

Topic Page No.

Cell Injury 2

Immunology

Staphylococci and Streptococci 8

Virology & Hemodynamics 12

Cell injury 2019

Date: _____

- returned to the invigilator within specified time after you have received the question paper.
2. Any cuttings or overwriting in answering the objective part will not be accepted and no marks will be given even if the answer is correct.

1. A 57-year-old lady has a malignant lymphoma. She is treated with a chemotherapeutic agent which results in the loss of individual neoplastic cells and the lymphoma decreases in size, as documented on abdominal CT scans. By which of the following mechanisms has her neoplasm primarily responded to therapy?

- A Coagulative necrosis
- B Mitochondrial poisoning
- C Phagocytosis
- D Acute inflammation
- E Apoptosis

2. A man of 58 years has experienced severe chest pain and tachycardia. Laboratory studies show a serum troponin I of 10 ng/mL. A coronary angiogram reveals >90% occlusion of the anterior interventricular artery. In this setting, an irreversible injury to myocardial fibers will have occurred when which of the following cellular changes occurs?

- A Glycogen stores are depleted
- B Cytoplasmic sodium increases
- C Nuclei undergo karyorrhexis
- D Intracellular pH diminishes
- E Blebs form on cell membranes

3. A man of 42 years fell down a pallet rack, which strikes him on his left thigh. The bone and skin is not broken. Within 2 days there is a 6 x 8 cm purple colour to the site of injury. Which of the following substances has most likely accumulated at the site of injury to produce a yellow-brown colour at the site of injury 16 days later?

- A Lipofuscin
- B Bilirubin
- C Melanin
- D Hemosiderin.
- E Glycogen

4. The thoracic surgeon notes that the hilar lymph nodes are small, 0.5 to 1.0 cm in size, and jet black in colour throughout while performing the pneumonectomy for his lung cancer. Which of the following is the most likely cause for this appearance to the hilar nodes?

- A Anthracotic pigment
- B Lipochrome deposits
- C Melanin accumulation
- D Hemosiderosis
- E Metastatic carcinoma

5. A boy of 12 years has had multiple episodes of ear pain accompanied by fever. On examination his right tympanic membrane is red and bulging with yellow exudate and culture positive for *Haemophilus influenzae*. A year later his head CT scan shows a mass in the right middle ear. Which of the following materials is most likely to be seen in the tissue curetted from his middle ear?

- A Lipofuscin pigment
- B Russell bodies
- C Neutrophil granules
- D Cholesterol crystals
- E Anthracotic pigment

6. A man 45 years has complained of mild burning substernal pain following meals for the past 3 years. Upper GI endoscopy reveals erythematous area of the lower esophageal mucosa and the biopsies show the presence of columnar epithelium with goblet cells. Which of the following mucosal alterations is most likely represented by these findings?

- A Dysplasia
- B Hyperplasia
- C Carcinoma
- D Ischemia
- E Metaplasia

7. A woman of 69 years had the loss of consciousness. A cerebral angiogram revealed an occlusion to her left middle cerebral artery. Months later, a computed tomographic (CT) scan shows a large 5 cm cystic area in her left parietal lobe cortex. This CT finding is most likely the consequence of resolution from which of the following cellular events?

- A Liquefactive necrosis
- B Atrophy
- C Coagulative necrosis
- D Caseous necrosis
- E Apoptosis

8. A 19-year-old lady gives birth to her first child. She begins breast feeding the infant. She continues breast feeding for almost a year with no difficulties and no complications. Which of the following cellular processes that began in the breast during pregnancy allowed her to nurse the infant for this period of time?

- A Stromal hypertrophy
- B Epithelial dysplasia
- C Steatocyte atrophy
- D Ductal epithelial metaplasia
- E Lobular hyperplasia

9. A man of 87 years dies from complications of Alzheimer disease. At autopsy, his heart is small (250 gm) and dark brown on sectioning. Microscopically, there is light brown perinuclear pigment with H&E staining of the cardiac muscle fibers. Which of the following substances is most likely increased in the myocardial fibers to produce this appearance of his heart?

