4.1 CLINICAL MICROBIOLOGY- IV

L	T	P
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RATIONALE

The students undergoing training of medical laboratory technology learn the techniques of collection of samples, their processing and identification of various fungal infections and diagnosis of microbial infections by serological methods. In addition to the above, students are given training in the use of safety measures while handling infected materials. The training is aimed to make the students competent to isolate and identify fungi and do serological tests for various microbial infections.

DETAILED CONTENTS

Theory

1. General characteristics and classification of medically important fungi (2 hrs)

2. Culture media for fungi (4 hrs)

   - SDA (Sabouraud's dextrose agar) with and without antibiotics
   - CMA (Corn meal agar)

3. Staining of fungi (3 hrs)

   - KOH preparation
   - LCB (Lactophenol cotton blue)
   - India ink

4. Cultivation of Fungi (5 hrs)

   - Medically important fungi - Candida, Cryptococci, Dermatophytes
   - Laboratory contaminant and Penicillum, Aspergillus, Rhizopus, Mucor

5. Immunity- Innate and Acquired (6 hrs)

6. Anigens - definition, types and properties (4 hrs)

7. Antibodies - definition, types and properties (4 hrs)

8. Antigen – Antibody reactions (Principle and applications of agglutination, precipitation and flocculation reactions) (6 hrs)

9. Serological tests – (Principle, techniques and interpretation) (6 hrs)

- Widal
- Rose waller
- Anti streptolysin
- C-reactive protein
- Rheumtoid factor
- VDRL

10. Rapid and advanced diagnostic techniques (6 hrs)
- Latex agglutination
- Co-agglutination
- Immuno-electrophoresis
- ELISA

11. Quality control in microbiology (2 hrs)

LIST OF PRACTICALS

1. Preparation of different culutre media used in mycology - Sabouraud's dextrose agar with and without antibiotics, Corn meal agar

2. To perform staining techniques – KOH, LCB, India Ink

3. To study characteristics of common laboratory fungal contaminants

4. Collection and processing of samples for diagnosis of fungal infections skin, hair, and nail (demonstration for body fluids and secretion)

5. To perform serological tests

- Widal test (Both slide and tube method)
- ASO (slide and tube method)
- CRP (slide and tube method)
- Rh factor (slide method)

6. - VDRL Test (slide and tube method)
- HIV Test
- HbSAg (strip method)

7. Demonstration of ELISA – pregnancy test

RECOMMENDED BOOKS

1. Medical Laboratory Technology by Kanai Lal Mukherjee; Tata McGraw Hill Publishers, New Delhi

2. An introduction to Medical Laboratory Technology by FJ Baker; Butterworth Heinemann Oxford

3. Parasitology by KD Chatterjee; Chatterjee Medical Publishers, Kolkatta

4. Textbook of Microbiology by Ananthanarayan and Panikar; Orient Longman, Hyderabad

5. Practical Book of Medical Microbiology by Satish Gupta; JP Brothers, New Delhi

6. Text Book of Medical Microbilogy by Satish Gupta; JP Brothers, New Delhi

7. Medical Laboratory Manual for Tropical Countries Vol. I and II by Monica Cheesberg; Cambridge University Press; UK

8. Text Book of Medical Laboratory Technology by Praful B Godkar; Bhalani Publishing House; Mumbai

9. Medical Lab Science Theory and Practice by J Ochei and A Kolhatkar

4.2 CLINICAL HAEMATOLOGY - IV

L	T	P
3	-	4

RATIONALE

This subject aims to enable the students to carry out routine clinical laboratory investigation (blood, urine etc). He/she should be able to provide technical help for selected sophisticated hematological techniques with adequate knowledge of various principles. The training in laboratory safety is also provided.

DETAILED CONTENTS

Theory

1. Introduction to normal haemostasis (18 hrs)

   1.1 Theories of blood coagulation
   1.2 Platelets and their role in haemostatis
   1.3 Bleeding disorders and related diseases
   1.4 Principles and methods of prothrombin time, prothromobin time index (PTI)/INR, Partial Thromboplastin time with Kaolin (PTTK) – bleeding time (BT), Hess test, clotting time (CT), and clot retraction test (CRT)

2. Bone – marrow (9 hrs)

   2.1 Composition and function of bone-marrow
   2.2 Collection of bone-marrow
   2.3 Preparation, staining and examination of bone-marrow smears
   2.4 Iron staining (Perls' reaction)
   2.5 Significance of bone-marrow examination

