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1. Cerebral malaria is caused by?

a) Plasmodium falciparum

b) Plasmodium ovale

c) Plasmodium vivax

d) Plasmodium malariae

Correct Answer - A

Ans. A. Plasmodium falciparum

- **Cerebral malaria is the most common complication and cause of death in severe *P. falciparum* infection. In falciparum malaria, 10% of all admissions and 80% of deaths are due to the CNS involvement.**
- **CNS manifestations are fairly common in malaria and it could be due to not only severe *P. falciparum* infection, but also high-grade fever and antimalarial drugs.**
- **A strict definition of cerebral malaria has been recommended for sake of clarity and this requires the presence of unarousable coma, exclusion of other encephalopathies and confirmation of *P. falciparum* infection.**
- Plasmodium falciparum REF: Harrison's 17th edition, chapter 203
- Cerebral Malaria: Coma is a characteristic and ominous feature of falciparum malaria and, despite treatment, is associated with death rates of 20% among adults and 15% among children. Any obtundation, delirium, or abnormal behavior should be taken very seriously. The onset may be gradual or sudden following a convulsion.

2. All are true regarding disinfectants except

- a) Glutaraldehyde is sporicidal
- b) Hypochlorites are virucidal
- c) Ethylene oxide is intermediate disinfectant
- d) Phenol usually requires organic matter to act

Correct Answer - D

Phenol is bactericidal and readily inactivated organic matter [Ref. - Anandmarayanan 7/e p. 30,31,32; Jawetz 24/c p. 6]

Phenols are bactericidal, but these are not readily inactivated by organic matter.

Disinfectant	Effective against		Virus	Susceptible to organic matter
	Bacteria	Spores		
Formaldehyde	+++	+++	+++	-
Glutaraldehyde	+++	+++	+++	?
Chlorine (hypochlorite)	+++	+1-	+++	+++
Phenols	++(+)	-	+	+/-

3. Acellular pertusis vaccine contains

a) Pertactin, flagillary hemagglutinin, cytotoxin, endotoxin

b) Pertactin, flagillary hemagglutinin, fimbriae, endotoxin

c) Pertactin, cytotoxin, fimbriae, pertactin,

d) Flagillary hemagglutinin, pertusis toxin, fimbriae

Correct Answer - D

Flagillary hemagglutinin, pertussis toxin, fimbrial [Ref: <http://www.who.int/biological/publication/tri/areas/haccine>; O. P. Ghai 7/e p. 169, Ananthnarayan Micro 8/e p. 336, 337, 338, 399]

- Whole cell pertussis vaccines consist of inactivated Bordetella pertussis bacterial cells.
 - They are given as combinations with diphtheria and tetanus toxoids (DTP) vaccines.
 - Whole cell DTP vaccines cause several local adverse effects. (e.g., erythema, swelling pain at the injection site) and other mild systemic events e.g., (drowsiness, fretfulness and anorexia).
 - They are also associated with serious systemic adverse effect such as convulsions with or without fever and hypotonic hyporesponsive episodes sometimes they may also be associated with encephalopathy.
- Concerns about the safety prompted the development of more purified (Acellular) pertussis vaccine that are associated with a lower frequency of adverse effects and are as effective in preventing pertussis as the whole cell vaccine.
- There is yet no consensus about the antigenic composition of an ideal acellular pertussis vaccine. Acellular pertussis vaccines currently available from different manufactures should be considered as different and unique products because of the

presence of one or more different components which are : ?

- Chemically or genetically detoxified pertussis toxin° (PT toxoid).
 - Filamentous hemagglutinin
 - 69k Da outer membrane protein (also known as pertactin)°
 - Fimbrial-2 and fimbrial-3 antigens.
 - These components are contained in different concentrations and with different degrees of adsorption.
 - *It was believed that active pertussis toxin and endotoxin are responsive for the high incidence of adverse effects of whole cell vaccine.*
 - *Therefore the acellular pertussis vaccine contains detoxified pertussis toxin or the toxoided pertussis toxin and it does not contain the endotoxins present in whole cell pertussis vaccine.*
- They are associated with considerably lesser side effects than whole cell vaccine and have similar efficacy to a cellular pertussis vaccine (90%).*

4. Which is NOT TRUE with regards to antibiotic resistance in bacteria?

- a) Most common mechanism is production of antibiotic destroying enzymes
- b) Lack of target binding site may be mechanism of resistance in some enterococci against vancomycin
- c) Plasmid mediated resistance is transmitted only vertically
- d) Target binding shifting is the mechanism in some pneumococci

Correct Answer - C

Plasmid mediated resistance can be transmitted both horizontally and vertically. Routes of horizontal transfer of plasmid mediated resistance are conjugation, transduction and transformation.

3 main mechanisms of drug resistance:

- Production of beta lactamases: Most common mechanism of penicillin resistance in both gram +ve and -ve bacteria.
- Alteration of PBP (penicillin binding proteins): Seen in gram +ve bacteria. This is the basis for methicillin resistance in MRSA also basis for penicillin resistance in pneumococci and enterococci.
- Impaired penetration: Seen only in gram -ve bacteria
PBP are localised on outer surface of cell membrane and not on cell wall. PBP are essential for synthesis of cell wall.

5. All of the statements regarding Lymes disease are true, EXCEPT:

- a) *Borellia bourgdroferi* replicates locally and invades locally
- b) Infection progresses inspite of good humoral immunity
- c) Polymorphonuclear lymphocytosis in CSF suggest meningeal involvement
- d) IgA intrathecally confirms meningitis

Correct Answer - C

CNS involvement in lymes disease is indicated by lymphocytic pleocytosis, elevated protein and normal glucose.

Lymphocytic meningitis is confirmed by intrathecal IgM, IgG or IgA antibodies to *Borrelia Burdogferi*.

Borrelia burdogferi replicates in the skin and then disseminates via bloodstream to other organs leading to extracutaneous manifestations.

3 Stages of Lymes disease infection are:

- **Stage 1:** Flu like symptoms and erythema migrans
- **Stage 2:** Facial palsy, meningitis
- **Stage3 :** Arthritis

6. The Halophilic Vibrio that is implicated in gastroenteritis is which of the following?

a) Vibrio Mimicus

b) Vibrio Vulnificus

c) Vibrio Alginolyticus

d) Vibrio Parahaemolyticus

Correct Answer - D

It is the causative agent of food poisoning due to sea fish.

Usual signs are abdominal pain, diarrhea, vomiting and fever.

Feces contain cellular exudate and blood. Dehydration is moderate.

Infections with V parahaemolyticus can result in two distinct gastrointestinal presentations (including nearly all cases in North America).

The most common presentation is watery diarrhea, usually occurring in conjunction with abdominal cramps, nausea, and vomiting and accompanied in —25% of cases by fever and chills.

Dysentery, the less common presentation, is characterized by severe abdominal cramps, nausea, vomiting, and bloody or mucoid stools.

V parahaemolyticus contains two type III secretion systems, which directly inject toxic bacterial proteins into host cells.

After an incubation period of 4 hours to 4 days, symptoms develop and persist for a median of 3 days.

V parahaemolyticus is linked to its ability to cause hemolysis on Wagatsuma agar) i.e. is called as Kanagawa phenomenon.

Recovery occurs in 1-3 days. Common in summer and in adults.

Ref: Ananthanarayan & Panicker's, 8th Edition, Page 312

7. A 30 year old farmer presents with the features of high fever, painful inguinal lymphadenopathy, vomiting and diarrhoea with hypotension. Which of the following stain will be helpful in making the diagnosis?

a) Wayson's stain

b) Neisser stain

c) Alberts stain

d) McFadyean's stain

Correct Answer - A

Wayson's stain is a basic fuchsin - methylene blue, ethyl alcohol - phenol microscopic staining procedure.

It is a modified methylene blue stain used for diagnosing bubonic plague.

Giemsa / Wayson stain reveals the typical safety-pin appearance of the organism.

In Bubonic plague the infected flea bite is usually on the legs and is marked by a small pustule or ulceration.

More often the lymph nodes draining the area of the flea bite become affected and the resulting adenitis produces intensely painful swellings or buboes in the inguinal axillary or cervical regions depending upon the position of the bite.

Ref: Levinson W. (2012). Chapter 20. Gram-Negative Rods Related to Animal Sources (Zoonotic Organisms). In W. Levinson

(Ed), Review of Medical Microbiology & Immunology, 12e.

8. A 30 year old farmer from the sub-Himalayan region presents with multiple leg ulcers. The most likely causative agent is:

a) Trichophyton Rubrum

b) Cladosporium species

c) Sporothrix Schenckii

d) Aspergillus

Correct Answer - C

Sporothrix schenckii is a thermally dimorphic fungus that lives on vegetation.

- ***Sporothrix schenckii***, a fungus that can be found worldwide in the environment,
- The conidia or hyphal fragments of *S schenckii* are introduced into the skin by trauma. The most common route of infection is the introduction of spores to the body through a cut or puncture wound in the skin.
- Patients frequently recall a history of trauma associated with outdoor activities and plants.
- The initial lesion is usually located on the extremities but can be found anywhere (children often present with facial lesions).
- About 75% of cases are lymphocutaneous; ie, the initial lesion develops as a granulomatous nodule that may progress to form a necrotic or ulcerative lesion. Meanwhile, the draining lymphatics become thickened and cord-like. Multiple subcutaneous nodules and abscesses occur along the lymphatics.
- Oral itraconazole or another of the azoles is the treatment of choice.

- For systemic disease, amphotericin B is given.
Ref: Brooks G.F., Carroll K.C., Butel J.S., Morse S.A., Mietzneron T.A. (2010). Chapter 45. Medical Mycology. In G.F. Brooks, K.C. Carroll, J.S. Butel, S.A. Morse, T.A. Mietzneron (Eds), Jawetz, Melnick, & Adelberg's Medical Microbiology, 25e.

9. Which of the following disease is associated with adenosine deaminase deficiency?

a) Chronic granulomatous disease

b) X-linked agammaglobulinemia

c) Severe combined immunodeficiency (SCID)

d) Transient hypogammaglobulinemia of infancy

Correct Answer - C

Adenosine deaminase deficiency is associated with the development of severe combined immunodeficiency.

Adenosine deaminase enzyme converts adenosine and deoxyadenosine into inosine and deoxyinosine.

In the absence of ADA, high intracellular levels of adenosine, deoxyadenosine, and their toxic phosphorylated metabolites cause apoptosis of lymphoid precursors, resulting in the virtual absence of T lymphocytes, that is usually associated with marked reduction of B and NK lymphocytes.

Ref: Williams Hematology, 8th Edition, Chapter 82; Harrisons Internal Medicine, 18th Edition, Chapter 316

10. All of the following are functions of CD4 helper cells except:

a) Immunogenic memory

b) Produce Immunoglobulins

c) Activate macrophages

d) Activate cytotoxic cells.

Correct Answer - B

- Immunoglobulins are secreted from the B lymphocytes.
- however, T helper cells help the B cells, by activating it and produce into plasma cells.
- These plasma cells secrete the immunoglobulins.
- Thus, T helper cells indirectly help in the secretion of immunoglobulins.

11. Which is the largest intestinal protozoa found in humans?

a) Entamoeba coli

b) Balantidium coli

c) Giardia lamblia

d) Toxoplasma gondii

Correct Answer - B

Balantidium coli is the **only ciliated protozoan** that causes human disease (i.e., **diarrhea**) and **its length is up to 200 micro meter, making it the largest of the human intestinal protozoa.**

Domestic animals, especially pigs, are the main reservoir for the organism, and humans are infected after ingesting the cysts in food or water contaminated with animal or human feces.

The trophozoites excyst in the small intestine, travel to the colon, and, by burrowing into the wall, cause an ulcer similar to that of *Entamoeba histolytica*.

However, unlike the case with *E. histolytica*, extraintestinal lesions do not occur.

Most infected individuals are asymptomatic.

Diagnosis is made by finding large ciliated trophozoites or large cysts with a characteristic V-shaped nucleus in the stool.

There are no serologic tests. The treatment of choice is tetracycline. Prevention consists of avoiding contamination of food and water by domestic animal feces.

Ref: Levinson W. (2012). Chapter 53. Minor Protozoan Pathogens. In W. Levinson (Ed), *Review of Medical Microbiology & Immunology*,

12e.

12. A 35 year old man who recently traveled to a third world country develops chronic, severe dysentery. Colonoscopy demonstrates ulceration of the cecum, and a cecal biopsy reveals 15-to-40 micron amoebae with ingested erythrocytes and small nuclei with distinctive tiny central karyosomes. Which of the following organisms is the most likely culprit?

a) *Acanthamoeba* sp

b) *Balantidium coli*

c) *Entamoeba histolytica*

d) *Giardia lamblia*

Correct Answer - C

Entamoeba histolytica is the usual cause of intestinal amebiasis, and has the microscopic features described in the question stem. A particularly helpful (but not always present) feature of this organism is the presence of ingested red blood cells within the amoebae.

These amoebae cause **flask-shaped ulceration** of the intestinal mucosa and submucosa, with a particular propensity for involving the cecum and ascending colon. The disease manifestations range from none (asymptomatic carriers) to mild chronic diarrhea, to severe, purging dysentery.

In symptomatic cases, the liver may develop destructive amoebic liver abscesses that tend to become secondarily (and potentially life-threateningly) infected by bacteria.

Acanthamoeba is a free-living amoebae that can cause amoebic meningoencephalitis.

Balantidium coli is a large ciliated intestinal parasite that can occasionally cause colonic disease resembling that caused by *Entamoeba histolytica*.

Giardia lamblia is a small intestinal protozoa with a distinctive pear-shaped morphology that appears to have a "face."

Ref: Ray C.G., Ryan K.J. (2010). Chapter 51. Rhizopods. In C.G. Ray, K.J. Ryan (Eds), *Sherris Medical Microbiology*, 5e.

13. Which of the following is FALSE regarding mycobacterium?

a) Cell wall has high lipid content

b) Mycolic acids and LAM form waxy coat

c) Lack exotoxins or endotoxins

d) None of the above

Correct Answer - D

Of particular importance is the presence of long-chain fatty acids called **mycolic acids (for which the mycobacteria are named) and lipoarabinomannan (LAM)**, a lipid polysaccharide complex extending from the plasma membrane to the surface.

These elements give the mycobacteria a cell wall with *unusually high lipid content* (more than 60% of the total cell wall mass), which accounts for many of their biologic characteristics.

It can be thought of as a waxy coat that makes them hardy, impenetrable, and hydrophobic.

Mycobacteria do not produce classic exotoxins or endotoxins.

Disease processes are thought to be the result of two related host responses:

- **Delayed-type hypersensitivity (DTH)**
- **Cell-mediated immunity (CMI)**

Ref: Ray C.G., Ryan K.J. (2010). Chapter 27. Mycobacteria. In C.G. Ray, K.J. Ryan (Eds), Sherris Medical Microbiology, 5e.

14. An elderly male presented with fever, dry cough and chest pain. The causative organism was detected in sputum which is cultured on charcoal yeast medium. The organism is:

a) H. influenzae

b) Moraxella catarrhalis

c) Legionella

d) Burkholderia cepacia

Correct Answer - C

This is a case of Legionella infection. The established approach to diagnosis combines direct fluorescent antibody (DFA) with culture of infected tissues.

Cultures must be made on buffered charcoal yeast extract (BCYE) agar medium that includes supplements (amino acids, vitamins, L-cysteine, ferric pyrophosphate), which meets the growth requirements of Legionella.

