# Viral hepatitis (B, C, D, G)

Dr. Abdulkarim Alhetheel

Assistant Professor

College of Medicine & KKUH

# Objectives

The students should know the following:

- Characteristics of viral hepatitis
- Mode of transmission
- Markers of hepatitis infections
- Serological profile
- Stages of hepatitis infection
- Lab diagnosis
- Management & treatment

# Hepatitis

- Is inflammation of the liver.

# Etiology

❑ Primary infection:

- Hepatitis A virus (HAV)
- Hepatitis B virus (HBV).
- Hepatitis C virus (HCV), was known as non-A non-B hepatitis,
- Hepatitis D virus (HDV) or delta virus.
- Hepatitis E virus (HEV).
- Hepatitis F virus (HFV).
- Hepatitis G virus (HGV).

❑ As part of generalized infection:

- (CMV, EBV, Yellow fever virus)

# Continued ….

- Hepatitis F has been reported in the literature but not confirmed.
- Viral hepatitis is divided into two large groups, based on the mode of transmission:

*1– Enterically transmitted hepatitis or water born hepatitis.* This group includes hepatitis A and E viruses.

*2– Parenterally transmitted hepatitis or blood born hepatitis.* This group includes hepatitis B, C, D & G viruses.

# Characteristics of HBV

- Family of *hepadnaviridae.*

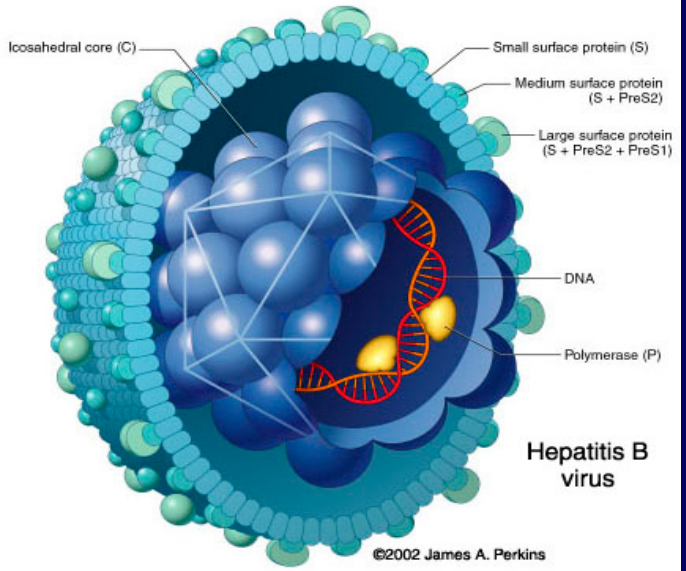
Virion consists of:

➢ Outer envelope containing hepatitis B surface antigen (HBsAg).

➢ Internal core (nucleocapsid) composed of hepatitis B core antigen (HBcAg).

➢ The viral genome which is small partially circular ds-DNA.

➢ The virus contains the enzyme reverse transcriptase.




The size is 42-nm in diameter.

# Characteristics of HBV

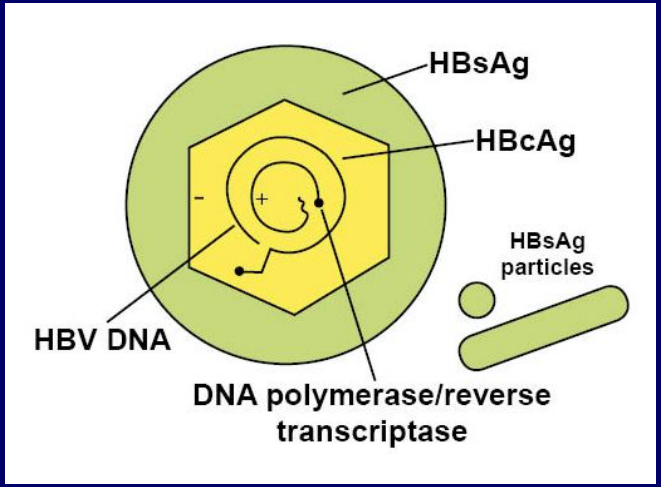
❑ The serum of infected individual contains three types of hepatitis B particles:

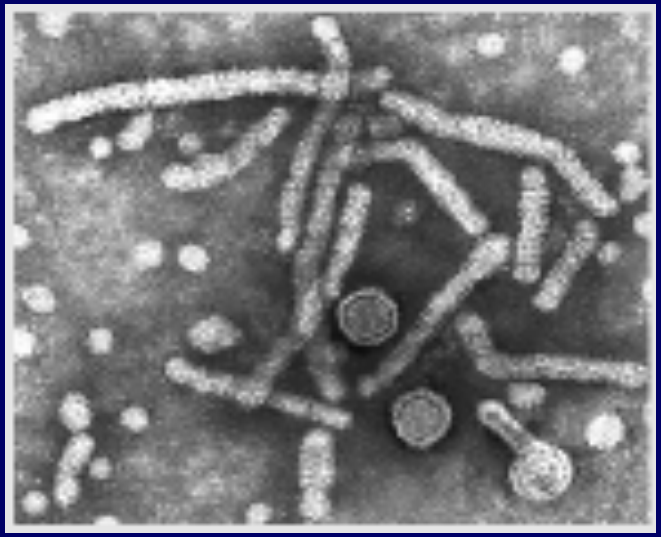
➢ Large number of small spherical free HBsAg particles.

