AMALA INSTITUTE OF MEDICAL SCIENCES

Second Professional MBBS Prelims – Paper I1 - 2023 Regulars

MICROBIOLOGY

Time: 3 hours. **Maximum Marks: 100**

(Answer all questions. Draw diagrams wherever necessary)

Long Essays (2x10=20 marks)

2. A 30- years old male present to medical casualty with fever headache and vomiting. He gives history of chronic liver disease. O/E he was febrile, neck rigidity present. CSF Gram staining showed pus cells and grampositive diplococci. (1+1+2+2+3+1=10 marks)
   a) What is the diagnosis?
   b) Name the causative organism.
   c) Discuss the pathogenesis of the above condition.
   d) Discuss the laboratory diagnosis.
   e) Name the vaccines available and the schedule
   f) Name two drugs used for treatment.

3. A 25-years old ladypresented to medicine O.P with fever sore throat and breathlessness. One of her family members is a health care worker who was on medical ICU duty. (1+1+2+3+2+1=10)
   a) What is the provisional diagnosis?
   b) Name two viruses responsible for this condition.
   c) Discuss the pathogenesis of this condition.
   d) How do you confirm the laboratory diagnosis?
   e) How do you manage the patient
   f) Discuss about the prophylaxis of the above condition.

Short Essays (6x6= 36 Marks)

4. Discuss the pathogenesis, laboratory diagnosis and prophylaxis of Tetanus.(2+2+2=6 Marks)
5. Discuss the laboratory diagnosis of Hepatitis B infection.
6. Discuss the pathogenesis and laboratory diagnosis of Hook worm infection (3+3=6)
7. Name the vaccines used and discuss the current vaccination schedule for Polio. (2+4=6)
8. Discuss about Pathogenesis and lab diagnosis of Cholera. (3+3=6 Marks)
9. Describe in detail Viral gastroenteritis.

Short Answers (6x4= 24 Marks)

10. Name four fungi causing respiratory infections.
11. Discuss about lung fluke.
12. Name four parasites causing hepatic infections.
13. Informed consent
14. Enumerate 4 bacteria causing community acquired Pneumonia
15. Name four Bactericidal Antituberculous drugs.

AMALA INSTITUTE OF MEDICAL SCIENCES

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1. **MCQ.** **(20X 1=20 marks)**

Questionsi-v are single response type

i. Food poisoning by preformed toxin is caused by

A. Shigellaflexneri. B. Staphylococcus aureus. C. Salmonella enteritidis D.Vibrio cholerae

ii. Drug of choice forMycoplasma pneumonia is

A. Doxycycline B. Gentamicin C. Ciprofloxacin D. Penicillin

iii. All are dimorphic fungi causing systemic infection **EXCEPT**

A. Histoplasmacapsulatum. B.BlastomycesdermatitidisC. Candida albicans D. Coccidioidesimmitis

iv. The infective form of intestinal taeniasis

A. Egg. B. CercariaeC. Metacercariae D. Cysticercus

v. Acute Hemorrhagic conjunctivitis is caused by

A. Enterovirus 70B. Enterovirus 72C. Coxasackie B D. Herpes simplex.

Questions vi-x are case scenario based

Read the following clinical history and select the most appropriate response.

A 30 years old male patient presented to medical casualty with fever, altered behavior and hydrophobia. He gives a history of bite by a stray dog one month back.

vi. Most probable clinical diagnosis is

A. Pyogenic meningitis. B. Encephalitis. C. Rabies. D. Tetanus.

vii. The test most commonly used for confirmation of clinical diagnosis is

A. IgM Antibody detection. B. PCR. C. Viral isolation. D. IgG detection.

viii. The specimens collected include all the following **EXCEPT**

A. Skin biopsy from nape of neck B. CSF C. Saliva. D. Blood

ix. Non neural vaccine used for prophylaxis include the following **EXCEPT**

A. Human Diploid Cell. B. Semple C. Chick Embryo. D. Vero Cell

x. The most important commonly affected site in brain is

A. Cranial nerves. B. Anterior horn cells. C. Hippocampus. D. Pons

Question numbers xi-xv consists of two statements-Assertion (A) and reason (R). Answer these questions by selecting the appropriate options given below.

A. Both A and R are true, and R is the correct explanation of A
B. Both A and R are true, and R is not the correct explanation of A
C. A is true but R is false
D. A is false but R is true

xi. A.Exotoxin is the virulence factor for Diphtheria.

R. It acts by protein synthesis inhibition. A

xii. A. Trophozoiteis the infective form for acute amoebic dysentery.

R. Trophozoite with ingested RBC in stool confirms acute amoebic dysentery. D

xiii. A. Syphilis is transmitted from mother to child.

R. Congenital syphilis infection is diagnosed by demonstrating IgM antibody in neonatal serum. B

xiv. A. In Trichomoniasis,both partners are treated simultaneously

R. Trichomoniasisis a sexually transmitted disease.. A

xv. A. Japanese encephalitis is a zoonotic disease.

B. Man to man transmission occurs by culex mosquito. C

Question numbers xvi-xx are Multiple Response type questions. Read the statements & mark the answers appropriately.

xvi. Examples of live viral vaccines include

1. Measles. 2.Rubella. 3. BCG. 4. Mumps

A. 1,2,4 are correct. B. 1,2,3 are correct. C. 2,3,4 are correct. D.1, 2,3, 4 are correct

xvii. All are vector borne bacterial infections

1. Plague. 2. Relapsing fever. 3. Scrub typhus. 4. Dengue

A. 1,2, are correct. B. 1,2,4 are correct. C. 2,3,4 are correct. D. 1,2, 3 are correct.

xviii. All the following parasites infect liver

1. Entamoebahistolytica 2. Echinococcusgranulosus 3. Fasciola hepatica. 4. Clonorchissinensis

A.1,2,3, are correct. B. 1,2,4 are correct. C. 1,2,3,4 are correct. D. 2,3,4 are correct.

xix. All the following are causative agents of bacterial STDs.

1. Neisseria gonorrhoeae. 2. Haemophilusducreyi 3. Klebsiellagranulomatis. D. Klebsiellapneumoniae.

A. 1,2 are correct. B. 1,2,3 are correct. C. 2,3,4 are correct. D. 1,3,4 are correct.

xx. All are intestinal nematodes

1. Ascaris. 2. Ancylostoma. 3. Trichinellaspiralis. 4. Trichuristrichiura.

A. 1,2,3,4 are correct. B. 1,2.3 are correct. C. 1,3,4 are correct. D. 1,2,4 are correct.

AMALA INSTITUTE OF MEDICAL SCIENCES

Second Professional MBBS Prelims – Paper 1 - 2023 Regulars

MICROBIOLOGY

Time: 3 hours. **Maximum Marks: 100**

(Answer all questions. Draw diagrams wherever necessary)

Long Essays **(2x 10=20 marks)**

2. Classify Hypersensitivity reactions. Describe in detail Type 1 hypersensitivity (4 + 6)
3. A 50 year old agriculture worker came with complaints of fever, malaise and headache. O/E, there was jaundice and microalbuminuria. Patient belonged to an area which was flood affected on the previous week.

   a) Write the probable diagnosis and the causative agent (2)

   b) Describe pathogenicity (3)

   c)Describe laboratory diagnosis (3)

   d) Write about treatment and prophylaxis (2)

Short Essays. **(6X6 = 36 marks)**

4. Describe major HAI s and its preventive measures
5. Enumerate different moist heat sterilisation methods. Describe autoclave(2+4)
6. Enumerate the clinical types and lab diagnosis of Dermatophytes (2+4)
7. Discuss the lab diagnosis of Dengue infection
8. Describe the different horizontal gene transfer methods
9. List the different methods of antimicrobial resistance.

Short Answers. **(6x4 = marks)**

10. Enumerate non treponemal and treponemal tests
11. Compare active and passive immunity
12. Describe the pathogenesis of Chicken pox and Varizella zoster
13. Name the vector of Bancroftianfilariasis. What is DEC provocation test?
14. Name 4 agents causing cutaneous larva migrans
15. A swab is collected from an abscess in the ward. The details of the patient on the sample container do not match those on the request form. Discuss the correct decision and the appropriate action to be taken.

Case based

HIV

A 35 year old man admitted to Medicine ward with complaints of recurrent fever and diarrhea of 6 months duration, not responding to treatment. Patient gives history of blood transfusion following a road traffic accident at age of 27. On examination he is emaciated and oral thrush present.

1. What is the provisional diagnosis
a. Hepatitis B b. Syphilis c. HIV d. Hepatitis C
2. What is the primary target cell of this organism?
a. CD4 b. ACE -2 c. CD80 d. CDHR3
3. Most recommended method for diagnosis of the above infection during infancy?
a. ELISA b. Western blot c. DNA PCR d. CD4 T cell count
4. Risk of infection transmission by needle stick injury is
a. 0.03 % b. 0.3% c. 3% d. 30%
5. Which of the following is not a fungal opportunistic infection?
a. Cryptococcal meningitis b. Toxoplasma encephalitis c. Disseminated histoplasmosis
b. d. Esophageal candidiasis

Multiple response

Which of the following are cell wall acting antibiotics?

1. Penicillin 2. Carbapenems 3. Macrolides 4. Fluoroquinolones

a.1,2,4 b. 2,3 c. 1,2 d. 3,4

Which of the following are high level disinfectants?

1. Alcohol 2. Gluteraldehyde 3. Phenol 4. Peracetic acid

a.2,3 b. 2,4 c. 1,2,3,4 d. 1,3

Which of the following items cannot be sterilised in autoclave?

1. Surgical instruments 2. Bronchoscopes 3. Culture media 4. Paraffin oil

a.3 and 4 b. 2,3,4 c. 1 and 3 d. 2 and 4

Which of the following are heterophile agglutination tests?

1. Widal test 2. Paul Bunnell test 3. Cold agglutination test 4. Weil – Felix reaction

a.1and 4 b. 2and 4 c. 2,3 and 4 d. 1 and 2

Which one is a dimorphic fungi?