It is buffered to meet the acidic conditions—optimal for Legionella growth (pH 6.9).

The isolation of large Gram-negative rods on BCYE after 2 to 5 days that have failed to grow on routine media (blood agar, chocolate agar) is presumptive evidence for Legionella.

Diagnosis is confirmed by DFA staining of bacterial smears prepared from the colonies.

Ref: Ray C.G., Ryan K.J. (2010). Chapter 34. Legionella. In C.G. Ray, K.J. Ryan (Eds), *Sherris Medical Microbiology, 5e.*

15. With reference to Bacteroides fragilis the following statements are true, EXCEPT:

a) B. fragilis is the same frequent anaerobe isolated from clinical samples.

b) B. fragilis is not uniformly sensitive to metronidazole

c) The lipopolysaccharide formed by B. fragilis is structurally and functionally different from the conventional endotoxin

d) Shock and disseminated intravascular coagulation are common in Bacteroides bacteremia

Correct Answer - D

Ans. D. Shock and disseminated intravascular coagulation are common in Bacteroides bacteremia

Bacteroides species have lipopolysaccharides, but lack the lipopolysaccharide structures with endotoxic activity (including beta-hydroxymyristic acid).

The lipopolysaccharides of B fragilis are much less toxic than those of other gram-negative bacteria.

Thus, infection caused by Bacteroides does not directly produce the clinical signs of sepsis (eg, fever and shock) so important in infections caused by other gram-negative bacteria.

When these clinical signs appear in Bacteroides infection, they are a result of the inflammatory immune response to the infection.

Ref: Brooks G.F. (2013). Chapter 21. Infections Caused by Anaerobic Bacteria. In G.F. Brooks (Ed), Jawetz, Melnick, & Adelberg's Medical Microbiology, 26e.

16. Albert's stain is used for ?

a) Staphylococcus

b) *Corynebacterium diphtheriae*

c) *C. perfringens*

d) *C. tetani*

Correct Answer - B

Ans. is 'b' i.e., *Corynebacterium diphtheriae*

- Albert's stain is used for metachromatic granules, mostly found in *Corynebacterium diphtheriae*.
- Albert's solution is of two types A & B given below briefly:

Albert's A solution Albert's B solution

Toluidine blue 0.15 g	Iodine 2 g
Malachite green 0.20 g	Potassium iodide (KI) 3 g
Glacial acetic acid 1 mL	
Alcohol (95% ethanol) 2 mL	

17. True about interferon -

a) It is virus specific

b) It is Bacteria specific

c) Produced from Bacteria

d) Effective against viral infection

Correct Answer - D

Ans. is 'd' i.e., Effective against viral infection

	IFN alpha	IFN beta	IFN gamma
Name	Leucocyte interferon	Fibroblast interferon	Immune interferon
Principal cell source	Most cell types	Most cell types	Lymphocytes
Inducing agent	Viruses; dsRNA	Viruses; dsRNA	Mitogens
Function	Induction of antiviral state; activation of NK cells, enhancement of cell-mediated immunity	Induction of antiviral state; activation of NK cells, enhancement of cell-mediated immunity	Activation of macrophage, promotion of IgG class switch, inflammation and TH1 but inhibition of TH2 responses
Chromosomal location of genes	9	9	12

Chromosomal location of IFN receptor genes	21	6
Glycosylated	No	Yes
	Yes	Yes

18. Bacteria coated with complement and Ig; phagocytosis is enhanced by-

a) Receptor mediated endocytosis

b) Pseudopod formation

c) Myeloperoxidase mediated destruction

d) C3b - Fc mediated destruction

Correct Answer - D

Ans. is 'd' i.e., C3b- Fc mediated destruction

- Here, the examiner is simply asking about the opsonization. Complement (especially C3b) and Ig coating the bacteria act as opsonin and enhance phagocytosis.
- The speed of phagocytosis can be increased markedly by bringing into action two attachment devices present on the surface of phagocytic cells
 - i) *Fc receptor* :- which binds the Fc portion of antibody molecule, *chiefly IgG*
 - ii) *Complement receptor (CR3)* :- which binds the third component of complement *especially C3b*.
- This coating of the organisms by molecules that speed up phagocytosis, is termed '*opsonization*' and the *Fc portion of antibody and C3b are termed as opsonins*.
Now the question crops, how does opsonins enhance phagocytosis :
?
- Both the membrane of a phagocytosing cell and its target have a negative charge (zeta-potential), making it difficult for the two cells to come close together. Once the opsonins attach to the target, the negative charge is masked. Take note that the negative charge of the target doesn't disappear. The opsonin simply overrides the

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charge, making it easier for white blood cells (phagocytic cells), to undergo phagocytosis. During the process of opsonization (also, opsonisation), antigens are bound by antibody or complement molecules. Phagocytic cells express receptors, CR1 and Fc receptors, that bind opsonin molecules, C3b and antibody, respectively. With the antigen coated in these molecules, binding of the antigen to the phagocyte is greatly enhanced. In fact, most phagocytic binding cannot occur without opsonization of the antigen.

- Furthermore, opsonization of the antigen and subsequent binding to an activated phagocyte will cause increased expression of complement receptors on neighboring phagocytes.

About option c

- As you all know, inside the phagocytes, bacteria are destroyed by lysosomal enzymes (lactoferrin, lysozyme defensins) and reactive oxygen intermediate (*myeloperoxidase system*, superoxide, H_2O_2 , hydroxy radicals).
- However, this process has nothing to do with opsonins. Opsonins enhance phagocytosis by masking the negative charge on the bacterium so that it easily comes in contact with phagocytes.

19. First chemical barrier encountered by microorganism for common exposed sites

-

a) Lysozyme

b) Acidic pH

c) Skin

d) Lactose

Correct Answer - B

Ans. is 'b' i.e., Acidic pH

- Human body can defend itself against infection-causing organisms by the use of passive barriers to prevent microorganisms entering inside the body.
- All surfaces of the body, which come in contact with the external environment, are equipped with mechanical and chemical barriers to prevent penetration by microorganisms.
- The skin is essentially an impermeable covering.
- *Surface secretions constitute one of the most important mechanisms of innate immunity*

20. Streptococcus all are true except-

a) Streptodornase cleaves DNA

b) Streptolysin O is active in reduced state

c) Streptokinase is produced from serotype A,C,K

d) Pyrogenic toxin A is plasmid mediated

Correct Answer - D

Ans. is 'd' i.e., Pyrogenic toxin A is plasmid mediated

- Three toxin types of streptococcal pyroexotoxin have been identified : A, B and C. *Type A and C are coded for bacteriophage genes, while type B gene is chromosomal.*
Streptolysin 'O' is oxygen labile; therefore, it is active in reduced state only
- *Streptokinase* is also known as *fibrinolysin*. It is expressed on all strains of streptococcus pyogenes (including A,C,K). It is expressed close to plasminogen binding site on the bacterial surface, it is activated to plasmin by streptokinase.
Deoxyribonucleases (streptodornases) hydrolyze nucleic acids (e.g. DNA).

21. A patient admitted to an ICU is on central venous line for the last one week. He is on ceftazidime and amikacin. After 7 days of antibiotics he develops a spike of fever and his blood culture is positive for gram positive cocci in chains, which are catalase negative. Following this, vancomycin was started but the culture remained positive for the same organism even after 2 weeks of therapy. The most likely organism causing infection is-

a) Staphylococcus aureus

b) Viridans streptococci

c) Enterococcus faecalis

d) Coagulase negative Staphylococcus

Correct Answer - C

Ans. is 'c' i.e., Enterococcus faecalis

- Option 'a' & 'd' can be excluded by following information in question : ?
 - 1) The isolated cocci are arranged in chains while staphylococci are arranged in grape like clusters.
 - 2) The isolated organism is catalase negative while staphylococci are catalase positive.
- Now two options are left : ?

Option 'b' - Viridans streptococci

Option 'b' - Viridans streptococci.

Option 'c' - Enterococcus faecalis

These two can be differentiated by following points :-

1) *Enterococci* are a frequent cause of nosocomial bacteremia in patients with intravascular catheters, while viridans streptococcal bacteremia occurs in neutropenic patients, particularly after bone marrow transplantation or high dose chemotherapy for cancer.

2) *Enterococci* are intrinsically resistant to all cephalosporins and also show high level of resistance to aminoglycosides. Resistance to vancomycin has also become quite common with enterococci, while viridans streptococci are sensitive to vancomycin and vancomycin is the drug of choice for presumptive treatment of viridans grp bacteremia.

- Now it is obvious that the infecting organism in this patient is enterococcus as patient has developed bacteremia on central venous line and he is not responding to cephalosporine, aminoglycoside and vancomycin.

22. All are true about non typhoid salmonella except -

a) Poultry is source

b) Can cause invasive disease in neonates

c) Blood culture is more sensitive than stool culture in gastroenteritis in adults

d) Resistance to fluoroquinolone has emerged

Correct Answer - C

Ans. is 'c' i.e., Blood culture is more sensitive than stool culture in gastroenteritis in adults

23. All are true about Brucella except -

- a) B. abortus is capnophilic
- b) Transmission by aerosol can occur occasionally
- c) Paesturisation destroys it
- d) 2ME is used to detect IgA

Correct Answer - D

Ans. is 'd' i.e., 2ME is used to detect IgA

2- MercaptoEthanol (2-ME) agglutination test

- . The 2ME (2-mercaptoEthanol) agglutination test is the most useful for differentiating active from inactive Brucellosis.
- In this test the IgM immunoglobulin is inactivated by treating with 2-MercaptoEthanol (2-ME) which breaks the disulfide bond and depolymerizes the IgM.
- The IgG immunoglobulin is resistant to depolymerization by 2-mercaptoethanol (2ME).
- The depolymerized IgM does not contribute to agglutination therefore the titre is primarily due to "ME resistant antibody (IgG)".
- The 2ME agglutination test is most useful for differentiating active from inactive brucellosis in persons having ill defined complaint.
 - . The presence of 2ME resistant (IgG) brucella agglutinins indicates active disease in these patients.
- In addition 2ME agglutination test has been found to be superior to the routine agglutination test for determining the adequacy of antibiotic therapy.
 - . *Adequate therapy reduces the IgG antibody level but not the IgM antibody level. If adequate therapy is not given this infection may progress to a state of chronic brucellosis in which the serological activity is mainly due to IgG antibody.*

. *A fall in 2ME resistant IgG antibody titre indicates satisfactory response to therapy.*

About other options

- . Brucella is capnophilic (requires 5-10% CO₂ for growth).
- Occasional the airborne infection (by aerosol) may occur due to inhalation of dried material of animal origin.
 - . Pasteurization destroys brucella, therefore it is transmitted by unpasteurized milk.

24. Which of the following is not a rapidly growing atypical mycobacteria causing lung infections ?

a) *M. chelonae*

b) *M. fortuitum*

c) *M. abscessus*

d) *M. kansasii*

Correct Answer - D
Ans. is 'd' i.e., *M. kansasii*

25. Under leprosy eradication programme the management of single lesion is -

- a) Single dose of Rifampicin and Dapsone
- b) Rifampicin and Dapsone for 6 months
- c) Rifampicin, ofloxacin and minocycline single dose
- d) Rifampicin and minocycline for 6 months

Correct Answer - C

Ans. is 'c' i.e., Rifampicin, ofloxacin and minocyclin single dose

For patients with single - lesion paucibacillary leprosy, the WHO recommends as an alternative a single dose of rifampicin, ofloxacin and minocycline.

PB adult treatment:

* **Once a month:** Day 1

- 2 capsules of rifampicin (300 mg x 2)
- 1 tablet of dapsone (100 mg) **Once a day:** Day 2-28
- 1 tablet of dapsone (100 mg) **Full course:** 6 blister packs

MB adult treatment:

* **Once a month:** Day 1

- 2 capsules of rifampicin (300 mg x 2)
- 3 capsules of clofazimine (100 mg x 3)
- 1 tablet of dapsone (100 mg) **Once a day:** Day 2-28
- 1 capsule of clofazimine (50 mg)
- 1 tablet of dapsone (100 mg) **Full course:** 6 blister packs

26. Which of the following is a method for acquiring infection by Legionella pneumophila ?

a) Consumption of contaminated water with protozoa of legionella

b) Breathing aerosols of environmental water sources such as air conditioning units

c) Consumption of contaminated meat and meat products

d) Close contact with carriers of legionella

Correct Answer - B

Ans. is 'b'

Inhalation of aerosols containing legionella is no more considered common mode of transmission of legionella.

Aspiration is the most common mode of transmission of legionella.

- *Earlier the most popular theory was that organism is aerosolized in water and people inhale the droplets containing legionella.*
- *However, new evidence suggests that another way of contracting legionella is more common.*
- *Aspiration now appears to be the most common mode of transmission of legionella.*

27. Chancre redux is a clinical feature of ?

a) Early relapsing syphilis

b) Late syphilis

c) Chancroid

d) Recurrent herpes simplex infection

Correct Answer - A

Ans. is 'a' i.e., Early relapsing syphilis

. Chancre redux is the appearance of relapsing lesion at the site of the healed lesion, it is due to relapse of original infection (not due to reinfection).

. Dead end infection is seen in

- | | | |
|----------------------------|-------------------|----------------|
| 1. Leptospirosis | 4. Human Rabies | 7. T. |
| 2. Legionella | 5. Endemic typhus | 8. |
| 3. Echinococcus granulosus | | |
| 4. Tetanus spiralis | 6. J.E. | 9. Trichinella |

28. A young lady complains of sore throat for 3 days along with fever and headache. On examination, she was severely dehydrated, her BP was found to be 90/ 50 mm Hg and on the distal aspect of the cuff, small red spots were noted. What could be the most probable etiological agent responsible for causing these symptoms -

a) *Brucella abortus*

b) *Brucella suis*

c) *Neisseria meningitidis*

d) *Staphylococcus aureus*

Correct Answer - C

. Ans. is 'c' i.e., *Neisseria meningitidis*

29. Which of the following statement is true about bacteriophage -

a) It is a bacterium

b) It helps in transformation

c) It imparts toxigenicity to bacteria

d) It transfers only chromosomal gene

Correct Answer - C

Ans. is 'c' i.e., It imparts toxigenicity to bacteria

. Bacteriophage is a virus (not bacteria) that infects bacteria.

. Bacteriophage helps in transduction (not transformation)

. Bacteriophage can impart toxigenicity to bacteria. Example is lysogenic conversion in diphtheria bacilli, which acquires toxigenicity (virulence) by lysogenisation with beta phage.

- Transduction by bacteriophage is not only confined to transfer of chromosomal DNA, episomes and plasmid may also be transduced.

30. Coxsackie group A does not cause ?

a) Conjunctivitis

b) Aseptic meningitis

c) Hepatitis

d) H.F.M.D

Correct Answer - B

Ans. is 'b' i.e., Aseptic meningitis

- In general, group A coxsackieviruses tend to infect the skin and mucous membranes, causing herpangina; acute hemorrhagic conjunctivitis; and hand, foot, and mouth (HFMD) disease.
- Both group A and group B coxsackieviruses can cause nonspecific febrile illnesses, rashes, upper respiratory tract disease, and aseptic meningitis.
- Group B coxsackieviruses tend to infect the heart, pleura, pancreas, and liver, causing pleurodynia, myocarditis, pericarditis, and hepatitis (inflammation of the liver not related to the hepatotropic viruses). Coxsackie B infection of the heart can lead to pericardial effusion.
- Aseptic meningitis is caused by all types group B Coxsackie viruses and by many group 'A' Coxsackie viruses most commonly A7 and A9.
- *History of fever and headache with neck stiffness suggest the diagnosis of meningitis. CSF analysis findings of increased opening pressure, mildly increased proteins, normal glucose, increased lymphocytes are highly suggestive of viral (Coxsackie virus) meningitis. Meningitis with normal glucose is highly suggestive of viral meningitis*
- Acute hemorrhagic conjunctivitis can be caused by Coxsackie virus

A-24, but it is not common. Mostly it is caused by enterovirus - 70.

