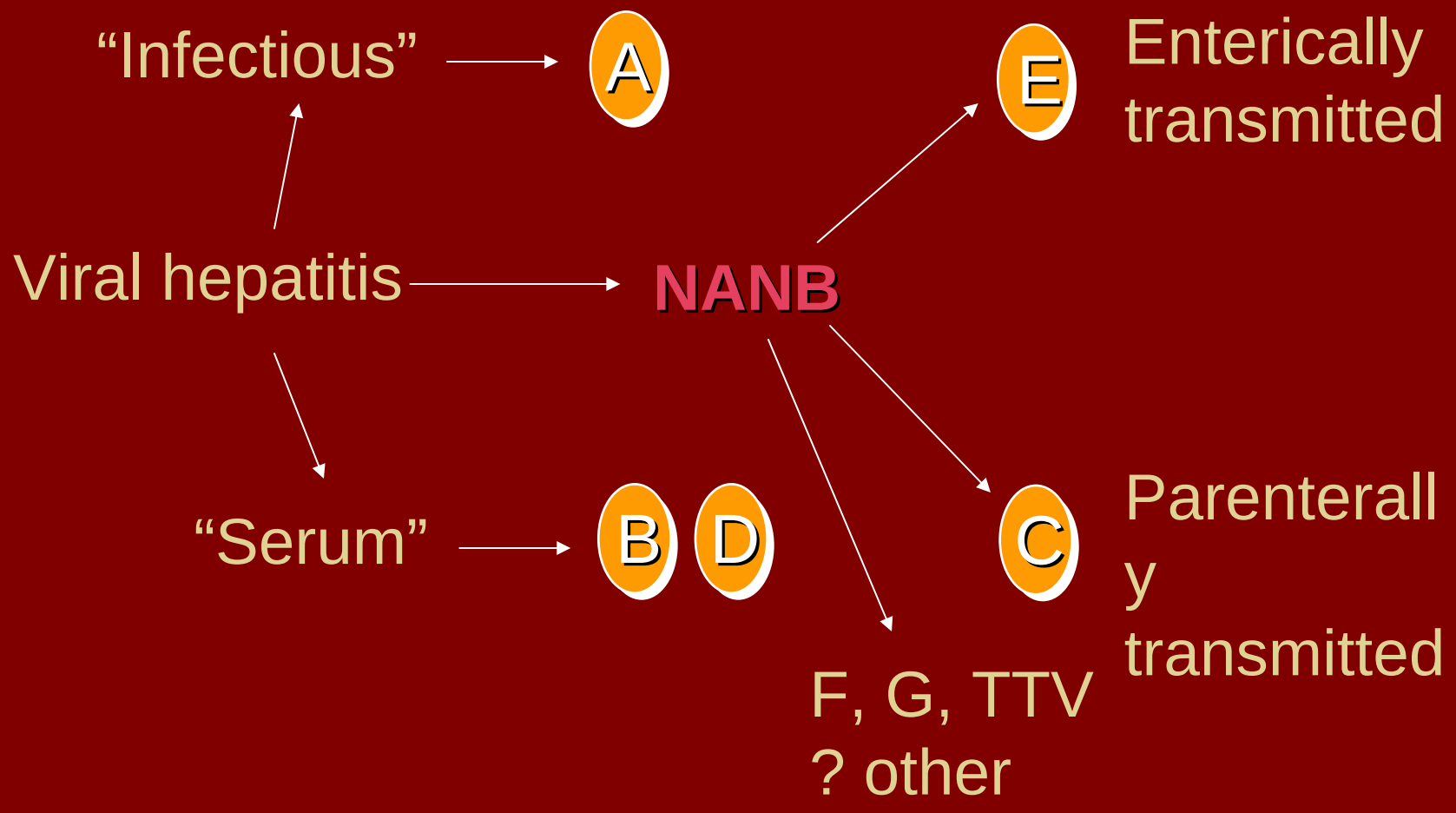
HEPATITIS VIRUSES

- ACUTE HEPATITIS:
  - HEPATITIS A
  - **HEPATITIS B**
  - HEPATITIS C
  - **HEPATITIS D**
  - HEPATITIS E
  - HEPATITIS G

Viral Hepatitis - Historical Perspectives

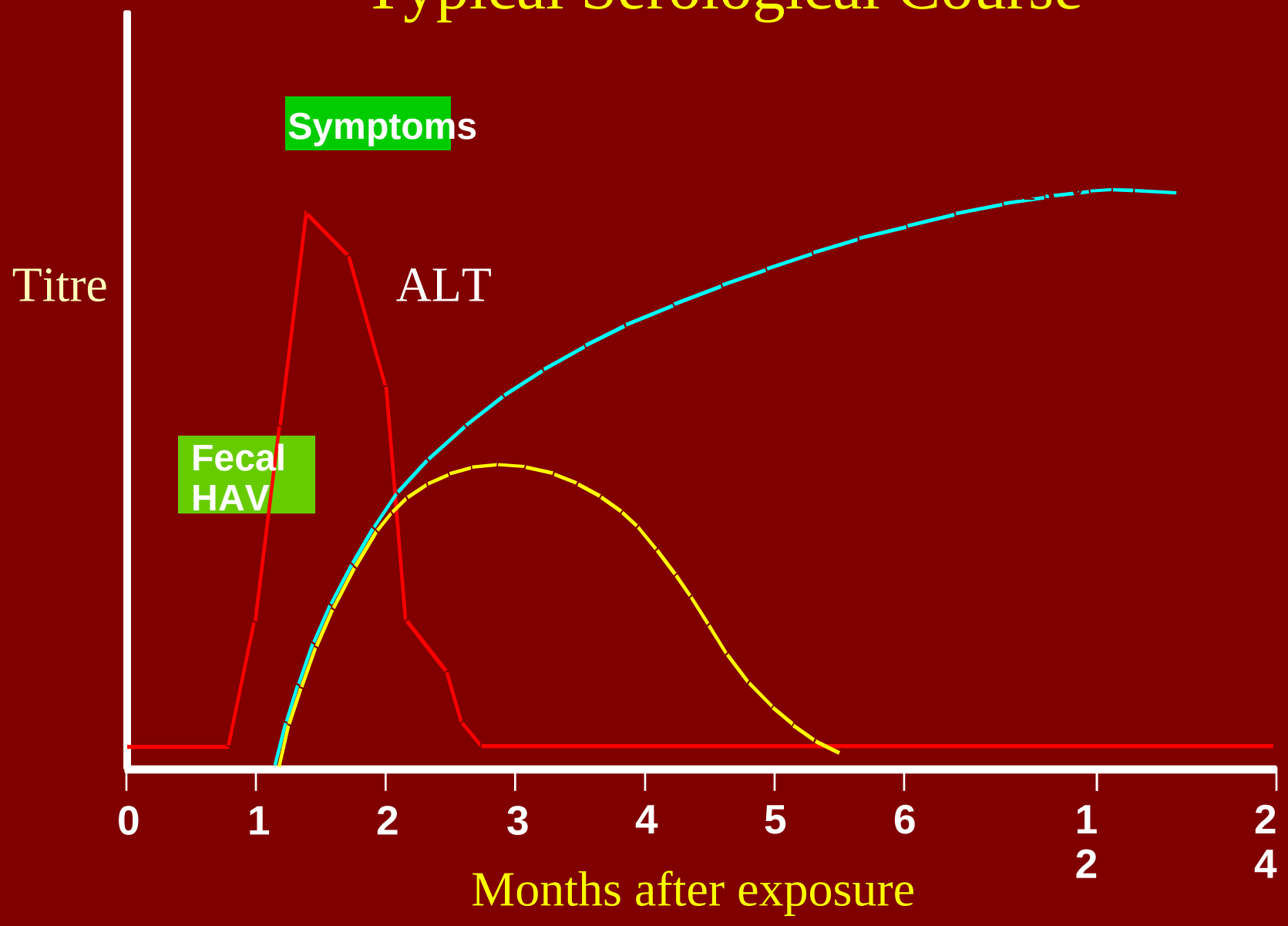


Type of Hepatitis

	A	B	C	D	E
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

Hepatitis A Infection

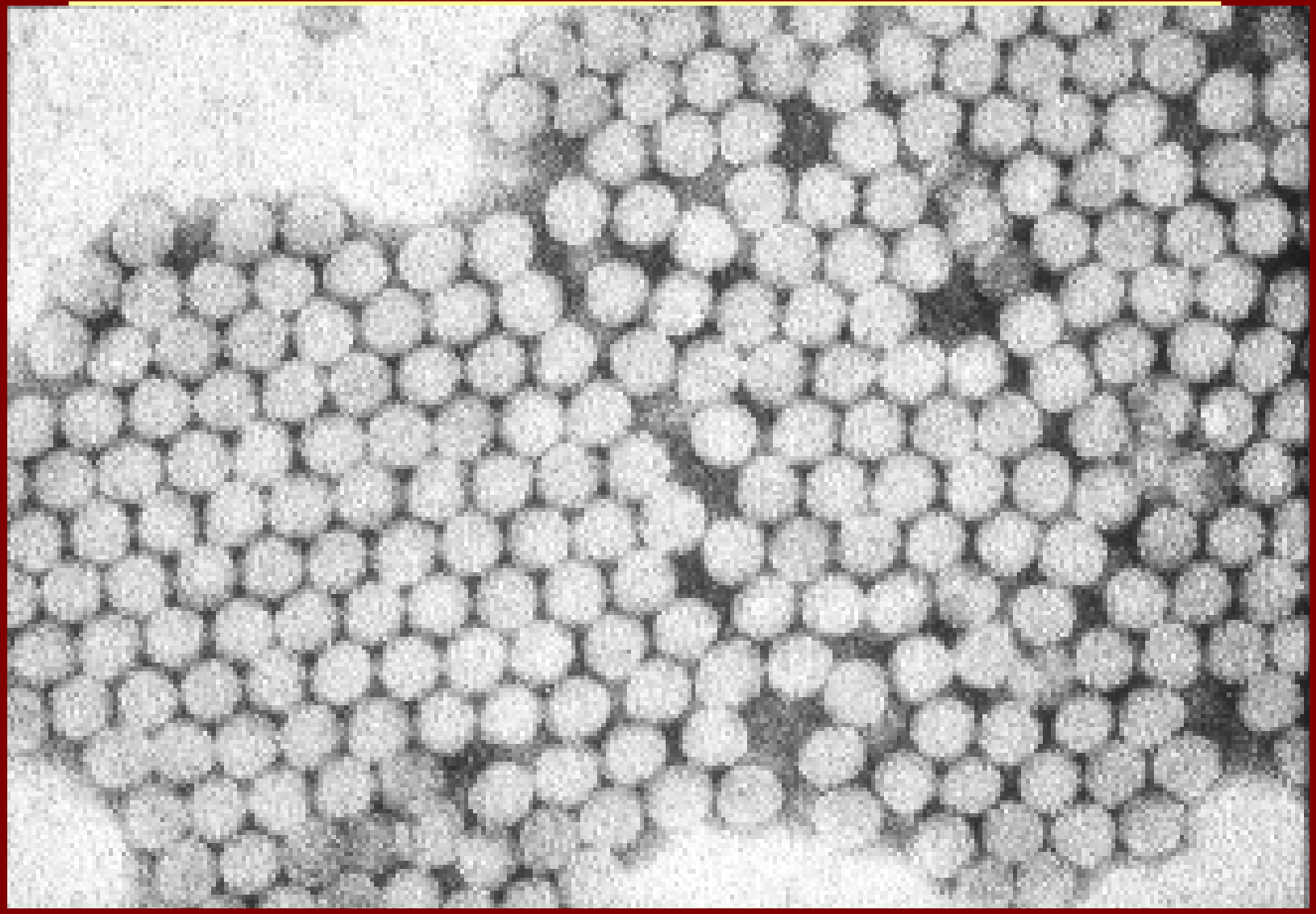
Typical Serological Course



Hepatitis A - Clinical Features

Incubation period:	Average 30 days Range 15-50 days
Jaundice by age group:	<6 yrs, <10% 6-14 yrs, 40%-50% >14 yrs, 70%-80%
Complications:	Fulminant hepatitis Cholestatic hepatitis Relapsing hepatitis
Chronic sequelae:	None