1. Candida albicans 2. Penicillium marneffei 3. Sporothrix schenckii 4. Trichophyton mentagrophytes

a.2,3 and 4 b. 2 and 4 c. 2 and 3 d. 1 and 4

Single response

Urinary schistosomiasis is caused by

a.Schistosoma japonicum b. Schistosoma haematobium c.Schistosoma mansoni d. Schistosoma mekongi

Which of the following is not a selective media

a.Thiosulphate citrate bile salt sucrose agar b. potassium tellurite agar c. Selenite F broth d. Lowenstein – Jensen medium

Transfer of a portion of DNA from one bacterium to another by a bacteriophage is called

a.Transduction b.Transformation c.Conjugation d.Transposition

Causative agent of eumycetoma include all except

a.Madurella b.Nocardia c .Pseudoallescheria d.Aspergillus

The scientist who introduced sterilization techniques

a.Robert Koch b.Joseph Lister c. Louis Pasteur d.Edward Jenner

A – In malaria, thin smear is used to for speciating the parasite

R - Schizont of plasmodium falciparum is banana shaped Answer C

A - Carbapenems cannot be used to treat MRSA infections

R - MRSA will be resistant to all beta lactam antibiotics Answer A

A - Clindamycin can be used to treat Gram negative organisms

R - Action of Clindamycin is protein synthesis inhibition Answer D

A - Beta D glucan is a marker of invasive fungal infection

R - Beta D glucan is not found on the cell wall of zygomycetes Answer B

A – Negative staining of CSF specimen is done to demonstrate capsule

R – Cryptococcus neoformans is a capsulated parasite which causes meningitis Answer C

ANSWER KEY

2. Classify Hypersensitivity Reactions

Immediate Hypersensitivity Reactions:

Type I – Ig E mediated

Type II – IgG/ IgM

Type III – Immune Complex mediated

Delayed Hypersensitivity Reactions:

T Helper cells

Type I Hypersensitivity:

IgE, Atopy and Anaphylaxis, Wheal & Flare response, Mechanisms – Sensitization phase and Effector phase – Explain with diagram, Mediators – Primary & Secondary

Detection- Skin prick test, IgE, Treatment

3.

a) Leptospirosis, Leptospira interrogans
b) Mode of transmission, Zoonotic, Septicemic phase & Immune phase, Clinical – Mild anicteric febrile illness, Weil's disease
c) Laboratory Diagnosis – Specimens collected, Microscopy : Dark ground/ phase contrast/silver impregnation, Culture medium – EMJH, Korthof, Fletchers, Serological tests (Microscopic agglutination tests), Molecular methods
d) Treatment: Doxycycline, Amoxycillin, Penicillin
Prophylaxis : SPIROLEPT

Short Essays

4. Describe major HAI s and its preventive measures

a. Catheter – Associated UTI: Major agents;

- pathogenesis: main entry points through which bacteria enter and spread;

- Lab diagnosis

- prevention : care bundle approach like insertion bundle and maintenance bundle

b. Catheter related blood stream infection (CRBSI)

- risk factors like device related , patient related and care giver related

- pathogenesis like colonisation and biofilm,

- diagnosis – differential time to positivity

- prevention: care bundle approach like insertion bundle and maintenance bundle

, adherence to hand hygiene

c. VAP: early onset and late onset, agents

- pathogenesis and diagnosis- microbiological criteria

- prevention:

d. Surgical site infection (SSI)- definition, agents, pathogenesis

- prevention: pre operative, peri operative and post operative measures

10. Enumerate different moist heat sterilisation methods. Describe autoclave

- Below 100 ◦C- name the methods and temperature employed
- At 100 ◦C- name the methods ant temperature employed
- Above 100 ◦C- Autocalve , principle, procedure, Temperature and holding period, articles sterilised, sterilization control

4. Enumerate the clinical types and lab diagnosis of Dermatophytes

- Clinical types depending on the site of involvement like Tinea capitis etc.
- Lab diagnosis - sample collection, direct examination with KOH , culture and morphological identification of three dermatophytes with diagram

5. Discuss the lab diagnosis of Dengue infection

- NS1 antigen detection – rapid as well as ELISA
- Antibody detection- primary infection - IgM with MAC-ELISA; Secondary infection- IgG
- Neutralization tests
- Virus isolation
- Molecular - Viral RNA, genotype detection

Short answers

8. Describe gene transfer methods

- Explain transformation, transduction, conjugation, Transposition
- Write down the clinical significance of each method

9. Different methods of antimicrobial resistance

- Explain phenotypic methods
- Explain genotypic methods- mutational, transferable
- Explain R factor.

10. Enumerate treponemal and nontreponemal tests

- Treponemal- TPI, FTA ABS,TPA,TPHA,TPPA
- Nontreponemal- VDRL,RPR,TRUST,USR

11. List the difference between active and passive immunity

12. Write Mode of transmission , Clinical features and complications of chicken pox and varicella Zoster. Zoster- Latent infection.

13. Vector- Culex quinquefasiatus.DEC provocation test – To collect blood in the day time.Orally DEC tablet – nocturnal microfilariae stimulated to peripheral blood within 15- 1 hour.

Contraindicated for Onchocerca and Loa loa

14. *A. brasiliensis, A. caninum* and *A. ceylanicum, Strongyloides stercoralis, Ancylostoma duodenale and Necator americanus* .

15.Reject the sample and ask for a repeat sample

ANSWER KEY PRELIMS II

Q4. Pathogenesis, lab diagnosis and prophylaxis of Tetanus

Pathogenesis: causative agent – Clostridium tetani; mode of infection – through injury, surgery without sepsis, otitis media, neonates following delivery and unhygienic practices, abortion

Virulence factor – Tetanospasmin (plasmid coded) – prevents presynaptic release of inhibitory neurotransmitters Glycine and GABA leading to spastic muscle contraction

Lab diagnosis : specimen – excised tissue; Gram stain – with diagram, culture and toxigenicity test

Prophylaxis: TT/ DPT/ Pentavalent vaccine/Td/TdaP – explain with schedule

Pregnancy and post injury vaccination

Q5. Lab diagnosis of Hep B infection

Specimen: Blood

Antigen detection: HbsAg, HbeAg, HbcAg(in hepatocytes)

Antibody detection: AntiHbc, AntiHbs, AntiHbe

Graph showing various serological markers of HBV against time

Molecular: HBV DNA detection by PCR

Non specific markers like elevated liver enzymes, bilirubin

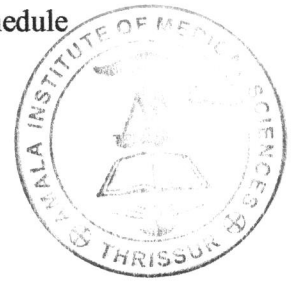
Q6. Pathogenesis and lab diagnosis of Hookworm infection

Pathogenesis: mode of infection – skin penetration; infective stage – L3 filariform larva, lif cycle description. Pathogenicity – sucks blood from intestine after secretion of anticoagulants and hydrolytic enzymes leading to anaemia

Lab diagnosis: specimen – stool, microscopy: diagnostic stage – egg with features and diagram

Molecular: PCR; Other tests – anemia, hypoalbuminemia, eosinophilia

Q7. Vaccines used for Polio and the current vaccination schedule



Oral Polio Vaccine (Sabin)

Injectable Polio Vaccine (Salk)

IPV – 2 f-IPV (0.1 mL/dose) ID 6th and 14th week along with OPV

OPV – bivalent (1&3) – 2 drpos/dose – At birth, 6, 10, 14 weeks; booster dose at 16-24 months

PPI – 2 doses 6 weeks apart every year for all children under 5 yrs of age irrespective of their vaccination status.

Qn 8 :Pathogenesis and lab diagnosis of Cholera

- The vibrios enter orally through contaminated water or food. Vibrios are highly susceptible to acids, and gastric acidity provides an effective barrier against small doses of cholera vibrios. Achlorhydria predisposes to cholera.
- Mode of transmission - Ingestion of contaminated water or food
- Infective dose - high infective dose of 10 8 bacilli
- Crossing of the protective layer of mucus: motility,Secreting mucinase and other proteolytic enzymes,Secreting hemagglutinin protease (cholera lectin) - Cleaves the mucus andfibronectin
- Adhesion and colonization - Facilitated by a special type IV fimbria called toxin-coregulatedpilus (TCP)
- Gene for cholera toxin (CTX): Cholera toxin is phage coded -
- Cholera toxin (CT)
- The toxin molecule consists of two peptide fragments—A and B.
- Fragment B is the binding fragment.Fragment A is the active fragment, causes ADP ribosylation of G protein - accumulation of cyclic adenosine monophosphate (cAMP).Increase in cyclic AMP -accumulation of sodium chloride in intestinal lumen -Water moves passively into the bowel lumen -accumulation of isotonic fluid (watery diarrhea)Loss of fluid and electrolytes -shock(due to profound dehydration) and acidosis (due to loss of bicarbonate
- Lab diagnosis
- Specimens: Watery stool or rectal swab (for carriers)Transport media: VR medium, Cary-Blair medium Direct microscopy: with fig , Motility Culture &Identification – Enrichment and selective media Biotyping,Serogrouping: To differentiate O1 and O139,Serotyping,Antigen detection, Molecular method, Antimicrobial susceptibility testing

Qn9: Viral Gastroenteritis

Agents causing viral gastroenteritis -explain about rotavirus – pathogenesis, lab diagnosis, treatment prevention and vaccine.

Qn 10: 4 Fungi causing Respiratory infection

Aspergillus, Penicillium, Mucor, Histoplasmosis, Blastomycosis, Coccidioidomycosis

Paracoccidioidomycosis

Qn11: Lung fluke

Paragonimus westermani is a trematode, also known as oriental lung fluke, Lifecycle , pathogenesis,clinical features,lab diagnosis, treatment prevention

12. E. histolytica

Echinococcus

Fasciofa hepatica, F.gigamtica, Clonorchis

Opisthorchri, S.japonicum, S.mansoni

Toxocara.

Rare - Plasmodium

Vis. Leishmania

B. coli, Enterobius

Occult filariasis

Capillasia hepatica

13. Informed consent definition – types written, verbal

14. CAP : S. pneumonia Atypical - Legionella , C. psitttaci

H. influenzae & Mycoplasma pneumoniae

15. Isoniazid, Rifampin

Pyrazinamide

Fluoroquinolones

Ethambutol

Streptomycin, Bedaquiline, Delaminid

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   b) Name two viruses responsible for this condition.
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Short Essays (6x6= 36 Marks)

4. Discuss the pathogenesis, laboratory diagnosis and prophylaxis of Tetanus.(2+2+2=6 Marks)
5. Discuss the laboratory diagnosis of Hepatitis B infection.
6. Discuss the pathogenesis and laboratory diagnosis of Hook worm infection (3+3=6)
7. Name the vaccines used and discuss the current vaccination schedule for Polio. (2+4=6)
8. Discuss about Pathogenesis and lab diagnosis of Cholera. (3+3=6 Marks)
9. Describe in detail Viral gastroenteritis.

Short Answers (6x4= 24 Marks)

10. Name four fungi causing respiratory infections.
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14. Enumerate 4 bacteria causing community acquired Pneumonia
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iv. The infective form of intestinal taeniasis

A. Egg. B. CercariaeC. Metacercariae D. Cysticercus

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Read the following clinical history and select the most appropriate response.

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vi. Most probable clinical diagnosis is

A. Pyogenic meningitis. B. Encephalitis. C. Rabies. D. Tetanus.

vii. The test most commonly used for confirmation of clinical diagnosis is

A. IgM Antibody detection. B. PCR. C. Viral isolation. D. IgG detection.

viii. The specimens collected include all the following **EXCEPT**

A. Skin biopsy from nape of neck B. CSF C. Saliva. D. Blood

ix. Non neural vaccine used for prophylaxis include the following **EXCEPT**

A. Human Diploid Cell. B. Semple C. Chick Embryo. D. Vero Cell

x. The most important commonly affected site in brain is

A. Cranial nerves. B. Anterior horn cells. C. Hippocampus. D. Pons

Question numbers xi-xv consists of two statements-Assertion (A) and reason (R). Answer these questions by selecting the appropriate options given below.

