Hepatitis C Epidemiology

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1 Introduction

More than 170 million individuals in virtually every area of the world have hepatitis C virus (HCV) infection. HCV is most often transmitted by percutaneous exposure to blood. However, the predominant modes of transmission have changed over time and differ between and even within countries. Before economic development occurs, HCV may be transmitted through folk and traditional medical procedures and other percutaneous practices such as injection drug use, acupuncture, tattooing, and sharing razors. In economically developed countries, most
new HCV infections are related to drug use, though blood transfused prior to HCV antibody screening has been an important source of infection. HCV may also be transmitted between sexual partners and from a mother to her infant, though this is uncommon.

1.1 Biologic Basis

Hepatitis C virus transmission requires that infectious virions contact susceptible cells that sustain replication. It is difficult to ascertain which body fluids contain infectious hepatitis C virions. Using sensitive techniques, HCV RNA can be detected in blood (including serum and plasma), saliva, tears, seminal fluid, ascitic fluid, and cerebrospinal fluid (Chen et al. 1995; Fiore et al. 1995; Liou et al. 1992; Mendel et al. 1997; Wang et al. 1992). HCV RNA-containing blood is infectious when administered intravenously, for example, by transfusion or experimental inoculation of chimpanzees. In addition, one chimpanzee was infected by intravenous inoculation of saliva (Abe and Inchauspe 1991). However, it is unknown whether these other non-blood body fluids harbor infectious virions, both because the experiments have not been performed and because accidental percutaneous exposures to non-blood body fluids are rare.

The second requirement for transmission is contact of infectious virions with a susceptible cell. HCV replication occurs in the hepatocyte and possibly elsewhere. However, it is not precisely known which cells are susceptible to HCV infection and how the virus enters the cell. As mentioned above, if HCV reaches the blood, infection commonly occurs, and transmission through the conjunctiva has been reported (Sartori et al. 1993). Seminal fluid may contain HCV RNA, but sexual transmission is uncommon. Whether this discrepancy is due to a paucity of infectious virions in seminal fluid or insufficient numbers of susceptible cells in the genital mucosa is unknown.

1.2 Molecular Tools for Studying Hepatitis C Virus Transmission

The nucleotide sequence corresponding to the HCV envelope and some nonstructural proteins is highly variable, and at least six distinct HCV genotypes have been described (Bukh et al. 1995; Simmonds et al. 1993). The genetic heterogeneity of HCV strains is sufficiently high that detection of the same or nearly identical nucleotide sequences in two individuals is strong evidence for a common source of infection. For example, RNA sequences in the E1 gene of HCV infected infants have 98%–100% identity with their mothers, but less than 92% with one another (Thomas et al. 1998). Similar comparisons have been used to demonstrate HCV transmission between sexual partners, within families, among patients, and from a health care worker to patients (Allander et al. 1995; Bronowicki et al. 1997; Esteban et al. 1996; Thomas et al. 1995b). HCV genotype/subtype classification also may be used epidemiologically, but is less specific than nucleotide sequence analysis.