- Myocarditis and hepatitis are mainly caused by Coxsackie virus group B.

31. Maternal to child transmission of HIV is prevented by -

a) Nevirapine

b) Lamivudine

c) Didanosine

d) Abacavir

Correct Answer - A

Ans. is 'a' i.e., Nivirapine

. Single dose of nivirapine given to the mother at the onset of labor followed by a single dose to the newborn within 72 hours of birth decreased transmission by 50%. *This is the preferred regimen now in developing countries.*

33. Sclerotic bodies is seen -

a) Sporothrix

b) Blastomycosis

c) Chromoblastomycosis

d) Coccidioides

Correct Answer - C

Ans. is 'c' i.e., Chromoblastomycosis

34. Biological indicator for determining efficacy of autoclaving is:
September 2009

a) *Pseudomonas aeruginosa*

b) *Clostridium Perfringenes*

c) *Bacillus stearothermophilus*

d) *Salmonella typhi*

Correct Answer - C
Ans. C: *Bacillus stearothermophilus*

35. Not true about *Histoplasma capsulatum* ?

a) Dimorphic fungus

b) May mimic TB

c) Capsulated

d) Mostly asymptomatic

Correct Answer - C

Ans. is 'c' i.e., Capsulated

Histoplasma capsulatum

- *A dimorphic fungus*
- *Non encapsulated → The only medically important capsulated fungus is cryptococcus.*
- *Infection is acquired by inhalation of microconidia (small spores) in dust contaminated with bird or bat dropping.*
- *It causes intracellular infection of reticuloendothelial system.*
- *Clinical manifestations → Majority of patients are asymptomatic*

36. Castleman disease is associated with ?

a) HSV

b) CMV

c) EBV

d) HHV- 8

Correct Answer - D

Ans. is 'd' i.e., HHV - 8

Castleman disease is group of lymphoproliferative disorders.

Disease is caused by hypersecretion of IL-6.

Release of these cytokines may be caused by HHV-8 in HHV-8 associated Multicentric Castleman Disease (MCD).

Castleman disease (CD) has been divided into a solitary and a multicentric form.

The solitary form presents as a mass located most commonly in the mediastinum, neck, lung, axilla, mesentery, broad ligaments and retroperitoneum.

Grossly, it is round, well circumscribed, with a solid gray cut surface and can measure 15 cm in diameter.

The follicles show marked vascular proliferation and hyalinization of their abnormal or atrophic germinal centers, surrounded by concentrically arranged small lymphocytes imparting an "onion-skin" appearance.

Remember angiolymphoid hyperplasia show thick walled blood vessels with prominent endothelial cells and inflammatory eosinophilia infiltrates.

37. Aerosol spread leading to epidemics is seen in infection with:

a) Legionella

b) Hemophilus

c) Influenza

d) Mycoplasma

Correct Answer - C

Ans. c. Influenza

Aerosol spread leading to epidemics is seen in infection with Influenza

Causative agent:

- Orthomyxovirus (3 types: A, B, C)

Type A: MC cause of outbreaks/ epidemics°; Only cause of pandemics° Type B

Type C: Not circulating currently

Incubation period 18-72 hours°

Period of infectivity 1-2 days before to 1-2 days after onset of symptoms°

ref-annanthnarayan(8/e pg 400-401)

38. An abattoir worker presented with a malignant pustule on his hand that progressed to form an ulcer. Smear was taken from the ulcer and sent to laboratory for investigation. The diagnosis

a) Cutaneous anthrax

b) Carbuncle

c) Ulcerating melanoma

d) Infected rodent ulcer

Correct Answer - A

Ans. a. Cutaneous anthrax

Anthrax

- Anthrax is a zoonoses, caused by *Bacillus anthracis*°, that occurs primarily in herbivores

Routes of Infection:

- Humans become infected when *B. anthracis* spores are introduced into the body by the following routes:
- Contact with infected animals or contaminated animal products°
- Insect bites°
- Ingestion°
- Inhalation°

Three major clinical forms in Humans:

- Cutaneous° (MC)
- Gastrointestinal (rare)
- Inhalational or pulmonary (it causes hemorrhagic pneumonia)

Woolsorters' disease

- Occupational hazard for people who sorted wool°
- Most dangerous form of inhalational anthrax

Hide porter's disease

- Caused by contact with contaminated hair, wool, hides or products

Malignant pustule

- Commonly seen in head and neck°
- Eschar stage that appears 2-6 days after the hemorrhagic vesicle dries to become a depressed black scab° surrounded by redness

Diagnosis:

- Presumptive diagnosis of the anthrax is made by staining it with polychrome methylene blue stain, called as Mc-Fadyean's reaction

Anthrax

Mc-Fadyean's Reaction

- When blood films containing anthrax bacilli are stained with polychrome methylene blue stain for few seconds and examined under microscope, an amorphous purplish material° is noticed around bacilli.
- This represents the capsular material and is characteristic of anthrax bacilliQ

Culture Characteristics of Bacillus anthracis

- On agar plate: Frosted glass appearance°
- On gelatin stab culture: Inverted fir tree appearance°

39. Which of the FOLLOWING is correct about Prions

a) Long incubation period

b) Destroyed by autoclaving at 121 °C

c) ving at 121 °C Nucleic

d) Immunogenic

Correct Answer - A

Ans. a. Long incubation period

Characteristic Features of Prions

- Long incubation period: Clinical illness is preceded by long incubation period (months to decades)
- Prions are the only known infectious pathogen that are devoid of nucleic acids
- Prions are most resistant to physical and chemical agents such as heat, irradiation and formalin
- Agents do not appear to be antigenic.

Prions

- Prions are infectious protein that cause degeneration of CNS
- They are infectious particles that lack nucleic acids°
- Prions are composed of largely, if not entirely of PrP (Prion related Proteins) molecules.

Important Points

- Prions are the only known infectious pathogen that are devoid of nucleic acids°
- Prions are most resistant to physical and chemical agents such as heat, irradiation and formalin°

Prion Disease:

- Fatal neurodegenerative diseases caused by transmissible proteins
- Caused by human Prion related Protein (PrP- a glycoprotein rich in alpha helix)
- Rarely, a mutation in the PrP gene will allow the protein to be made incorrectly and it will fold incorrectly making PrP^{sc} prion (glycoprotein rich in beta helix)

Hallmark of Prions Disease

- Disease is confined to CNS°
- Basic features are: Neurodegeneration and spongiform changes°
- Clinical illness is preceded by long incubation period° (months to decades)
- Onset of clinical illness is followed by chronic progressive disease° (weeks to years)
- The disease is always fatal° with no known cases of remission or recovery.
- The host shows no inflammatory response and no immune response°
- Agents do not appear to be antigenic°

Spectrum of Prion Disease:

- Sporadic form of CJD is the MC prion disorder in humans°
- Sporadic CJD (sCJD) accounts for 85% of all cases of human prion disease, while inherited prion diseases account for 10-15% of all cases
- Familial CJD (fCJD), Gerstmann-Straussler-Scheinker (GSS) disease, and fatal familial insomnia (FFI) are all dominantly inherited prion diseases that are caused by mutations in the PrP gene°.

Prion Disease

Human

- Cruetzfeldt-Jacob disease°
- Gerstmann-Stràussler-Scheinker (GSS) disease°
- Fatal familial insomnia (FFI)°
- Kuru°

Animals

- Scrapie (sheep)°
- Bovine spongiform encephalopathy (cattle)°
- Mink encephalopathy (mink)°
- Chronic wasting disease (Mule, Deer, Elk)°

- Feline spongiform encephalopathy (cats)°

40. Sputum can be disinfected by all except:

a) Auto claving

b) Boiling

c) Cresol

d) Chlorhexidine

Correct Answer - D

Ans. d. Chlorhexidine

Sputum can be disinfected by autoclaving, boiling or Cresol.

Chlorhexidine has no role in disinfection of sputum.

"Chlorhexidine (hibitane) is one of the most useful skin antiseptic.

Creams and lotion containing 1% Chlorhexidine are recommended for burns and hand disinfection."

41. In a 4-year old boy who has history of pyogenic infections by bacteria with polysaccharide-rich capsules, which of the following investigations should he done?

a) IgA deficiency

b) IgG 1 deficiency

c) IgG2 deficiency

d) IgA and IgG2 deficiency

Correct Answer - D

Ans. d. IgA and IgG2 deficiency

- Recurrent episodes of pyogenic infections by capsulated organisms are most commonly observed in patients with selective IgA deficiency and decreased IgA or IgG subclass levels (especially IgG2).
- "Specific Antibody Deficiency (SAD) patients generally present with recurrent upper and/or lower respiratory infections due to an encapsulated organisms (Streptococcus pneumonia, Haemophilus influenza, Branhamella catarrhalis, or Staphylococcus aureus). Frequent, recurrent episodes of otitis media are most commonly observed in patients with selective IgA deficiency and decreased IgA or IgG subclass levels (especially IgG2)."
Specific Antibody Deficiency (SAD)
- Antibody deficiency against microbial polysaccharide antigens is a well-established clinical entity and has been referred to as either antigen specific antibody deficiency (ASAD) or specific antibody

deficiency (SAD)Q

- Frequent, recurrent episodes of otitis media are most commonly observed in patients with selective IgA deficiency and decreased IgA or IgG subclass levels (especially IgG2) Q.
- Frequent infections were reported in 92% of patients with SAD (sinusitis, 77%; pneumonia, 42%; otitis media, 25%; bronchitis, 28%).

42. An abattoir worker presented with a pustule on his hand that progressed to form an ulcer. Smear is taken from the ulcer and sent to laboratory for investigation. Which of the following is the best stain to determine the causative agent of the ulcer

a) Polychrome methylene blue

b) Kinyoun's acid fast

c) Periodic acid schiff

d) Calcoflour white

Correct Answer - A

Ans. a. Polychrome methylene blue

- In an abattoir worker, a pustule on the hand that progressed to form an ulcer indicates the diagnosis of cutaneous anthrax. Staining it with polychrome methylene blue stain, called as Mc-Fadyean's reaction, makes presumptive diagnosis of the anthrax.
- "When blood films containing anthrax bacilli are stained with polychrome methylene blue stain for few seconds and examined under microscope, an amorphous purplish material^Q is noticed around bacilli. This represents the capsular material and is characteristic of anthrax bacilli^e. This is called the Mc-Fadyean's reaction."- Ananthanarayan 8/e p245

43. With reference to antibiotic resistance all of following statements are true except

- a) The most common mechanism is production of neutralizing enzymes by bacteria
- b) Plasmid mediated resistance is exclusively transferred vertically
- c) Complete elimination of target is the mechanism by which enterococci develop resistance to vancomycin
- d) Alteration of target lesions leads to development of resistance to antibiotics in *Streptococcus pneumoniae*

Correct Answer - B

Ans. b. Plasmid mediated resistance is exclusively transferred vertically

44. A person presents with pneumonia. His sputum was sent for culture. The bacterium obtained was gram positive cocci in chains and alpha haemolytic colonies on sheep agar. Which of the following will help in confirming the diagnosis

a) Novobiocin

b) Optochin

c) Bacitracin

d) Oxacillin

Correct Answer - B
Ans. b. Optochin

45. A young male patient presented to OPD with urethral discharge. On urine examination pus cells were found but not organisms. Which method would be the best for culture

a) McCoy cell line

b) Thayer Martin medium

c) PPLO broth

d) Cooked meat medium

Correct Answer - A

Ans. a. McCoy cell line

Urine examination in a patient of urethral discharge demonstrating only pus cells but no gram-negative diplococci suggest "non-gonococcal urethritis". The most common cause of non-gonococcal urethritis is Chlamydia trachomatis. Chlamydia trachomatis is cultured on McCoy cells, HeLa cells or Hep-2 cells.

Culture Media	Organism
McCoy cell line	Chlamydia ^Q
Thayer Martin medium	Neisserie ^Q
PPLO broth	Mycoplasam ^Q
Cooked meat medium	Cooked meat medium ^Q

Organisms causing Non-gonococcal Urethritis

Chlamydia trachomatis (MC) *Gardnerella*

Q

vaginalis^Q

*Urea plasma
urealyticum*^Q

Candida albicans

*Mycoplasma
genitalium*^Q

*Trichomonas
vaginalis*

Herpes virus^Q

*Mechanical or
chemical irritation*

CMV^Q

46. Synthesis of an immunoglobulin in membrane bound or secretory form is determined by

a) Carbohydrate content

b) Class switching

c) Differential RNA processing

d) Allelic exclusion

Correct Answer - C

Ans. c. Differential RNA processing

- Synthesis of an immunoglobulin in membrane bound or secretory form is determined by differential RNA processing.
- "B cells express a form of IgM, which is located on the cell surface. Cell surface IgM has the same specificity as the secreted IgM antibody molecule. This is achieved by a differential RNA splicing mechanism. Later on in development of B cell, regulation of RNA processing allows expressions of a membrane-bound form of IgD, again with same antigen-binding specificity Throughout this process, the same v region segment is being expressed with different C region segments."

Class Switching

- Initially, all B cells matched to an antigen carry IgM specific for that antigen and produce IgM in response to this exposure to antigen.
- Later gene rearrangement permits elaboration of antibodies of same antigenic specificity but of different immunoglobulin classes.
- In class switching, the same assembled VH gene can sequentially associate with different CH gene, so immunoglobulin produced later (IgG, IgA or IgE) has the same specificity as original

IgM but different biologic characteristics.

- Class switching is dependent on cytokines released from T cells and also happens after antigenic stimulation.
- Class switching is possible through a novel recombination event between repeat regions adjacent upstream of each constant heavy region class, the S regions

47. Enterohemorrhagic, enterotoxigenic and enteroinvasive are types of:

a) E. coli

b) Klebsiella

c) Shigella

d) Streptococcus pneumoniae

Correct Answer - A

Ans. a. E. coli

Enterohemorrhagic, enterotoxigenic and enteroinvasive are types of E. coli

Enteropathogenic (EPEC)-

- . Epidemic diarrhea (infants and children)
- . Sorbitol nonfermentor

Enteroinvasive (EIEC)

Shigellosis like illness

- . Has plasmid coding for virulence marker Antigen .
- . Sereny test (Rabbit eye) and HeLa penetration.

Enterotoxigenic (ETEC)

Endemic and traveller's diarrhea

Enterohemorrhagic (EHEC)

Verotoxin production caused HUS.

Growth on SMAC (Sorbitol MacConkey)/ Rainbow agar

Enteraggregative (EAEC)

Persistent diarrhea

Stacked brick formation of Hep-2 cells

48. The role played by Major Histocompatibility Complex (MHC)-1 and -2 is to:

a) Transduce the signal to T-cell following antigen recognition

b) Mediate immunogenic class switching

c) Present antigens for recognition by T-cell antigen receptors

d) Enhance secretion of cytokines

Correct Answer - C

Ans. c. Present antigens for recognition by T-cell antigen receptors
The role played by Major Histocompatibility Complex-I and -2 is to present antigens for recognition by T cell antigen receptors.

'Main function of MHC molecule is to bind peptide fragments of foreign protein for presentation to appropriate antigen specific T cells.'

