VETERINARY PUBLIC HEALTH

AT A GLANCE

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VETERINARY PUBLIC HEALTH: AT A GLANCE

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Preface

Zoonotic diseases of bacterial, viral, rickettsial, chlamydial, fungal and parasitic origins constitute an important global health problem. Out of a total of 1405 infectious diseases that infect human beings 58% (817) are zoonotic in nature and out of 177 infections that are emerging or reemerging 73% (130) are zoonoses. Emerging and reemerging zoonoses are newly evolved or have occurred previously but have more recently shown an increase in incidence or expansion into a new geographic host or vector range. The emergence of zoonotic diseases is increasing in many countries in the world and represent a global threat to human and animal health. Zoonoses occur in sporadic as well as epidemic forms and affect both sexes and all age groups. A wide range of animals (domestic, pet, companion, zoo, wild etc.) act as carrier of zoonotic pathogens and thus transmit the infection to humans. Zoonoses act as a double edged weapon. Besides, being direct effect on human and animal health, all major zoonotic diseases cause great economic losses due to reduced productivity. In most of the countries zoonoses are not officially declared as notifiable diseases. Human induced ecological changes such as deforestation, industrialization, urbanization, construction of dams, canals, amusement parks are responsible for reemergence of many zoonoses. In recent years a number of fatal zoonoses such as haemorrhagic fever caused by Marburg and Ebola viruses, Hantavirus infections, SARS, Bird flu, Swine flu, Nipah and Hendra virus infections caused significant casualties and need special attention in the direction of development of diagnostics and immunoprophylactic agents.

With the implementation of new trimester/semester systems, the students have to face a number of quizzes, midterm and final examinations. This system evaluates the student's learning capability and teacher's teaching techniques on a regular basis. Mostly objective type and short notes are asked in the examinations. Again, in various competitive examinations namely IAS, IPS, IFS, CSIR, ICMR, ICAR, NET, JRF, SRF etc objective type questions are set to evaluate the depth of knowledge of a particular subject of the students. Further, a

number of organization/institutions hold regular examination for admission in various degree programmes, award of merit scholarships and appointment on various jobs based on objective type questions.

It is therefore hoped that the book will be extremely useful for teachers as well as students and personnel of Veterinary and Medical Sciences and other disciplines of various institutions particularly associated with the Public Health.

Lastly, the authors will appreciate receiving comments on the quality of book and errors if any for further improvement of the book.

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A. VIRAL ZOONOSES

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Chapter 1
Rabies

A. Answer the followings.

Q.1. Describe the different serotypes and genotypes of rabies and rabies related viruses.

A. Rabies is caused by a number of different strains of the large, bullet shaped with one end rounded or conical and other planar or concave, single stranded negative sense RNA viruses of the genus *Lyssavirus,* family *Rhabdoviridae.* The rabies virus measures approximately 180X75 nm. The RNA genome encodes 5 proteins : the glycoprotein G is the primary structural component of the surface spikes embedded in the viral envelope and is associated with the smaller M protein. Enclosed by the host cell derived envelope is an infectious viral core of nucleocapsid (N) proteins, thus encapsidating the viral genome and the RNA polymerases. The NS protein is associated with the nucleocapsid.

Classical rabies is generally a fatal encephalomyelitis of warm blooded animals caused by *Lyssavirus* genotype 1, with several different strains prevalent throughout the world. With the discovery of rabies related viruses, the cross-reactivity of internal antigens (the ribonucleoprotein complex) was used to identify new viruses under the *Lyssavirus* genus within the *Rhabdoviridae* family. Virus neutralizing antibodies (VNAbs) which recognize the membrane glycoprotein (G) or MAbs subdivided the genus into six serotypes. Comparison of the viral nucleoprotein gene (N) sequences delineated 7 genotypes. The genetic diversity of representative members of the *Lyssavirus* genus (rabies and rabies related viruses) using the sequence of

the gene encoding transmembrane glycoprotein revealed two major phylogroups. Phylogroup I comprises the worldwide serotype 1 [classic rabies virus and Australian bat lyssaviurs(ABL)], serotype 4 (Duvenhage virus), serotype 5 [European bat Lyssavirus 1(EBL-1)] and serotype 6 [European bat Lyssavirus 2 (EBL-2)]. Phylogroup II comprises the divergent African serotype 2 (Lagosbat virus) and serotype 3 (Mokola virus). The details of the rabies and rabies related virus have been given in the table 1.

Comparison of the viral nucleoprotein gene (N) sequence delineated 7 genotypes (1) Rabies virus (2) Lagosbat virus (3) Mokola virus (MOKV) (4) Duvenhage virus (5) European Bat Lyssavirus 1 (EBLV 1) subdivided into 1a and 1b (6) European Bat Lyssavirus 2 (EBLV 2) subdivided into 2a and 2b and (7) Australian Bat Lyssavirus (ABLV). Rabies virus is distributed worldwide among terrestrial mammals and bats, presents the most comprehensive collection of isolates and has been extensively studied due to its health and economic significance. Rabies related viruses have so far been isolated in limited geographical regions.

Q.2. What is Fermi antirabies vaccine?

A. Fixed rabies virus is grown in sheep brain and treated with phenol at 22°C. Some residual live virus is present. This has caused vaccine induced rabies in some persons. It is no longer used now-a-days.

Q.3. What is Semple antirabies vaccine?

A. It is a 5% suspension of sheep brain infected with fixed rabies virus and inactivated with phenol at 37°C leaving no residual virus. It was developed by Semple in 1911 at Central Research Institute, Kasauli.

Q.4. What are the two diploid cell strains used in growing rabies virus for vaccine production.

A. WI-38 and MRC-5.

Q.5. Describe the shape and size of the rabies virus.

A. The rabies virus is bullet shaped and measures 180 nm in length and 75 nm in diameter.

Q.6. What are the different countries free from the rabies?

A. Japan, Bulgaria, Ireland, the Netherlands, Portugal, Spain, the U.K., Australia, Japan, Hawaii, Scandinavian countries and most of the Islands of Caribbean basins.

Q.7. What are the different organs of an animal can be positive for rabies virus antigen?

A. The rabies virus has been found in supradrenal glands, brown fats (interscapular glands) of bats, kidney, bladder, ovaries, testicles, sebaceous glands, salivary glands, germinal cells of hair follicles, cornea, tongue papillae and intestinal wall, besides CSF, milk and brain.

Q.8. How many days before the symptoms, rabies virus can be detected?

A. Dogs -1 to 3 days (upto 13 days), Cat - 1-3 days, Cattle - 1-2 days, Skunk - 18 days, Foxes - 17 days, vampire bats - 106 days and non hematophagus bats- 10-27 days.

Q.9. What is the incubation period of rabies in man and animals?

A. The incubation period in man ranges from 2-8 weeks (10 days to more than 1year has also been reported). The incubation period is longer when the bite is farther away from the brain. Dog - 10 days to 2 months or long, Cat - similar to dogs, Cattle - 25 days to more than 150 days, Wild animals- 10 days to 6 months.

Q.10. What is the duration of clinical course of rabies in animals?

A. Man - 2-6 days, Dog - 1-11 days, cattle - 2-15 days (average 10 days).

Q.11. What is abortive rabies?

A. Mice inoculated with rabies virus become ill and then recover. This is called abortive rabies. So, the rabies virus infection is not always fatal. It has been seen in dogs as well as in human beings, although in limited number of cases.

Q.12. Is there any carrier state of rabies in dogs?

A. In Ethiopia and India, rabies virus has been isolated from the saliva of several asymptomatic dogs over a prolonged period. In this case, the rabies virus is maintained in the tonsils but not in brains or other organs.

Q.13. What is the site of inoculation of cell culture rabies vaccine in human beings?

A. The cell culture anti-rabies vaccine should be administered in the deltoid region not in the buttocks because low antibody titre is obtained in latter method. In children, it should be given in the anterolateral area of the thigh.

Q.14. What is the ideal procedure to wash the biting wound in rabies suspected cases?

A. The wound should be washed as soon as possible with a strong jet of water and cleaned with soap and detergent followed by application of 40-70% alcohol, tincture iodine, iodized alcohol or 0.1% compound of quaternary ammonium. The wound should not be sutured but should be infiltrated with anti-rabies serum.

Q.15. What are Negri bodies?

A. Negri bodies are inclusion bodies 1-27 μm in diameter having small, central, dark staining innerkorperchen and found prevalently in Ammon's horn of the hippocampus besides cerebral cortex, thalamus and Purkinje cells of cerebellum.

Q.16. What is intravitam test for diagnosis of rabies?

A. The antemortem diagnosis of rabies in suspected cases based on the demonstration of rabies virus antigen by FAT is called intravitam test. It was reported in corneal cells by Schneider and Hamann in 1969, oronasal mucosal cells in 1971 by Schaaf and Schaal and nerve bundle of hair follicles in 1972 by Smith and co-workers.

Q.17. What is LEP strain of rabies virus?

A. This strain was isolated from Flury, a girl died of rabies. This strain was passaged 138 times in day old chick I/C followed by 40-50 serial passages in yolk sac in 6-7 days

old embryonated hen's eggs.

Q.18. What is HEP strain of rabies virus?

A. The LEP strain of rabies virus was further passaged in yolk sac of the embryonated eggs to further attenuate it and at passage level 183, it is called HEP strain of rabies virus.

Q.19. Can the present vaccine against rabies give protection against the Lagosbat and Mokola virus infections?

A. Adult mice and monkeys experimentally immuninized against Lagosbat and Mokola viruses were not protected against rabies virus challenge but mice immunized with rabies virus resisted challenge with Lagosbat virus and to a lesser extent with Mokola virus.

Q.20. Are the Lagosbat and Mokola viruses cross protective ?

A. Immunization of mice with Lagosbat virus did not protect against Mokola virus challenge but immunization with Mokola virus protected against both the viruses.

Q.21. What is the size of the Negri bodies in different species of animals.

A. Negri bodies are typically small in cats, rabbits and raccoons, medium size in dogs, skunks and guineapigs and very large in cattle.

Q.22. What are the pathological lesions found in rabies infected animals?

A. Beside Negri bodies, other changes are ballooning or swelling of neurones followed by pyknosis, karryorrhexis, lysis and neuronophagia. Perineuronal infiltration with monocytes and lymphocyte, perivascular cuffing, interstitial round cell infiltration and perivascular haemorrhage. The nerve cells in the grey matter of the brain are most affected. Subependymal and subcortical demyelination are observed. Inflammation and neuronal degeneration are more marked in rabid dogs than rabid swine and cattle.

B. Write true or false about the followings.

Q.1. Rabies virus haemagglutinates goose RBC at 4°C and pH 6.2.

A. True.

Q.2. The haemaggulutination activity of rabies virus is inhibited by heating at 56°C for 30 min, ether, trypsin, pronase, deoxycholate or tween 20.

A. True.

Q.3. The haemaggulutination of rabies virus is not inhibited by betapropriolactone.

A. True.

Q.4. Pups are more susceptible to rabies than adult dogs.

A. True.

Q.5. The fixed rabies virus is more neurotropic.

A. True.

Q.6. Rabies in animals is called hydrophobia.

A. False.

Q.7. The rabid animals do not show the symptoms of 'hydrophobia'.

A. True.

Q.8. The rabies virus moves at a speed of 3 mm/hour in the axon.

A. True.

Q.9. The movement of rabies virus from bite site to axon to the neuronal body and ultimately to brain is called centripetal migration.

A. True.

Q.10. The movement of rabies virus from brain to salivary gland and virtually every tissue of the body is called centrifugal migration.

A. True.

Q.11. The rabies virus may be shed in urine and milk.

A. True.

Q.12. Among human infections, rabies is believed to be the 10^{th} most common cause of death.

A. True.

Q.13. More than 99% of all human deaths from rabies occur in Africa, Asia and South America.

A. True.

Q.14. Rabies is endemic in 100 countries where more than 2.5 thousand million people live.

A. True.

Q.15. Although, all mammals are susceptible to rabies, only member of the canid, viverrid (skunks and raccoons) and chiropteran (bats) species are considered as the most efficient vectors of the diseases.

A. True.

Q.16. Bats are capable of transmitting all the genotypes of rabies and rabies related viruses.

A. False. Mokola virus (genotype 3) is not transmitted by bats.

Q.17. The present English name 'rabies' is derived from Latin meaning raging, furious, savage or madness.

A. True.

Q.18. The neurological reactions varies between 1 in 200 to 1600 recipient in Semple type vaccines.

A. True.

Q.19. The neurological reactions varies between 1 in 8000 to 27000 recipient in Fuenzalida type vaccines.

A. True.

Q.20. Rabies virus is stable between pH 3 and pH 11.

A. True.

Q.21. The dose of equine immune globulin is higher compared to human immunoglobulin because of short half life of equine immunoglobulin in man.

A. True.

Q.22. Fixed rabies virus can invade the salivary glands.

A. False. It does not invade the salivary glands.

Q.23. Not all the rabid dogs shed the virus through saliva and some bites are non-infectious.

A. True.

Q.24. Male (man) below the age of 15 are most commonly affected with rabies.

A. True.

Q.25. Rabies virus infections does not always leads to death.

A. True. The antibodies to rabies virus have been found in several wildlife species such as foxes, raccoons, mongooses, insectivorous and hematophagus bats and rabies infection does not always cause death.

Q.26. Both Canada, US and many European countries are free from canine rabies but wild animals maintain the rabies.

A. True.

Q.27. The carrier state of rabies is also observed in bats.

A. True.

Q.28. Air borne transmission of rabies has been reported only in human beings.

A. False. It has also been reported in coyotes and foxes.

Q.29. Indiscriminate culling of street dogs is effective in controlling rabies.

A. False.

Q.30. Mass immunization of dogs with vaccines against rabies and sterilizing both males and females are effective in controlling rabies.

A. True.

Q.31. I/D route is as effective as I/M route of administration of anti-rabies vaccines but less costly.

A. True.

Q.32. LEP produced an effective immune response in adult dogs over 3 years but produce encephalitis in dogs under 3 weeks of age.

A. True.

Q.33. The rabies virus does not contain any RNA dependent RNA polymerase.

A. False.

Q.34. The N protein of the RNP are shared by lyssavirus genus and responsible for CF and FA test reactions.

A. True.

Q.35. Dogs are highly susceptible to rabies virus.

A. False. Dogs are moderately susceptible.

Q.36. During the furious period, dogs may show increased thirst.

A. True.

Q.37. Hydrophobia is a symptom of rabies in dogs.

A. False.

Q.38. Some rabid dogs both male and female show sexual arousal.

A. True.

Q.39. In dumb form, the paralysis starts at the head and neck.

A. True.

Q.40. Field voles, cotton rats and kangaroo rats are extremely high susceptible to rabies virus infections.

A. True.

Q.41. The street rabies virus migrate at more variable and generally slower rate than fixed rabies virus.

A. True.

Q.42. The inoculation of rabies virus into animals by I/V route is having long incubation period than other routes.

A. True.

Q.43. Experimentally, salivary gland infections have appeared more frequently and in higher titer in animals exposed to low virus inocula.

A. True.

Q.44. The rabies virus has been demonstrated in milk of infected

cattle, bats and skunks.

A. True.

Q.45. Negri bodies are found in rabid bats in 2% cases only.

A. True.

Q.46. Negri bodies are not commonly found in birds infected with rabies.

A. True.

Q.47. Homogenous eosinophilic inclusion bodies lacking internal structure are found in experimentally infected with rabies virus in ducks.

A. True.

Q.48. In human beings, rabies following bite of rabid animals, incubation period usually varies from 3-8 weeks.

A. True.

Q.49. In human beings, the incubation period is generally shorter in children than in adults.

A. True.

C. Fill in the blanks.

Q.1. The rabies in postmortem materials is diagnosed by immunofluorescent test of impression smears of ———— ————, ———————— and ———————— ———.

A. Medulla, cerebellum and hippocampus.

Q.2. ———————— and ———————— strains of rabies virus can be used in preparing anti-rabies vaccine.

A. Pasteur strain, Pittman and Moore, Street Alabama Dufferin (SAD), Flury's strain.

Q.3. The rabies virus can be grown in ———————— and ———————— cell lines.

A. Vero , BHK-21.

Q.4. The rabies virus can be grown in primary ———————— cells.

A. Chicken embryo fibroblast.

Q.5. The rabies virus can be grown in – – – – – – – – and – – – – – – – – – – – – diploid cell strains.

A. WI-38 , MRC-5.

Q.6. There are two strains of VSV namely – – – – – – – – – and – – – – – – – – – – – –.

A. New Jersey, Indiana.

Q.7. On the basis of clinical signs, there are two forms of rabies – – – – – and – – – – – –.

A. Furious and dumb forms.

Q.8. According to WHO, there are – – – – – – human deaths from rabies per year in the world.

A. 60,000.

Q.9. In India about – – – million people undergo anti-rabies treatment annually with a death toll of – – – – – – people.

A. 0.7 ; 30,000.

Q.10. The encephalitogenic factor present in the sheep brain used in preparation of anti-rabies vaccine is – – – – –.

A. Myelin.

Q.11. The rabies virus attaches to skeletal muscle cells via – – – – – – – receptors.

A. Acetylcholine.

Q.12. – – – – – and – – – – – – are two tests usually carried out to determine the potency of anti-rabies vaccine.

A. Habel's test and NIH test.

Q.13. The diagnosis of rabies from saliva or CSF in live human beings is called – – – – – – test.

A. Intra Vitam.

Q.14. The murine neuroblastoma cell line namely – – – – – – is the most susceptible one for rabies virus isolation.

A. CCL-131.

Q.15. The cell culture anti-rabies vaccine must have – – – I.U. per I/M dose as per WHO recommendation.

A. 2.5.

Q.16. In LEP and HEP anti-rabies vaccine – – – – – strain is used.

A. Flury's.

Q.17. In primary chicken embryo cell based anti-rabies vaccine – – – – – – strain is used.

A. Flury's (LEP).

Q.18. – – – – – vaccine is used to control rabies in wild animals.

A. Bait.

Q.19. In the world, more than – – – – million people receive post exposure vaccination against rabies per year.

A. 10.

Q.20. The purified Vero cell rabies vaccine contains the – – – – strain of rabies virus.

A. Wistar.

Q.21. Although, modern cell culture based anti-rabies vaccines are potent, one failure in – – – – – post exposure cases does occur.

A. One million.

Q.22. The rabies vaccination of – – – – % dogs is sufficient to break the canine transmission chain.

A. 80%.

Q.23. The dose of human rabies immune globulin is – – I.U./Kg, whereas equine rabies immunoglobulin is – – – – – I.U./Kg.

A. 20 ; 40.

Q.24. Now-a-days, – – – – is used as inactivant to prepare inactivated anti-rabies vaccine.

A. Betapropriolactone (BPL).

Q.25. The incubation period of fixed rabies virus varies from – – – – to – – – – days.

A. 4 to 6 days.

Q.26. In rabies, much higher titre has been found in – – – – – – – – – – – – than in the brain.

A. Salivary glands.

Q.27. The dose of virus necessary to infect skunks is – – – – – times more than that of foxes.

A. 100.

Q.28. Most of the wild animals manifest – – – – – – type of rabies.

A. Furious.

Q.29. – – – – – – – – – % of human cases of rabies in world are attributed to rabid dogs.

A. 90%.

Q.30. – – – – – % of all rabid dogs shed the virus in the saliva.

A. 60-75%.

Q.31. The movement of virus from bite site to CNS via peripheral nerves and from CNS to salivary glands, other organs and tissues are called – – – – – – – – and – – – – – – – – – – migration respectively.

A. Centripetal and centrifugal.

Q.32. The immunization of at least – – – % of total canine population in an area is effective in inducing herd immunity and breaking the chain of infection.

A. 80%.

Q.33. – – – – – – – – – – – anti-coagulant which causes internal haemorrhages can be used to control rabies in bats.

A. Diphenadione.

Q.34. The protective antibody titre in serum against rabies in human being should be – – – – – or more I.U./ml.

A. 0.5.

Q.35. Worldwide – – – million persons undergo antirabies treatment/vaccination each year.

A. 10.

Q.36. Homologous anti-rabies serum (human derived) and

heterologous serum should be given by I/M once as early as possible at the rate of – – – –I.U./KBW and – –I.U./ KBW respectively.

