

The Epidemiology of Hepatitis A, B, and C

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Definitions

- **Epidemiology:**
 - The study of the *incidence* and *prevalence* of diseases in large populations and the detection of the source and cause of epidemics of infectious disease.
 - The study of the relationships between exposures such as nutrition, biological agents, stress, or chemicals to outcomes such as disease, wellness, and health indicators.
- **Incidence:**
 - The number of *new cases* of a disease during a given time interval, usually one year.
- **Prevalence:**
 - The total number of cases of a disease in the population at a given time.

Definitions

- **Virus:**
 - A microscopic particle that can infect the cells of biological organisms. Viruses can replicate themselves only by infecting a host cell. Consist of genetic material contained within a protective protein coat.
- **Hepatotropic viruses:**
 - Predominantly infect the liver.
 - Hepatitis A, B, C, D, and E.
 - AKA; HAV, HBV, HCV, HDV, and HEV.
- **Incubation period:**
 - The time between exposure to an infection and when symptoms and signs first occur.

Viral Hepatitis in the US

	HAV	HBV	HCV
Acute infections	930K	780K	28K
Acute liver failure deaths/year	50	100	Rare
Chronic infections	0	1-1.25 million	2.8-4 million
Chronic liver disease deaths/year	0	5,000	8,000-10,000

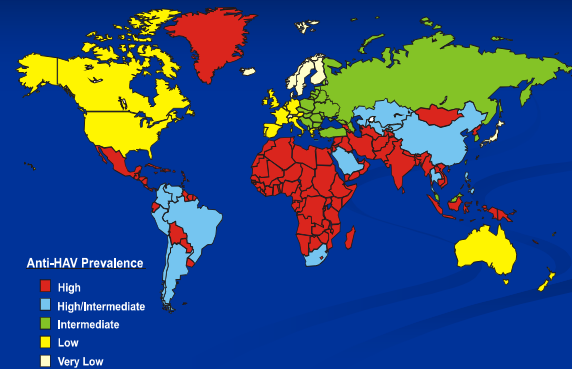
CDC estimates, 2001.

REPORTED CASES OF SELECTED NOTIFIABLE DISEASES PREVENTABLE BY VACCINATION, UNITED STATES, 2001

Hepatitis A	10,609
Hepatitis B	7,843
Pertussis	7,580
Meningococcal disease	2,333
H. influenzae, invasive	1,597
Mumps	266
Measles	116

Source: NNDS, CDC

Geographic Distribution of Hepatitis A Virus Infection



Hepatitis A: Clinical Features

- **Transmission:**
 - Fecal-oral, unsanitary conditions, contaminated food/water, rarely blood.
- **Incubation:**
 - 2 to 6 weeks (average 25 days).
- **Infectivity:**
 - 2 to 3 weeks.
 - > 1 week prior to the onset of symptoms.

Hepatitis A: Epidemiology

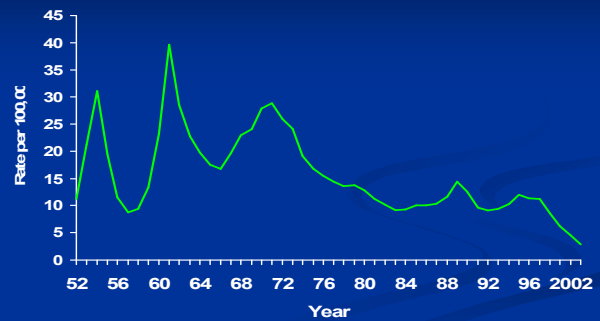
- **Prevalence:**
 - $\geq 40\%$ in U.S. have had previous infection.
 - $\sim 100\%$ in developing countries.
 - Accounts for 40% of all cases of acute viral hepatitis.
- **Groups at risk:**
 - Children/workers in day-care
 - Homosexual men
 - Residents and traveler in underdeveloped countries

Hepatitis A: Clinical Course

- **Symptoms:**
 - **Early:** fever, nausea and vomiting, fatigue, diarrhea, anorexia.
 - **Late:** right-upper abdominal pain, dark urine, and jaundice.
- **Severity/Natural history:**
 - Age dependant.

Jaundice by age group:	< 6 yrs	< 10%
	6-14 yrs	40%-50%
	> 14 yrs	70%-80%
 - Recover is the rule: provides life long immunity from future infections.
 - Never causes chronic disease.
 - Rarely may lead to fulminant liver failure (< 1:3000).

