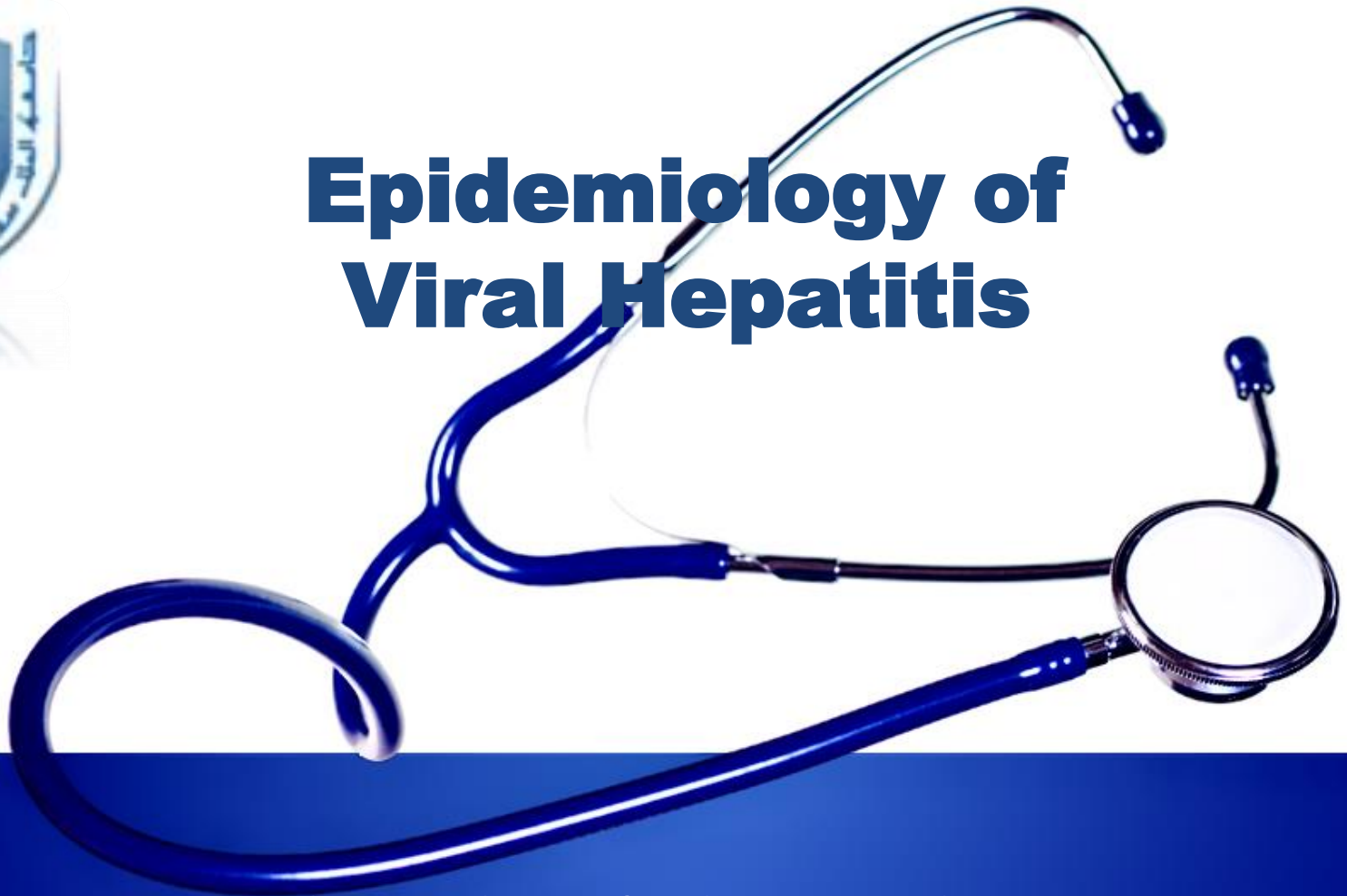




# Epidemiology of Viral Hepatitis



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**College of Medicine**  
**November, 2017**

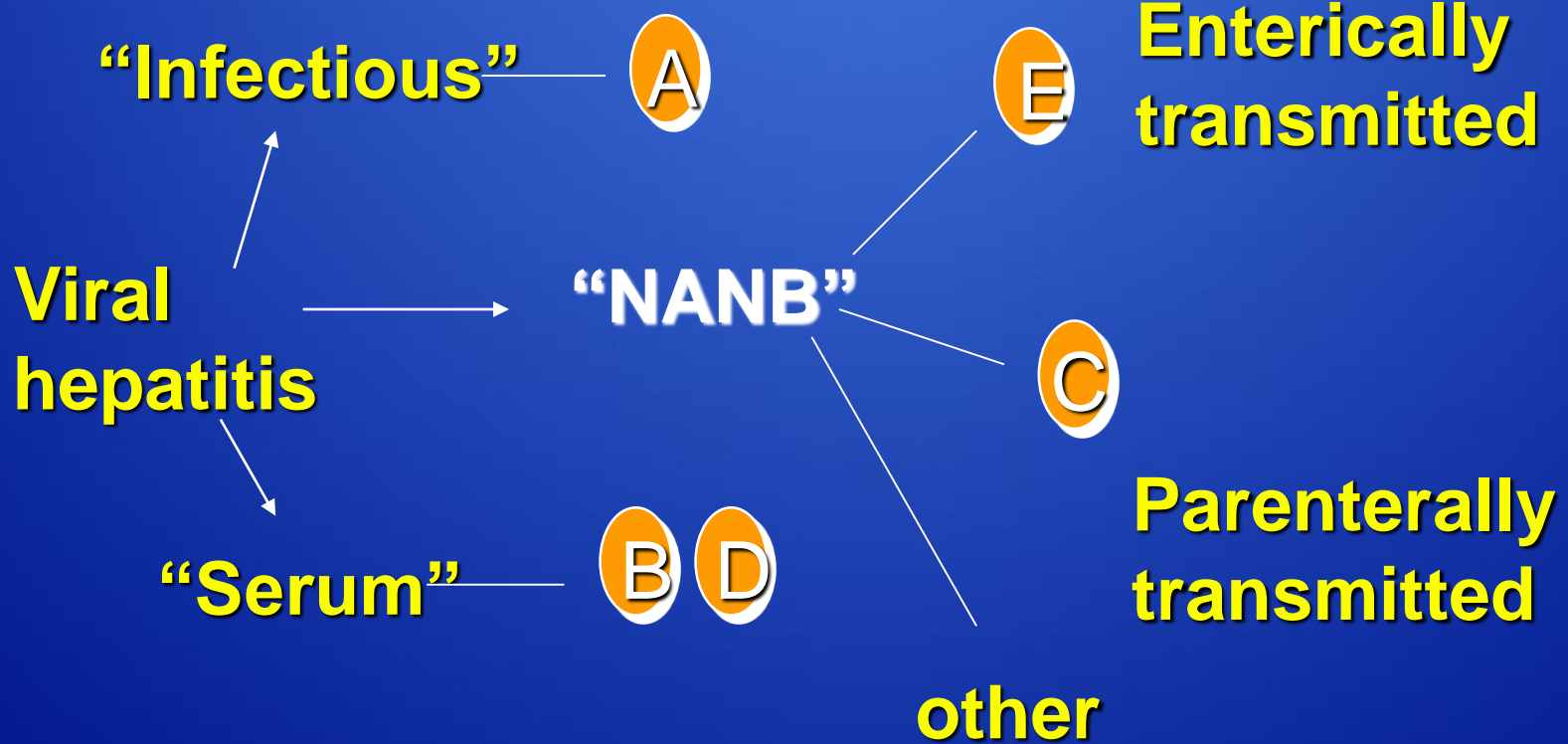
# Objectives



At the end of the lecture students should be able:

- Understand Classification of viral hepatitis.
- Recognize the magnitude of viral hepatitis infections.
- Understand modes of transmission of different serotypes.
- Understand measures of prevention and control of different serotypes of viral hepatitis.