Hepatitis A Virus



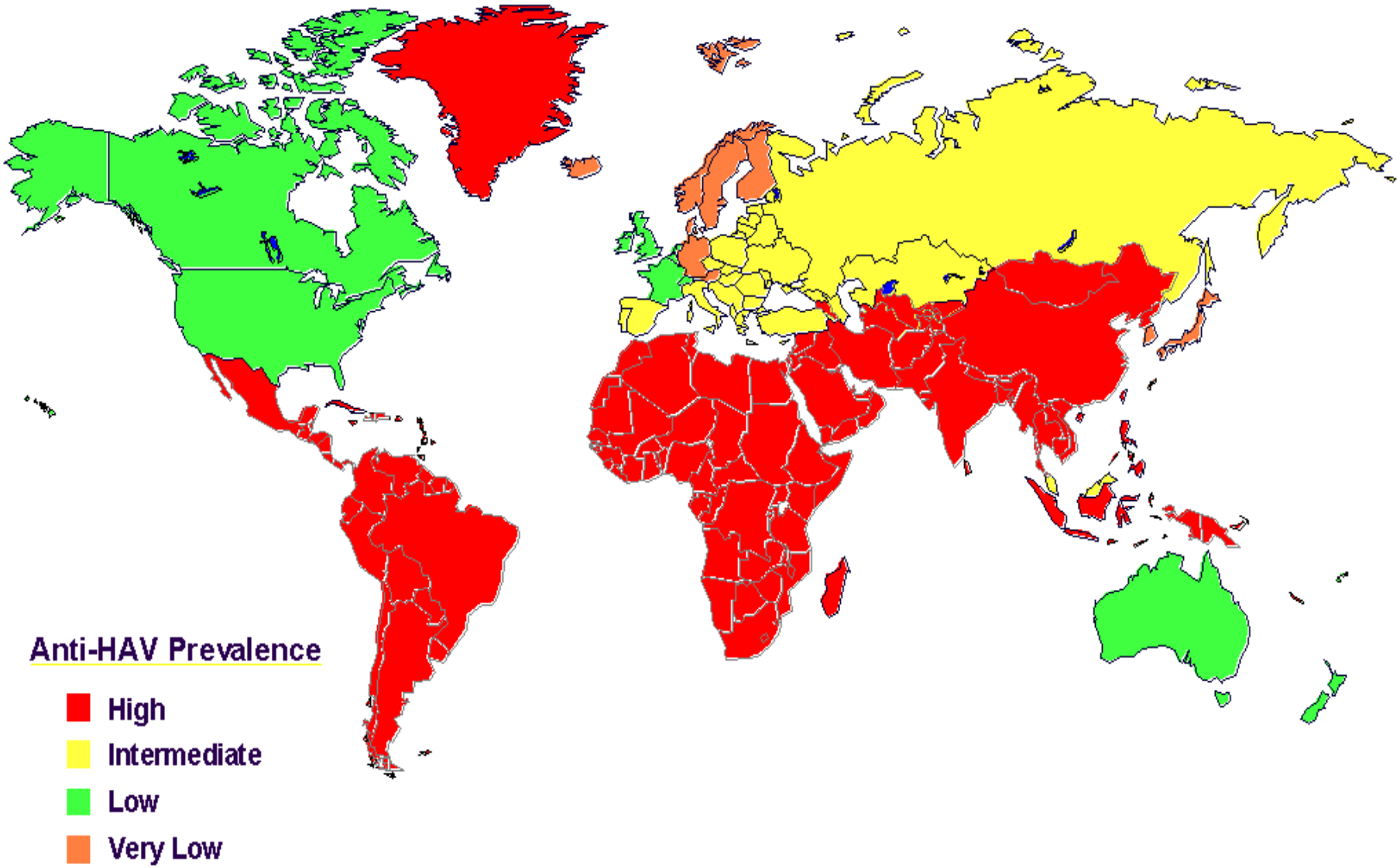
Hepatitis A Virus Transmission

- Close personal contact
  (e.g., household contact, sex contact, child day care centers)
- Contaminated food, water
  (e.g., infected food handlers, raw shellfish)
- Blood exposure (rare)
  (e.g., injecting drug use, transfusion)

Global Patterns of Hepatitis A Virus Transmission

Endemicity	Disease Rate	Peak Age of Infection	Transmission Patterns
High	Low to High	Early childhood	Person to person; outbreaks uncommon
Moderate	High	Late childhood/ young adults	Person to person; food and waterborne outbreaks
Low	Low	Young adults	Person to person; food and waterborne outbreaks
Very low	Very low	Adults	Travelers; outbreaks uncommon

Geographic Distribution of HAV Infection



Laboratory Diagnosis

- Acute infection is diagnosed by the detection of HAV-IgM in serum by EIA.
- Past Infection i.e. immunity is determined by the detection of HAV-IgG by EIA.

Hepatitis A Vaccination Strategies
Epidemiologic Considerations

- Many cases occur in community-wide outbreaks
  - no risk factor identified for most cases
  - highest attack rates in 5-14 year olds
  - children serve as reservoir of infection
- Persons at increased risk of infection
  - travelers
  - homosexual men
  - injecting drug users

Hepatitis A Prevention - Immune Globulin

- Pre-exposure
  - travelers to intermediate and high HAV-endemic regions
- Post-exposure (within 14 days)

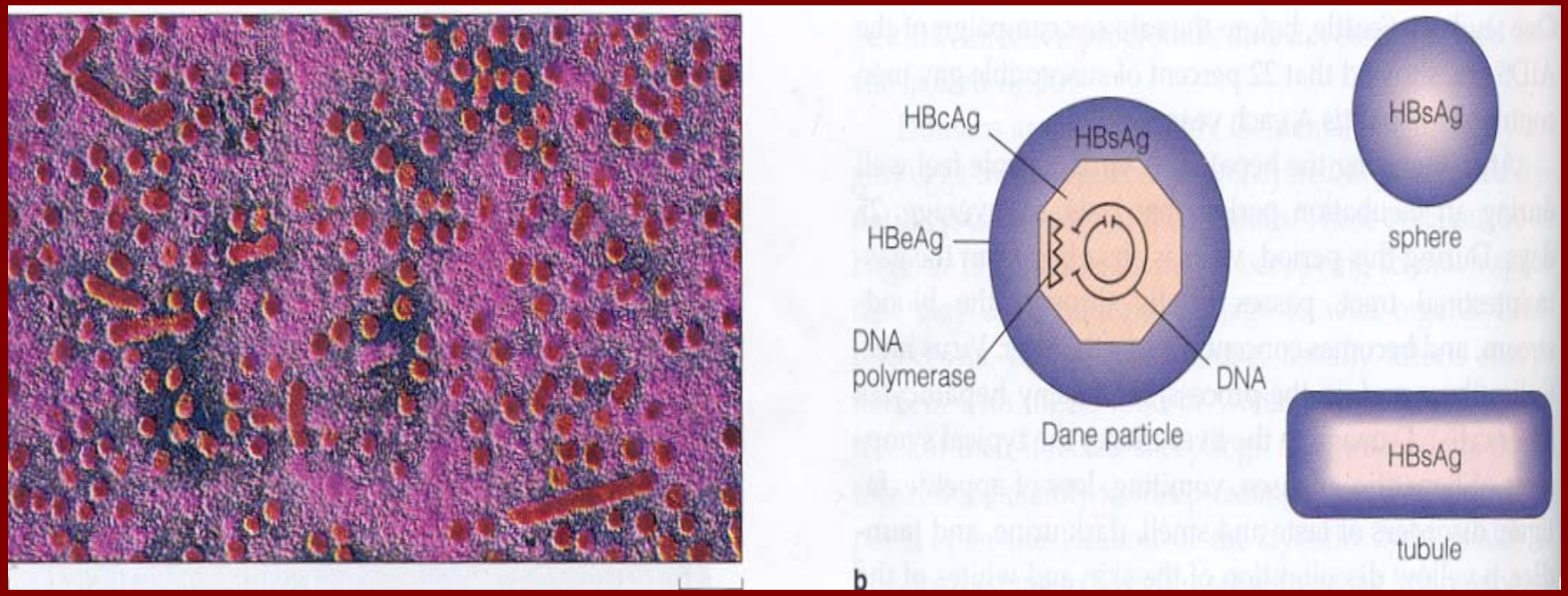
  Routine
  - household and other intimate contacts

  Selected situations
  - institutions (e.g., day care centers)
  - common source exposure (e.g., food prepared by infected food handler)

HEPATITIS B VIRUS

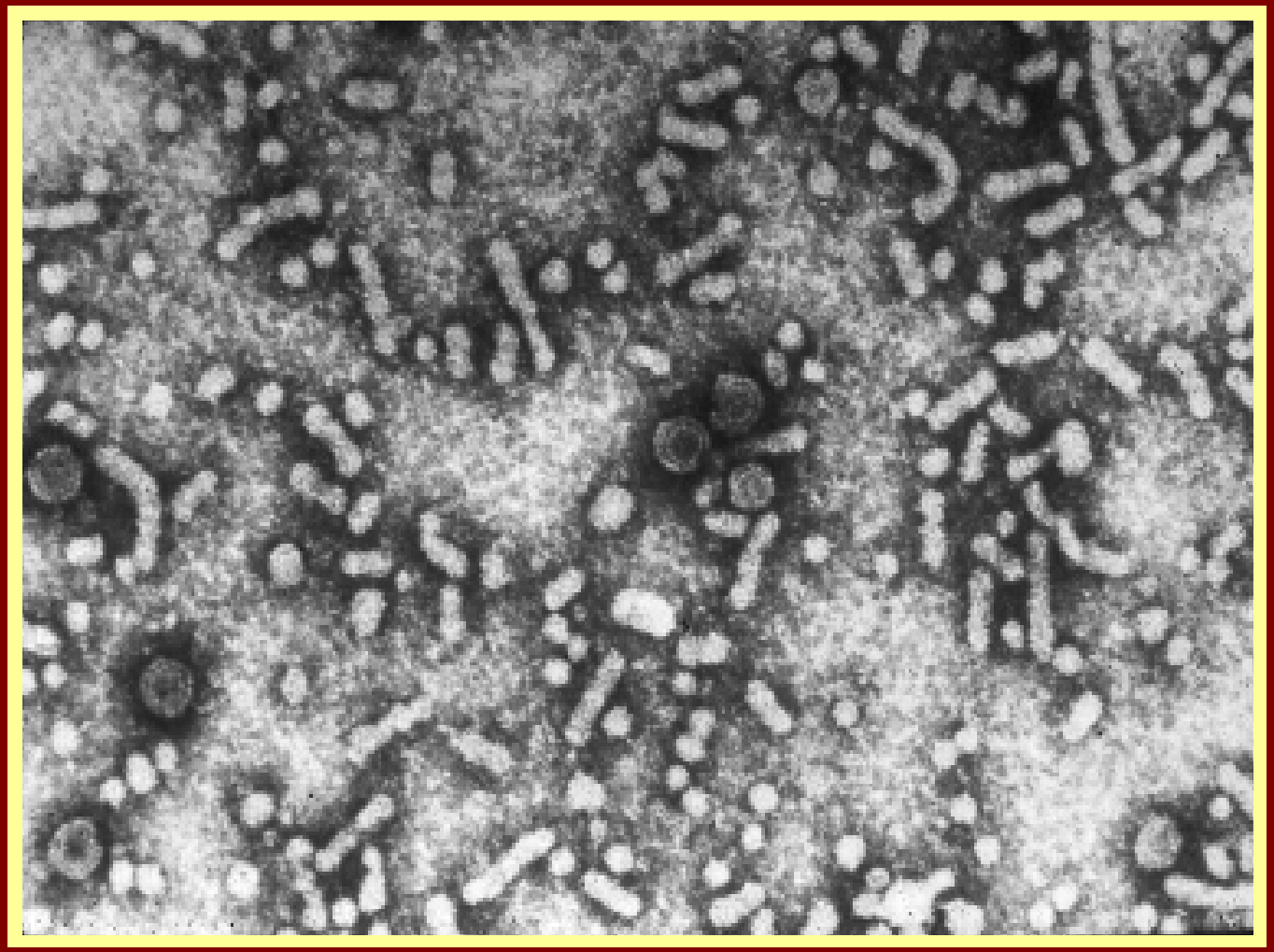
- AUSTRALIA ANTIGEN IS HB_SAg.
  - THE ANTIGEN WAS FIRST DETECTED BY BLUMBERG IN THE SERUM OF AN AUSTRALIAN ABORIGINE.
- IN 1970, USING IMMUNE ELECTRON MICROSCOPY, DANE AND HIS COLLEAGUES IDENTIFIED THE DANE PARTICLE.

HEPATITIS B VIRUS



- Colorized transmission electron micrograph pf the Dane particle. The structure of the Dane particle, sphere, and tubule is also shown.

Hepatitis B Virus



Hepatitis B - Clinical Features

Incubation period:	Average 60-90 days Range 45-180 days
Clinical illness (jaundice):	<5 yrs, <10% 5 yrs, 30%-50%
Acute case-fatality rate:	0.5%-1%
Chronic infection:	<5 yrs, 30%-90% 5 yrs, 2%-10%
Premature mortality from chronic liver disease:	15%-25%

Spectrum of Chronic Hepatitis B Diseases

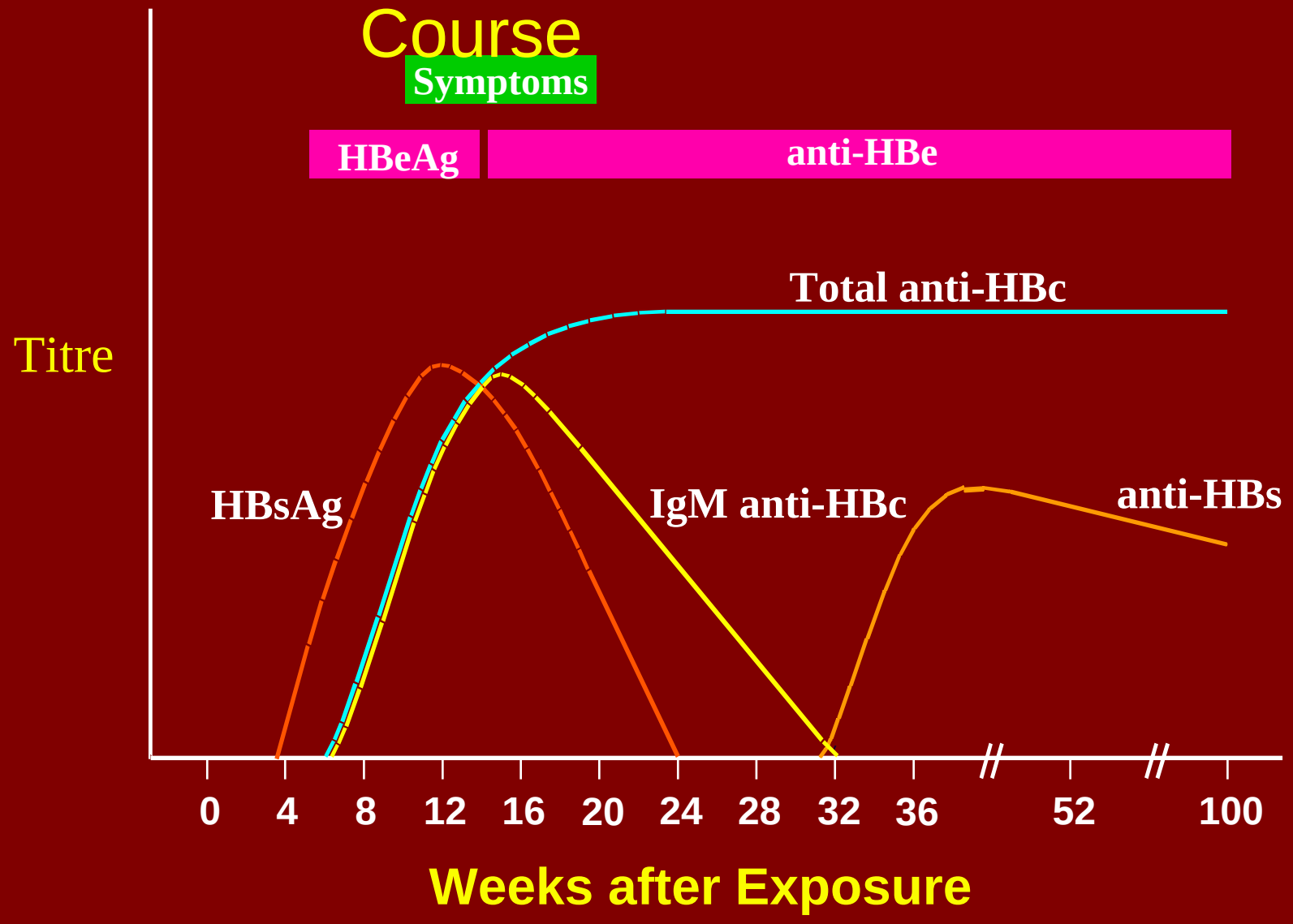
1 . Chronic Persistent Hepatitis - asymptomatic