➢ Some of these HBsAg particles are linked together to form filaments.

➢ The complete HBV particles (Dane particles).

❑ There are 8 known genotypes (A-H), Genotype D is the dominant in Saudi patients.



# Transmission of HBV

1- Parentally:

- Direct exposure to infected blood or body fluids (e.g. receiving blood from infected donor).
- Using contaminated or not adequately sterilized tools in surgical or cosmetic practice (dental, tattooing, body piercing).
- Sharing contaminated needles, razors, or tooth brushes.

2- Sexually (unprotected sex):

- The virus is present in blood and body fluids.

# Continued..

3- Perinatally (from mother to baby):

- Infected mothers can transmit HBV to their babies mostly during delivery.
- Breastfeeding is also way of perinatal transmission.

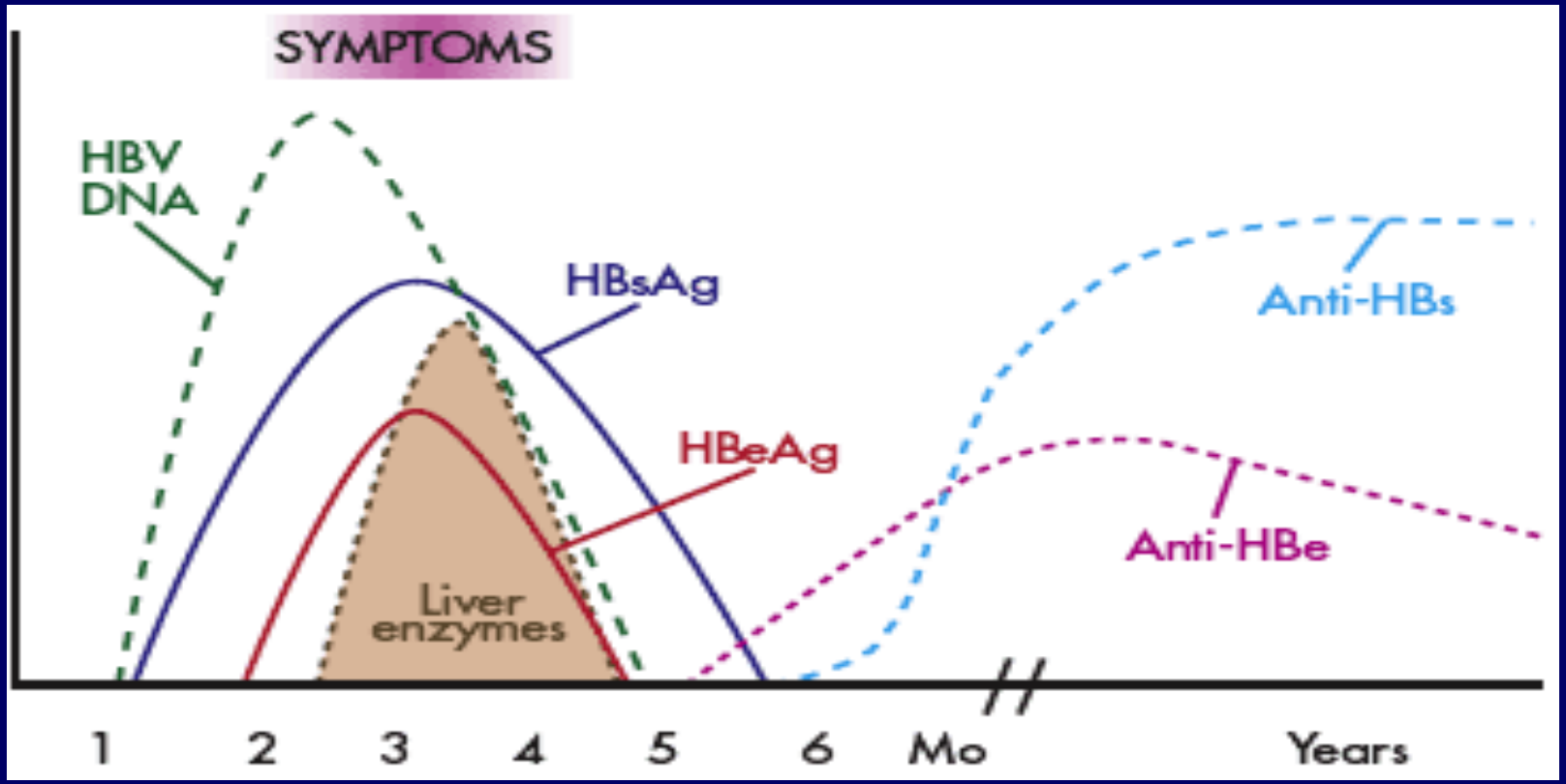
➢ High risk groups INCULDES:

- Intravenously drug users.
- Hemodialysis patients.
- Patients receiving clotting factors.
- Individuals with multiple sexual partners.
- Health care workers with frequent blood contact.
- Individuals who exposed to tattooing, body piercing or cupping.

