Microbiology

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Hepatitis

- **Introduction**
  - Hepatitis: Inflammation of the liver with the presence of inflammatory cells in liver tissue.
  - Causes: Includes viruses, bacteria, protozoa, drugs (e.g., isoniazid, ethanol), and toxins.
  - Acute Hepatitis: Symptoms last less than 6 months.
  - Viral Hepatitis: Inflammation caused by viral infections. The clinical symptoms and course of acute viral hepatitis are often similar regardless of the etiology. Laboratory tests determine the specific cause.
  - Viruses that cause Hepatitis:
    - ✓ HAV (A), HBV (B), HCV (C), HDV (D), HEV (E)
    - ✓ Other viruses: Epstein–Barr virus, cytomegalovirus (can cause liver inflammation but not primary hepatitis).

- Hepatitis A **(HAV)**
  - Virus: Picornavirus; 27-32 nm spherical particle; single-stranded RNA.
  - Replication: Replicates in the liver, excreted in bile, and then in feces.
  - Transmission: Fecal-oral route (contaminated food or water).
  - Structure:
    - ✓ Linear single-stranded RNA, icosahedral symmetry, nonenveloped.
    - ✓ Stable to treatment with ether, acid (pH 1.0 for 2 hours), heat (60°C for 1 hour).
    - ✓ Only one serotype.
  - Epidemiology:
    - ✓ Common worldwide, particularly in children and young adults.
    - ✓ Spread through overcrowding and poor sanitation.
    - ✓ No carrier state; 90% of adults in developing countries have past exposure.
    - ✓ Contagious 1-2 weeks before clinical symptoms.
  - Incubation Period: 10 to 50 days.
  - Clinical Manifestations:
    - ✓ Symptoms: Fever, anorexia, nausea, right upper abdominal pain, jaundice, dark urine, clay-colored stools.
    - ✓ Liver: Enlarged and tender.
    - ✓ Recovery: Typically occurs in days to weeks; 99% are self-limiting.
    - ✓ Asymptomatic or mild cases are common, especially in children.
  - Diagnosis:
    - ✓ Liver biochemistry: Raised serum AST/ALT, bilirubin levels.
    - ✓ Hematological tests: Leucopenia, relative lymphocytosis, raised ESR.
    - ✓ Viral markers: Anti-HAV IgM for acute infection, IgG for past infection.
    - ✓ Electron microscopy: Virus can be detected in feces.
  - Treatment:
    - ✓ No specific treatment; supportive care.
    - ✓ Prevention:
      - Vaccination with formalin-killed vaccines.
      - Passive immunization with immune serum globulin (ISG) before or during the incubation period.

- Hepatitis B **(HBV)**
  - Virus: Small, partially double-stranded DNA virus.
  - Genomic Components: Core antigen (HBcAg), pre-core antigen (HBeAg), surface antigen (HBsAg).
  - Transmission: Blood (e.g., transfusions, contaminated needles), sexual contact, vertical transmission (from mother to child).
  - Clinical Manifestations:
    - ✓ Incubation: 7 to 160 days.
    - ✓ Early symptoms: Fatigue, loss of appetite, nausea, right upper abdominal pain.
    - ✓ Fulminant hepatitis: Occurs in <1% of cases.
    - ✓ Chronic hepatitis: Develops in 10% of patients; may lead to cirrhosis or hepatocellular carcinoma.
    - ✓ Jaundice, clay-colored stools, dark urine.
  - Diagnosis:
    - ✓ Serology: HBsAg (marker of infection), anti-HBc IgM (acute infection), anti-HBs (recovery/immunity), HBeAg (active replication), HBV-DNA (active virus replication).
    - ✓ Liver function tests: Elevated AST/ALT, ALP, bilirubin.
    - ✓ HBV-DNA PCR: Accurate viral load marker.
  - Treatment:
    - ✓ No specific treatment for acute hepatitis B; high-calorie diet recommended.
    - ✓ Chronic hepatitis: Interferon alpha, Lamivudine (3TC), Adefovir.
  - Prevention:
    - ✓ Vaccination: Recombinant vaccines highly effective.
    - ✓ HBIG (Hepatitis B Immunoglobulin): Protects those exposed to the virus.
    - ✓ Screening of blood donors and using safe injection practices.

- Hepatitis D **(Delta Hepatitis)**
  - Virus: Single-stranded RNA virus requiring HBsAg for transmission (found only in those with HBV infection).
  - Transmission: Parenteral (e.g., injection drug use), vertical, non-parenteral (rare).
  - Clinical Manifestations:
    - ✓ Simultaneous Delta and Hepatitis B infection: Symptoms similar to acute hepatitis A or B but with a higher risk of fulminant hepatitis.
    - ✓ Delta Superinfection: In those with chronic HBV, results in relapses of jaundice and high risk of cirrhosis.
  - Diagnosis:
    - ✓ Serology: Detection of IgM/IgG antibodies to delta antigen.
    - ✓ IgM: Appears within 3 weeks, persists for several weeks.
    - ✓ IgG: Lasts for years.
  - Treatment:
    - ✓ Response to interferon alpha is lower (15-25%).
    - ✓ Prevention: Prevent HBV transmission to reduce risk of Delta hepatitis.

- Hepatitis C **(HCV)**
  - Virus: Flavivirus, RNA virus.
  - Transmission: Bloodborne (e.g., needle sharing), sexual transmission (rare).
  - Clinical Manifestations:
    - ✓ Often asymptomatic or mild; 85% of adults develop chronic hepatitis.
    - ✓ Chronic hepatitis may progress to cirrhosis and hepatocellular carcinoma over 10-18 years.
  - Diagnosis:
    - ✓ Serology: Antibody tests for HCV (may take 1-3 weeks post-infection for antibodies to appear).
    - ✓ HCV RNA testing: For diagnosing, prognosis, and monitoring therapy.
    - ✓ Liver biopsy: To assess liver damage.
  - Treatment:
    - ✓ Combination therapy with interferon alpha and ribavirin.
    - ✓ Prevention: Avoid needle sharing, screen blood donations.

- Hepatitis E **(HEV)**
  - Virus: RNA virus, similar to caliciviruses.
  - Transmission: Fecal-oral route, primarily through contaminated water.
  - Clinical Manifestations:
    - ✓ Often subclinical but can cause acute disease.
    - ✓ More severe in pregnant women, with a higher risk of fulminant hepatitis.
  - Diagnosis: Presence of IgM antibodies to HEV.
  - Treatment: No specific treatment.

- Hepatitis G **(HGV)**
  - Virus: RNA virus, related to hepatitis C.
  - Transmission: Bloodborne.
  - Clinical Manifestations:
    - ✓ Often asymptomatic; co-infection with hepatitis C does not result in worse disease.
  - Diagnosis: Detection of HGV RNA by PCR.
  - Treatment: No established treatment.

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