Reported Cases of Hepatitis A, United States, 1952-2002



Source: NNDSS, CDC

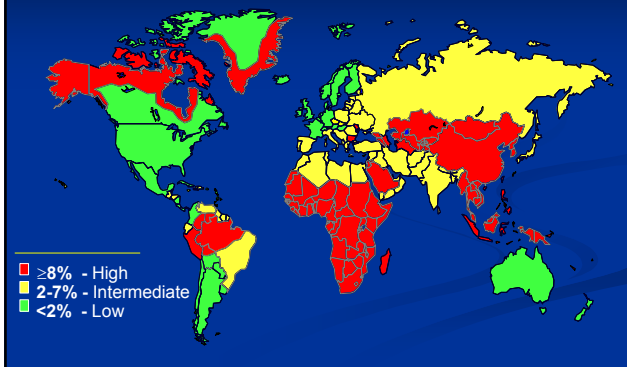
Hepatitis A: Treatment

- Prevention, prevention, prevention.
- No effective treatment exists:
 - Supportive care.
- Fulminant Liver Failure:
 - Liver transplantation.
- Immune globulin, (IG):
 - For unvaccinated persons, who have recently been exposed to HAV.
 - Must be given within two weeks of exposure to HAV in order to work.

Hepatitis A: Prevention

- Wash hands after using the bathroom, changing a diaper, or before preparing or eating food.
- Hepatitis A vaccines:
 - Provide long-term protection against hepatitis A.
 - High-risk persons (IV drug users, homosexual men, travelers to endemic areas).
 - Chronic liver disease.
 - Transplant recipients.
 - Success rate: > 95%.

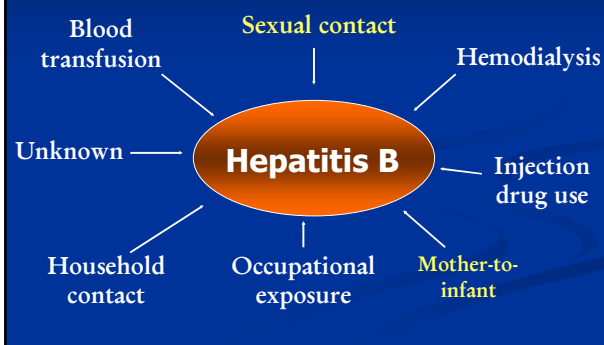
Geographic Distribution of Hepatitis B Virus Infection



Hepatitis B: Epidemiology

- 30% of acute viral hepatitis and 15% of chronic viral hepatitis in the US
- Globally
 - 350 million persons infected
 - 75% in Asia
 - $> 500,000$ deaths per year
- United States
 - 1.25 million persons infected (0.3%)
 - 5-15% of Asian Americans
 - 4-5,000 deaths per year

Modes of Transmission



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%

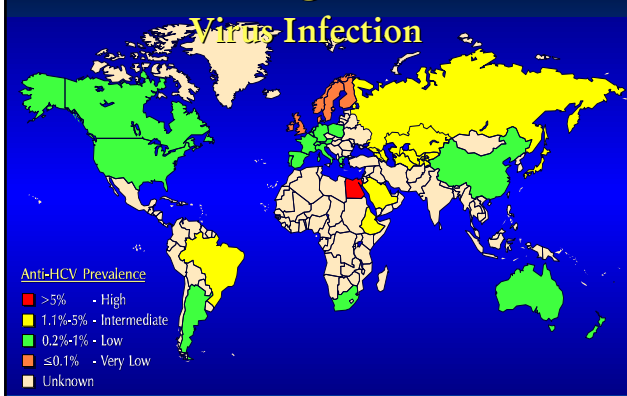
Clinical Features & Natural History

- 95% clear infection and develop lifelong immunity (HBsAg negative, IgG HBc Ab positive).
- 5% HBsAg positive for > 6 month = chronic infection
 - Chronicity: 90% in neonates, 25-50% of children < 6 years old
 - Inactive carrier state (low viral level, normal LFT's and biopsy)
 - Chronic active hepatitis (elevated LFT's, necrosis and inflammation on liver biopsy)

Hepatitis B Prevention and Vaccination

- Prevent perinatal HBV transmission
- Vaccination is routine for infants
- Ages 11-15 "catch up", and through age 18
- Over 18 – high risk groups:
 - Occupational risk (Health care workers)
 - Hemodialysis patients
 - All STD clinic clients
 - Multiple sex partners or prior STD
 - Inmates in Correctional settings
 - MSM
 - IDU
 - Household contacts/sex partners of persons with chronic HBV.
- Post-vaccination testing: 1-2 months after last shot, if establishing response is critical (HCW).