3. Lukaemia (8 hrs)

   3.1 Introduction to theory
   3.2 Classification (FAB)
   3.3 Laboratory diagnosis of various leukaemias

4. LE Cell phenomenon (5 hrs)

   4.1 Phenomenon of LE cell, its differentiation from tart cell
   4.2 Demonstration of LE cell by various methods
   4.3 Clinical importance

5. Processing of biological fluids and interpretation of results (8 hrs)
   Such as semen, CSF, pleural and ascitic fluids, urine etc

LIST OF PRACTICALS

1. Determination of bleeding time
2. Determination of clotting time
3. Determination of prothrombin time, index and INR (Internationa Normalised Ratio)
4. Determination of Partial thromboplastin time with kaolin
5. Demonstration of Hess test
6. Performance of Clot retraction test
7. Demonstration of LE Cell
8. Performance of Semen analysis and its interpretation
9. Cytological examination of biological fluids

RECOMMENDED BOOKS

1. Medical Laboratory Technology Vol. 1 by KL Mukherjee; Tata McGraw Hill Publishing Company, New Delhi
2. An Introduction to Medical Laboratory Technology by FJ Baker; Butterworths Heinenmann, Oxford
3. Medical Laboratory Manual for Tropical Countries by Monica Cheesberg; Cambridge University Press; UK
4. Textbook of Medical Laboratory Technology by Praful B Godkar; Bhalani Publishing House, Mumbai
5. Practical Haematology by J.V Decie; ELBS with Churchill Living Stone, UK
6. Medical Laboratory Science Theory and Practical y JO Chei and Kolhatkar Tata McGraw Hill Publishing Company Ltd., New Delhi 2000 Ed

4.3 CLINICAL BIOCHEMISTRY- IV

L	T	P
3	-	4

RATIONALE

The students are imparted basic training of theoretical and practical aspects in the field of clinical biochemistry. The students are made to learn the technique of collection of clinical samples and their processing along with recording of data. The student will also obtain the basic knowledge of chemistry and metabolism of various metabolites which are routinely estimated in different diseases so that a clear understanding of different tests is obtained. The students are also given basic training in safety measures, quality control and automation

DETAILED CONTENTS

Theory

1. Urine Analysis (9 hrs)

   1.1 Normal composition of urine and its properties
   1.2 Clinical importance of urine analysis
   1.3 Presence of abnormal constituents like protein, sugar, bile salts and bile pigments (bilirubin and urobilinogen)
   1.4 Quantitative estimation for proteins
   1.5 Identification of sugars
   1.6 Detailed discussion on glycosuria and albuminuria
   1.7 Ketone bodies

2. Stool Chemistry (7 hrs)

   2.1 Physical characteristics and chemical composition of stool
   2.2 Significance of presence of blood and excess fat in stool
   2.3 Occult blood detection

3. Renal Calculi (5 hrs)

   3.1 Formation, composition and properties of renal calculi
   3.2 Principle of procedure for identifying types of renal calculi

4. Cerebro-Spinal Fluid (7 hrs)

   4.1 Composition and functions of CSF
   4.2 Methods of determination of proteins, sugar and chloride in CSF
   4.3 Normal levels and clinical importance

5. Biological fluids (6 hrs)

   Formation and composition of different biological fluids like peritonial pleural, synovial and gastric fluid

6. Electrophoresis (4 hrs)
   Principle and use of cellulose acetate electrophoresis

7. Chromatography (5 hrs)
   Principle and use of chromatography (thin layer)

8. Thyroid function tests (T_3, T_4 and TSH) (5 hrs)

9. Automation in clinical Biochemistry laboratory (5 hrs)

LIST OF PRACTICALS

1. Analysis of urine for sugar and proteins (qualitative and quantitative)
2. Detection of ketone bodies in urine
3. Detection of haematuria
4. Detection of bile pigments (bilirubin and urobilinogen)
5. Occult blood test for stool specimen
6. Qualitative analysis of renal calculi
7. Estimation of glucose in CSF
8. Estimation of total proteins and globulins in CSF
9. Estimation of chloride in CSF
10. Titration for acidity determination and qualitative analysis of gastric juice
11. Demonstration of electrophoresis (cellulose acetate)
12. Demonstration of chromatography (thin layer chromatography)

RECOMMENDED BOOKS

1. A Procedure Manual for Routine Diagnostic Tests Vol. I, II and III by KL Mukherjee; Tata McGraw Hill Publishers, New Delhi
2. Practical Clinical Biochemistry by Varley; Heinmann Publishers, Oxford
3. A Text Book of Medical laboratory Technology by P Godkar; Bhalani Publishers, Mumbai
4. Medical Laboratory Science Theory and Practice by J Ochei and A Kolhatkar
5. Medical Laboratory Manual for Tropical Countries Vol. I and II by Monica Cheesberg; Cambridge University Press, UK

4.4 HISTOPATHOLOGY AND CYTOLOGY

L	T	P
3	-	4

RATIONALE

This subject is aimed at preparing the students to prepare stained tissue section of various types. One should be able to provide special stain, prepare exfoliative cytology smears and carry out routine and special staining procedures on cytological smears, and should be able to display specimens for museum.