- A Hemosiderin from iron overload
- B Lipochrome from 'wear and tear'
- C Glycogen from a storage disease
- D Cholesterol from atherosclerosis
- E Calcium deposition following necrosis

10. A woman of 21 years had Goodpasture syndrome which progressed to chronic renal failure and she has blood pressure in the range of 150/90 to 180/110 mm Hg. She developed chronic renal failure and requires renal dialysis. A chest x-ray shows an enlarged heart. The size of her heart is most likely to be the result of which of the following processes involving the myocardial fibers?

- A Hypertrophy
- B Fatty infiltration
- C Hyperplasia
- D Fatty degeneration
- E Edema

11. A girl of 19 years went to a park for whole day sunbath. The next day she has a darker complexion and skin does not show warmth, erythema, or tenderness. Her skin tone fades to its original appearance within a month. Which of the following substances contributes the most to the biochemical process leading to these skin changes?

- A Iron oxide
- B Lipofuscin
- C Tyrosine
- D Homogentisic acid
- E Glycogen

12. A study is performed to identify predisposing risks for tissue cellular changes. In some persons epithelial metaplasia occurs. In which of the following situations is the process of epithelial metaplasia most likely to take place?

- A Tanning of the skin following sunlight exposure
- B Lactation following pregnancy
- C Vitamin A deficiency
- D Acute myocardial infarction
- E Urinary obstruction from an enlarged prostate

13. A study is performed involving the microscopic analysis of tissues obtained from surgical procedures. Some of these tissues have the microscopic appearance of an increased cell size of multiple cells within the tissue, due to an increase in the amount of cell cytoplasm, with nuclei remaining uniform in size. Which of the following conditions is most likely to have resulted in this finding?

- A Uterine myometrium in pregnancy
- B Female breast at puberty
- C Liver following partial resection
- D Ovary following menopause
- E Cervix with chronic inflammation

19. In a
free

14. A lady of 22-year has a congenital anemia and required multiple transfusions of red blood cells for many years. She now has no significant findings on physical examination. Which of the following microscopic findings would most likely present in her liver?

- A Steatosis in hepatocytes
- B Bilirubin in canaliculi
- C Hemosiderin in hepatocytes
- D Glycogen in hepatocytes
- E Amyloid in portal triads

15. A woman of 40-year has the sudden onset of severe abdominal pain with marked guarding and muscular rigidity. She has laboratory findings that include serum AST of 43 U/L, ALT of 30 U/L, LDH 630 U/L, and lipase 415 U/L. An abdominal CT scan reveals peritoneal fluid collections and decreased attenuation along with enlargement of the pancreas. Which of the following cellular changes is most likely to accompany these findings?

- A Coagulative necrosis
- B Dry gangrene
- C Fat necrosis
- D Apoptosis
- E Liquefactive necrosis

16. A 26-year-old man has had a high fever for the past 2 days. Echocardiography shows destruction of the aortic valve by large, irregular vegetations. Staphylococcus aureus is cultured from his blood. He develops left upper quadrant pain. Abdominal CT shows a wedge-shaped 1.5 x 3 cm splenic lesion with base on the capsule. The splenic lesion is most likely to result from which of the following cellular abnormalities?

- A Coagulative necrosis
- B Abscess formation
- C Metaplasia
- D Caseous necrosis
- E Liquefactive necrosis

17. A 35-year-old western cultured lady has developed increasing icterus over the last week with enlarged liver. Laboratory studies show hyperammonemia. Abdominal CT scan shows a liver twice normal size. These changes in her liver most likely resulted from which of the following conditions?

- A Galactosemia
- B Hemochromatosis
- C Tuberculosis
- D Alcoholism
- E Hypoxemia

18. A 73-year-old man has difficulty with urination. On digital rectal examination, his prostate is diffusely enlarged. Which of the following represents a pathologic change leading to this man's problem?

- A Dysplasia
- B Hypertrophy
- C Hyperplasia
- D Metaplasia
- E Neoplasia

19. In an experiment, a tissue preparation is subjected to oxidant stress. There are increased numbers of free radicals generated within the cells. Generation of which of the following enzymes within these cells is the most likely protective mechanism to reduce the number of free radicals?

- A Glutathione peroxidase
- B Catalase
- C Hydrogen peroxide
- D NADPH oxidase
- E Myeloperoxidase

20. A 45-year-old man has a history of chronic alcohol abuse and is performing work at his job. He has had no major illnesses. Laboratory studies show a serum albumin of 4.1 g/dL, ALT 30 U/L, AST 33 U/L, and total bilirubin 1.1 mg/dL. Which of the following microscopic findings in his liver is most likely to be present?