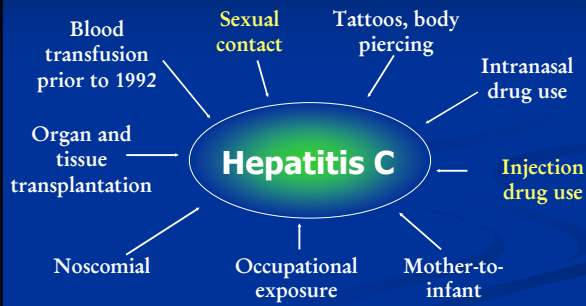
Geographic Distribution of Hepatitis C Virus Infection



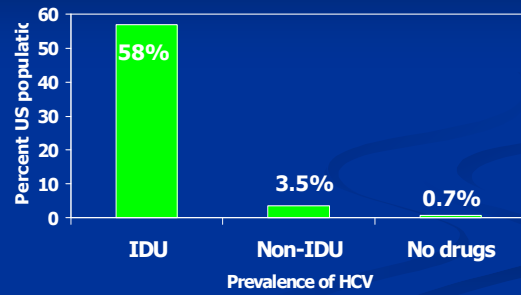
Hepatitis C (HCV)

- Hepatitis C is a hepatotropic viral that causes chronic inflammation of the liver.
- Parenteral transmission.
- 20% of persons infected with HCV develop cirrhosis over a 40-50 year period.
- Acute and chronic infection is typically asymptomatic until overt liver failure develops (AKA the "silent killer")
- HCV has replaced alcoholic liver disease as the leading indication for liver transplantation in the US.

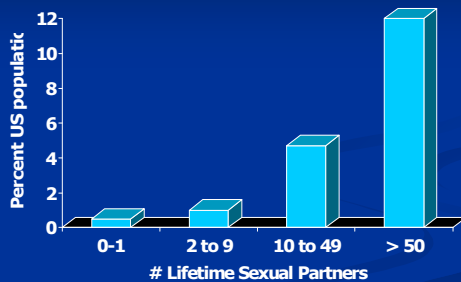
Modes of Transmission



Prevalence by Risk Factors



Sexual Transmission



Hepatitis C: Clinical Features

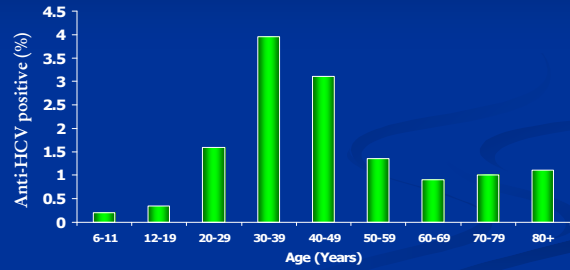
- Incubation: 2 to 22 weeks
- Symptoms
 - 75% asymptomatic, jaundice uncommon
 - Fatigue, right upper quadrant abdominal pain most common symptoms
- Chronic infection occurs in 60-85%
- 30% have normal liver enzymes
 - “silent killer”

NHANES III (Third National Health and Nutrition Examination Survey)

- HCV seropositivity: (1.8%)
 - 3.9 million (3.1-4.8)
- HCV viremia: (0.96%)
 - 2.7 million (2.4-3.0)
- Highest observed prevalence: (9.8%)
 - black men 40 to 49 years old.
- Incidence: 28,000 new infections annually
- Mortality: 8-10,000 deaths annually

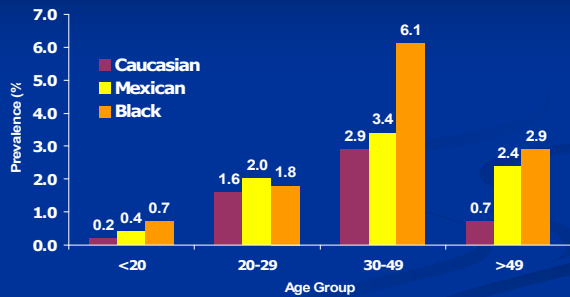
Alter MJ, et. al. N Engl J Med 1999

Age Specific Prevalence NHANES III 1988 - 1994



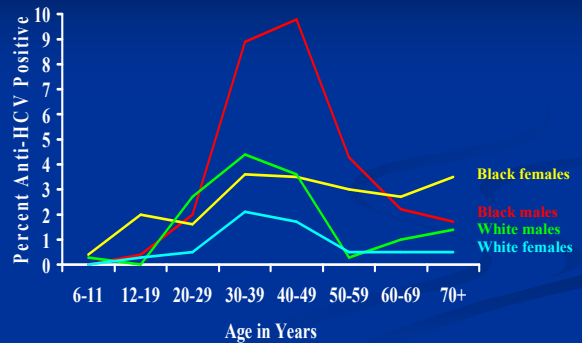
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HCV Prevalence by Age & Ethnicity

