



Transmission of Hepatitis B and C Viruses – Update

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Chronic infection with hepatitis B virus or hepatitis C virus, two common blood-borne pathogens, is responsible for significant morbidity and mortality. The prevalence of exposure to HCV among blood donors in Israel is estimated at 0.44–0.66% [1,2] and that of HBV at 0.4–0.88% [1]. Higher rates are observed among specific subpopulations [3]. Over the years, focus on the mode of transmission of these viruses shifted from the “classic” modes (transfusion, intravenous drug abuse, vertical transmission and sexual intercourse) to include nosocomial infection. Two articles highlighting this shift are published in *IMAJ*, one in the March issue and one in this issue.

The incidence of transfusion-related infection was practically abolished when serologic screening of donors became available during the early 1970s (for HBV) and 1990 (for HCV) [4]. The risk of transfusion-associated HCV infection, for example, is estimated at 0.01% [5] to 0.001% [6] per unit, while the risk for HBV infection is estimated at 0.0015% [6]. During the early 1990s, it was estimated that 4% or less of acute HCV infections were transfusion related [5], with rates probably continuing to decline especially as new screening methods become available.

The acquisition of HBV or HCV by intravenous drug abuse continues to be a major route of infection, accounting for almost half of all new cases of HCV infection in the USA [5]. An extremely high prevalence of HCV antibodies was noted in Israeli IV drug abusers [7], but seropositivity for hepatitis B surface antigen may be lower than in other countries [8]. Results from needle exchange programs are equivocal, although two large recent trials show no significant benefit in reducing the risk of infection [9,10].

Perinatal (“vertical”) transmission or infection during early childhood of children to infected mothers is an important route of infection with HBV in geographic areas of moderate or high endemicity [11]. Israel is considered a country with overall low endemicity [12] although a high prevalence of infection is seen among specific subpopulations, most notably immigrants from various countries [1,3,13]. However, the routine immunization since 1992 of all newborns in Israel against HBV is likely to greatly reduce the significance of vertical transmission, as

numerous studies have shown a decrease in chronic infection [14] and hepatocellular carcinoma [15] in children following immunization. Vertical transmission of HCV is much less common, occurring mostly in infants born to mothers with high viral load or mothers co-infected with human immunodeficiency virus. The likelihood of perinatal transmission of HCV is estimated at 5–6% [16].

Sexual transmission continues to play a major role in the transmission of HBV, especially for individuals partaking in homosexual or high risk multi-partner heterosexual activity. In this issue, Zamir and Zamir [17] discuss the prevalence of HBsAg positivity in family members of HbsAg-positive blood donors. They found 5.9% of the spouses to be infected but none of the children. This hints at sexual transmission, although other modes (such as shared razors, or common origin from a highly endemic country) should also be considered. These rates are similar to previously reported data implying a low risk of infection. A significant portion of sexual partners of the patients in Zamir and Zamir’s report were not tested by the primary physician for HBV serology, neither were the siblings and parents of the patients. Sexual transmission is less important in HCV infection, with a higher risk of infection attributed mostly to high risk sexual behavior (promiscuity, multiple partners). A stable, monogamous sexual activity is probably not associated with an increased risk of infection [16], and routine use of barrier precautions is not recommended for monogamous sexual partners of HCV carriers [18].

Although the classic modes of transmission still account for most infections, nosocomial infection with HBV and HCV plays an increasingly greater role. Most nosocomial infections with the blood-borne hepatitis viruses occur in the setting of the hemodialysis unit [19]. HBV transmission in hemodialysis units was almost completely abolished by routine testing of patients for HBsAg, vaccination against HBV, and segregation of HBV-positive patients [20]. On the other hand, HCV infection is common [19], and evidence for nosocomial transmission in hemodialysis units has been provided by several reports using phylogenetic analysis [21]. The mode of transmission was not

