Hepatitis Viruses

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Introduction

- Hepatitis: inflammation of liver; presence of inflammatory cells in organ tissue
- The causes of hepatitis are varied and include viruses, bacteria, and protozoa, as well as drugs and toxins (eg, isoniazid, carbon tetrachloride, and ethanol).
- Acute hepatitis: symptoms last less than 6 months
- Viral Hepatitis: is inflammation of the liver induced by viral infections
- The clinical symptoms and course of acute viral hepatitis can be similar, regardless of etiology, and determination of a specific cause depends on laboratory tests.

Viral hepatitis *types:*

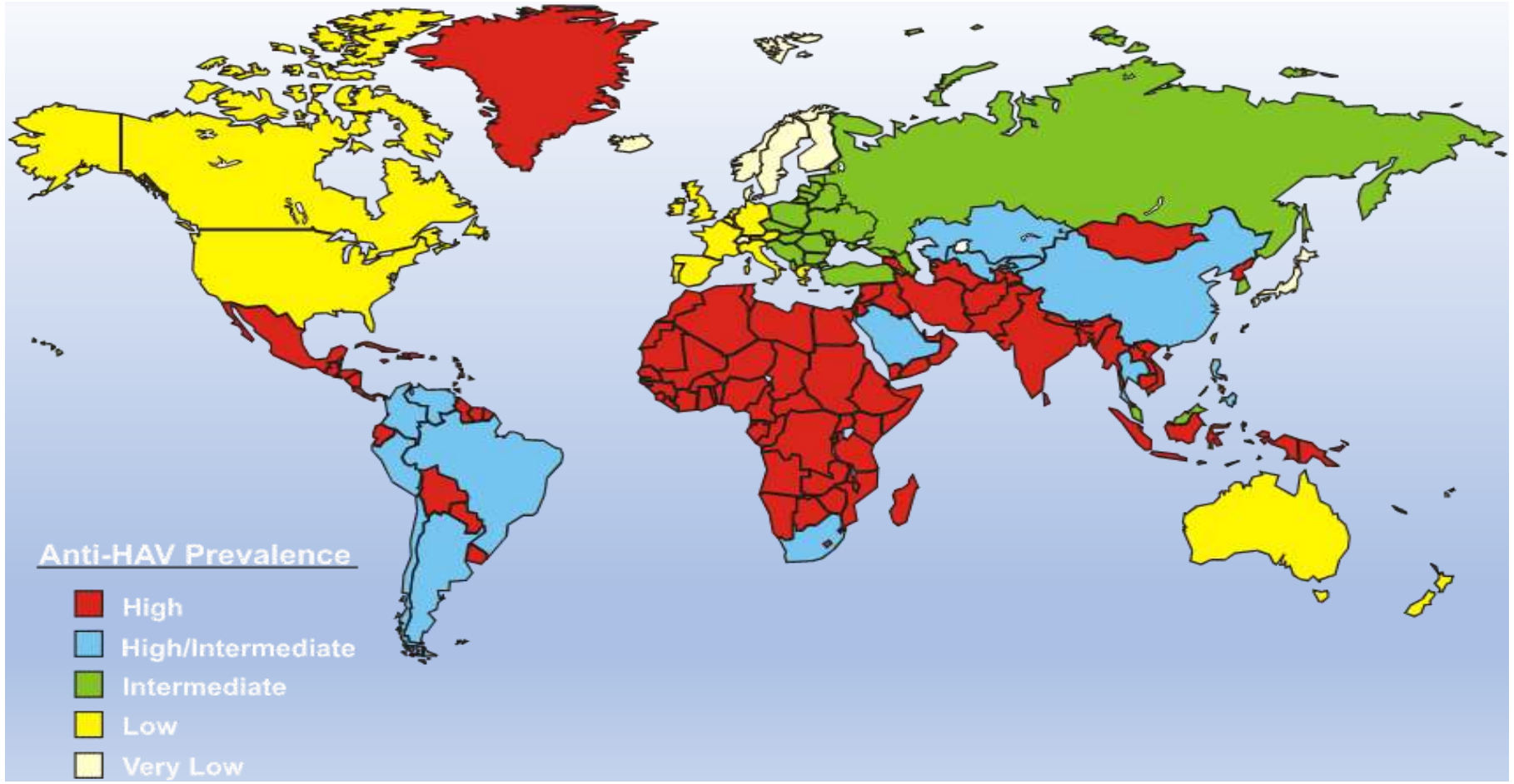
- *A:* Picornavirus: +ssRNA, Non enveloped
- B: Hepadnavirus Ds DNA, Partial, has enzyme, enveloped
- C: Flavivirus, +ssRNA genome, enveloped
- *D: Deltaviruses, Defective –ssRNA virus*
- E: Hepevirus, +ssRNA non enveloped