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B. Both A and R are true, and R is not the correct explanation of A
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D. A is false but R is true

xi. A.Exotoxin is the virulence factor for Diphtheria.

R. It acts by protein synthesis inhibition. A

xii. A. Trophozoiteis the infective form for acute amoebic dysentery.

R. Trophozoite with ingested RBC in stool confirms acute amoebic dysentery. D

xiii. A. Syphilis is transmitted from mother to child.

R. Congenital syphilis infection is diagnosed by demonstrating IgM antibody in neonatal serum. B

xiv. A. In Trichomoniasis,both partners are treated simultaneously

R. Trichomoniasisis a sexually transmitted disease.. A

xv. A. Japanese encephalitis is a zoonotic disease.

B. Man to man transmission occurs by culex mosquito. C

Question numbers xvi-xx are Multiple Response type questions. Read the statements & mark the answers appropriately.

xvi. Examples of live viral vaccines include

1. Measles. 2.Rubella. 3. BCG. 4. Mumps

A. 1,2,4 are correct. B. 1,2,3 are correct. C. 2,3,4 are correct. D.1, 2,3, 4 are correct

xvii. All are vector borne bacterial infections

1. Plague. 2. Relapsing fever. 3. Scrub typhus. 4. Dengue

A. 1,2, are correct. B. 1,2,4 are correct. C. 2,3,4 are correct. D. 1,2, 3 are correct.

xviii. All the following parasites infect liver

1. Entamoebahistolytica 2. Echinococcusgranulosus 3. Fasciola hepatica. 4. Clonorchissinensis

A.1,2,3, are correct. B. 1,2,4 are correct. C. 1,2,3,4 are correct. D. 2,3,4 are correct.

xix. All the following are causative agents of bacterial STDs.

1. Neisseria gonorrhoeae. 2. Haemophilusducreyi 3. Klebsiellagranulomatis. D. Klebsiellapneumoniae.

A. 1,2 are correct. B. 1,2,3 are correct. C. 2,3,4 are correct. D. 1,3,4 are correct.

xx. All are intestinal nematodes

1. Ascaris. 2. Ancylostoma. 3. Trichinellaspiralis. 4. Trichuristrichiura.

A. 1,2,3,4 are correct. B. 1,2.3 are correct. C. 1,3,4 are correct. D. 1,2,4 are correct.

Answer Key Paper II

Essays

2a) Pyogenic meningitis

a) S. pneumonia
b) Virulence factors, Source, Mode of entry, how it reaches brain, predisposing factors.
c) Specimen, Culture media, Identification, AST, Other tests
d) Name the two vaccines and the schedule
e) Any two drugs (Penicillin, Ceftriaxone, Vancomycin).

3a). Acute viral pharyngitis, Influenza like syndrome COVID 19, H1N1 infection

b). SARSCoV- 2, Influenza A virus (H1N1,H3N2)
c). Pathogenesis of either. Mode of transmission, receptor, further spread and complications.
d) Specimen, Transport, Tests.
e) Specific drugs and supportive therapy
f) Vaccines and other measures

Q4. Pathogenesis, lab diagnosis and prophylaxis of Tetanus

Pathogenesis: causative agent – Clostridium tetani; mode of infection – through injury, surgery without sepsis, otitis media, neonates following delivery and unhygienic practices, abortion

Virulence factor – Tetanospasmin (plasmid coded) – prevents presynaptic release of inhibitory neurotransmitters Glycine and GABA leading to spastic muscle contraction

Lab diagnosis : specimen – excised tissue; Gram stain – with diagram, culture and toxigenicity test

Prophylaxis: TT/ DPT/ Pentavalent vaccine/Td/TdaP – explain with schedule

Pregnancy and post injury vaccination

Q5. Lab diagnosis of Hep B infection

Specimen: Blood

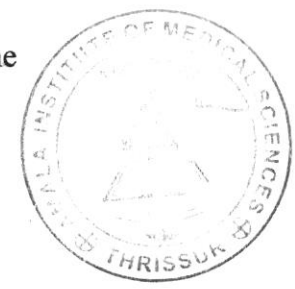
Antigen detection: HbsAg, HbeAg, HbcAg(in hepatocytes)

Antibody detection: AntiHbc, AntiHbs, AntiHbe

Graph showing various serological markers of HBV against time

Molecular: HBV DNA detection by PCR

Non specific markers like elevated liver enzymes, bilirubin



Q6. Pathogenesis and lab diagnosis of Hookworm infection

Pathogenesis: mode of infection – skin penetration; infective stage – L3 filariform larva, lif cycle description. Pathogenicity – sucks blood from intestine after secretion of anticoagulants and hydrolytic enzymes leading to anaemia

Lab diagnosis: specimen – stool, microscopy: diagnostic stage – egg with features and diagram

Molecular: PCR; Other tests – anemia, hypoalbuminemia, eosinophilia

Q7. Vaccines used for Polio and the current vaccination schedule

Oral Polio Vaccine (Sabin)

Injectable Polio Vaccine (Salk)

IPV – 2 f-IPV (0.1 mL/dose) ID 6th and 14th week along with OPV

OPV – bivalent (1&3) – 2 drpos/dose – At birth, 6, 10, 14 weeks; booster dose at 16-24 months

PPI – 2 doses 6 weeks apart every year for all children under 5 yrs of age irrespective of their vaccination status.

Q8 :Pathogenesis and lab diagnosis of Cholera

- The vibrios enter orally through contaminated water or food. Vibrios are highly susceptibleto acids, and gastric acidity provides an effective barrier against small doses of choleravibrios. Achlorhydria predisposes to cholera.
- Mode of transmission - Ingestion of contaminated water or food
- Infective dose - high infective dose of 10 8 bacilli
- Crossing of the protective layer of mucus: motility,Secretingmucinase and other proteolyticenzymes,Secreting hemagglutinin protease (cholera lectin) - Cleaves the mucus andfibronectin
- Adhesion and colonization - Facilitated by a special type IV fimbria called toxin-coregulatedpilus (TCP)
- Gene for cholera toxin (CTX): Cholera toxin is phage coded -
- Cholera toxin (CT)
- The toxin molecule consists of two peptide fragments—A and B.
- Fragment B is the binding fragment.Fragment A is the active fragment, causes ADP ribosylationof G protein - accumulation of cyclic adenosine monophosphate (cAMP).Increase in cyclic AMP - accumulation of sodium chloride in intestinal lumen -Water moves passively into the bowellumen - accumulation of isotonic fluid (watery diarrhea)Loss of fluid and electrolytes -shock(due to profound dehydration) and acidosis (due to loss of bicarbonate
- Lab diagnosis
- Specimens: Watery stool or rectal swab (for carriers)Transport media: VR medium, Cary-Blair mediumDirect microscopy: with fig , Motility Culture &Identification – Enrichmentand selective media Biotyping,Serogrouping: To differentiate O1 andO139,Serotyping,Antigen detection, Molecular method, Antimicrobial susceptibility testing

Qn9: Viral Gastroenteritis

Agents causing viral gastroenteritis -explain about rotavirus – pathogenesis, lab diagnosis, treatment prevention and vaccine.

Qn 10: 4 Fungi causing Respiratory infection

Aspergillus, Penicillium, Mucor, Histoplasmosis, Blastomycosis, Coccidioidomycosis

Paracoccidioidomycosis

Qn11: Lung fluke

Paragonimuswestermani is a trematode, also known as oriental lung fluke, Lifecycle ,pathogenesis,clinicalfeatures,lab diagnosis, treatment prevention

12. E. histolytica

Echinococcus

Fasciofa hepatica, F.gigamtica, Clonorchis

Opisthorchri, S.japonicum, S.mansoni

Toxocara.

Rare - Plasmodium

Vis. Leishmania

B. coli, Enterobius

Occult filariasis

Capillasia hepatica

13. Informed consent definition – types written, verbal

14. CAP : S. pneumonia Atypical - Legionella , C. psitttaci

H. influenzae & Mycoplasma pneumoniae

15. Isoniazid, Rifampin

Pyrazinamide

Fluoroquinolones

Ethambutol

Streptomycin, Bedaquiline, Delaminid

AMALA INSTITUTE OF MEDICAL SCIENCES
Second Professional MBBS Prelims – Paper 1 - 2023 Regulars

MICROBIOLOGY

Time: 3 hours. **Maximum Marks: 100**

(Answer all questions. Draw diagrams wherever necessary)

Long Essays **(2x 10=20 marks)**

2. Classify Hypersensitivity reactions. Describe in detail Type 1 hypersensitivity (4 + 6)
3. A 50 year old agriculture worker came with complaints of fever, malaise and headache. O/E, there was jaundice and microalbuminuria. Patient belonged to an area which was flood affected on the previous week.

   a) Write the probable diagnosis and the causative agent (2)

   b) Describe pathogenicity (3)

   c)Describe laboratory diagnosis (3)

   d) Write about treatment and prophylaxis (2)

Short Essays. **(6X6 = 36 marks)**

4. Describe major HAI s and its preventive measures
5. Enumerate different moist heat sterilisation methods. Describe autoclave(2+4)
6. Enumerate the clinical types and lab diagnosis of Dermatophytes (2+4)
7. Discuss the lab diagnosis of Dengue infection
8. Describe the different horizontal gene transfer methods
9. List the different methods of antimicrobial resistance.

Short Answers. **(6x4 = marks)**

10. Enumerate non treponemal and treponemal tests
11. Compare active and passive immunity
12. Describe the pathogenesis of Chicken pox and Varizella zoster
13. Name the vector of Bancroftianfilariasis. What is DEC provocation test?
14. Name 4 agents causing cutaneous larva migrans
15. A swab is collected from an abscess in the ward. The details of the patient on the sample container do not match those on the request form. Discuss the correct decision and the appropriate action to be taken.