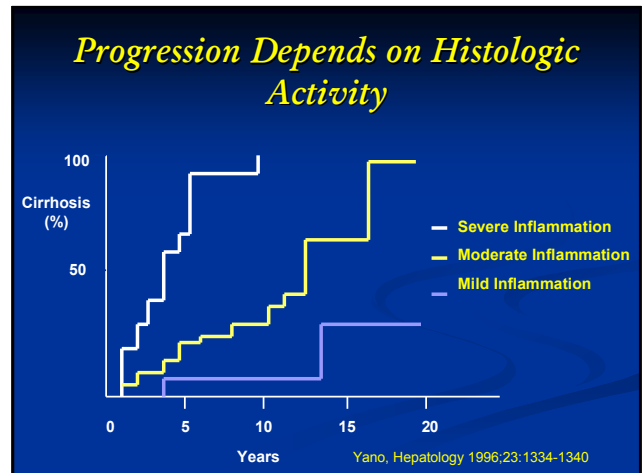
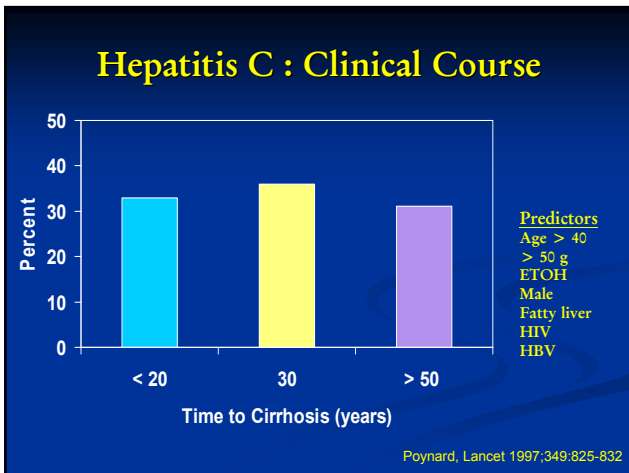
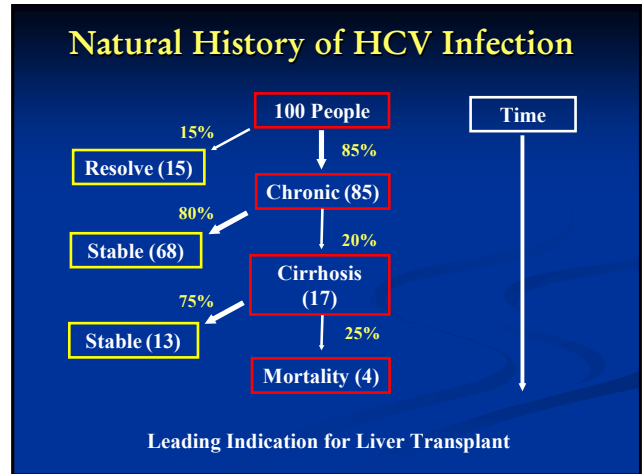
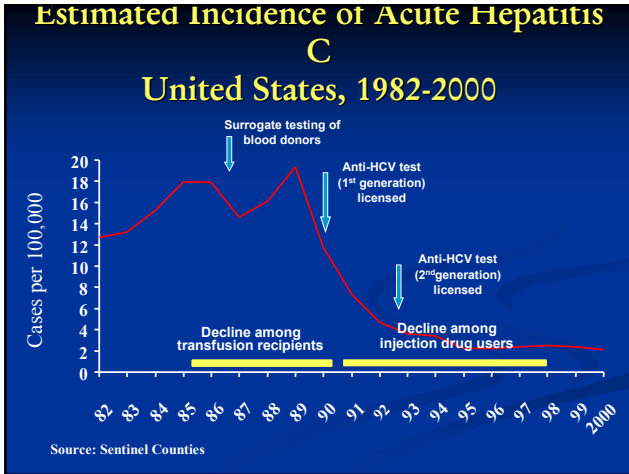


Alter MJ, et. al. N Engl J Med 1999

Prevalence of HCV Infection by Age, Ethnicity, and Gender, 1988-1994



Source: NHANES III



Hepatitis C: Indications for Testing

- Transfusion prior to 1992
- Hemodialysis
- Multiple sexual partners
- Spouses/partners
- Injection drug use
- Intranasal cocaine use

Hepatitis C : Prevention

- No vaccine available
- Screening and testing donors of blood, organs, and tissues
- Risk-reduction counseling and services
 - Latex condoms if multiple partners
 - Avoid sharing toothbrushes, razors, combs
 - Cover open wounds
- Infection control practices
- Blood and body fluid precautions