A. 20 and 40.

Q.37. Experimental transmission of rabies virus by inoculation of saliva from a suspected rabid animal was first shown by – – – – – – – – in 1804.

A. Zinke.

Q.38. Experimental transmission of rabies virus by inoculation of brain suspension or CSF from a suspected rabid animal was first shown by – – – – – – – – in 1881.

A. L. Pasteur.

Q.39. The application of FAT to the diagnosis of rabies by examination of CNS tissue was reported by – – – – – – – – – – in 1958 and salivary gland by – – – – – – – – – – in 1959.

A. Goldwasser and Kissling ; Goldwasser and co-workers.

Q.40. One peripheral dog LD50 of street rabies virus is – – – – – – – –I/C mouse LD50.

A. 86,000.

Q.41. Fixed rabies virus travel along the nerve pathways at approximately – – – –/hour.

A. 3mm.

Q.42. The frequency of salivary gland infection in rabid animals varies from – – –to – %.

A. 20-80.

Q.43. The titer in salivary glands is – – – – – log higher than in brain.

A. 3.

Q.44. Negri bodies occur in about – – – – – – % of animals died of rabies in the field.

A. 75-90.

Q.45. The R.B.C. of human beings with – – – – – – blood group is agglutinated by rabies virus.

A. O.

Q.46. The rabies virus has a CsCl buoyant density of – – – – – g / cm^3.

A. 1.20.

Chapter 2
Eastern Equine Encephalitis

A. Answer the followings.

Q.1. Describe the clinical signs of EEE in human beings.

A. The incubation period varies from 5-15 days. The symptoms include fever, encephalalgia, conjunctivitis, vomiting and lethargy and progresses to delirium and coma. The neurological signs are stiffness of neck, convulsion, spasticity in the muscles of the extremities and altered reflexes. The predominance of lymphocytes (600-2000/mm^3) is observed in CSF.

Q.2. Describe the clinical signs of EEE in horses.

A. The symptoms in equines are similar to WEE but the course of EEE is shorter but more fatal than WEE. The animals show a biphasic temperature. The first one appears after 1 day and last for 1 day. The second phase begins 4-6 days after initial infection and lasts for 1-4 days. The nervous symptoms appear. There is profound depression, flaccid lips and animals keep its head close to the ground. Diarrhoea or constipation are common. Some animals become excitable, walk around in circles and stumble over obstacles. Mortality in horses occurs in 75-90% cases due to encephalitis.

Q.3. Describe the clinical signs of EEE in birds.

A. EEE outbreaks has been reported in pheasants, ducks, turkeys and emus. The symptoms include fever, depression, profuse diarrhea, complete paralysis of one or both legs and involuntary circular movements.

Q.4. What is the mode of transmission of EEE ?

A. The basic infection cycle takes place between wild birds and mosquitoes. The mosquitoes feed on the blood of

viraemic birds and virus reproduces in their middle intestine (extrinsic incubation). When the mosquito bites a susceptible bird, it transmit the infection and the virus starts to reproduce in this new host (intrinsic incubation) eventually invading the circulating system (viraemia). From the birds, the infection spreads to horses and human beings through mosquito bite. Both *Aedes species* and *Culex species* are involved in the transmission of the disease.

Q.5. What are the diagnostic tests for diagnosis of EEE?

A. HI, CFT, IFT, SNT and ELISA.

B. Write true or false about the following.

Q.1. EEE, WEE and VEE occur exclusively in the Americas.

A. True.

Q.2. EEE is less frequent than WEE or St. Louis EE but more serious and causes high mortality.

A. True.

Q.3. The disease manifestations of EEE occurs in horses, pheasants, turkey and other birds.

A. True.

Q.4. Human, equine and pheasants are accidental hosts for EEE.

A. True.

Q.5. Wild birds are reservoirs of EEE virus.

A. True.

Q.6. Inactivated monovalent/bivalent vaccines are available for EEE for use in horses.

A. True.

C. Fill in the blanks.

Q.1. The EEE virus has been placed under the genus – – – – and family – – – – – – – – – – .

A. Alphavirus , Togaviridae.

Chapter 3
Marburg and Ebola

A. Answer the followings.

Q.1. How the Marburg disease is transmitted?

A. Laboratory personnel caught the infection by handling viscera, body fluids and kidney tissue culture of African green monkey (*Cercopi thecusaethiops*).

Q.2. Describe the clinical signs of Marburg disease in man.

A. The incubation period ranges from 4-9 days. The disease onset is sudden with fever, cephalalgia, prostration, arthralgia, vomiting, diarrhea, conjunctivitis, gastrointestinal haemorrhages, epitaxis, lymphadenopathy and hepatitis.

Q.3. Describe the clinical signs of Marburg disease in animals.

A. No symptoms are observed in African green monkeys. Experimental infection into different species of monkeys is generally fatal. The virus is not pathogenic for mice but causes 100% mortality in guineapigs after 3-5 passage.

Q.4. Which animals act as reservoir of the Marburg virus?

A. Monkeys are the reservoir of the virus and shed the virus through urine and saliva by FAT.

Q.5. Describe the clinical signs of Ebola virus infections in animals?

A. In cynomolgus macaque, the symptoms include fever, depression, diarrhoea, petechiae, shock and finally death.

Q.6. What are the tests used to diagnose the Ebola disease?

A. ELISA, FAT and RT-PCR.

Q.7. Why is it called Marburg disease?

A. The disease was first reported and pathogenic virus was isolated in Marburg, Germany in 1967.

Q.8. How do human beings catch the infection of Marburg virus?

A. Human beings catch the infection through contact with blood, tissue, body fluid and viscera of infected African green monkeys.

B. Write true or false about the following.

Q.1. Marburg virus, another member of the same genus of Ebola virus is antigenically different.

A. True.

Q.2. Ebola virus infection in humans has only been reported from Africa.

A. True. [Democratic Republic of Congo (formerly known as Zaire), Gabon, Ivory Coast]

Q.3. The Marburg virus is not pathogenic in mice and guineapigs.

A. True. But after 3-5 passages, it causes 100% mortality.

Q.4. Both Marburg virus and Ebola virus can produce cytopathic effect on Vero cells.

A. True.

C. Fill in the blanks.

Q1. The Ebola virus is under the genus ——————— and family ———————.

A. Ebolavirus and Filoviridae.

Q.2. Marburg disease is also called ——————————————.

A. African haemorrhagic fever or green monkey disease.

Q.3. Marburg virus is under the genus ——————— and family ———————.

A. Marburg virus; Filoviridae.

Q.4. ——————————— (animals) are reservoir of Marburg virus.

A. African green monkeys.

Chapter 4
Japanese B Encephalitis

A. Answer the followings.

Q.1. What are the clinical signs of the disease in man?

A. The incubation period varies from 4 to 14 days. There is sudden onset of high fever, intense encephalalgia, vomiting and cerebral and meningeal manifestations such as stiffness of the neck, convulsions, delirium, paresis and paralysis.

Q.2. What kind of treatment is recommended for Japanese B encephalitis?

A. Usually symptomatic treatment is given. The administration of recombinant α interferon has been found effective.

Q.3. What are the clinical signs of Japanese B encephalitis in animals?

A. In swine, abortion and neonatal mortality in 50-70% porcine population has been reported. The fetuses are often found to be mummified and hydrocephalic and some newborns with neurological symptoms. In equine, the symptoms include pyrexia, depression, photophobia, muscle tremors, incordination and ataxia. Abortion and neonatal death has also been reported.

Q.4. Which mosquito acts as vector of the disease?

A. *Culex tritaeniorhynchus, C. vishnui, C. gelidus, C. fuscephala.*

Q.5. What are the different methods to diagnose the diseae?

A. The virus can be isolated from brains of human, dead animals and porcine fetuses in 1-5 days old mice, pig or BHK21, C6/36 (*A. albopictus* cell line). Other tests are HI, CFT, ELISA and LAT.

Q.6. What are the vaccines available to control the Japanese B encephalitis?

A. Both modified live vaccine and inactivated Vero cell derived vaccines are available.

B. Write true or false about the following.

Q.1. In *Culex tritaeniorhynchus* mosquitoes, the JE virus is transmitted sexually from male to female.

A. True.

Q.2. The vertical transmission of the disease has been reported in mosquito vectors.

A. True.

C. Fill in the blanks.

Q.1. The Japanese B encephalitis virus is under the genus – – – – – – and family – – – – –.

A. Flavivirus, Flaviviridae .

Q.2. The Japanese B encephalitis is prevalent in – – – – – – – – – (countries) of the world.

A. Widespread in Asia and part of Australia.

Chapter 5
Kyasanur Forest Disease

A. Answer the followings.

Q.1. Describe the clinical signs of the KFD in man.

A. The incubation period ranges from 3-8 days. The disease is characterized by sudden onset, fever, encephalalgia, myalgia, anorexia and insomnia. On 3rd or 4th day, the patient experiences diarrhoea and vomiting. Other symptoms are papulovesicular lesions on the palate, palpable cervical and axillary lymph nodes, bradycardia and hypotension. The fever lasts for 6-11 days. The second phase of pyrexia of 2-12 days duration appears after a gap of 9-21 days. The neurological symptoms are stiffness of neck, mental confusion and tremor. The case fatality rate is 5-10%.

Q.2. Describe the clinical signs of the KFD in monkeys.

A. Experimentally inoculated monkeys with virus by I/V route showed diarrhoea, bradycardia and hypotension.

Q.3. What are the vectors of KFD virus?

A. *Haemaphysalis spinigera. Ornithoros sp.* and *Ixodes sp.*

Q.4. What are the diagnostic tests recommended for KFD?

A. HI, CFT, ELISA and Neutralization test.

Q.5. What is the origin of the name Kyasanur Forest Disease?

A. First case of the disease was detected in Kyasanur forest area in Karnataka in India.

B. Fill in the blanks.

Q.1. ———— acts as amplified host and ———— and ———— are accidental host in KFD.

A. Monkeys ; Man and cattle.

Q.2. The virus which causes Kyasanur forest disease (KFD) is under the genus – – – – – and family – – – – – –.

A. Flavivirus , Flaviviridae.

Q.3. Besides, human beings, the disease also occurs in – – – – – – – – – – (animal).

A. Bonnet macaque (*Macaca radiata*) and grey langur (*Presbytis entellus*).

Chapter 6
Chikungunya

A. Answer the followings.

Q.1. What are the mosquito vectors of Chikungunya?

A. *A. aegypti* and *A. albopictus* in Asia and *A. frucifer, A. luetocephalus, A. taylori* in Africa.

Q.2. Why *A. aegypti* is an efficient vector for the Chikungunia?

A. *A. aegypti* is an efficient vector because it is highly susceptible to the virus, lives close to people and bite painlessly several people in a short period for one blood meal.

Q.3. How the mosquitoes can spread the disease across the globe?

A. The mobility of the people is responsible for the spread of the disease across the globe.

Q.4. In 2006 which state is severely affected with Chikungunya?

A. Karnataka state was severely affected. Out of 1.38 million people affected, Karnataka accounted for almost half and Maharashtra nearly a quarter.

Q.5. What is the origin of the word 'Chikungunya'?

A. The term Chikungunya has been derived from 'Kungunyala' a word from the Makonde language of Tanzania meaning 'that which bends up' as patients adopt a stooped posture because of severe arthritis.

Q.6. Describe the clinical signs of Chikungunya in man?

A. The incubation period varies from 2-10 days. The disease is characterized by acute fever with or without chills, headache, nausea, abdominal pains, photophobia, conjunctival infection, skin rash and disabling arthralgia. The disease preferentially affects adults over 15 years of

age. Typically the wrists, hands, ankles and feet become intensely painful due to arthritis and affected people are unable to walk because of incapacitating pain. Although, the fever and skin rash are short lasting, the joint pain may recur or linger for a long time up to 3 years. Lymph nodes like other viral infections are enlarged and tender.

Q.7. How the Chikungunya virus infection is diagnosed?

A. IgG and IgM ELISA, virus isolation, RT-PCR, realtime PCR and RT-LAMP.

B. Write true or false about the followings.

Q.1. The Chikungunya virus contains single copy of single stranded positive sense RNA.

A. True.

Q.2. African genotypes have high degree of sequence homology, whereas Asian genotypes exhibit wider sequence diversity.

A. False. Reverse is true.

Q.3. East African genotype of Chikungunya virus has been reported from Indian Ocean during 2005 and in India during 2006 outbreak.

A. True.

Q.4. *A. aegypti* and *A. albopictus*, the vectors of Chikungunya can fly many kilometers.

A. False. They can fly only few meters.

Q.5. Most of the African victims of Chikungunya live close to forests similar to yellow fever.

A. True.

Q.6. In Asian outbreaks of Chikungunya, affected people were living in both rural and periurban area.

A. True.

Q.7. In Chikungunya infection, leucopenia, anaemia and elevation of serum aminotransferase has been noticed.

A. True.

Q.8. In Chikungunya virus infections, patients should be treated

with paracetamol or non-steroidal anti-inflammatory agent but not aspirin.

A. True. Besides, symptomatic treatments for fever, rash and arthritis should be provided.

Q.9. Vaccines are available against Chikungunya virus infections.

A. False.

C. Fill in the blanks.

Q.1. In 2006, about – – – – – million people were affected with Chikungunya in India.

A. 1.38.

Q.2. The Chikungunya virus is under the genus – – – – – and family – – – – – – – – –.

A. Alphavirus, Togaviridae.

Q.3. The Chikungunya virus was first isolated from – – – – – (country) in 1953.

A. Tanzania.

Q.4. The Chikungunya virus contains – – – nonstructural proteins and – – structural proteins.

A. 4 (nsp1-4) and 3 (E1-E3).

Q.5. There are 3 distinct genotypes of Chikungunya virus namely – – – –, – – – & – – –.

A. East African, West African and Asian.

Q.6. – – – – – – – and – – – – – – – – – were the principal vectors in the outbreaks of Chikungunya in the Indian Ocean in 2005 and in India in 2006 respectively.

A. *A. albopictus* and *A. aegypti*.

Q.7. In India, the first outbreaks occurred in 1964 in – – – – – – – – – – (name of the place).

A. South India (Pondicherry, Chennai and Vellore).

Q.8. The chikungunya virus has been placed under the genus – – – – – and family – – – –.

A. Alphavirus and Togaviridae.

Chapter 7
Nipah Virus Infections

A. Answer the followings.

Q.1. Which are the different countries affected by Nipah virus infections?

A. India, Bangladesh, Malayasia and Singapore.

Q.2. What kind of symptoms are produced by Nipah virus infection in man and pigs?

A. It produces usually encephalitis in humans and respiratory symptoms in pigs.

Q.3. What is the origin of the word 'Nipah'?

A. The word 'Nipah' has been originated from the name of a village 'Sungai Nipah' in the Malaysian peninsula.

Q.4. How are the pigs infected with Nipah virus?

A. The pigs are infected through ingestion of fruits contaminated with urine and faeces of infected bats.

Q.5. Describe the symptoms of Nipah virus infections in man?

A. The incubation period in humans varies from several days to 2 months with 4-18 days in most of the cases. The symptoms include fever, headache, drowsiness, cough, abdominal pain, nausea, vomiting, weakness, problems with swallowing and blurred vision. A majority of patients had impaired level of consciousness (55%) with brain stem dysfunction, abnormal doll's eye reflex, pinpoint pupils, hypertension and tachycardia. Neurological signs include seizures and ataxia. The salient clinical features of Nipah virus encephalitis that distinguish it from JE, include early brain stem signs, early ataxia, segmental myoclonus and terminal autonomic dysfunction.

Q.6. Describe the symptoms of Nipah virus infections in pigs?

A. The clinical disease in pigs can be very subtle and a large

proportion of pigs in a farm may not exhibit any clinical signs. The incubation period varies from 7 to 14 days. In suckling pigs, mortality is high and infected piglets showed symptoms of open mouth breathing.

In weaners (> 4 weeks) and growers, clinical signs include fever (>39°C) with respiratory signs ranging from rapid and laboured breathing to harsh non-productive coughing. Blood tinged mucous discharge from the nostrils appeared in severe cases. Neurological signs included trembling, twitching, muscular spasms, rear leg weakness and varying degree of lameness or spastic paresis.

In sows and boars, clinical signs included sudden death or acute febrile illness with laboured breathing, increased salivation and serous or mucopurulent nasal discharge. Neurological signs observed included agitation, head pressing, tetanus like spasms and seizures, champing of mouth and apparent pharyngeal muscle paralysis. Abortions occurs in 1st trimester of pregnancy in affected sows. In animals especially in pigs, the virus causes porcine respiratory and neurologic syndrome also known as barking pig syndrome or one mile cough.

Q.7. Describe the post mortem lesions of pigs infected with Nipah virus.

A. In pigs, the post mortem lesions are relatively non-specific. The lungs present mild to severe lesions with varying degree of consolidation, emphysema and petechial to ecchymotic haemorrhages and blood tinged exudates in the airways. The meninges show generalized congestion and oedema. Kidneys showed congestion both on surface and in the cortex. Histologically, interstitial pneumonia with widespread haemorrhages and syncytial cell formations in the endothelial cells of the blood vessels of the lungs have been noticed. Generalised vasculitis, haemorrhages and infiltration of mononuclear cells were observed in the lungs, kidneys and brain tissue. Immunohistology showed a high concentration of the viral antigens in the endothelium of the blood vessels of lungs.

It indicates that respiratory secretions from infected pigs were likely to be a rich source of infectious virus.

Q.8. Which samples should be collected for isolation of Nipah virus from animals?

A. Nipah virus can be isolated from CSF, tracheal secretion, throat swabs, nasal swabs and urine.

Q.9. What are the different diagnostic tests for Nipah virus infections?

A. Neutralization test, ELISA, RT-PCR and electron microscopy.

B. Fill in the blanks.

Q.1. Nipah virus is under the genus ------ and family ----------.

A. Henipavirus ; Paramyxoviridae.

Q.2. The disease is similar to another emerging zoonotic disease caused by ---- virus.

A. Hendra virus.

Q.3. The disease was first reported in --------(country) in the year ----------.

A. Malayasia ; 1999

Q.4. Henipavirus (Hendra virus and Nipah virus) are naturally harboured by --------.

A. Pteropid fruit bats (flying foxes).

Q.5. Humans are usually infected via -----, the intermediate host.

A. Pigs.

Q.6. -----, an antiviral drug effective against DNA and RNA viruses can be used to treat humans infected with Nipah virus.

A. Ribavirin.

Q.7. ------ cell line can be used for isolation of Nipah virus.

A. Vero.

Chapter 8
Yellow Fever

A. Answer the followings.

Q.1. Describe the clinical signs of yellow fever infections in man.

A. The incubation period ranges from3-6 days. Based on the gravity of the clinical picture, there are 4 forms of the disease. The first one is very mild, fever last for few hours and encephalagia. 2. It is more intense and characterized by fever, cephalalgia, nausea, epistaxis, vomiting, photophobia, vertigo and malaise. 3. It is moderately severe. It is characterized by fever, cephalalgia, chills, postration, nausea, vomiting, epitaxis, oral and gastrointestinal haemorrhages, hematemesis (black vomit), melena and jaundice. 4. This form is malignant. In the fulminant cases, the patient dies between 6-8th day of coma or suddenly after an episode of hematemesis or black vomiting.

Q.2. What are Council's bodies?

A. These are round bodies produced by acidophilic or eosinophilic degeneration of infected hepatocytes. They are typical but not pathognomonic of yellow fever.

Q.3. What are the different non-primates susceptible to yellow fever?

A. Experimental studies showed that following species of monkeys are susceptible to yellow fever. Owl or night monkeys (*Aotus sp.*), howler monkey (*Alouatta sp.*), Capuchin or white monkey (*Cebus sp.*), Spider monkey (*Aleles sp.*), marmosets (*Callithrix sp.*) and Squirrel monkey (*Saimiri sp*).

Q.4. In which monkeys, the yellow fever virus infections are fatal ?

A. Howler and spider monkeys.

Q.5. What are the diagnostic tests for yellow fever?

A. HI, neutralization test, CFT, FAT, ELISA and RT-PCR.

Q.6. Is there any vaccine against yellow fever?

A. In yellow fever, chicken embryo adapted live attenuated vaccine (17 D strain) is used. The vaccine should not be given in children below 6 months of age. It can be given along with Measles.

Q.7. What is the type strain of yellow fever virus?

