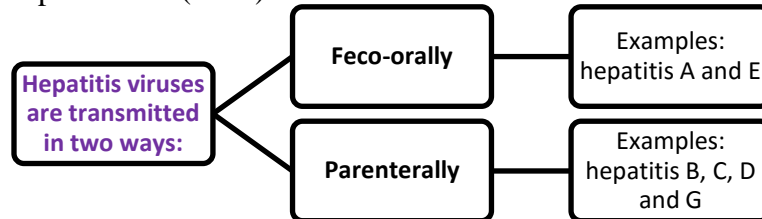




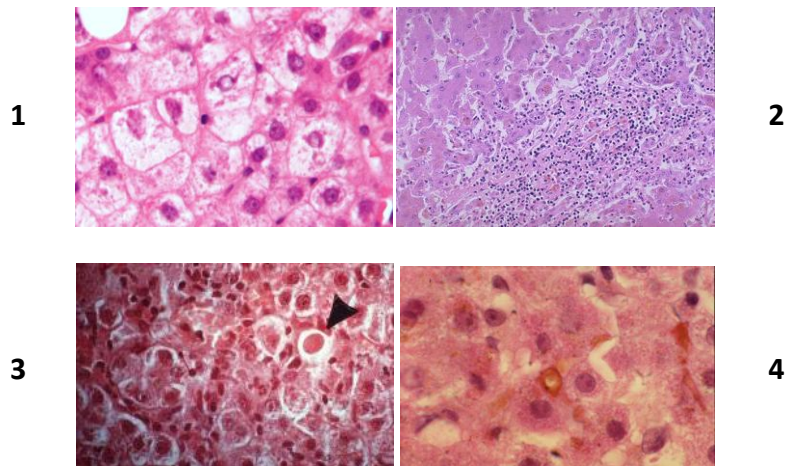
- **Introduction:**

- At least seven hepatitis viruses have been identified. These are: A, B, C, D, E, F and G.
- **Hepatitis can also be caused by other viral infections such as:**
 - ✓ Cytomegalovirus (CMV).
 - ✓ Epstein-Barr Virus (EBV).
 - ✓ Herpes Simplex Virus (HSV).



- **Hepatitis A:**

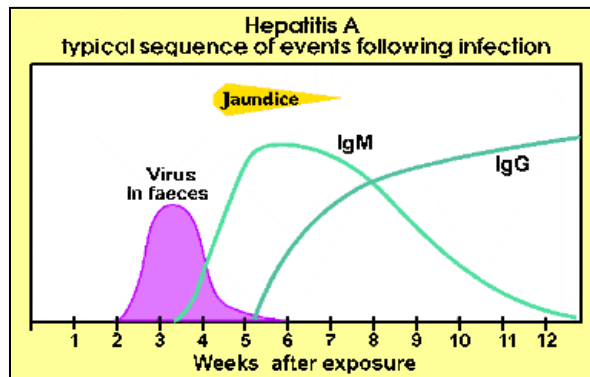
- **Characteristics:** picornavirus, small, non-enveloped with single-stranded RNA genome.
- **Pathogenesis:** it enters the body through the gut → replicates there → and then spreads to the liver where it multiplies in hepatocytes. Notice that the virus can be detected in feces two weeks before the appearance of clinical symptoms.
- **Clinical features:**
 - ✓ Incubation period: 28 days.
 - ✓ Causing only acute hepatitis with no chronic state.
 - ✓ Fulminant hepatitis is a rare complication which might occur (0.1%).
 - ✓ Patient presents with: fever, nausea & vomiting, fatigue and jaundice (yellow skin, sclera and mucous membranes due to high levels of bilirubin).
- **Histopathology:**
 - ✓ (1): Ballooning degeneration
 - ✓ (2): Predominantly sinusoidal and lobular mononuclear cell infiltrate (with occasional neutrophils and eosinophils).
 - ✓ (3): Scattered apoptotic bodies
 - ✓ (4): Canalicular cholestasis



- **Epidemiology:** endemic in most countries.
- **Transmission:** feco-oral, represented by:
 - ✓ Case-to-case.
 - ✓ Contaminated food or water (e.g. contaminated shell-fish).



- **Labs:**
 - ✓ The virus can be detected in feces two weeks before the appearance of symptoms.
 - ✓ Symptoms will appear four weeks after being infected (incubation period).
 - ✓ During the acute disease: IgM is elevated.
 - ✓ During recovery from the disease: IgM levels will fall down and will be replaced by IgG.



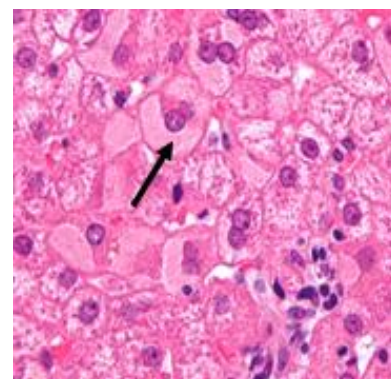
- **Prevention:** a vaccine is available (especially for travelers to endemic areas).

- **Hepatitis E:**

- **Characteristics:** calicivirus, spherical, non-enveloped with single-stranded RNA genome.
- **Pathogenesis:** similar to hepatitis A.
- **Clinical features:**
 - ✓ Incubation period: 30-40 days.
 - ✓ Affecting young adults.
 - ✓ Causing only acute hepatitis with no chronic state.
 - ✓ Fulminant hepatitis in pregnant females is a serious complication.
- **Epidemiology:**
 - ✓ Large outbreaks in India, Mexico and North Africa.
- **Transmission:** feco-orally
- **How is it diagnosed?**
 - ✓ Virus is detected in stool by electron microscope.
 - ✓ IgM in the serum (especially with acute stage of the disease).
 - ✓ PCR for stool.