2. Chronic Active Hepatitis - symptomatic exacerbations of hepatitis

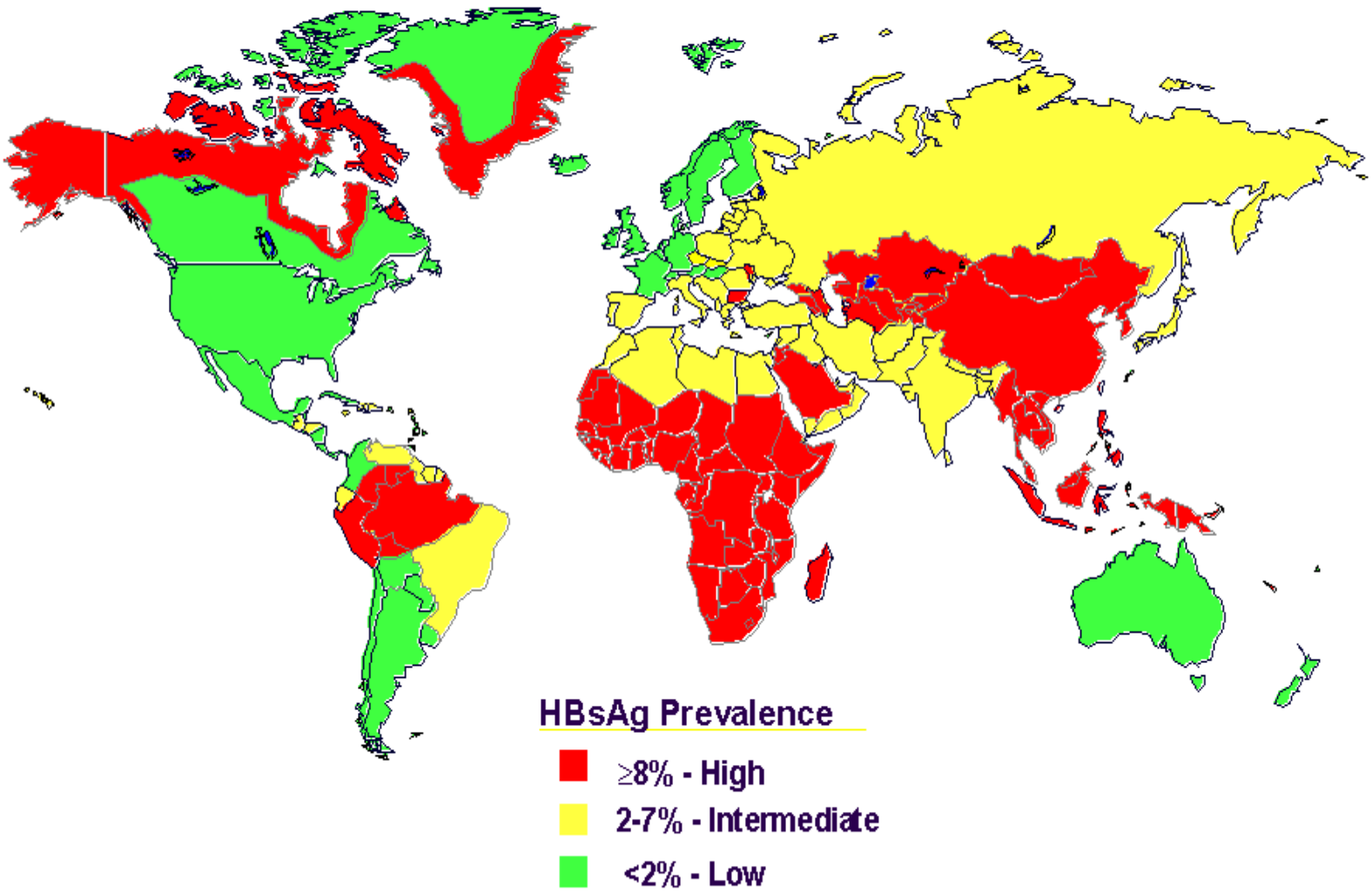
3. Cirrhosis of Liver

4. Hepatocellular Carcinoma

Acute Hepatitis B Virus Infection with Recovery: Typical Serologic Course



Geographic Distribution of Chronic HBV Infection



Concentration of Hepatitis B Virus in Various Body Fluids

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

Hepatitis B Virus
Modes of Transmission

- Sexual - sex workers and homosexuals are particular at risk.
- Parenteral - IVDA, Health Workers are at increased risk.
- Perinatal - Mothers who are HBeAg positive are much more likely to transmit to their offspring than those who are not. Perinatal transmission is the main means of transmission in high prevalence populations.

- HEPATITIS B VIRUS
- INJECT ONE MILLILITER OF HBV POSITIVE BLOOD INTO A SWIMMING POOL (APPROXIMATELY 24,000 GALLONS OF WATER), INJECT ONE MILLILITER INTO A PERSON - THERE IS A VERY GOOD CHANCE THAT DISEASE WILL DEVELOP.

HEPADNAVIRIDAE

- HEPATITIS B VIRUS (HBV)
- WORLDWIDE THERE ARE OVER 300 MILLION INFECTED PERSONS AND APPROXIMATELY 200 MILLION OF THOSE ARE CARRIERS.
- IT IS SECOND ONLY TO SMOKING AS A CAUSE OF CANCER.

RISK GROUPS

- Persons with multiple sex partners or diagnosis of a sexually transmitted disease
- Men who have sex with men
- Sex contacts of infected persons
- Injection drug users
- Household contacts of chronically infected persons

- **LONG-TERM EFFECTS WITHOUT VACCINATION** Chronic infection occurs in:

- 90% of infants infected at birth
- 30% of children infected at age 1 - 5 years
- 6% of persons infected after age 5 years
- Death from chronic liver disease occurs in:
- 15-25% of chronically infected persons

TRANSMISSION

- Occurs when blood or body fluids from an infected person enters the body of a person who is not immune.
- Infants born to infected mothers.
- Hemodialysis patients

- The virus is most efficiently transmitted through percutaneous introduction. Sexual transmission and perinatal transmission are less efficient, typically requiring high titers of virus. HBV is most concentrated in the liver and blood, with lesser amounts found in saliva and semen

SYMPTOMS

- An infected person may have zero, mild or severe symptoms that in some cases may prove fatal, in the elderly mortality rates can reach 10 to 15%. When symptoms occur they normally begin with anorexia, malaise, nausea and vomiting and often fever. After around 3-10 days dark urine occurs and jaundice may follow.

- Other symptoms may include itching and pale stools. Symptoms then typically subside and the period of illness normally lasts between 4 to 8 weeks. Frequently an acute hepatitis B infection is misdiagnosed as 'flu' and an infected person may not realize that they have been exposed to the virus.
- Some cases may develop into fulminant, fatal liver failure.

CARRIER

Hepatitis B carriers are people who are have chronic (long-term) infection with HBV and never recover fully from the infection; they carry the virus and can infect others for the rest of their lives. In the United States, about one million people carry HBV.

PATHOGENESIS

- The pathogenesis of both acute and viral hepatitis is slowly being unraveled. Thus far, most data show that members of the hepadnaviridae family are not highly cytotoxic per se. It appears that the intense levels of cellular death are primarily due to host defense mechanisms against the HBV infection..

- HBV is spread through having sex with an infected person without using a condom (the efficacy of latex condoms in preventing infection with HBV is unknown, but their proper use may reduce transmission).
- sharing needles or "works" when "shooting" drugs, through needlesticks or sharps exposures on the job,

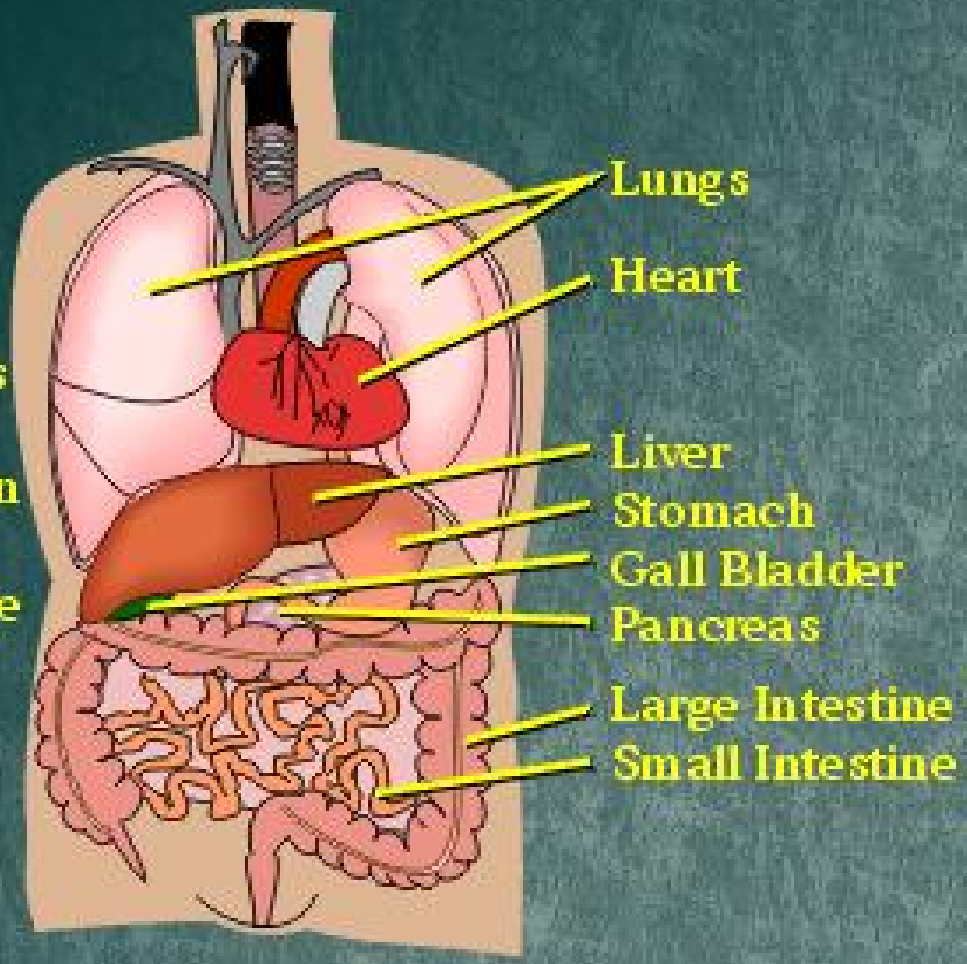
- **The Liver**
  The liver plays a pivotal role in helping the body maintain adequate levels of metabolites in the blood stream. The liver is also important in detoxifying potentially toxic chemicals that may enter our blood stream.

Human Torso Anatomy
(Male)

Original Clipart from CorelDRAW 8.0 CD

Some Liver Facts:

- the liver is one of the largest internal organs
- the liver's primary functions are blood metabolite regulation and detoxification
- the liver is one of the few organs which can regenerate if damaged



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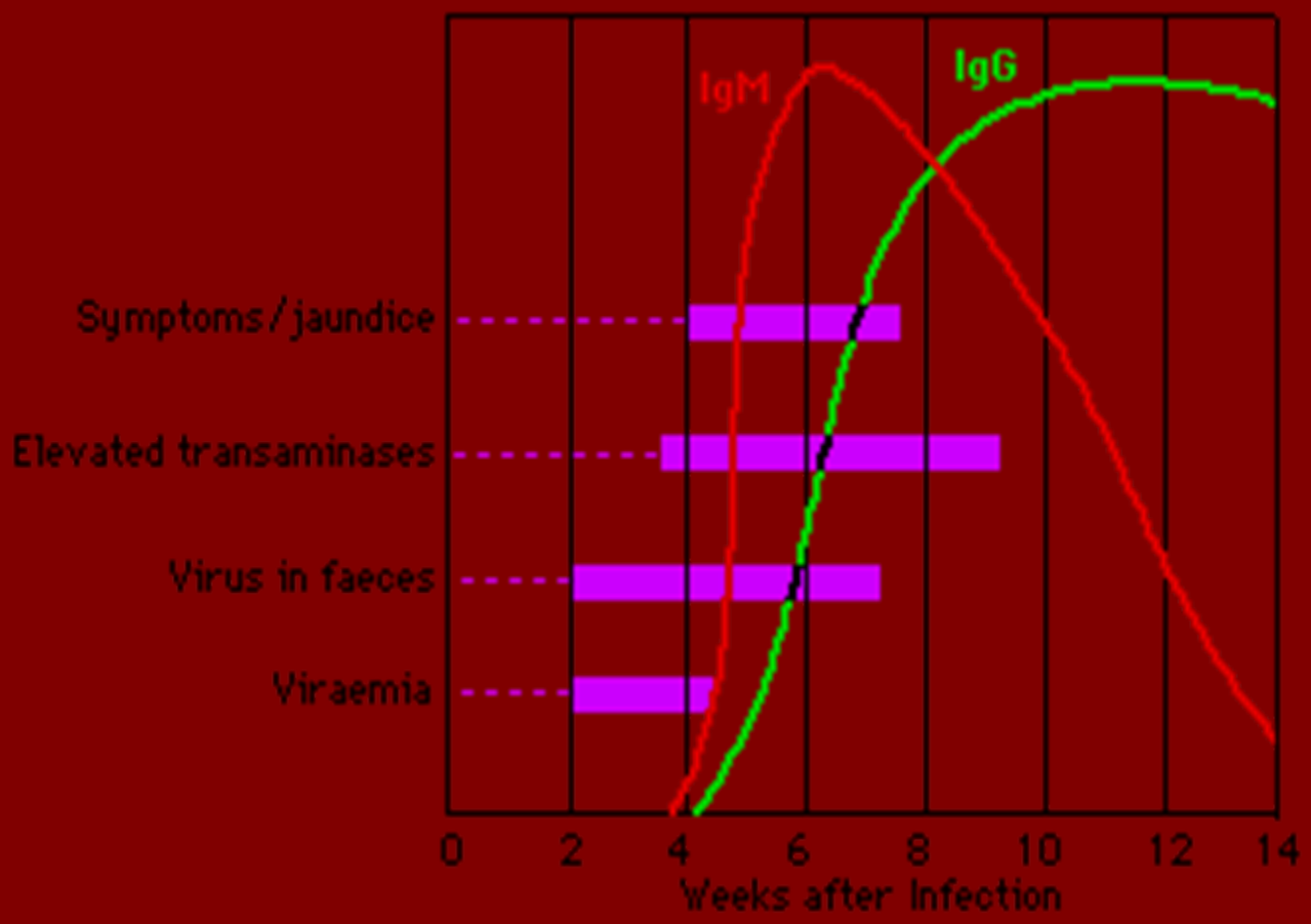
- On average, the liver weighs about four pounds and is the only organ able to regenerate itself even when up to 25% of it is removed.