2. Classify Hypersensitivity Reactions

Immediate Hypersensitivity Reactions:

Type I – Ig E mediated

Type II – IgG/ IgM

Type III – Immune Complex mediated

Delayed Hypersensitivity Reactions:

T Helper cells

Type I Hypersensitivity:

IgE, Atopy and Anaphylaxis, Wheal & Flare response, Mechanisms – Sensitization phase and Effector phase – Explain with diagram, Mediators – Primary & Secondary

Detection- Skin prick test, IgE, Treatment

3.

a) Leptospirosis, Leptospira interrogans
b) Mode of transmission, Zoonotic, Septicemic phase & Immune phase, Clinical – Mild anicteric febrile illness, Weil's disease
c) Laboratory Diagnosis – Specimens collected, Microscopy : Dark ground/ phase contrast/silver impregnation, Culture medium – EMJH, Korthof, Fletchers, Serological tests (Microscopic agglutination tests), Molecular methods
d) Treatment: Doxycycline, Amoxycillin, Penicillin
Prophylaxis : SPIROLEPT

Short Essays

4. Describe major HAI s and its preventive measures

a. Catheter – Associated UTI: Major agents;

- pathogenesis: main entry points through which bacteria enter and spread;

- Lab diagnosis

- prevention : care bundle approach like insertion bundle and maintenance bundle

b. Catheter related blood stream infection (CRBSI)

- risk factors like device related , patient related and care giver related

- pathogenesis like colonisation and biofilm,

- diagnosis – differential time to positivity

- prevention: care bundle approach like insertion bundle and maintenance bundle

, adherence to hand hygiene

c. VAP: early onset and late onset, agents

- pathogenesis and diagnosis- microbiological criteria

- prevention:

d. Surgical site infection (SSI)- definition, agents, pathogenesis

- prevention: pre operative, peri operative and post operative measures

10. Enumerate different moist heat sterilisation methods. Describe autoclave

- Below 100 ◦C- name the methods and temperature employed
- At 100 ◦C- name the methods ant temperature employed
- Above 100 ◦C- Autocalve , principle, procedure, Temperature and holding period, articles sterilised, sterilization control

4. Enumerate the clinical types and lab diagnosis of Dermatophytes

- Clinical types depending on the site of involvement like Tinea capitis etc.
- Lab diagnosis - sample collection, direct examination with KOH , culture and morphological identification of three dermatophytes with diagram

5. Discuss the lab diagnosis of Dengue infection

- NS1 antigen detection – rapid as well as ELISA
- Antibody detection- primary infection - IgM with MAC-ELISA; Secondary infection- IgG
- Neutralization tests
- Virus isolation
- Molecular - Viral RNA, genotype detection

Short answers

8. Describe gene transfer methods

- Explain transformation, transduction, conjugation, Transposition
- Write down the clinical significance of each method

9. Different methods of antimicrobial resistance

- Explain phenotypic methods
- Explain genotypic methods- mutational, transferable
- Explain R factor.

10. Enumerate treponemal and nontreponemal tests

- Treponemal- TPI, FTA ABS,TPA,TPHA,TPPA
- Nontreponemal- VDRL,RPR,TRUST,USR

11. List the difference between active and passive immunity

12. Write Mode of transmission , Clinical features and complications of chicken pox and varicella Zoster. Zoster- Latent infection.

13. Vector- Culex quinquefasiatus.DEC provocation test – To collect blood in the day time.Orally DEC tablet – nocturnal microfilariae stimulated to peripheral blood within 15- 1 hour.

Contraindicated for Onchocerca and Loa loa

14. *A. brasiliensis, A. caninum* and *A. ceylanicum, Strongyloides stercoralis, Ancylostoma duodenale and Necator americanus* .

15.Reject the sample and ask for a repeat sample

Betsy

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PRELIMS

MICROBIOLOGY - Paper II

20/6/2025

Aksa Manoj
UG23007

80 3/4

Theory

10.) Aspergillus ~~fumigatus~~
Penicillium ~~marneffi~~
Candida
Mucor

3½

27/06

~~11)~~

12) Echinococcus granulosus
Fasciola hepatica
Entamoeba histolytica
Fasciola gigantica

4

14) ~~Streptococcus~~ pneumoniae
~~Neissesia~~
Haemophilus influenzae b
Klebsiella pneumoniae
~~SARS-CoV-2~~ Mycoplasma pneumoniae.

4

~~15)~~

15) Isoniazid
Ethambutol
Rifampicin
~~Beda-Delamanid~~ Delamanid

4

9) Viral gastroenteritis.

- Gastroenteritis caused by viruses.

↳ DTO

* Rotavirus.

- in infants → ~~diarrhea~~

→ Morphology: ~~stuff~~ spokes of a wheel around the hub.


(Electron microscopy of Rotavirus)

- ~~belongs to~~ ~~Retroviridae~~ two copies of ss RNA is present
- belongs to Reoviridae family.

→ Clinical manifestations: Severe diarrhea in infants → ready to dehydration & hypovolemic shock.
- causes 'weaning diarrhea'

→ Vaccination
- Rotavac & Rotarix.

* Rotavac → given at ~~to~~ 6, 10, 14th weeks after birth (according to the National Immunisation schedule). ~~(against GP 9~~

* Astroviruses:
- star-shaped viruses.

* Norovirus.
- Norwalk virus → causative of 'Winter vomiting diarrhea'.

* Sapovirus.

* Caliciviridae family

Lab diagnosis:

Specimen collection: Stool, blood.

Direct microscopy: No significant findings.

~~Immuno~~ Electron microscopy of stool sample ⇒ Rotavirus: at spokes of a wheel.
⇒ Astro virus (Ea: as asteroid bodies)

Serum: Antigen detection using direct Immunofluorescence & ELISA.
Antibody detection: IgM & IgG using ELISA but are non-specific.

* RT-PCR (polymerase chain Reaction - Reverse transcription)
  - Nucleic acid amplification test to detect the ~~viral~~ ~~RN~~ DNA after ~~to~~ reverse transcription of the RNA genome.

real time PCR - to quantify the viral load.

* Multiplex PCR & Nested PCR : using the GI panel, to detect the virus.

* Viral isolation : on various cell lines.

(5.) Hepatitis B infection. - lab diagnosis.

~~Lab~~ * Specimen collection : ~~Serum~~ Blood.
  - Serum is separated from blood & analysed.

* Antigen & Antibody detection using ELISA, Direct Immunofluorescence tests for hepatitis B viral proteins' detection.

* HBsAg (Antigen against the surface antigen) ⇒ present in acute Hep B infection; present from 2nd week of infection to 6th wee

* Anti-HBsAg →
  IgM ~~& IgG~~ antibodies to HBsAg appear first.
  Later, converted to IgG antibodies.
  - Anti HBsAg titre starts rising from the 6th week of infection.
  - Also present in ~~Immunized~~ previously vaccinated individuals. (protective titre ≥ 10mIU/

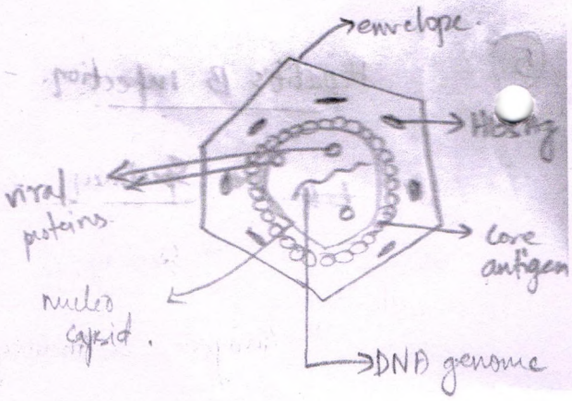
* HBeAg ⇒ Hepatitis B precore antigen
  → the titre indicates the viral replication in the body.
  → higher titre of HBeAg ⇒ high viral load → high infectivity.

* HBcAg → Hepatitis B core antigen
  - Not detectable in serum
  - only within the hepatocytes
  - demonstrated by Immunofluorescence only.

* Anti-HBc Ag → appears by 3rd week → ~~rises its~~ level rises gradually & persists in circulation.

~~for He~~

→ Electron Microscopy: helical;
  - seen → 3 antigens; Nucleocapsid & envelope seen.

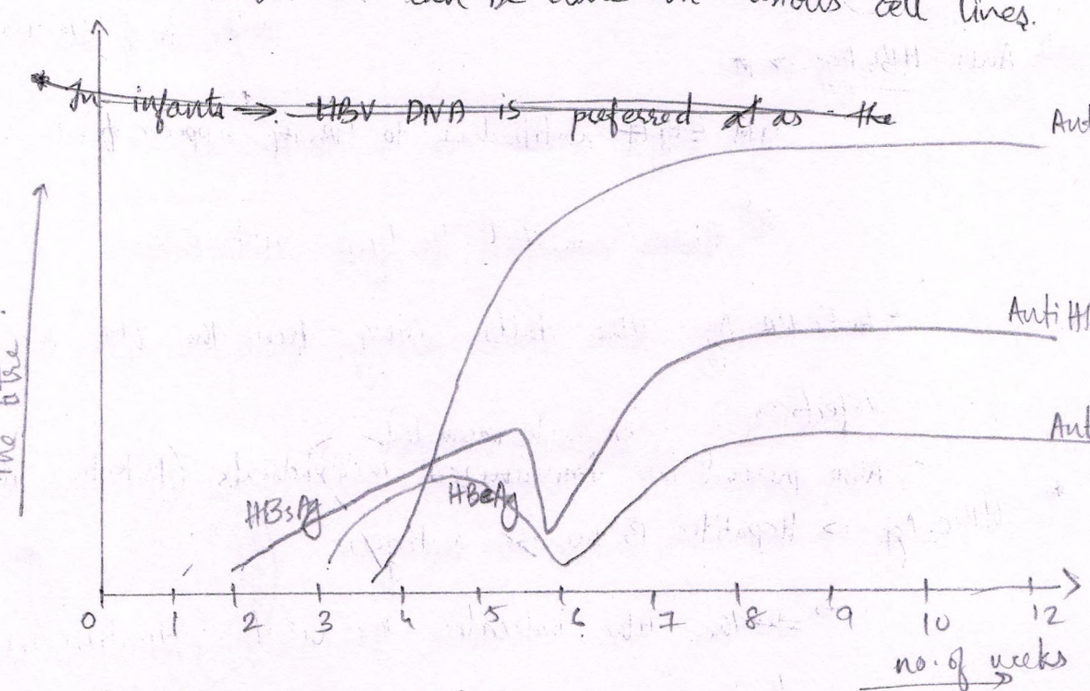


* PCR - polymerase chain Reaction.
  - to detect the DNA of Hepatitis B virus.

* RT-PCR → real time PCR → to quantify the viral load.

* Virus isolations can be done on various cell lines.

* ~~In infants → HBV DNA is preferred as the~~



Titres of various markers during the Hep. B infection.

Tetanus.

- Pathogenesis

  - toxin mediated by Clostridium tetani.
  - Tetanolysin & Tetanospasmin ✓

* Tetanospasmin — infections.

Mode of transmission :- from soil in injuries.

- In deliveries; if proper aseptic measures are not implemented → the baby develops tetanus, by the 8th day.

Risk factors :- Deep injuries.

- In neonates. (in homedeliveries, etc)
- ~~In~~ Following delivery in mothers.

Pathogenesis:

Tetanospasmin → binds to the Acetylcholine Receptors at the neuromuscular junctions. (NMJs).

↓

Retrograde travel to the Anterior horn cells at the Dorsal column degeneration of the neurons which mediate the GABA & glycine-mediated inhibitory pathways to CNS.

~~at the~~

↓

1st sign → degeneration of the Nissl's granules.

↓

Absence of inhibitory signals ~~on the~~ at the NMJs.

↓

Continuous excitation.

spastic paralysis.

Clinical features: ~~of~~ lockjaw. - contraction of masseters.

opisthotonus. - a posture

grinning face. = Risus ~~sp~~

Lab diagnosis.

1. Clinical diagnosis → from the symptoms)

- Specimen collection: Deep bits of Necrotic tissue from the wound.