- A Cholestasis
- B Fatty change
- C Hemochromatosis
- D Hypertrophy of smooth endoplasmic reticulum
- E Coagulative necrosis

21. An ultrasound of a 30-year-old woman reveals a 2 cm left breast mass when she went under examination after sexual harassment. There is no lymphadenopathy. No skin lesions are seen. A needle biopsy of the breast mass is performed. On microscopic examination, the biopsy shows fat necrosis. This biopsy result is most consistent with which of the following etiologies?

- A Physiologic atrophy
- B Breast trauma
- C Lactation
- D Radiation injury
- E Hypoxic injury

22. At the end of a normal menstrual cycle, the endometrium sloughs. Examination of the endometrium microscopically shows cellular fragmentation. Which of the following is most likely to trigger apoptosis in these endometrial cells?

- A Acute inflammation
- B Hypoxia
- C p53 protein accumulation
- D Decreased estrogen
- E Anaerobic glycolysis

23. A 43-year-old man has a routine chest x-ray that shows a 2 cm nodule in the right lower lobe. The nodule has focal calcifications. A wedge resection of the nodule is done. On microscopic examination the nodule shows caseous necrosis and calcification. Which of the following processes explains the appearance of the calcium deposition:

- A Dystrophic calcification
- B Apoptosis
- C Hypercalcemia
- D Metastatic calcification
- E Excessive ingestion of calcium

24. A morbidly obese 51-year-old lady dies from complications of heart disease. At autopsy, her heart was enlarged. Microscopically, there is increased fibrous connective tissue adipocytes interdigitating with the myocardial fibers. Which of the following terms best describes the presence of the adipocytes in her myocardium?

- A Steatosis
- B Lipid degeneration
- C Fatty infiltration
- D Cholesterosis
- E Xanthomatosis

25. A 62 years old man recovered from the myocardial infarction by immediate thrombolytic therapy. If it had been possible to examine microscopically the sections of his heart, which of the following would be most likely cellular changes found?

- A. Karyolysis
- B. Karyorehexis
- C. Pyknosis
- D. Swelling of endoplasmic reticulum
- E. Bleb formation

صکرات زخم



Department of Pathology
Azra Naheed Medical College
Grand Test-5, March 2019
MBBS 3rd Year (MCQ)
(Immunology/ Staphylococci & Streptococci)

Time Allowed: 25 min

Total Marks: 25

Name: _____

Roll No: _____

Date: _____

Instructions:

1. All objective questions are to be attempted on the paper and returned to the invigilator within specified time after you have received the question paper.
2. Any cuttings or overwriting in answering the objective part will not be accepted and no marks will be given even if the answer is correct.

1. Which category of hypersensitivity best describes haemolytic disease of the newborn caused by Rh incompatibility?
a. Anaphylactic
 b. Cytotoxic
c. Immune complex
d. Delayed
e. All of the above
2. A child stung by a bee experiences respiratory distress within minutes and lapses into unconsciousness. This reaction is probably mediated by?
 a. IgE antibody
b. IgG antibody
c. Sensitized T cells
d. Complement
e. IgM antibody
3. B and T cells are produced by stem cells that are formed in:
 a. Bone marrow
b. The liver
c. The circulatory system
d. The spleen
e. The lymph nodes
4. Which of the following substances will not stimulate an immune response unless they are bound to a larger molecule?
a. Antigen
b. Virus
 c. Hapten
d. Mitogen
e. Antibody
5. The specificity of an antibody is due to:
a. its valence
b. The heavy chains
c. The Fc portion of the molecule
 d. The variable portion of the heavy and light chain
e. All of the above

Marks: 25

The classical complement pathway is initiated by interaction of C1 with which of the following.