# Hepatitis B markers

| Types | Description |
| --- | --- |
| HBV DNA | Marker of infection. |
| Hepatitis B surface antigen (HBsAg) | Marker of infection. |
| Hepatitis B e antigen (HBeAg) | Marker of active virus replication, the patient is highly infectious, the virus is present in all body fluids. |
| Antibody to hepatitis B e antigen (Anti-HBe) | Marker of low infectivity, the patient is less infectious. |
| Antibody to hepatitis B core (Anti-HBc) | Marker of exposure to hepatitis B infection. |
| Antibody to hepatitis B surface antigen (Anti-HBs) | Marker of immunity. |

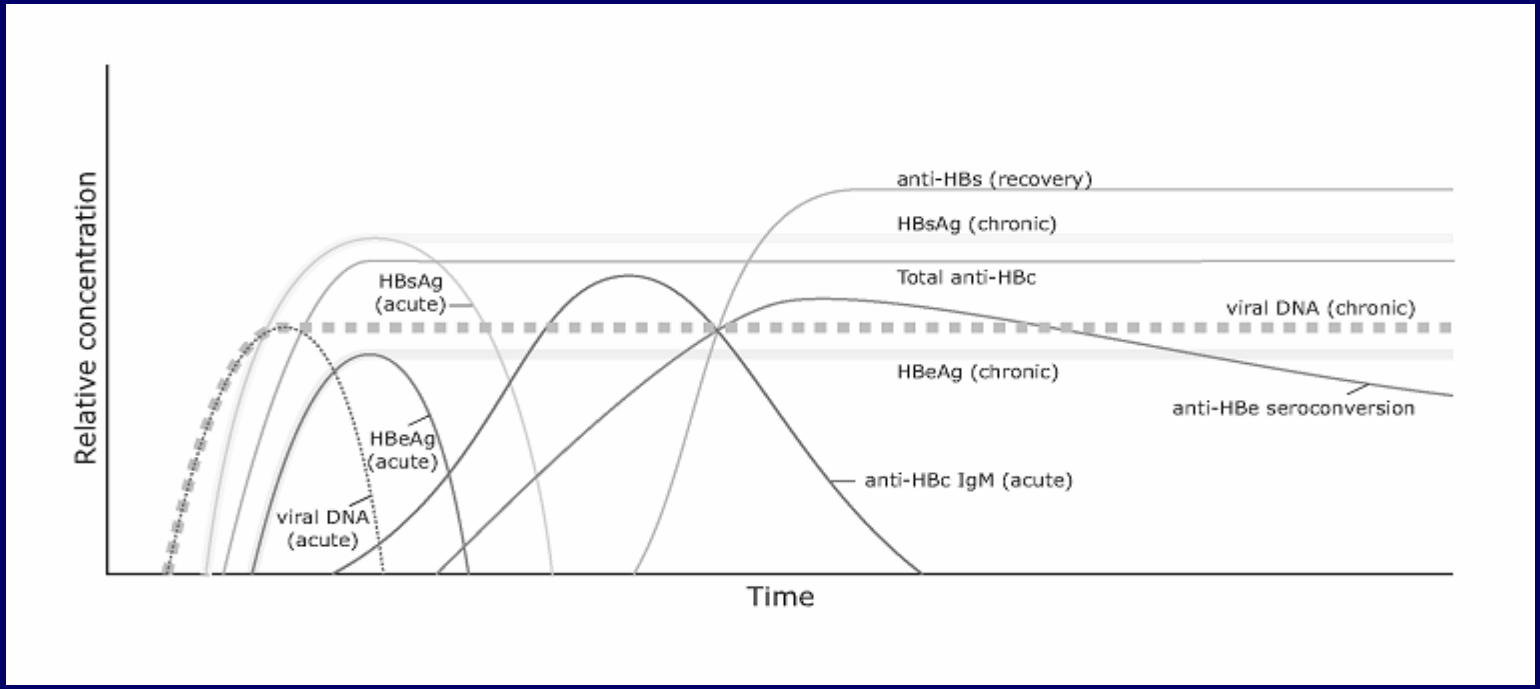
# Serological profile of acute HBV infection



# Serological profile of acute HBV infection

- Hepatitis B DNA is the 1st marker that appears in circulation, 3-4 weeks after infection.
- HBsAg is the 2nd marker that appears in the blood and persists for < 6 months, then disappears.
- HBeAg is the 3rd maker that appears in circulation and disappears before HBsAg.
- Anti-HBc Ab is the 1st antibody that appears in the blood and usually persists for several years.
- with the disappearance of HBeAg, anti-HBe appears and usually persists for several weeks to several months.
- Anti-HBs Ab is the last marker that appears in the blood, It appears few weeks after disappearance of HBsAg and persists for several years, It indicates immunity to hepatitis B infection.