- Direct microscopy: ~~Clostridium tetani~~

Gram positive rods of bacilli seen.

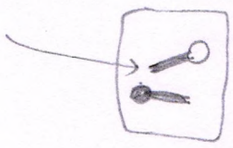
~~with terminal spores~~ shape??

- Culture: highly fastidious. anaerobic

- cholate agar:

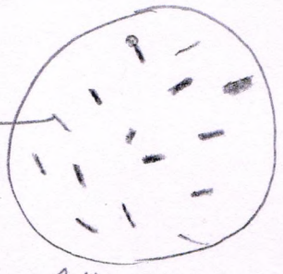
Selective medium: Potassium tellurite: black colonies seen (tellurite is converted to metallic tellurium).

- Culture smear: Gram positive bacilli with terminal bulging spores like a drum-stick.



- Toxin demonstration; mouse inoculation Rise in titre in 2 ~~separately~~ separate specimens is required.

- Antigen detection by direct immunofluorescence and ELISA.



Gram positive bacilli.

Culture smear

- Antibody detection → by ELISA.

- PCR ⇒ to detect the bacterial genome & for speciation.

- Antimicrobial susceptibility testing: Using Kirby-Bauer method or Automated.

Prophylaxis:

- Post exposure prophylaxis

HTIG → Human tetanus Immunoglobulin

ATS → Anti-Tetanus serum.

Status:	No tetanus prone wound	tetanus prone wound.
Tetanus vaccine taken <5yrs	Not needed	not needed.
>5yrs & <10yrs.	Td dose 1	Td dose 1
>10yrs.	Td dose 1	Td dose 1 + HTIG.
Unknown.	Td complete	Td complete.

Other vaccines:

Tetanus toxoid (formalin inactivated toxin; antigenicity present).

* TT → tetanus toxoid.; booster in 10th & 16th years of age

* Td → Tetatanus toxoid + diphteria toxoid; given in pregnancy 1st dose in 3rd month & 2nd dose after 4 weeks.

* TDaP → Diphteria, acellular pertussis & tetanus toxoid.

* DPT → Diphteria & tetanus toxoids + Pertussic cellular cell vaccine

↳ as per National Immunisation schedule.

6, 10, 14 weeks & @ 16-24 months & @ 5 years of age

DPT - boosters.

6. Hookworm infection.

Pathogenesis

Causative organisms: Old world: Ancylostoma duodenale.
New world: Necator americanus.

Transmission: Feco-oral route.

Infective form: L_2 larvae (Rhabditiform larvae)

- Ingestion of Rhabditiform larvae from soil / contaminated food/water
  ↓
  Reaches the intestines.
  ↓
  Molts ~~twice~~ → Adult hookworms.
  ↓
  ~~L_4 larvae are excreted in~~
  L_4 larvae (filariform larvae). L_3

* ground itch — maculopapular rashes ~~be~~ as by wandering just below the skin.

* cercarial dermatitis *.

** Larvae develop into adults
  ↓
  female worms release eggs
  ↓
  Eggs are the diagnostic forms

* Hookworms: cause ulcers in the ~~lower GI~~ intestine.
  ↓
  ~~be~~ Iron deficiency anaemia.

**

Lab diagnosis

Specimen collection: Stool sample.

- In a wide mouthed container.

- Direct microscopy: ~~Sat~~ wet mount
  ↓
  - ~~two~~ eggs of hookworms are diagnostic
    ↓
    - oval eggs with 4 blastomeres inside.
    - Non-bile stained.

- Antigen detection ⇒ using ELISA, direct immunofluorescence.
- Antibody detection ⇒ using ELISA.
- PCR (Polymerase chain reaction) – to differentiate between Necator & Ancylostoma. using detection of their genomes.

7. Polio.

* f-IPV – fractionated injectable polio vaccine – Sabin. vaccine.
* OPV – oral polio vaccine – salk vaccine

Current vaccination schedule (National Immunisation Schedule)

OPV → 2 drops/dose → @ birth, 6th, 10th, 14th weeks, between

fIPV - ~~dose~~ fIPV-1 → 6th week.

fIPV-2 → @ 14th week.

* OPV → 2 drops/dose; oral.
* fIPV → injected; ~~intramuscular~~ ~~intradermally~~ intradermally.

→ OPV - ~~0 dose vaccines~~ → has to be given within 1 week after birth.

* OPV → provides herd immunity as it is transmitted feco-orally.
* fIPV → no herd immunity, but lasts longer.
* bivalent OPV → includes 1 & 3 strains of polio.

9. (a) Pyogenic ~~meningitis~~
2. (b) Streptococcus pneumoniae
9. (c)

Pathogenesis

- Mode of transmission: droplet transmission.
- Route of transmission:

haematogenous: through blood.

Direct spread: ~~the~~ ~~they~~ pneumococci are nasal colonisers; can be easily ~~the~~ spread to the CSF.

Local spread: from adjacent foci ~~of~~ of infection.

- Risk factors:
  - In old age -
  - ~~In~~ In ventilator - patients.

Virulence factors

(i) ~~the~~ polysaccharide capsule evades phagocytosis
(ii) Carbohydrate - antigen ~~evades~~
(iii) autolysin.
(iv) pneumolysin.

2. (d) Lab. diagnosis.

Specimen collection: CSF, blood.

Direct microscopy of CSF: Gram positive diplococci with abundant pus cells.

- Quelling reaction: Application of specific antiserum causes swelling of the capsule.

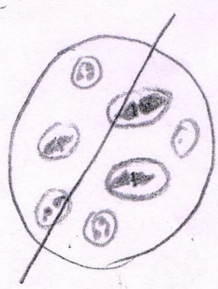
Culture:

Blood agar: Doughtsman/cassom coin appearance of colonies.; β-hemolytic.

- After incubation for a long time, the central region becomes cleared and hence gives a cassom coin appearance.

Culture smear: Gram positive diplococci with capsule.

- flame shapped pairs of cocci.
- Clear halo around the diplococci.



Identification:

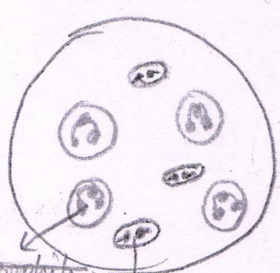
Biochemical

Bile soluble (unlike S. pyogenes) & viridans.

Inulin fermenter.

Optochin sensitive (≥14mm clearing)

Catalase positive coagulase negative.



neutrophils (pus cells)

capsulated flame shaped Gram-positive diplococci.

*VITEK, MALDI-TOF.

PCR → Antigen detection: C-Antigen detection. by Immunofluorescence & ELISA.

- Antibody detection: by ELISA.

- PCR= polymerase chain reaction.
- Antibiotic susceptibility testing: Using Kirby Braeur method. or Automated methods

2

2(e). Vaccines:

* Pneumococcal conjugate Vaccine → PCV
* Polysacc 23 valent ~~polysaccharide~~ polysaccharide pneumococcal vaccine
* In the schedule;
  * PCV-13 to infants → (3 doses)
    PCV-1 → 6th week
    PCV-2 → 14th week
    PCV-booster → ~~16th - 24 months~~ 9-12 months after bir
  * PPSV-23 → given to adults;
    in immunocompromised & old aged - individuals
    ↳ given as two doses. in epidemics, etc.

2(f). drugs → Ceftriaxone, Cefotaxime. Penicillin Vancomycin

(g).

Cholera.

→ Pathogenesis:

- Causative organism: Vibrio ~~cho~~ cholerae
- ~~toxin med~~
- Mode of infection: feco-oral; contaminated water & food.
- Vibrio cholerae; infection: ~~entry of~~ Virulence factor.
  Ingestion of ~~gra~~ Gram negative bacilli
- Infective dose → 10^5 or more. 10^6

~~toxin mediated~~

The bacilli binds to the enterocytes using fimbriae.

↓

Endocytosed by the cells. ; Fragment A → binds to GMP.

↓

activates ~~Increases~~ adenylyl cylase and increases the concentration of cAMP

~~cAMP~~ ↓

disrupts the Cl⁻ & Na⁺ balances.

↓

- ~~blockage~~ inhibits the sodium channels from reabsorption from the lumen

- ~~of~~ activates Chloride-channels → increased Chloride efflux into the lumen

↓

increases osmotic gradient; increased movement of water into the lumen

↓

large amount of water expelled in feces.

↓

Rice water like diarrhoea.

Clinical features: Severe diarrhea, dehydration, loss of electrolyte balance.

Lab diagnosis.

→ Specimen collection: Stool; in a wide ~~tapped~~ mouthed, screw capped container. Transport in 1 hour, if delayed.

Transport medium: ~~Alkaline peptone water~~ Cary-Blair medium or Venkataraman Ramkrishnan medium

~~Direct microscopy~~: ~~large number of~~

→ Direct microscopy

Wet mount: No ova, RBCs, trophozoites, larvae, ~~etc~~ seen.

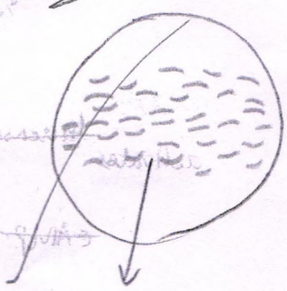
→ Culture: ← Darting motility

~~One~~ selective medium: Alkaline peptone water, Wilson Blair medium.

McConkey Agar: ~~Non~~ lactose fermenting colonies.

Enrichment medium: Selenite F Broth or Potassium tellurite agar

Culture smear: fish ~~water~~ stream appearance of Gram negative curved bacilli seen.



Gram Negative bacilli (curved).

Identification.

	Classical Vibrio cholerae	El-Tor
optochin sensitivity	⊖	⊕
Phage IV susceptible	⊕	⊖
Phage V susceptible	⊖	⊕
Von-Prausker test.	⊖	⊕
Chick cell agglutination	⊖	⊕

* MALDI-TOF, VITEK.
* string test → positive

* PCR (polymerase chain reaction). ; Nested PCR / Multiplex PCR.

↳ to identify the sero var, biovar of the organism.

* Antigen detection: ELISA & direct immunofluorescence. in serum.

* Antibody detection: IgM & IgG antibodies in serum. using ELISA.

* Antibiotic susceptibility testing: to ~~find the resis~~ exclude the resistant drugs during treatment.

Using Kirby-Bauer method or Automated methods like VITEK.

(11) Lung fluke.

"Paragonimus westermani"

- A trematode infecting the lung.
- causes "Paragonimiasis"
- Pathogenesis

Mode of infection: ingestion of the ~~encysted~~ metacercaria.

* Definitive host: Man.
* Intermediate host: 1st: snail
  2nd: crab.
* ~~Infective form~~:

Infective form: ~~larvae~~ metacercaria

* diagnostic form: Embryonated egg

~~Pathogenesis~~ Life cycle.

Metacercariae ingested
↓
reaches the intestine
↓
Metacercaria develops → adult worms
↓
travel in circulation to the Right side of the heart
↓
moves to the lungs.
↓
multiply & shed eggs ⇒ embryonated eggs.
↓
Excreted in stool.