Fig 1. Evolution in time of HBV infection



- **Hepatitis B Antigens and Markers.** The various components produced by hepatitis B, while reproducing, are detailed below. Some of these components enter the blood stream and cause detectable changes, some may only be determined via liver biopsy and others require sophisticated, experimental or unreliable tests.

- **Hepatitis B DNA (HBV DNA)**

- This is one of the first things that can be detected in the bloodstream after initial infection. It can be detected as soon as 1 week after infection using sensitive tests. It is believed that the level of HBV DNA may indicate how fast the virus is replicating. The test for HBV DNA is however expensive and difficult to perform, it is therefore not frequently used. Tests for HBV DNA are not performed as a standard test and generally only used as indicators of disease progression, suitability for therapy and research purposes.

- **Hepatitis B DNA polymerase.** (HBV DNA Polymerase, DNAp)

- This enzyme can be detected in the bloodstream soon after initial infection by hepatitis B at about the same time as HBV DNA, i.e. generally within 1 week or so after infection. Tests for HBV DNA polymerase are not performed as a standard test and generally only used as indicators of disease progression, suitability for therapy and research purposes.

Hepatitis B Surface protein(s). (HBsAg)

- The outer surface coat composed of hepatitis B surface proteins is produced in larger quantities than required for the virus to reproduce. The excess surface proteins clump together into spherical particles of between 17-25nm in diameter but also form rods of variable length.

- In some cases these particles encapsulate a core particle and produce a complete, and infectious, virus particle that enters the blood stream and can infect other liver cells.
- The excess spheres, rods and also complete viral particles enter the blood stream in large numbers and are easily detectable. It does however take a while for these proteins to appear.

- It is thought that excess HBs proteins produced may allow infectious viral particles to escape the immune system by mopping up any low levels of surface antibodies that may be produced by the immune system.

- The incubation of the Hepatitis B Virus (hepatitis B) is between 6 to 25 weeks. After infection and 1 to 6 weeks before symptoms occur HBsAg appears. A positive test for the presence of hepatitis B surface protein (HBsAg), is the standard currently taken to indicate current infection with hepatitis B. If HBsAg is present for more than 6 months this is generally taken to indicate chronic infection.

- **Antibodies to HBs protein** (HBsAb) These are generally the last antibodies to appear. HBsAb can neutralise the hepatitis B virus and there appearance taken as an indicator that an initial infection has been defeated.

- **HBsAb can also be induced to appear by vaccination and so provide protection against hepatitis B. However the immune response produced by vaccination may not be 100%. Although very rare, hepatitis B infection has occurred in vaccinated individuals. It is believed that this may be due to mutant virus strains that express different surface proteins to those used in the genetically engineered vaccine(?).**

- **HBe Protein.** (HBeAg or 'e' antigen)
  The Hepatitis 'e' antigen (HBeAg) is a peptide and normally detectable in the bloodstream when the hepatitis B virus is actively reproducing, this in turn leads to the person being much more infectious and at a greater risk of progression to liver disease. The exact function of this non structural protein is unknown, however it is thought that HBe may be influential in suppressing the immune systems response to HBV infection. HBeAg is generally detectable at the same time as HBsAg and disappears before HBsAg disappears.

- **Antibodies to HBe protein** (HBeAb) Antibodies to the 'e' antigen (HBeAb) normally appears a few weeks after HBeAg is no longer detectable. The presence of HBeAb is generally taken to be a good sign and indicates a favourable prognosis.

- The presence of HBeAg in chronic infection is generally taken to indicate that HBV is actively reproducing and there is a higher probability of liver damage. In acute infection HBeAg is generally only transiently present. However mutant strains of HBV exist that replicate without producing HBeAg. In many cases infection with these mutant strains is more aggressive than HBe producing strains.

- **Hepatitis B Core protein.** (HBcAg)

- The core protein (HBc) is not detectable in the bloodstream, however it can be detected in the sample of liver cells taken after a liver biopsy. Generally the HBc proteins link together to form the hepatitis B core that encapsulate HBV DNA and DNA Polymerase.

- **Antibodies to HBc** (HBcAb).

- **The first detectable antibody to appear around 8 weeks after infection with HBV are antibodies to the HBV core protein. These antibodies to HBcAg (HBcAb) do not neutralise the virus. HBcAb's persist in serum after an infection with HBV has been defeated and testing for this antibody has been used to detect previous exposure to the live virus.**

- All pregnant women should be tested for HBV early in their pregnancy. If the blood test is positive, the baby should receive vaccine along with another shot - hepatitis B immune globulin, at birth. The second dose of vaccine should be given at 1-2 months of age and the third dose at 6 months of age.

WHO SHOULD BE VACCINATED?

- **All babies, at birth**
- **All children 0-18 years of age who have not been vaccinated**
- **Persons of any age whose behavior puts them at high risk for HBV infection**
- **Persons whose jobs expose them to human blood**

IS THERE A CURE FOR HEPATITIS B?

- There are medications available to treat long-lasting (chronic) HBV-infection. These work for some people, but there is no cure for hepatitis B when you first get it. That is why prevention is so important. Hepatitis B vaccine is the best protection against HBV. Three doses are commonly needed for complete protection.

TREATMENT AND MEDICAL MANAGEMENT

HBV infected persons should be evaluated by their doctor for liver disease.

- **Adefovir dipivoxil, alpha interferon, and lamivudine are three drugs licensed for the treatment of persons with chronic hepatitis B.**
- **These drugs should not be used by pregnant women.**
- **Drinking alcohol can make your liver disease worse**

VACCINES

- **THE FIRST HBV VACCINE – HEPATAVAX - WAS AN INACTIVATED HEPATITIS B VACCINE.**
- **PLASMA FROM INFECTED CARRIERS WAS HARVESTED FOR HBsAg. IT WAS THEN TREATED AS FOLLOWS:**
- **1. PEPSIN AT Ph 2. PEPSIN HAS BEEN SHOWN TO INACTIVATE EVERY KNOWN VIRUS GROUP.**

- 2. 8M UREA. THE UREA TREATMENT INACTIVATES SEVERAL VIRUS GROUPS AND PRIONS.
- 3. 1:4,000 DILUTION OF FORMALIN. THE FORMALIN INACTIVATES A WIDE VARIETY OF VIRUSES.

NEWER VACCINES

- ENGERIX-B (MONOVALENT)
- RECOMBIVAX HB (MONOVALENT)
- THESE ARE RECOMBINANT VACCINES PREPARED IN *SACCHAROMYCES CEREVISIAE AND ARE VERY SAFE*
- HAVRAX AND TWINIX (COMBINATION VACCINES)

PASSIVE IMMUNIZATION

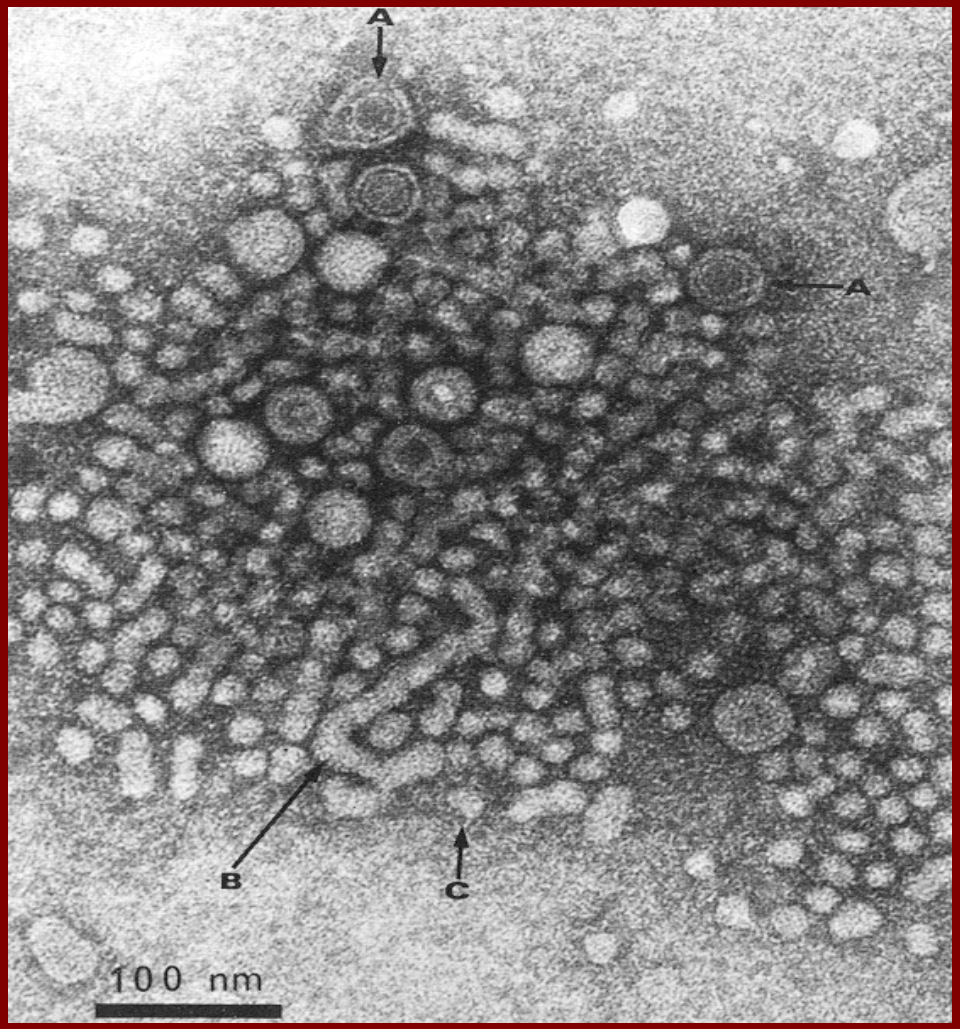
- BayHep B
- Nabi-HB
  - HYPERIMMUNE GLOBULIN

- **VACCINE RECOMMENDATIONS**
- Hepatitis B vaccine available since 1982
- Routine vaccination of 0-18 year olds
- Vaccination of risk groups of all ages (see section on risk groups)

PREVENTION

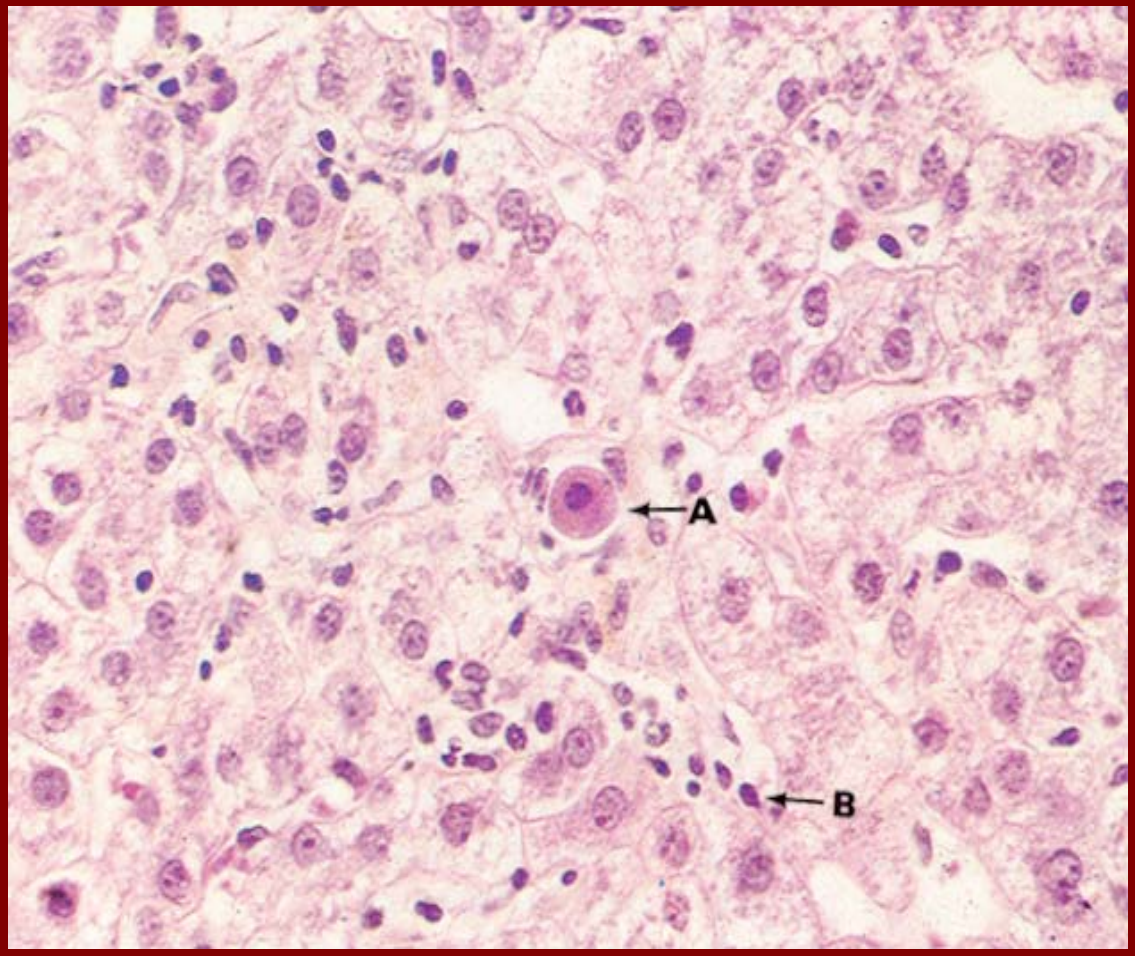
- Hepatitis B vaccine is the best protection.
- If you are having sex, but not with one steady partner, use latex condoms correctly and every time you have sex. The efficacy of latex condoms in preventing infection with HBV is unknown, but their proper use may reduce transmission.