A. Asibi strain, a viscerotropic strain.

B. Write true or false about the followings.

Q.1. Yellow fever virus has never been established outside Africa and Americas.

A. True.

Q.2. Both African and American strains of yellow fever virus are related antigenically.

A. False. They are antigenically different.

Q.3. The infection in the America is limited to jungle cycle but in Africa both urban and jungle cycles are noticed.

A. True.

Q.4. In jungle cycle, the yellow fever virus circulates between mosquitoes and monkeys.

A. True.

Q.5. In yellow fever, transovarian transmission in mosquitoes has been reported.

A. True.

Q.6. All the primate species are susceptible to yellow fever virus infections.

A. True.

Q.7. African species of primates are most susceptible to yellow fever virus.

A. False. They are much more resistant to yellow fever virus

infections.

Q.8. South American and Indian monkeys are considered resistant to yellow fever virus infections.

A. False. They are more susceptible to yellow fever virus infections.

Q.9. Baboons and some marsupials develop viraemias but no clinical signs following yellow fever infections.

A. True.

C. Fill in the blanks.

Q.1. The Yellow fever virus is under the genus – – and family – – – – – –.

A. Flavivirus; Flaviviridae.

Q.2. The Yellow fever virus shares antigens with the – – – – –,– – – – – & – – – – viruses.

A. West Nile, Wesselsbron and dengue viruses.

Q.3. – – – – – – – – is the mosquito vector for yellow fever virus.

A. *A. aegypti.*

Q.4. – – – – – – – – mosquito is the main vector of jungle yellow fever in America.

A. *Haemagogus sp.*

Q.5. In Africa, the yellow fever virus is transmitted among the urban residents by – – – – and – – – – – – – mosquitoes.

A. *A. aegypti* and *A. simpsoni.*

Q.6. In Africa, the yellow fever virus is transmitted from monkey to monkey by - – – – – mosquitoes.

A. *A. africanas.*

Q.7. – – – – – – mosquito can transmit the yellow fever virus infection from human to human.

A. *A. simpsoni.*

Q.8. In yellow fever, – – – – – – act as amplified host and – – – – act as reservoir host.

A. Monkeys ; mosquitoes.

Chapter 9
Dengue

A. Answer the followings.

Q.1. What are the different countries facing problems with dengue?

A. Caribbean, C. America, S. America, Australia, Asia, Africa etc.

Q.2. What are the main vectors of the four serotypes of dengue viruses?

A. *Aedes aegypti* and *A. albopictus.*

Q.3. What are different tests used in diagnosis of dengue?

A. HI, CFT, SNT, FAT, IgG and IgM ELISA.

Q.4. How many forms of the dengue disease is there?

A. There are 3 forms of the diseases namely dengue fever, dengue haemorrhagic fever and dengue shock syndrome.

Q.5. Which mosquito species is the principal vector of dengue?

A. Although, *A. aegypti*, *A. albopictus*, *A. polynesiensis* and *A. scutellaris* act as vectors of dengue, *A. aegypti* is the principal vector.

Q.6. What are the different cell lines used for isolation of dengue virus?

A. BHK-21, Vero and LLC-MK2 (rhesus monkey kidney).

Q.7. Which are the most sensitive methods for isolation of dengue virus?

A. 1-2 days old suckling mice by I/C route and intrathoracic inoculation of adult mosquitoes (male or female).

Q.8. What are the different tests for diagnosis of dengue?

A. ELISA, FAT, CFT, plaque reduction neutralization test, HI and RT-PCR.

Q.9. Which one is the WHO approved test for diagnosis of dengue?

A. HI.

Q.10. Is there any vaccine available against dengue?

A. No vaccine is available against dengue.

Q.11. How many serotypes of dengue virus are there?

A. There are 4 serotypes of dengue viruses namely 1, 2, 3, and 4.

B. Write true or false about the following.

Q.1. Transovarian transmission of dengue virus has been demonstrated in *A. aegypti* and *A. albopictus.*

A. True.

Q.2. According to WHO, there are >50 million dengue cases with 24,000 deaths annually in the world.

A. True.

Q.3. Acetyl salicylic acid should not be given in dengue patients as there is a risk of bleeding.

A. True.

Q.4. *A. aegypti* has become resistant to DDT.

A. True.

C. Fill in the blanks.

Q.1. The dengue virus has been placed under the genus– – – – and family– – – – – –.

A. Flavivirus and Flaviviridae.

Q.2. About – – – – –% of all the dengue patients are children.

A. 90.

Q.3. The genome of the dengue virus is a – – – – – (DNA/ RNA) of – – – – – Kb in length.

A. Single stranded positive sense RNA ; 10.7.

Chapter 10
Hantaviruses

A. Answer the followings.

Q.1. What are the two different types of diseases caused by Hantaviruses?

A. Haemorrhagic fever with renal syndrome, an old world disease and Haemorrhagic fever with pulmonary syndrome, a new world disease.

Q.2. What is the shape and size of the hanta virus?

A. It is an enveloped virus with 90-100 nm in diameter containing three copies of negative sense single stranded RNA.

Q.3. How many recognized sero/genotypes of hantaviruses are prevalent in the world?

A. 47.

Q.4. What is the origin of the word 'hanta'?

A. The term hanta is derived from Hantaan, a river in S. Korea where it was first isolated.

Q.5. What are the different diagnostic tests for hantavirus infections in humans?

A. FAT, ELISA, HA, CFT and RT-PCR.

B. Write true or false about the followings.

Q.1. Each hantavirus type appears to be specific to particular rodent host.

A. True.

Q.2. Hantavirus affected more than 3000 UN soldiers during Korean war (1950-53).

A. True.

Q.3. Like other genera in the family Bunyaviridae, hantavirus is transmitted through arthropod vector.

A. False. It is not transmitted by arthropod vector.

Q.4. Hantaviruses are horizontally transmitted between rodents.

A. True.

Q.5. Childhood infections are generally uncommon and men are more commonly affected than women.

A. True.

C. Fill in the blanks.

Q.1. Hantavirus is under the genus ---------- and family ---------.

A. Hantavirus ; Bunyaviridae.

Q.2. -------- and ---------- are two characteristic syndromes produced by hanataviruses.

A. Haemorrhagic fever with renal syndrome ; Haemorrhagic fever with pulmonary syndrome.

Q.3. Hantavirus infection was first recognized in ----- about 1000 years ago.

A. China.

Q.4. Hantavirus affects as many as ----------people each year in Asia and Europe.

A. 2 lakhs.

Q.5. Hantaviruses infect and replicate----, ----- and ---- cells.

A. Pulmonary endothelial cells, monocytes and macrophages.

Q.6. ------ act as receptor of the hantavirus.

A. Integrins.

Q.7. Hantavirus can be grown in ----- cell line.

A. Vero E6.

Q.8. Other than rodents, hantaviruses have been isolated from ---------(species of animals).

A. Shrews, birds, bats, rabbits and cats.

Q.9. Rodent infected with hantaviruses shed the virus in – – – –, – – – – and – – – – – – –.

A. Saliva, urine and faeces.

Q.10. Case fatality is – – – – – to – – – – % in humans infected with hantavirus.

A. 0.1 -10%.

Q.11. Most of the hantavirus cases are reported from – – – – – – (country) in the world.

A. China.

Chapter 11
Rotaviral Gastroenteritis

A. Answer the followings.

Q.1. How many genomic segments are there in a rotavirus?

A. There are 11 double stranded RNA segments in a rotavirus.

Q.2. Which one is the group specific antigen present in all the serogroup A rotaviruses?

A. VP6 found in all the serogroup A rotaviruses irrespective of species origin.

Q.3. How many subgroups and serotypes are there within serogroup A rotaviruses?

A. The serogroup A rotaviruses have been divided into two (possibly three) subgroups and 11 serotypes. The determinants of the subgroups are also found in the VP6 protein on the inner capsid. The determinant of the serotypes are in proteins VP7 and VP4 on the outer capsid. The serotypes are determined by SNT.

Q.4. How many major groups of rotaviruses are there based on the genomic and serological properties?

A. Rotaviruses are classified into seven major groups A to G.

Q.5. What are different groups of rotaviruses, infect human and animals?

A. All the seven groups of rotavirus infect animals but only groups A to C are known to infect humans.

Q.6. Which particular group of rotavirus is most common in human beings?

A. Group A rotaviruses are the most common and antibodies to it have been detected in 100% children below 5 years of age.

Q.7. What are the clinical signs of the group B rotavirus infections in humans?

A. Unlike the group A rotaviruses, group B rotaviruses tend to infect a larger proportion of adults. It is transmitted through the contaminated drinking water. It is also called adult diarrhoea rotavirus. It is a self limiting disease and characterized by a severe large volume cholera like watery diarrhoea, vomiting and dehydration.

Q.8. What are the clinical signs of the group C rotavirus infections in humans?

A. Group C rotavirus infection occurs most commonly in children aged 4-7 years and characterized by abdominal pain, nausea, vomiting, fever and diarrhoea.

B. Write true or false about the followings.

Q.1. The serogroup B to G rotaviruses do not contain VP6 antigen.

A. True.

Q.2. Strains of rotavirus that do notbelong to serogroup A can not be detected by ELISA.

A. True.

Q.3. The chelating agents such as EDTA disrupt the outer shell of rotaviruses making them non-infectious.

A. True.

Q.4. Calcium chloride and other chaotropic agent can degrade the inner capsid of the rotavirus and release the core.

A. True.

Q.5. Rotavirus infectivity is rapidly lost at pH below 3 and above 10.

A. True.

Q.6. The proteolytic enzymes such as trypsin and pancreatin enhance rotavirus infectivity in vitro while isolating the virus in cell culture.

A. True.

Q.7. Group C rotaviruses are not cultivable.

A. True.

Q.8. Rotaviral infection is a particularly serious disease in developing countires causing 6 lakhs death in children annually.

A. True.

Q.9. Rotaviruses can be grown in cell culture particularly monkey kidney.

A. True.

Q.10. Rotavirus disease is more common in winter months in countries with temperate climate and throughout the year in tropical countries.

A. True.

C. Fill in the blanks.

Q.1. Rotavirus is under the genus ———————— and family ————————.

A. Rotavirus; Reoviridae. There are different serogroups starting from A to G.

Q.2. Group C rotaviruses have been detected ——% in of the populations.

A. <50%.

Q.3. Human can be infected with ——————TCID50 of rotavirus orally.

A. 1.

Q.4. Most severe infection in young children have been caused by serotype ————.

A. Serotype G1 to G4 with G1 is predominant.

Q.5. Rotaviruses cause more than ———— million cases of diarrhoea in children under 5 years of age annually worldwide.

A. 130.

Q.6. ———————— viruses have a characteristic wheel like appearance under EM.

A. Rotavirus.

Q.7. Addition of trypsin to the culture medium is required to enhance growth of – – – – virus.

A. Rotavirus.

Q.8. Calves and humans infected with roatavirus are known to shed – – – – virus particles/g of faeces.

A. 10^{10}.

Chapter 12
Measles

A. Answer the followings.

Q.1. Which species other than human beings are affected with Measles?

A. Besides human beings, the disease has been reported in rhesus monkey (*Macaca mulatto*), crab eating macaque, the black and white colobus monkey (*Colobus guereza*), the silvered leaf monkey (*Presbytis cristatus*), cottontop tamarin (*Saguinus Oedipus*) and common marmoset (*Callithrix jacchus*). Antibodies have been detected in chimpanzees, orangutans and gibbons.

Q.2. Describe the clinical signs of Measles in man?

A. The incubation period varies from 8-18 days. The characteristic signs are fever, conjunctivitis, coryza, cough, pharyngitis and development of brownish red maculopapular eruptions on the face and other parts of the body.

Q.3. Describe the clinical signs of Measles in animals.

A. In monkeys, it causes high morbidity but low mortality. In silvered leaf monkeys maculopapular eruptions has been seen on the ventral surface of the body.

Q.4. How the disease Measles is transmitted?

A. The disease is transmitted through airborne route, direct contact with nasal and throat secretions.

Q.5. How does the animal get infection of Measles?

A. Animals acquire the infection through exposure to humans.

Q.6. What are the diagnostic tests available for Measles?

A. CFT and HI.

Q.7. What are the immunoprophylactic agents available against Measles?

A. Potent live attenuated virus vaccine is available.

B. Write true or false about the followings.

Q.1. The Measles virus is distributed worldwide.

A. True.

C. Fill in the blanks.

Q.1. The Measles virus is under the genus – – – – – – – – – and family – – – – – – – – – – –.

A. Morbillivirus ; Paramyxoviridae.

Q.2. The Measles virus is similar to – – – – – – – – – – – – – – – viruses.

A. Rinderpest, PPR and Canine distemper viruses.

Q.3. The only known reservoir of measles is – – – – – – – –.

A. Man.

Chapter 13
Lassa Fever

A. Answer the followings.

Q.1. Why is it called lassa fever?

A. The disease was first observed in 1969 in a nurse at Lassa, Nigeria and that is why it is called lassa fever.

Q.2. Describe the clinical signs of lassa fever in human beings.

A. The incubation period varies from 7-10 days (3-17 days). The symptoms include fever, chills, malaise, myalgia, headache, sore throat, dysphagia, diarrhoea, vomiting and pain in the chest and abdomen.

Q.3. Describe the pathological lesions of lassa fever in human beings.

A. Grossly moderate to marked congestion and oedema of the viscera with effusions in pleural, peritoneal and pericardial cavities. Petechial haemorrhages may be seen on the skin of neck, face, shoulder and back. Microscopically the lungs show interstitial pneumonia with oedema and congestion. The liver appears to the main target of the virus with fatty degeneration and eosinophilic necrosis of individual hepatocytes. Councilman like bodies are seen in the hepatic cords and sinusoids.

Q.4. How to diagnose the lassa fever disease in human beings?

A. The diagnosis of the disease is made by isolation of virus from patient's serum and less frequently from urine, throat washing, pleural, peritoneal and pericardial effusions by inoculation into Vero cells or by CFT or FAT.

B. Write true or false about the followings.

Q.1. The lassa fever virus has been placed in the high risk category class 4 by CDS.

A. True.

Q.2. There is little or no cross reactivity between arenaviruses by neutralization test or plaque reduction test.

A. True.

C. Fill in the blanks.

Q.1. The lassa fever virus is under the family – – – – – and genus – – – – – – – – – – –.

A. Arenaviridae; Arenavirus

Q.2. Other members of the same family are – – – – – – – and – – – – – – – – – – –.

A. LCM virus and Junin and Machupo virus.

Q.3. LCM virus and Junin and Machupo virus are also called – – – – – and – – – – respectively.

A. Argentine haemorrhagic fever and Bolivian haemorrhagic fever.

Q.4. – – – – – – – –, – – – – – – – – and – – – – – – – – act as reservoir of the lassa fever virus.

A. The reservoirs of the virus are African multimammate rat (*M. natalensis*), common rat (*Rattus rattus*) and mouse (*Mus minutoides*).

Chapter 14
Hepatitis A

A. Answer the followings.

Q.1. What is the incubation period of hepatitis A virus infection and duration of the course of the disease?

A. The incubation period of hepatitis A is about 28 days and the disease lasts for 2-6 weeks.

Q.2. What are the cell/cell lines used to isolate the HAV?

A. African green monkey cells (BSC-1), fetal rhesus monkey (FRhK-4 and FRhK-6) and human fibroblasts.

Q.3. Describe the clinical signs of HAV infections in humans.

A. The incubation period varies from 2-6 weeks. Initial symptoms are non-specific and include fever, headache, fatigue, anorexia, dark urine, diarrhoea, nausea and vomiting. One to 2 weeks later, hepatitis and jaundice appear.

Q.4. What is the genus and family of hepatitis A virus?

A. It is under the genus Hepatovirus and family Picornaviridae.

Q.5. Describe the clinical signs of hepatitis A virus infections in humans.

A. The clinical signs include fever, chills, headache, fatigue and malaise followed by anorexia, nausea, vomiting, diarrhoea, right upper abdominal pain, passage of dark urine and jaundice.

Q.6. What are the vaccines available against the HAV infections?

A. Two highly efficient vaccines consisting of inactivated whole virus particles and empty capsid are licensed in the US. Both Havrix (Smithkline Beecham) and Vaqta(Merck) are given as a single dose followed by a booster dose 6-12

months later (in adults Havrix, 1440 ELISA units or Vaqta, 50 units). Vaccines induced low level of neutralizing antibodies than natural infection. They provide protection for atleast 10 years.

B. Write true or false about the followings.

Q.1. Only one serotype of hepatitis A virus (HAV) is known and infection with virus gives long lasting immunity.

A. True.

Q.2. Persons with hepatitis A virus infections become carrier of the disease.

A. False.

Q.3. The principal source of hepatitis A virus is the faeces of infected humans and virus spread through ingestion of faeces contaminated materials.

A. True.

Q.4. Shellfish can concentrate hepatitis A virus from water and concentration of the HAV is more in the fish than in the surrounding water.

A. True.

Q.5. HAV can not grow in the shellfish but can survive there for prolonged period.

A. True.

Q.6. HAV can remain infectious for days to weeks in dairy foods and vegetables.

A. True.

Q.7. Many germicidal soaps are active against food borne bacteria but less so against HAV.

A. True.

Q.8. 60% ethanol are effective in inactivating HAV.

A. True.

Q.9. Is there any vaccine available against HAV?

A. Yes. The vaccine against HAV is available which is safe and effective.

Q.10. There is only one species of HAV with two strains or biotypes.

A. True. Human HAV and Simian HAV.

Q.11. Seven genotypes of HAV have been recognized based on nucleotide sequence of VP1 and VP3 genes; four infect humans and remaining three infect non-human primates.

A. True.

Q.12. Gamma irradiation is not effective for inactivation of HAV on fresh fruits and vegetables.

A. True.

Q.13. Hepatitis A virus has not been associated with chronic liver disease.

A. True.

Q.14. Natural infection by rotavirus and HAV confers long term immunity.

A. True.

Q.15. Vaccination against HAV confers protection for several years.

A. True.

Q.16. HAV is quite resistant to physical and chemical agents.

A. True.

Q.17. HAV remains viable few hours on human hands and few days on articles of common use.

A. True.

Q.18. Persons with hepatitis A do not become chronic carriers of the virus.

A. True.

Q.19. Shellfish can concentrate HAV from water and concentration is several fold higher than surrounding water.

A. True.

Q.20. HAV can not grow in shellfish but survive for prolonged periods there.

A. True.

Q.21. Shellfish can concentrate upto 100 times the original level of HAV from the surrounding water.

A. True.

Q.22. HAV can survive for about 7 days in contaminated mussels.

A. True.

Q.23. HAV is inactivated by heating food to 85°C for 1 min or disinfecting the surfaces with Na hypochloride at a dilution of 1:100.

A. True.

C. Fill in the blanks.

Q.1. Other than humans, HAV infects ———————, ——————, ——————— species of animals.

A. Chimpanzees, owl monkeys and marmosets.

Q.2. Simian HAV infects ——————— and ——————— species of animals.

A. Green monkeys and Cynomolgus monkeys.

Chapter 15
Hepatitis E

A. Answer the followings.

Q.1. What are the viruses transmitted through food in humans?

A. Norovirus (previously known as Norwalk virus like viruses), HAV, HEV, rotavirus, enterovirus, adenovirus and astrovirus.

Q.2. What is the genus and family of the HEV?

A. HEV is under the genus Hepevirus and family Hepeviridae. It is a positive sense, ssRNA virus without any envelope.

Q.3. How many serotypes and genotypes of HEV are there?

A. There are two serotypes and 4 major genotypes of HEV. Genotype 1 includes Asian and African strains, genotypes 2 includes a Mexican strain, genotype 3 US swine and human strains and genotype 4 includes strains from china, Japan and Taiwan.

Q.4. Describe the clinical signs of HEV in humans.

A. The incubation period varies from 22-60 days. The symptoms include nausea, dark urine and general malaise.

Q.5. When does the HEV excrete in the stool of the infected humans?

A. HEV is excreted in stool from 4 days before to 6 days after the onset of clinical symptoms.

B. Write true or false about the followings.

Q.1. Faecally contaminated drinking water has been the most commonly implicated vehicle for transmission of HEV.

A. True.

Q.2. Noroviruses are the major group identified in food borne

outbreaks of gastroenteritis.

A. True.

Q.3. HEV is a self limiting and does not progress to carrier or chronic state.