49. All of the following are true about amebic liver abscess except:

a) Trophozoites in stool are essential for clinical diagnosis

b) Mostly asymptomatic

c) More common in males than females

d) Rarely affects brain, eye and skin

Correct Answer - A

Ans. a. Trophozoites in stool are essential for clinical diagnosis

50. A cystic fibrosis patient presented with an episode of pneumonia. On sputum culture, mucoid colonies of Pseudomonas were seen. What does this indicate?

a) It formed a biofilm on bronchial walls

b) It underwent a mutation

c) It is resistant to most of antibiotics

d) There is a mistake with the culture technique

Correct Answer - A

Ans. a. It formed a biofilm on bronchial walls

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51. Which of the following is true about viral antibodies?

- a) Appear before interferon
- b) Formed against viral nuclear acid
- c) Formed against viral surface proteins
- d) Maximum levels are seen within one week

Correct Answer - C

Ans. c. Formed against viral surface proteins

Resistance to viral infections is initially provided by factors that, are not virus-specific. Physical protection is afforded by the cornfied layers of the skin and by mucous secretions that continuously sweep over mucosal surfaces. Once the first cell is infectetk IFNs are induced and confer resistance to viral replication. Viral infection may also trigger the release of other cytokines from infected cells. These cytokines may be chemotactic to inflammatory and immune cells. Viral protein epitopes expressed on the cell surface in the context of MHC class I and II proteins can stimulate the expansion of T cell populations with receptors that can recognize the virus-encoded peptides. IFNs and NK cells are particularly important in containing viral infection for the first several days. 7-10 days after infection, virus-specific antibody responses, virus-specific HLA class II—restricted CD4+ helper T lymphocyte responses, and virus-specific HLA class I—restricted CD8+ cytotoxic T lymphocyte responses develop. These responses, whose magnitude typically increases over the second and third weeks of infection, are important for rapid recovery. Also between the second and third weeks, the antibody type usually changes from 1gM to IgG; IgG or IgA antibody can then be detected at infected mucosal surfaces. Antibody may directly

neutralize virus by binding to its surface and preventing cell attachment or penetration. Complement can significantly enhance antibody-mediated virus neutralization. Antibody and complement can also lyse virus-infected cells that express viral membrane proteins on the cell surface. Cells infected with a replicating enveloped virus usually express the virus-envelope glycoproteins on the cell plasma membrane. Specific antibodies can bind to the glycoproteins, fix complement, and lyse the infected

52. Which of the following is correct regarding staining of microbes?

a) Gram positive bacteria stain black

b) Gram negative bacteria stain red

c) Gomorri's methenamine silver stains fungi green

d) Calcoflour white stains acanthamoeba red

Correct Answer - B

Ans. b. Gram negative bacteria stain red

- Gram-negative bacteria stain red on Gram's staining.
- Gram-negative bacteria stain pink-red in colour.
- Gram-positive bacteria stain blue-violet in colour.
- Gomorri's methenamine silver stains fungi black in colour.
- Calcoflour white stains acanthamoeba fluorescent bright green to blue-white in colour.

Gram Negative Bacteria:

- Gram-negative bacteria do not take gram stain because it is made of Lipopolysaccharide.
- The alcohol, being a lipid solvent, dissolves the outer Lipopolysaccharide membrane of the cell wall^o and also damage the cytoplasmic membrane to which the peptidoglycan is attached.
- As a result, the dye-iodine complex is not retained^o within the cell and permeates out of it during process of decolonization.
- Hence when a counter stain is added, they take up the colour of the stain and appear pink.

Gram's Staining

Principle:

- Dependent on permeability of the bacterial cell wall and cytoplasmic

membrane^Q, to the dye-iodine complex

Gram Positive Bacteria:

- Crystal violet dye-iodine complex combines to form a larger molecule, which precipitates in the cell.
 - The alcohol/acetone mixture, which acts as decolorizing agent, cause dehydration of multi-layered peptidoglycan of the cell wall^Q.
 - This causes decreasing of the space between the molecules causing the cell wall to trap the crystal violet iodine complex within the cell^Q.
 - Hence gram-positive bacteria do not get decolorized and retain primary dye appearing violet.
- Gram Negative Bacteria:**
- The alcohol, being a lipid solvent, dissolves the outer Lipopolysaccharide membrane of the cell wall') and also damage the cytoplasmic membrane to which the peptidoglycan is attached.
 - As a result, the dye-iodine complex is not retained^g within the cell and permeates out of it during process of decolonization.
 - Hence when a counter stain is added, they take up the colour of the stain and appear pink.

53. Both DNA and RNA are present in:

a) Bacteria

b) Prions

c) Virioids

d) Plasmid

Correct Answer - A

Ans. a. Bacteria

Both DNA and RNA are present in Bacteria

Micro-organism	Genetic Material
-----------------------	-------------------------

Bacteria	Contain both DNA and RNA, as well as extra-chromosomal DNA material (plasmids) ^Q
----------	---

Plasmid	Extra-chromosomal circular DNA present in cytoplasm of bacteria and capable of autonomous
---------	---

Virioids	Contain low molecular weight RNA (No DNA) ^Q
----------	--

Prions	Are misfolded proteins ^Q Devoid of both DNA and RNA
--------	---

54. Which of the following is not true regarding IgE antibodies?

- a) It mediates release of histamine and other chemical mediators
- b) It is the primary antibody involved in allergic reactions
- c) It is involved in anti-parasitic immune responses
- d) May cross the placenta and fix complement

Correct Answer - D

Ans. d. May cross the placenta and fix complement

IgE:

- Exhibits unique properties such as heat lability (inactivated at 56°C in one hour)
- Affinity for the surface of tissue cells (particularly mast cells) of the same species (homocytotropism).
- It mediates the Prausnitz-Kustner reaction.
- Normal serum contains only traces but greatly elevated levels are seen in atopic conditions (type 1 allergic conditions such as asthma, hay fever and eczema.)
- Children living in insanitary conditions, with a high load of intestinal parasites, have high serum levels of IgE. IgE is chiefly produced in the linings of the respiratory and intestinal tracts.
- It is responsible for the anaphylactic type of hypersensitivity
- The physiological role of IgE appears to be protection against pathogens by mast cell degranulation and release of inflammatory mediators
- It is also believed to have a special role in defense against helminthic infections

55. A 10-year old child presented with severe sore throat and a grey pseudomembrane over pharynx and tonsils. The organism causing this infection is most likely:

a) A gram positive bacillus

b) A gram negative bacillus

c) A catalase-positive gram positive coccus that grows in clusters

d) A single-stranded positive sense RNA virus

Correct Answer - A

Ans. a. A gram positive bacillus

- A 10-year old child presented with severe sore throat and a grey pseudomembrane over pharynx and tonsils. The clinical features are strongly suggestive of a diagnosis of diphtheria, caused by *Corynebacterium diphtheria*, a gram positive bacillus.
- Respiratory Diphtheria (Caused by *Corynebacterium diphtheria*):
- Pseudomembrane in diphtheria is tightly adherent to the underlying tissues.
- The diphtheritic pseudomembrane is gray or whitish and sharply demarcated^Q.
- Diagnosis requires the isolation of *C. diphtheria* or the histopathologic isolation of compatible gram-positive organisms^Q.
- The pseudomembranous lesion is most often located in the tonsillopharyngeal region^Q

Respiratory Diphtheria

Clinical Features:

- The clinical diagnosis of diphtheria is based on
- Constellation of sore throat^Q

- Adherent tonsillar, pharyngeal, or nasal pseudomembranous lesions^Q
- Low-grade fever^Q
- Occasionally, weakness, dysphagia, headache, and voice change are the initial manifestations^Q.
- Neck edema and difficulty breathing are seen in more advanced cases and carry a poor prognosis^Q
- The systemic manifestations of diphtheria stem from the effects of diphtheria toxin and include weakness as a result of neurotoxicity and cardiac arrhythmias or congestive heart failure due to myocarditis^Q
- The pseudomembranous lesion is most often located in the tonsillopharyngeal region^Q.
- The diphtheritic pseudomembrane is gray or whitish and sharply demarcated^Q
- Pseudomembrane in diphtheria is tightly adherent to the underlying tissues^Q.
- Less commonly, the lesions are detected in the larynx, Pares, and trachea or bronchial passages^Q
- Large pseudomembranes are associated with severe disease and a poor prognosis^Q
- A few patients develop swelling of the tonsils and present with "bull-neck" diphtheria, which results from massive edema of the submandibular and paratracheal region and is further characterized by foul breath, thick speech, and stridorous breathing^Q
- Unlike the exudative lesion associated with streptococcal pharyngitis, the pseudomembrane in diphtheria is tightly adherent to the underlying tissues^Q.

Diagnosis:

- Attempts to dislodge the membrane may cause bleeding
- Hoarseness suggests laryngeal diphtheria, in which laryngoscopy may be diagnostically helpful.
- In addition, diagnosis requires the isolation of C. diphtheria or the histopathologic isolation of compatible gram?positive organisms^Q

56.

The hemoatoxylin and eosin staining of a lung section during autopsy of a patient suffering from AIDS shows desquamation of type 1 pneumocytes with prominent intracuclear basophilic inclusion bodies surrounded by a clear halo. The CD4 count was less than 100/mm³ before detnis- ' most likely diagnosis causing these featuresis:

a) Acute respiratory distress syndrome

b) Pneumocystic jiroveci pneumoni

c) CMV pneumonia

d) Mycobacterium avium-intracellulare pneumonia

Correct Answer - C

Ans. c. CMV pneumonia

Petechiae, hepatosplenomegaly, and jaundice are the most common presenting features (60-80% of cases) of congenital CMV infection.

Fetal infections range from inapparent to severe and disseminated.

Cytomegalic inclusion disease develops in 57% of infected fetuses

Seen almost exclusively in infants born to mothers who develop primary infections during pregnancy.

Petechiae, hepatosplenomegaly, and jaundicea are the most common presenting features (60-80% of cases).

Microcephaty with or without cerebral calcifications, intrauterine growth retardation, and prematurity are reported in 30-50% ofcases

57. Giemsa stained smear of epithelial cells obtained from a newborn with hepatosplenomegaly is shown below. What is the most likely cause of this congenital infection?

a) CMV

b) Rubella

c) HIV

d) Epstein-Barr virus

Correct Answer - A

Ans. a. CMV

Petechiae, hepatosplenomegaly, and jaundice are the most common presenting features (60-80% of cases) of congenital CMV infection.

Fetal infections range from inapparent to severe and disseminated.

Cytomegalic inclusion disease develops in 57% of infected fetuses

Seen almost exclusively in infants born to mothers who develop primary infections during pregnancy.

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58. The term 'recrudescence' in malaria refers to:

a) Same as relapse in *P.vivax* and *P ovale malaria*

b) Resistance to antimalarial drugs

c) Recurrence of sexual parasitemia after completion of treatment

d) Reinfection with the same species

Correct Answer - C

Ans. c. Recurrence of sexual parasitemia after completion of treatment

Recrudescence-

Seen in *P. falciparum* & *P. malariae*

Due to persistence of the asexual parasite (cryptic erythrocytic rather than exoerythrocytic stage) at subclinical level in circulation even after completion of treatment. It can be due to waning immunity or antigenic variation.

Occurs within a few weeks or months of a previous attack (period of latency usually 8 weeks after primary attack)

Can be prevented by adequate drug therapy or use of newer antimalarial drugs in case of drug resistance.

59. Hybridoma technique is used to obtain ?

a) Specific antigen

b) Complement

c) Specific antibody

d) Interleukins

Correct Answer - C

Ans. is 'c' i.e., Specific antibody

- Hybridomas are cells that have been engineered to produce a specific antibody in huge numbers.

Hybridomas

- Hybridomas are cells that have been engineered to produce a specific antibody in huge numbers
- To achieve this, qualities of two types of cells have to be combined together i.e.
- Cells which can produce large amount of pure antibody and
- Cells which have the ability to grow continually.
- These two types of cells are then fused together to form hybridoma.

Procedure

- The pure antibody secreting cells are produced by injecting specific antigen in a mouse and obtaining the antigen specific plasma cells (antibody producing cell) from the mouse's spleen.
- Cell which can grow indefinitely in culture are myeloma cells (cancerous cells).
- These two cell lines are fused together. The hybrid cell which is thus produced can be cloned to produce large number of identical daughter clones.
- These daughter clone cells then produce antibodies. Since these antibodies come from only one type of cell (hybridoma cell) they are

called monoclonal antibodies.

- HAT (hypoxanthine, Aminopterin and thymidine) medium is used for preparation of monoclonal antibodies because it allows only fused hybridoma cells to grow. It does not allow the unfused myeloma and unfused antibody cells to grow. So HAT medium is a selective medium which allows (which allow selective growth of fused hybridoma)
- How does this happen ?
- Before we move on with the discussion, remember these few points about purine synthesis.
- Purine synthesis is essential for the survival of cells.
- Purine can be synthesized in two way i.e.
- De novo synthesis (dihydrofolate reductase enzyme is required for this pathway).
- Salvage pathway (an enzyme hypoxanthine - guanine phosphoribosyl transferase is required for salvage pathways)
- Myeloma cells lack HGPRTase enzyme therefore they cannot synthesize purine by salvage pathways. o Antibody cells have HGPRTase enzyme so they can use the salvage pathways.
- Aminopterin inhibits dihydrofolate reductase an enzyme used in denovo synthesis of purine
- When two cell lines i.e. antibody producing cell and myeloma cells are grown in HAT medium only the fused hybridoma cells survive.
- Myeloma cells die because they lack the enzyme HGPRTase so they cannot use the salvage pathways for purine synthesis. They also cannot use de-novo pathway, because Aminopterin present in the HAT medium inhibits dihydrofolate reductase (an enzyme essential for denovo synthesis of purine).
- The unfused antibody producing cells die as they cannot grow indefinitely because of their limited life span.
- Only fused hybridoma cells grow indefinitely because the antibody cell partner supplies HGPRTase and the myeloma partner gives it immortality. (as it is a cancer cell)

60. Which of the following features is not shared between T cells and B cells

a) Positive selection during development

b) Class I MHC expression

c) Antigen specific receptors

d) All of the above

Correct Answer - A

Ans. (a) Positive selection during development

B cell undergoes negative selection, whereas T cells undergoes both positive and negative selection.

Mechanism of central tolerance:

B cell:

* The recognition of antigens by the immature B-cells in the bone marrow is critical to the development of immunological tolerance to self. For proper immunological function it is essential B cell do not recognize self antigen and should recognize antigen derived from pathogens.

* In the bone marrow the immature B cells bearing surface IgM, if recognizes self molecule undergo negative selection. This self antigen induce loss of cells from the B cell repertoire is called as clonal deletion. Thus only those B cells that do not recognizes self molecules as antigen comes out of bone marrow.

T cells tolerance:

* T cells are selected for survival more rigorously than B cells. They undergo both positive and negative selection to produce T cells that recognizes self MHC but do not recognizes self peptides. T cell tolerance is induced in thymus.

- Positive selection occurs in thymic cortex, if a maturing T cell is

able to bind to a surface MHC molecule it is saved from program cells death; whereas cells fails to recognize MHC dies. Positive selection ensures that T cell recognize antigen in association with MHC molecule only.

- Negative selection occurs in cortex, cortico-medullary junction, and the medulla. Here MTEC (medullary thymic epithelial cells) signal self reactive T cells to die via apoptosis.