- **Hepatitis B:**

- **Characteristics:** hepadna virus with circular double-stranded DNA genome.
- **Hepatitis B virus antigens:**
 - ✓ **HBsAg:** surface protein produced in excess as small spheres and tubules.
 - ✓ **HBcAg:** inner core protein.
 - ✓ **HBeAg:** secreted protein; function is unknown.
- **Pathogenesis:** infection is parenterally transmitted. The virus replicates in the liver. Viral particles and surface protein are shed in large amounts into the blood (the blood of infected individuals is highly infectious).
- **Clinical features:**
 - ✓ Incubation period: 2-5 months.
 - ✓ There is a gradual onset of symptoms.
 - ✓ There are two forms of the disease: acute and chronic (especially in babies and immunocompromised patients).
- **Histopathology:**
 - ✓ Ground-glass hepatocytes (see the image).

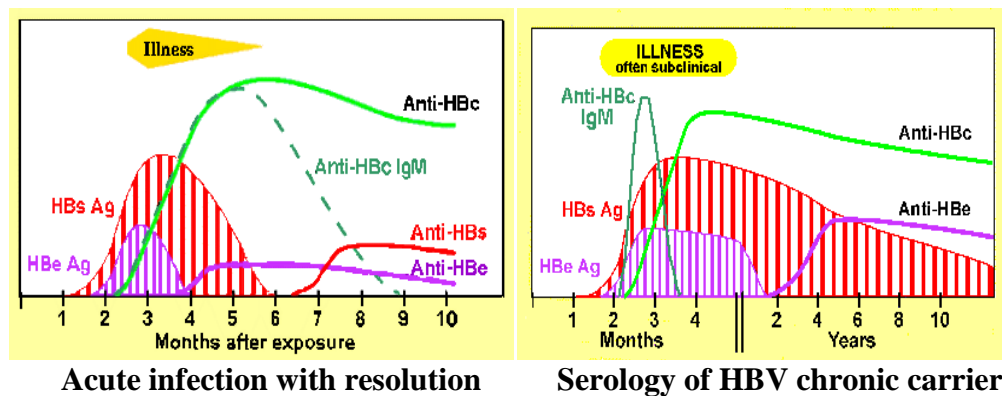




- **Transmission:**
 - ✓ Parenterally.
 - ✓ Vertical transmission: from a carrier mother to her baby through three ways:
 - ❖ Transplacental (across the placenta: rare).
 - ❖ During delivery.
 - ❖ Breast-feeding.
- **Labs:**
 - ✓ Hepatitis B serology:

	HBsAg HBeAg* HBV-DNA	HBcAb IgM	HBcAb IgG	HbsAb IgG
Acute infection	+	+	-	-
Window period	-	+	-	-
Prior infection	-	-	+	+
Immunization	-	-	-	+
Chronic infection	+	+	+	-

* HBeAg: correlates with viral proliferation and infectivity

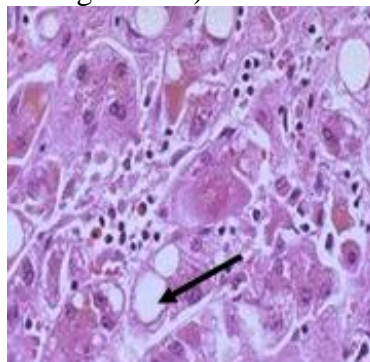


- Hepatitis D:

- **Characteristics:** encapsulated with a single-stranded RNA genome. It is a defective virus which needs hepatitis B as a helper virus to replicate. Notice that infections occurs only in patients who are already infected with hepatitis B virus!
- **Clinical features:** increased severity of disease in HBV carriers.
- **Epidemiology:** identified in intra-venous drug abusers in Italy.

- Hepatitis C:

- **Characteristics:** flavivirus, enveloped with single-stranded RNA.
- **Clinical features:**
 - ✓ Incubation period: 6-8 weeks.
 - ✓ 50-80% of patients will progress into a chronic state which might eventually results in hepatocellular carcinoma.
- **Histopathology:**
 - ✓ Mild fatty change (see the image below).





- **Epidemiology:** endemic worldwide but there is a high incidence in:
 - ✓ Japan.
 - ✓ Italy.
 - ✓ Spain.
 - ✓ Egypt.
- **Transmission:**
 - ✓ Blood transfusions (blood products).
 - ✓ Organ donation.
 - ✓ Intravenous drug abusers.
 - ✓ Sexual intercourse (??)
- **Labs:**
 - ✓ Serology:
 - ❖ *IgG*: indicates exposure but not infection.
 - ❖ *IgM*: not useful.
 - ✓ Molecular methods:
 - ❖ PCR
 - ✓ Viral genome can be detected in patient's serum by:
 - ❖ *Viral load*.
 - ❖ *Genotyping*.

- **Interferons:**

- They act as short-acting messengers which protect other cells from viral infection.
- Types:

α-interferon	Inhibits viral replication; increases NK cells and induces MHC-I antigens
β-interferon	Inhibits viral replication; increases NK cells and induces MHC-I antigens
γ-interferon	Activates macrophages and induces MHC-II antigens