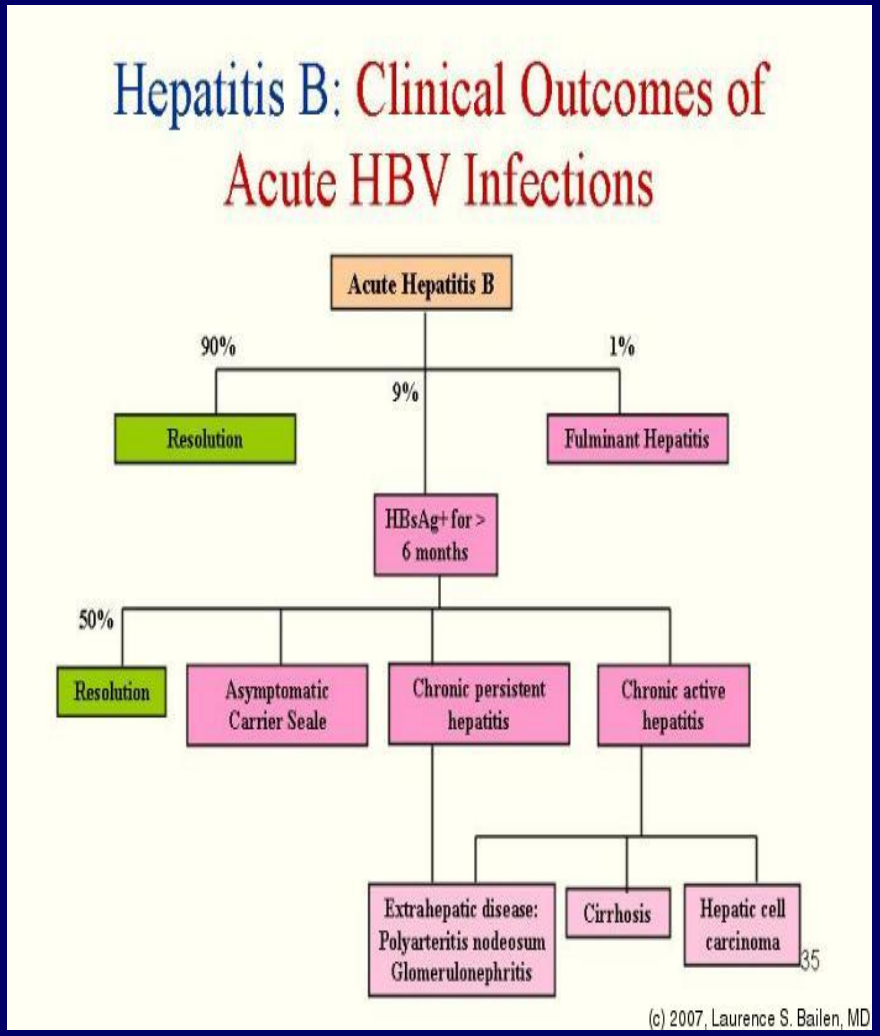
# Serological profile of chronic HBV infection




- Chronic hepatitis B infection is defined by the presence of HBV-DNA or HBsAg in the blood for > 6 months.
- HBsAg may persist in the blood for life.
- After disappearance of HBsAg, anti-HBs Ab appears and persists for several years.

# The clinical outcome of HBV infection

- About 90 % of infected adults will develop acute hepatitis B infection and recover completely.
- < 9 % of the infected adult, 90% of infected infants and 20% of infected children may progress to chronic hepatitis B.
- < 1 % may develop fulminant hepatitis B, characterized by massive liver necrosis, liver failure and death.



# Acute hepatitis B infection

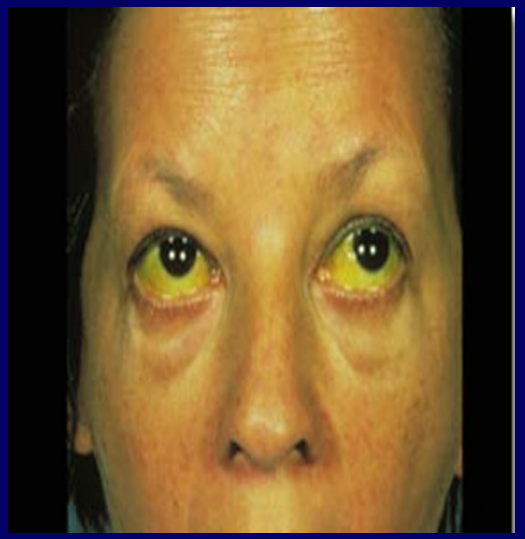
- Acute viral hepatitis usually lasts for several weeks or < 6 months.

- Most acute hepatitis B & C are asymptomatic or anicteric.

- 1- *Anicteric phase:*
  - Low grade fever, anorexia, malaise, nausea, vomiting and pain at the right upper quadrant of the abdomen.

- 2- *Icteric phase:* which is characterized by jaundice, dark urine and pale stool.