Other Options

Option b: Class I MHC are expressed by all nucleated cells and platelets. Ref. Robbin's 8/e 190

Option c: Both B cells and T cell possess antigen receptors. On B cells surface Ig acts as antigenic receptor whereas on T cell, TCR along with CD₃ acts as antigenic receptors. Ref. AA 8/e 128, 9/e, p 133

61. Lambda phage true ist:

a) Cause mad cow disease

b) Lytic and lysogenic interconversion can't occur

c) Lytic form incorporated within host DNA and multiply causing rupture of cell membrane

d) Lysogenic form incorporates with host DNA and remains dormant

Correct Answer - A

Ans. (a)

Transduction

Transmission of genetic material = gene transfer = acquisition of characteristic occur by four process.

a. Transformation: - Transfer of genetic information (about 10-50 genes) through the free DNA.

- Seen mainly in pneumococci; bacillus species and Hemophilus influenza.
- Any characteristic may be transferred by transformation.
- **b. Transduction:** - Transfer of portion of DNA from one to other bacteria by agency of bacteriophage (acts only as vehicle).
- It may be generalised (when **it** involves any segment of donor DNA) or restricted (when specific bacteriophage transduces only a particular genetic trait).
- It is most widespread mechanism of gene transfer among prokaryotes.
- Episomes and plasmids (e.g. plasmid determining Pn resistance in staphylococci) may also transduced.
- It is used in genetic engineering in the treatment of some inborn errors of metabolism.

c. Conjugation

- Bacterial equivalent of sexual mating
- Described by Lederberg and Tatum in strain of *E. coli* (K12), e.g. Transfer of episomes and plasmids of drug resistance.

d. Lysogenic conversion: - Phage DNA becomes integrated with bacterial chromosome as the prophage which codes for new characteristic, e.g. toxin production in *C. diphtheriae*.

62. Which of the following is not a common case of neonatal sepsis in India:

a) Staphylococci

b) Klebsiela

c) E.coli

d) Group B Streptococci

Correct Answer - D

Ans. is d i.e Group B Streptococci *Ref. Arch Dis Child Fetal Neonatal Ed2005;90:F220-FF224*

The pathogens most often implicated in neonatal sepsis in developing countries differ from those seen in developed countries:

- Overall, Gram negative organisms are more common and are mainly represented by Klebsiella, Escherichia coli, Pseudomonas, and Salmonella.
- Of the Gram positive organisms, Staphylococcus aureus, coagulase negative staphylococci (CONS), Streptococcus pneumoniae, and Streptococcus pyogenes are most commonly isolated.

Further it is stated that

Group B streptococcus (GBS) is generally rare or not seen at all, although maternal rectovaginal carriage rates of GBS may be similar to those recorded in developed countries.

Neonatal Sepsis

- **Neonatal sepsis** specifically refers to the presence of a bacteriemic infection (such as meningitis, pneumonia, pyelonephritis, or gastroenteritis) in the setting of fever in a newborn baby.
- It is divided into two categories:
- **Early Onset Sepsis (EOS):** EOS refers to sepsis presenting in the first 7 days of life

- Late Onset Sepsis (LOS). with LOS referring to presentation of sepsis after 7 days
Diagnosis: Culturing for microorganisms from a sample of CSF, blood or urine, is the gold standard test for definitive diagnosis of neonatal sepsis.
Note: In western countries, Group E streptococci is the most common etiologic organism responsible for neonatal sepsis.

63. 1-3 beta-D-glucan assay for fungi is not used for?

a) Aspergillus species

b) Candida species

c) Cryptococcus species

d) Pneumocystis jirovecii

Correct Answer - C

Ans. (c) *Cryptococcus* sp. *Journal of Clinical Microbiology* 2013 Nov. 3478-3484

- 1-3-D-glucan is the component of fungal cell-wall of all fungus (except *Cryptococcus*, zygomycetes and *Blastomyces dermatitidis*) which is detectable in case of invasive infection.
- Currently **Fungitell** assay is a FDA approved **1-3-DG** assay which is positive in invasive candidiasis, Aspergilliosis and pneumocystis jirovecii.
False positive reaction may be seen with certain hemodialysis filters, beta lactam antimicrobials and immunoglobulins

64. An early diabetic has left sided orbital cellulitis CT scan of paranasal sinus shows evidence of left maxillary sinusitis. Gram stained smear of the orbital exudate shows irregularly branching septate hyphae. The following is most likely etiological agent:

a) *Aspergillus*

b) *Rhizopus*

c) *Mucor*

d) *Candida*

Correct Answer - A

Ans. (a) *Aspergillus* Ref. Ananthanarayan 8/e, p 613, 9/e, p 609; Harrison 19/e, p 1345 - 1347, 18/e, p 1658

"Presence of branched septate hyphae in a patient of orbital cellulitis (occur as complication of sinusitis) suggest Aspergillus."

Aspergillus Sinusitis occur in three forms:

1. Ball of hyphae may form in chronically obstructed paranasal sinus, without tissue invasion.
 2. A chronic fibrosing granulomatous inflammation begin in sinus and spread slowly to the orbit and brain.
 3. Allergic fungal sinusitis
- Mucor* and *Rhizopus* belong to family Zygomycetes and have non-septate hyphae.

65. All of the following are dimorphic fungi, except:

a) *Sporotricum*

b) *Blastomyces*

c) *Histoplasma*

d) *Cryptococcus*

Correct Answer - D
Ans. d. *Cryptococcus*

66. Painful vaginal ulcer with inguinal lymphadenopathy and school of fish appearance of microorganism or microscopy are characteristic of:

a) Syphilis

b) LGV

c) Granuloma inguinale

d) Chancroid

Correct Answer - D

Ans. is. 'd' i. e., Chancroid

- Chancroid is a bacterial sexually transmitted disease (STD) caused by infection with *Haemophilus ducreyi*.
- It is characterized by painful necrotizing genital ulcers that may be accompanied by inguinal lymphadenopathy. It is a highly contagious but curable disease.
- *H ducreyi*, a small, gram-negative, facultative anaerobic bacillus that is highly infective.
- It is pathogenic only in humans, with no intermediary environmental or animal host.
- *H ducreyi* enters the skin through disrupted mucosa and causes a local inflammatory reaction
- *H ducreyi* is transmitted sexually by direct contact with purulent lesions and by autoinoculation to nonsexual sites, such as the eye and skin.
- The organism has an incubation period of 1 day to 2 weeks, with a median time of 5-7 days.

67. Tick is vector for:

a) Crimean congo fever

b) Rocky mountain spotted fever

c) Epidemic typhis

d) Endemic typhis

e) Scrub typhus

Correct Answer - A:B

Ans is (a) Crimean congo fever and (b) Rocky mountain spotted fever

Crimean congo is a viral illness, caused by flavi virus and is transmitted by ticks.

Rocky mountain spotted fever is **Hard Tick-borne disease**

Kyansur Forest disease is a febrile disease associated with haemorrhages caused by an arbovirus flavivirus and is transmitted to man by bite of infective hard ticks.

68. A boy got unprovoked bite from a neighbour's dog. The animal control authority caught the dog and it was found to be healthy. What will be the next step?

a) Test antibody level in the dog

b) With hold immunization and observe the dog for 10 days for signs of rabies

c) Start post-exposure prophylaxis

d) Perform euthanasia for the dog

Correct Answer - B

Ans. (b) With hold immunization and observe the dog for 10 days for signs of rabies

- Unknown or escaped, Rabid or suspected to be rabid--> Start PEP immediately
- Dogs, cats, and ferrets--> Healthy and available for 10-d observation--> PEP should not be initiated unless animal develops clinical signs of rabies*

*During the 10-d observation period, consult a veterinarian and the public health department if any sign of illness develops in the animal that might be consistent with rabies. If it is determined that the animal is exhibiting clinical signs of rabies, the exposed victim should be started on PEP and the animal should be immediately euthanized and sent for testing to confirm the diagnosis. Consider starting PEP immediately if the bite wound is to the head and neck region.

Adapted from the *Canadian Immunization Guide*, 7th edition, and the *Guidelines for Management of Suspected Rabies*

Exposures

69. Which is NOT AIDS defining illness?

a) *Oropharynx candidiasis*

b) *CMV retinitis*

c) *Primary CNS lymphoma*

d) *Kaposi's sarcoma*

Correct Answer - A

Ans. (a) Oropharynx candidiasis

Candidiasis of bronchi, trachea, lung, oesophagus comes under AIDS defining criteria. Infections listed in the AIDS surveillance case **definition**

- Candidiasis of bronchi, trachea, lungs, oesophagus
- Coccidioidomycosis, disseminated or extrapulmonary
- Cryptococcosis, extrapulmonary
- Cryptosporidiosis, chronic, intestinal (> 1 month's duration)
- Cytomegalovirus disease (other than liver, spleen, or nodes)
- Cytomegalovirus retinitis (with loss of vision)
- Encephalopathy, HIV-related
- Herpes simplex: chronic ulcer(s) (> 1 month's duration); or bronchitis, pneumonia, or esophagitis
- Disseminated or extrapulmonary histoplasmosis
- Isosporiasis, chronic intestinal (> 1 month's duration)
- Mycobacterium avium complex or M. kansasii, disseminated or extrapulmonary
- Mycobacterium tuberculosis, any site (pulmonary or extrapulmonary)
- Mycobacterium, other species or unidentified species, disseminated or extrapulmonary.
- Pneumocystis jirovecii pneumonia

- Salmonella septicemia, recurrent
- Toxoplasmosis of brain
- Wasting syndrome due to HIV

70. HIV virus was discovered in?

a) 1976

b) 1983

c) 1996

d) 1988

Correct Answer - B

Ans. (b) 1983

History of HIV

- In 1981 AIDS was first recognized when US centre for disease control and prevention reported the unexplain occurrences of P. jiroveci infection in five previously health homosexual male. They appear to have lost their immunocompetence. So the condition was given the name "*Acquired immune deficiency syndrome*" (AIDS).
- In 1983 Lue montognier and colleagues from pasteur institute, Paris isolated a retro virus from a West African patient with persistent generalized lymphadenopathy and called it lymphadenopathy associated virus (LAV).
- In 1984 Ader Gallo reported isolation of a retrovirus from AIDS patient and called it human T-cell lymphotropic virus III.
- To reduce the nomenclature confusion, the interventional committee on virus nomenclature in 1886 decided a generic name *human immuno deficiency virus* to the virus isolated from AIDS cases.

71. Microbiological test for diagnosing leptospira infection?

a) Cold agglutination

b) Standard agglutination

c) Microscopic agglutination test (MAT)

d) None of these

Correct Answer - C

Answer: C. Microscopic agglutination test (MAT)

- Dark-field microscopy or by immunofluorescence or light microscopy after appropriate staining used
- Microscopic agglutination test [MAT](Gold Standard) also Macroscopic agglutination test
- Differential diagnosis list for leptospirosis is very large due to diverse symptoms.

72. A 15 years old boy presents with loose motions and intermittent abdominal pain over the past 1 year. Wet mount stool specimen showed the presence of multiple ova, which are more than 100 μ in diameter. The causative organism for the disease shall not include:

a) *Fasciola gigantica*

b) *Gastrodiscoides hominis*

c) *Echinostoma ilocanum*

d) *Opistorchis viverrini*

Correct Answer - D

Answer- D (*Opistorchis viverrini*)

- Inhabit the bile duct of fish eating animals
- Caused by ingestion of raw or under cooked freshwater fish
- Abdominal discomfort, gas
- Fatigue is typical
- Associated with bile duct cancer

73. A 5-year-old child from a rural area presented to the OPD with pustular lesions on the lower legs. The culture from the lesion showed hemolytic colonies on the blood agar which were Gram-positive cocci. Which of the following reactions would help to provisionally confirm the diagnosis of group A streptococcal pyoderma?

a) Optochin sensitivity

b) Bacitracin sensitivity

c) Catalase positivity

d) Bile solubility

Correct Answer - B

Answer: b. Bacitracin sensitivity (Ref Ananthanaravan 8/e pe p205-206)

Gram-positive cocci with alpha hemolytic colonies on sheep agar are *Streptococcus viridians* and *Streptococcus pneumoniae*.

They can be further differentiated on basis of optochin sensitivity, *Streptococcus viridians*-optochin resistant or *Streptococcus pneumoniae*-optochin sensitive.

74. A child was admitted to the hospital with H. influenza meningitis. Cefotaxime is preferred over ampicillin because:

a) Cefotaxime is more bioavailable

b) Cefotaxime is more active against altered penicillin binding protein

c) Drug of choice is trimethoprim sulfamethoxazole but cannot be given

d) Cefotaxime is more active against beta-lactamase

Correct Answer - D

Ans: D. Cefotaxime is more active against beta-lactamase
Cefotaxime or ceftazidime - DOC for Haemophilus meningitis treatment.

* Preferred because of "plasmid-borne resistance to ampicillin & cotrimoxazole".

* Due to plasmid for beta-lactamase production.

75. Which of the following malignancy is not caused by Human Papilloma Virus (HPV) infection?

a) Carcinoma base of tongue

b) Cervical carcinoma

c) Tonsillar carcinoma

d) Nasopharyngeal carcinoma

Correct Answer - D

Ans: D. Nasopharyngeal carcinoma

(Ref Ananthanaravan 10/e p557, 9/e p553)

Human infections caused by HPV

Diseases	Serotype
Skin warts (Plantar wart , common wart, flat wart & Epidermodysplasia verruciformis)	1, 2, 4, 3,
Papilloma (Laryngeal, Oral)	6, 11
Condyloma acuminatum (genital wart)	6, 11
Oral squamous cell carcinoma	16, 18
Cervical intraepithelial neoplasia (CIN)	6, 11
Carcinoma cervix	16, 18, 31, 33, 35, 42-44

Infectious Agent Lymphoid Malignancy

	Diffuse large B cell lymphoma°
HIV	Burkitt's lymphoma°

76. IgE receptor is present on:

a) Mast cell

b) Promonocyte

c) B cell

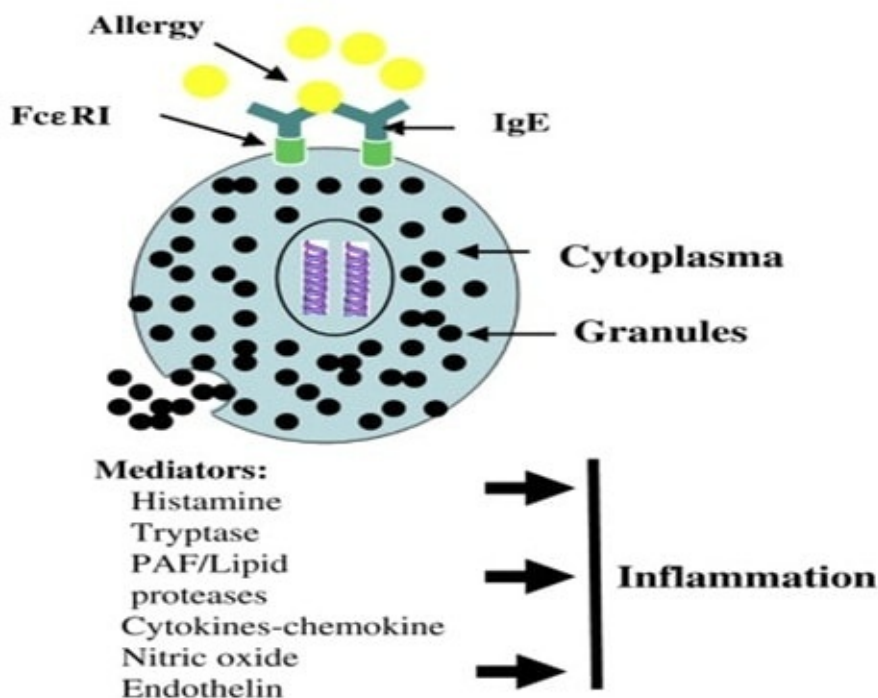
d) NK cell

Correct Answer - A

Ans: A. Mast cell

(Ref Ananthanarayan 10/e p100, 9/e p162, 163)

- **IgE receptor is present on Mast cell.**



Events in mast cells:

- **IgE molecules are bound to surface receptors on mast cells & basophils.**
- **Mast cells possess large number of Fc ER receptors (analogous to**

TCR receptors on T-cell surface).