# Viral Hepatitis – Classification & Historical Perspective



# Hepatitis A



## Clinical presentation:

- Abrupt onset.
- Fever
- Malaise
- Anorexia
- Abdominal discomfort
- Jaundice



# Hepatitis A



- More than **90% are asymptomatic**
- Seroprevalence **increases with age.**
- At age 15, 95% are seropositive.
- Case fatality rate (CFR)= **0.3%.**
- If age **> 40 years CFR=2%.**

- **Studies in KSA:**

1997      25%

1999      25%      Taif

10-82%      Jazan (1-12 years)

# Chain of infection



- **Agent:** RNA virus
- **Reservior** : Human (Clinical & subclinical cases)
- **Incubation period:** 15-45 days ( median one month).

# Chain of infection



- **Period of communicability** : Last two weeks of I.P. + one week of illness.
- **Modes of transmission:**
  - Fecal-oral route.
  - Common source outbreaks.
  - Blood transfusion (rare).

# Prevention and Control



- **Good sanitation & personal hygiene.**

“Careful hand washing”

- Day- Care centers

**Hand washing** after every diaper change and before eating.

- **Shellfish**

heat 85-90C      4 minutes.

steam              90 seconds.



# Prevention and Control



- Inactivated **hepatitis A vaccine**
- Schedule 2 doses after 6 months interval.
- Intramuscularly.
- Protection after one month.
- Lasting immunity at least 10 years.

Hepatitis A patient:

- **Enteric precaution** for the Period of communicability

# Hepatitis B

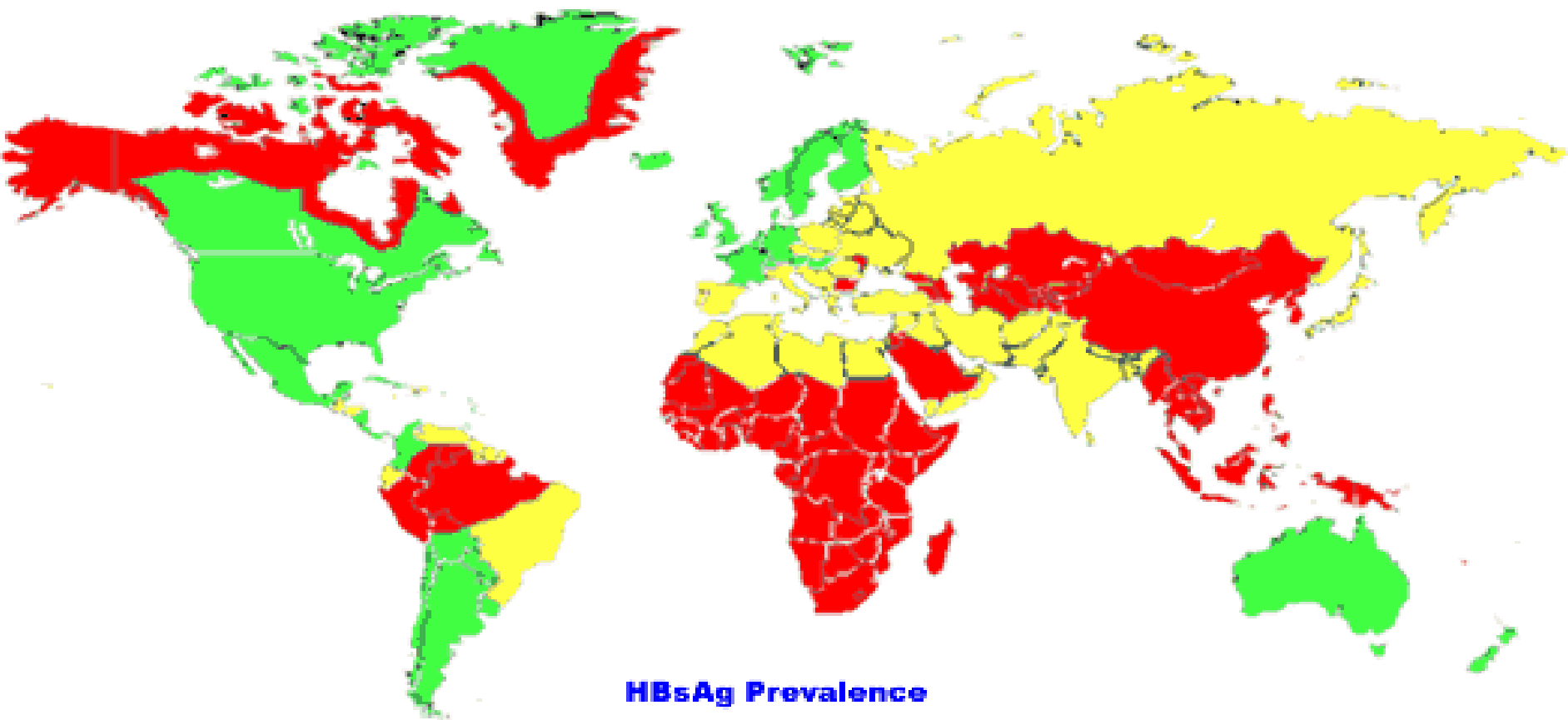


## Clinical presentation:

- Insidious onset.
- Anorexia.
- Abdominal discomfort.
- Nausea.
- Vomiting.
- Arthralgia.
- Jaundice.