A. True.

Q.4. HEV is transmitted through faecal oral route.

A. True.

Q.5. Faecally contaminated drinking water has been the most commonly implicated vehicle of transmission of HEV.

A. True.

C. Fill in blanks.

Q.1. All the enteric viruses of humans except – – – – – – contain RNA rather than DNA.

A. Adenovirus.

Q.2. – – – – – – – – –, an enteric virus of human do not grow in vitro in cell culture and no animal model exists.

A. Norovirus.

Q.3. Other than humans, HEV has been isolated from faces of – – – – – and – – – – (species of animals).

A. Swine and deer.

Chapter 16
Norovirus and Sapovirus

A. Answer the followings.

Q.1. How many genera are there in the Caliciviridae family?

A. Norovirus and Sapovirus are the human pathogens, whereas Lagovirus and Vesivirus are animal not human pathogens.

Q.2. How many species and strains of Norovirus are there?

A. There is a single species of Norovirus with seven strains : Snow Mountain virus, Hawaii virus, Southampton virus, Lordsdale virus, Mexico virus, Desert Shield virus and one tentative swine calicivirus.

B. Write true or false about the followings.

Q.1. The Norwalk like viruses and Sapporo like viruses were renamed Norovirus and Sapovirus.

A. True.

Q.2. Both the Norovirus and Sapovirus have characteristic cup shaped morphology of Calicivirus.

A. False. Sapovirus have cup shaped morphology but Norovirus have fuzzy or ragged appearance.

Q.3. Noroviruses infect all age groups and are usually responsible for outbreaks of acute gastroenteritis associated with contaminated food and water.

A. True.

Q.4. Sapoviruses are associated with sporadic cases of acute gastroenteritis and mainly infect infants and young children.

A. True.

C. Fill in the blanks.

Q.1. There are – – – – and – – – – – – – genogroups of norovirus and sapovirus respectively based on the DNA sequence.

A. 5 ; 3.

Q.2. Winter vomiting diease is caused by – – – – – – .

A. Norovirus.

Chapter 17
Astrovirus

A. Answer the followings.

Q.1. What is the genus and family of human astrovirus?

A. It is under the genus Mamastrovirus and family Astroviridae.

Q.2. Describe the genome of the astrovirus.

A. Astrovirus is a naked virus containing positive sense ssRNA as genome.

Q.3. How many serotypes of astroviruses are there?

A. There are 8 human serotypes, 2 bovine serotype and one each of feline, ovine and porcine astroviruses are known.

Q.4. How many genera are there under Astroviridae family?

A. There are two genera : Mamastrovirus and Avastrovirus.

Q.5. What are the species of birds affected by avastrovirus?

A. Avastrovirus affects turkey and ducks.

Q.6. Describe the clinical signs of astrovirus infection in humans.

A. The incubation period varies from 3-4 days. The symptoms include diarrhoea, fever, nausea, general malaise and occasional vomiting.

B. Write true or false about the followings.

Q.1. Astroviruses are worldwide in distribution.

A. True.

Q.2. Astrovirus can infect birds, cats, dogs, pigs, sheep, cows and man.

A. True.

Q.3. Trypsin is required to boost the growth of astrovirus in cell culture.

A. True.

Q.4. Astroviruses are distributed worldwide and cause infections around the year particularly during winter and spring months.

A. True.

Q.5. Astroviral gastroenteritis in humans is most common among 1-3 years old infants.

A. True.

Q.6. There are 7 serotypes of astroviruses of humans.

A. False. There are 8 serotypes in humans. The serotype 1 is most prevalent and serotype 6 is relatively uncommon.

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B. BACTERIAL ZOONOSES

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Chapter 1
Anthrax

A. Answer the followings.

Q.1. How *B. anthracis* can be distinguished from other species of anthrax organism?

A. It has lack of motility, absence of haemolysis on blood agar and susceptibility to penicillin and the anthrax γ phage.

Q.2. Name the virulence factor present in capsule and excretes in exponential phase?

A. Poly- γ-D-glutamic acid polypeptide. It protects the organism from phagocytosis by the defense cells of host.

Q.3. Mention the toxin produced in log phase of growth and their interrelationship in pathogenesis.

A. The toxins are protective antigen (PA), lethal factor (LF) and Oedema factor (EF). Individually, these are non-toxic but I/V inoculation of protective antigen (PA), lethal factor (LF) together is lethal in mice and rats, whereas I/D inoculation of protective antigen (PA) and Oedema factor (EF) together leads to localized oedema in guinea-pigs and rabbits.

Q.4. What is the possible contributing factors causing death in anthrax?

A. a) The massive abnormal fluid movements induced cytotonicity by oedema factor and cytotoxically by the lethal factors directly and possibly also indirectly by release of vasoactive mediators producing vascular leakage. b) Hypoxia from massive terminal bacterimia in susceptible species.

Q.5. What is the concentration of *Bacillus anthracis* in blood at death of a susceptible species?

A. 10^7-10^8 bacilli/ml

Q.6. What is a typical anthrax eschar?

A. In post cutaneous anthrax period, the centre of pimple ulcerates to become dry, black, firmly adherent scab, surrounded by a ring of vesicles. This is called typical anthrax eschar.

Q.7. How industrial anthrax is differed from non-industrial anthrax?

A. Industrial anthrax occurs as a result of handling and processing contaminated hair, wool, hides and bone or other animal products. It is usually a cutaneous form but has higher chance of being pulmonary through inhalation of spore loaded dusts. However, non industrial anthrax generally affects people who work with animals and animal carcasses such as farmer, abattoir workers, knackers, butchers and veterinary personnels and it is a intestinal form.

Q.8. What are important disinfectants against spores of anthrax organism?

A. 5-10% formaldehyde and chlorine solutions.

Q.9. Name the scientist who has significant contribution to the development of anthrax spore vaccine.

A. Dr. M. Sterne. The vaccine consists of 10^7 spores/ ml in 50% glycerin saline with about 5% saponin as adjuvant.

B. Write true or false about the followings.

Q.1. Anthrax is also known as Woolsorter's disease.

A. True.

Q.2. At the point of entry of the anthrax bacilli the edematous surrounding tissue is called pustule maligna.

A. True.

Q.3. Haematogenous spread of *B. anthracis* leads to anthrax meningitis.

A. True/ false.

Q.4. For confirmatory diagnosis of pulmonary anthrax specimen should be taken from sputum.

A. True.

Q.5. The blood of an anthrax victim clots poorly.

A. True.

C. Fill in the blanks.

Q.1. Infections that exist in environment but are not necessarily transmitted from animals to humans directly called – – – – – – or – – – – – – – –.

A. Spronoses ; sprozoonoses.

Q.2. Anthrax is an acute infections of – – – – – –, caused by – – – – – – – – – and occurs in three form i.e. – – – – –, – – – – – – – and – – – – – – – – – .

A. Herbivores ; *Bacillus anthracis* ; pulmonary ; cutaneous ; gastrointestinal.

Q.3. *Bacillus anthracis* is a nonmotile, aerobic, – – – – – – forming Gram-positive – – – shaped organism.

A. Spore ; rod.

Q.4. *Bacillus anthracis* spores have been used as agents of – – – – – – and – – – – –

A. Bioterrorism ; biological warfare.

Q.5. Airborne infection of anthrax may occur by tanning or by – – – – – of sheep.

A. Shearing.

Q.6. About 95% cases of human anthrax are – – – – – form.

A. Cutaneous.

Q.7. Incubation period of anthrax infection varies from – – to – days.

A. 2 to 5.

Q.8. Critical inoculum is needed to produce pulmonary anthrax varies from – – – – to – – – – – spores.

A. 8000 ; 50000.

Q.9. To diagnose the cutaneous anthrax, the vesicular exudates

is stained with ——————— or ——————— stain.

A. M'Fadyean ; polychrome methylene blue.

Q.10. In cutaneous anthrax biopsy is taken from ..... and immunohistochemical staining is done to identify the ..... and ————— antigen.

A. Skin, capsule, cell wall.

Q.11. Selective media for growth of *B. anthracis* is ————— in diagnostic point of view.

A. Polymyxin-lysozyme-EDTA-thallous-acetate agar.

Q.12. In animals, ————————— test is the test of choice for confirmation of anthrax.

A. Ascoli's thermo precipitation.

Q.13. ————————— or ————————— is the choice of drug for treatment of anthrax.

A. Penicillin ; ciprofloxacin.

Q.14. For working with anthrax organism biosafety level ——— is mandatory.

A. BSL-3.

Q.15. *B. anthracis* contains three types of antigen namely ——, ——————— and —————.

A. Protective antigen, lethal factor and edema factor.

Q 16. A live attenuated vaccine against anthrax contains ——— ——— without plasmid.

A. *B. anthracis* spores.

Q.17. Anthrax is primarily a disease of ————, whereas ——— is the incidental host only.

A. herbivores, man.

Q.18. ———, ———— and ———— are three toxic genes encode PA, LF and EF antigens in anthrax organisms.

A. *pag, lef* and *cya.*

D. Match the following:

Form of anthrax	Incubation period
a. Cutaneous	i. 1-7 days
b. Pulmonary	ii. 2-4 days
c. Intestinal	iii. 9- 10 days

A. a-ii, b-iii. c-i.

Chapter 2
Bartonelloses

A. Fill in the blanks.

Q.1. Two important genera belong to genus *Bartonella* are – – – – – – and – – – – – – – – .

A. *Rochalimaea* and *Grahemella.*

Q.2. Bacillary peliosis is called – – – – – – when it involves liver, whereas it is also known as – – – – – – if it involves spleen.

A. Peliosis hepatic ; peliosis lienalis.

Q.3. Bartonellae are small, slightly curved, gram – – – – (+/-), oxidase – – – (+/-) negative, aerobically/ anaerobically growing fastidious rod/cocci shaped organisms.

A. - ; - ; aerobically ; rod.

Q.4. *B. bacilliformis* and *B. clarridgeiae* are motile with flagellae and show – – – – – – – – type of motility.

A. Twitching.

Q.5. *B. tribocorum* grows well in – – – – – – – and – – – – cells.

A. RBC ; endothelial.

Q.6. Cat Scratch disease is caused by – – – – – – – – – – and it occurs only in – – – – – – – – – – but not in domestic animals.

A. *B. henselae,* human.

Q.7. The reservoir host of *B. henselae* is – – – – .

A. Domestic cats.

Q.8. The incubation period of Cat Scratch disease is – – – – – .

A. 1 to 2 weeks.

Q.9. The conspicuous symptom of Cat Scratch disease is ——————————————.

A. Regional purulent lymphadenitis.

Q.10. ———— is one of the important clinical manifestation of *B. washoenses* infection. A. Myocarditis.

Q.11. In immunocompomised (i.e HIV infected) patients, *B. henselae* induces ——————— and ——————————.

A. Bacillilary angiomatosis and peliosis.

Q.12. HIV-associated neuropsychiatric disease is caused by ——————————.

A. *B. henselae.*

Q.13. Patients suffering from bacillary angiomatosis, peliosis and bacterimia can be treated by ————, ———— and ————.

A. Doxycyclin, ciprofloxacin and azithromycin.

B. Write true or false about the followings.

Q.1. Transmission of cat scratch disease occurs through scratch or bite wound from cats.

A. True.

Q.2. Cat Scratch disease can be diagnosed by positive culture, PCR and antigen detection by IFA and ELISA.

A. True.

Q.3. The synonyms of Bartonelloses are Carrions disease, Oroya fever, Verrruca peruviana bacillary angiomatisis and cat scratch disease.

A. True.

Q.4. *B. bacilliformis* resides intra and extra cellularly in RBC and endothelial cells.

A. True.

C. Match the following.

Q.1.

Host	Organisms
a)Dogs and coyotes	*i)B. hensalae, B. clarridgeiae B. koehlerae, B. elizabethae and B. weissii*
b) Wild rabbits	*ii) B. vinsonii subsp. berkhoffii*
c) Rats	*iii) B. alsatica*
d) Mice	*iv) B. tribocorum*
e)Mammals, birds and fishes	*v) B. grahamii, B. talpae, B. peromysci B. taylorii and B. doshiae*
f) Human	*vi)B. vinsonii subsp. vinsonii and B. vinsonii subsp. arupensis*
g) Cats	*vii)B. bacilliformis and B. quintana*

A. a-ii, b-iii, c-iv, d-vi ,e-v, f-vii, g-i.

Q.2. Match the following

Vectors	Organisms
a) Sand flies	*i)B.hensalae,*
b) Body lice	*ii)B.vinsonii*
c) Cat fleas	*iii)B. bacilliformis*
d) Mites and Ticks	*iv)B. quintana*

A. a-iii, b-iv, c-i, d-ii.

D. Answer the followings

Q.1. What is the causative agent of trench fever?

A. *Bartonalla Quintana*

Q.2. What are the morphological features of *Bartonella henselae*?

A. It is bacciliform, curved slightly inword, size- 1-2 microns long by 0.5 -0.6 microns in diameter. It is Gram negative in nature and stained well with Giemenez stain. It can be grown in noncellular culture media such as tryptose soy agar or brain heart infusion agar containing 5% sheep's blood with 5% carbon dioxide. However, the genus bartonella differs from the genus Rickettsia most notably

by the fact that it does not require eukaryotic cells to develop.

Q.3. Who is the reservoir of B. henselae and what does it cause?

A. Domestic cat is the reservoir of and it causes bacillary angiomatosis, bacillary parenchyma peliosis, cat scratch disease and recurrent rickettsemia.

Chapter 3
Borrelioses

A. Match the following.

Q.1.

Species	Host
a)Borrelia anserine	i)Cattle
b)Borrelia coriaceae	ii)Geese, ducks, chickens and turkey
c)Borrelia latyschewii	iii)Bovine and equine
d) Borrelia theileri	iv)Reptiles

A. a-ii, b-i, c-iii, d-iv.

B. Fill in the blanks.

Q.1. Lyme borreliosis is caused by – – – – – – affecting – – – – and – – – (Species).

A. *B. burgdorferi* ; man ; animal.

Q.2. The etiological agent first identified by – – – – – in the year – – – – –.

A. Willy Burgdorfer and coworkers ; 1982.

Q.3. The main vector of Lyme borreliosis is – – – – – – – –.

A. *Ixodes sp.*

Q.4. The important reservoir of Lyme disease are – – – –, – – – –, – – – –, – – and – – –.

A. Wild rodents, white footed mice, hedgehogs, roe and deer.

Q.5. The maximum altitude at which *B. burgdorferi* can be found in ticks is – – – meters.

A. 1000.

Q.6. The routine serological tests for diagnosis of Borreliosis are – – – – and – – – – –.

A. IFA and ELISA.

Q.7. – – – – – – – – – is an important selective media of diagnosis of Lyme borreliosis.

A. Barbour-Stoenner-Kelly media, BSK media.

Q.8. Borreliosis in humans is also called – – – – – –.

A. Relapsing fever.

Q.9. The reservoir hosts of relapsing fever are – –,– – – – ,– – – –,– – – – – and – – – –.

A. Mice , rat, hamster, chipmunks, domestic animals.

Q.10. In lice, *B. recurrentis* is found exclusively in the – – – – whereas relapsing fever borreliae in ticks invade all tissues including – – – – and – – –.

A. Haemolymph, salivary gland, ovaries.

C. Write true or false about the followings.

Q.1. Biopsy should be taken from skin for successful isolation of this organism.

A. True.

Q.2. Recombinant OspA with post transttranslatonally added lipid is used as vaccine against Lyme borreliosis.

A. True.

D. Answer the followings.

Q.1. Write down the clinical manifestation of Lyme borreliosis.

A. There are 3 stages of clinical manifestations: Stage I (localized infection) : erythema migraines, fever, lymphadenopathy. Stage II (disseminated infection): Ipsilateral migraines and neuropathy, pains in joint, bone and muscle, headache, malaise, weakness and fatigue. Other important signs are myocarditis, pericarditis and pancarditis as well as CNS manifestations. Stage III (persistent infection): This occurs after 2-3 yrs of infection and characterized by joint pain and arthritis caused by damage of collagen tissue. Chronic progressive encephalomyelitis, cerebellitis, spastic paraperesis, ataxia, transverse myelopathy, cranial nerve paralysis and mental

disturbance are the other signs.

Q.2. Name the protein expressed by *B. burgdorferi* that helps to bind midgut epithelium of tick.

A. Outer surface protein A (Osp A).

Q.3. Name the protein expressed by *B. burgdorferi when tick starts feeding on host* that helps to bind midgut epithelium of tick.

A. Outer surface protein C (Osp C).

Q.4. How many forms of relapsing fever are observed?

A. a) Epidemic form (louse born) caused by *Borrelia recurerntis* and it is transmitted by human body louse *Pediculus humanus corporis.*

b) Endemic form (tick born) caused by *Borrelia duttoni* and it is transmitted by human soft ticks *Ornithodoros spp.*

Q.5. Name the major protein expressed by organism which causes relapsing fever.

A. From a single cell infection about 30 antigenic variants arise. These are called variable major protein (Vmp) which is of 2 classes i.e. the variable large proteins (Vlps, mol wt 36kd) and the variable small proteins (Vsps, mol wt 20 kd).

Q.6. What are the major clinical signs of relapsing fever?

A. The epidemic form is more dangerous than endemic form. The signs are fever, chills, headache, muscle ache, and the abdominal signs are nausea, vomiting, splenomegaly, hepatomegaly, bleeding tendency from skin. The major complications are jaundice, arthritis, nephritis, hepatitis, iridocyclitis, and facial paralysis.

Q.7. What are the diagnostic tests for relapsing fever?

A. (i) Staining by Giemsa or acridine orange (ii) Isolation in BSK II medium (iii) Xenodiagnostic test (louse test) (iv) Serological tests by IFA and ELISA (v) Polymerase chain reaction.

Chapter 4
Brucelloses

A. Fill in the blanks.

Q.1. – – – – – – and – – – – – – – – – – – are the synonyms of Brucelloses.

A. Bang's disease, Malta fever.

Q.2. Incubation period of brucelloses varies from – – – – to – – – – – – – .

A. 1 weeks to 3 months.

Q.3. Two vaccines namely – – – – and – – – – are accepted worldwide to prevent bovine and ovine-caprine brucellosis respectively.

A. *Brucella abortus* S19, *Brucella melitensis* Rev 1.

Q.4. - – – – vaccine is used against ovine, bovine and porcine brucellosis.

A. *Brucella suis* S2.

Q.5. – – – – - test is used as the most sensitive rapid screening test.

A. Rose Bengal test.

Q.6. In brucellosis – – – immunoglobulins appear first and – – – and – – – appear later.

A. IgM, IgG and IgA.

Q.7. Brucellosis causes – – – – – in horses when it comes contact with infected cows.

A. Osteo-articulat lesion- fistulous withers.

Q.8. – – – – – – test is recommended to detect the disease at herd level.

A. Bulk milk ring test (MRT).

Q.9. The classical serological tests are – – – and – – – – based on reaction between cell surface antigen S-LPS and immunoglobulin isotypes in animal brucellosis.

A. SAT and CFT.

B. Match the following.

Q.1.

Species of Brucella		Host	
(i)	*Brucella abortus*	(a)	Pigs
(ii)	*B. suis*	(b)	Cattle
(iii)	*B. melitensis*	(c)	desert wood rats
(iv)	*B. neotomae*	(d)	Sheep and goat
(v)	*B. canis*	(e)	Sheep
(vi)	*B. ovis*	(f)	Dolphins
(vii)	*B. maris*	(g)	Dogs

A. (i) b ; (ii) a ; (iii) d ; (iv) c ; (v) g ; (vi) e ; (vii) f.

C. Write true or false about the followings.

Q.1. *Brucella spp.* can be used as potential agents in bioterrorism.

A. True.

Q.2. Third term abortion, placental retention and endometritis are characteristic signs of brucellosis in ruminants.

A. True.

Q.3. Milk, cream and fresh cheese are the main source of human brucellosis.

A. True.

D. Answer the followings.

Q.1. How brucella organisms are transmitted to human beings?

A. (i) direct contact and secretion of infected materials (ii) conjunctiva and skin lesions (iii) raw milk or non pasteurized milk consumption (iv) infectious aerosol and (v) infected dust from abattoir.

Q.2. Which sp. causes most severe infection?

A. *B. melitensis.*

Q.3. Which specimen is to be taken for cultural isolation of *Brucella sp.*?

