THE HEPATITIS VIRUSES

I. HEPATITIS A VIRUS

A. CLASSIFICATION
   1. AN ENTEROVIRUS IN THE PICORNAVIRIDAE
   2. HUMAN ENTEROVIRUS-72

B. STRUCTURE
   1. 27 nm IN DIAMETER, ICOSAHEDRON, NON-ENVELOPED
   2. SEQUENCED SS RNA WITH Vpg AT THE 5'-END AND
      POLY A AT 3'-END
   3. TYPICAL PICORNAVIRUS

C. REPLICATION
   1. LIKE PICORNAVIRUSES
   2. CODES FOR COAT PROTEINS, REPLICASE, ETC
   3. POLYPROTEIN PRODUCED

D. IMMUNOLOGY
   1. HA Ag (MAJOR ANTIGEN)
   2. ANTI-HA IgG AND IgM PRODUCED

E. CLINICAL DISEASE AND PATHOLOGY
   1. USUALLY ACUTE INFECTION WITH FEW SEQUELAE OR
      COMPLICATIONS
   2. FULMINANT HEPATITIS IN 1-4 %

II. HEPATITIS B VIRUS

A. CLASSIFICATION
   1. ONLY HUMAN VIRUS IN THE HEPADNAVIRIDAE
   2. HEPADNAVIRUS TYPE 1

B. STRUCTURE
   1. 42 nm DANE PARTICLE, ENVELOPED, ICOSAHEDRAL 28 nm CORE
   2. CIRCULAR, PARTIALLY DS DNA, SEQUENCED, 5'-PROTEIN ON L
      STRAND
   3. FOUR ORFs-OVERLAPPING, ONE DIRECTION

C. REPLICATION
   1. LIKE "OUT-OF-PHASE RETROVIRUS"
   2. ORF 1 CODES FOR A REVERSE TRANSCRIPTASE
   3. INTEGRATION OF DS DNA INTO HOST GENOME MAY OCCUR
   4. ORF1-RT; ORF2-THREE SURFACE PROTEINS, S, S-1 AND
      S-2; ORF3-CORE PROTEIN, C; ORF4-UNKNOWN

D. IMMUNOLOGY
   1. THREE MAJOR ANTIGENS:
      a. HBsAg--surface antigen protective Ab produced
      b. HbcAg--core antigen denotes acute or chronic
         infection
      c. HBeAg--core-related antigen ditto

E. CLINICAL DISEASE AND PATHOLOGY
   1. LONG INCUBATION PERIODS--2 MO. OR MORE
   2. ACUTE INFECTION WITH EXTRAHEPATIC (IMMUNE-MEDIATED)
      MANIFESTATIONS
   3. FULMINANT FORM (1-4%, AS IN HAV INFECTIONS)
   4. CHRONIC: PERSISTENT (3%); AGGRESSIVE (3%); CARRIER (5%)
   5. CIRRHOSIS AND HEPATOCELLULAR CARCINOMA
   6. PERINATAL TRANSMISSION LEADING TO CHRONIC INFECTION(90%)
III. HEPATITIS C VIRUS—NANB HEPATITIS—BLOOD-BORNE
   A. CLASSIFICATION—UNKNOWN
   B. STRUCTURE—UNKNOWN—"TOGAVIRUS-LIKE"
      1. SENSITIVE TO ORGANIC SOLVENTS
      2. SMALLER THAN 80 nm IN DIAMETER
      3. CONTAINS A PLUS STRAND RNA OF 10 KB
   C. REPLICATION—UNKNOWN
   D. IMMUNOLOGY—CURRENTLY A DIAGNOSIS OF EXCLUSION (eg. NANB)
   E. CLINICAL DISEASE AND PATHOLOGY
      1. POST TRANSFUSION HEPATITIS (PTH)
      2. WIDE RANGE OF INCUBATION PERIODS
      3. LIKE HBV INFECTIONS WITH:
         a. less fulminant disease
         b. much more chronic disease (eg. 30% chronic aggressive)

IV. HEPATITIS D VIRUS—THE DELTA AGENT
   A. CLASSIFICATION—NOT CLASSIFIED—PROBABLY UNIQUE
   B. STRUCTURE
      1. 36 nm PARTICLE, ENVELOPED WITH A 27 nm DELTA CORE
      2. CONTAINS HBsAg (HBV SURFACE ANTIGEN)
      3. CORE PROTEIN IS DELTA SPECIFIC
      4. RNA IS SS, CIRCULAR, 1678 N; VIROID-LIKE
      5. CODES FOR A 215-AA PROTEIN
   C. REPLICATION
      1. SELF REPLICATES RNA ?
      2. REQUIRES HBV FOR TRANSMISSION (COATING)
   D. IMMUNOLOGY
      1. DELTA ANTIGEN—PROBABLY THE CORE PROTEIN
      2. ANTI-DELTA Ab MEANS IMMUNITY
   E. CLINICAL DISEASE AND PATHOLOGY
      1. THOUGHT TO MODIFY HBV INFECTION—ACTUALLY INHIBITS HBV—MAY PROMOTE CHRONIC STATE
      2. FIRST FOUND IN CHRONIC HBV PATIENTS (20%)
      3. ACUTE (5%); CHRONIC CARRIERS (3%)

V. HEPATITIS E VIRUS—ET—NANB—ORAL-FECAL
   A. CLASSIFICATION—UNKNOWN
   B. STRUCTURE—UNKNOWN—"CALICIVIRUS-LIKE"
      1. NON-ENVELOPED
      2. 32-34 nm IN DIAMETER
      3. POLY A-CONTAINING RNA OF 7.6 KB
      4. cDNA CLONES HAVE BEEN MADE
   C. REPLICATION—UNKNOWN
   D. IMMUNOLOGY—CURRENTLY NANB
      1. ABs DO DEVELOP POSTINFECTION AND THEY AGGREGATE
         VLPs (VIRUS-LIKE PARTICLES)
      2. THUS FAR ALL ET-NANB OUTBREAKS RESULT IN SIMILAR ABs
   E. CLINICAL DISEASE AND PATHOLOGY
      1. ENTERICALLY TRANSMITTED—ENDEMIC IN ASIA/AFRICA
         CONTAMINATED WATER
      2. AFFECTS MAINLY ADULTS, MORTALITY ABOUT 4%
      3. HIGH MORTALITY AMONG PREGNANT WOMEN
      4. USUALLY AN ACUTE DISEASE—LIKE HAV DISEASE
VI. TRANSMISSION
A. BLOOD AND BLOOD PRODUCTS
   1. HBV, HCV (NANB), AND DELTA AGENT
   2. HBV AND DELTA ALSO SEXUALLY TRANSMITTED
   3. VERTICAL TRANSMISSION ALSO WITH HBV AND DELTA
   4. HBV TRANSMITTED IN MALE GAY POPULATION
B. ORAL-FECAL ROUTE
   1. HAV AND HEV
   2. ENDEMIC AREAS
   3. PROBABLY NO SEXUAL OR VERTICAL TRANSMISSION
   4. USUALLY ASSOCIATED WITH POOR SANITATION AND
      CONTAMINATION OF WATER SUPPLIES
   5. HAV ASSOCIATED WITH SHELLFISH ON GULF COAST