol1&2 Chapman and Hall
5. Roy DN & Brown AWA(1970) Entomology (Medical&Veterinary)Bangalore printing &publishing co.
6. BatesM(1949) Natural History of mosquitoes The Macmillan Co
7. BakerRH and WhartonR (1952) Introduction to Acarology the MacmillanCo

Paper 6: Recent advances in Molecular Virology

<u>Bioinformatics</u>

Introduction and Biological Databases

Nucleic Acids, proteins, genomes- Structure data bases, search engines, sequence data forms and submission tools, scoring matrices for sequence alignments, algorithms- pairwise sequence alignments, database similarity searches- BLAST, FASTA

Methods for sequence analysis

Multiple sequence alignment, phylogenetic analysis and tree building methods, motif searches, epitope prediction, data mining tools and applications, promoter and gene prediction, comparative analysis.

Recommended Books

1. Introduction to Bioinformatics- Lesk.A
2. Introduction to Bioinformatics- Attwood
3. Instant notes in Bioinformatics- Westhead, Parish &Twyman
4. Bioinformatics: A practical guide to the analysis of genes and proteins-Baxevanis, Qoellette, John & Sons, NY

Advanced Molecular Techniques

1. RFLP
2. Sequencing-basic
3. Sequencing-methodology and its application
4. Microarrays

Introduction to Nano Technology

Overview / Application

Antivirals and viral vaccines

Viral Vaccines

Conventional vaccines- killed and attenuated, modern vaccines- recombinant proteins, subunits, DNA vaccines, peptides, immune-modulators (cytokines), vaccine delivery and adjuvants, large scale manufacturing- QA/QC issues

Antivirals

Interferons, designing and screening of antivirals, mechanism of action, antiviral libraries, antiretrovirals- mechanism of action and drug resistance.

Modern approaches of virus control

Anti-sense RNA, siRNA, ribozymes.
Assignments, group discussions and presentations.

Recommended books

1. Antiviral Agents, Vaccines and immunotherapies. Stephen K. Tyring.

2. Latest Edition/ Pub Date: Oct 2004. Publisher: Marcel Dekker.

3. Animal Drug Discovery for Emerging diseases and Bioterrorism Threats. Paul F. Torrence (Editor). Latest Edition/ Pub Date: July 2005. Publisher: wiley, John & Sons, Incorporated.

4. Chimeric Virus- like particles as vaccines. Wolfram H. Gerlich (Editor), Deltev H. Krueger (Editor), Rainer Ulrich (Editor), Latest Edition/ Pub Date: Nov 1996. Publisher: Karger. S Inc
5. Vaccines. Stanley A. Plotkin, Walter A. Orenstein. Latest Edition/ Pub Date: Sep 2003. Publisher: Elsevier health Sciences.

M.Sc.,(Molecular Virology)

Practical – First Year

Paper I: Basic Microbiology, Virology & Immunology

1. Glassware Decontamination, Washing, Sterilization, Packing & Sterile Handling
2. Media & Reagents Preparation, Sterility Checks
3. Sample Collection & Processing
    a. Stool
    b. Throat & Nasal Swabs
    c. Urine
4. Preparation, Maintenance of Cell Cultures & Viral Inoculation
5. Freezing & Revival of Cell Lines
6. Estimation of TCID50
7. Routes of Inoculations in Embryonated Eggs
8. Agar Gel Diffusion
9. Lymphocyte Separation
10. ELISA
11. IFA
12. Serodiagnosis of HCV
13. Serodiagnosis of HBV
14. Serodiagnosis of HIV

Paper II: Epidemiology, Biostatistics & Entomology

1. Graphical Presentation of Data
2. Presentation of Data: Mean, Deviation,Std.Error & ANOVA
3. Epidemiological Exercise – Study Design
4. Water Sample Analysis(As Breeding Sources of Vector Mosquitoes)
5. Feeding Patterns of Mosquitoes & Houseflies & Mouthparts Dissection
6. Mosquito Collection & Taxonomy
7. Taxonomy of Ticks & Sandflies
8. Processing of Arthropods
9. Biochemical Analysis of Insects(Protein & Sugar)
10. Thin Layer Chromatography
11. Biostatistics(Sampling Technique & Sample Size)

Paper III: Basic & Applied Viral Genetics

1. Nucleic Acid Extraction
2. Detection of DNA & RNA
3. Estimation of DNA & RNA
4. PCR
5. RT-PCR
6. Real Time PCR
7. Agarose Gel Electrophoresis
8. PAGE
9. Identification of PCR Amplified Products of Viral Antigens
10. Rt-PCR-Arbovirus
11. RT-PCR-Influenza