A. Bone marrow, joint fluid, lymph node, biopsy from liver and spleen.

Q.4. What are the serological tests for brucellosis?

A. (i) Agglutination test with *B. abortus* 99 Weybridge stain (Rose bengal) (ii) Coomb's test and (iii) ELISA to determine the IgG and IgM Ab titre.

Q.5. What kind of samples should be taken to diagnose the brucellosis in animals?

A. Culture from aborted fetus, placenta, vaginal mucous, testicular tissue, milk, semen etc.

Q.6. What is the WHO recommended therapy for human brucellosis?

A. Doxycyclin @ 100mg BIDPO plus oral Rifampin @ 600-900mg/day for 6 weeks.

Q.7. Which biosafety level should be used for handling the brucella organism?

A. BSL-3.

Q.8. What are growth requirements for brucella organism?

A. Aerobic condition, supplementary CO_2, thiamine, nicotinamide, biotin, 5-10% normal serum, temperature 36-38^{0}C.

Q.9. Name the strains of brucella organisms used for the killed vaccines.

A. *B. melitensis* H38, *B. abortus* 45/20.

Q.10. Why the classical undulating fever and relapsing forms are less frequent nowadays?

A. Because, the diagnosis is carried out earlier and treatment given sooner.

Q.11. Mention the tests used for correct serological diagnosis of human brucellosis.

A. Rose Bengal test, tube serum agglutination test, 2-mercaptoethanol, Coombs, Complement fixation, immunofluorescence and ELISA.

Q.12. Why false positive reaction often observed in classical serological tests in brucellosis?

A. Due to LPS cross-reacting infection by Yersinia and some long -lasting post-vaccinal responses usually IgM type.

Chapter 5
Campylobacterioses

A. Fill in the blanks.

Q.1. *Campylobacter jejuni* causes – – – – – in human being.

A. Diarrhoea.

Q.2. – – –, – – – – are main reservoir of *Campylobacter sp.*

A. Wild birds, poultry.

Q.3. Indirect transmission via – –, – – – – – and – – – – – is believed to account for most infection in campylobacteriosis.

A. Milk, food, water.

B. Answer the followings.

Q.1. Write down the morphology of *Campylobacter jejuni*?

A. Motile, slender, comma like spiral, non spore forming, Gm negative and rod shaped organism.

Q.2. What is the ideal condition for growth of this organism?

A. It grows well under microaerophilic condition (5% O_2, 10% CO_2, 85% N_2 at 42^0C).

Q.3. How the campylobacteriosis is transmitted?

A. Ingestion of contaminated raw poultry meat, pork, milk and drinking water.

Q.4. Which specimen should be taken for proper diagnosis of this disease?

A. Liquid stool/ rectal swab.

Q.5. What are the common tests for diagnosis of this disease?

A. PCR from suspected materials, CFT and agglutination tests for serology.

Q.6. Which component of the organism is responsible for Ab-mediated demyelination and axonal degeneration?

A. Sialytated oligisachharide of outer coat of lipopolysachharide.

Q.7. Name the endotoxin secreted from cell wall of *C. jejunii* and *E. coli.*

A. Lipopolysaccharide with a lipid-A component.

Q.8. *C. jejuni* is associated with — — — organism and leads to severe enteritis in developing countries.

A. *E. coli*

Q.9. — — — — — is the causative agent of Traveller's diarrhoea.

A. *Campylobacter jejuni* and enterotoxigenic *E. coli* (ETEC).

C. Write true or false about the followings.

Q.1. *Helicobacter pylori* play a major role in in pathogenesis of peptic ulceration and gastric cancer.

A. True.

Q.2. *H. cinaedi* and *H. fennelliae* causes proctocolitis in homosexual men.

A. True.

Q.3. Guillain-Barre syndrome (postinfective polyneuropathy) is a serious complication in campylobacteriosis.

A. True.

Q.4. Direct transmission occurs through handling of poultry, either live or during processing or preparation of carcasses and contact with infected pets.

A. True.

Chapter 6
Glanders

A. Answer the followings.

Q.1. What is glanders?

A. Glanders (Malleus or farcy) is caused by *Burkholderia mallei* and characterized by pustular skin lesions, multiple abscess, pneumonia and sepsis.

Q.2. What are the different species affected by glanders?

A. Horse, donkey and mule.

Q.3. How long the *Burkholderia mallei* survives in a contaminated environment?

A. More than 6 weeks.

Q.4. What does it cause in human beings ?

A. Granulomatous lesions and pyemia.

Q.5. What is the most accurate/specific serological test of glanders?

A. Complement fixation test (CFT).

Q.6. How mallein test is performed?

A. Mallein (0.1 ml) is injected via intradermal route into the lower eyelid by tuberculin syringe. The reading is taken at 48 hrs. Positive reactions show the edema of lid with blepharospasm and severe purulent conjunctivitis. Some animals exhibit the general hypersensitivity reaction after inoculation.

Q.7. How glanders organism is demonstrated in G. pig?

A. By Strauss reaction.

Q.8. What does *Burkholderia pseudomallei* cause in human beings?

A. Acute pulmonary infection, myocardial abscess, focal disease in bone, skin and joints and acute septicemia.

Q.9. What are the common clinical manifestations in glanders?

A. Skin lesion (acute cases), multiple subcutaneous abscess and ulceration, lymphadenopathy, (chronic cases) and nasal lesions (inflammation and purulent bloody discharge).

B. Fill in the blanks.

Q.1. *B. mallei* is isolated in – – – – – and – – – – – – – media.

A. McConkey's agar and meat infusion.

Q.2. – – – – –. – – – – – – – –, – – – – – tests are usually carried out for diagnosis of the glanders?

A. Agglutination titre $\geq$1:400, CFT and ELISA.

Q.3. The major manifestations of chronic form of glanders in equines are – – –, – – – – and – – – –.

A. Pulmonary form, skin form and nasal form.

Q.4. – – – – causes melioidosis and – – – is the most virulent factor?

A. *Burkholderia pseudomallei*, LPS.

Chapter 7
Leptospiroses

A. Fill in the blanks.

Q.1. *Leptospira interrogans* contains approximately – – – serovars and – – – serogroups on the basis of antigenic relationship.

A. 200, 20.

Q.2. Leptospira causes – – – – – – – disease in human.

A. Weil's disease.

Q.3. – – – – – – – – is the choice of test for detection of Abs against leptospira.

A. Micro agglutination-lysis test, MAT.

Q.4. *L. pomona* causes renal disease in dog and uveitis in horses by – – – reaction.

A. Autoimmune reaction.

B. Answer the followings.

Q.1. What is the shape of Leptospira organism?

A. Motile, Gm–ve and spiral shaped with terminal hook.

Q.2. How leptospira is transmitted?

A. By skin lesions, by bite of mice, rat and hamster and by animal urine.

Q.3. How leptospira evades the tissue?

A. They damage the endothelial tissue by cytotoxic glycoprotein and induces vasculitides, bleeding and ischemic lesions.

Q.4. What is the drug of choice for treatment of leptospirosis?

A. Penicillin G.

Q.5. What are major structural components of leptospira organism?

A. An outer envelope which surrounds a cell wall or peptidoglycan complex, and two polar endoflagella.

Q.6. Who gave first description of clinical leptospirosis/ Weil's disease?

A. Adolf Weil in 1886.

Q.7. Mention the major reservoir of *L .canicola, L. hardjo* and *L. Bratislava*?

A. *L .canicola* -cat, *L. hardjo* -cattle, *L. Bratislava* –pig.

Q.8. What is morphology of Leptospira organism?

A. It is thin, helical, motile and Gram-negative. In suitable liquid environment, they spin constantly on their long axis.

Q.9. Which methods are adopted for serotyping the leptospira?

A. Monoclonal antibody agglutination profile, factor analysis, restricted fragment length polymorphism, rRNA gene restriction pattern by pulse field gel electrophoresis analysis.

Q.10. What are the important signs of leptospirosis in man?

A. Severe headache, muscle pain, fever, conjunctival suffusion, rash on the palate, skin, photophobia, mucosal hemorrhage, jaundice, haemoptysis, myocarditis, liver failure, pulmonary oedema, severe meningitis etc.

Q.11. What is the useful diagnostic tools of acute leptospirosis?

A. For serology: Microscopic agglutination test (MAT), ELISA. Micro-capsule agglutination test (MCA). For antigen : PCR from blood, CSF and tissue biopsy, For demonstration: dark-ground microscopy of body fluids.

Q.12. State one important media used for isolation of leptospira organism?

A. Semi-solid (0.1-0.2% agar) EMJH medium plus 0.4-2.0% rabbit serum.

B. Write true or false about the followings.

Q.1. Acute leptispirosis in lactating cows causes "*Milk drop syndrome*" and "*flabby bag syndrome*".

A. True

D. Match the followings.

Serovars of Leptospira sp	Maintenance host
1. *L. icterrohaemorrhagiae* and *L. copenhageni*	i. Pig, dog, horse, hedgehogs
2. *L. canicola*	ii. Cattle
3. *L.pomona*	iii. Pig
4. *L. hardjo*	iv. Dog
5. *L. bratislava*	v. Brown rat

A. 1-v, 2-iv, 3-iii, 4-ii, 5-i

Chapter 8
Erysipeloid

A. Answer the followings.

Q.1. What is Erysipeloid?

A. It is caused by *Erysipelothrix rhusiopathiae,* a non motile, non spore forming, Gm+ve rod shaped organism having peptidoglycan antigen and causes localized or diffuse skin lesions, endocarditis and septicaemia.

Q.2. What are the source of this organism?

A. Pigs, poultry and fish.

Q.3. How the disease is transmitted?

A. Injuries through cuts, stabs, tears when one is handling animal tissues or contaminated instruments.

Q.4. What are the synonyms in human condition and in animals of Erysipeloid?

A. Human condition: Erysipeloid, Rosenbach's Erysipeloid, erysipelotrichosis, fish handler's disease and erythema migrans. Animals : sheep joint ill, swine erysipelas, diamonds, diamond skin disease and fish rose.

Q.5. Who first demonstrated the organism in man?

A. A German surgeon Friedrich Julius Rosenbach in 1884.

Q.6. What is the mechanism of action of pathogenicity of *Erysipelothrix rhusidopathy*?

A. All *Erysipelothrix* sp. produce an enzyme called neuraminidase, it cleaves alpha-glycosidic linkage in neuraminic acid, a reactive mucopolysaccharide present on surface of body cells.The neuraminidase activity increases permeability of cell wall, forms excess fibrin from fibrinogen and stimulates haemolysis by erythrocyte agglutination.

Q.7. How many forms of clinical manifestations observed in Erysipelothrix infection?

A. Three major form are seen. They are as follows:

A mild cutaneous form: mainly hands and fingers are affected and characterized by formation of cutaneous rash fading with central clearing, elevation peripheral edges, the lesions are painful and oedematous without suppuration.

A severe generalized cutaneous form: Here lesions are found on remote areas and there may be fever and articular pain.

A septicaemic form: There will be fever, endocarditis, purpuric skin lesions, petechial rash accompanied by thrombocytopenia and dissemination of infection.

Q.8. What are vaccines are used for animals?

A. a) adsorbed vaccine (bacterin adsorbed on aluminium hydroxide) b) Live avirulent vaccine.

Chapter 9
Listeriosis

A. Answer the followings.

Q.1. What is the etiological agent of listeriosis?

A. *Listeria monocytogenes.*

Q.2. What are the important reservoirs of Listeria?

A. Soil, silage of corn, grass, rye, oat , legume, animal feces and surface water.

Q.3. How the disease is transmitted?

A. Direct contact during parturition, air borne, conjunctival route etc.

Q.4. Mention the clinical manifestations.

A. During pregnancy: abortion in third pregnancy, chills, malaise, myalgia, arthralgias, back pain, in newborn it causes dyspnea, vomiting, convulsion and purulent meningitis

CNS form: meningoencephalitis

Glandular form: swelling of salivary gland, nuchal lymph node, occuloglandular tissue (Parinaud's syndrome) and localized lymph node.

Local form: papular and pustular skin lesions in hands, arm, thorax and face

Typhoid form: high fever in immunocompromised individuals.

Q.5. Name the selective media for isolation of this organism.

A. Lithium chloride phenylethanol (LPM) media, Oxford media, and PALCAM media.

Q.6. Which particular antibody is used for serodiagnosis?

A. Antibody directed against lysterolysin O.

Q.7. Who first authenticated the cases of human Listeriosis?

A. Nyfeldt in the year 1929 from Denmark.

Q.8. What are important typical morphological features of listeria?

A. These organisms are gram-positive rods, motile by peritrichous flegella, non spore forming, non acid fast, catalase positive and aerobic. The cell wall contains alanine and glutamic acid cross-linked by meso-diaminopiemelic acid and teichoic acid.

Q.9. What are the common forms of human Listeriosis encountered?

A. Septicemic form with pharyngitis and mononucleosis, oculoglandular form, cervicoglandular form, meningoencephalitis form, granulomatosis, typhodal-pneumonia form, newborn Listeriosis, Listeriosis during pregnancy and cutaneous Listeriosis.

Q.10. Which animals are most susceptible to Listeriosis among the domestic animals?

A. Sheep and goat

Q.11. What is Anton's eye test for Listeriosis?

A. *This test is used to demonstrate the virulence of L. monocytogenes.* This is performed to produce experimental keratoconjunctivitis by instilling a live bacterial suspension into the conjunctiva of guinea-pigs or rabbit.

Chapter 10
Mycobacterial infections

A. Fill in the blanks.

Q.1. The principal agent of zoonotic tuberculosis is – – – – .

A. *M. Bovis.*

Q.2. Among the animals highly natural resistance to tuberculosis are – – – and – – – –

A. Sheep and horse.

Q.3. Tuberculosis spreads in the body by two stages viz. – – – – and – – – – – – –

A. Primary complex ; post primary dissemination.

B. Answer the followings.

Q.1. How tuberculosis spreads?

A. Droplet/inhalation of dust, orally (consumption infected meat), directly by skin injury and by mucous membrane.

Q.2. What is Pott's disease?

A. It is the sequelae of spinal tuberculosis in which destruction of vertebrae which leads to damage of spinal cord.

Q.3. What is lupus vulgaris?

A. Cutaneous tuberculosis is commonly known as lupus vulgaris which is characterized by maculopapular, nodular, ulcerative and haemorrhagic lesions spreading from superficial to deeper tissues.

Q.4. Which is the choice of stain to diagnose it microscopically?

A. Kinyoun, auramine-rhodamine or acridin orange.

Q.5. Which media is used for isolation of this organism?

A. Lowenstein-Jensen medium and Middlebrook 7H10 and 7H11.

Q.6. What is the preferred skin test?

A. Delayed type hypersensitivity (intradermal skin test or Mendel mantoux method).

Q.7. Write down the dose of tuberculin.

A. 5 units of tuberculin or 0.1ml of purified protein derivative in volar surface of forearm.

Q.8. What are the non tubercular mycobacteria?

A. *M.kansasii, M. avium, M. intracellulare, M.. malmoence, M. haemophilum, M. simiae, M. xenopi* etc.

Q.9. Name the vaccine of tuberculosis.

A. BCG.

Q.10. What is the most common mode of transmission of tuberculosis?

A. Inhalation and ingestion.

Q.11. What are the most common pathognomic consequences of tuberculosis?

A. Initially the necrotic foci is surrounded by granulation tissue, monocytes and plasma cells and followed by calcification.

Q.12. What is the important finding during milking in tubercular mastitis in cattle as it is a public health importance?

A. Milk is not macroscopically abnormal initially but very fine floccules appear later and settle after the milk stands, leaving a clear, amber coloured fluid.

Q.13. What are the various types of tuberculin test?

A. Single intradermal test, Short thermal test and Stormont test.

Q.14. What is the main drawback of Single intradermal test?

A. Lack of specificity and occurrence of no-visible lesion reactors (NVLs).

Q.15. What is the maximum limit of NVLs in a farm?

A. 10%.

Q.16. How potency of tuberculin is adjudged?

A. It depends upon the concentration of purified protein derivatives.

Q.17. What is the most suitable dose in tuberculin test in cattle?

A. A dose rate between 5000 and 10000 tuberculin units (0.1 ml tuberculin contains 0.1 or 0.2 mg of bovine PPD).

Q.18. What do you mean by the term 'Anergy' in tuberculosis?

A. The Anergic animals are those which show the visible lesions of tuberculosis but which do not react to a cutaneous, delayed hypersensitivity test.

Q.19. What is the site of tuberculin test in pigs?

A. A fold of skin at the base of the ear.

Q.20. What is the important component of cell wall of Mycobacterium tuberculosis?

A. Mycolic acid.

Q.21. Mention an important test where cattle are to be handled once for proper diagnosis of tuberculosis.

A. Interferon- γ assay (an *in vitro* assay of cell mediated reactivity).

Q.22. What is satisfactory method of eradication of tuberculosis when overall incidence of tuberculosis is 5% or less in a herd?

A. Test and slaughter (A compulsory testing and the slaughter of the reactors).

Q.23. What is the etiological agent of skin tuberculosis in cattle?

A. *Mycobacterium farcinogenes.*

C. Write true or false about the followings.

Q.1. Zebu cattle (*Bos indicus*) are thought to be much more resistant to tuberculosis than other cross bred cattle.

A. True.

Chapter 11
Plaque

A. Fill in the blanks.

Q.1. – – – – is the causative organism of plaque under the family – – – – – – –.

A. *Yersinia pestis* ; Enterobacteriaceae.

Q.2. The clinical form of plaque is of 3 forms namely – – – – , – – – – – – – and – – – – – – – .

A. Bubonic, septicaemic and pneumonic.

Q.3. The main reservoir host of plaque is – – – – – – – – .

A. Rodents.

Q.4. Plaque organism is primarily transmitted by thebite of – – – – – .

A. Rat flea (*Xenophylla cheopis*).

Q.5. – – – – and – – – – – media could be used for isolation of *Y. pestis* from sputum and lymph node.

A. McConkey, cefsulodin-Irgasan-novobiocin agar.

Q.6. Antibodies in serum to – – – – – – – antigen can be demonstrated by agglutination, IHA, CF and ELISA to diagnose *Y. pestis*.

A. Capsular F1 antigen.

B. Write true or false about the followings.

Q.1. Plaque organism is a nonmotile, Gm negative rod shaped organism.

A. True.

C. Answer the followings.

Q.1. What are the other means of transmission of the disease?

A. Skin blemishes, inhalation of infected dust, consumption of infected rabbit meat, scratch wounds etc.

Q.2. What do you mean by bubonic plaque?

A. This is characterized by severe painful lympodenopathy. The surrounding tissues become edematous, inflammled and stretched. In intra abdominic bubo there is acute abdominal pain, nausea, vomiting and diarrhoea. Ultimately, bacterimia and endotoxaemia leads to severe septicaemia. The common clinical signs are high rise of temperature, headache, myalgias and malaise.

Q.3. Write a brief note on fulminant septicaemic plaque.

A. It may occur without recognizable lymphadenopathy. The important signs are gastrointestinal signs, hypotension, intravascular coagulopathy and shock followed by death.

Q.4. What is primary cutaneous plaque?

A. It is characterized by pustules, carbuncle and necrotic foci in the skin and mucous membrane.

Q.5. What does the plaque organims cause in wild rodents?

A. Haemorrhagic septicaemia.

Q.6. What is the important biochemical and haematological finding in plaque?

A. Urine contains protein and RBC and leukocytosis with shift to left.

Chapter 12
Salmonelloses

A. Fill in the blanks.

Q.1. Salmonelloses causes – – – –, – – – – – – – and – – – – – (disease/ symptoms).

A. Systemic typhoid, paratyphoid and acute gastroenteritis.

Q.2. *Salmonella typhi* infects only – – – – and *S. gallinarum* and *S. pullorum* only – – -

A. Man, fowl.

B. Answer the followings.

Q.1. How Salmolloses is transmitted?

A. It is primarily transmitted by oral route either directly by consumption of contaminated feedstuff or by indirectly by contact with contaminated feedstuff.

Q.2. What are the clinical signs of Salmonelloses?

A. Fever, nausea, vomiting, watery to foul smelling diarrhoea, stool is stained with blood or mucous if colon is affected. In complicated cases systemic signs like meningitis, septicaemia, arthritis, osteomyelitis, peritonitis, cystitis and endocarditis are seen.