- **IgE molecules attach to Fc ER receptors by their Fc end.**
- Shocking dose exposure to antigen molecules combine with cell bound IgE à bridging gap between adjacent antibody molecules.

77. Which of the following causes tropical spastic paresis?

a) HIV

b) HBV

c) HTLV

d) EBV

Correct Answer - C

Ans: C. HTLV

(Ref Ananthanarayan 10/e p571, 574, 9/e p567; Harrison 19/e p697).

Tropical Spastic Paraparesis:

- Caused by HTLVQ
- Affects females disproportionately

Pathology:

- **Spinal cord:**
- Symmetric degeneration of lateral columns (including corticospinal tracts) & posterior columns.

Spinal meninges & cord parenchyma:

- Inflammatory infiltrate with myelin destruction.

Clinical Features:

- Insidious onset.
- Weakness or stiffness in one or both legs, back pain & urinary incontinence.
- Slowly progressive.
- Unremitting thoracic myelopathy.
- Patients display spastic paraparesis or paraplegia with hyperreflexia, ankle clonus & extensor plantar responses.
- Cognitive function usually spared.

- Cranial nerve abnormalities are unusual.

78. Reverse transcriptase is a RNA dependent DNA polymerase. Which of the following uses reverse transcriptase?

a) Hepatitis A virus

b) Hepatitis B virus

c) Hepatitis C virus

d) Hepatitis E virus

Correct Answer - B

Ans: B. Hepatitis B virus

(Ref Ananthanaravan 10/e p548, 9/e p544, 8/e p540; Harrison 19/e p2005; Robbins 9/e p831-83).

Hepatitis B virus Genes & Antigens

Gene	Antigen Produced
C gene	HBcAg (Hepatitis B core antigen) ^o
C & Pre C genes	HBeAg (Hepatitis B e antigen) ^o
S gene	HBsAg (Hepatitis B surface antigen): large, middle & small HBsAg ^o
P gene	DNA polymerase (pol) & reverse transcriptase^o
X gene	HBxAg: virus replication & transcriptional transactivator^o

79. Adult stage of filarial worms responsible for diseases in all of the following except:

a) *Brugia malayi*

b) *Onchocerca volvulus*

c) *Mansonella ozzardi*

d) *Wuchereria bancrofti*

Correct Answer - B

Ans: B. *Onchocerca volvulus*

- Adult stage of *Onchocerca volvulus* filarial worms does not cause any illness or disease.

Onchocerciasis:

- Primarily affects skin, eyes & lymph nodes.
- In contrast to pathology in lymphatic filariasis, onchocerciasis damage elicited by microfilariae & not by adult parasites.

***Onchocerca microfilariae*:**

- Released from female worms causing most severe damage.
- Migrating microfilariae (exclusively found in interstitial fluids of skin & subdermal tissues not bloodstream).
- Cause changes in skin pigment & loss of elastic fibers à "hanging groin, severe intractable & intolerable pruritus.
- Blindness (primarily men) develops over many years – Due to microfilariae accumulation in vitreous humor.
- Are not blood borne & hence, concentrate & remain in eye.
- Visual clouding, photophobia & ultimately retinal damage à Incurable blindness.
- (Ref: Harrison 19/e p1420).

80. Which of the following structure is disrupted by *Vibrio cholerae*?

a) Hemi desmosome

b) Gap junctions

c) Zona occludens

d) Zona adherens

Correct Answer - C

Ans: C. Zona occludens

(Ref Sleisenger and Fordtran's textbook of Gastrointestinal and Liver Disease 10/e p1903).

Vibrio cholerae also produces additional toxins that may contribute to disease, including the zonula occludens toxin (ZOT) that alters intestinal permeability by acting on intestinal epithelial cells tight junctions, and the accessory cholera endotoxin (ACE)."

Cholera toxin:

- *Vibrio cholerae* secretes enterotoxin protein.
- Encoded by bacteriophage (CT Xfi resident in *V. cholera*).

Enterotoxin:

- Made up of 1A subunit (composed of 1A1 & 1 A2 peptide joined by disulfide link) & 5B subunits.

Other toxins:

- **Zonula occludens toxin (ZOT):**
- Alters intestinal permeability by acting on intestinal epithelial cells tight junctions.
- Accessory cholera endotoxin (ACE).

81. A 35-year-old male farmer presents with multiple discharging cervical sinuses. Which of these stains will be useful for the diagnosis? Where does this organism normally colonise in the body?

a) Grocott Methenamine silver, skin

b) PAS, intestine

c) AFB, mouth

d) Gram-stain, oropharynx

Correct Answer - C

Ans: C. AFB, mouth

(Ref Ananthanarayan 10/e p398, 8/e p391-391' | larrison 19/e p1088)

- In this farmer, who presented with multiple discharging cervical sinuses, the most likely diagnosis is actinomycosis.
- Actinomyces - Not acid-fast organism.
Actinomycosis:
- Occurs most commonly at an oral, cervical, or facial site, usually as a soft tissue swelling, abscess, or mass lesion that is often mistaken for a neoplasm.
- The angle of the jaw is generally involved, but a diagnosis of actinomycosis should be considered with any mass lesion or relapsing infection in the head and neck.

82. Phage mediated change in *C. diphtheria* is due to which of the following?

a) Conjugation

b) Transformation

c) Transduction

d) None of the above

Correct Answer - C

Ans: C. Transduction

(Ananthanarayan 10/e p59, 8/e p65-67; Jawetz 27/e p112).

- Phage mediated change in *C. diphtheria* is due to Transduction.
- In transduction, donor DNA is carried by a phage coat and is transferred into the recipient by the mechanism used for phage infection.

Methods of transfer	Mechanism	Nature of DNA transferred
Conjugation	Transfer of DNA from one bacterium to	Chromosomal or plasmid DNA°
Transduction	Transfer of DNA from one bacterium to	Any gene in generalized transduction, only selected genes in specialized transduction°
Transformation	Transfer of DNA from one bacterium to	Any gene°

83. Antibody-dependent enhancement is implicated in the immunopathogenesis of which disease?

a) Influenza

b) Staphylococcal toxic shock syndrome

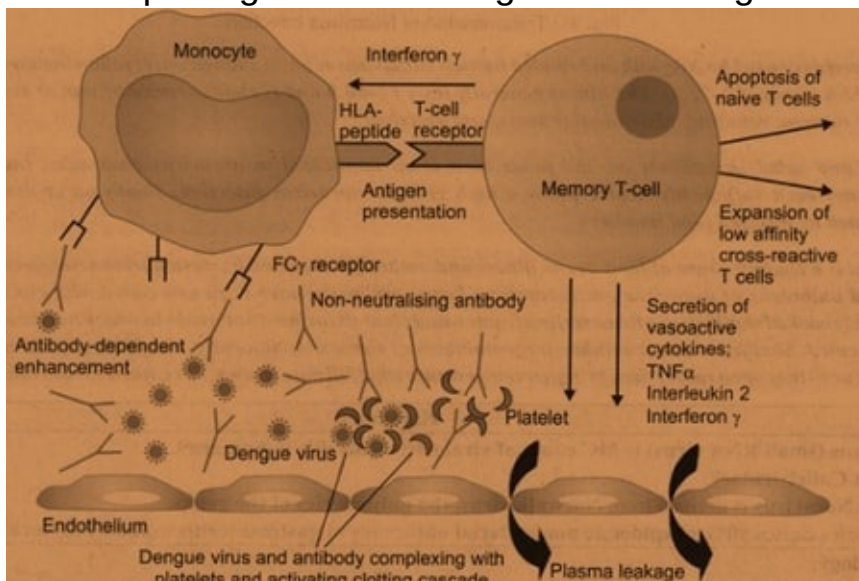
c) Waterhouse-Friderichsen syndrome

d) Dengue hemorrhagic fever

Correct Answer - D

Ans: D. Dengue hemorrhagic fever

- Antibody-dependent enhancement is implicated in the immunopathogenesis of Dengue hemorrhagic fever.



84. A patient comes to your clinic with a complaint of multiple episodes of loose watery stool for 3 days. On probing, you discover that these episodes start after he had ingested shellfish at a local restaurant 3 days back and other people who had food from that restaurant had similar symptoms. What is the most common cause of viral diarrhoea in adults?

a) Calicivirus

b) Rotavirus

c) Adenovirus

d) Norovirus

Correct Answer - D

Ans: D. Norovirus

Ref Harrison 19/e p1285, 1286; Jawetz 27/e p537

- History of multiple episodes of loose watery stool for 3 days & history of ingestion shellfish with similar symptoms in other patients who consumed the shellfish is suggestive of acute viral gastroenteritis.
- Most likely organism responsible – Norovirus.
Noroviruses:
- Most common infectious agents of mild gastroenteritis in the community and affect all age groups, whereas sapoviruses primarily cause gastroenteritis in children.

85. Postrenal transplant patient presents with diarrhoea after 3 months; it was showing organism measuring 2-6 micron meter and kinoyrn stain positive. Most likely it is caused by:

a) *Balantidium coli*

b) *Clostridium difficile*

c) *Cystoisospora belli*

d) *Cryptosporidium hominis*

Correct Answer - D

Ans. d. *Cryptosporidium hominis*

- Opportunistic infections are extremely common post-transplant in the period starting from 1 month post-transplant to 6 months post-transplant.
- *Clostridium difficile* is usually seen within 1 month post-transplant because of profound antibiotic use.
- Kinoyrn stain (Modified acid fast) positivity rules out *Balantidium*.
- Now it is between *cryptosporidium* vs *cycloisospora*. Size (smaller i.e., 2-6 microns) tells us that the organism is undoubtedly *cryptosporidium hominis* (previously *parvum*).

86. A newly introduced vaccines include all, except:

a) Rota virus

b) Influenza

c) Dengue

d) Malaria vaccine

Correct Answer - B

Ans. b. Influenza

Vaccination Update 2016-2018

- It has been approved by the government of India for inclusion
 - into the UIP with the phase 1 launch of the vaccine in 4 states
 - (Himachal Pradesh, Odisha, Andhra Pradesh and Haryana) in
 - **February 2016.**
 - **It is administered at age 6-15 weeks.**
 - Maximum age for administering the last dose of either vaccine **should be 32 weeks.**
 - It is known as Dengvaxia (CYD-TDV).
 - It is live recombinant as a 3-dose series on a 0/6/12 months
 - schedule in Phase-II clinical studies.
 - It has been registered for use in individuals 9-45 years of age
 - living endemic areas.
 - April **2016, WHO** Strategic Advisory Group of
- Rota virus
- Dengue Vaccine

Experts (SAGE) on immunization recommended introduction of the vaccine only in geographic settings (national or subnational) with endemicity.

Malaria Vaccine

- It is known as RTS, S/AS01
- It is the first malaria vaccine to have completed phase 3 testing.
- RTS, S is a vaccine against plasmodium falciparum.
- It offers no protection against *P. vivax* malaria
- The vaccine is being considered as a complementary malaria control tool in Africa.

87. Biofilm forming bacteria causes antimicrobial resistance by all of the following except:

a) Mechanical barrier

b) Increased excretion of antibiotics

c) Altered metabolism

d) Adherence

Correct Answer - D

Ans. d. Adherence

- Biofilm in the bacteria leads antimicrobial resistance by acting as mechanical barrier, increased excretion of antibiotics and altered metabolism inside the biofilms.
- Growth in biofilms leads to altered microbial metabolism, production of extra cellular virulence factors, and decreased susceptibility to biocides, antimicrobial agents, and host defense molecules and cells. *P aeruginosa* growing on the bronchial mucosa during chronic infection, staphylococci and other pathogens growing on implanted medical devices, and dental pathogens growing on tooth surfaces to form plaque are several examples of microbial biofilm growth associated with human disease.

88. Schizonts and late trophozoite stages of plasmodium falciparum not seen in peripheral blood smear because:

- a) They are sequestered in the spleen
- b) Due to adherence to the capillary endothelium, they are not seen in peripheral blood
- c) Due to antigen-antibody reaction and removal
- d) They are seen in mosquito blood

Correct Answer - B

Ans: B. Due to adherence to the capillary endothelium, they are not seen in peripheral blood

(Ref: Harrison 1y/e p1371, Jawetz 27/e p719)

Plasmodium falciparum:

- Only ring stages or gametocytes are seen in infected peripheral blood.
- **Schizonts & late trophozoite stages of Plasmodium falciparum are not seen in infected peripheral blood.**
- Parasites make red cells sticky → Tend to be retained in deep capillary beds (except in overwhelming fatal infections).

89. Which of the following is the most common systemic symptom during migration of larval phase of Helminths like Ancylostoma, Strongyloides and Ascaris?

a) Asymptomatic

b) Pneumonitis

c) Liver failure

d) Larva migrans

Correct Answer - A

Ans: A. Asymptomatic

(Ref Paniker's 7/e p162, 6/e pg180, 210)

- Larvae of Ascaris, Hookworm and Strongyloides migrate through lung & various other tissues during their lifecycle.

Larva migrans:

- Sometimes larvae appear to lose way & wander around aimlessly.
- Generally seen when human infection occurs with nonhuman species of nematodes.

Ascaris:

- Pathogenic effects of larval migration due to allergic reaction & not larvae presence.
- Hence larvae's initial exposure usually asymptomatic.
- Except on very heavy larval load.

Symptomatic conditions:

- Visceral larva migrans is produced by infection with non-human nematodes.
- Le. Nematodes frequently infecting dogs & cats.
- Cause local alveolar hemorrhages.

- Symptoms during migration due to allergic reaction & significant only in massive infections.
- **Clinical pneumonitis seen only in massive infections.**
- **Hence mostly asymptomatic.**

90. In a suspected patient of dengue, all of these are acceptable investigations at day 3 of presentation except:

a) Viral culture and isolation in C6/36 cell line

b) ELISA for antibody against dengue virus

c) NS I antigen detection

d) RT-PCR

Correct Answer - B

Ans: B. ELISA for antibody against dengue virus

(Ref Ananthanarayan 10/e p529, 8/e p519: Harrison 19/c 1)1319).

ELISA in antibody detection against Dengue virus:

- Yields diagnostic results after 5 days (acute infection phase) for antibody detection against dengue virus.

Other diagnosis methods:

- For mosquito inoculation/mosquito cell culture - Virus readily isolated from blood in acute phase.

Laboratory tests for Dengue:

- Virus isolation within six days: Serum, plasma, autopsy tissue
- Viral nucleic acid detection (RT-PCR assay).