- 3- *Convalescent phase.*



# Chronic hepatitis infection

- Chronic hepatitis is limited to hepatitis B, C , D and may be G viruses.
- The majority of patients with chronic hepatitis B and C are asymptomatic or have mild fatigue only.
- Symptoms include right upper quadrant abdominal pain, enlarged liver & spleen. Jaundice may or may not developed, fatigue.
- Chronic hepatitis B is defined by the presence of HBsAg or HBV-DNA in the blood for > 6 months.

# Chronic hepatitis B infection

Chronic hepatitis B has three phases:

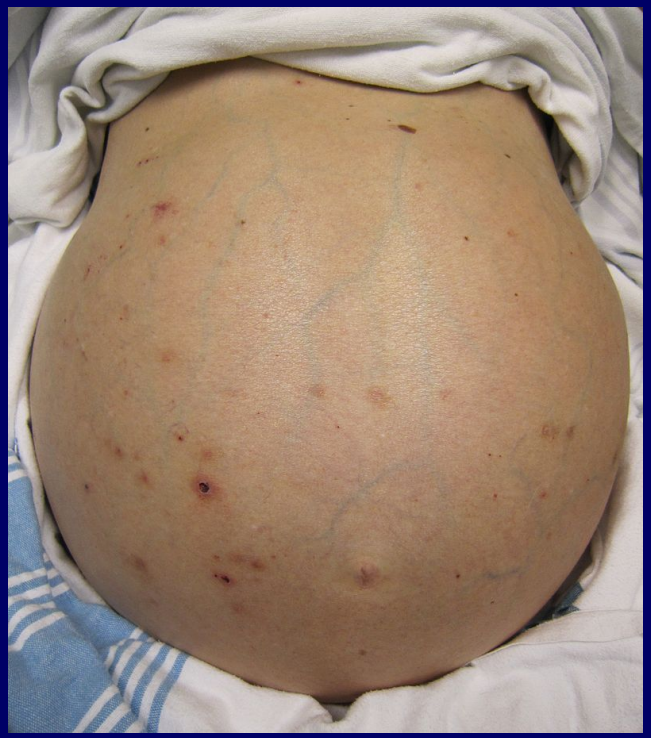
*1- The replicative phase:* The patient is positive for HBsAg, HBeAg and HBV-DNA, High viral load > $10^5$ copies/ml, ALT is normal or nearly normal, Liver biopsy shows minimal damage.

*2- Inflammatory phase:* HBsAg positive for > 6 months, HBeAg positive, Decline in HBV-DNA in the blood but VL is > $10^5$ copies/ml, ALT is elevated, The immune system attacks hepatocytes harboring the virus, Liver biopsy shows damage to hepatocytes.

*3- Inactive phase:* Negative for HBeAg, Positive for anti-HBe, HBV-DNA VL < $10^5$ copies/ml, Normal ALT.

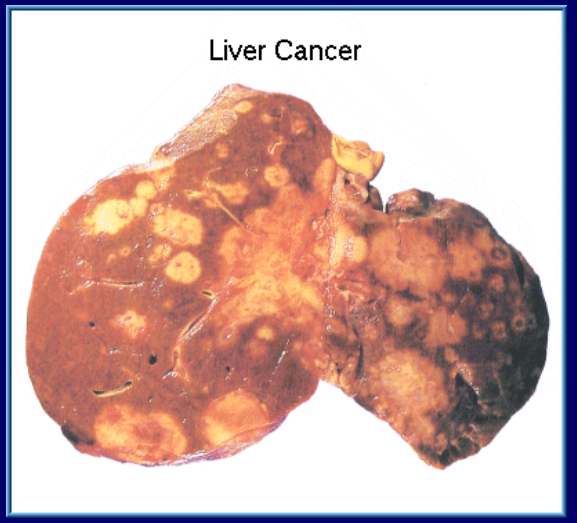
# Cirrhosis

- Is a chronic diffuse liver disease.
- Characterized by fibrosis and nodular formation.
- Results from liver cell necrosis and the collapse of hepatic lobules.
- Symptoms includes: ascites, coagulopathy (bleeding disorder), portal hypertension, hepatic encephalopathy, vomiting blood, weakness, weight loss.