M.Sc.,(Molecular Virology) – Second Year

Paper IV: Diagnostic Virology

1. HAI
2. HA
3. IgM CAPTURE ELISA Chikungunya
4. IgM CAPTURE ELISA Dengue
5. Rubella Diagnosis
6. Measles Diagnosis
7. Neutralization Test
8. MTT Assay
9. Cell Toxicity Determination
10. HIV Diagnosis
11. Lymphocyte Separation
12. Serum ALT, Urine Bile Salt & Bile Pigments
13. Immuno Florescence Assay for Influenza
14. Animal Experiments – Mice, Guinea Pig, Rabbit & Goose.

Paper V: Applied Epidemiology & Applied Entomology

1. MS EXCEL 2000
2. Statistical Softwares SPSS
3. Mosquitoe Inoculation & IFA
4. Dusk & Dawn Collection
5. Dissection of Mosquitoes – Salivary Glands & Midguts
6. Insecticide Bioassays (Larval & Adult)

7. Repellent Evaluation
8. Epidemiological Exercise – Surveillance
9. Protein Analysis
10. Risk measures in Epidemiology

Paper VI: Recent Advances in Molecular Virology

1. Biological Data Banks & Bio-informatics
2. NCBI,IVR, SWISSPROT & GISAID
3. Sequence Alignment Tools
4. Multiple Alignment
5. BLAST
6. Nucleic Acid to Translation
7. Sequence Assembly
8. Phylogeny Analysis
9. Softwares: Mega & Bio Edit

SYLLABUS

Epidemiology, Biostatistics and Medical Ethics

UNIT I: Epidemiology

Introduction: Historical aspects and evolution of epidemiology, definitions and concepts in Epidemiology.
Approaches in epidemiology: Descriptive and analytical epidemiology, disease burden, natural history of diseases and measures of risk and death.
Study design and sampling: Sample size estimation and introduction to study design in epidemiological investigations.

UNIT II: Biostatistics

Fundamentals of biostatistics: Introduction, types of data, tabular and graphical presentation of data. Measures of location, dispersion and correlation: Measures of central tendency. Mean, mode, median, GM, HM, quartiles Measures of dispersion—ra nge, standard deviation, variance, coefficient of variation.
Probability and statistical inference: Concept and probability distribution. Normal distribution—density curves, applications and statistical tables. Concept of significance tests, parametric and nonparametric tests, standard error and confidence intervals.
Inferential statistics: Probability and distributions – Poisson, Binomial a nd Normal distribution – Chi-square test – Hypothesis test - Student's t-tes t – Correlation and Regression – ANOVA.

UNIT III: Medical Ethics

Bioethics and Medical ethics: Historical perspectives & Introduction to Bioethics, Nuremberg Code, Declaration of Helsinki, Principle of essentiality, informed consent, confidentiality, minimisation of risk, accountability and responsibility. Ethics of clinical trials: Drug trials, vaccine trials, Clinical trials with medical devices/surgical procedures/radioactive materials, Research in transplantation and stem cell therapy. Regulatory framework and guidelines for conduction of human research: Review processes, Institutional ethical committees, composition of committees, review procedures, WHO, UNESCO and ICMR guidelines.

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Epidemiology. Leon Gordis. Latest edition / Pub. Date: November 2004. Publisher: Elsevier Health Sciences.

Diseases and Human Evolution. Ethne Barnes. Latest edition / Latest edition / Pub. Date: March 2005. Publisher: University of New Mexico Press.

4. Epidemiology: Beyond the Basics. F. Javier Nieto, Moyses Szklo. Latest edition / Pub. Date: November 2003. Publisher: Jones & Bartlett Publishers, Inc.
5. Basic and Clinical Biostatistics. Beth Dawson, Robert G. Trapp, Robert Trapp. Latest edition / Pub. Date: March 2004.
6. Discovering Statistics Using SPSS. Andy Field. Latest edition / Pub. Date: April 2005. Publisher: SAGE Publications.
7.Arora PN & Malhon PK (1996). Biostatistics Imalaya Publishing House, Mumbai.
Sokal & Rohif (1973). Introduction to Biostatistics, Toppan Co. Japan.
Stanton A & Clantz, Primer of Biostatistics — T he McGraw Hill Inc., New York. 10.Government of India. Good Clinical Practices for Clinical Research in India. New Delhi: 2001
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12. United Nations Educational, Scientific and Cultural Organisation (UNESCO). Universal Declaration on Bioethics and Human Rights. Paris; 2005

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