DETAILED CONTENT

Theory

1. Museum Techniques (10 hrs)
   - Preservation of museum specimens
   - Preparation of mounting solutions (Kaicerling I, II, II)
   - Care, mounting and displaying of specimens
   - Care of mounted specimen
   - Cataloguing of museum specimen
2. Quality Control in Histopathology and Cytology (2 hrs)
3. Automation in Histopathology (2 hrs)
   - Embedding station
   - Automatic tissue processor
   - Automatic knife sharpner
   - Automatic staining machines
4. Introduction to exfoliative cytology (I hr)
5. Collection, processing and fixation of various cytological specimens (5 hrs)
6. Collection and preparation of cervical and vaginal smears (3 hrs)
7. Staining of cytological specimen smears (10 hrs)
   - Papanicolouq stain (PAP)
   - May Grun Wald-Giemsa stain (MGG)
   - Haemotoxylin and Eosin stain (H&E)
8. Special stains (10 hrs)
   - PAS (periodic acid Schiff's regent stain)
   - Alcian blue PAS stain
   - Z-N stain for AFB
   - Mayer's mucicarmine stain

9. Aspiration Cytology (5 hrs)

- Principle of aspiration cytology
- FNAC applications
- Advantages and disadvantages

LIST OF PRACTICALS

1. Preparation of mounting solutions
2. Demonstration of mounting of museum specimens
3. Preparation of different types of smears (dry and wet)
4. Demonstration of PAP staining
5. Demonstration of MGG staining
6. Demonstration of H&E staining
7. Demonstration of PAS staining
8. Demonstration of Z-N staining
9. Demonstration of Alcian blue PAS
10. Demonstration of Mayer/s mucicarmine staining

RECOMMENDED BOOKS

1. Cellular Pathology Techniques by CFA Culling, Butterworths Co., London
2. Theory of Practice of Histopathological Techniques by Bancroft and Stevens
3. Histological Techniques by Carleton, Harry, Oxford
4. An Introduction to Medical Laboratory Technology by FJ Baker et. al., Butterworths Co., London
5. Laboratory Methods of Histotechnology by Armed Forces Institute of Pathology, Washington DC
6. Histotechnologic Basis of Diagnostic Cytology by Koss LG
7. Cytopathology by Naib's
8. Cytology Technical Manual by et.al. Luthra
9. Basic Medical Laboratory Techniques Publisher by Delmer Thomson
10. Comprehensive Cytopathology by Marluce Bibbo

4.5 BLOOD BANKING

L	T	P
3	-	2

RATIONALE

Blood transfusion has become an important procedure in the modern medical sciences. The students must understand and learn the antigen-antibody reaction, their classification and application. They also taught the basic techniques used in the performing of ABO, Rh and cross matching (major and minor). The students should be competent enough to be able to identify an ideal blood donor, collect blood from a donor and preservation and long term storage of blood

DETAILED CONTENTS

Theory

1. Historical introduction to blood banking (2 hrs)

2. Glassware used in Blood Banking (3 hrs)

   2.1 Types of glassware and cleaning agents used
   2.2 Cleaning of new and used glassware/plasticware
   2.3 Care of glassware/plasticware

3. Antigen and Antibody (4 hrs)

   3.1 Definition
   3.2 Types of antigens and antibodies
   3.3 Composition and role of antigen and antibody

4. The ABO Blood Group System (6 hrs)

   4.1 Antigens and antibodies involved
   4.2 Inroduction, formation of ABO antigens
   4.3 Principle of ABO blood grouping
   4.4 Subtypes (subgroups) of A

5. The Rhesus Blood Group System (5 hrs)

   5.1 Antigen and antibody involved
   5.2 Principle of Rh blood grouping
   5.3 Subtypes (subgroups) of D

6. Coomb's Test (4 hrs)

   6.1 Direct Coomb's test (principle, importance and its application)
   6.2 Indirect coombs test (principle, importance and its application)