# Geographic Distribution of Chronic HBV Infection



**HBsAg Prevalence**

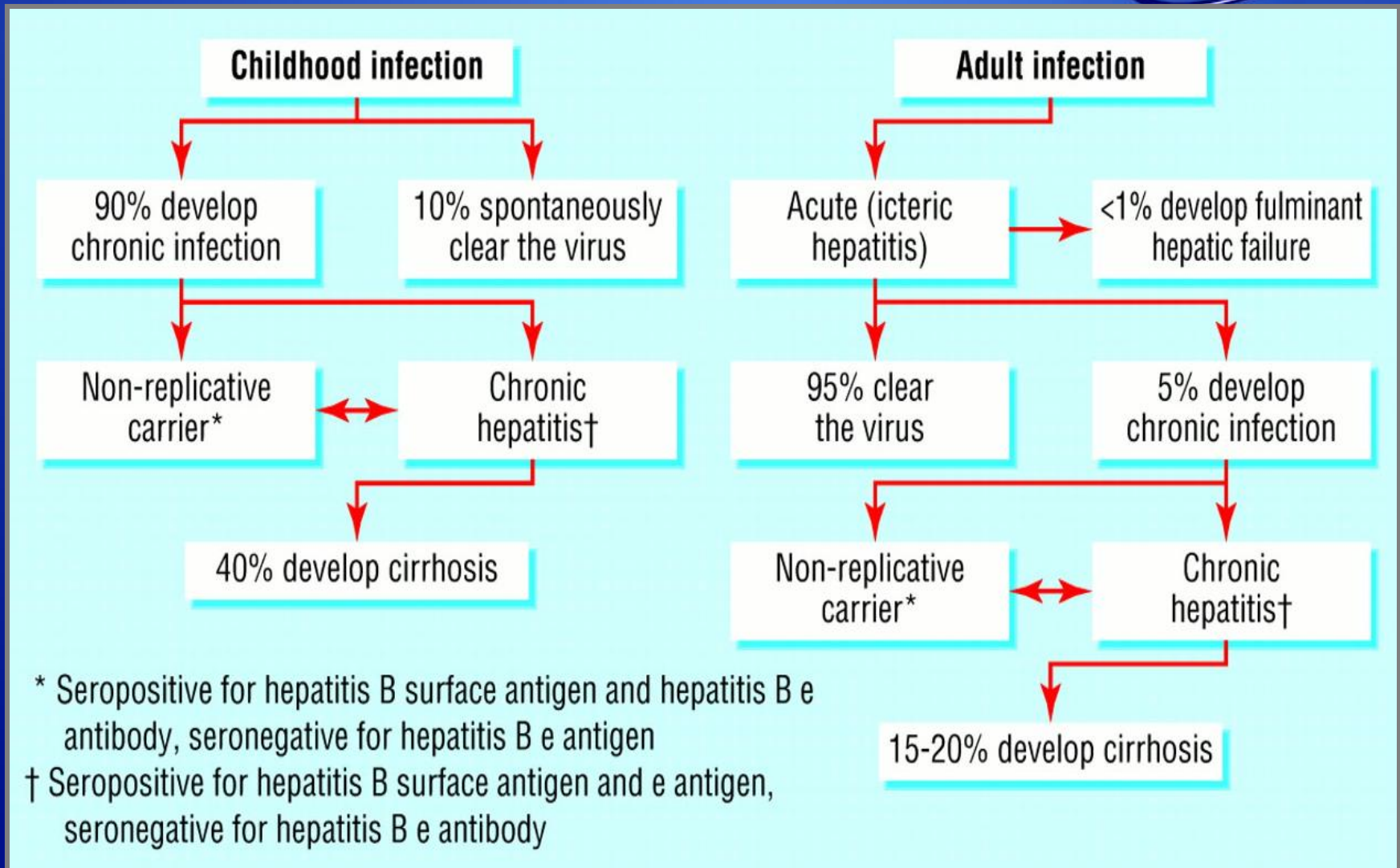
- 8% - High
- 2-7% - Intermediate
- <2% - Low

**More than  
500,000  
death/year**

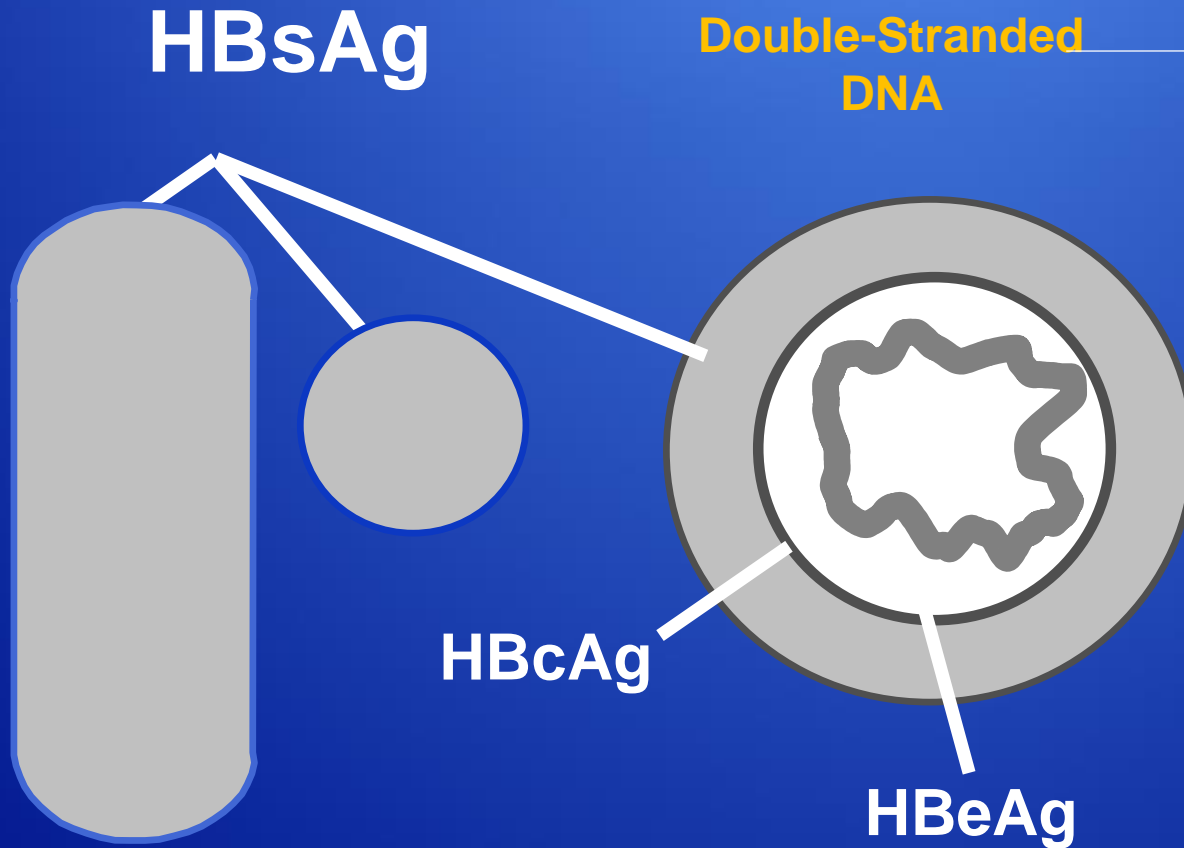
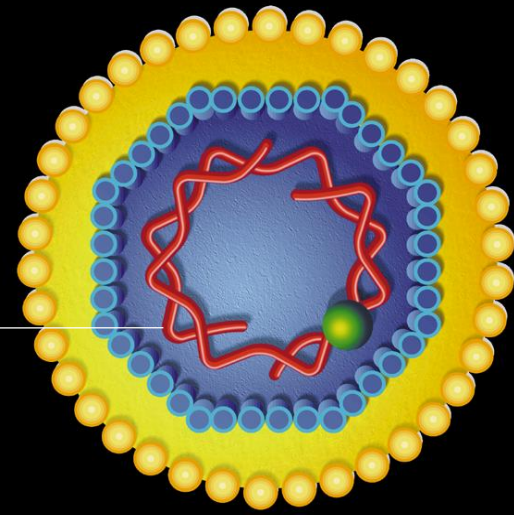
***2 billion people infected***