Q.3. Mention an important serological test for diagnosis of typhoid and paratyphoid fever.

A. Widal test.

Q.4. What is the line of treatment of salmonella infection?

A. Antibiotics i.e. Ciprofloxacin, Co-trimoxazole and oral poly electrolyte solution.

Q.5. Who first isolated salmonella (probably *S. enteritidis*)?

A. Gaertner (1888). Note that the term salmonella was adopted

in the honour of an American veterinary surgeon, Daniel E. Salmon who was involved in early studies.

Q.6. How is phenotypic characterization done in salmonella?

A. The phenotyping characterization is done by bacteriophage typing, biotyping (by fermentation of various substrates, motility and presence of haemagglutinating fimbriae), antibiogram typing (R-typing). However, presently it is done by analysis of LPS content or outer membrane proteins (OMPs) and analysis of plasmid and or chromosomal DNA (plasmid profile typing, plasmid finger printing and identification of plasmid-mediated virulence genes) for specific investigation.

Q.7. What are the characteristic signs of salmonella infection in man?

A. Diarrhoea, abdominal pain, fever, nausea, muscle pain, vomiting, headache and blood in stool.

Q.8. Which types of food are more prone to the contamination of salmonella?

A. Meat and meat products, carcasses, eggs, milk and milk products.

C. Write true or false about the followings.

Q.1. During pathogenesis salmonella penetrates the epithelium cells and disrupts the brusborder cells.

A. True

Chapter 13
Vibrioses

A. Fill in the blanks.

Q.1. *Vibrio spp.* causes – – – – –, – – – ,– – – –, – – – and – – – – (disease/symptoms).

A. Cholera, gastroenteritis, wound infection, cellulitis and sepsis.

Q.2. Cholera is caused by – – – – – which is a curved, highly motile, Gm-ve flagellated bacterium.

A. *Vibrio cholera.*

Q.3. *V. cholerae* strains carry – – – and – – – somatic antigens that are associated with cholera.

A. O1, O139.

Q.4. *V. cholerae* O1 can be classified into – – serotypes according to the presence of somatic antigens and into – – – biotypes according to the specific phenotypic characteristics.

A. 3, 2.

Q.5. *V. cholerae* O1 is found in two biotypes namely – – – – and – – – – – – – –.

A. Classical, El Tor.

Q.6. *V. cholerae* is transmitted from aquatic environment to human by – – – and – – – –.

A. Contaminated water and food.

B. Match the following.

Serotype	Type of antigen
1. Inaba	a) OAg A,B &C
2. Ogawa	b) O Ag A &C
3. Hikojima	c) O Ag A&B

A. 1-b, 2-c,3-a.

C. Write true or false about the followings.

Q.1. Natural reservoir of *V. cholerae* is aquatic organisms.

A. True.

D. Answer the followings.

Q.1. Name the toxins secreted by *V. cholerae.*

A. Zona occludens toxin, accessory cholera endotoxin and cytotoxin.

Q.2. What are the signs of vibriosis?

A. Painless watery diarrhoea and vomiting. The stool is grey and slightly cloudy with mucous, severe dehydration, dry mucous membrane, sunken eye, hypotension, weak/ absent radial pulses, tachycardia, oligouria, renal failure, generalized cramps, somlonence and coma followed by death.

Q.3. How *V. cholerae* is identified?

A. By dark-field microscope and by culturing a selective media i.e. thiosulfate-citrate-bile salt-sucrose agar (TCBS) which shows flat yellow colonies.

Chapter 14
Tularaemia

A. Fill in the blanks.

Q.1. Tularaemia is caused by – – – – – – – – – – .

A. *Francisella tularensis.*

Q.2. The major antigen of *Francisella tularensis* that has a potential importance for as component of vaccine is – – – – .

A. Lipopolysaccharide

Q.3. The *Francisella tularensis* has high lipid content and contains two important phospholipids, – – – – – – – and – – – – – – – – – – .

A. Phosphatidylethanolamine and phosphotidylglycerol.

B. Answer the followings.

Q.1. What are the synonyms of tularaemia?

A. Francis's disease, marketmen's disease, rabbit fever, deer fly fever, Ohara's disease and yato-byo disease.

Q.2. What does it cause in human?

A. Local cutaneous ulcer and regional to systemic lymphadenopathy.

Q.3. How tularaemia transmission occurs?

A. From bites of ticks (Dermacentor, Ixodes, Rhipicephalus) and mosquitoes; water borne infection from drinking water; airborne outbreak from moving rodent-contaminated hay etc.

Q.4. Mention the stains used for diagnosis of *Francisella tularensis.*

A. Hot carbol fuchsin and aniline gentian violet.

Q.5. What are the media to be used for primary isolation of *Francisella tularensis*?

A. Coagulated egg-yolk, glucose-cysteine blood agar, peptone-cysteine agar, glucose serum agar and Brain Veal infusion agar.

Q.6. State the important serological and immunological tests used for diagnosis of tularaemia?

A. Widal-type tube agglutination test, ELISA, Delayed type hypersensitivity to the product of *F. tularaemia* and cell mediated immunity by lymphocyte stimulation test.

Chapter 15
Pasteurellois

A. Match the followings.

Q.1.

Species	Mode of transmission
1. *Pasteurella multocida*	a. Pig bites
2. *Pasteurella haemolytica*	b. Dog bites and other animal wounds
3. *Pasteurella pneumotropica (P. dagmatis)*	c.Wound infections
4.*Pasteurella dagmatis, P. stomatis, P. canis*	d. Dog bite wounds
5. *Pasteurella aerogens*	e. Dog and cat bites

A. 1-e, 2-d, 3-c, 4-b, 5-a.

Q.2.

Organism	Speicies affected
i)*Pasteurella multocida* subspecies *multocida*	a) Birds/pigs
ii)*Pasteurella multocida* subspecies *septica*	b) Domestic animals
iii)*Pasteurella multocida* subspecies *gallicide*	c) Dog/ human beings

A. i- b, ii- c, iii- a

B. Answer the followings

Q.1. How *Pasteurella multocida* transmissions occur to human beings?

A. *Pasteurella multocida* is transmitted to human beings by bite and scratch wounds of infected animals and consumption

of infected meat, respiratory droplets are the rare route of transmission.

Q.2. What are the important morphological features of genus *Pasteurella* ?

A. These are Gram-negative, non motile, aerobic and facultative anaerobic, fermentative, coccoid, ovoid or rod shaped pleomorphic bacteria.

Q.3. How serological subdivisions of *Pasteuralla* species can be done?

A. *Pasteurella multocida* is typed serologically by the indirect hemagglutination method of Carter, it determines capsular type. The direct agglutination test of namioka and Murata identifies the somatic antigens. However, the different combinations of capsular and somatic types are found in various hosts and clinical conditions.

Q.4. What is the characteristic staining feature of *Pasteuralla multocida*?

A. When the organism is stained with Romanovsky-tyep stain, it retains stains at both the ends, leaving the centre unstained except for a feeble contour.

Q.5. What does *Pasteurella multocida* cause in bovine?

A. Hemorrhagic septicemia.

Q.6. What is the actual causative agent of shipping fever

A. *Pasteurella multocida* type A and *Pasteurella multocida* serotype 1 (biotype A).

Q.7. How transmission of Pasteurellosis occurs in man ?

A. Transmission is primarily via bites or scratches from dog and cat and less frequently from other animals.

Q.8. How Pasteurellosis causes disease in man?

A. Pasterurellosis follows two principles: 1. wound infection originating with an animal bite or scratch, 2. non traumatic infection mostly related to respiratory tract infection.

C. Fill in the blanks

Q.1. In avian species, the epidemic form of *Pasteurella multocida* infection causes — — — — —-

A. Fowl cholera

Chapter 16
Miscellaneous

A. Fill in the blanks.

Q.1. *Corynebacterium pseudotuberculosis* causes – – – – – – – in human.

A. Granulomatous necrotizing lymphodenitis.

Q.2. *Helicobacter sp.* a Gm -ve spirillum causes – – – – and – – – – – – in the stomach and duodenum.

A. Chronic gastritis and ulcer.

B. Answer the followings.

Q.1. What are main clinical signs caused by *Dermatophilus congolensis*?

A. Eczematoid lesions, multiple pustules, furuncles and minute keratinolysis (pitted keratolysis) on hands and forearm.

Q.2. What are the important clinical signs of *Arcanobacterium pyogenis* infection?

A. In human it causes septicemia, endocarditis, meningitis, arthritis, empyema, pneumonia, pharyngitis and abscesses on extremities.

C. Rickettsioses

A. Fill in the blanks.

Q.1. Sennetsu fever glandular fever in human is caused by – – – – – – – – –.

A. *Ehrlichia sennetsu.*

Q2. – – – – – – – – – and – – – – blood cells are mostly affected in human ehrlichiosis caused by *E. chaffeensis* and *E. phagocytophilia.*

A. Monocytes, granulocytes.

Q3. The family Rickettsiacae includes two tribes namely – – – – – – and – – – – –.

A. Rickettsieae, Ehrlichieae.

B. Match the following.

Q.1.

Disease	Organisms
1. Asian ixodo-rickettsiosis	*a. Rickettsia conorii*
2. Boutonneuse fever	*b. Rickettsia sibirica*
3. Flea borne typhus	*c. Coxiella burnetii*
4. Q fever	*d. Rickettsia typhus*
5. Queensland tick typhus	*e. Rickettsia australis*

A. 1-b, 2-a, 3-d, 4-c, 5-e

C. Answer the followings.

Q.1. What are the morphological features of genus Ehrlichia ?

A. The organisms are tiny, Gram-negative and pleomorphic cocci.

Q.2. What is the etilogical agent of Siberian tick typhus (Asian ixodo-rickettsiosis)?

A. *Rickettsia sibirica*

Q.3. Who are the accidental and reservoir host of Asian ixodo-rickettsiosis?

A. Man is an accidental host and wild rodents and ticks (Dermacentor, Haemophysalis and Rhipicephalus) are the reservoir host.

Q.4. What is the etilogical agent of Boutonneuse fever?

A. *Rickettsia conorii*

Q.5. What is the reservoir and vector of *R. conorii*?

A. *Rhipicephalus sanguinieus* (brown dog tick)

Q.6. What are the major clinical signs of Boutonneuse fever?

A. Initially at site of attachment of tick, a primary lesion of a small reddish ulcer covered by a small black scab (tachy noire) is found followed by lymphodenopathy, severe headache, muscle and joint pain, generalized eruption, purpuric exanthema, renal failure, hypoxemia, thrombocytopenia, irreversible shock and encephalopathy.

Q.7. How the causative agent is transmitted from one tick generation to next generation?

A. Trans-ovarially

Q.8. What are the serological tests used for diagnosis of Boutonneuse fever?

A. 1) Microimmunofluorescence test 2) Latex agglutination test 3) PCR. Apart from this, the orgnism can also be isolated in cell culture i.e. BHK21, mouse L-cells and chick embryo fibroblasts.

Q. 9. What is the etiological agent of endemic typhus/murine typhus/ urban typhus?

A. *Rickettsia typhi*

Q.10. What are the reservoir host and principal vector of endemic typhus?

A. Reservoir host is domestic rat (*Rattus rattus, R. exulans* and *R. norvegicus*) and principal vector is rat flea (*Xenopsylla cheopis*).

Q.11. What is Neil-Mooser reaction?

A. For isolation of *Rickettsia typhi* organism, when the blood from the infected febrile patient is inoculated into male guinea pigs, the infection in guinea pig produces Neil-Mooser reaction. Here the tunica vaginalis testis is adhered and prevents reintroduction of testis into abdomen.

Q.12. What is the etiological agent of Queensland tick typhus?

A. *Rickettsia australis.*

Q.13. How is Queensland tick typhus transmitted?

A. By the bite of *Ixodes holocyclus.*

Q.14. What is the etiological agent of Rickettsialpox?

A. *Rickettsia akari.*

Q.15. What is the natural host and how is Rickettsialpox transmitted?

A. The natural host of Rickettsialpox is house mouse and rat and it is transmitted transovarially by the mite *Liponyssoides sanguineus.*

Q.16. What is the etiological agent of Rocky mountain spotted fever?

A. *Rickettsia rickettsii*

Q.17. Which type of cell culture systems are suited for growth of *Rickettsia rickettsii*?

A. Chick embryo fibroblast, Vero, mouse L cells and golden hamster cells.

Q.18. What are the cell surface antigens of *Rickettsia rickettsii*?

A. Several outer membrane proteins and lipopolysachharides

Q.19. What acts as vector for transmission of *Rickettsia rickettsii*?

A. Ticks like *Dermacentor andersonii, Dermacentor variabilis, Amblyomma Americana and Rhipicephalus sanguineus.*

Q.20. Who are the primary reservoir of Rocky mountain spotted fever?

A. Field mice, pine voles, cotton rat, dog, rabbit chipshunks and squirrels.

Q.21. Who causes Scrub typhus?

A. Rickettsia tsutsugamushi

Q.22. Who acts as vector for scrub typhus?

A. Mites

D. Write true or false

Q.1. Boutonneuse fever is also known as India tick typhys (True/false).

A. True

Q.2. *Rickettsia rickettsii* can be grown in vitro in the yolk sac of developing chick embryo (True/False).

A. True.

Q Fever

A. Answer the followings.

Q.1. What is the causative agent of Q fever?

A. *Coxiella burnetii.*

Q.2. What is the common source of infection of Q fever in human beings?

A. The important source of infection for man are cattle, sheep and goats.

Q.3. Describe the clinical signs of Q fever in man.

A. The incubation period varies from 2 weeks to 30 days (average 20 days). The disease has a sudden onset, fever, chills, sweating, malaise, anorexia, myalgia, nausea and vomiting, pneumonia, severe cephalalgia and retroorbital pain is common. Acute hepatitis can also occur.

Q.4. Describe the clinical signs of Q fever in animal.

A. In ruminants *C. burnetii* after entering blood stream, it localizes in the mammary gland, supramammary lymph nodes and placenta. Many cows get rid of infection after a few months but other becomes carriers with localization of agents in the mammary glands and eliminated throughout many lactation period.

Q.5. What are the diagnostic tests available for Q fever?

A. FAT, CFT, standard agglutination, microagglutination and capillary agglutination.

B. Write true or false about the followings.

Q.1. *Coxiella burnetii* is more resistant than other rickettsia to physical and chemical agents.

A. True.

Q.2. *Coxiella burnetii* does not produce agglutination in Weil Felix test.

A. True.

Q.3. *Coxiella burnetii* does not produce cutaneous rash in man.

A. True.

Q.4. *Coxiella burnetii* can be transmitted without any vector involvement.

A. True.

Q.5. *Coxiella burnetii* takes residence in phagolysosome rather than nucleus and cytoplasm in the infected cells unlike other *Rickettsia sp.*

A. True.

Q.6. The Q fever has been found in almost all species of domestic and many wild animals including birds.

A. True.

Q.7. Q fever is more serious in adults over 40 years of age.

A. True.

Q.8. Q fever rarely attacks children under 10 years of age.

A. True.

Q.9. The case fatality rate for acute Q fever is less than 1%.

A. True.

Q.10. In Q fever, hepatitis occurred more frequently in younger patient and pneumonia in older or immunocompromised patients.

A. True.

Q.11. The case fatality rate of chronic Q fever is about 65%.

A. True.

Q.12. In Q fever, endocarditis is the most serious complication occurs more frequently in adult males than in adult females.

A. True.

Q.13. Acute cases of Q fever heal spontaneously.

A. True. But in chronic cases treatment is recommended. The treatment include tetracycline or its derivatives particularly doxycycline for 2-3 weeks. Tetracycline with trimethoprim-sulphamethoxazole, rifampicin with doxycycline, tetracycline with quinolones or hydroxychloroquine are given.

Q.14. The IgM detection in Q fever indicates recent infection.

A. True.

Q.15. High IgA and IgG titre against phase I antigens is indicative of chronic disease.

A. True.

Q.16. Strains of *C. burnetii* that have recently been isolated and maintained by passage in laboratory animal are in antigenic phase I.

A. True.

Q.17. After a number of passages in embryonated eggs, the strains convert to antigenic phase II.

A. True.

Q.18. Formalin killed whole cell preparation made with phase II antigens confers greater protection than phase I antigen.

A. False. Reverse is true. After vaccination the vaccinees experience erythema, induration and granuloma.

Q.19. Chloroform methanol residue vaccine (CMRV) containing Phase I cell is also available.

A. True.

D. Ehrlichioses

A. Fill in the blanks.

Q.1. – – – – – cells are parasitized by Ehrlichia.

A. Leukocytes namely monocytes, granulocytes, lymphocytes and megakaryosites.

B. Answer the followings.

Q.1. Name three genimogroups of Ehrlichia.

A. *Ehrlichia canis, Ehrlichia phagocytophilia* and *Ehrlichia sennetum.*

C. Match the following.

Q.1.

	Species	Vector	
1.	*E. chaffensis*	A	*Amblyoma americana*
2.	*E. phagocytophilia*	B	*Rhipicephalus sp.*
3.	*E. canis*	C	*Ixodes sp*
4.	*E. sennetsu*	D	*Amblyomma sp. and Dermacentor sp.*

A. 1 D ; 2 C ; 3 B ; 4 A.

Q.2.

	Species		Target cells
1	*E. chaffensis, E. canis*	A	Granulocytes
2	*E. phagocytophilia, E. equi, E.ewingii*	B	Monocytes, macrophages

A. 1 B ; 2 A.

D. Answer the followings.

Q.1. Mention the clinical signs in human beings.

A. Dyspnea, cough, ARDS, CNS symptoms (confusion, polyneuropathy, meningeal irritation), cutaneous,

pulmonary and intestinal haemorrages, anaemia, marked granulo, lympho- and thrombocytopenia etc.

Q.2. How Ehrlichia is detected in blood?

A. Morulae are detected in peripheral blood smears or in buffy coat (Wright or Giemsa stain) but are found rarely in monocytes and granulocytes.

Q.3. What are the routine serological tests for erhlichiosis?

A. IFA, ELISA and PCR from EDTA-anticoagulated blood.

E. Chlamydial Infections

A. Answer the followings.

Q.1. Name two genera under family Chlamydiaceae?

A. Chlamydia and Chlamydophila (zoonotic).

Q.2. What are the important zoonotic spp.?

A. *Chlamydophila psittaci* (avian), *C. abortus* (ruminants), *C. felis* (cat).

Q.3. What do you mean by Psittacosis/Ornithosis?

A. It refers to chlamydial infection in psittacine birds and those transmitted from psittcine birds to human and is characterized by fever, chills, headache, photophobia, interstitial pneumonia, cough and myalgia. Here birds are the natural host.

Q.4. What are the common clinical signs of chlamydial infections in human?

A. Respiratory signs, high rise of temperature, headache, cardiac lesions- bradycardia, myalgia, cough etc.

Q.5. What are the characteristic signs of interstitial pneumonia?

A. It denotes consolidation of single lode or extensive homogenous or spotty infiltrates with the appearance of ground glass.

Q.6. How human beings get chlamydial infection?

A. It is transmitted via aerosol route from inhalation of infected avian excreta or fomites.

Q.7. Write down the components present in cell wall of Chlamydia.

A. The cell wall is comprised of outer membrane proteins (40 kDa, 52 kDa, 12 kDa) and LPS but it lacks peptidoglycan.

Q.8. What are the characteristic features of Chlamydia by which it can be differed from bacteria?

A. The major exceptional characteristics are that they are strict intracellular, metabolic and structural difference and a distinct evolutionary cycle.

Q.9. What are the infectious and noninfectious body of chlamydia?

A. The infectious body is elementary body and reticulate body is noninfectious.

Q.10. Name the new chlamydia sp. which is isolated from bovine encephalitis and ovine polyarthritis.

A. Chlamydia pecorum

Q.11. How many biotypes are found in *C. psittaci?*

A. *C. psittaci* has five biotypes and avian biotype has four serotype.

Q12. Who are the natural reservoir of C. pissittaci?

A. Wild and domestic birds

Q13. What are the popular serological techniques for diagnosis of pissitacosis?

A. Direct complement fixation test, modified complement fixation test (by adding 5% chick serum to guinea pig complement) and latex agglutination test

Q.14. Who first recognized the chlamydiosis?

A. Ritter in 1879.

Q.15. What are the morphological characteristics of chlamydia?