Diagnostic Method	Time to Results	Specimen	Time of collection after onset of symptoms
Viral isolation & serotype identification	1-2 weeks	Whole blood, serum, tissues	1-5 days
Nucleic acid detection	1 or 2 days	Tissues, whole blood, serum, plasma	1-5 days°

Antigen detection	1 day	Serum	1-6 days°
	>1 day	Tissue for immunocytochemistry	NA
IgM ELISA	1-2 days	Serum, plasma, whole blood	After 5 days

91. A patient presented to the hospital with severe hydrophobia. You suspect rabies, obtained corneal scrapings from the patient. What test should be done on this specimen for a diagnosis of rabies?

a) Negri bodies

b) Antibodies to rabies virus

c) RT-PCR for rabies virus

d) Indirect immunofluorescence

Correct Answer - C

Ans: C. RT-PCR for rabies virus

Ref: Ananthanarayan 10/e p536, 8/e p529; Harrison 19/e p1302).

Detection of rabies virus:

RT-PCR with genetic sequencing:

- Highly sensitive & specific.
- Accurately identify rabies genome (viral RNA) in CSF, fresh saliva samples, corneal scrapings or urine.
- Distinguish among rabies virus variants.
- Permits identification of probable infection source.

Reverse transcription-polymerase chain reaction testing:

- Used to amplify rabies virus genome parts from fixed or unfixed brain tissue or saliva.
- Sequencing of amplified products allows identification of infecting virus strain.

92. Which of the following is an obligate intracellular pathogen?

a) *Coxiella burnetii*

b) *Listeria monocytogenes*

c) *Klebsiella*

d) *Legionella pneumophila*

Correct Answer - A

Ans: A. *Coxiella burnetii*

(Ref: Harrison 19/e p 1161; Ananthanarayan 10/e p418. 8/e p409: Jawetz 27/e p346)

***Coxiella burnetii*:**

- Small obligate intracellular organism.
- Membrane similar to Gram-negative bacteria.
- Causative agent of Q fever.

Obligate Intracellular Parasites (CRV CM PTL)

- Mycobacterium lepra
- Plasmodium species
- Pneumocystis jiroveci
- Toxoplasma gondii
- Trypanosoma cruzi
- Leishmania
- Chlamydia
- Rickettsia
- Ehrlichia & Anaplasma)
- Viruses
- *Coxiella burnetii*
- *Cryptosporidium parvum*

Facultative Intracellular Parasites (MBBS CRY For N)

- Mycobacterium
- *Bartonella henselae*
- *Brucella*
- *Salmonella typhi*
- *Cryptococcus neoformans capsulatum*
- *Rhodococcus equi*
- *Yersinia*
- *Francisella tularensis*
- *Nocardia*
- *Neisseria meningitidis*
- *Histoplasma*
- *Listeria monocytogenes*
- *Legionella*

species

•

**93. The following is the ovum of a helminth.
What is true about the helminth?**

a) Transmission is through ingestion of infected pork

b) Both adult and larval stages are seen in humans

c) The helminth causes a transient self-resolving infection in humans

d) Drug of choice for this condition is albendazole

Correct Answer - B

Ans: b. Both adult and larval stages are seen in humans

(Ref: Paniker's 7/e p135, 6/e p156)

- The given image is the egg of *Hymenolepis nano* showing characteristic polar filaments, polar knobs, yolk granules and, 6 hooklets (hexacanth) in the oncosphere (embryo).
- Both adult and larval stages of this species are seen in humans.
- It causes a transient infection in humans but does not resolve on its own and has to be treated.

94. Autoinfection can be caused by all the following helminths except:

a) *Enterobius vermicularis*

b) *Hymenolepis nana*

c) *Taenia solium*

d) *Ascaris lumbricoides*

Correct Answer - D

Ans: D. *Ascaris lumbricoides*

Autoinfection:

- Infection of a primary host with a parasite, particularly a helminth, in such a way that the complete life cycle of the parasite happens in a single organism, without the involvement of another host.
- Primary host is at the same time the secondary host of parasite.

Autoinfection is seen in (CHEST)

Cryptosporidium parvum°

Hymenolepis nana°

Enterobius vermicularisQ

Strongyloides stercoralis°

Taenia solium°

95. Helminth implicated in causing pernicious anemia is:

a) Diphyllbothrium latum

b) Ascaris

c) Taenia solium

d) Hymenolepis nana

Correct Answer - A

Ans: A. Diphyllbothrium latum

(Ref: Paniker's 7/e p118, b/e p142; lawetz 27/e p731; Harrison 19/e p1434.

- Helminth implicated in causing pernicious anemia is Diphyllbothrium latum.
- **Diphyllbothrium latum:**
- Disease caused by tapeworms is chiefly vague abdominal discomfort and loss of appetite, leading to weight loss.
- D latum has an unusual capacity to absorb vitamin B12 à causing vitamin B12 deficiency à Pernicious anemia may rarely develop.

96. In which of the following ways is CLED medium better than MacConkey agar?

a) It prevents proteus swarming

b) Inhibits growth of other commensals

c) It allows Staphylococcus and Candida to grow

d) It differentiates lactose fermenters from non-fermenters

Correct Answer - C

Ans: C. It allows Staphylococcus and Candida to grow

- Ref: Ananthanarayan 10/e p39, 10/e p39, 81e p667)

Advantage of CLED medium over MacConkey agar is that it allows Staphylococcus and Candida to grow

Typical colony morphology on CLED Agar

Escherichia coli	Opaque yellow colonies with a slightly deeper yellow center°
Klebsiella spp	Yellow to whitish-blue colonies, extremely mucoid°
Proteus spp	Translucent blue colonies°
Pseudomonas aeruginosa	Green colonies with typical matted surface & rough periphery°
Enterococci	Small yellow colonies, about 0.5 mm in diameter°
Staphylococcus aureus	Deep yellow colonies, uniform in color°
Coagulase negative Staphylococci	Pale yellow colonies, more opaque than Enterococcus faecalis

97. Which of the following is an obligate intracellular parasite?

a) *Tropheryma whippelii*

b) *Bartonella henselae*

c) *Ehrlichia chaffeensis*

d) *Coxiella burnetii*

Correct Answer - C

Ans: C. *Ehrlichia chaffeensis*

(Ref: Ananthanarayan 10/e p416, 8/e p409; Jawetz 27/e p346, 347; Harrison 19/e p1159, 1162)

- Though both *Coxiella* and *Ehrlichia* are obligate intracellular pathogens, in 2009 scientists reported a technique allowing the Q-fever pathogen *Coxiella burnetii* to grow in an axenic culture and suggested the technique may be useful for study of other pathogens.
- Hence, *Ehrlichia* is a better answer in this case.

98. Transfusion-associated malaria has a shorter incubation period because of the presence in blood of:

a) Trophozoites

b) Sporozoites

c) Female gametocyte

d) Merozoites

Correct Answer - A

Ans: A. Trophozoites

(Ref: Paniker's 7/e p77, 6/e p69; Harrison 19/e p1374)

- Transfusion associated malaria has a shorter incubation period because of presence of trophozoites in blood.
- Malaria can be transmitted by blood transfusion, needle-stick injury, sharing of needles by infected injection drug users, or organ transplantation.
- The incubation period in these settings is often short because there is no pre-erythrocytic stage of development.
- Parasites may remain viable in blood bank for 1-2 weeks.
- As this condition is induced by direct infection of red cells by the merozoites, pre-erythrocytic schizogony and hypnozoites are absent.
- Relapse does not occur and incubation period is short.

99. A patient was brought to emergency with complaints of high-grade fever and altered sensorium. He was diagnosed to be suffering from meningococcal meningitis. Which of the following is the most appropriate empirical treatment option?

a) Ceftriaxone

b) Piperacillin—Tazobactam

c) Penicillin

d) Cotrimoxazole

Correct Answer - A

Answer- A. Ceftriaxone

Meningococcal meningitis

Treatment: Though penicillin is the drug of choice for susceptible strains in meningococcal meningitis, a 3rd generation cephalosporin Like Ceftriaxone or cefotaxime is preferred as empirical therapy in patients with meningococcal septicemia.

- 3rd generation cephalosporin such as cefotaxime or ceftriaxone is DOC for initial therapy
- Prophylaxis: Rifampicin is DOC for meningococcal prophylaxis

ANTIBIOTIC RECOMMENDATIONS FOR BACTERIAL MENINGITIS:

BACTERIA	ANTIBIOTIC(IV)	DURATION
Streptococcus	Vancomycin + 3rd gen. Cephalosporin	10-14 days

pneumoniae	(Cefotaxime or ceftriaxone)	
Neisseria meningitidis	3rd gen. Cephalosporin(Cefotaxime or ceftriaxone) or Penicillin G or Ampicillin	5-10 days
H.influenzae	3rd gen. Cephalosporin(Cefotaxime or ceftriaxone)	7-10 days
Listeria monocytogens	Penicillin G or Ampicillin + Aminoglycoside	14-21 days
GBS	Penicillin G or Ampicillin + Aminoglycoside	14-21 days
E.coli	3rd gen. Cephalosporin(Cefotaxime or ceftriaxone)	21 days

100. MHC Class II proteins are expressed by:

a) B-cells, dendritic cells and macrophages

b) Platelets

c) T-cells

d) All nucleated cells

Correct Answer - A

Answer- A. B-cells, dendritic cells and macrophages

- MHC Class II proteins are expressed by all antigen-presenting cells, which include B-cells, follicular dendritic cells and macrophages.
- MHC Class I proteins are expressed by all nucleated cells, which excludes platelets and RBCs
- HLA class I antigens (A, B and C) are found on the surface of virtually all nucleated cells- They are the principal antigens *involved in graft rejection and cell-mediated cytotoxicity*.
- Class, I molecules may function as components of hormonal receptors.
- HLA class II antigens are more restricted in distribution, being found only on cells of the immune system macrophages, dendritic cells, activated T cells, and particularly on B cells."

101. Hydrolysis of IgG with papain will lead to formation of following fragments:

a) 1 Fc and 2 Fab fragments

b) 2 Fc and 1 Fab fragment

c) 1 variable chain and 1 constant chain

d) 1 Fab and 1 hypervariable region

Correct Answer - A

Answer- A. 1 Fc and 2 Fab fragments

- Hydrolysis of IgG with papain will lead to the formation of 1 Fc and 2 Fab fragments.
- Papain hydrolyzes IgG at the hinge region, which lyses IgG into one constant Fc region and two Fab fragments.
- When studying the Ig molecule structure, it was identified experimentally that an antibody molecule, such as IgG, can be split into two fragments by the proteolytic enzyme, papain.
- When this happens, the peptide bonds in the hinge region are broken.
- The antigen-binding activity is associated with one of these fragments, the Fab portion-
- The second fragment is the Fc portion that is involved in the placental transfer, complement fixation, attachment to various cells, and other biologic activities.

102. *Rhinosporidium seeberi* belongs to:

a) Fungus

b) Bacteria

c) Aquatic protistan protozoa

d) Virus

Correct Answer - C

Answer- C. Aquatic protistan protozoa

- "Rhinosporidium seeberi: This organism has been considered to be a protozoan, a fungus, and most recently has been placed in the novel clade of aquatic protistan parasites, the Mesomycetozoa.
- Because *R. seeberi* will not grow in synthetic media, this classification was based on sequence analysis of the 18S small-subunit ribosomal DNA (rDNA) of this organism.
- This analysis placed *R. seeberi* among the Mesomycetozoa (formerly DRIP: Dermutocystidium, Rosette agent, Ichthyophonus, and Psorospermium), a clade of fish parasite that forms a branch of an evolutionary tree near the animal fungal divergence."

103. 1,3-beta- glucan assay can identify all the following organisms except:

a) Invasive aspergillosis

b) Pneumocystis jiroveci pneumonia

c) Invasive candidiasis

d) Invasive cryptococcosis

Correct Answer - D

Answer- D. Invasive cryptococcosis

- 1,3-beta D-glucan assay cannot identify invasive cryptococcosis.
- (1-3)-Beta-D-glucan BG is a component of the cell walls of most fungi.
- The main exceptions are Mucorsles and cryptococcal, which release no or little BG to be detected in human serum.
- BDG is found in the cell walls of most fungi (eg, Candida, Aspergillus, Fusarium, Pneumocystis jirovecii) with the notable exception of Cryptococcus species, Blastomyces species, and the Mucorales (eg, Lichtheimia, Mucor, Rhizopus), which either lack BDG entirely or produce it in very low amounts.
- Elevated serum BDG levels have been associated with the presence of a fungal infection, often prior to the development of clinical symptoms and before isolation or identification of the fungal organism via routine methods.

104. A 22 years old male presented with history of fever, sore throat and enlarged neck lymph nodes. He was ordered a Paul-Bunnell test with a suspicion of Infectious mononucleosis. What is the immunological basis behind the use of this test?

a) Heterophile antibody test

b) Complement mediated agglutination reaction

c) Homophile antibody test

d) Latex agglutination test

Correct Answer - A

Answer- A. Heterophile antibody test

Epstein-Bat virus (EBV) infection includes specific antibodies to EBV and various unrelated non-EBV heterophile antibodies. These heterophile antibodies react to antigens from animal RBCs. Sheep RBCs agglutinate in the presence of heterophile antibodies and are the basis for the Paul-Butrnell test.

105. A patient comes after a dog bite with hydrophobia, tearing and altered sensorium. You suspect rabies in this patient. Corneal impression has been taken. What test will you do on it for most accurate diagnosis?

a) Indirect immunofluorescence

b) RT-PCR for virus

c) Histopathological examination for Negri bodies

d) Antibodies against Rabies virus

Correct Answer - B

Answer- B. RT-PCR for virus

Detection of rabies virus RNA by RT-PCR is highly sensitive and specific. This technique can detect virus in fresh saliva samples, skin, CSF, and brain tissues.

Detection of rabies virus RNA by RT-PCR is highly sensitive and specific. This technique can detect virus in fresh saliva samples, skin, CSF, and brain tissues. In addition, RT-PCR with genetic sequencing can distinguish among rabies virus variants, permitting identification of the probable source of an infection."-Harrison 19/e p1302.

Reverse transcription-polymerase chain reaction testing can be used to amplify parts of a rabies virus genome from fixed or unfixed brain tissue or saliva. Sequencing of amplified products can allow identification of the infecting virus strain.

106. A 2 weeks old infant has conjunctivitis, which later developed into respiratory distress and pneumonia. Chest X-ray showed bilateral lung infiltrates. WBC count was 14,300/dL. Which of the following is the most likely organism?

a) *Chlamydia trachomatis*

b) *Streptococcus agalactiae*

c) *Gonococcus*

d) *Haemophilus influenzae*

Correct Answer - A

Answer- A. *Chlamydia trachomatis*

- *Chlamydia trachomatis*: Of newborns infected by the mother, 10-20% may develop respiratory tract involvement 2-12 weeks after birth, culminating in pneumonia.
- Affected newborns have nasal obstruction or discharge, striking tachypnea, a characteristic paroxysmal staccato cough, an absence of fever, and eosinophilia.
- Interstitial infiltrates and hyperinflation can be seen on radiographs.
- The diagnosis should be suspected if pneumonitis develops in a newborn who has inclusion conjunctivitis and can be established by isolation of *C. trachomatis* from respiratory secretions.

107. Disease caused by *Staphylococcus aureus* which is not mediated through a toxin is

a) Food poisoning

b) Septicemic shock

c) Toxic shock syndrome

d) Staphylococcal scalded skin syndrome

Correct Answer - B

Answer- B. Septicemic shock

Septicemia is mainly due to endotoxin like activity as seen in Gram-negative bacilli and not due to exotoxin.