7. Cross matching (4 hrs)

   7.1 Types of cross matching (major and minor)
   7.2 Various methods, their principles and importance

8. Selection and screening of an ideal blood donor (2 hrs)

9. Blood Collection and Storage (4 hrs)

   9.1 Blood collection
   9.2 Anticoagulants used
   9.3 Methods of preservation
   9.4 Storage of blood

10. Screening of blood for: (5 hrs)

   10.1 Immune antiboides
   10.2 Malaria and microfilaria
   10.3 AIDS
   10.4 Hepatitis and Australia antigen, HCV, HAV
   10.5 VDRL

11. Various Blood Components (5 hrs)

   11.1 Preparation
   11.2 Preservation

12. Blood Transfusion reactions (4 hrs)

LIST OF PRACTICALS

1. ABO blood grouping – (Slide and Tube techniques)

   1.1 Direct grouping – slide technique
   1.2 Direct grouping – tube technique
   1.3 Indirect (reverse) – tube technique
   1.4 Subgroup of A - (slide and tube technique)

2. Rh (antigen D) typing (Slide and Tube techniques)

   2.1 Slide technique
   2.2 Tube technique
   2.3 Variant (tube technique) of D

3. Coomb's Test (anti-human globulin test)

    3.1 Performance of Direct Coomb's test
    3.2 Performance of Indirect Coomb's test

4. Cross-match (compatibility testing)

    4.1 Major – Saline at room temperature, saline at 37^{o} C, albumin cross-matching and Coomb's cross matching
    4.2 Minor – Saline at room temperature, saline at 37^{o} C, albumin cross-matching and Coomb's cross matching

5. Preparation of anticoagulants

    5.1 Acid Citrate Dextrose (ACD)
    5.2 Citrate Phosphate Dextrose (CPD)
    5.3 Citrate Phosphate Dextrose Adenine (CPDA)

6. Demonstration of equipment/material used for blood collection

INSTRUCTIONAL STRATEGY

Because of highly technical nature and importance of the subject, greater emphasis should be given on practical. The teachers are required to arrange various known positive clinical samples to demonstrate various blood groups and other procedures. Model and charts should also be used for explaining various types of equipment and material used in blood banking

RECOMMENDED BOOKS

1. Introduction to Medical Laboratory Technology by FJ Baker, Butterworth Heinemann Publishers; Oxford

2. Textbook of Medical Laboratory Technology by Praful B Godkar; Bhalani Publishers, Mumbai

3. Medical Laboratory Technology, A procedure Manual for Routine Diagnostic Tests by Kanai L. Mukherjee, Vol. 1; Tata McGraw Hill Publishers, New Delhi

4. Modern Blood Banking and Transfusion Practices by denise M Harmening; Jaypee Brothers, New Delhi

4.6 MEDICAL LABORATORY MANAGEMENT AND PROFESSIONAL ETHICS

L	T	P
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RATIONALE

The students are taught techniques of planning a clinical laboratory. They are also supposed to taught how to procure chemical reagents and equipment. The students are imparted special training in maintaining laboratory equipment, the preventive maintenance and daily upkeeping. They are also given training for the maintenance of stocks and inventory. They are also given knowledge of recording results, interpretation, quality control and reproducibility. Students also learn how to communicate effectively.

DETAILED CONTENTS

Theory

1. Role of medical laboratory technology in total health care, principles of management, techniques of planning, physical facilities/equipment – layouts and design (8 hrs)

2. Laboratory organization, operation, job description, evaluation, performance (7 hrs)

3. Materials management, procurement, financial resource, importing, inventory control and analysis, inspection, storage etc (5 hrs)

4. Quality assurance – prepare-analytical control, Internal and external quality control in clinical laboratories, precision, accuracy, standard deviation etc

   (8 hrs)

5. Safety measures in clinical laboratories (microbiology, haematology, biochemistry, histopathology, blood bank) (5 hrs)

6. Human relations: Inter-personal relations, inter-departmental relations and their importance (4 hrs)

7. Medical ethics – legal aspects – confidentiality malpractice/negligence; legal implications, law suits, consumer protection and insurance for professional health hazards (4 hrs)

8. Preventive maintenance and care of various laboratory equipments (3 hrs)

9. Storage and retrieval of laboratory data with help of computers (4 hrs)

RECOMMENDED BOOKS

1. Medical Laboratory Technology by Praful B Godkar; Bhalani Publishing House, Mumbai (India)

2. Text Book of Medical Laboratory Technology by FJ Baker; Butterworths Heinmann Publishers, Oxford

3. Text Book of Medical Laboratory Technology by KL Mukherjee Vol I, II and III; Tata McGraw Hill Publishers, New Delhi

4. Laboratory Management by Puthwilliums