A. These are small, coccoid, obligatory, intracellular, RNA and DNA containing parasites.

Q.16. What rae the main constituents of cell wall of chlamydia?

A. The cell wall contains protein and lipopolysaccharides but lacks peptidoglycan

B. Fill in the blanks.

Q.1. ..... is considered a potential bioterrorism agent.

A. *C. psittaci.*

Q.2. The incubation period of Psittacis is — — — — — — —.

A. 7-21 days but it may extend up to 3 months.

Q.3. *C. psittaci* can be grown on – – – and – – – – cell line.

A. McCoy, BGM.

Q.4. For treatment of this disease the choice of antibiotics are – – – – – and – – – – –.

A. Doxycycline, tetracycline.

Q.5. In Chlamydial infection, two types of cell populations are – – – – and – – – – –.

A. Small infectious elementary body (EB) and large, vegetative non infectious reticulate body (RB).

Q.6. The incubation period of chlamydial infection is – – – – – in human but it is – – – in birds.

A. 4-15 days, 5-10 days.

Q.7. What are signs of chlamydial infection in human beings?

A. Fever, headache, generalized malaise, chest pain, non productive cough, epistaxis, hepatomegaly, meningoencephalitis, myocarditis, pericarditis and leucopenia.

Q.8. The important diagnostic applicable to human chlamydial infection is – – –-

A. Complement fixation test (CFT).

Q.9. According to different characteristics, C. psittaci strains fall into two broad groups namely ---------- and ----------.

A. Agents of avian pissitacosis and agents of mammalian pissitacosis.

C. Write true or false about the followings.

Q.1. Surface-exposed outer membrane constituents of the chlamydial EBs (major outer membrane protein and LPS) act as a target of immune response.

A. True.

D. Match the following:

Causative agent	Disease
1. *C. trachomatis*	a. bovine encephalitis and ovine polyarthritis
2. *C. pissitaci*	b. keratoconjunctivitis
3. *C. pneumoniae*	c. human pulmonary disease
4. *C. pecorum*	d. pissittacosis/ornithosis

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

F. PARASITIC ZOONOSES

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Chapter 1
Amoebiasis

A. Fill in the blanks.

Q.1. – – – – is the causative agent of Amoebiasis.

A. *Entamoeba histolytica.*

Q.2. Order Amoebida includes two identical species namely – – – – and – – – – –.

A. *E. histolytica* and *E. dispar.*

Q.3. Invasive Amoebiasis is caused by – – – – – – –.

A. *E. histolytica.*

Q.4. – – – method is used to detect amoebic antigen in extraintestinal Amoebiasis and primary amoebic meningoencephalitis (PAM).

A. PCR.

B. Answer the followings.

Q.1. Write the characteristic forms of *Entamoeba spp.*

A. (a) Tissue or motile vegetative form (b) Vegetative intestinal lumen form and (c) Permanent cyst form.

Q.2. How transmission occurs in Amoebiasis ?

A. Oral ingestion of water and food, plant contaminated with cyst, fly/cockroach play a mechanical vector, transmitted by anilingus, children become infected by their mother excreting cyst and/or by manual feeding with contaminated fingers.

Q.3. What are the important clinical manifestations?

A. (a) Amoebic dysentery- severe mucoid blood- tinged diarrhoea (b) lapsing colitis and chronic granuloma (c) tropical liver abscess due to metastasis in liver (d)

Pleuropulmonary Amoebiasis leads to intrapulmonary abscess (e) cutaneous Amoebiasis causes painful ulceration and condyloma like lesions in anal and perianal skin region (f) primary amoebic meningoencephalitis (PAM).

Q.4. How intestinal amoebiasis is diagnosed?

A. History & clinical signs, b) endoscopic examination (sigmoidoscopy and colonoscopy) c)Microscopic detection of trophozoits by staining with Heidenhain's iron haematoxylin and Wheatley trichome stain c) fecal samples are examined by sodium acetate-acetic acid formaldehyde (SAF) or merthiolate iodine-formaldehyde technique d) ELISA for fecal and serum sample.

Q.5. What are the drug of choice in amoebic dysentery and amoebic abscess?

A. Metronidazole and tinidazole, paromomycin or diloxanidfuroate (intestinal cyst).

Chapter 2
Babesiosis

A. Fill in the blanks.

Q.1. *Babesia spp.* invade – – – cells and it causes haemolytic anaemia, haemoglobinuria, ARDS, shock and death.

A. Erythrocytes.

B. Answer the followings.

Q.1. Name the vectors for transmission of *Babesia sp.*

A. Mainly hard ticks like *Ixodes, Dermacentor, Rhipicephalus* and *Hyalomma.*

Q.2. Which stage of life cycle of babesia is infective?

A. Sporozoites

Q.3. Who first recognize babesia first time and in which species?

A. Viktor Babes, a Romanian scientist first recognized babesia in cattle in 1888. In human, Wilson and Chowning identified first babesia in 1904.

Q.4. What is the causative agent of rodent Babesiosis and how is it transmitted?

A. *Babesia microti,* transmission by deer tick *Ixodes dammini.*

Q.5. Which species of babesia are virulent to cattle and human?

A. *Babesia bovis* in cattle and *Babesia divergens* in human being.

Chapter 3
Balantidiasis

A. Answer the followings.

Q.1. What is the etiological agent and what does it cause?

A. It is caused by *Balantidium coli* and causes abdominal pain, weight loss, intermittent diarrhoea, occasionally severe colitis with stool containing blood and mucous.

Chapter 4
Chagas' Disease (American trypanosomiasis)

A. Fill in the blanks.

Q.1. – – – – causes Chagas's disease or American trypanosomiasis.

A. *Trypanosoma cruzi.*

Q.2. The vector harvours – – – – – – – – stage of *T. cruzi.*

A. Trypanomastigote

B. Answer the followings.

Q.1. What are the drug of choice in acute phase of Chagas disease?

A. Nifurtimox and benzenidazole.

Q.2. Name the vectors of Chagas disease.

A. Vinchuga bugs or kissing bug of subfamily Triatominae.

Q.3. What are the important clinical manifestations in Chagas disease?

A. Regional lymphadenopathy, affection eye, generalized edema, myocarditis with congestive heart failure, meningoencephilitis, gastrointestinal magasyndrome and congenital abnormalities in new-born child.

Q.4. Write down the diagnostic approaches of Chagas disease.

A. Demonstration of parasite in peripheral blood or in buffy coat, culturing of blood of other specimen in specific media i.e. NNN media, animal (mice, guineapig) inoculation test, xenodiagnosis using laboratory reared bugs, PCR and serological tests like ELISA and IFA.

Q5. Why birds are not susceptible to *Trypanosoma cruzi*?

A. Because of higher body temperature.

Q.6. What are the possible pathogenic mechanisms of *T. cruzi*?

A. a. direct tissue destruction by the antigen of the parasites, b. autoimmune inflammatory reaction by the *T. cruzi* antigens shared with tissue cells of host.

Q7. How *T. cruzi* can be grown *in vitro*?

A. *T. cruzi* Can grow on agar slant containing 10% defibrinated blood of rabbit at 26°C

Chapter 5
Cryptosporidosis

A. Fill in the blanks.

Q.1. The genus Cryptosporidium belongs to the phylum – – – – – – –.

A. Apicomplexa.

Q.2. The etiological agent of cryptosporidiosis is – – – – – – and it is of two types i.e. – – – – – – and – – – – – –

A. *Cryptosporidium parvum* ; genotype1 for human, genotype 2 for calf.

B. Answer the followings.

Q.1. How is cryptosporidiosis transmitted?

A. Contaminated water and food, person to person contact directly or indirectly, surface vegetables, fruit, meat and seafood and aerosal transmission (respiratory cryptosporidiosis).

Q.2. How is cryptosporidiosis diagnosed?

A. Direct examination by phase contrast after concentrating by floatation using zinc sulfate or sugar, by Z-N staining, FAT, PCR and ELISA.

Chapter 6
Giardiasis (Lambliasis)

A. Fill in the blanks.

Q.1. Giardiasis is caused by– – – – – – – –, the ubiquitous flagellated organism.

A. *Giardia intestinalis.*

Q.2. This parasite occurs in two morphologically distinct forms namely – – – – – and – – – – – – – – .

A. Vegetative form (trophozoite); thin walled cyst form.

B. Answer the followings.

Q.1. How is giardiasis transmitted?

A. Transmission of giardiasis occurs through: feces of infected person, drinking water, food, vegetables and fruit.

Q.2. what are the clinical manifestations?

A. Sudden onset of diarrhoea accompanied by yellowish, foul smelling stool without blood, mucous or pus, cramps in abdomen, vomiting, anorexia, nausea, bloating with malodorous flatulence etc.

Q.3. How is giardiasis diagnosed?

A. By demonstrating the cyst or trophozoite in stool by Giemsa/wheatly trichrome stain.

Q.4. What are the drugs of choice for treatment of giardiasis?

A. Metronidazole, furazolidone and paromomycin.

Q.5. Who first observed Giardia?

A. Antony van Leeuwenhoek in the year 1681 in his own feces.

Q.6. Which stage of life cycle of *Giardia* is infective and what are its morphological features?

A. Trophozoit stage is infective. It is binucleated having characteristic ventral adhesive disc, eight flagellae and a pair of distinctive median bodies.

Q.7. Which portion of intestine is affected by trophozoites and how it involves in disease process?

A. Duodenum and jejunum of intestine of host are mostly affected by ventral disc of trophozoites. It leads to epithelial damage, increased epithelial cell turnover, villus shortening, diasaccharidase deficiency and ultimately malabsorption of nutrients.

Q.8. What are common modes of transmission of *Giardiasis*?

A. Faecal-oral transmission, water-borne transmission, food-borne transmission and zoonotic transmission.

Chapter 7
Leishmaniases

A. Fill in the blanks.

Q.1. Leishmania spp. is divided into two subgenera viz. – – – – – and – – – – –.

A. Viannia, Leishmania.

Q.2. Visceral Leishmaniasis is also known as – – – – – and is caused by – – – –.

A. Kala-azar/ black disease; *Leishmania donovani.*

Q.3. – – – – – – – – are reservoir host and – – – – acts as vector of leishmaniasis.

A. Human and animals; phlebotomines (sand flies).

Q.4. Old World cutaneous Leishmaniasis is also known as – – – –.

A. Oriental sore.

B. Write true or false about the followings.

Q.1. Excessive eyelash growth in children is an important sign in leishmaniasis.

A. True.

C. Answer the followings.

Q.1. Write down the clinical signs.

A. In acute kala-azar, the symptoms include chills, intermittent fever, anaemia, peripheral edema and excessive eyelash growth. In chronic kala-azar : massive hepatomegaly, peripheral lymphadenopathy, pancytopania, interstitial pneumonia, haemorrhage, diarrhoea and grey to dark brown colour of skin are noticed.

Q.2. What is the cutaneous Leishmaniasis?

A. It is also called post kala-azar dermal Leishmaniasis and characterized by hyper pigmentation, erythematous macules, papules and nodules formation on face, limbs and oral mucosa.

Q.3. What are drugs used for treatment of Leishmaniasis.

A. Pentavalent-antimony containing drugs, sodium stibogluconate, pentamidine isothionate.

Q.4. What is the etiology of oriental sore?

A. *L. tropica minor* (dry form, Leishmaniasis recidinans), *L. tropica major* (wet form) and *L. tropica aethiopica* (chronic oriental sore, old world diffuse cutaneous Leishmaniasis).

Q.5. Write down the vectors of Oriental sore.

A. *Phlebotomus sergenti, P. paptasii* (*L. tropica minor, L. tropica major*), *P. longipes, P. pedifer* (*L. tropica aethiopica*).

Q.6. How the leishmaniasis is diagnosed?

A. Skin biopsy from cutaneous lesions is stained with Wright or Giemsa stain for amastigote, Culture in NNN agar, Antibody detection by ELISA, IFA and by direct agglutination.

Chapter 8
Sarcosporidosis

A. Fill in the blanks.

Q.1. – – – – and – – – – are etiological agents of Sarcosporidosis.

A. *Sarcocystis bovihominis, Sarcocystis suihomonis.*

Q.2. Sarcosporidosis in cattle and pigs are caused by – – – – – – and – – – – – – – – respectively.

A. *Sarcocystis bovihominis ; Sarcocystis suihomonis.*

B. Answer the followings.

Q.1. How Sarcosporidosis infection occurs in humans?

A. By consuming raw or uncooked cyst containing meat from cattle or pigs.

Q.2. What are the clinical manifestations of sarcosporidosis?

A. There are two forms: a) Intestinal infection with oocysts and sporocysts characterized by severe diarrhoea, dehydration, abdominal pain, nausea and dizziness b) Cysts infection in striated muscles characterized by swelling of muscle, myalgias and fever.

Chapter 9
Sleeping Sickness (African Trypanosomiasis)

A. Fill in the blanks.

Q.1. In vertebrate host the organism resides in – – –, – – – – – and – – – – –.

A. Blood, tissue fluid and CSF.

B. Answer the followings.

Q.1. What are the causative agents and vector of this disease?

A. *Trypanosome bruci gambiense* and *Trypanosome bruci rhodesiense* (salivaria group).

Q.2. How African trypanosomiasis is transmitted?

A. *Trypanosome bruci gambiense* is transmitted by *Glossina palpalis, G. fuscipes* and *G. tachinoides,* where as *G. morsitans, G. pallidips* and *G. swynnertoni* transmit *Trypanosome bruci rhodesiensis.*

Q.3. What is the trypanosomal chancre?

A. It is the primary lesions found at the site of bite of tsetse fly and it is characterized by inflammatory reaction, development tender nodules with centrally located pustules which may extend to a diameter of several centimeters and heals after 2-3 weeks.

Q.4. Mention the different phases of trypanosomiasi infection.

A. Stage I (haemolymphatic stage): The parasite is disseminated via lymph and blood. It starts with bouts of high temperature lasting for some days alternate with afebrile periods. lymphadenopathy is a predominant signs where supraclavicular, cervical and nuchal node

(Winterbottom's signs) are enlarged. Other signs are headache, arthralgia, myalgias, hepatosplenomegaly, edema in dependent parts, cachexia, congestive heart failure, endocrine disorders, anaemia, thrombocytopenia and disseminated coagulopathy.

Stage II (meningoencephalitic stage): In this stage, the parasite invades CNS and the important signs are headache, memory loss, progressive apathy, listlessness, dizziness, ataxia, tremors, seizures, depression, nocturnal insomnia and blindness.

Q.5. How is trypanosomiasis diagnosed?

A. (a) Microscopic examination of the parasite from lymphnode aspirates, peripheral blood, bone marrow and CSF (lumber puncture).

(b) Cultivation in rodents after i.p. inoculation or in liquid media.

(c) Serological tests like agglutination test, IHA, IFA and ELISA in serum or CSF.

(d) Detection of nucleic acid by PCR.

Chapter 10
Toxoplasmosis

A. Fill in the blanks.

Q.1. – – – – is the causative agent and it belongs to class – – – – – – –.

A. *Toxoplasma gondii*, Sporozoa.

B. Answer the followings.

Q.1. Mention the definitive and intermediate hosts of Toxoplasmosis.

A. Definitive host: Domestic cats and other felines; Intermediate hosts: cattle, sheep, pigs etc.

Q.2. How toxoplasmosis is transmitted?

A. It is transmitted by oral ingestion of sporulated oocysts or by consumption of cyst-containing raw or uncooked meat.

Q.3. Mention the important clinical signs of toxoplasmosis in humans.

A. The acute *T. gondii* infection in immunocompetent adults is characterized by localized symptoms which include generalized lymphadenopathy, general weakness, headache, pneumonia, chorioretinitis and encephalopathy. Mainly CNS signs are observed in immunocompromised adults affected with toxoplasmosis. Ocular toxoplasmosis is characterized by blurred vision, scotoma, photophobia, central blindness. Fetal abortion, stillbirth, preterm delivery, microcephalus, hydrocephalus, intracranial calcification, chorioretinitis, seizure, anaemia, jaundice, hepatomegaly and lymphadenopathy are observed when women are affected during pregnancy.

Chapter 11
Coenurosis

A. Fill in the blanks.

Q.1. Cerebral Coenurosis is caused by – – – –.

A. *Taenia multiceps.*

Q.2. – – – and – – – – act as intermediate host of Coenurosis in natural conditions.

A. Herbivorous and small mammals.

Q.3. 'Gid' or 'staggers' is seen in – – – – (species of animals) due to *T. multiceps* infection.

A. Sheep.

Q.4. What does it cause in human beings?

A. Heavy infection leads to acute meningoencephalitis, whereas the chronic infection causes pressure induced atrophy of CNS.

Q.5. How Conuri survive for prolong time during chronic coenurosis?

A. Two immunosuppressive factors i.e. TMCF F24 and F7 play important role for prolong survival. Here TMCF F24 modify the accessory cells to inhibit their helper cell activity and F7 , a mitogen , acts on CD4+ T cells to intensify the inhibition induced by the accessory cells.

Q.6. What is the prepatent period of infection of*T. multiceps* in dogs?

A. 38-43 days.

Q.7. What are site of predilection of ingested onchospheres of *T. multiceps*?

A. Central nervous system, muscles and subcutaneous tissues.

Chapter 12
Echinococcosis

A. Fill in the blanks.

Q.1. Echinococcosis is of two types viz. – – – – and – – – – – and caused by – – – – and – – – – respectively.

A. Alveolar ; cystic ; *Echinococcus multiocularis* ; *E. granulosus.*

Q.2. *Echinococcus multiocularis* has only – – – proglotides.

A. Four.

Q.3. Intermediate host of *Echinococcus multiocularis* is – – –.

A. Rodents.

Q.4. Primary location of cyst is – – – – but metastasis is very common.

A. Liver.

Q.5. Cystic Echinococcosis is also known as – – – –.

A. Hydatidosis.

Chapter 13
Taeniasis Saginata

A. Fill in the blanks.

Q.1. *T. saginata* is a human infection with adult tapeworms derived from — — —in cattle.

A. Cysticerci.

Q.2. Cysticerci of *T. saginata asiatica* are predominantly found in the — — — — —.

A. Liver.

Q.3. *T. saginata saginata* is transmitted by — — — — —.

A. Consumption of raw or uncooked beef.

Q.4. The final host of *T. saginata saginata* is — — — —.

A. Human.

Q.5. The drug of choice of Taeniasis is — — — and — — — .

A. Niclosamide, praziquantel.

B. Write true or false about the followings.

Q.1. *T. saginata saginata* lacks rostellum or hooks.

A. True.

Chapter 14
Taeniasis Solium and Cysticercosis

A. Answer the followings.

Q.1. What is cysticercosis?

A. It is an important infection of humans with metacystodes of *T. solium* which causes a chronic, often lethal disease with brain as it is one of the predominant area of location.

Q.2. How is Cysticercosis transmitted?

A. By oral ingestion of cysticerci (cysticecus cellulosae) in raw or uncooked pork or other tissues of pigs or vegetables contaminated with human feces containing *T. solium* eggs.

Q.3. What are the clinical signs of cysticercosis in human beings?

A. Inflammatory reactions in brain, seizure, focal or generalized sensomotoric disorders, reduce consciousness, increase intracranial pressure and neuritis. Other manifestations are myocarditis, infestation in eye causes impaired vision and blindness. Muscle cysts cause myalgias and palpable nodules.

Q.4. How cysticercosis is diagnosed in human beings.

A. (a)Demonstration of proglottides in feces (b) Cerebral cysticercosis is diagnosed by X-ray, CT scan, MRI and (c) Antigen is detected by immunoblotting and ELISA.

Q. 5. Mention the different site of location of adult and metacestode stage of *Taenia* sp.

A.

Species	Adult tape worm	Metacestodes
Taenia multiceps	Dog and other canidae	Sheep, goat. cattle, man
Taenia serialis	Dog and other canidae	Logomorphos, rodent., act, man
Taenia brauni	Dog and other canidae	Rodents, primates, man
Taenia Saginata	Human	Cattle, pigs, wild ruminant
Taenia solium	Human	Pigs, human, dogs

B. Fill in the blanks.

Q.1. *T. solium* is also known as – – – – – – –.

A. Pork tapeworm.

Chapter 15
Filariasis

A. Answer the followings.

Q.1. What are the major zoonotic filarial organisms?