**360  
million  
CHB**

# Natural History



# Hepatitis B Virus



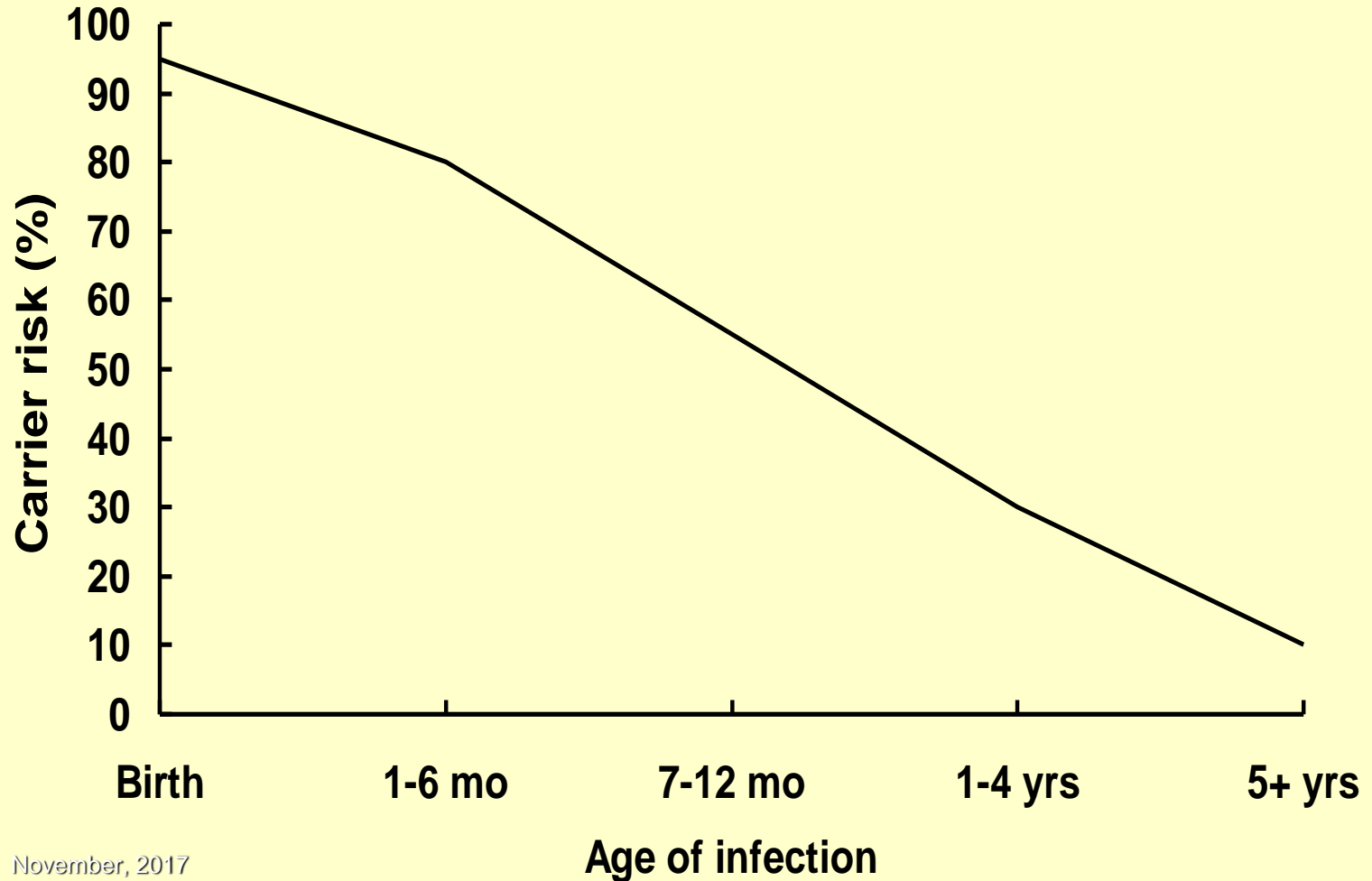
The presence of HBsAg indicates active infection or chronic carrier.  
Antibody to HBsAg, from either disease or vaccine, indicates immunity.

# Chain of infection



- **Agent:** Double strand DNA.  
Serotypes adw, ayw, adr, ayr.
- **Reservoir:** Human (case + carrier).
- **I.P.** 2-3 months.
- **P.C.** One week of I.P. + illness period + carriage.
- **Carriage depends on age at infection;**
  - <5 yrs, 30%-90% chronicity
  - >5 yrs, 2%-10% chronicity

# Risk of Chronic HBV Carriage by Age of Infection



# Concentration of Hepatitis B Virus in Various Body Fluids

<b>High</b>	<b>Moderate</b>	<b>Low/Not Detectable</b>
blood	semen	urine
serum	vaginal fluid	feces
wound exudates	saliva	sweat
		tears
		breastmilk



# Hepatitis B Virus

## Modes of Transmission

- Parenteral
- Sexual
- Perinatal

# Modes of transmission:



- Percutaneous and permucosal exposure to:
  - infective body fluids
  - Blood transfusion
  - Organs transplants
  - Sharing needles
  - Haemodialysis
  - Needlestick
  - Tattooing
  - Razors & toothbrushes.

# Modes of transmission:



- **Sexual transmission.**
- **Perinatal transmission** especially when HBs Ag carrier mothers are also HBe Ag positive.

# Prevention and control



- **Hepatitis B Vaccine**

Subunit recombinant HBs Ag **IM** in the deltoid region.

3 dose series, typical schedule 0, 1, 6 months - no maximum time between doses (no need to repeat missed doses or restart)

- Wide scale **immunization of infants** (revise compulsory vaccination schedule).

- **Immunization of high risk persons.**

Haemodialysis patients.

Bleeding disorders.

Susceptible households.

Health care personnel.

# Prevention and control



- **Blood banks:**

Avoid donors from risky groups.

Education & history taking.

Testing for HBs Ag.

- **Discourage:**

Tattooing, Drug abuse,

Extramarital sexual relations.

- **Needle stick**

Single dose of HBIG (24 hours).

Vaccine series.