Hepatitis A

- A typical Enterovirus , also known as entervirus 72
- Naked Icosahedral nucleocapsid virus with a single stranded positive polarity RNA. No virion polymerase. One serotype
- Enterically transmitted (fecal/oral route)
- *Ingestion* > Multiplies in oropharynx and intestinal epithelial cells > blood > Liver > Periportal necrosis + mononuclear infiltrates

- Virus is not cytopathic but the CMI causes cell necrosis

Epidemiology of *Hepatitis A*



Clinical Manifestations

- Incubation period: 2-6 WEEKS

- Most HAV infections are asymptomatic.
- fever; anorexia; nausea, vomiting and jaundice .
- Abdominal pain, hepatomegally, spenomegally, Dark urine and clay-colored stools and elevated transaminase levels.

- Resolve spontaneously in 2-4 weeks.

Hepatitis A Diagnosis:

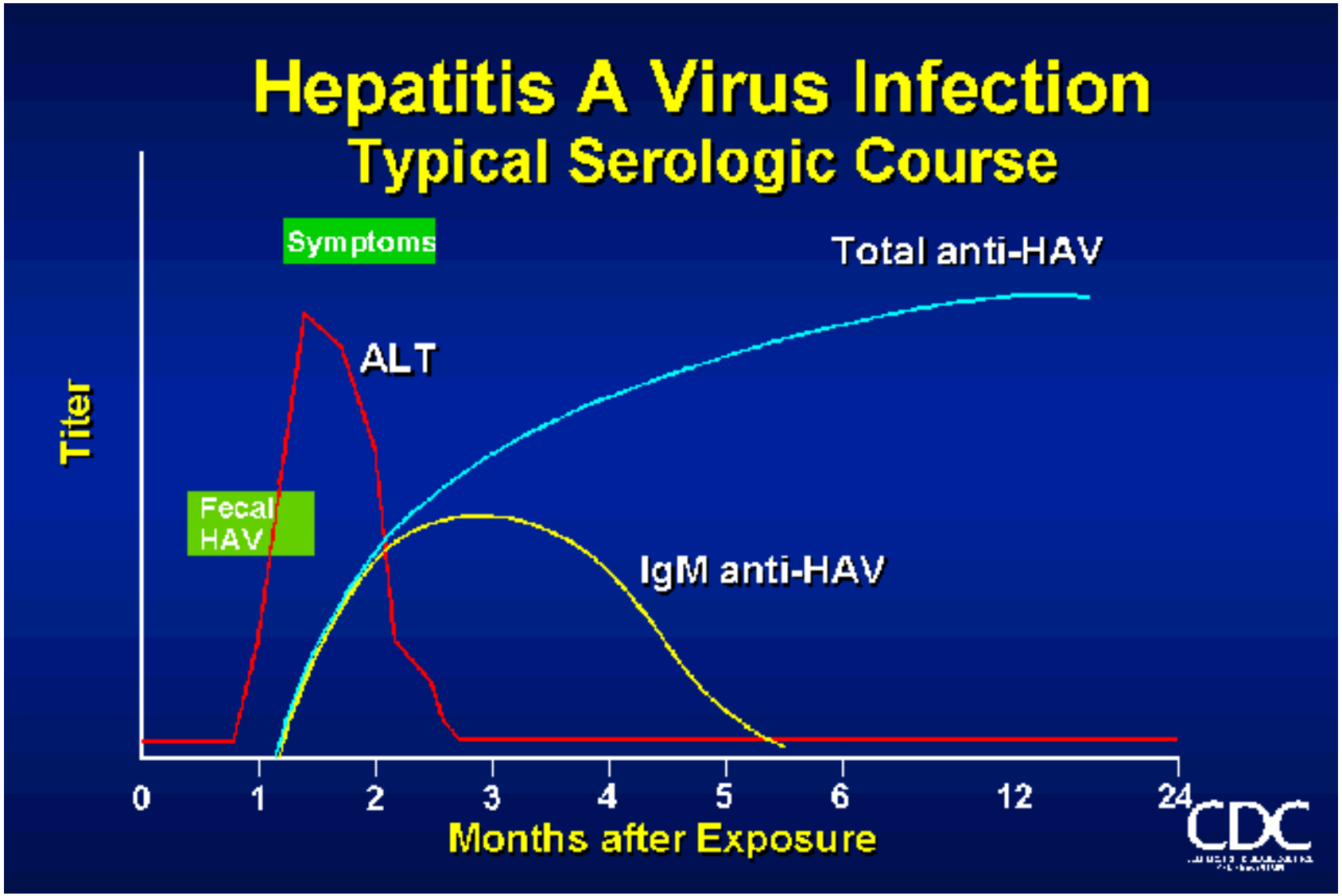
- Clinically
- *Liver enzyme: High AST and ALT, mild elevation of bilirubin.*

