

Transmission of Hepatitis B in the Health Care Setting: The Elephant in the Room ... or the Mouse?

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(See editorial commentary by Hecht et al., on pages 1239–41; the major article by Blick et al., on pages 1250–9; and the brief report by Redd et al., on pages 1311–4.)

Most infections with hepatitis B virus in the United States occur as a result of specific high-risk behaviors. Most, but not all. Approximately 1.2 million people living in the United States have chronic hepatitis B virus infection [1]. Each year, another 8000 acute infections—mostly in adults—are reported to the Centers for Disease Control and Prevention (CDC) [1]. Many of these infections are the result of sexual activity (both heterosexual and homosexual) or intravenous drug use; however, up to one-third report no risk factors for infection [2]. Although it is likely that a large number of these risk-deniers simply are unwilling to acknowledge behaviors they may view as socially stigmatizing, it also is possible that some have acquired their hepatitis B infection in nonclassical ways. The blunt epidemiologic tools used in recent decades to assess risks of transmission have been important and useful. Nevertheless, finer implements may be needed

to tease out smaller but perhaps substantial risk factors.

This need is illustrated in the report published in this issue of the *Journal* by Redd et al. [3]. They describe a 60-year-old, white, non-Hispanic woman who was not sexually active, did not use intravenous drugs, and who had no contacts with persons with hepatitis B virus infection. She went to her dentist in October 2001 for routine tooth extractions. There, despite the oral surgeon's adherence to standard infection control precautions, she was infected with hepatitis B virus. The oral surgeon and all the office staff were tested, and none had serologic evidence of infection with hepatitis B virus. How did this happen? The meticulous investigation that ensued demonstrated that this unfortunate woman's virus was identical to virus isolated from an hepatitis B surface antigen-positive 36-year-old woman who had hepatitis B infection dating back to at least 1999. The chronically infected woman had visited the same oral surgeon on the same day and had had 3 teeth extracted just 161 min before the index patient had a similar procedure.

The authors conclude that patient-to-patient transmission of hepatitis B infection occurred in the dentist's office and also state that such transmission appears to be rare. How certain should we be that events similar to this are, indeed, rare?

Ought we to be confident that the magnitude of the problem is small (the proverbial mouse), or might we be dealing with a hidden elephant? We suggest that the current burden of health care-acquired bloodborne infection is largely unknown because only modest efforts have been made to identify such cases and quantify the risk. A series of circumstances in this particular case led to the investigation that identified the source of the 60-year-old woman's infection. The New Mexico Department of Health (DOH) did what some local and state health departments would have done—they conducted a routine investigation of the index patient's newly diagnosed hepatitis B infection. In similar circumstances, if no traditional risk factors are found, the investigation typically stops. However, for reasons that are not entirely clear, when the DOH and the CDC could find no traditional risk factors to account for this infection, they looked further. They began by searching the state's registry of patients with hepatitis B to identify the epidemiologic link between the source and index patient. Subsequent genotyping of viruses obtained from both women established that the younger woman was the source of the older woman's infection. Thus, the investigators coupled traditional "shoe leather" epidemiology to newer molecular techniques to create an even more pow-

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erful scientific tool—a tool that hopefully may one day be used by most public health investigators.

What would happen if *all* persons who are infected with bloodborne pathogens and who do not fit the classical epidemiologic paradigm were thoroughly investigated as was done in this case? Sixty-year-old women who are not sexually active and do not use intravenous drugs ought not to be getting infected with hepatitis B or other bloodborne viruses. In similar circumstances, other health departments also must be curious and motivated and have sufficient infrastructure to track down the source of infection. Special efforts should be made to identify potential exposures in medical, surgical, or dental settings.

Fear of transmission of bloodborne viruses in the health care setting reached almost hysterical levels in the early 1990s when a 19-year-old woman and 5 other persons were shown to have been infected with HIV by their dentist during routine dental procedures [4]. In 3 other published reports, epidemiologic studies and DNA analysis confirmed that an HIV-positive physician or nurse had transmitted HIV to a patient [5–8]. For a period of time, a flurry of “look-back” investigations of patients of HIV-infected health care workers was done and did not identify additional cases of transmission [9, 10]. Nosocomial transmission of hepatitis B virus is ~100-fold more efficient than transmission of HIV [11] and once was a commonly reported event. Surgeon-to-patient and dentist-to-patient transmissions of hepatitis B were essentially eliminated when vaccination of health care workers became routine. Nevertheless, in the past 10 years, 91 cases of health care worker-to-patient transmission of hepatitis B virus occurred in settings where no breaches in infection control practices could be identified; 38 cases of health care worker-to-patient transmission of hepatitis C transmission have been reported [5].

To prevent future hepatitis B virus

transmissions between patients in medical settings, the authors encourage strict adherence to standard infection control practices in dental settings. Although we also are strongly in favor of meticulous maintenance of bloodborne pathogen infection control standards in all medical settings, it is apparent that such practices were inadequate in blocking the movement of hepatitis B virus from the source to the index patient in the Redd et al. report. There and in other instances [12, 13] investigators have been unable to explain how the virus traveled from person A to person B—and that is troubling. It is troubling because it suggests that there are aspects of transmission of bloodborne disease that remain poorly understood. It also illuminates the insufficiency of the prevention message to this oral surgeon. If the oral surgeon could go back in time and reenact the day of transmission, one cannot make specific suggestions that anything should have been done differently because no infection control deviations were found.

Redd et al. report that they contacted and tested 25 patients who had procedures done at the oral surgery center during the same week but after the source patient's procedure. Only 16 (64%) had been previously vaccinated for hepatitis B. It is not surprising that the rate of vaccination among persons <25 years of age (93%) greatly exceeded that of persons ≥25 years of age (20%) ($P < .001$). We advocate adoption of another prevention strategy: universal hepatitis B virus vaccination of all adults up to 40 years of age. Sadly, but not surprisingly, the current risk-based vaccination recommendations endorsed by the Advisory Committee on Immunization Practices have resulted in meager vaccination rates for persons in high-risk groups. Fewer than 10% of young adults with high-risk behaviors (intravenous drug users, persons with multiple sex partners, and men who have sex with men) have received hepatitis B virus vaccine [14, 15].

In the United States, the majority of

new cases of hepatitis B infections occur in adults [16]. Universal hepatitis B vaccination policies produced dramatic declines in the incidence of acute hepatitis B infection in children [16]. In contrast, despite the availability of an effective and safe vaccine for adults, rates of acute hepatitis B virus infection in many adult age groups have plateaued or continue to increase [1]. Universal age-based recommendations might have prevented both the source patient's infection and subsequent transmission to the index patient in the oral surgeon's office.

Bloodborne viruses such as HIV, hepatitis B, and hepatitis C that may be transmitted in health care settings continue to present challenges to hospitals, physicians, dentists, and patients. The best efforts of well-meaning providers to eliminate these events will likely not completely succeed. However, strategies that may limit their number include meticulous infection control practices, postexposure prophylaxis administered promptly to those known or suspected of having been exposed to hepatitis B or HIV, and universal hepatitis B vaccination. A thorough search for non-traditional exposure sources for all patients with no recognized risk factors who are diagnosed with HIV, hepatitis B, or hepatitis C also may quantify the magnitude of the risk to patients in medical settings and perhaps shed light on mechanisms of transmission.

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