# Prevention and control

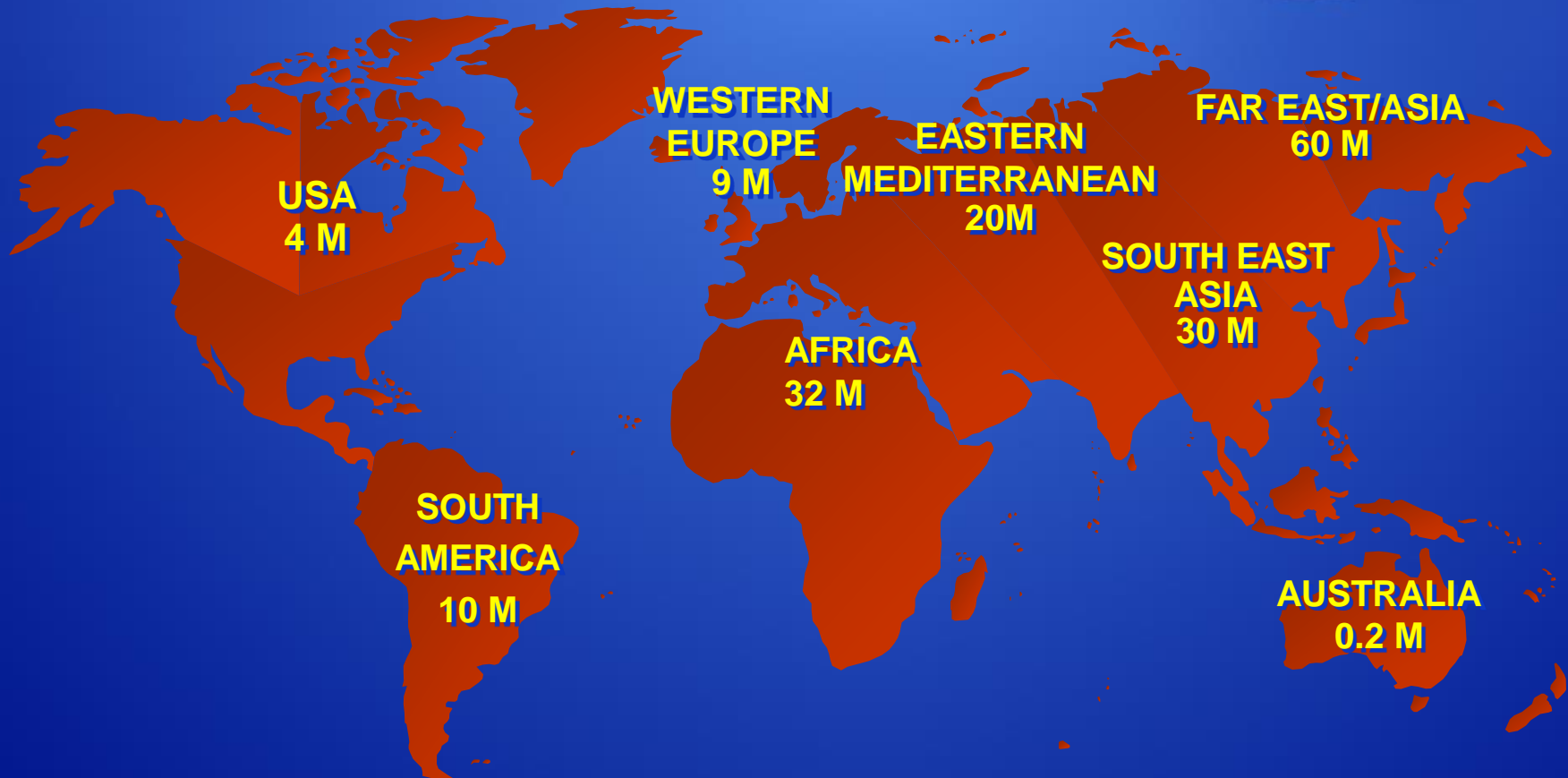


- **Sexual exposure**
  - Single dose of HBIG (14 days) and
  - Vaccination.
  
- **Infants to HBsAg +ve mothers.**
  - 0.5 ml HBIG (IM).
  - First dose of the vaccine.
  - 2<sup>nd</sup> & 3<sup>rd</sup> doses at 1 & 6 months later.
  
- **Health care personnel.**



# Hepatitis C

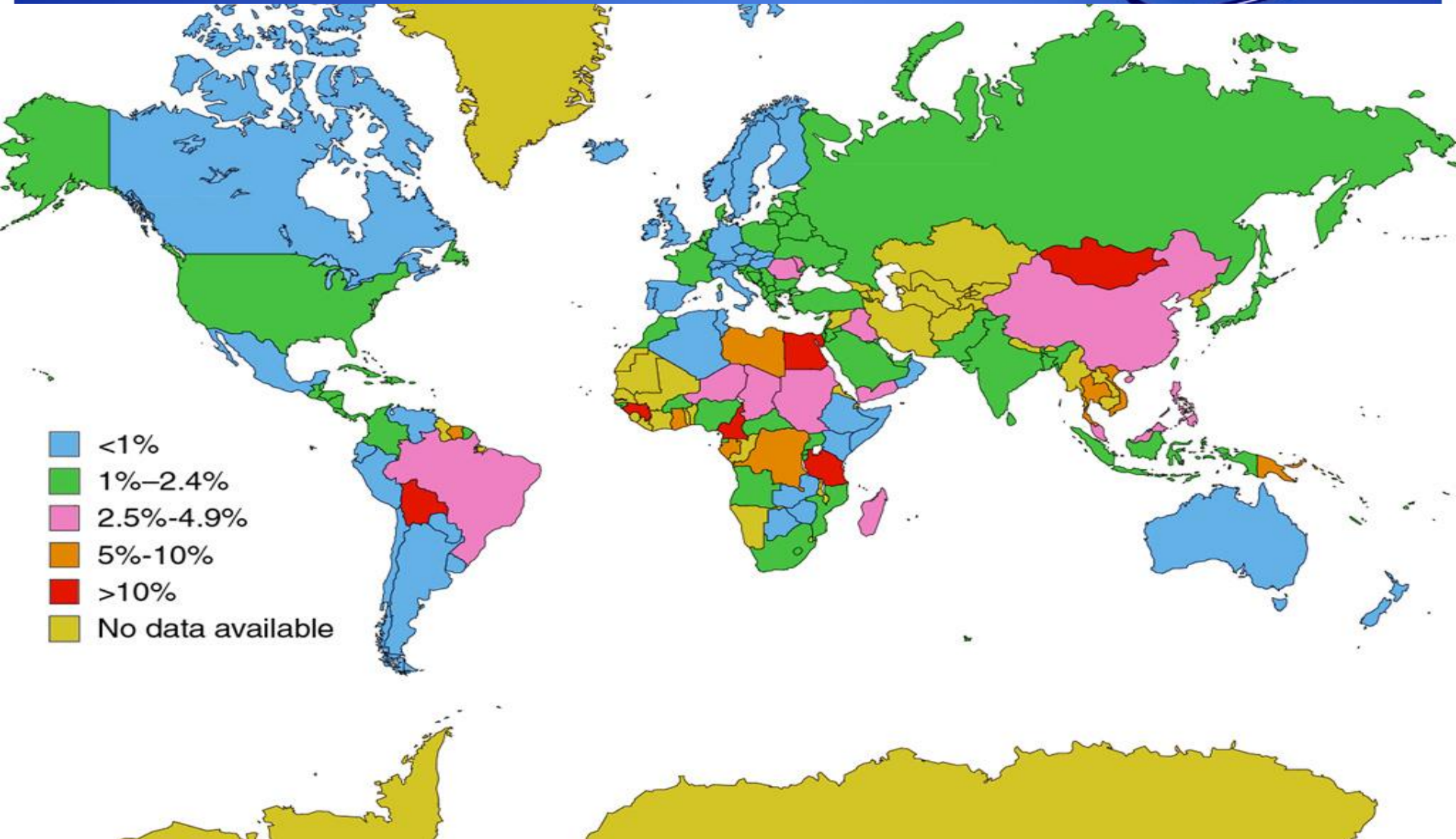
# Hepatitis C



**170 Million Hepatitis C virus (HCV) carriers**  
**3-4 MM new cases / year**



# Hepatitis C



# AGE SPECIFIC PREVALENCE OF ANTIBODY TO HCV/ANTI-HCV AMONG HEALTHY SAUDIS

Age Group (years)	Community Based Study		
	No. tested	Anti-HCV Pos. (%)	Location
1 – 10	1214	0.6	Central Province
	490	0.0	Eastern Province
	677	0.4	North-Western Province
	1096	0.9	South-Western Province
	1019	1,9	Southern Province
10 – 19	504	6 (1.2)	Gizan
20 – 29	361	4 (1.1)	Gizan
30 - 39	290	6 (2.1)	Gizan
40 – 49	183	6 (3.3)	Gizan
> 50	144	5 (3.5)	Gizan
<b>Total</b>	<b>1482</b>	<b>27 (1.8)</b>	<b>Gizan</b>

# PREVALENCE OF ANTIBODY TO HCV TO SAUDI HIGH RISK GROUPS



High Risk Group	No. Tested	No. Pos.	%	Location
Hemophiliacs	28	22	78.6	KKUH, Riyadh
Thalassaemia and sickle cell disease	78	26	33.3	KKUH, Riyadh
$\beta$ -thalassaemia major	20	14	70.0	KKUH, Riyadh*
Sickle cell anaemia	55	10	18.2	KKUH, Riyadh*
Patients with sexually transmitted diseases	220	35	15.9	KKUH, Riyadh*

November, 2017 <sup>2<sup>nd</sup></sup>-generation anti-HCV tests and confirmation were only done in this study.