- a. Antigen
- b. Factor B
- c. Antigen-Antibody complex
- d. Bacterial lipopolysaccharide
- e. All of the above

7. IgM present on surface of naïve mature B cells is:

- a. Pentamer
- b. Trimer
- c. Dimer
- d. Monomer
- e. All of the above

8. Pattern recognition receptors (PRR) include:

- a. LPS
- b. PAMPs
- c. Lipoteichoic acid
- d. Lectin like molecules
- e. Unmethylated CpG sequences

9. The function of C3a and C5a is to cause:

- a. Cell lysis
- b. Vascular permeability
- c. Phagocytosis
- d. Aggregation of C4
- e. None of the above

10. Which of the following Immunoglobulin crosses the placenta?

- a. IgA
- b. IgD
- c. IgG
- d. IgM
- e. IgE

11. MHC class II molecules are critically important in which immune response

- a. Antigen presentation
- b. Phagocytosis
- c. Immunoglobulin class switching
- d. Opsonisation
- e. CD8 cell cytotoxicity

12. Prior to class switching all B cells bound to antigen have which of the following antibody class on their surface?

- a. IgM
- b. IgG
- c. IgA
- d. IgD
- e. IgE

13. The ability of the immune system to recognize self versus nonself antigen is an example of:

- a. Specific Immunity
- b. Tolerance
- c. Cell mediated Immunity
- d. Antigenic immunity
- e. Humoral Immunity

following the specificity of an antibody is due to:

- a. Its valency
- b. The heavy chains
- c. The Fc portion of the molecule
- d. The variable portion of the heavy and light chain
- e. The variable portion of heavy chain

15. Grafts between genetically identical twins:

- a. Are rejected slowly as a result of minor histocompatibility antigens
- b. Are subject to hyper-acute rejection
- c. Are not rejected even without immunosuppression
- d. Are subject to acute rejection
- e. None of the above

16. A student developed food poisoning after having dinner at a new restaurant. He had fever, nausea and vomiting. Which of the following virulence factor of *Staph aureus* was responsible for his disease:

- a. Exfoliative toxin
- b. Lipid A
- c. Toxic shock syndrome toxin
- d. Enterotoxin
- e. Alpha-toxin

17. Gram staining of a positive blood culture revealed Gram positive cocci. *Staphylococcus aureus* was suspected to be the causative agent. Which of the following test is required to differentiate *Staphylococcus aureus* from *Staphylococcus epidermidis*?

- a. Oxidase
- b. Catalase
- c. Coagulase
- d. Protease
- e. Indole

18. Seven days ago, a 27 year old medical student returned from Central America, where she had spent the summer working in a clinic. Four days ago, she developed an erythematous sunburn-like rash. She also has had headache, muscle aches, and abdominal cramps with diarrhea. Her blood pressure is 70/40 mm Hg. Pelvic examination shows she is having her menstrual period with a tampon in place; otherwise, the pelvic examination is normal. Her kidney function tests (serum urea nitrogen and creatinine) are abnormal, indicating mild renal failure. Her illness is likely to be caused by which of the following?

- a. *S. aureus*
- b. *S. epidermidis*
- c. *Str. Saprophyticus*
- d. *Str. Agalactiae*
- e. Enterococci

19. A young female presented with signs and symptoms of urinary tract infection. Urine culture revealed Gram positive cocci, showing catalase and coagulase test negative. Which test distinguishes *S. epidermidis* from *Staph saprophyticus*?

- a. Catalase test
- b. Optochin sensitivity test
- c. Coagulase test
- d. DNase test.
- e. Novobiocin sensitivity test

20. Which of the following is Alpha hemolytic bacteria, catalase negative, found in chains and is optochin resistant?
- Staphylococcus aureus*
 - Streptococcus pyogenes*
 - Streptococcus agalactiae*
 - Streptococcus viridans*
 - Streptococcus pneumoniae*
21. A 27 year old female in her 36 weeks of gestation during routine screening tests was found to have a positive culture of a gram positive, beta hemolytic bacteria colonizing her vagina. It was Bacitracin resistant Hippurate test positive. Prophylactic penicillin treatment was given. Which bacteria was isolated on culture?
- S. aureus*
 - viridans group*
 - S. pneumoniae*
 - S. agalactiae*
 - S. pyogenes*
22. A patient developed Scarlet fever; characterized by skin rash with sandpaper like texture, strawberry tongue, pallor, and subsequent desquamation. The organism obtained on blood culture was Beta hemolytic, Lancefield group A. What is the causative agent?
- S. aureus*
 - S. pyogenes*
 - S. epidermiditis*
 - S. pneumoniae*
 - viridans group*
23. Which of the following test is used to distinguish *Streptococcus pyogenes* from *Streptococcus agalactiae*?
- Lancefield grouping
 - Esculin hydrolysis
 - Growth in 6.5 % NaCl
 - Growth in presence of bile
 - CAMP test
24. A 2-month-old baby develops high grade fever, vomiting, sleep disturbance and seizures. Lumbar puncture reveals high neutrophil count. On Gram staining long chains of Gram positive cocci seen. Which of the following is most likely causative pathogen of this condition?
- Escherichia coli*
 - Streptococcus agalactiae*
 - Neisseria meningitidis*
 - Staphylococcus aureus*
 - Haemophilus influenza*
25. A patient suffered from acute glomerulonephritis 3 weeks after skin infection by group-A beta hemolytic *Streptococci*. Which of the following bacteria shows beta hemolysis on blood agar plate?
- Streptococcus pyogenes*
 - Streptococcus viridans*
 - Streptococcus agalactiae*
 - Streptococcus pneumoniae*
 - Enterococci