- *Serology: IgM, IgG (life long immunity)*

➢ *IgM: Acute infection remains high for 3-6 months*

➢ *IgG: Past infection or vaccine*

Hepatitis A


Hepatitis A Virus Infection
Typical Serologic Course
Symptoms
Total anti-HAV
ALT
Titer
Fecal HAV
IgM anti-HAV
0
1
2
3
4
5
6
12
24
Months after Exposure
CDC

- *Rx: Usually full recovery in 90% of patients in 3-6m*

➢ *Acute:*

- *Supportive: Do not give Paracetamol and Alcohol*
- *Immunoglobulins*

➢ *Fulminat hepatitis:*

- *Supportive, but may need liver transplantation*
- *Prevention:*
- *Hygiene, Vaccine: killed, IM 2 doses separated by 3- 6 months*

Hepatitis E Virus

- Hepatitis E virus is a none enveloped, single stranded RNA virus.
- The viral particles in stool are spherical, 27 to 34 nm in size, and unenveloped and exhibit spikes on their surface.

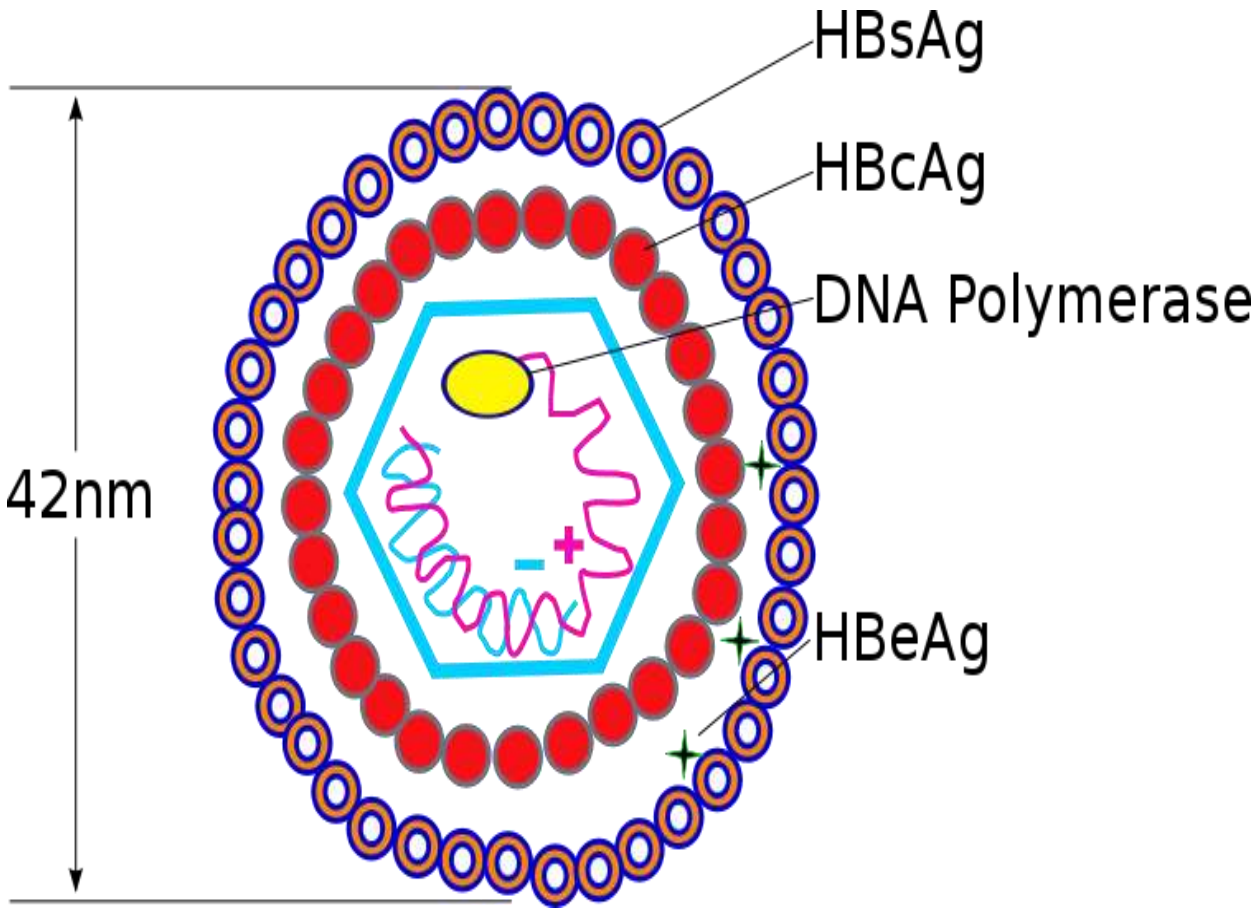
- Feco-oral transmission

- Waterborne epidemics of hepatitis

- High mortality rate in pregnant women.
- No chronicity , No carrier state.

Hepatitis B virus

- Hepadnavirus , Partially –Double stranded circular DNA genome.
- Enveloped
- Icosahedral nucleocapsid
- Antigens:
- The main components of the virus include the core - hepatitis B core antigen (HBcAg) and the pre-corehepatitis B e antigen (HBeAg), and the envelope of the virus contains the hepatitis B surface antigen (HBsAg)