# ANTI-HCV IN HAEMODYLYSIS PATIENTS IN SAUDI POPULATION



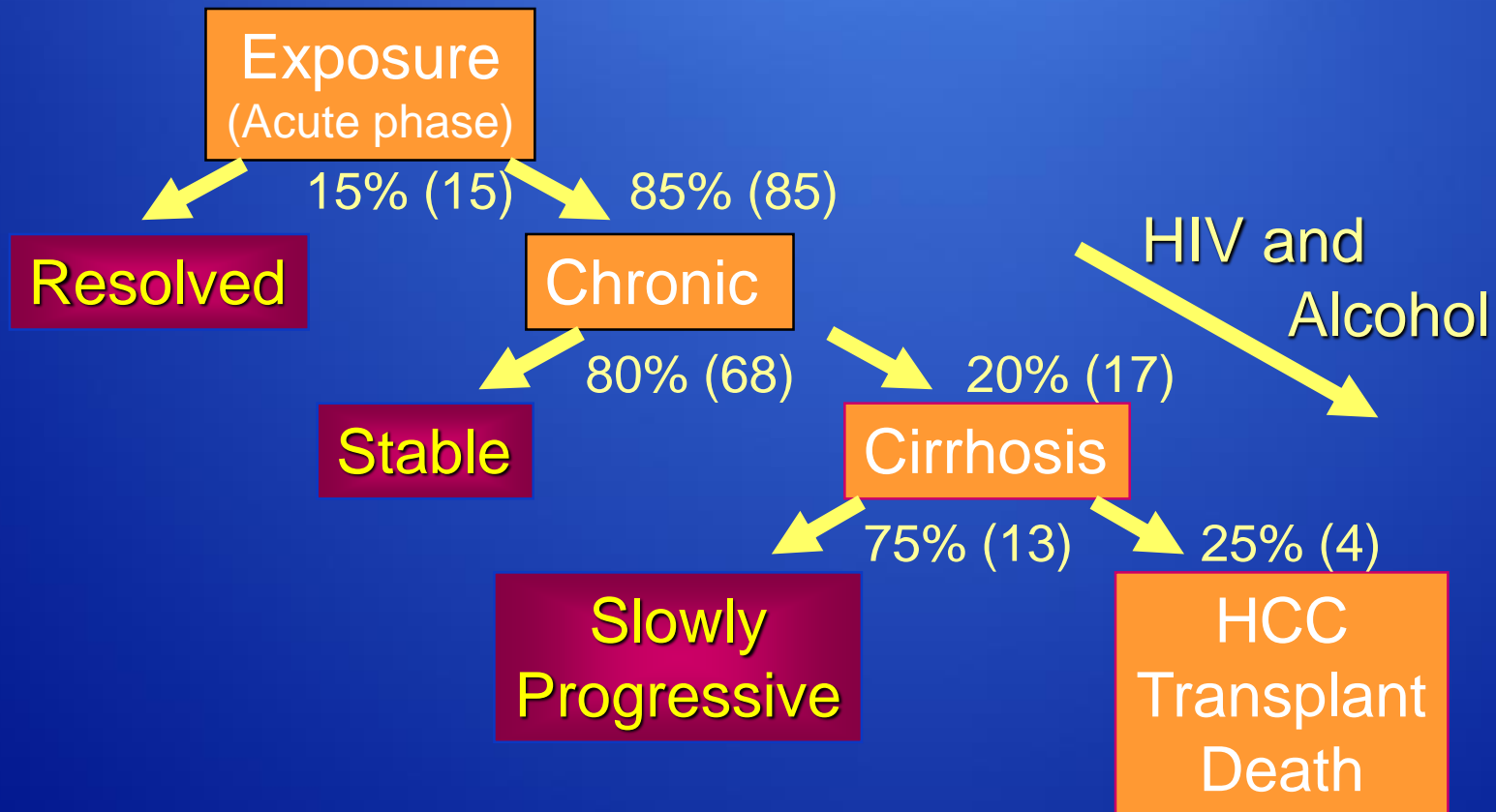
Author	No. of Persons	Type of Test	%
Fakunle et al	895	ELISA I	53.7
Al-Mugeriren et al	20 Children	ELISA I	45.0
Ayoola et al	74	ELISA I	41.9
Huraib et al	22 HD Centre 1147 Persons	ELISA II	<b>68.8</b>