Lab diagnosis

- Specimen: ~~stool~~ Sputum; Serum
- Wet mount (Direct microscopy)

gp → diagnostic form.

~~Direct~~ Identification:

Serology - Antigen detection: using direct Immunofluorescence & ELISA.

- Antibody detection: using ELISA.

Identification: using PCR (Polymerase Chain Rxn).

Treatment: ~~Dox~~ Praziquantel and Ivermectin

(13) Informed consent:

- Consent is the permission ~~to be~~ granted by one to manipulate upon his/her body/belongings.

- In medical setup; Informed consent ~~refers to~~ includes:

(i) ~~(a)~~ Implied consent

(ii) Written consent

* Implied consent: A written/recordable format is not required.

eg:- The act of the patient ~~at coming~~ visiting the doctor in the OPD implies that he/she wills to be auscultated, temperature checked for, etc.

* Written consent: for ~~more~~ invasive procedures; ~~more~~ in situations which may go out of control Written consent is required.

eg: prior to surgeries, endoscopies, other invasive procedures.

* In written consent: ~~Con~~ the patient & bystanders are made well-understood of the ~~complications~~ indications,

, the procedure and the likely complications and aftermaths to the procedure.

~~* In future, if~~

- In the future, if any attempts to sue the healthcare workers, the consent form plays a role.
- The consent form, after being signed and acknowledge by the ~~be~~ patient, bystanders & doctors has to compiled ~~with~~ in the patient's file itself.
- Any ~~act~~ procedure without due consent ⇒ can ~~get~~ make trouble.

* Loco parentis' - eg: consent is given by the hostel warden for a student in the absence of his/her parents.

* In emergency situations: the treating doctor can give consent

3. (a) ~~for~~ Coronavirus infection.

3. (b) ~~&~~ SARS-CoV2
MERS-CoV2

3. (c) Pathogenesis:

~~Coronavirus.~~

Causative organism: coronavirus.

Mode of transmission: Respiratory droplets ~~& aerosol &~~ (~~if~~ infective at 3 metres of distance from the patient)

~~Coron~~ Pathogenesis

Coronavirus enters the nasal cavity

↓

Binds to ACE-2 receptors present on the nasopharyngeal mucosa.

↓

Colonises the Nasal ~~regions~~

In immuno deficient

↓

releases massive amount of cytokines and other inflammatory mediators

↓

"cytokine storm syndrome"

↓

- difficulty in breathing, sore throat
- thrombotic episodes (due to high amounts of ~~clo~~ ~~coagulation indu~~ clotting promoting substances)
- GI complaints
- Increases chances of 2° fungal infections like mucormycosis.

competent individuals

↓

Destruction of the viruses by the ~~body~~ body:

↓

Expelled

or mild symptoms manifested.

3(d). Lab diagnosis

- Specimen collection: Nasopharyngeal swabs.
- Direct microscopy: ~~Not~~ pus cells ⇒ lymphocytes, macrophages visualised.

Electron microscopy: Coronaviruses with spikes seen. ; crown like spikes.

Immuno fluorescence: detected.

- ~~Ant~~ Serology: Antigen detection: direct Immuno fluorescence & ELISA.

Antibody detection: ~~by ELISA~~; IgM (if acute)

IgG ~~over chronic~~ over long periods of time).

- Confirmation (Gold standard): RT-PCR (Polymerase chain Reaction)
  - Reverse transcriptase — PCR.
- Identification of the viral genome & ~~speciation~~ & ~~biovar~~ strain identification.

3 (e) Management

- ~~Admit~~ Aerosol. Respiratory precautions + Aerosol. Standard precautions.
- Saturation levels, other parameters to be checked.
    - if stable; can be send home & advice ~~for~~ isolation.
    - if not; admit to isolation ward.
- Covid is a reportable disease → to be reported ~~immediate~~ to higher authorities.

Treatment: - Remdesevir;
- to prevent thrombotic episodes: Low molecular weight heparins eg- Enoxaparin given.
(- ~~to~~ lower inflammation: ~~hydroxychloro~~ hydrocortisone).

- Advice use of N95 ~~mask~~ respirators; direct contact, sharing of objects to be avoided.

prophylaxis

- Covaxin - 2 doses; ~~Adenovirus subunit~~ with interval of 4 weeks
- Covishield → (from Adenovirus); 2 doses; to health care workers; 2 doses with interval of 8 weeks.
- Inhalational vaccine - by Govt of India. (novel).

PRELIMS

MICROBIOLOGY - Paper #1

18/5/2025

82½

Aksa Manoj
UG23007

27/06

2. Hypersensitivity Reactions

Classification → into 4.

Type	Type I HSN	Type II	Type III	Type IV. (DTH) (Delayed hypersensitive Re
Antibody involved	IgE	IgM	IgM or IgG	T cells.
Examples	- Asthma - Anaphylactic Reactions. - Rh incompatibility	- Blood transfusion reactions - ~~Rh incompatabi~~ - Arthus reaction.	- Systemic lupus Erythematosus - ~~Rheumatoid~~ post streptococcal glomerulonephritis	- Lepra Reaction type II. - Lepromin test - Mantoux test.
onset.	- ~~sensitisation~~ & effective phases. - takes time for production of antibodies;	- Rapid.	- time taken. ~~effective autoimmunity~~	time taken.
Immune system involved	- humoral	- humoral	- humoral	Cell-mediated.
triggers	- pollen, peanuts, ~~dog~~ grass, ~~house~~ dust.	~~Rh~~	~~presence of corresponding antigen/antibo~~ Molecular mimicry.	- injection of antigens (eg: ~~PPD~~ purified protein derivative in Mantoux test)
→ Cells involved.	Mast cells, APCs, T_h cells. T_{h1} & T_{h2}.	NK cells.		CD_4+ cells & ~~T~~ Memory T ce
Types		- Antibody-dependent cellular cytotoxicity, - complement mediated cytotoxicity, etc.	- Exogenous ~~antigen~~ (as in post-strep-glomerulo nephritis). -.	- If lepromin & Matoux test are positive ↓ Indicates cell mediated immunity is intact.

Type I HSN.

- Mediated by IgE antibodies.
- 2 phases: Sensitisation & Effector.
- Triggered by various antigens like pollen, dust, peanuts, mustards, etc.

Sensitisation phase.

→ Entry of allergen into circulation.

↓

→ ~~Activat~~ Detection & ~~capture~~ phagocytes by the Antigen Presenting Cells (APCs) (Dendritic, B cells) & macrophages.

↓

Phagosome + lysosome fusion within the macrophage

↓

the antigenic substances are degraded.

↓

MHC II of ~~macro~~ APC ~~show~~ presents the antigenic peptides to the T helper cell Receptors. (TCRs)

↓

helper T cells differentiate

↙ ↘

T_H effector — T_H memory.

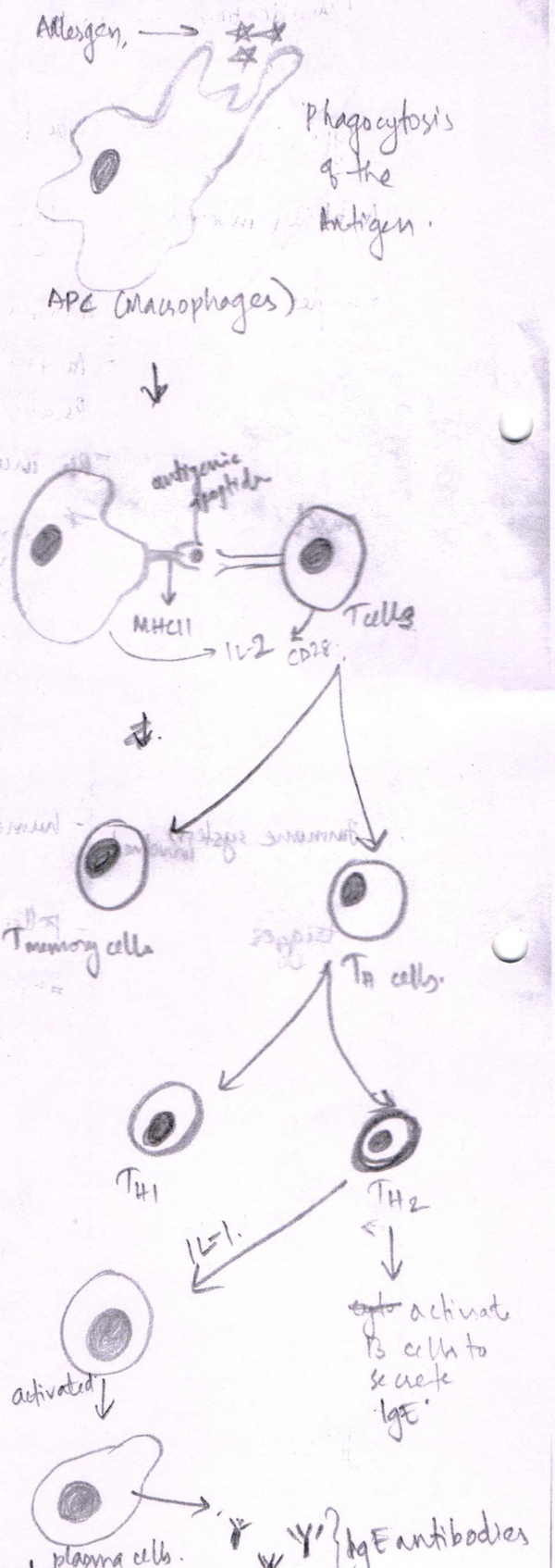
↙ ↘

T_{H1} — T_{H2}

↓ ↓

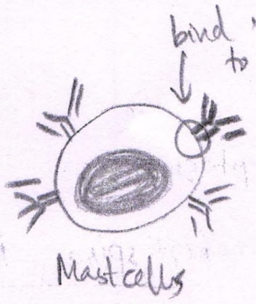
produce cytokines. for humoral pathway.

stimulates B cells → IgE production.



PTO.

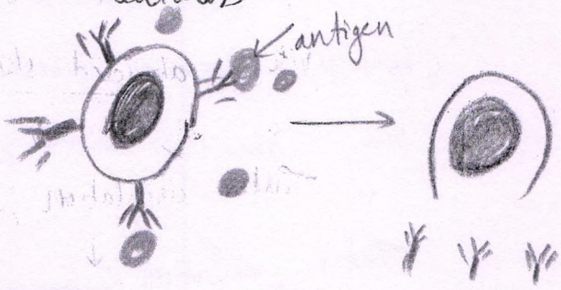
IgE binds to Mast cell
via Fc portion.
onto FcεReceptor of Mast cells.
⇓
Activated Mast cells !!