- Clinically, *Staphylococcus aureus* sepsis presents like that documented for sepsis due to other bacteria. Septicemic shock is not directly caused due to toxins and other virulence factors play a role like protein A, fibrinolysin and coagulase, which are anti-phagocytic, suppress host immunity and helps in the spread of infection. Septicemia is mainly due to endotoxin like activity as seen in Gram-negative bacilli and not due to exotoxin.
- *S.aureus* produces free types of toxin: cytotoxins, pyrogenic toxin superantigens, and exfoliative toxins. Both epidemiologic data and studies in animals suggest that antitoxin antibodies are protective against illness in TSS' staphylococcal food poisoning, and staphylococcal scalded skin syndrome (SSSS). Illness develops after toxin synthesis and absorption and the subsequent toxin-initiated host response

108. Organism most likely associated with VAP?

a) Acinetobacter

b) Clostridium

c) Mycobacterium TB

d) None of these

Correct Answer - A

Ans. A. Acinetobacter- A gram negative bacteria

Ventilator-associated pneumonia (VAP) :

- A study from AIIMS Surgical Department and ICUs shows that Acinetobacter is nowadays the most common and most specific cause for Ventilator-Associated Pneumonia (VAP).
- Pneumonia that develops in a patient who has been on mechanical ventilation > 48 hours.
- 2nd MC hospital-acquired infection among pediatrics and neonatal ICU patients.
- The rate of pneumonia in pediatric intensive care units (PICU) is lower than in adult intensive care units (ICU).
- In neonates, the rate of ventilator-associated pneumonia is inversely proportional to birth weight.
- Children with artificial airways, such as a tracheostomy tube for management of chronic respiratory failure or an endotracheal tube for acute airway management, are at risk for ventilator-associated pneumonia.
- It is difficult to diagnose ventilator-associated pneumonia.

109. All of the following are associated with HHV8 except?

a) Kaposi sarcoma

b) Primary effusion lymphoma

c) Castleman disease

d) T-cell leukemia

Correct Answer - D

Ans. D. T-cell leukemia

- Human Herpes Virus-8 Aka Kaposi's sarcoma-associated herpesvirus (KSHV).
- Human herpesvirus-8 (HHV-8) or Kaposi's sarcoma-associated herpesvirus (KSHV infects B lymphocytes, macrophages, and both endothelial and epithelial cells) appears to be causally related to Kaposi's sarcoma and a subgroup of AIDS-related B-cell body cavity-based lymphomas (primary effusion lymphomas) and multicentric Castleman's disease.
- HHV-8 infection is more common in parts of Africa than in the United States. Primary HHV-8 infection in immunocompetent children may manifest as fever and maculopapular rash.
- Among individuals with intact immunity, chronic asymptomatic infection is the rule, and neoplastic disorders generally develop only after subsequent immunocompromise. In patients with AIDS, effective antiretroviral therapy has caused improvement in HHV-8-related disease. The virus is sensitive to ganciclovir, foscarnet, and cidofovir, but the clinical benefit has not been demonstrated in trials. Invasive cervical carcinoma has been causally implicated with human papillomavirus infection.

110. The incubation period of LGV is?

a) 3-7 days

b) 7-10 days

c) 10-30 days

d) 30-90 days

Correct Answer - C

Ans. C. 10-30 days

- **The incubation period for LGV (the time interval between sexual contact and the appearance of symptoms) varies on average from 10 to 14 days. At times the incubation period may be as long as up to 6 weeks after sexual contact with an infected partner.**

Feature	Syphilis	Herpes	Chancroid	LGV	Donovanosis
Incubation period	9-90 days	2-7 days	1-14 days	3 days- 6 weeks	1-4 weeks (up to 6 months)

111. ($\gamma\delta$) T cell is associated with?

a) CD4

b) CD5

c) Cd8

d) First line defense against bacterial peptides

Correct Answer - D

Ans. D-First line defense against bacterial peptides

($\gamma\delta$) T cell:

- **Gamma delta ($\gamma\delta$) T cells have a TCR that is made up of one γ (gamma) chain and one δ (delta) chain.**
- **This group of T cells is usually much less common than $\alpha\beta$ T cells, but are at their highest abundance in the gut mucosa, within a population of lymphocytes known as intraepithelial lymphocytes (IELs).**
- **Constitute 5% of total cells, express $\gamma/6$ chains of TCR chains; instead of α/β chains.**
- **They lack both CD4 and CD8 molecules.**
- **They do not require antigen processing and MHC presentation of peptides.**
- **They lack both CD4 and CD8 molecules.**
- **They do not require antigen processing and MHC presentation of peptides.**
- **They are part of innate immunity as the($\gamma\delta$) receptors exhibit limited diversity for the antigen.**
- **They are usually found in the gut mucosa, as intraepithelial lymphocytes (IELs).**
- **The function of ($\gamma\delta$) T-cells is not known, they may encounter the lipid antigens that enter through the intestinal mucosa.**

112. STERRAD is a gas plasma sterilizer used in operation theaters for disinfecting OT articles. Which of the following is the active agent used in it?

a) H₂O₂

b) N₂O

c) Ozone

d) EtO

Correct Answer - A

Ans. A. H₂O₂

- The Sterrad Sterilization System by Advanced Sterilization Products (ASP) exploits the synergism between peroxide and low-temperature gas plasma (an excited or ionized gas) to rapidly destroy microorganisms.
- After the sterilization process based on this technology, no toxic residues remain on the sterilized items.
- The technology is particularly suited to the sterilization of heat and moisture sensitive instruments since process temperatures do not exceed about 50 degrees C (140 degrees F) and sterilization occurs in a low moisture environment. The total process time is about one hour.
- The strerrad system offers a short cycle (averaging 75 minutes), low temperature and humidity, no aeration requirement, no chemical residues, negligible environmental impact, and wide compatibility with materials.
- Its drawback is an inability to process liquids, powders, or strong absorbers (e.g., cellulosic).

113. In which of the following, viral load done by Real Time PCR is of no role in investigative procedures?

a) Person with hepatitis B on tenofovir therapy

b) HSV causing temporal encephalitis

c) BK virus in patient of allograft renal transplant

d) CMV PCR in blood of patient of liver transplant

Correct Answer - B

Ans. B. HSV causing temporal encephalitis

Ref: "Diagnosis of herpesvirus infections of the central nervous system.", Herpes : the journal of the IHMF I1 Suppl 2 2004, pp. 48A-564.

- The question simply asks in which of the given conditions calculation of Viral load is not required. In HSV causing temporal encephalitis the role of PCR is just to detect HSV DNA and make a diagnosis of the disease.
- There is no role of detection of the viral load copies in the management or diagnosis of the disease.

114. A 6-month child presented with diarrhea and vomiting for three days. Which of the following enterotoxin is most likely responsible for the condition?

a) NSP4

b) NSP6

c) VP3

d) VP7

Correct Answer - A

Ans. A. NSP4

- Rotavirus nonstructural protein 4 (NSP4) is known to function as an intracellular receptor at the endoplasmic reticulum (ER) critical to viral morphogenesis and is the first characterized viral enterotoxin.
- The association of NSP4 and caveolin-1 contributes to NSP4 intracellular trafficking from the ER to the cell surface and speculate that exogenously added NSP4 stimulates signaling molecules located in caveola microdomains.

115. SD plasma destroys lipid enveloped virus. On SD plasma transfusion, which of the following infection is the likely possibility?

a) HIV

b) HAV

c) HBV

d) HCV

Correct Answer - B

Ans. B. HAV

- All the above given viruses except HAV are enveloped, so the HAV infection will spread even if the SD plasma destroys lipid envelope of the virus.

116. The correct order of gram staining is

a) Gentian violet → Iodine → Carbol fuchsin

b) Iodine → Gentian violet → Carbol fuchsin

c) Carbol fuchsin → Iodine → Gentian violet

d) Carbol fuchsin → Gentian violet → Iodine

Correct Answer - A

Answer-A- Gentian violet → Iodine → Carbol fuchsin

1. Application of the primary stain (crystal violet). Gentian violet also known as crystal violet stains all cells blue/purple
2. Application of mordant: The iodine solution (mordant) is added to form a crystal violet-iodine (CV-I) complex; all cells continue to appear blue.
3. Decolourization step: The decolourization step distinguishes gram-positive from gram-negative cells. The organic solvent such as acetone or ethanol extracts the blue dye complex from the lipid-rich, thin-walled gram-negative bacteria to a greater degree than from the lipid-poor, thick-walled, gram-positive bacteria. The gram-negative bacteria appear colourless and gram-positive bacteria remain blue.
4. Application of counterstain (safranin): The red dye safranin stains the decolourized gram-negative cells red/pink; the gram-positive bacteria remain blue.

NOTE → If you are struggling to remember the staining reagents used in this procedure and their order you can remember this sentence "Come In And Stain" i.e. the order is Crystal violet, Iodine, Alcohol/Acetone and the final one is Safranin.

117. Antibody in chronic allergy ?

a) IgM

b) IgA

c) IgG

d) IgE

Correct Answer - D

Answer- D- IgE

- When someone has allergies, their immune system makes an antibody called immunoglobulin E (IgE). These antibodies respond to allergens. The symptoms that result are an allergic reaction.
- IgE also has an essential role in type I hypersensitivity, which manifests in various allergic diseases, such as allergic asthma, most types of sinusitis, allergic rhinitis, food allergies, and specific types of chronic urticaria and atopic dermatitis.

118. clostridium difficile diarrhoea associated with:

a) Aminopenicillins

b) Carbapenems

c) Macrolide

d) Fluoroquinolones

Correct Answer - D

Answer-D-fluoroquinolones,

- Clostridium difficile colitis results from a disturbance of the normal bacterial flora of the colon, colonization by C difficile, and the release of toxins that cause mucosal inflammation and damage.
- It is a spore-forming bacillus that is responsible for the development of antibiotic-associated diarrhea and colitis.
- The antibiotics that most often lead to C. difficile infections include fluoroquinolones, cephalosporins, penicillins and clindamycin. Once established, C. difficile can produce toxins that attack the lining of the intestine

119. The dimorphic fungus exists in two phases: a unicellular yeast form at 37 C and a mycelium at 25 C; the fungus is:

a) *Malassezia furfur*

b) *Cryptococcus neoformans*

c) *Aspergillus*

d) *Histoplasma capsulatum*

Correct Answer - D

Answer-d- *Histoplasma capsulatum*

- Dimorphic fungi are fungi that can exist in the form of both mold and yeast. An example is *Penicillium marneffeii*, a human pathogen that grows as a mold at room temperature, and as a yeast at human body temperature.

Mnemonics: Body Heat Probably (Changes) Shape

- *Blastomyces dermatitidis*, *Histoplasma capsulatum*, *Paracoccidioides brasiliensis*, (*Coccidioides immitis*) is in parentheses because it changes to a spherule of endospores, not yeast, in the heat), *Sporothrix schenckii*.

120. Mw vaccine is made from which bacteria?

a) M. Welchii

b) M. Bovis

c) M. Indicus pranii

d) none of these

Correct Answer - C

Answer-C- M. Indicus pranii

- Killed Mycobacterium indicus pranii (previously known as Mycobacterium w, popularly known as Mw) vaccine has earlier been investigated in genital warts with encouraging results
- Mycobacterium w **vaccine**, a useful adjuvant to multidrug therapy in multibacillary leprosy.

121. All are seen in sickle cell anemia except ?

a) Target cells

b) Malaria

c) Reticulocytosis

d) Jaundice

Correct Answer - B

Answer-B- malaria

- The possession of the sickle cell allele protects these individuals against malaria because the parasite dies when potassium leaks out of RBCs as they become sickle shaped.
- Types,of anemia that have protective effect against P. falciparum malaria : - G6PD deficiency, Sickle cell anemia, Thalassemia, HbC, Pyruvate kinase deficiency

122. CLED is better medium than MacConkey medium for processing of urine samples

a) It differentiate LF from NLF Bacteria

b) Prevents swarming of proteus

c) Identifies pseudomonas

d) Allows staphylococcus,Streptococcus and candida to grow

Correct Answer - D

Answer- D. Allows staphylococcus,Streptococcus and candida to grow

* **CLED agar (cystine–lactose–electrolyte-deficient agar or medium)** is a valuable non-inhibitory [growth medium](#) used in the isolation and differentiation of [urinary](#) microbes

* It supports the growth of **urinary** pathogens and contaminants but prevents undue swarming of Proteus species due to its lack of electrolytes.

123. Beta-1,3-D Glucan testing is done for all except-

a) Aspergillosis

b) Mucormycosis

c) Candidiasis

d) Pneumocystis

Correct Answer - B

Ans- B. Mucormycosis

* Detection of fungal antigens in body fluids, including cryptococcus capsular polysaccharide, histoplasma antigen, galactomannan, and β -d-glucan, is viewed as being clinically useful for at least the presumptive diagnosis of invasive fungal infections.

β -d-Glucan is an attractive antigen in that it is found in a broad range of fungal agents, including the commonly encountered agents ***Candida spp.***, ***Aspergillus spp.***, and ***Pneumocystis jirovecii.***

124. Anaphylaxis is mediated by

a) 5-hydroxytryptamine

b) Heparin

c) Prostaglandin

d) All of these

Correct Answer - D

Answer- D. All of these

* Primary mediators (These are present in mast cell granules)

Includes:

* Biogenic Amines :- Histamine, 5-Hydroxytryptamine

* Proteoglycans : Heparin

* Secondary mediators:

* Leukotrienes :- LTC₄ D₄,V

* Cytokines:- IL1,ILg,IL4,IL-5, IL4 TNF and GMCSF

125. EOSINOPHILS are activated by

a) IL2

b) IL-10

c) IL-1

d) IL-5

Correct Answer - D

Ans-D- IL-5

* Interleukin-5 has long been associated with the cause of several allergic diseases including allergic rhinitis and [asthma](#), wherein a large increase in the number of circulating, airway tissue, and induced sputum eosinophils have been observed

* BASOPHILS ARE ACTIVATED BY INTERLEUKIN-5

126. All parasites are in hepatocytes Except ?

a) Toxoplasma

b) P. falciparum

c) Leishmania

d) Babesia

Correct Answer - D

Answer- D. Babesia

* Babesia is an parasite which parasitizes RBCs like Plasmodium

* visceral leishmaniasis is an infection in hepatocytes ,

* Malaria especially with Plasmodium falciparum hepatomegaly can develop early and subsides with treatment.

127. 23 serotypes pneumococcal vaccine Most useful in

- a) Cystic fibrosis
- b) Recurrent otitis media & sinusitis
- c) Child less than 2 years
- d) Sickle cell anaemia

Correct Answer - D

Ans-D. Sickle cell anaemia

- * PPSV23 (Pneumovax or Pnu-Immune) is the most widely available formulation and contains 23 pneumococcal polysaccharides
- * A single dose of the 23-valent pneumococcal polysaccharide vaccine (PPSV23) is indicated for adults (ages 19 to 64 years)
- * Vaccination with both PCV13 and PPSV23 is indicated in individuals with impaired splenic function for eg- Sickle cell disease or other hemoglobinopathy

128. Which is the most common virus infection in post solid organ transplant in Indian setting

a) CMV

b) HSV 1

c) EBV

d) VZV

Correct Answer - A

Answer - A. CMV

* Maximum risk of infection after kidney transplant is between 1-4 months after transplantation.

* Most common presentation is fever , leukopenia and hepatosplenomegaly,

* Most common presentation after bone marrow transplantation is interstitial pneumonia

129. Giemsa stained smear cannot detect

a) Coxiella burnetii

b) E.chaffnessis

c) Bartonella

d) Toxoplasmosis

Correct Answer - A

Ans -A. Coxiella burnetii

*Coxiella is diagnosed by peripheral Blood smear

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