# Hepatitis C Virus Genotypes



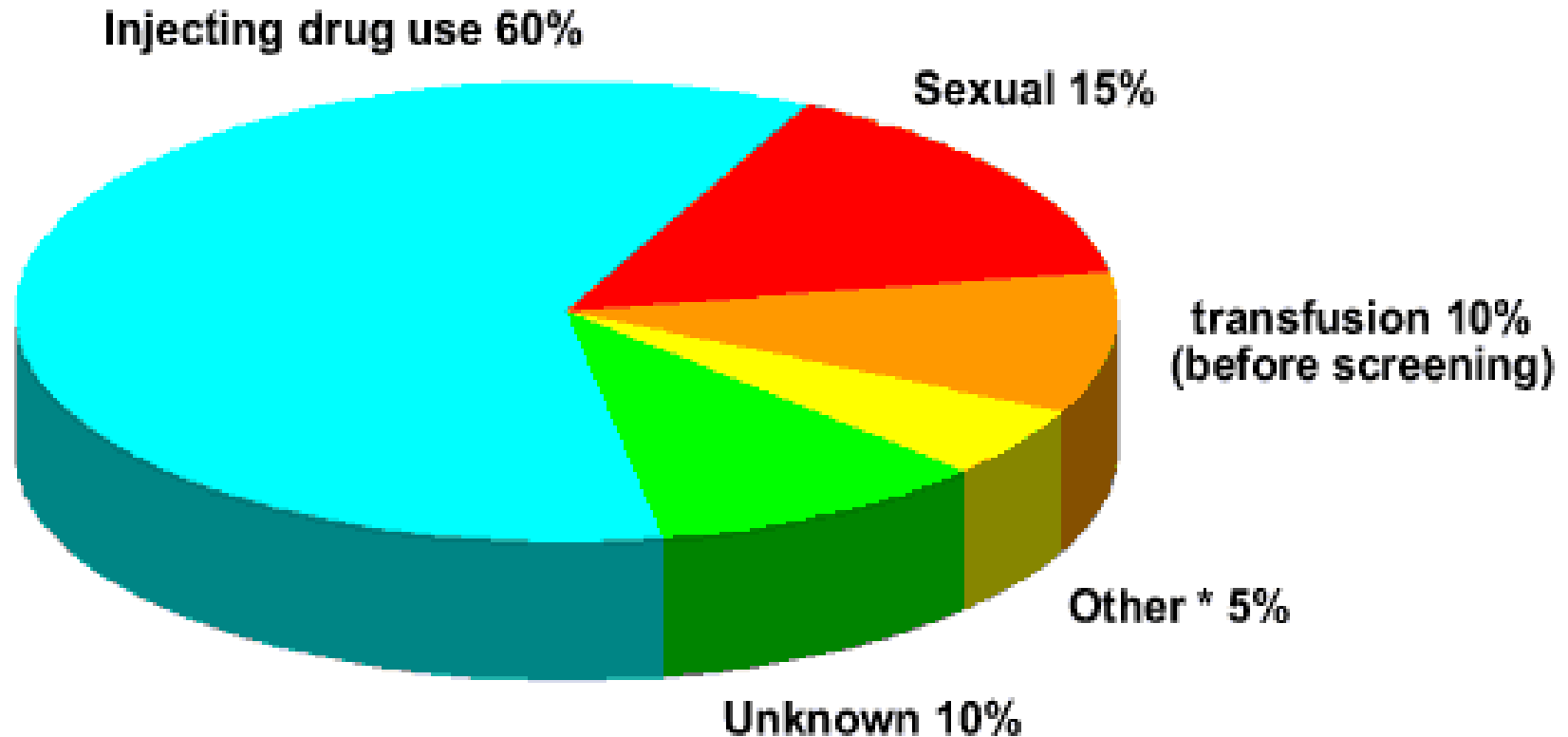
- 11 (6 major) with many subtypes and quasispecies
  - The predominate genotype in Saudi is Genotype 4 (62.9% )
  - Europe & America Genotype 1 → 75 (24.8) %
  - Genotype 2 = 10.8 (7.4) %
  - Genotype 3 = 5.8 (5.9) %
  - Genotype 1 & 4 → Poor response to therapy
- } → severe disease

# Natural History of HCV Infection



*MJ Semin Liver Dis 1995; 15:  
Management of Hepatitis C NIH Consensus Statement 1997; March  
24-26:15(3).*

# Sources of Infection for Persons with Hepatitis C



\*Nosocomial: Health-care work; Perinatal

# Important HCV Transmission Modes

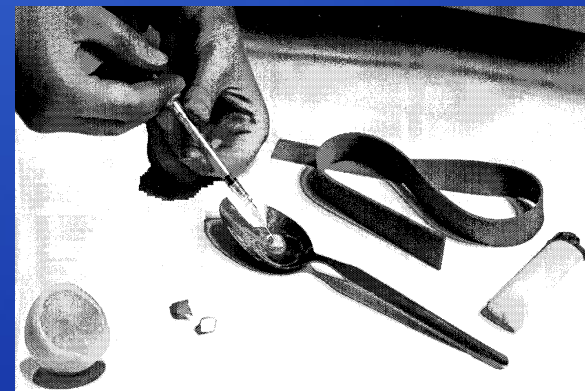


## Blood transfusion



**1:100,000 in US**

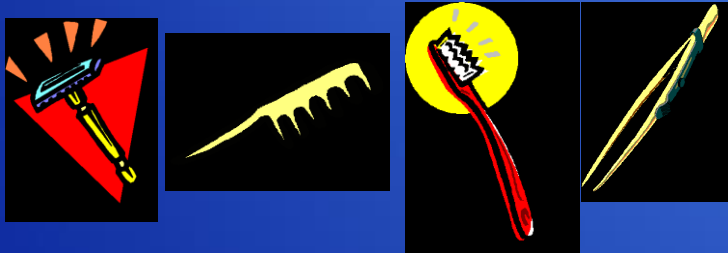
## IV drug abuse



**80% infected in first year**



# Un-common HCV Transmission Modes



Household transmission

?



Needle stick injury

3%



Vertical  
transmission  
mother - Child

1-5%

## Other Transmission Issues

---

- **HCV not spread by kissing, hugging, sneezing, coughing, food or water, sharing eating utensils or drinking glasses, or casual contact**
- **Do not exclude from work, school, play, child-care or other settings based on HCV infection status**

# Features of Hepatitis C Virus Infection



<b>Incubation period</b>	Average 6-7 weeks Range 2-26 weeks
<b>Acute illness (jaundice)</b>	Mild ( $\leq 20\%$ )
<b>Case fatality rate</b>	Low
<b>Chronic infection</b>	60%-85%
<b>Chronic hepatitis</b>	Age-related 10%-70%
<b>Cirrhosis</b>	$< 5\%$ -20%
<b>Mortality from CLD</b>	1%-5%