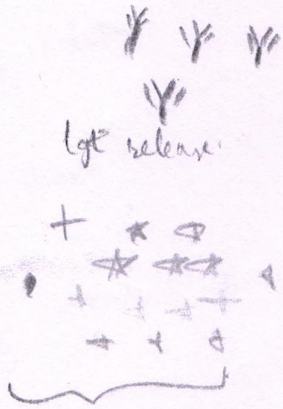


~~Sensitisation~~
Effector phase
Same Antigen exposure again
↓
~~Act~~ Antigens bind to F_{AB} site
of the IgE Antibodies fixed to
Mast cells.
↓
Mast cells release ~~it~~

~~Immediat~~
Primary mediators: serotonin, histamine.
2° mediators: ~~interferons~~, etc.

2nd entry of antigen
↓
⇒ degranulation of mast cells
to release IgE and 1°
mediators





Results:
- Vasodilation (local).
- contraction of endothelial cells
- increased vascular permeability
- edema. ~~→ wheal~~ & swelling.
- Systemically → triggers ~~the~~ ~~symp~~ bronchoconstriction
↓
difficulty in breathing
↓
O_2 levels go down.
↓
Anaphylaxis.

→ Reversed by immediate administration of ~~anti~~ Adrenaline 0.3-0.5mg 1in1000. IM.

3@ @ Leptospirosis.

Leptospira interrogans.

3b Pathogenicity:

- Mode of transmission: Contaminated water & soil. & ~~to~~ vegetables.
- Source: ~~Soil~~ Urine of rodents like rats, fox, etc. infected with leptospira.
- Leptospira ~~bac~~ ~~tac~~ (spirochete) bacteriae enter the human body via abraded skin & mucosa.

↓

Enter circulation; ~~phagocytosed by mac~~

↓

Reach liver → damages the hepatocytes → ↓clotting factor synthesis, ↓protein synthesis, ↓ ~~urea~~ detoxification of ammonia.

R. 2 phases: Septicemic phase. (1st week); fever, jaundice, headache, fatigue, ~~petechial~~ ~~rashes~~ petechiae. & 2nd phase.
- CNS manifestations
- CNS depression, encephalopathy.
- Uveitis (sign to be elicited)

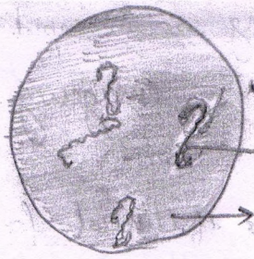
* Weil's disease: severe form of leptospirosis; hepatorenal haemorrhagic syndrome

- If not intervened, fatal.

© Laboratory diagnosis

- 1st week → urine, CSF : ~~Specimens~~ Specimens to be collected.
- Direct microscopy: Not visible under light microscope.
- & Dark ground microscopy, flouresent microscopy: spirochetes with closely wound ~~coil~~ spirals at regular intervals with

an umbrella shaped ends.



→ spirochetes (leptospira)

→ India Ink. (negative staining).

- Immunofluorescence: Apple green spiral & spirochetes seen.

* Motility → motile with ~~the~~ cork screw twisting motility.

Culture

- EMJH medium, Korthoff's medium, Fletcher's medium.

~~Antigen detec~~ Rapid Antigen detection - by Immunochromatography.

- Dipstick assay

- ELISA → for Antigen & Antibody detection. (IgM-early; IgG-late).

- PCR → ~~RT real time~~ to be done.

3d. Treatment & proplylaxis.

Treatment: Doxycycline, oral.; within the 1st 10 days; If progresses to 2nd stage → fatal.

Proplylaxis → Doxycycline ~~100mg~~ to all residents at the area of flood.

4. Major HAIs & preventive measures.

→ HAIs: Acquired by the patient apart from the context of infection for which he sought the treatment

(*) Catheter-Associated urinary tract infection (CAUTI)

- ~~Caused b~~ In catheterized patients; more chances in latex catheter than in silicone.

- Caused by E. coli, Klebsiella;

In hospitals → pseudomonas, proteus, staphylococcus aureus, etc

other organisms include:

Enterobacter, & Acineto bacter ~~baumanii~~, Enterococci, ~~&~~ etc.

~~Causes~~

Pathogenesis: - ~~Out~~ patient's own enteric flora. eg: E. coli, Klebsiella.

- healthcare worker's hands

- caregiving → ~~rapid~~ improper aseptic measures taken, emergency situation of catheterization.

~~Complications~~ Clinical features: (Criteriae).

* fever
* suprapubic tenderness
* vomiting or any other symptom ~~like dysuria~~.

- ~~Show~~ Reported ~~within~~ after 48 hours of catheterization.

(*) ~~CRBSI~~ ~~Cathet~~

CRBSI → Catheter Related Blood Stream infections.

eg: central line insertion.

Pathogenesis:

(i) from the flora on HCWs hands.

(ii) lack of asepsis followed.

(iii) ~~Circulation~~ deposition of circulating antigens on the central line.

~~(iv)~~ * Biofilm formation by bacteriae. is a virulence factor. in CRBSI & CAUTI as they are unable to be detected & phagocytosed by the host immune cells.

~~Const~~

- MRSA may be involved.

(*) VAP → Ventilator associated pneumonia.

- No specific diagnostic criteria
- As the patient is reduced → chances of aspiration are more; can develop pneumonia. by ~~E~~ pseudomonas aeruginosa, Mycoplasma pneumoniae.

(*) Surgical site infections.

- If ~~occurs~~ infection occurs with 30 days after procedure.
- In large surgeries like breast → If in 60 days → SSIs.

* · ~~E~~ - can lead to complications

P.T.O.

Preventive:

(*) Adoption of appropriate aseptic measures before the procedures.

(*) Proper hand hygiene by HCW & proper antiseptic ~~cleans~~ application on the patient.

(*) In CAUTI → ~~Rem~~ Replacement of the ~~cat~~ Foley's catheter required from time to time.

(*) Elevation of head end in Ventilated patients ⇒ prevents aspiration.

(*) Surgical site ⇒ proper care & wound dressing to be done from time to

(*) ~~Ventila~~ Decreasing the use of ~~&~~ ~~but~~ broad-spectrum high-end antimicrobial agents ⇒ help in reduction of resistant organisms

(*) ~~HIV~~ Narrow spectrum, short duration therapies & fixed dose combination in chronic conditions like leprosy, HIV & TB helps to prevent development of resistance.

(5)

Moist heat sterilization methods.

(Above) >100°C ⟹ Autoclave

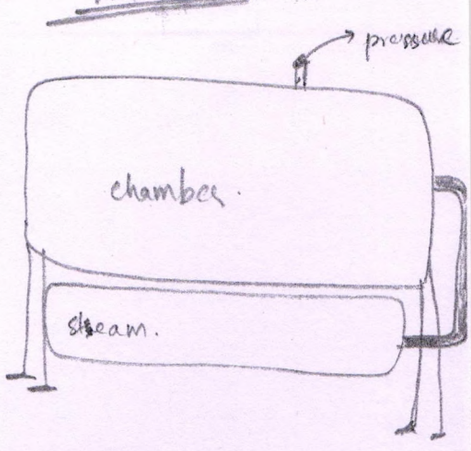
at 100°C → ~~Inspissation, pasteurisation~~ Boiling

~~dd~~ (below) <100°C → Inspissation,
Tyndallization, pasteurisation.

→ Autoclave (steam sterilises)

- Makes use of steam
- ~~Opti~~ Conditions: 120°C ~~for~~ + for 15 mins at 50 pounds pressure.

Principles: under high pressure, water boils at a higher pressure; steam is obtained.



Controls: ~~&~~ Spores of Geobacillus stearothermophilus; dies at 12 minutes

autoclaving.

External controls: the display showing time, temperature ~~etc~~ pressure, etc.

Internal control: Bowie-stick, ~~Dip~~ Autoclave tape.

Mechanism of Action: Irreversible coagulation, denaturation of proteins & cell walls, destruction of the spores and ~~bacteria~~ organisms.

Uses: To sterilise scalpels, culture media, etc after disinfection, linen.

- Biomedical wastes → also sterilised (but in a different autoclave)
- Not suitable for ~~oils~~ sterilising oils and plastics ~~etc~~.

~~Mechanism~~:

Mechanism:

~~Do~~ Air evacuation: the air is completely evacuated.

Pressurisation: high pressure and the walls are ~~also~~ sealed.

- Introduction of steam for 15 mins ~~at~~ at 120°C.
- depressurising ⇒ & removal of the objects.

Advantages: ~~large load~~, ~~not~~ time-effective, non-inflammable, low cost, non-toxic (unlike ETO).

disadvantages: less load at a time, not suitable for heat-susceptible equipments & plastics.

* the equipments are to be well-packed ~~in~~ before loading.

* Can kill all spores, enveloped & non-enveloped viruses, fungi, bacteriae ~~etc~~.

6. Dermatophytes.

Clinical types: — Superficial mycoses.

Trichophyton
~~Tri~~ mentagrophytes : Infects skin, nail, hair

Microsporum : Infects skin, hair

Epidermophyton : Infects skin, nail.

* Tinea capitis → infect scalp
* Tinea ~~barbae~~ barbae on the beard area of face.
* Tinea corpora → on body
* Tinea pedis → on foot
* Tinea unguium → on ~~ta~~ nails.
* Tinea manuum → on the sole.
* Tinea faciei


endothrix.


Ectothrix

Lab diagnosis

Specimen collection: Nail clippings, hair plucked, skin scrapings.

- 10% KOH → for degradation of ~~keratin~~ keratin.
- More time required for hair & nail (higher amounts of keratin.

~~Culture~~: ~~Lab~~

Microscopy: Calcofluor ~~white~~ white stain

Macro & microconidia seen.

→ hair clipping: endothrix & ectothrix (see above)

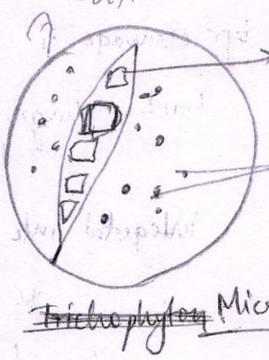
→ Culture: Sabouraud dextrose agar (pH=5.4)

~~Lactophenol cotton blue~~.

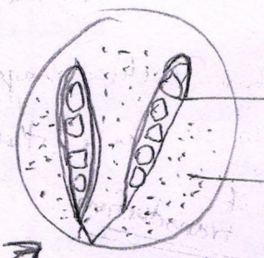
→ Culture smear microscopy: lactophenol cotton blue.

Can be differentiated.

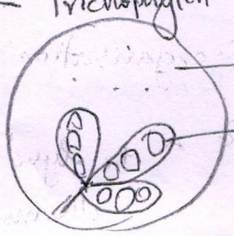
Culture smear



~~Trichophyton~~ Microsporum



Trichophyton



Epidermophyton.

~~→ ELISA~~

Identified using microscopy.

⇒ Serology : Antigen & Antibody detection: β-D-glucan & galactomannan

⇒ ELISA & PCR

---

(8) Horizontal gene transfer methods.

(i) Transformation.

- based on 'Griffith's experiment on mice'.

- Bacteriae, ~~when~~ after death, lyse → to release genetic materials

↓

'Competence factor' → uptake of the released materials by other bacteriae.

confers the features of these materials to the bacteriae.

* Useful in Bacterial resistance & transfer.