Hepatitis B virus

➢Transmission:

- Parenteral via blood or plasma, needle stick injury
- Vertically: mother to baby
- Body fluids

➢Risk groups:

- Health care workers
- Drug abusers
- Recipients of blood or its products (blood should be ideally screened)
- Dialysis patients, Homosexual men...

Hepatitis B virus

- Pathogenesis:
- Blood borne > liver cells > hepatocytes injury and necrosis (piecemeal necrosis) ---Largely cell mediated.
- Clinically :
- Incubation period: 1-4 months (infectious dose)

✓Asymptomatic: 90% of children and 50% of adults (increased liver enzymes)

✓Symptomatic:

- Preicteric phase: flu like symptoms nausea, anorexia, malaise
- Icteric phase: Jaundice, pale stool, dark- coloured urine, increased liver enzymes and billirubin

Hepatitis B

Hepatitis B virus

➢Outcome:

- 90-95% recovery
- 5-10% chronic carriers (sAg > 6 months):

- chronic active hepatitis (more fatal)

- 1% fatality

- 1% of HBV chronic carriers develop hepatocellular carcinoma

- Diagnosis of HBV :

1. Clinical picture

2. Liver, kidney function tests, other tests to role out other causes e.g: CMV, EBV infection

3. Serology:

- We rely on:

- S, e antigens and antibodies
- Anti core antibodies
- DNA detection

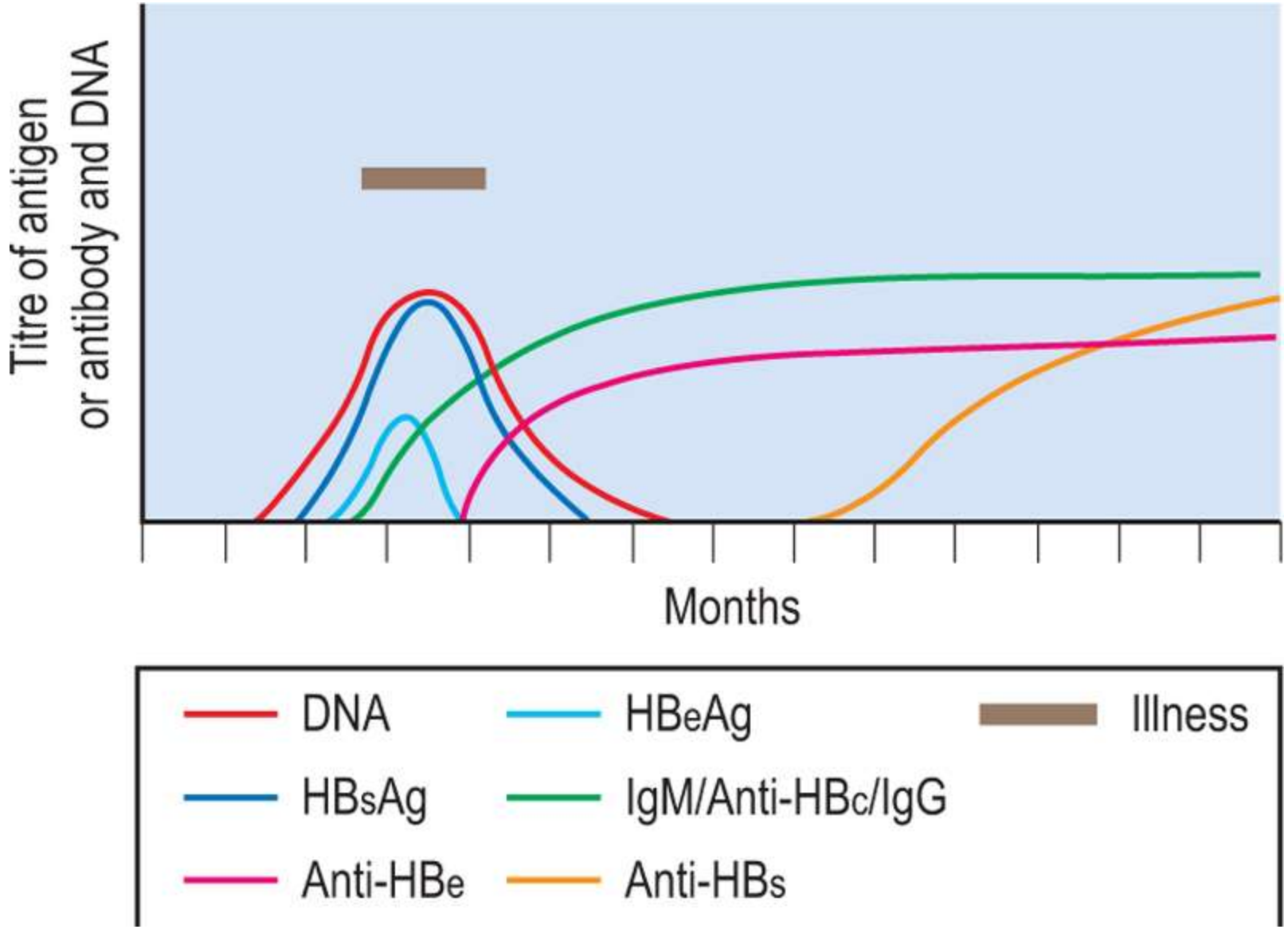

Titre of antigen
or antibody and DNA
Months
DNA
HBeAg
Illness
HBsAg
IgM/Anti-HBc/IgG
Anti-HBe
Anti-HBs

TABLE 41–4 Serologic Test Results in Four Stages of HBV Infection

Test	Acute Disease	Window Phase	Complete Recovery	Chronic Carrier State
HBsAg	Positive	Negative	Negative	Positive
HBsAb	Negative	Negative	Positive	Negative[1]
HBcAb	Positive[2]	Positive	Positive	Positive

	HBsAg HBeAg* HBV-DNA	HBcAb IgM	HBcAb IgG	HBeAb	HBsAb
Acute infection	+	+	–	–	–
Window period	–	+/–	+	+	–
Prior infection	–	–	+	+	+
Immunization	–	–	–	–	+
Chronic infection	+	–	+	+/–	–

Hepatitis B virus

Treatment:

1. *Peg Interferon alpha*
2. *Lamivudine, Tenofovir, entecavir*

Prevention:

1. Immunoglobulin / passive

Accidental exposure in non vaccinated

Newborns of infected mothers

2. Vaccine (Recombinnt HBsAg) 3 I.M doses at 0, 1, 2 OR 6 months

- *Fridge storage*
- *Check response by measuring anti HBsAg antibodies 2 months after last dose (>10mIU/ml is protective)*
- *Part of ministry of health vaccination program (2, 3, 4 months)*