A. *Brugia malayi, Brugia timori, Dirofileria immitis, Onchoceca volvulus, Wucheria bancrofti, Dipetalonema perstans, Dipetalonema streptocerca and Mansonella ozzardi.*

B. Fill in the blanks.

Q.1. – – – – – – is a chronic disease caused by filarial organism.

A. Tropical eosinophilia.

Q.2. *D. immitis* is called – – – – – in dog.

A. Heart worm.

Q.3. *D. immitis* infects – – – and – – – – – tissues.

A. Lung ; subcutaneous.

Q.4. *D. immitis* is transmitted as 3rd stage larvae during blood sucking by – – –.

A. Simulia or black flies.

Q.5. The adult *D. immitis* parasite resides in – – – – and – – – of their final host.

A. Right heart ; pulmonary artery.

Chapter 16
Schistosomiasis (Bilharziosis)

A. Answer the followings.

Q.1. What are the etiological agents of schistosomiasis?

A. *Schistosoma mansoni* – intestinal schistosomiasis, *Schistosoma haematobium* – urinary schistosomiasis, *Schistosoma japonica*- Asian intestinal schistosomiasis.

Q.2. What are the main host and reservoir host of schistosomiasis?

A. Main host – man, reservoir hosts- domestic ruminants, dogs and rodents.

Q.3. How does it invade in final hosts?

A. By percutaneous route during swimming.

Q.4. What are the clinical manifestations of schistosomiasis?

A. *Schistosomiasis of the bladder:* Fever, headache, generalized pain, vomiting, elevated eosinophilia, hematuria, strangury, frequent micturation, fibrosis and calcification induced obstructive uropathy.

Schistosomiasis of the intestinal tract: Fever, headache, hepatomegaly, lymphadenopathy, eosinophilia, colicky pain, bloody diarrhoea, alternating constipation, fibrosis of intestinal wall, colonic polyposis, blockage of portal blood flow and cirrhosis of liver.

Chapter 17
Trichinellosis

A. Answer the followings.

Q.1. What are the main sources of *Trichinella spiralis* infection of human?

A. Larvae infected raw or uncooked meat products from pig, wild boar, walrus and horses and meat products from other animals.

Q.2. What do you mean by 'Nurse Cell' in Trichinellosis infection?

A. During developmental stages, the new-born larva penetrates the striated muscles of host, where it lies free in the cytoplasm. This condition induces a complex series of changes which result in the host cell becoming transformed into a different structure. This is called Nurse Cell. The nurse cells serve to ensure the growth, development and survival of the parasite.

Q.3. What are the pathognomonic/ diagnostic clinical signs of Trichinellosis?

A. High eosinophilia and allergic symptoms after a period of gastrointestinal symptoms strongly suggest Trichinellosis as a diagnosis.

Q.4. What is the reason behind the development of allergic reaction during *Trichinella* infection?

A. *Trichinella* infection stimulates the T-helper 2 and subset of CD4+ T lymphocytes, which release the cytokines required for the development of many allergic reactions.

B. Fill in the blanks.

Q.1. Trichinellosis is caused by – – – – and characterized by

two main cycles, – – – – – and – – – – – –

A. *Trichinella spiralis*, synanthropic-domestic cycle, sylvatic cycle.

Q.2. The muscle larvae of – – – – – is highly resistant to freezing.

A. *Trichinella native.*

Q.3. *Trichinella* infection induces – – – – hypersensitivity reaction in host.

A. Type-I.

C. Write true or false about the followings.

Q.1. *Trichinella sp* requires more than single hosts to complete all the developmental cycles i.e. from larvae to adult and to larvae.

A. False.

Q.2. The ELISA, indirect immunofluorescence test, IgE response and stool examination for adult worms can be used for diagnosis of *Trichinella* infection.A. True.

Chapter 18
Zoonotic hookworm (Ancylostomiasis)

A. Answer the followings.

Q.1. What are various pathogenesis caused by *Ancylostomum spp.*?

A. Cutaneous larval migrans: skin lesions, creeping eruption, affection of epidermis, hair follicle, transient papules in ground itch condition etc. Anaemia: *A. ceylanicum* causes anaemia in human beings. *A. caninum* causes blood loss to 0.84 ml/worm/day in canines. Eosinophilic enteritis: *A. caninum* is the main organism causing such type of enteritis.

Q.2. Mention the major *Ancylostoma spp.* which possess highly zoonotic importance.

A. *A. caninum*, *A. tubaeforme*, *A. braziliense*, *A. duodenale*, and *A. ceylanicum*.

B. Write true or false about the followings.

Q.1. *Ancylostoma caninum* is a common parasite of dog and it is able to develop in human gut and causes eosinophilic enteritis.

A. True.

C. Fill in the blanks.

Q.1. – – – – – is found in dogs and cats and it causes creeping eruption (cutaneous larvae migrans) in human.

A. *Ancylostoma braziliensis.*

Q.2. – – – – and – – – – enzymatic activity are seen in L3 larval stage of *A. caninum.*

A. Collagenolytic protease, geletinolytic protease.

Q.3. Adult *A. caninum* and *A. duodenale* secret a 36 kDa protease which shows— — — property.

A. Anticoagulant.

Chapter 19
Miscellaneous

A. Fill in the blanks.

Q.1. – – – – is responsible for causing human Blastocystiosis.
A. *Blasticystis hominis.*
Q.2. Seat of predilection of *Blasticystis hominis* in human is –.
A. Colon.
Q.3. – – – – and – – – – forms are the most important stages of life cycle of *Blasticystis hominis.*
A. Avacuolar, multivacuolar.

B. Answer the followings.

Q.1. What does *Blasticystis hominis* cause in human?
A. Diarrhoea and other gastrointestinal symptoms.
Q.2. What are the important species cause human malaria?
A. *Plasmodium falciparum, P. vivax, P. ovale, P. malariae.*
Q.3. What is Myiasis?
A. It may be defined as the infestation of live human or other vertebrate animals with larvae of Diptera (true flies), the larvae feeding for at least some period upon the host's living or locally necrotic tissue, liquid body substances or ingested food.
Q.4. What is 'pseudomyiasis'?
A. It is a special category of myiasis when the gut of a living host contains live or dead larvae which have been accidentally swallowed. Example, eating of ripe food containing larvae of *Drosophila.*

C. Match the following.

Type of myiasis	Causative agent
1. Dermal/subdermal	*a. Auchmerimyia luteola*
2. Creeping subdermal	*b. Cordylobia sp., Cochlomyia sp., Chrysomya sp., Lucilia sp., Dermatobia sp.*
3. Nasopharyngeal	*c. Hypoderma sp., Gatrophilus sp.*
4. Ophthalamomyiasis	*d. Oestrus sp., Wohlfahrtia sp.*
5. Aural	*e. Calliphora sp., Fannia sp.*
6.Urinogenital	*f. Musca sp., Oestrus sp., Wohlfahrtia sp*
7. Intestinal/enteric	*g. Oestrus sp.,*
8 Sanguinivorous	*h. Sarcophaga sp., Musca sp., Fannia sp., Calliphora sp.*

A. 1-b, 2-c, 3-g, 4-d, 5-f, 6-e, 7-h, 8-a

G . Fungal Zoonoses

A. Fill in the blanks.

Q.1. Dermatophytoses are acute infections of skin, hair or nails and may be caused by .....dermatophytes and are transmitted from animal to human beings.

A. Zoophilic.

Q.2. Fungal Zoonoses caused by dimorphic fungi are....., ..., ...and.....

A. *Blastomyces dermatitides, Histoplasma capsulatum, Coccidiodes, Pracoccidoidides brasiliensis.*

Q.3. Ringworm or dermatophytosis infects ——————— tissues of body.

A. Keratinized (stratum cornium, hair or nails).

Q.4. Depending upon major reservoir in nature dermatophytes species are classified into ——————— categories and these are ———————, ——————— and ———————.

A. Three, anthrophilic (human), zoophilic (animal) and geophilic (soil).

Q.5. The term dermatophyte is referred to three genera of fungi, these are ———————, ——————— and ———————.

A. *Microsporum, Trichophyton* and *Epidermophyton.*

Answer the followings

Q.1. What is the difference between yeasts and molds?

A. Yeasts are unicellular fungi with round to oval cells that reproduce asexually by giving off small cells called buds. Whereas, molds are nothing but filamentous fungi and these are multicellular and form long tubular chains of cells called hyphae.

Q.2. What are dimorphic fungi?

A. These are the fungi which can exist as yeast or mold depending upon the growth condition.

Q.3. What is the main chemical constituent of cell wall of mold?

A. The main chemical constituent of cell wall of mold is chitin, a long carbohydrate polymer but in plants it is cellulose.

Q.4. What is the difference in purpose of spore production by fungi and bacteria?

A. Fungi produce spore for reproduction but bacterial spore is produced for resistance mechanism.

Q.5. Categorize the fungal disease based on their location of infection.

A. Three types: a) Superficial mycoses by *Trichophyton* and *Microsporum* b) Systemic mycoses by *Blastomycoses* c) Oppotunistic mycoses by *Candida sp.*

Q.6. What is the optimum temperature required for culture of *Histoplasma capsulatum*?

A. 30°C

Chapter 1
Microsporum spp.

A. Write true or false about the followings.

Q.1. The genus *Microsporum* causes infections mostly in human beings and is also encountered in animals.

A. True.

Q.2. Human disease caused by *M. canis* due to contact with horse, pigs, sheep, rabbit, hamster, rats and monkeys.

A. True.

Q.3. Incubation period of dermatomycoses varies from several days to few weeks.

A. True.

Q.4. Signs of inflammation is very prominent in tinea capitis infection.

A. False.

Q.5. Redness and swelling may occur at the margin of the lesions.

A. True.

Q.6. Lesions of tinea corporis are flat and discrete and covered with crusts and scale.

A. True.

B. Fill in the blanks.

Q.1. The clinical presentation of Dermatophytoses occurs in two clinical form i.e. .....and ..... .

A. *Tinea capitis* and *tinea corporis.*

Q.2. Number of *Microsporum species* known to cause diseases in human and animals are..... .

A. 16.

Q.3. They are represented by ..... ,..... and..... species.

A. Zoophilic, anthrophilic and geophilic.

Q.4. The most significant Zoonoses is caused by – – – – – (species) of *Microsporum.*

A. Canis.

Q.5. ..... play an important role in transmission of *M. canis.*

A. Cats.

Q.6. 90% of feline dermatomycoses are caused by .....

A. *M. canis.*

Q.7. ....., ..., ..., ..., ...and.....spread the *Microsporum sp.* from infected animals to human.

A. Lice, flea, mite, flies and cat.

Q.8. Tinea capitis occurs on the .....as single or multiple round or ovoid lesions and develops in areas covered by ....., whereas tinea corporis in the areas covered by .....

A. Head ; hair ; lunugo.

Q.9. Breakage of hair occur at a distance of ..... to .....mm from the skin.

A. 2 to 4.

Q.10. The margins of the lesions of tinea corporis are ..... in colour and may.....

A. Red ; coalesce.

Q.11. For microscopy examination of dermatophytes the hair, scales and crusts are treated with .....

A. KOH.

Q.12. Culture of dermatophytes is best done in ..... media.

A. Sabouraud dextrose agar.

Q.13. In humans, the use of a .....has a low sensitivity.

A. Wood's lamp.

Q.14. Hair infected with *Microsporum spp.* shows .....fluorescence under UV light.

A. Greenish.

Q.15. ....., ... and .....are the drug of choice for patients infected with *Microsporum.*

A. Terbinafine, ketoconazole, griseoflavin.

C. Match the followings.

Species of Microsporum	Transmission from which sp. to human
a. M. nanum	1. Chicken
b. M. audouinii	2. Pig
c. M. equinum	3. Horse
d. M. gallinae	4. Dog

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

Chapter 2
Histoplasmosis

A. Fill in the blanks.

Q.1. The *Histoplasma capsulatum* is a dimorphic fungus resides in – – – – of human being and animals.

A. Mononuclear phagocytic system.

Q.2. *Histoplasma capsulatum* var.*farciminosum* and *Histoplasma capsulatum* var. *duboisii* cause – – – – – – – – and – – – – – – respectively in human beings.

A. Epizootic lymphangitis, African histoplasmosis.

Q.3. *Histoplasma capsulatum* var. *farciminosum* primarily infects – – – and – – – – – – –

A. Horses, donkeys.

Q.4. *Histoplasma capsulatum* could be cultured in laboratory at the temperature less than 30^0C from infected tissues and it produces – – – – and – – – – coloured mould colonies.

A. White type A (albino), brown type B (brown).

Q.5. The mycelia of *Histoplasma capsulatum* may be transformed to the yeast form at the temperature above – -^{0}C and – – – – protein is expressed for its yeast phase transition.

A. 30 ; heat-shock protein.

Q.6. Among the animals – – – and – – – harbour the *Histoplasma capsulatum* in their lungs and associated lymphnodes.

A. Cats, dogs.

B. Write true or false about the followings.

Q.1. *Histoplasma capsulatum* var. *capsulatum* is saprophyte soil fungus causes transient flu like pneumonitis.

A. True.

Q.2. In human beings, disseminated histoplasmosis is a sequele of pulmonary histoplasmosis in immuno-compromised individuals.

A. True.

C. Answer the followings.

Q.1. Which type of components is released from yeast phase of *Histoplasma capsulatum* during its pathogenesis?

A. Elastolytic and collagenolytic proteinases.

Q.2. What are virulent factors of *Histoplasma capsulatum* during yeast phase transition?

A. *hsp-70, yps-3* and á-1, 3 glucan cell wall content.

Q.3. What are important clinical signs of *Histoplasma capsulatum* in cats and dogs?

A. Cats: anaemia, weight loss, diarrhoea, lethargy, fever, interstitial pneumonia, lameness, skin lesions, oral ulcer, ocular discharge and blindness. Dogs: Sub acute to chronic diarrhoea, anaemia, weight loss, fever, lameness, skin lesions, oral ulcer, ocular discharge, blindness, lymphadenopathy and hepatosplenomegaly.

Chapter 3
Trichophyton spp.

A. Fill in the blanks.

Q.1. Trychophyton spp induces inflammation process on .....and ..... tissues.

A. Superficial ; cutaneous.

Q.2. The important species of trichophyton causing zoonoses are....., ...,.....,.....and.....

A. *T. mentagrophytes, T. verrucosum, T. equinum, T. quinckeanum and T. erinacei.*

Q.3. Human infections are caused due to..... with animals which are overtly or latently with *Trichophyton spp.*

A. Direct contact.

Q.4. Incubation period of dermatophytosis caused by *Trichophyton spp.* ranges from — — to— — — —weeks.

A. 2 ; 4.

Q.5. Infection mainly occurs in — — — — —,— — — — —and— — — — — — —(parts of the body).

A. Head, neck and extremities.

Q.6. Acute inflammatory deep seated process due to *Trichophyton spp* is commonly known as .....

A. Keriso celsi.

Q.7. Pustular inflammation of hair follicle of the scalp is called .....

A. Keriso celsi.

Q.8. The superficial forms of Trichophytosis are — — — —, — — — — — — and — — — —.

A. *Tinea tonsurans, tinea circinata, Folliculitis acuminate and tinea corporis.*

Q.9. Lesions in superficial form of trichophytosis are characterized by ------and formation of ----- and ------.

A. Exudation, crusts, scales.

Q.10. Mouse favus is caused by ---------, whereas *T. gallinae* causes ------favus in comb.

A. *T. quinckeanum*, chicken.

Q.11. Faster diagnosis of Trychophyton is done by ----- than 10% KOH method.

A. PCR.

Q.12. Trychophytosis can be best treated by:

Drugs	Dose
Ketoconazole	200mg/day
Gresioflavin	10mg/kg/day
Oral terbinafin	250mg/day
Itraconazole	200mg/day

Chapter 4
Sporotrichosis

A. Fill in the blanks.

Q.1. Sporotrichosis is caused by – – – – – – – – – – .

A. *Sporothrix schenckii.*

Q.2. It is mostly prevalent in tropical and subtropical zones, where temperature is – – – to – – – and humidity is – – – to – – .

A. 26^0C ; 29^0C ; 92% to 100%.

Q.3. The incubation period of sporotrichosis is – – – to – – – days and occasionally up to – – – – – months.

A. 3 to 21 ; 3.

Q.4. – – – – – – – – – form of sporotrichosis occurs most frequently.

A. Cutaneous.

Q.5. The mucosal form causes nodules in the – – –, – – –, – – –, – – – – and – – – .

A. Nose, mouth, pharynx, larynx and trachea.

Q.6. Sporotrichosis occasionally affects internal organs such as ....., ..., ..., ..., ..., ...and.....

A. Lungs, bones, joints, muscles, eyes, testes and epididymis.

Q.7. The diagnosis of sporotrichosis is done by – – – – – and – – – – – .

A. Histology; culture of biopsy samples.

Q.8. Histology done by – – – – – – – – or – – – – – stain reveals pyogranulomatous response and show *S. schenckii* as round to oval cell and a typical – – – – – – – shaped fungal elements.

A. Periodic acid-Schiff ; Grocott, cigar.

Q.9. *S. schenckii* grows on ————as a yeast at .....^{0}C but mycelia form at .....^{0}C.

A. 37 ; 22.

Q.10. ———————— test is used to detect antibody against *S. schenckii* and the titre of ———— is considered presumptive evidence of *S. schenckii.*

A. Latex agglutination ; $\geq$ 1:4.

Q.11. Other important tests to diagnosis of *S. schenckii* are ——————— and ———————.

A. Precipitation ; complement test.

Q.12. ———————— is the drug of choice for the treatment of cutaneous *S. schenckii* and the duration of treatment is ——to———weeks.

A. Potassium iodide ; 4 to 8.

Q.13. ————————chemotherapeutic agent is useful when internal organs are affected, whereas ———— is the drug of choice for disseminated sporotrichosis.

A. Itraconazole, amphotericin B.

Chapter 5
Dermatophytosis (Ringworm)

A. Match the following.

Type of infection	Location of infection
1. tinea capitis	a. scalp
2. tinea barbae	b. beard
3. tinea corporis	c. body or glabrous skin
4. tinea cruris	d. groin
5. tinea pedis	e. foot
6. tinea unguium	f. nail

A. 1-a, 2-b, 3-c, 4-d, 5-e, 6-f

Chapter 6
Miscellaneous

A. Answer the followings.

Q.1. What are the different viruses transmitted through human breast milk?

A. HIV, CMV, HTLV-1 etc. CMV infection is the most prevalent.

Q.2. What symptoms does CMV cause in humans?

A. About $3/4^{th}$ of the human population under the age of 10 are affected but mainly subclinical infection. Usually, CMV infected immunocompromised individuals develop clinical symptoms such as hepatitis, occlusions in the gastrointestinal tract and respiratory complications.

Q.3. Name the families of the following food borne viruses of humans.

(1) Astrovirus (2) Calicivirus (3) HAV (4) HEV (5) Norwalk virus.

A. 1) Astroviridae 2) Caliciviridae 3) Picornaviridae 4) Togaviridae 5) Caliciviridae.

Q.4. What are the food borne viruses of humans?

A. Norwalk virus, astrovirus, rotavirus, HAV and HEV.

Q.5. What are the zoonotic viral diseases transmitted through meat products?

A. Tick borne encephalitis virus and HEV.

B. Write true or false about the followings.

Q.1. Compared to bacterial food borne diseases, viral food borne diseases are more severe and fatal.

A. False.

Q.2. Viruses can not multiply in food or water but remain infectious for prolonged periods.

A. True.

Q.3. Compared to bacterial zoonotic infections (*Salmonella, Campylobacter sp.*) viral zoonosis is rare.

A. True.

Q.4. Norwalk virus infection does not confer long term immunity.

A. True.

Q.5. Boiling shellfish for 4-6 minutes is needed to kill HAV and Norwalk virus.

A. True.

Q.6. Faecally contaminated drinking water has been the most commonly implicated vehicle for transmission of HEV.

A. True.

C. Fill in the blanks.

Q.1. Norwalk virus appears to be relatively resistant to chlorine treatment of water and may require level of — — — — —/L to be inactivated.

A. 10mg/L.

Q.2. Norwalk virus causes either — — — — — — or— — — — — — — or both.

A. Vomiting; diarrhoea.

Q.3. Most enteric viruses have low infectious dose of — — — — — — — particles.

A. 10-100.