(ii) Transduction.

- Bacteriophage mediated.

Generalised

Bacteriophage injects into contents to a cell.

↓

cleavage of the host genome &

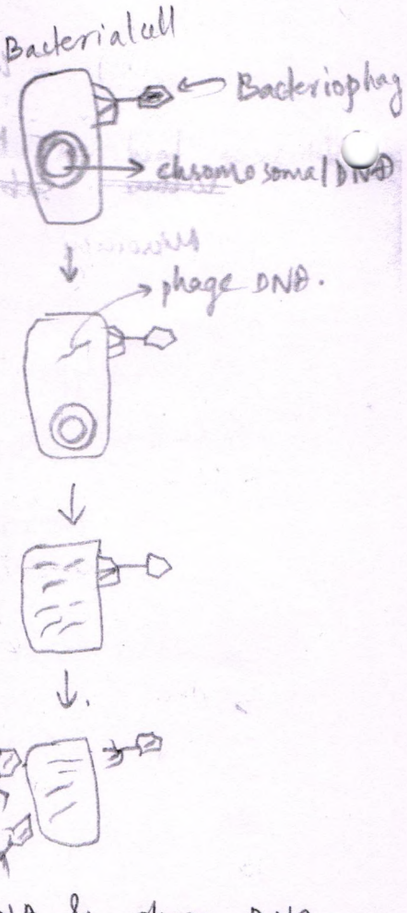
bacteriophages'

↓

integrated into daughter bacteriophages

&

released.



- These bacteriophages can infected normal cells & confer them resistance.

and type of transduction

Reorganisation of the cleaved chromosomal DNA & phage DNA.

↓

the lysed gene sequences will have some parts of the chromosal DNA.

transferred into daughter bacteriophages.

↓

infects other cells

↓

Confers resistance.

Use: Antibacterial resistance & toxin production.

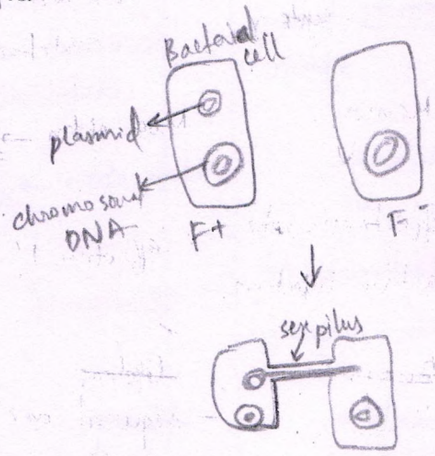
Conjugation:

(i) $F^+ \times F^-$

(F^+ cell = with the F factor for resistance
F^- cell = without the F factor for resistance)

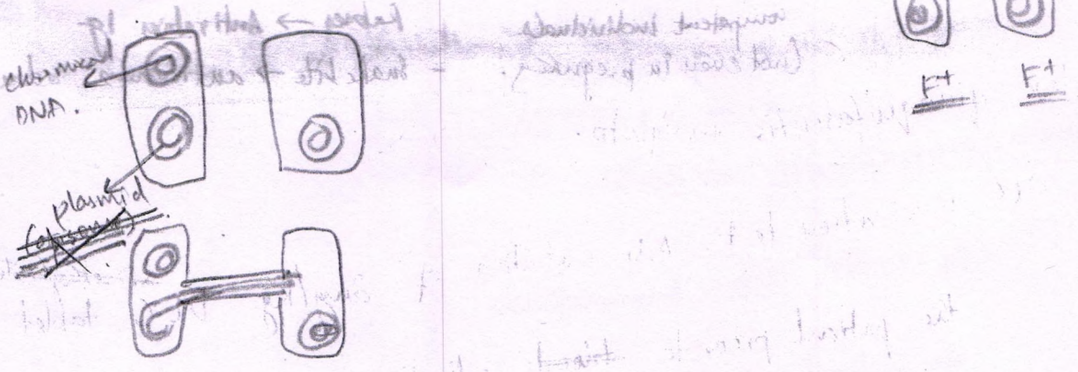
F-factor codes for resistance.

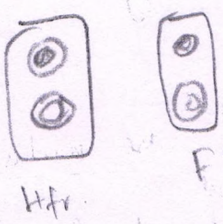
F^+ cell transfer the F factor to F^- cell (without resistance factor) via sex pilus.



(ii) $HFr \times F^-$

High frequency F factor (integrated with the chromosomal DNA)





→ F^+ cell in this conjugation is reversible.

(iii) F' (= F prime)

- F' plasmid containing bacteria cannot be reverted into their normal states.

11. Active & passive immunity.

Features	Active immunity	Passive immunity
Example (artificial)	Vaccination (cell wall antigens / subunit / killed)	Immunization (injecting antibodies / immunoglobulins)
Natural	Natural infection	Mother's breastmilk (IgA) ~~foetal period (from placenta)~~
~~Action~~: Host immune system	Involved in producing antibodies.	Not involved.
Memory.	Most often → lifelong.	No memory.
Effectiveness to active infection.	Effective !!	After disappearance of the Ig; not effective.
~~Duration~~. Useful.	lifelong - required over the course of life; in a healthy individual	- given in immunocompromised state eg: Cancer therapies, Transplantation, splenectomy, to infants.
—	- Vaccination; can be done only to healthy, immunocompetent individuals. (not even in pregnancy.	- in immediate events like Rabies → Anti rabies Ig - Snake bite → antivenom administration.

4.

13. Culex quinquifasciatis mosquito.

DEC provocation test: Administration of 2mg/kg DEC tablet to the patient prior to ~~blood~~ collection drawing blood for diagnosis of filasiasis.

- ~~Filasiatiat~~ Microfilariae in blood are nocturnal; appear only at the night in the peripheral blood vessels. from the lymphatics.
- 15-30 minutes after DEC administration, the parasites migrate/appear to peripheral circulation.

14. Ancylostoma braziliense, Ancylostoma canis, Strongyloides stercoralis, hookworm

12.

Pathogenesis of Chicken pox & Varicella zoster.

- These are viruses.

~~Route of~~ Mode of transmission: Droplets & aerosols

Route of entry: Conjunctiva, abraded mucosa - by direct contact, inhalation.

Pathogenesis:

Entry into circulation

↓

Phagocytosed by Macrophages.

↓

Reticuloendothelial cells. (Lymphnodes), ~~spleen~~

↓

Manifests on skin: Chicken pox: ~~Macu~~ ~~Pustular~~ Vesicular lesions on the back trunk & forearms (centripetal).

~~Varicella zoster: along a single dermatome.~~

3 Y2 Undergoes ~~latency~~ in the trigeminal ganglia. (most often)

↓

Reactivation in immunocompromised states like undergoing chemotherapy, HIV infection, etc.

↓

presents as Varicella - Zoster. (herpes - zoster).

↓

lesions along a single dermatome.

(most commonly: along ophthalmic Nerve distribution).

&

Complications of Varicella Zoster: Reye's syndrome: fatty degeneration of liver.
- congenital varicella,

or. of herpes - Zoster → post herpatic neuralgia ~~neuralgiarum~~. & Zoster opthalmicus

Congenital Varicella.

↳ If pregnant mother is affected with varicella. 5 days before or 2 days after ~~to~~ delivery.

↓

VZIG to be given to infant.

↓

if not, the ~~neonate~~ infant can develop CNS malformations & ~~hypo~~ limb defects.

* Varicella → infective 5 days before to after appearance of rashes.
→ with each crop of lesions → fever spikes.

10.

Non-Treponemal tests.

- V.D.R.L (Venereal Disease Research lab)
- R.P.R. (Rapid plasma reagin)

Treponemal tests.

TPI (Treponema pallidum immunodiffusion)

TPHA. (Treponema pallidum haem agglutination)

FTS-AB ~~&~~ (Fluorescent tagged syphilis Antibody).

9.

Antimicrobial resistance. - Methods.

~~(i) efflux pumps.~~

~~Bacteriae~~

⇒ Intrinsic Resistance: Naturally resistant microbes to certain antibacterial agents.

↓

eg: Proteus to nitrofurantoin

Gram negative organisms to ~~anti~~ vancomycin. and aminoglycosides.

Acquired resistance.

- Resistance acquired by the bacteria over time

Mutation

- spontaneous & irreversible alteration in the genetic sequences of cells ⟹ confers antimicrobial resistance.

eg: mecA gene mutation in staphylococcus aureus makes them resistant to penicillins (Methicillin)

Physical methods

→ Efflux pumps:

- introducing efflux pumps on the cell walls

↓

After entry of the antimicrobial agent, it is

expelled out via their

↓

Cannot attain sufficient concentration within the organism for effective antimicrobial activity.

→ Enzymes.

eg: β-lactamase enzymes

- cleave the β-lactam rings in penicillin, cephalosporins, meropenems & aztreonams & prevent their action.
- seen in staphy (gram positive organisms)

eg: Extended β-lactamase enzyme.

- provided resistance against cephalosporins

→ Altered binding site.

In MRSA → mecA gene ⟹

codes for PBP2a (Penicillin binding protein's altered form)

↓

~~inhibits~~ prevent interaction of PBP2a to β-lactam rings.

→ Decreased affinity to bind to RNA polymerase enzyme.

- ~~seen~~ provides resistance against macrolides.

7. Lab diagnosis of Dengue infection.

~~***~~ Specimen collection: Blood, urine.

Serology

* In the 1st week → NS-1 ~~antigen~~ antigen by ELISA } in serum

IgM antibodies → ELISA.

~~After which~~ → * NS-1 Ag → earliest diagnostic (marker).

* After which → IgM antibodies can be detected by ELISA.

↳ MAT (Microscopic agglutination test).

* ~~PCR~~ → Rapid Card test → for NS-1 antigen ; Immuno chromatographic test.

~~***~~ ~~IgM~~ * Polymerase chain Reaction.

↓

to detect the viral sequence.

* rt-PCR → real time ~~RT~~ PCR → to quantify the viral load in body.

* PCR → helps in speciating the Dengue virus.

4 species → DEN-1, DEN-2, DEN-3, DEN-4 & new: DEN-5.

~~***~~

15. The sample should be rejected.

- A repeat sample should be asked with proper labelling.

* from an abscess → the ideal specimen is ~~pus aspirate~~ aspirate.

- A swab is not satisfactory.

Actions:

~~The swab~~ If the specimen was appropriate; the correct details
- could have been enquired from the ~~ward~~ staff in the ward.
&
- Above all, ~~pus~~ aspisate ~~from~~ an abscess is not a precious sample.
And hence, repeating is not a problem.

- The ~~ward~~ healthcare workers should be advised the proper collectio
& labelling aspects immediately.

- The labelling & on the container & ~~sep~~ details on the request form
should contain a minimum of the below details.

4

* Name, Age & sex of the patient.
* Ward & bed number.
* Name of treating physician.
* Time & date of collection.
* Sample type & collected method.
* Initiation of antibiotics.
* Provisional diagnosis.
* Required tests to be performed.
* ~~Co~~ Sample collected by ____, designation.

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