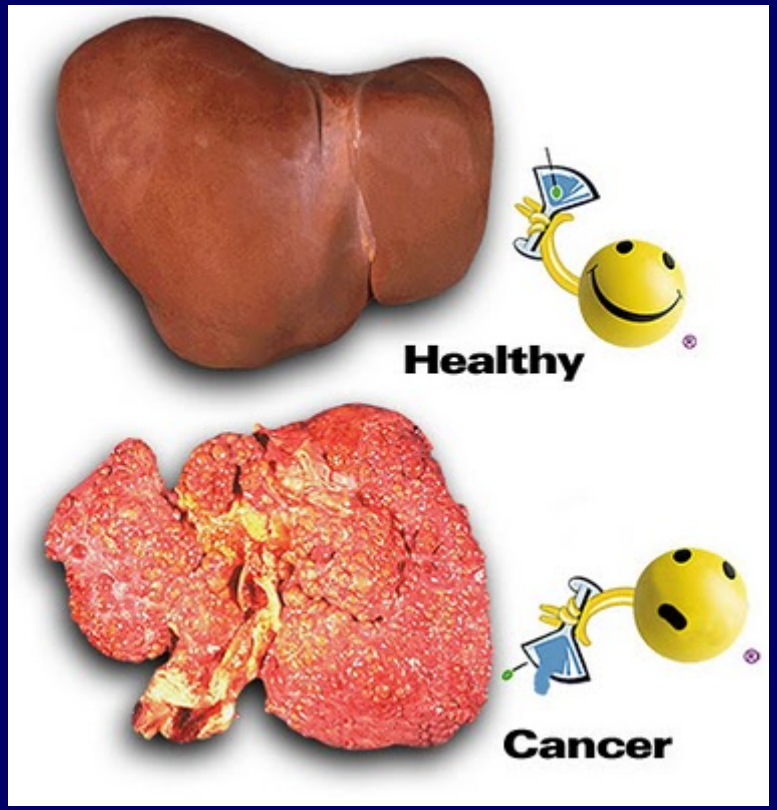
# Hepatocellular carcinoma ( HCC )

- One of the most common cancer in the world. Also, one of the most deadly cancer if not treated.
- Hepatitis B and C viruses are the leading cause of chronic liver diseases.
- Symptoms include: abdominal pain, abdominal swelling, weight loss, anorexia, vomiting, jaundice.
- Physical examination reveals hepatomegaly, splenomegaly and ascites.



# HCC

- Prognosis: without liver transplantation, the prognosis is poor and one year survival is rare.
- Diagnosis: alpha-fetoprotein measurement with multiple CT-abdominal scan are the most sensitive method for diagnosis of HCC.
- Treatment: surgical resection and liver transplant.



# Lab diagnosis of hepatitis B infection

- Hepatitis B infection is diagnosed by detection of HBsAg in the blood.
  - Positive results must be repeated in duplicate.
  - Repeatedly reactive results must be confirmed by neutralization test.

- Additional lab investigations:

1- Liver function tests ( LFT ).

2- Ultrasound of the liver.

3- Liver biopsy to determine the severity of the diseases.

# Hepatitis B vaccine

- It contains highly purified preparation of HBsAg particles, produced by genetic engineering in yeast.
- It is a recombinant and subunit vaccine.
- The vaccine is administered in three doses at 0,1, & 6 months.
- The vaccine is safe and protective.

# Treatment of hepatitis B infection

- There are several approved antiviral drugs:

1- Pegylated alpha interferon, one injection per week, for 6- 12 months.

2- Lamivudine, antiviral drug, nucleoside analogue. One tablet a day for at least one year.

3- Adefovir, antiviral drug, nucleoside analogue. One tablet a day for at least one year.

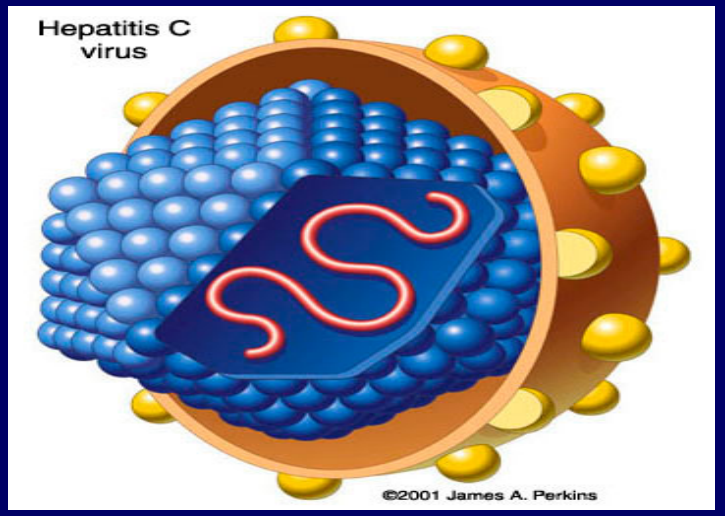
# Hepatitis C virus: Classification & structure

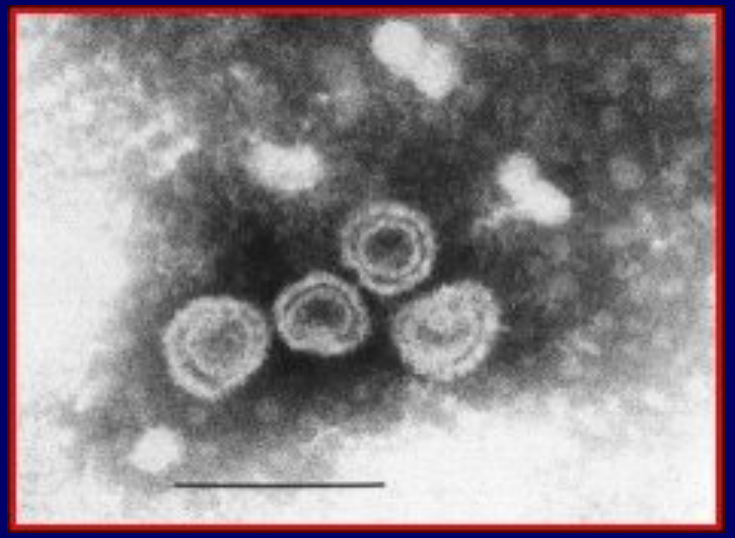
- Family: *Flaviviridae.*
- Genus: *hepacivirus.*

- The virus is small, 60 – 80 nm in diameter.