Hepatitis D virus

- *It needs HBV to replicate (provide the envelop)*
- *Route of transmission:*

✓ *As HBV*

- *conditions:*

✓ *Co- infection with HBv*

✓ *Super infection of HBV chronically infected patients (High risk of liver failure)*

- *Diagnosis: serology*
- *Rx: as HBV*

Hepatitis C virus

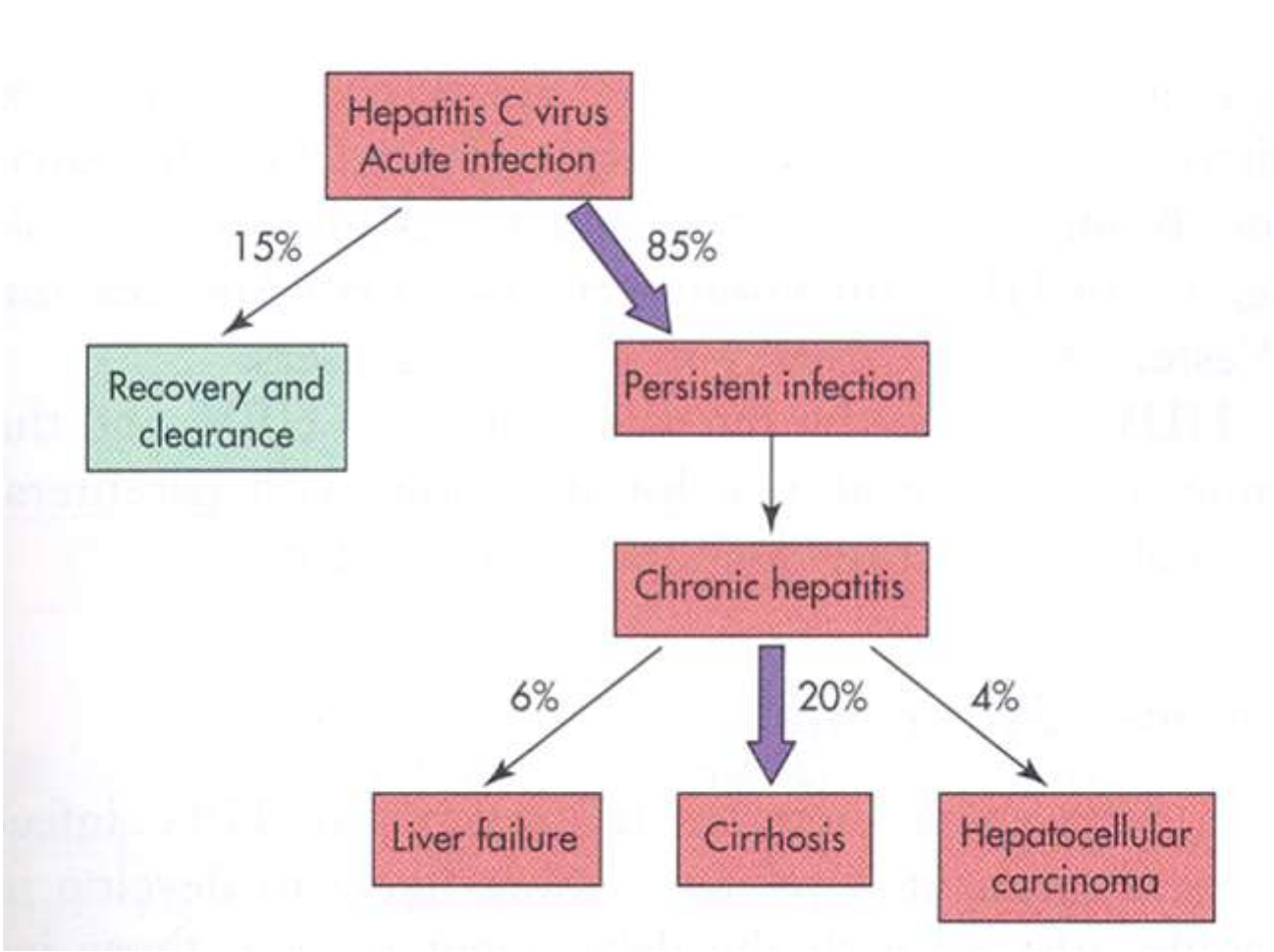
- Flavivirus, Enveloped , single stranded , positive sense RNA virus
- No polymerase in the virion
- 6 genotypes: needed for Rx and medicolegal
- Spread via infected blood and sexual contact
- 6 - 8 week incubation period / most infections are sub-clinical