HEPATITIS B VIRUS



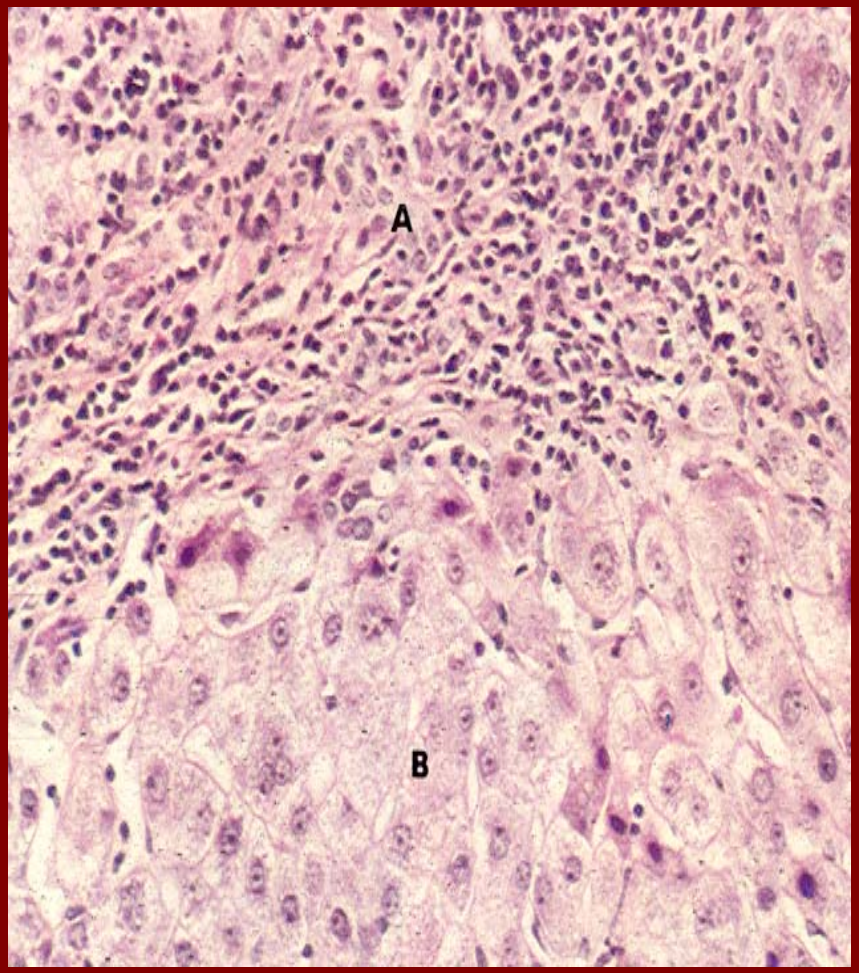
- Electron micrograph of negatively stained preparation of serum from patient with hepatitis B.

HISTOLOGY OF ACUTE HEPATITIS (H and E)



- (A = degenerate hepatocyte with pyknotic nucleus.
- B=Kupffer cells

CHRONIC PERSISTENT HEPATITIS

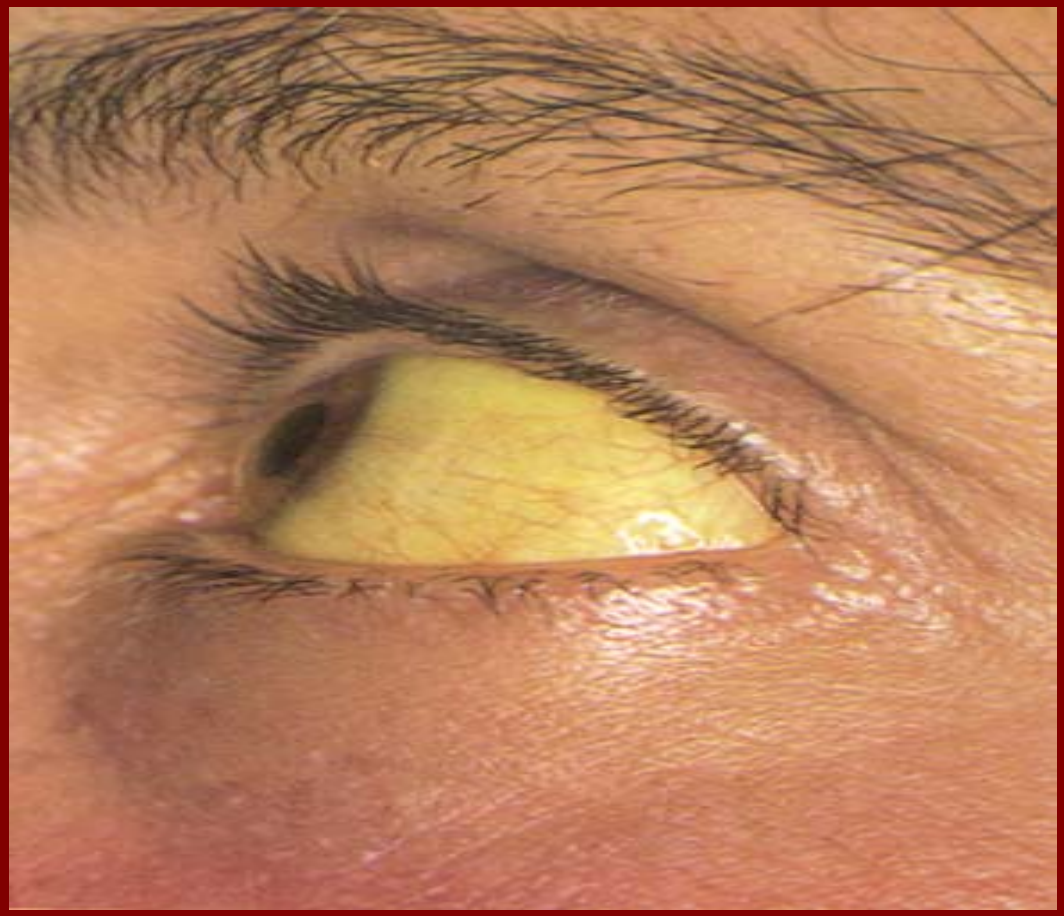


- Section of liver (H and E). Some of the parenchymal cells show evidence of necrosis with darkly stained cytoplasm and pyknotic nuclei. (A=portal tract, B = parenchyma)

APPEARANCE OF URINE IN HEPATITIS

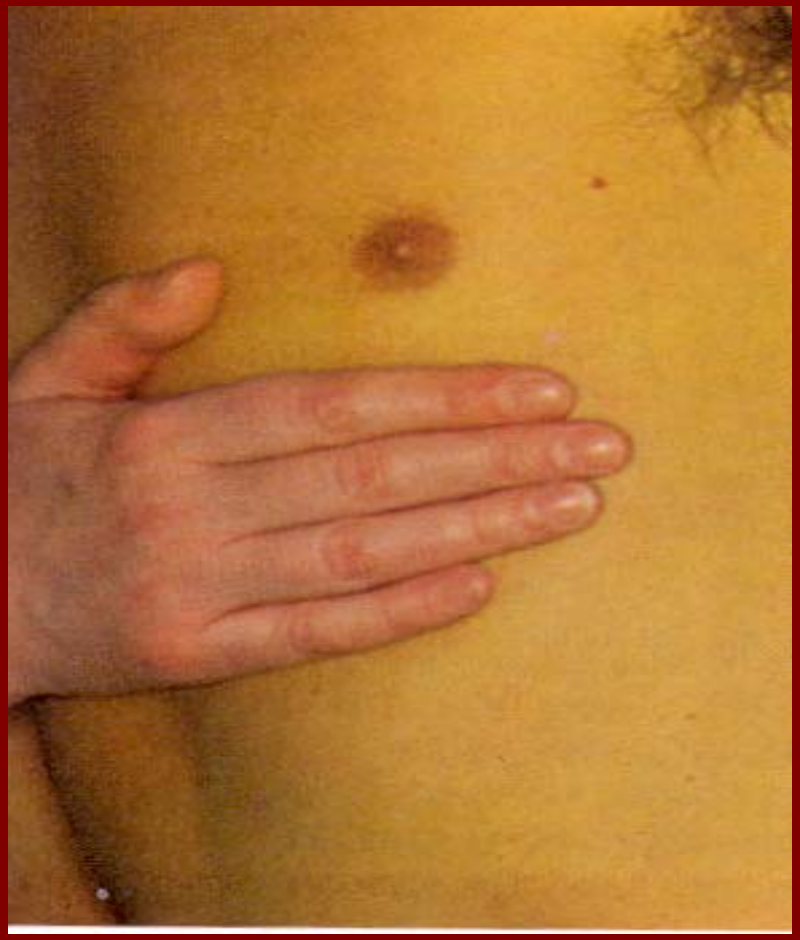
- Urine containing bile is greenish or brownish-yellow in color. The surface tension is altered and the froth, which forms on top after shaking, is usually permanent.

JAUNDICED EYE OF PATIENT WITH VIRAL HEPATITIS



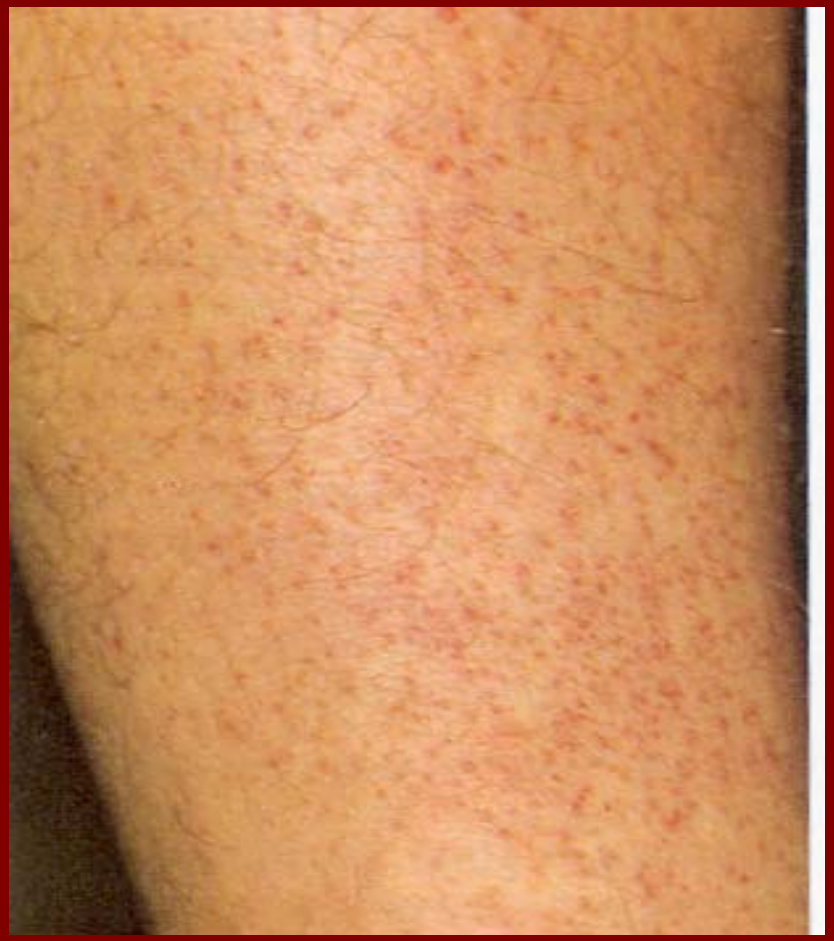
- Jaundiced sclera. Ocular sclera readily becomes jaundiced.