fully elucidated, but contamination of the ultrafiltrate [22], of the equipment or of the hands of staff members [23] has been implicated. In the March issue of *IMAJ*, Weinstein and colleagues [24] report their findings on the prevalence and prevention of HCV infection in a dialysis center. They detected HCV RNA in 18% of hemodialysis patients, a rate similar to previously reported data (although a wide range of HCV prevalence rates exists [19]), and also observed seroconversion of two patients during a 1 year study period. Mandatory segregation of HCV patients to different rooms and the use of dedicated dialysis equipment was shown to decrease the rate of seroconversion in a hemodialysis unit with a high prevalence (49%) of HCV patients [25]. Others, however, have shown that simply using systematic disinfection procedures of dialysis monitors [26] or even simply observing the universal precautions more carefully [27] similarly prevent HCV spread. Amazingly, when the degree of adherence to universal precautions was assessed in a dialysis unit, it was found that glove-wearing and hand-washing occurred in only 19% and 32%, respectively, of the occasions necessitating them. Weinstein et al. [24] also report that following the implementation of a segregation program, with the use of dedicated machines for HCV-positive patients, no seroconversion was observed for 5 years. Their work adds to the accumulating body of evidence marking HCV infection in hemodialysis units a preventable disease.

Other ways of nosocomial infection with hepatitis viruses exist. Nosocomial outbreaks of HBV in medical wards were attributed to contamination of multiple-use medication vials [28] or to reusable finger-stick glucose monitoring devices [29]. Alternative medicine practices are not immune to nosocomial infections either – HBV transmission was reported in association with acupuncture [30] while autohemotherapy was associated with both HBV and HCV outbreaks [31]. Even in cosmetic procedures such as piercing [32], tattooing and barber shop shaving [33], was HBV infection reported. As for HCV, at least in the U.S., no clear link appears between infection and acupuncture, tattooing or piercing. For every outbreak researched, the epidemiological investigation yielded the same result – nosocomial infection appeared where the universal precautions [34] were not observed.

Endoscopic procedures of the gastrointestinal tract [35–38] as well as urological invasive procedures [39] were also reported to be rarely involved in patient-to-patient transmission of HCV and HBV. HBV infection was transmitted with gastroscopy and colonoscopy equipment [38], while for HCV, only colonoscopy [36] and retrograde cholangiography [37] were implicated. Although to date no report of HCV transmission following gastroscopy exists, gastroscopy equipment was shown to be contaminated with HCV prior to disinfection [35]. Proper cleaning and disinfection of equipment is sufficient to eliminate the risk of transmission.

Finally, nosocomial infections can also be transmitted by healthcare workers. Being themselves at risk for infection with blood-borne viruses, healthcare workers were reported to infect

their patients with HCV [40] or HBV [41]. As most of these infections occurred in a surgical setting, surgeons who are hepatitis B e antigen positive (an indication of a replicative virus) are not allowed to perform exposure-prone procedures, at least in the UK. A debate exists whether similar restrictions should apply to the HCV RNA-positive surgeon [42].

What is the role of physicians in preventing the spread of HBV and HCV infection? Since an efficient vaccine has become available for HBV, vaccination should be the major course of action. We agree with Zamir and Zamir's statement that better education of physicians and a stronger emphasis on screening family members are paramount to proper vaccination [17]. Apart from strongly advocating the routine vaccination of newborn infants, physicians should actively offer the vaccine to family members of HBV carriers (including siblings and parents), hemodialysis patients and individuals engaging in high risk sexual activity or IV drug abuse. As no vaccine is available for HCV, emphasis should be placed on educating patients, their families and persons likely to engage in high risk behavior (especially adolescents). These active preventive measures are suitable for the primary care physician. However, all members of the medical and nursing professions, especially those working in a hospital setting, should endeavor to prevent nosocomial transmission of blood-borne hepatitis viruses, conforming to the adage of "*primum non nocere*" – first, do no harm. It is not clear whether complete segregation of HCV carriers in dialysis units is necessary to prevent transmission, although as Weinstein et al. have shown, these measures are certainly sufficient [24]. In conclusion, we strongly advise the strict enforcement of universal precautions – including hand-washing, changing of gloves, using single-use equipment and avoiding multiple-use vials, adhering to recommended disinfecting measures for invasive reusable equipment, and keeping a close vigil for nosocomial outbreaks. These easy, inexpensive measures would greatly reduce the occurrence of preventable cases of viral hepatitis.

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When I was young, I was told: "You'll see, when you're fifty." I am fifty and I haven't seen a thing.

Erik Satie, French composer (1866–1925)