Department of Pathology
Azra Naheed Medical College
Grand Test- 06 August 2019
MBBS 3rd Year (MCQ)
(Virology/ Hemodynamics)

Total Marks: 25

Time Allowed: 25 min

Name: _____

Roll No: _____

Date: _____

Instructions:

1. All objective questions are to be attempted on the paper and returned to the invigilator within specified time after you have received the question paper.
2. Any cuttings or overwriting in answering the objective part will not be accepted and no marks will be given even if the answer is correct.

1. _____ are venous emboli that reach the arterial circulation through the foramen ovale or an interventricular septal defect that can cause symptoms similar to those of arterial emboli.
 - a. Paired emboli
 - b. Parental emboli
 - c. Passage emboli
 - d. Paradoxical emboli
 - e. Arterial emboli
2. A patient comes in with an acute MI, after one night of hospitalization and subsequent treatment you send them home with instructions. What is something that can occur in the patient 1-2 weeks after the MI?
 - a. CHF
 - b. COPD
 - c. Kidney failure
 - d. Stroke
 - e. Fat metabolism syndrome
3. Where do most arterial emboli originate?
 - a. In the deep veins of the leg
 - b. In the jugular veins of the neck
 - c. In the right atrium, inferior vena cava, and major veins
 - d. Pulmonary vein
 - e. Left atrium or ventricle, aorta, and major arteries
4. Which of the following thrombi are found in arterioles, capillaries, venules and are typical of disseminated intravascular coagulation?
 - a. Arterial thrombi
 - b. Mural thrombi
 - c. Venous thrombi
 - d. Microvascular thrombi
5. An infarction is typically caused by:
 - a. Overexhaustion
 - b. Liver failure
 - c. Thrombosis of emboli
 - d. Respiratory failure
 - e. Stroke

6. Where are Red infarcts not typically seen:

- a. Intestines
- b. Testes
- c. Liver
- d. Lungs
- e. Kidneys

7. Nutmeg Liver is seen in:

- a. Liver cirrhosis.
- b. Liver necrosis.
- c. Chronic passive congestion.
- d. Thrombosis of the portal veins.
- e. Hemorrhage due to liver trauma.

8. Which of the followings is the mechanism of edema in patients with congestive heart failure?

- a. Decreased plasma oncotic pressure.
- b. Endothelial damage.
- c. Increase hydrostatic pressure.
- d. Increase vascular permeability
- e. Lymphatic obstruction.

9. Petechiae is best defined as:

- a. Subcutaneous hemorrhage measuring 1-2 cm
- b. Subcutaneous edema in association with heart failure
- c. Skin hemorrhages appearing as minute spots measuring 1-2 mm.
- d. Hemorrhage into the thoracic cavity.
- e. Bleeding inside the pericardial cavity.

10. Mural thrombi is the term used to define thrombi of:

- a. Thrombi of heart valve.
- b. Venous thrombi of the legs.
- c. Thrombi of atherosclerotic coronary arteries.
- d. Thrombi of ovarian venous plexus.
- e. Thrombi occurring in the heart chambers.

11. Which of the following is not pox virus

- a. Cow pox
- b. Molluscum contagiosum
- c. Chicken pox
- d. Small pox

12. All of the following statements are true about poliovirus except

- a. It is transmitted by feco-oral route
- b. There is single serotype causing infection
- c. Asymptomatic infections are common in children
- d. Live attenuated vaccine produces herd immunity

13. HIV affects:

- a. T helper cells and macrophages
- b. Only T helper cells
- c. NK cells
- d. B-lymphocytes
- e. Mast cells

A blood donor society advises all its members to get tested for hepatitis. Studies suggest that most post transfusion cases of Hep B are due to donor being in window period. Which single serological marker can be used to identify such donors?