PATIENT WITH ACUTE HEPATITIS



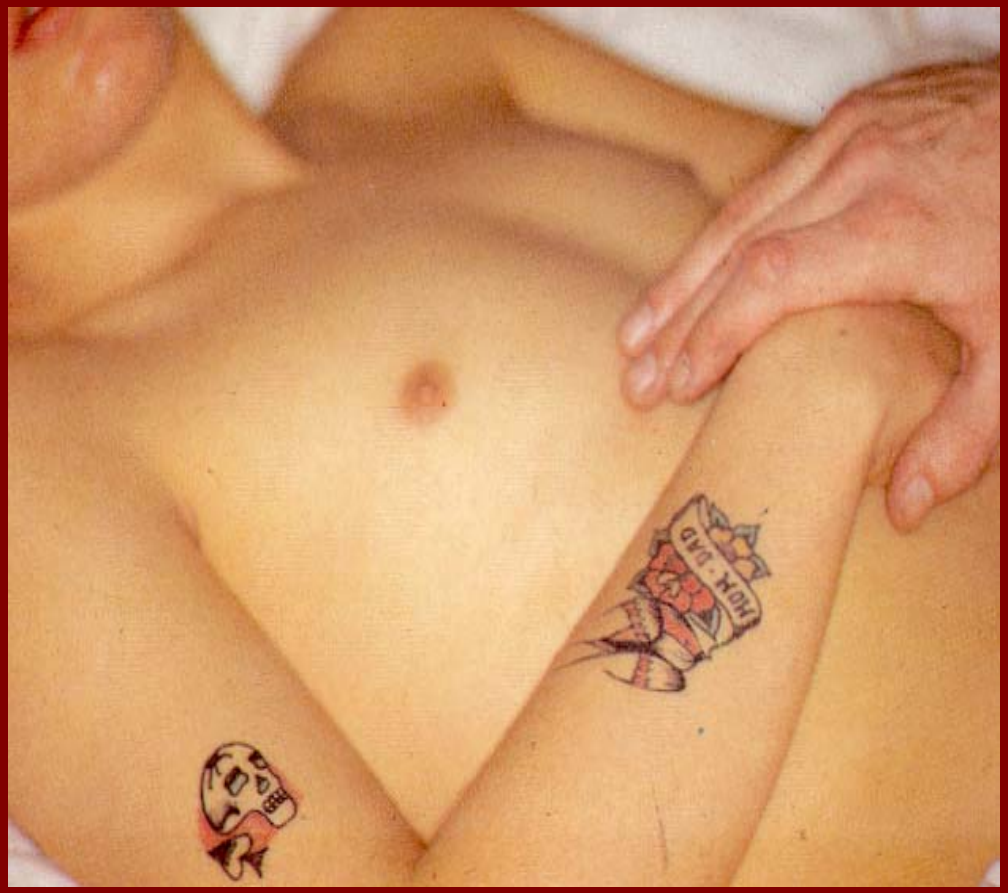
- Jaundiced skin. In this illustration, the color of normal skin is contrasted with the yellow skin of a patient with acute hepatitis.

RASH IN VIRAL HEPATITIS



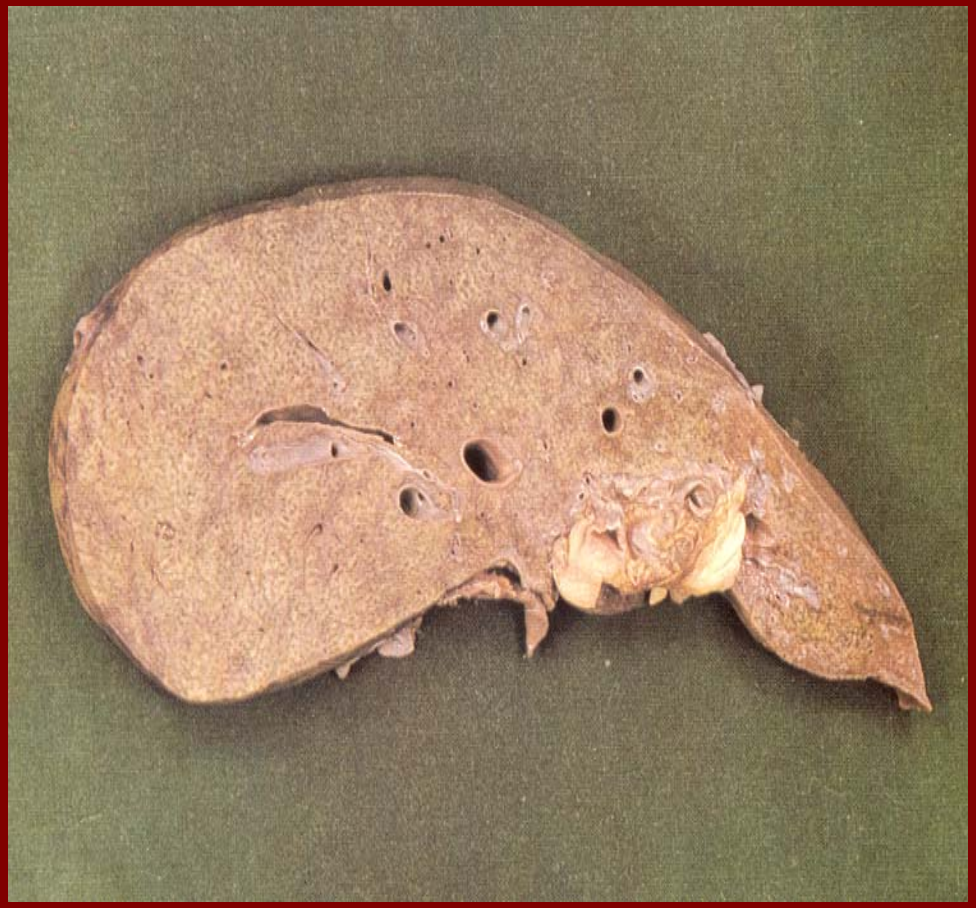
- This illustration shows an erythematous rash on the leg of a patient with hepatitis B.

HEPATITIS B VIRUS



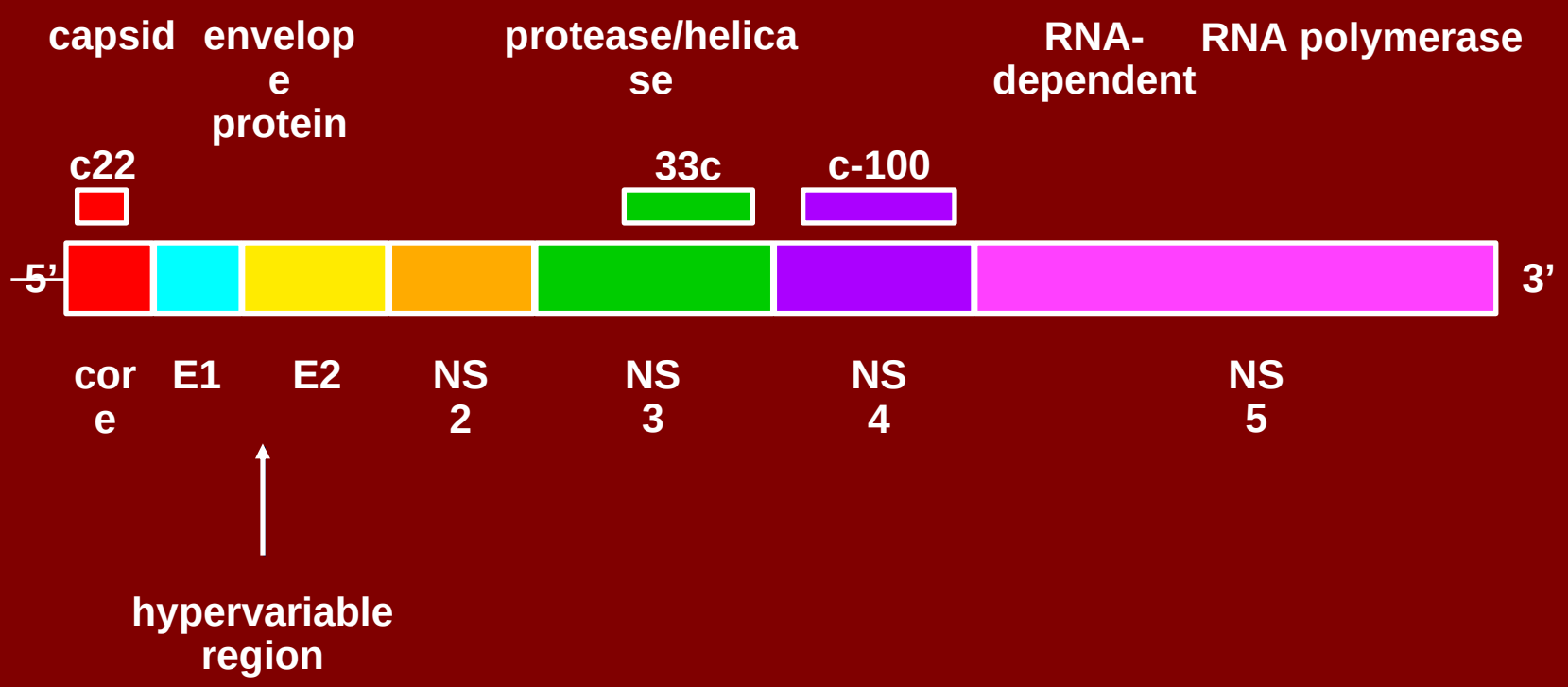
- The patient shown here was one of a group of young men infected from a tattooing needle.

VIRAL HEPATITIS



- Viral hepatitis: macroscopic specimen of liver showing massive hepatic necrosis (‘acute yellow atrophy’).

Hepatitis C Virus



Hepatitis C - Clinical Features

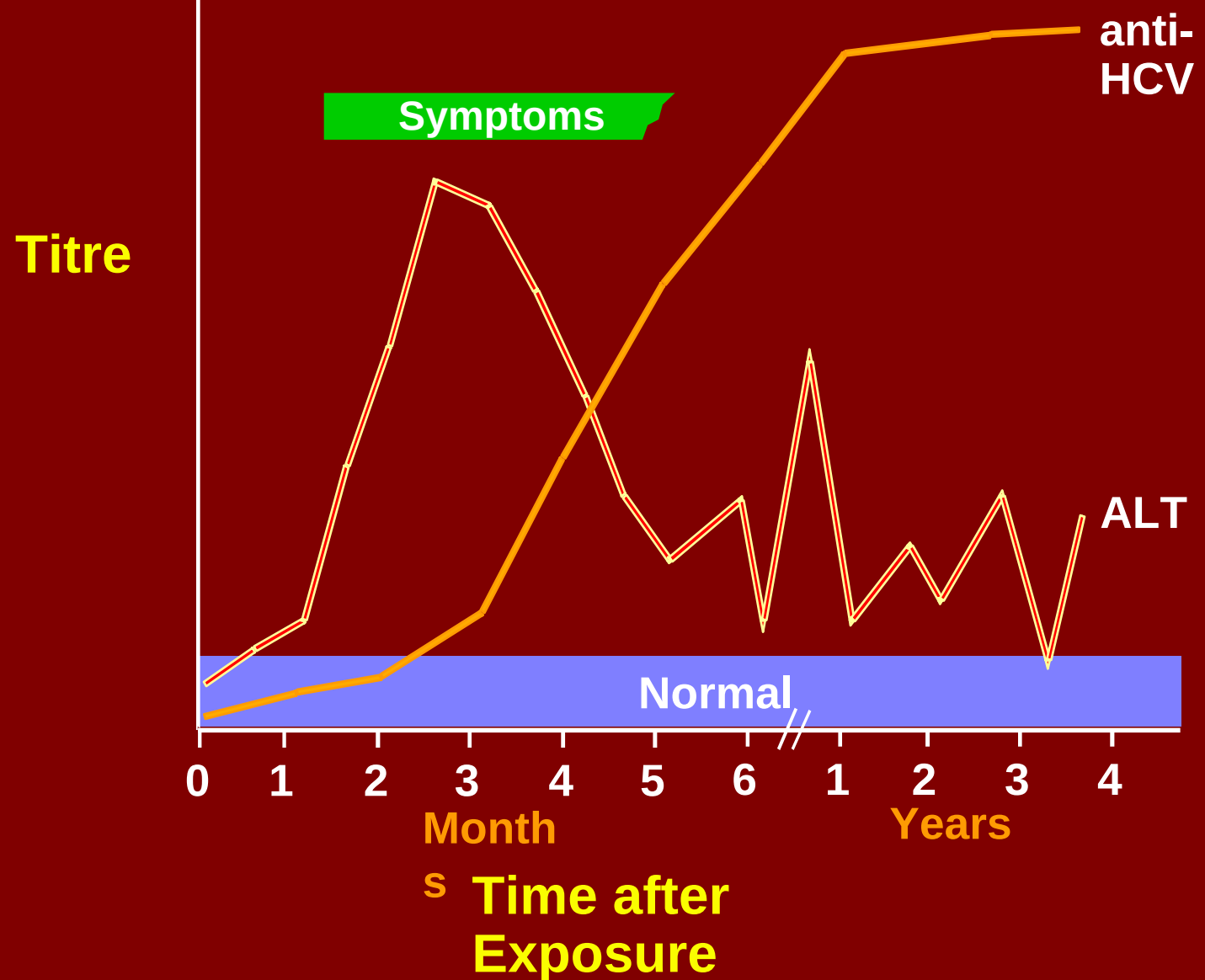
Incubation period:	Average 6-7 wks Range 2-26 wks
Clinical illness (jaundice):	30-40% (20-30%)
Chronic hepatitis:	70%
Persistent infection:	85-100%
Immunity:	No protective antibody response identified

Chronic Hepatitis C Infection

- The spectrum of chronic hepatitis C infection is essentially the same as chronic hepatitis B infection.
- All the manifestations of chronic hepatitis B infection may be seen, albeit with a lower frequency i.e. chronic persistent hepatitis, chronic active hepatitis, cirrhosis, and hepatocellular carcinoma.