- Consists of an outer envelope, icosahedral core and linear positive polarity ss-RNA gemone.

- There are 6 major genotypes (1 – 6), genotype 4 is the dominant in Saudi patients.



# Transmission of HCV

Similar to HBV:

1- Parenterally:

- Direct exposure to infected blood.
- Using contaminate needles, surgical instruments.
- Using contaminate instruments in the practice of tattooing, ear piercing & cupping.
- Sharing contaminated razors 7 tooth brushes.

2- Sexually.

3- From mother to child perinatally.

# Hepatitis C markers

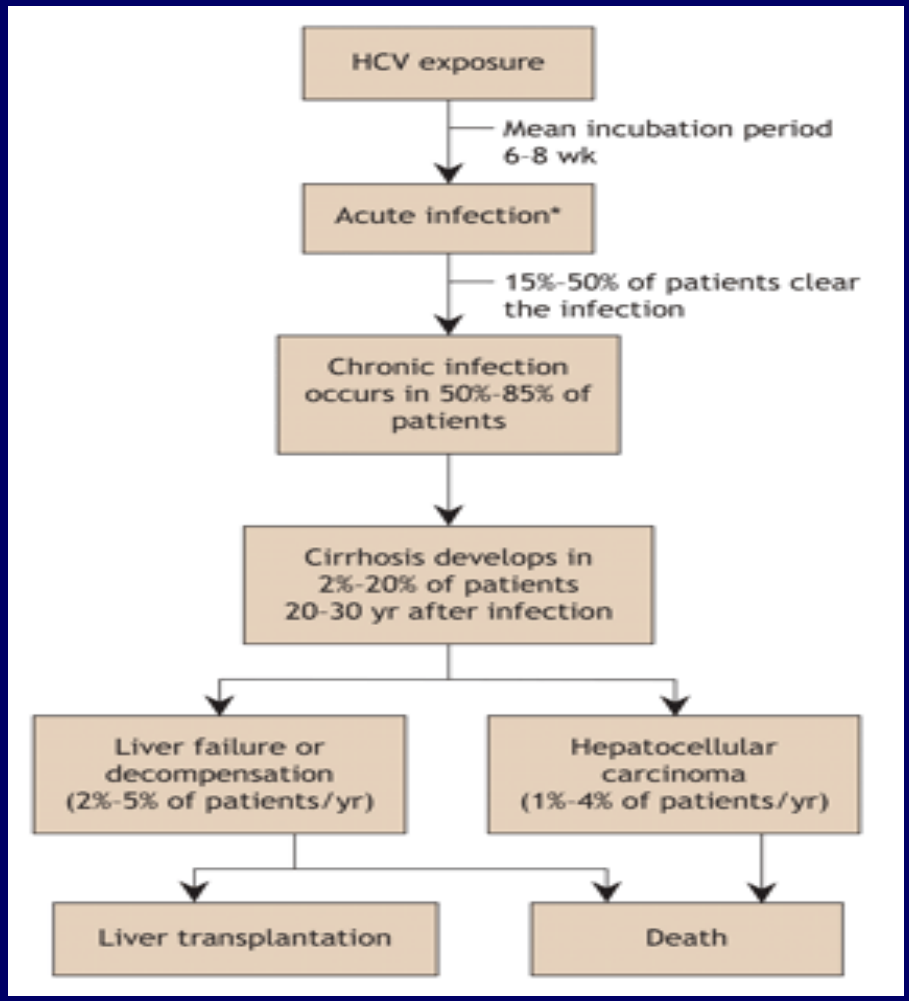
- *1- hepatitis C virus RNA.*
- Is the 1st marker that appears in circulation, it appears as early as 2-3 weeks after exposure. It is a *marker of infection.*

- *2- hepatitis C core antigen.*
- The 2nd marker that appears in the blood, usually 3-4 weeks after exposure. Marker of infection.

- *3- IgG antibody to hepatitis C.*
- Antibodies to hepatitis C virus is the last marker that appears in the blood, usually appear 50 days after exposure (long window period).

# The clinical outcome of HCV infection

- About 20 % of the infected individuals will develop self-limiting acute hepatitis C and recover completely.
- About 80 % of the infected will progress to chronic hepatitis C.
- < 1 % will develop fulminant hepatitis C, liver failure and death.