- a. HBsAg
- b. Anti-HBs
- c. Anti-HBc
- d. HBcAg

15. All of the following are general properties of virus except

- a. May contain both DNA and RNA
- b. Obligate intracellular parasite
- c. They do not have cellular organization
- d. Heat labile
- e. Not affected by antibiotics

16. A 27-year-old man presents to his primary care physician with complaints of a fever, headache, muscle aches, and swollen glands. The physician observes disseminated lymphadenopathy, pharyngitis, and a rash on the man's upper chest. The patient states that he had been to a party 2 weeks ago where he experimented with injecting drugs to get high. Needles were shared among the party-goers. A rapid latex test for human immunodeficiency virus (HIV) antibodies performed in the physician's office is negative. The doctor has a strong suspicion that this man has acute retroviral syndrome. Which of the following test is most likely to support a diagnosis of HIV infection at this time?

- a. CD4 lymphocyte count
- b. HIV antibody test by enzyme-linked immunosorbent assay (EIA)
- c. HIV p24 antigen
- d. Reverse transcriptase polymerase chain reaction (PCR) for HIV RNA
- e. Western blot for HIV antibodies

17. Regarding rubella virus, which one of the following statements is most accurate?

- a. Systemic infection with rubella virus often causes severe liver damage resulting in cirrhosis.
- b. If a pregnant woman is infected during the first trimester, significant fetal abnormalities typically result.
- c. The main source of virus is adults who have recovered from the disease but are chronic carriers of the virus
- d. Immunization of both male and female health care workers with the formalin-inactivated vaccine is recommended.
- e. The significant changes in the antigenicity of this virus are attributed to reassortment of the segments of its genome.

18. A 3-year-old child who had not been immunized presents at the physician's office with symptoms of coryza, cough, conjunctivitis, and photophobia. He has a low-grade fever, and small bluish-white ulcerations are seen on the buccal mucosa opposite the lower molars. What is the causative agent of this child's symptoms?

- a. Adenovirus
- b. HSV
- c. Influenza virus
- d. Measles virus
- e. Rubella virus

19. Kuru was a fatal disease of certain New Guinea natives and was characterized by tremors and ataxia; Creutzfeldt-Jakob disease (CJD) is characterized by both ataxia and dementia. CJD has been accidentally transferred to others by contaminated growth hormone from human pituitary glands, corneal transplants, and contaminated surgical instruments. These diseases are thought to be because of which of the following?

- a. Cell wall-deficient bacteria
- b. Environmental toxins
- c. Flagellates
- d. Prions
- e. Slow viruses

20. A group of healthcare workers from the United States staffing a clinic in Pakistan were working with children admitted with acute flaccid paralysis. The illness began with fever, nausea, vomiting, and severe headache followed by neck stiffness, muscle pain and weakness, and constipation. None of the workers became ill because they had been vaccinated against this disease. Which viral vaccine protected these workers?
- HAV
 - Measles virus
 - Poliovirus
 - Rubella virus
 - Yellow fever virus
21. A 6-month-old infant has had watery diarrhea for 5 days; he vomited a couple of times. The stools have no blood or pus. He is dehydrated. Two other toddlers who visited for a day are also sick. What is the most likely cause of this child's diarrhea?
- Enterovirus
 - Norwalkvirus
 - Rota virus
 - Salmonella enterica
 - Staphylococcus aureus enterotoxin
22. A 57-year-old man diagnosed previously with chronic hepatitis C is being treated for his infection. Which of the following tests is the best to evaluate his therapy for a nearly virologic response?
- HCV IgG
 - HCV IgM
 - HCV RNA level
 - Liver biopsy
 - Serum ALT levels
23. Brick-shaped virus:
- Chicken pox
 - Small pox
 - CMV
 - EBV
24. Kaposi sarcoma is caused by:
- HHV 5
 - HHV 6
 - HHV 7
 - HHV 8
25. The term vertical transmission refers to
- Transmission by insect vector from reservoir to patient
 - Transmission from a sex worker to a client
 - Transmission from mother to child
 - Transmission from one child to another at school
 - Transmission from person to person within a family