Hepatitis C Virus Infection

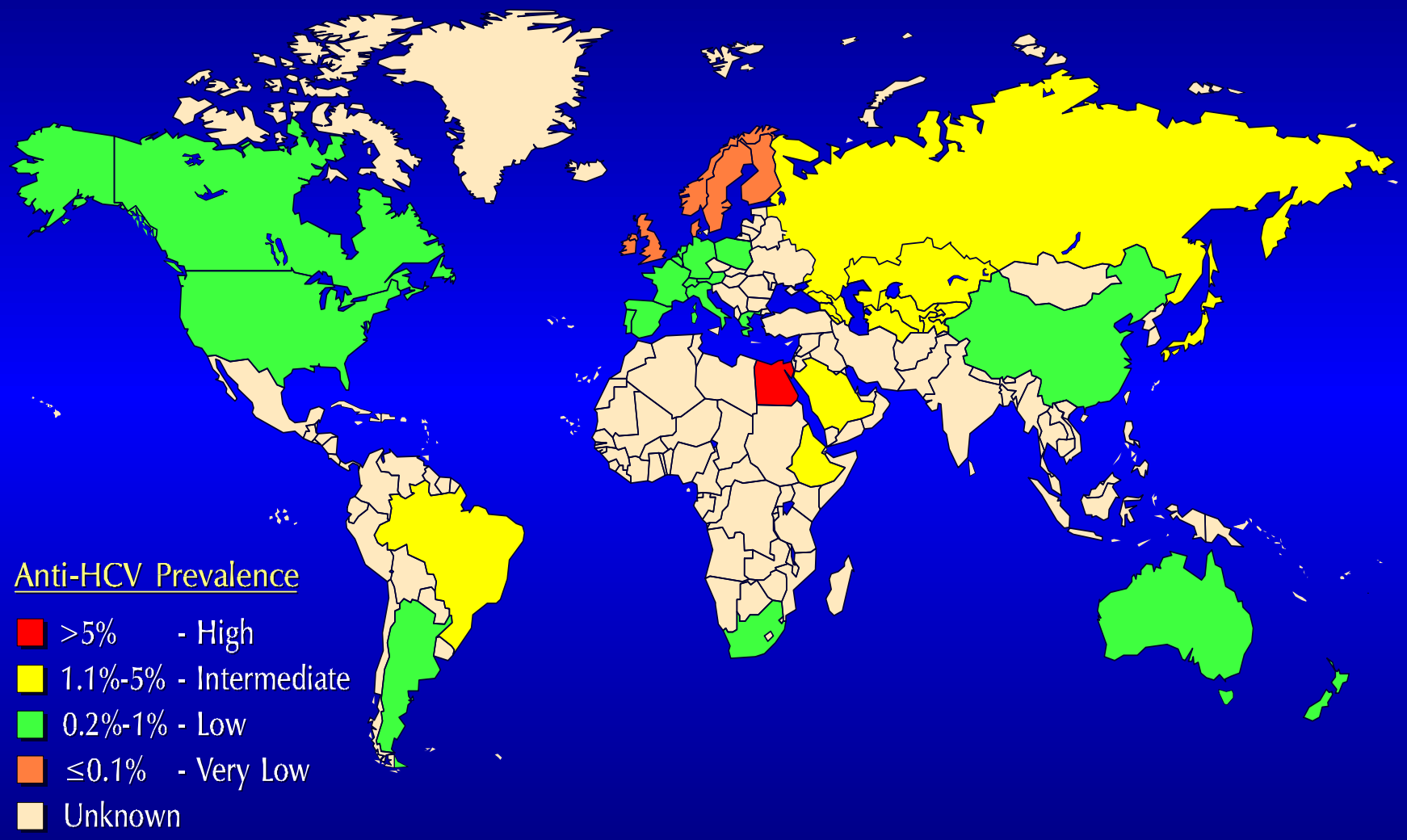
Typical Serologic Course



Risk Factors Associated with Transmission of HCV

- Transfusion or transplant from infected donor
- Injecting drug use
- Hemodialysis (yrs on treatment)
- Accidental injuries with needles/sharps
- Sexual/household exposure to anti-HCV-positive contact
- Multiple sex partners
- Birth to HCV-infected mother

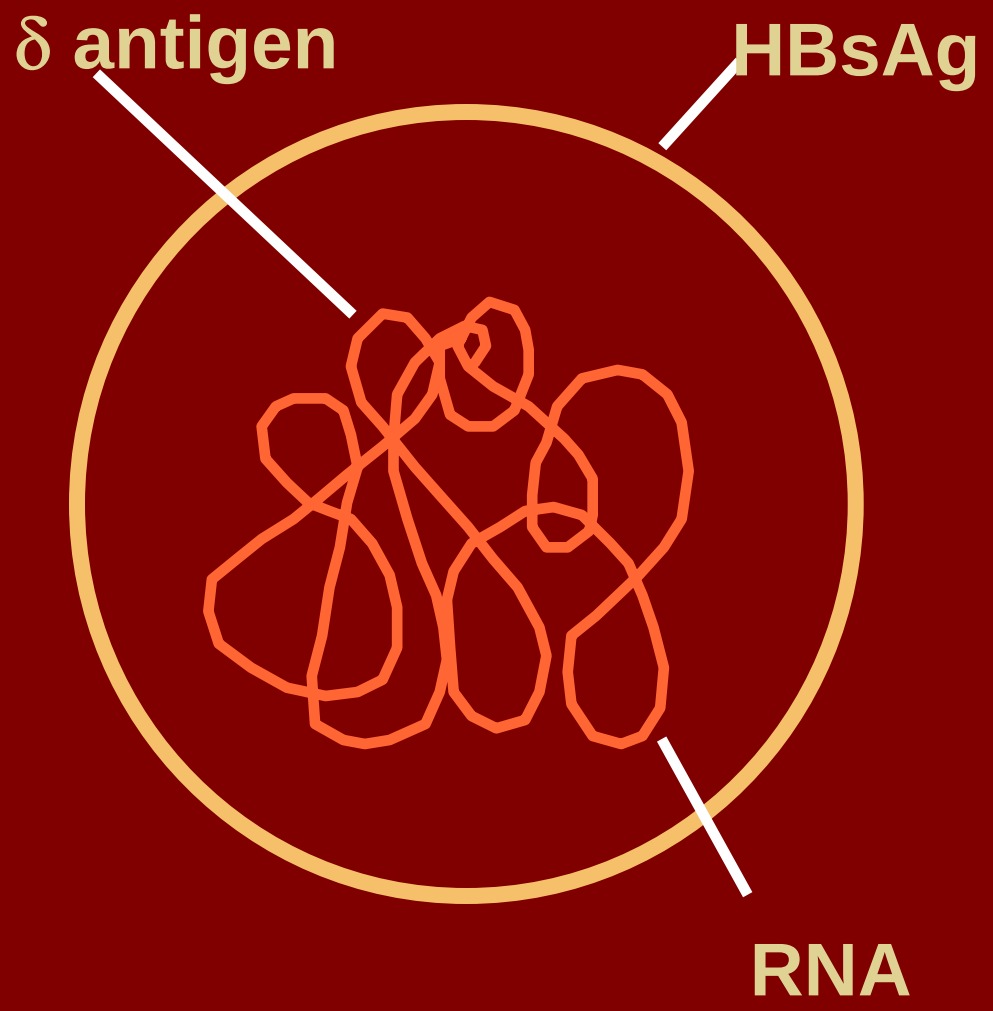
Prevalence of HCV Infection Among Blood Donors*

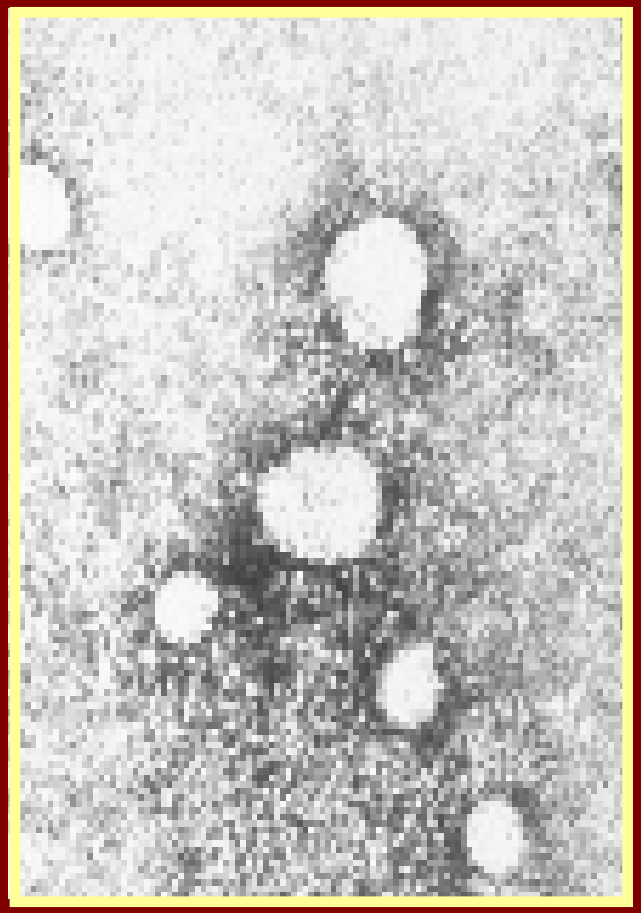


* Anti-HCV prevalence by EIA-1 or EIA-2 with supplemental testing; based on data available in January, 1995.

CDC
CENTERS FOR DISEASE CONTROL AND PREVENTION

Hepatitis D (Delta) Virus





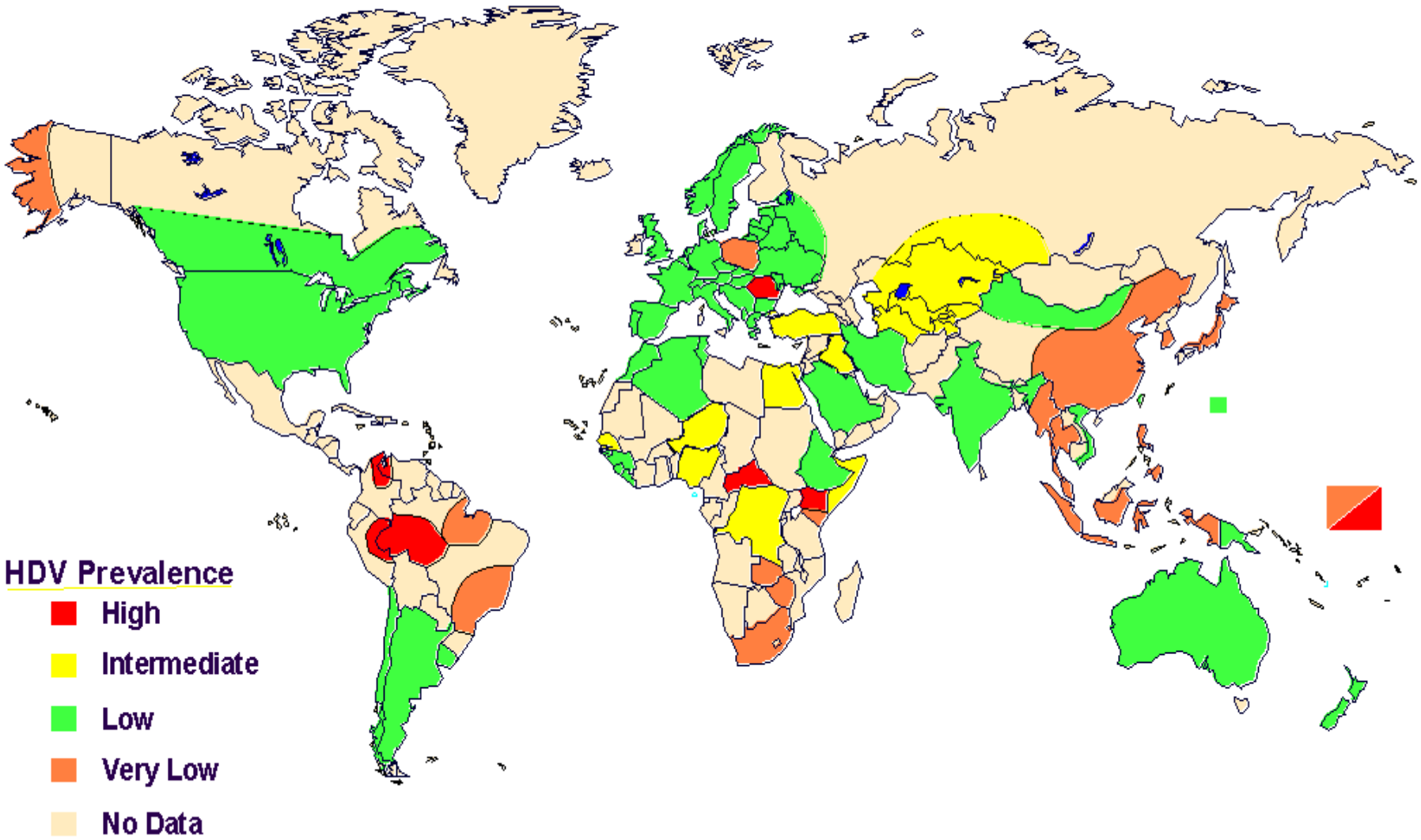
Hepatitis D - Clinical Features

- Coinfection
  - severe acute disease.
  - low risk of chronic infection.
- Superinfection
  - usually develop chronic HDV infection.
  - high risk of severe chronic liver disease.
  - may present as an acute hepatitis.