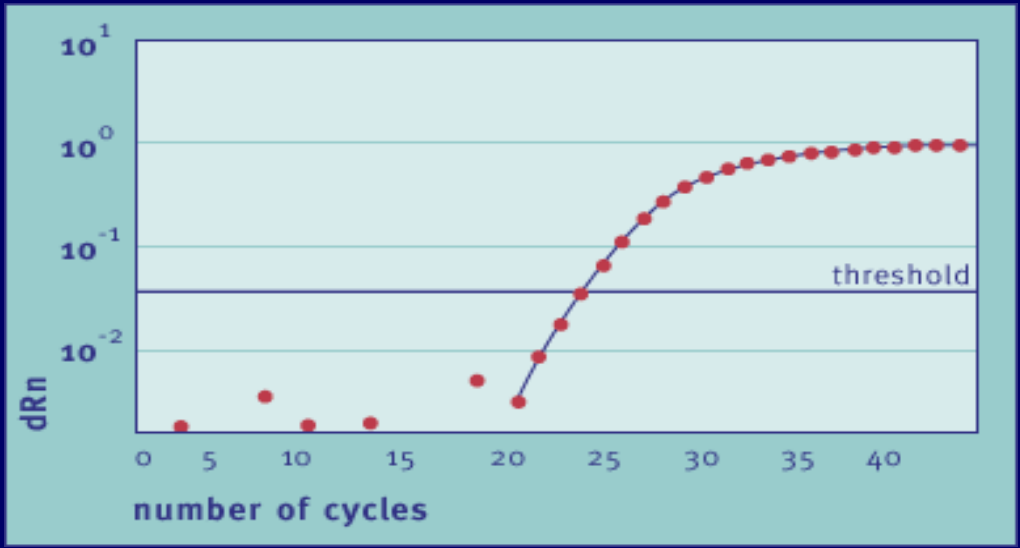


# Lab diagnosis of hepatitis C infection

- By detection of both:

1- Antibody to HCV in the blood by ELISA, if positive the result must be confirmed by RIBA or PCR.

2- HCV-RNA in the blood using PCR.



# Treatment of hepatitis C infection & vaccine

- The currently used treatment is the combined therapy using: Pegylated alpha interferon and ribavirin.

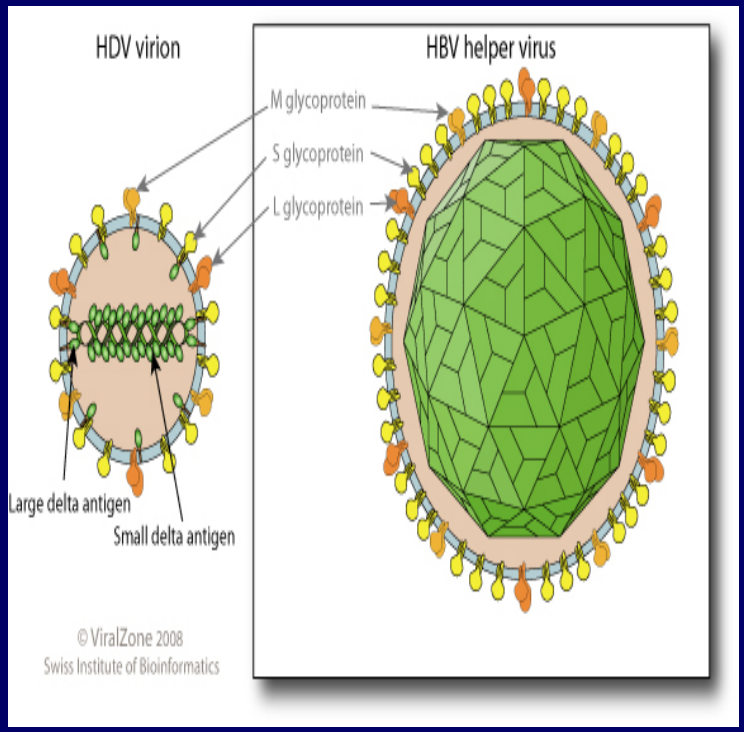
- The dose: for pegylated alpha interferon, one injection per week.
- For ribavirine two capsules a day.

- Hepatitis C vaccine:

At the present time, there is no vaccine available to hepatitis C.

# Hepatitis D virus (delta virus): Structure

- It is a defective virus, that cannot replicates by its own.
- It requires a helper virus.
- The helper virus is HBV.
- HBV provides the free HBsAg particles to be used as an envelope.
- HDV is small 30-40 nm in diameter.
- Composed of small ss-RNA genome, surrounded by delta antigen that form the nucleocapsid.



# Types of HDV infections

- *1- Co-infection:*
- The patient is infected with HBV and HDV at the same time leading to severe acute hepatitis .
- Prognosis: recovery is usual.

- *2- Super infection:*
- In this case, delta virus infects those who are already have chronic hepatitis B leading to severe chronic hepatitis.

# Hepatitis G virus

- Hepatitis G virus or GB-virus was discovered in 1995.
- Share about 80% sequence homology with HCV.
- Family: *Flaviviridae*, genus: *Hepacivirus*.
- Enveloped, ss-RNA with positive polarity.
- Parenterally, sexual, and from mother to child transmission have been reported.
- Causes mild acute and chronic hepatitis infection.
- Usually occurs as co-infection with HCV, HBV and HIV.

Thank you for your attention !