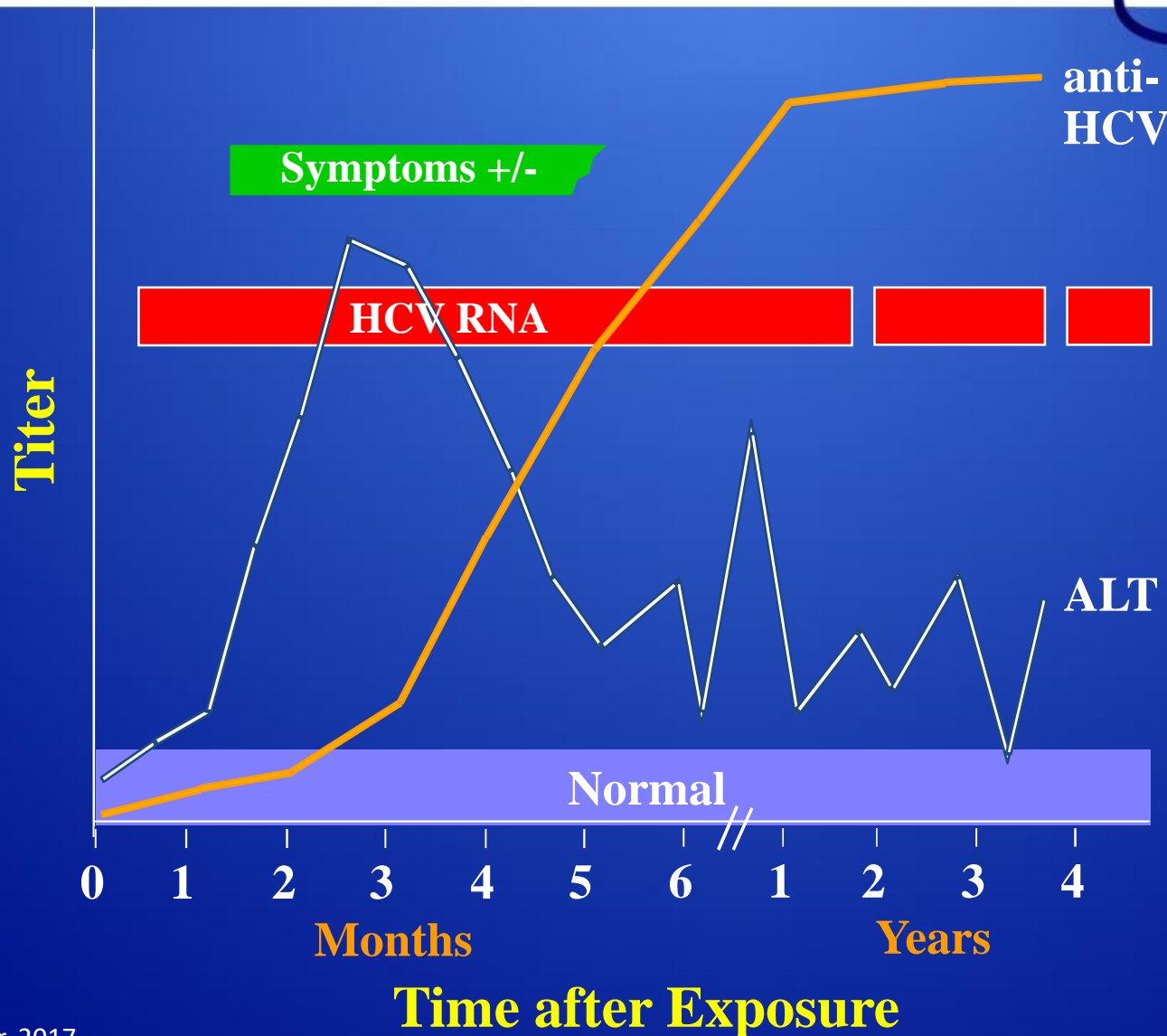
# Chronic Hepatitis C

## Factors Promoting Progression or Severity



- Increased alcohol intake
- Age > 40 years at time of infection
- HIV co-infection
- Other
  - Male gender
  - Chronic HBV co-infection

# Serologic Pattern of Acute HCV Infection with Progression to Chronic Infection



# Perinatal Transmission of HCV



- Transmission only from women HCV-RNA positive at delivery
  - Average rate of infection 6%
  - Higher (17%) if woman co-infected with HIV
  - Role of viral titer unclear
- No association with
  - Delivery method
  - Breastfeeding
- Infected infants do well
  - Severe hepatitis is rare

# Sexual Transmission of HCV



- Case-control, cross sectional studies
  - Infected partner, multiple partners, early sex, non-use of condoms, other STDs, sex with trauma, **Partner studies**
  - Low prevalence (1.5%) among long-term partners
    - infections might be due to common percutaneous exposures (e.g., drug use), BUT
  - Male to female transmission more efficient
    - more indicative of sexual transmission

# Household Transmission of HCV



- Rare but not absent
- Could occur through percutaneous/mucosal exposures to blood
  - Contaminated equipment used for home therapies
    - IV therapy, injections
  - Theoretically through sharing of contaminated personal articles (razors, toothbrushes)



# Public Health Service Guidelines for Anti-HCV-Positive Persons



## Anti-HCV-positive persons should:

- Be considered potentially infectious
- Keep cuts and skin lesions covered
- Be informed of the potential for sexual transmission
- Be informed of the potential for perinatal transmission
  - no evidence to advise against pregnancy or breastfeeding

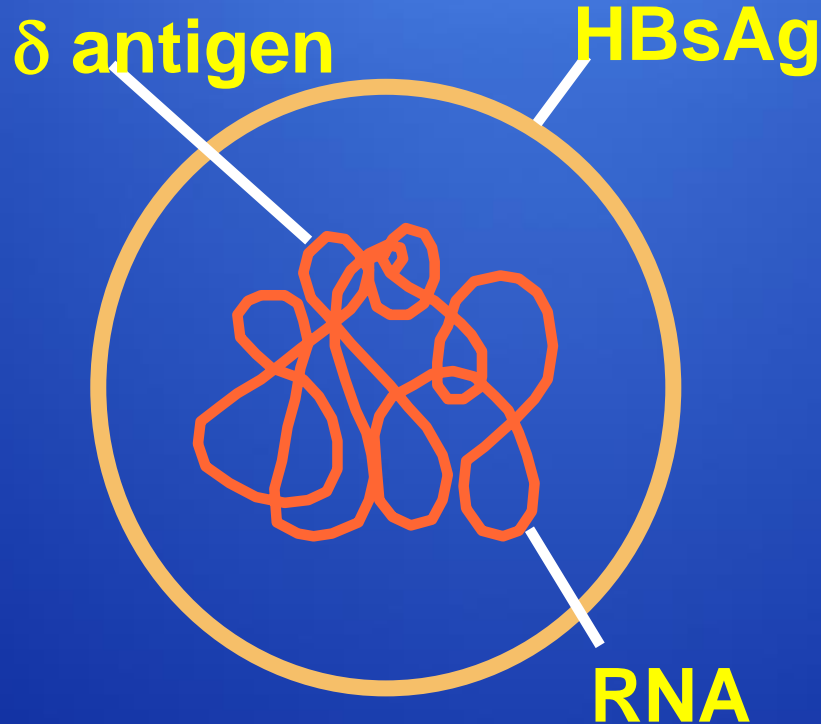
## Anti-HCV-positive persons should not:

- Donate blood, organs, tissue, or semen
- Share household articles (e.g., toothbrushes, razors)



# Hepatitis D

# Hepatitis D (Delta) Virus



**HDV is a defective single-stranded RNA virus (delta Ag)**

**It requires HBV for synthesis of envelope protein composed**

**of HBsAg**  
November, 2017

# Hepatitis D - Clinical Features



- **Coinfection with HBV**
  - severe acute disease
  - low risk of chronic infection
- **Superinfection on top of chronic HBV**
  - usually develop chronic HDV infection
  - high risk of severe chronic liver disease

# Hepatitis D Virus

## Modes of Transmission



- Percutaneous exposures
  - ▶ injecting drug use
- Permucosal exposures
  - ▶ sex contact

# Hepatitis D - Prevention



- HBV-HDV Coinfection
  - Pre or postexposure prophylaxis to prevent HBV infection (HBIG and/or Hepatitis B vaccine)
- HBV-HDV Superinfection
  - Education to reduce risk behaviors among persons with chronic HBV infection



# Hepatitis E

# Hepatitis E - Clinical Features



- **Incubation period:** Average 40 days  
Range 15-60 days
- **Case-fatality rate:** Overall, 1%-3%  
Pregnant women, 15%-25%
- **Illness severity:** Increased with age
- **Chronic sequelae:** None identified



# Hepatitis E - Epidemiologic Features



- Most outbreaks associated with fecally contaminated drinking water
- Minimal person-to-person transmission

# Geographic Distribution of Hepatitis E



Outbreaks or Confirmed Infection in >25% of Sporadic Non-ABC Hepatitis



# Viral Hepatitis - Overview

## Type of Hepatitis

	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>
Source of virus	feces	blood/ blood-derived body fluids	blood/ blood-derived body fluids	blood/ blood-derived body fluids	feces
Route of transmission	fecal-oral	percutaneous permucosal	percutaneous permucosal	percutaneous permucosal	fecal-oral
Chronic infection	no	yes	yes	yes	no
Prevention	pre/post- exposure immunization	pre/post- exposure immunization	blood donor screening; risk behavior modification	pre/post- exposure immunization; risk behavior modification	ensure safe drinking water





# References

1-Nelson KE, Thomas L. Viral hepatitis. In: Infectious disease Epidemiology, theory and Practice. 2<sup>nd</sup> edition . Edited by Nelson KE and Williams CM 2007. Published by Jones & Bartlett. Toronto Pages895-939.