- Clinical infections are generally less severe than HBV, damage due to cell mediated immune response

- HVC has *a higher incidence of chronic liver disease than HBV* (70-80% of patients remain viremic for more than 1 year)

- 170 million cases globally

Hepatitis C virus



Hepatitis C virus

Diagnosis:

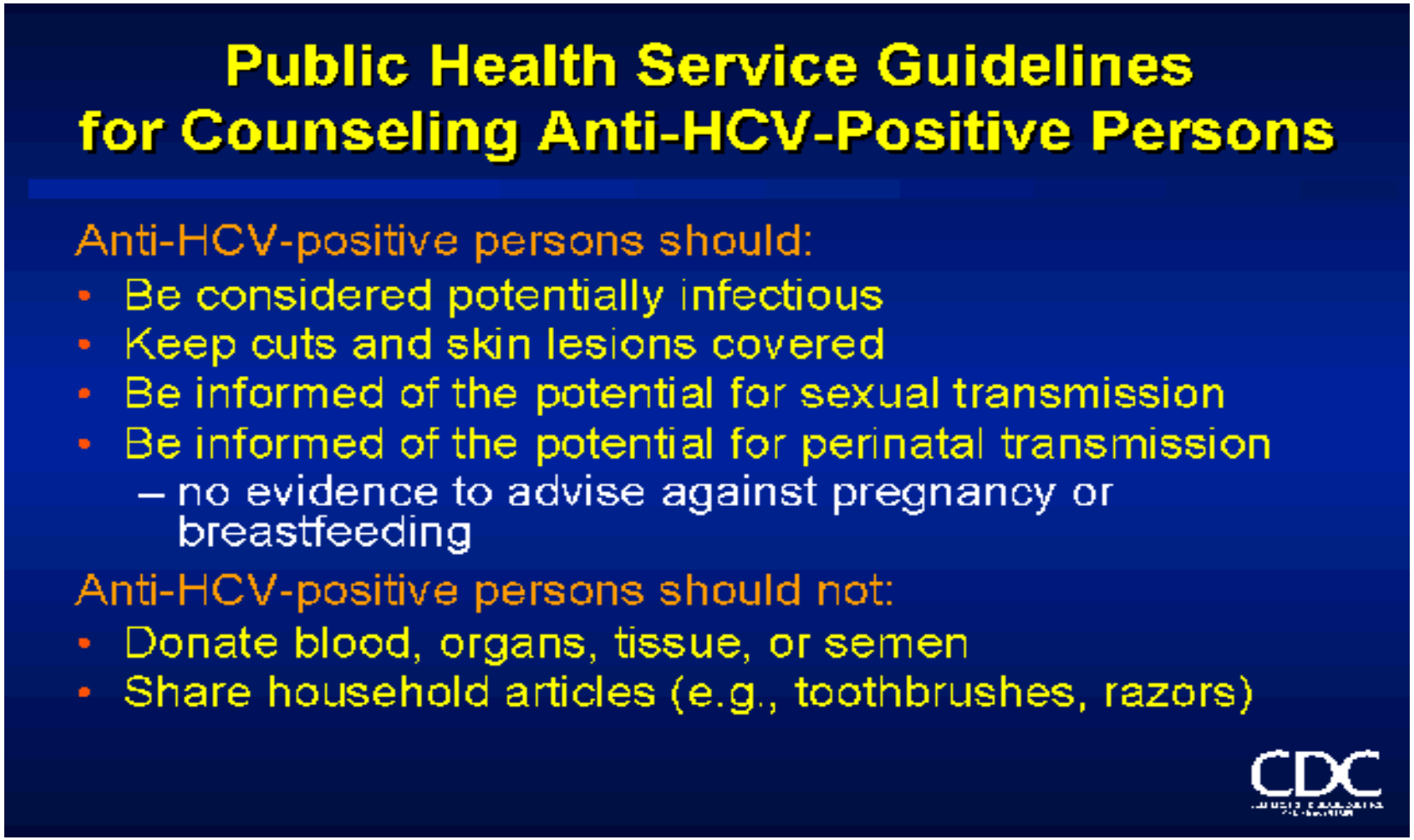
1. *Anti HCV IgM*
2. *RNA detection*

Treatment:

antivirals

Hepatitis C virus / prevention

- No vaccine
- Blood screening



Post exposure prophylaxis

جدول رقم (9) الاجراءات الفورية بعد اصابة عمل

المريض مصدر الاصابة	الوضع التطعيمي للموظف	الاجراء
التهاب الكبد (B) موجب HBsAg (positive)	- لم يتم تطعيمه - غير مكتمل الجرعات - ثلاث جرعات من التطعيم	-اعطاء التطعيم فورا + جرعة جليوبيولين مناعي* - إكمال كل الجرعات و اعطاء جليوبيولين مناعي* - فحص الاجسام المناعية (اذا كان أكثر أو يساوي 10 وحدة دولية لا شيء) **
التهاب الكبد (B) سالب HBsAg (negative)	- لم يتم تطعيمه - تم تطعيمه	- يتم تطعيمه - لا شئ
غير معروف اصابته بالتهاب الكبد ب	- لم يتم تطعيمه - غير مكتمل الجرعات - ثلاث جرعات من التطعيم	- -يعامل كما لو كان مصدر الاصابة ايجابيا - يعامل كما لو كان مصدر الاصابة ايجابيا - يعامل كما لو كان مصدر الاصابة ايجابيا
حامل لمضاد فيروس التهاب الكبد (C)	لا يوجد لقاح للالتهاب الكبد (C)	فحص الموظف بعد الاصابة مباشرة ثم بعد اسبوعين و بعد شهر ثم بعد 3 اشهر بطريقة HCV-Abو PCR و اذا ظهرت بوادر اصابته يحول الى أخصائي جهاز هضمي
غير معروف اصابته بالتهاب الكبد (C)	لا يوجد لقاح للالتهاب الكبد (C)	فحص الموظف بعد الاصابة مباشرة ثم بعد اسبوعين و بعد شهر ثم بعد 3 اشهر بطريقة HCV-Abو PCR و اذا ظهرت بوادر اصابته يحول الى أخصائي جهاز هضمي
حامل لفيروس العوز المناعي البشري HIV	لا يوجد لقاح لفيروس العوز المناعي البشري HIV	- مدة اربعة اسابيع يتم فيه تناول ثلاثة ادوية مضادة للفيروسات (مثل زيدوفودين ولاميفودين) ويجب الرجوع الى البرنامج الوطني لمكافحة الايدز*** - يبدأ العلاج فوراً(خلال ساعات)

* يتم ذلك خلال 24 ساعة من التعرض للعدوى

* *تقاس الاستجابة المناعية لمطعوم الكبد (B) بفحص الاجسام المضادة (Hbs Ab) وتعتبر ايجابية اذا كانت أكبر أو يساوي 10 وحدة دولية

Table 1 summary

Comparison of A, B, D (Delta), C, and E Hepatitis

Feature	A	B	D	C[a]	E
Virus type	Single-stranded RNA	Double-stranded DNA	Single-stranded RNA	RNA	RNA
Percent of viral hepatitis	50	41	<1	5	<1
Incubation period (days)	15–45 (mean, 25)	7–160 (mean, 60–90)	28–45	15–160 (mean, 50)	?
Onset	Usually sudden	Usually slow	Variable	Insidious	?
Age preference	Children, young adults	All ages	All ages	All ages	Young adult
Transmission					
Fecal–oral	+++	±	±	–	+++
Sexual	+	++	++	+	+?
Transfusion	–	++	+++	+++	–
Severity	Usually mild	Moderate	Often severe	Mild	Variable
Chronicity (%)	None	10	50–70	>50%	None
Carrier state	None	Yes	Yes	Yes	?
Immune serum globulin protective	Yes	Yes[b]	Yes[c]	Uncertain	?

Abbreviation: Plus and minus signs indicate relative frequencies.

[a] Many individuals with hepatitis C virus are also infected with the hepatitis G virus, which is similar to hepatitis C.

[b] Hyperimmune globulin more protective.

[c] Prevention of hepatitis B prevents hepatitis D.

The End