Hepatitis D Virus Modes of Transmission

- Percutanous exposures
  - injecting drug use
- Permucosal exposures
  - sex contact

Geographic Distribution of HDV Infection

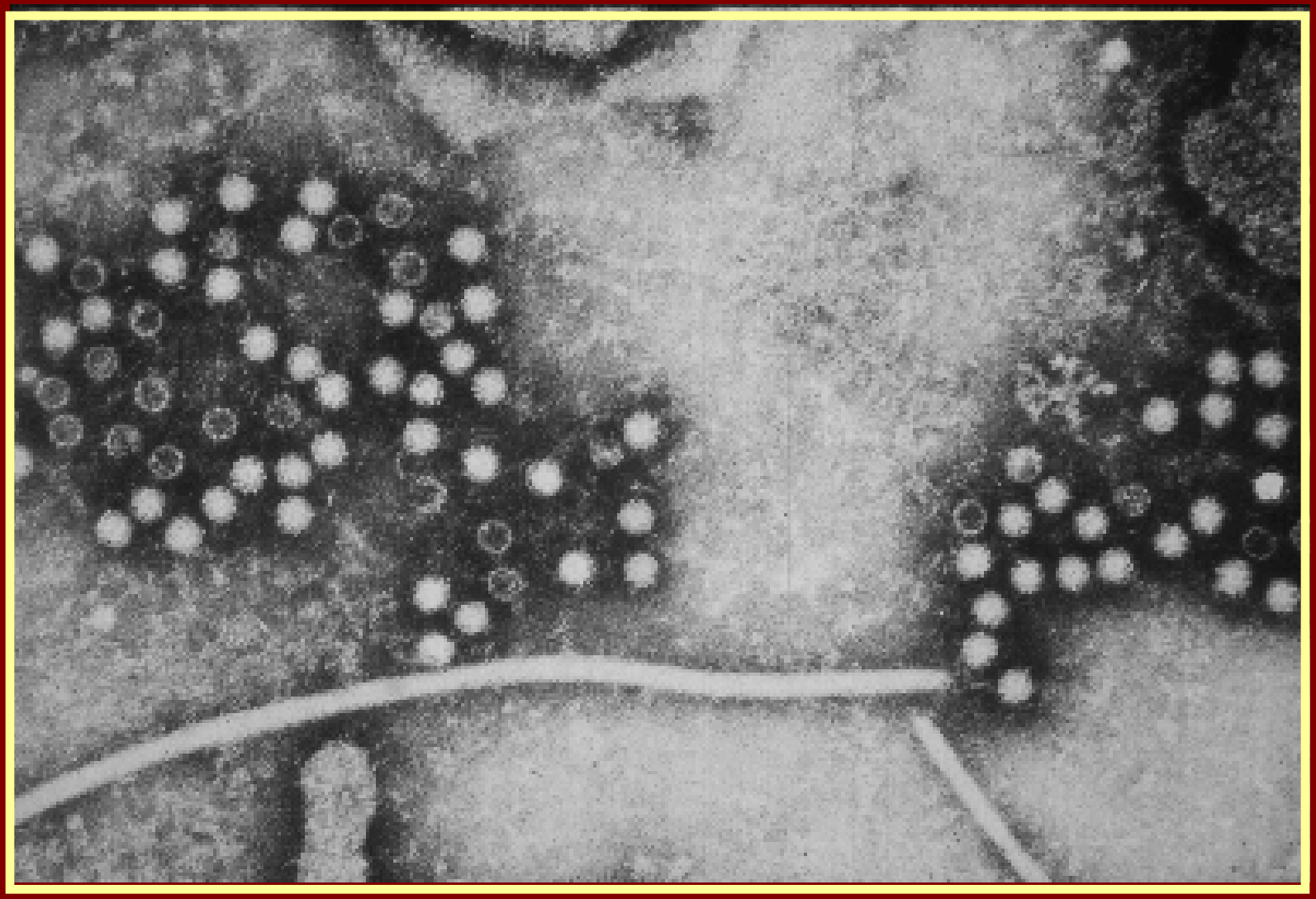


DELTA AGENT OR HEPATITIS D (HDV)

- HDV Fact Sheet Virus:
- Incomplete RNA virus, dependent on HBV envelope proteins.
- Disease: Coinfection: acute infection with hepatitis B virus. Superinfection: acute HDV infection on chronic hepatitis B.

- Outcome: May cause persistent infection (80% as superinfection, <10% with coinfection). Long-term sequelae as with HBV, but more severe/accelerated.
- Epidemiology: Transmission: bloodborne and sexual. Risk groups: as with HBV.
- Endemic to Mediterranean regions. Case Management: Diagnosis: anti-HDV and as with

Hepatitis E Virus



Hepatitis E - Clinical Features

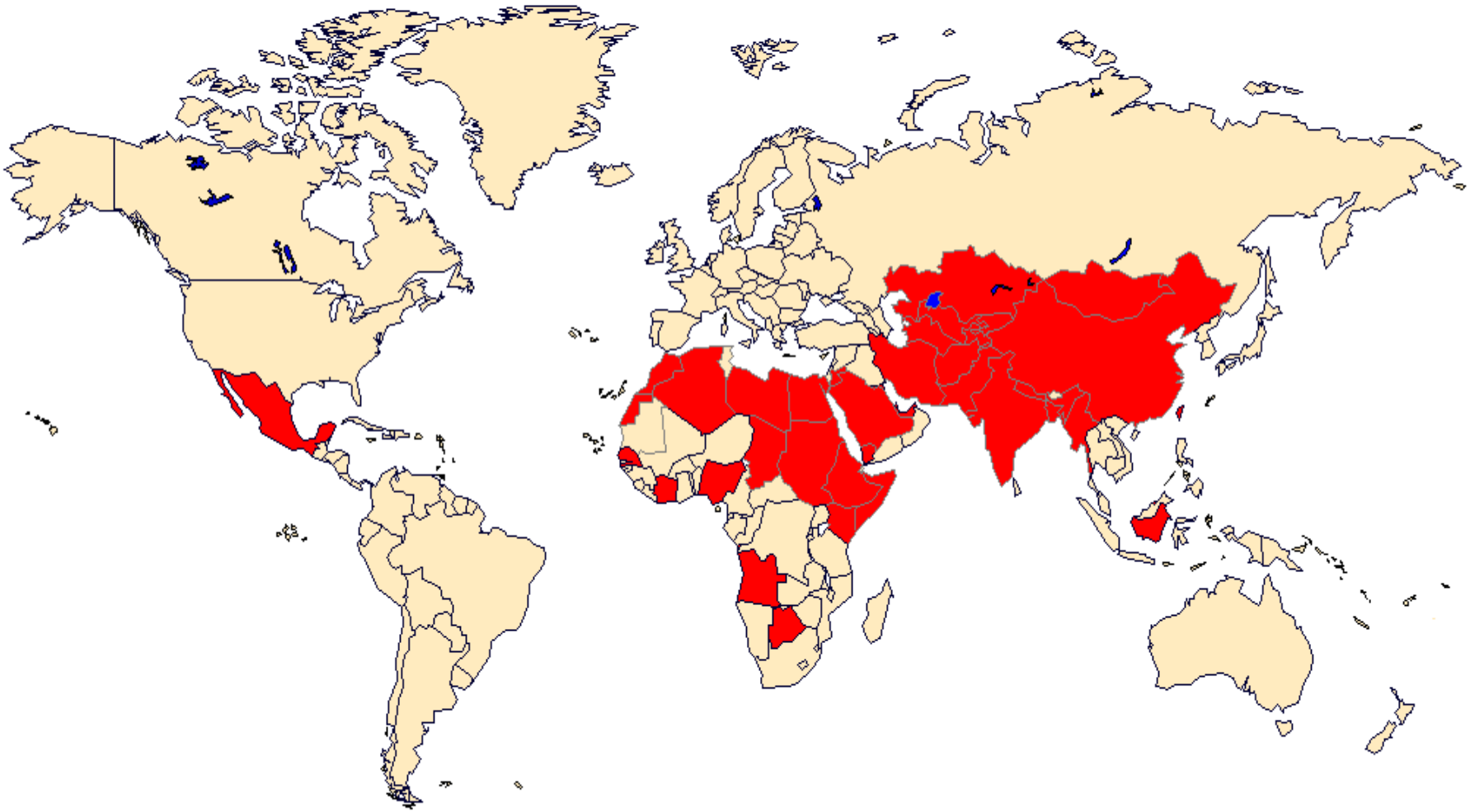
- Incubation period: Average 40 days
  Range 15-60 days
- Case-fatality rate: Overall, 1%-3%
  Pregnant women, 15%-25%
- Illness severity: Increased with age
- Chronic sequelae: None identified

Hepatitis E - Epidemiologic Features

- Most outbreaks associated with faecally contaminated drinking water.
- Several other large epidemics have occurred since in the Indian subcontinent and the USSR, China, Africa and Mexico.
- In the United States and other nonendemic areas, where outbreaks of hepatitis E have not been documented to occur, a low prevalence of anti-HEV (<2%) has been found in healthy populations. The source of infection for these persons is unknown.
- Minimal person-to-person transmission.

Geographic Distribution of Hepatitis E

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



Prevention and Control Measures for Travelers to HEV-Endemic Regions

- Avoid drinking water (and beverages with ice) of unknown purity, uncooked shellfish, and uncooked fruit/vegetables not peeled or prepared by traveler.
- IG prepared from donors in Western countries does not prevent infection.
- Unknown efficacy of IG prepared from donors in endemic areas.
- Vaccine?

HEPATITIS VIRUSES

- ACUTE HEPATITIS:
  - HEPATITIS A
  - HEPATITIS B
  - HEPATITIS C
  - HEPATITIS D
  - HEPATITIS E
  - HEPATITIS G

HEPADNAVIRIDAE

- HEPATITIS B VIRUS (HBV)
- WORLDWIDE THERE ARE OVER 300 MILLION INFECTED PERSONS AND APPROXIMATELY 200 MILLION OF THOSE ARE CARRIERS.

HEPATITIS B

- **SIGNS & SYMPTOMS**About 30% of persons have no signs or symptoms. Signs and symptoms are less common in children than adults.

- jaundice
- fatigue
- abdominal pain
- loss of appetite
- nausea, vomiting
- joint pain
- **CAUSE**
- Hepatitis B virus (HBV)

- **LONG-TERM EFFECTS WITHOUT VACCINATION** Chronic infection occurs in:
- 90% of infants infected at birth
- 30% of children infected at age 1 - 5 years
- 6% of persons infected after age 5 years
- Death from chronic liver disease occurs in:
- 15-25% of chronically infected persons

- **TRANSMISSION**
- Occurs when blood or body fluids from an infected person enters the body of a person who is not immune.

- HBV is spread through having sex with an infected person without using a condom (the efficacy of latex condoms in preventing infection with HBV is unknown, but their proper use may reduce transmission).
- sharing needles or "works" when "shooting" drugs, through needlesticks or sharps exposures on the job,

- or from an infected mother to her baby during birth.
- Persons at risk for HBV infection might also be at risk for infection with hepatitis C virus (HCV) or HIV.

- **RISK GROUPS**
- Persons with multiple sex partners or diagnosis of a sexually transmitted disease
- Men who have sex with men
- Sex contacts of infected persons
- Injection drug users
- Household contacts of chronically infected persons

- Infants born to infected mothers
- Infants/children of immigrants from areas with high rates of HBV infection Health care and public safety workers
- Hemodialysis patients

- **PREVENTION**
- Hepatitis B vaccine is the best protection.
- If you are having sex, but not with one steady partner, use latex condoms correctly and every time you have sex. The efficacy of latex condoms in preventing infection with HBV is unknown, but their proper use may reduce transmission.

- If you are pregnant, you should get a blood test for hepatitis B; Infants born to HBV-infected mothers should be given HBIG (hepatitis B immune globulin) and vaccine within 12 hours after birth.

- Do not shoot drugs; if you shoot drugs, stop and get into a treatment program; if you can't stop, never share needles, syringes, water, or "works", and get vaccinated against hepatitis A and B.
- Do not share personal care items that might have blood on them (razors, toothbrushes).

- Consider the risks if you are thinking about getting a tattoo or body piercing. You might get infected if the tools have someone else's blood on them or if the artist or piercer does not follow good health practices.

- If you have or had hepatitis B, do not donate blood, organs, or tissue.
- If you are a health care or public safety worker, get vaccinated against hepatitis B, and always follow routine barrier precautions and safely handle needles and other sharps.

- **VACCINE RECOMMENDATIONS**
- Hepatitis B vaccine available since 1982
- Routine vaccination of 0-18 year olds
- Vaccination of risk groups of all ages (see section on risk groups)

- **TREATMENT & MEDICAL MANAGEMENT**
- HBV infected persons should be evaluated by their doctor for liver disease.
- Adefovir dipivoxil, alpha interferon, and lamivudine are three drugs licensed for the treatment of persons with chronic hepatitis B.
- These drugs should not be used by pregnant women.
- Drinking alcohol can make your liver disease worse

- **TRENDS & STATISTICS**

- Number of new infections per year has declined from an average of 260,000 in the 1980s to about 78,000 in 2001.
- Highest rate of disease occurs in 20-49-year-olds.

- Greatest decline has happened among children and adolescents due to routine hepatitis B vaccination.
- Estimated 1.25 million chronically infected Americans, of whom 20-30% acquired their infection in childhood.

- *Who is at risk?*
- In 2001, an estimated 78,000 persons in the U.S. were infected with HBV. People of all ages get hepatitis B and about 5,000 die per year of sickness caused by HBV.

- *How great is your risk for hepatitis B?*
- One out of 20 people in the United States will get infected with HBV some time during their lives. Your risk is higher if you
- have sex with someone infected with HBV
- have sex with more than one partner
- are a man and have sex with a man

- live in the same house with someone who has lifelong HBV infection
- have a job that involves contact with human blood
- shoot drugs
- are a patient or work in a home for the developmentally disabled
- have hemophilia

- travel to areas where hepatitis B is common Your risk is also higher if your parents were born in Southeast Asia, Africa, the Amazon Basin in South America, the Pacific Islands, and the Middle East.
- If you are at risk for HBV infection, ask your health care provider about hepatitis B vaccine.

- *How do you get hepatitis B?*
- You get hepatitis B by direct contact with the blood or body fluids of an infected person; for example, you can become infected by having sex or sharing needles with an infected person. A baby can get hepatitis B from an infected mother during childbirth.
- Hepatitis B is not spread through food or water or by casual contact.

- *What does the term "hepatitis B carrier" mean?*
- Hepatitis B carriers are people who are have chronic (long-term) infection with HBV and never recover fully from the infection; they carry the virus and can infect others for the rest of their lives. In the United States, about one million people carry HBV.

- *How do you know if you have hepatitis B?*
- You may have hepatitis B (and be spreading the disease) and not know it; sometimes a person with HBV infection has no symptoms at all. Only a blood test can tell for sure.
- If you have symptoms
- your eyes or skin may turn yellow

- you may lose your appetite
- you may have nausea. vomiting, fever, stomach or joint pain
- you may feel extremely tired and not be able to work for weeks or months

- *Is there a cure for hepatitis B?*
- There are medications available to treat long-lasting (chronic) HBV-infection. These work for some people, but there is no cure for hepatitis B when you first get it. That is why prevention is so important. Hepatitis B vaccine is the best protection against HBV. Three doses are commonly needed for complete protection.

- *If you are pregnant, should you worry about hepatitis B?*
- If you have HBV in your blood, you can give hepatitis B to your baby. Babies who get HBV at birth may have the virus for the rest of their lives, can spread the disease, and can get cirrhosis of the liver or liver cancer.

- All pregnant women should be tested for HBV early in their pregnancy. If the blood test is positive, the baby should receive vaccine along with another shot, hepatitis B immune globulin (called HBIG), at birth. The second dose of vaccine should be given at 1-2 months of age and the third dose at 6 months of age.

- *Who should get vaccinated?*All babies, at birth
- All children 0-18 years of age who have not been vaccinated
- Persons of any age whose behavior puts them at high risk for HBV infection
- Persons whose jobs expose them to human blood
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