# Letters to the Editor

## Hepatitis C Virus Infection in Healthcare Workers

**To the Editor:**

In a recent article, Lanphear et al[1] stated that healthcare workers (HCWs) have a significant risk of occupational acquisition of hepatitis C virus (HCV) infection. The data presented in this article should be interpreted with caution.

The reported annual incidence of 21 cases of clinical non-A, non-B hepatitis (NANBH) per 100,000 HCWs enrolled in a hospital surveillance program cannot be compared directly to 7.1 cases per 100,000 population based on voluntary disease reporting to health departments of four counties.[2] Indeed, as Alter et al stated in the referenced paper, NANBH is the most underreported of the three types of hepatitis, and there was no evidence that the level of reporting improved during the 7-year surveillance period.

Moreover, Alter et al showed that NANBH incidence varies widely among, and even within, geographical areas. Therefore, because the HCWs in the Lanphear study were not drawn from the same reference population as the Alter study, the two incidence rates cannot be compared directly.

An incidence rate that is three times higher in HCWs than in non-HCWs should yield a prevalence rate in HCWs that is significantly higher than in the general population. However, although some prevalence studies have reported higher prevalence rates among HCWs, several others conducted in the United States,[3,4] as well as elsewhere,[5-11] failed to find an elevated HCV prevalence among HCWs when compared to blood donors or other non-HCW populations.

The small number of HCWs enrolled and the high loss to follow-up (56%) may have affected the observed 6% HCV seroconversion rate after an occupational needlestick. If none of the HCWs lost to follow-up had seroconverted to HCV, assuming that 69.4% were needlestick cases, a seroconversion rate as low as 2.6% following needlestick would have been observed.

Based on our experience, we documented two HCV seroconversions among 123 HCWs who had a needlestick exposure to HCV- and HIV-positive source patients (1.6%)[12] and no seroconversions among 61 dialysis workers who were exposed by a needlestick to anti-HCV-positive dialysis patients.[13] In both studies, the source patients were likely to have a high HCV viremic level, but the seroconversion rate was, nevertheless, lower than that found by Lanphear et al.

We identified six additional studies reporting the rate of HCV transmission after an occupational exposure to source patients with documented HCV infection among HCWs who were followed up for at least 5 months.[11, 14-18] The rate of HCV transmission reported in these studies ranges from 0% to 10%. This wide range probably reflects differences in the study designs, diagnostic methods used, number of cases followed, and, perhaps, different infectivity of HCV strains. The number of HCWs studied generally was small, and biases due to selection of different types of occupational exposures and different characteristics of source patients cannot be ruled out.

Although these studies are not directly comparable, the median rate of HCV needlestick transmission across studies is 1.6%. The pooled HCV transmission rate is 2.5% ($CI_{95}$, 1.4% to 4.2%, Table).

A reliable estimate of the rate of HCV transmission after an occupational exposure is important for counseling the exposed HCWs, for planning preventive measures, and as a basis for calculating sample size for potential vaccine trials in the future. Studies employing RNA detection methods would provide the most precise estimate of HCV occupational infection, although cost, reliability, and availability remain important issues. Studies using second- or third-generation serologic assays are acceptable by current standards, but they should include adequate sample sizes and should employ standardized methods of data collection to define the specific transmission risk associated with different devices and exposure mechanisms.

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TABLE
RATES OF NEEDLESTICK SEROCONVERSION AMONG HEALTHCARE WORKERS EXPOSED TO HEPATITIS C VIRUS, WITH A MINIMUM FOLLOW-UP OF 5 MONTHS

| Country | Healthcare Workers | Seroconversion | Percentage | Comments |
|---|---|---|---|---|
| USA' | 50 | 3 | 6.0 | |
| UK[11] | 24 | 0 | | |
| Italy[12] | 123 | 2 | 1.6 | All source patients HIV + |
| Italy[13] | 61 | 0 | | Dialysis source patients |
| Italy[14] | 30 | 0 | | |
| Japan[15] | 88 | 3 | 3.4 | Frozen serum samples collected from 1979 to 1990 |
| Japan[16]* | 91 | 5 | 5.5 | Frozen serum samples collected from 1977 to 1990 |
| Spain[17] | 53 | 1 | 1.9 | 49/53 source patients HIV+ |
| Spain[18] | 31 | 0 | | Most source patients HIV+ |
| Total | 551 | 11 | 2.0 | |

* In this study, among 68 healthcare workers exposed to HCVRNA-positive source patients, seven (10%) showed appearance of HCV RNA by polymerase chain reaction. of whom five (7.3% of the 68) seroconverted by first-generation assays.

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*The authors reply*

We appreciate the comments and additional citations provided by Puro et al. Specifically, Puro et al are concerned about the "high" rate of HCV transmission found in our study (6% following a needlestick injury) compared with some other studies. Puro et al suggest that the median rate of transmission (1.6%) and the mean rate of transmission (2.0%) of these combined studies indicate that a 6% rate of transmission is too high. In fact, both of these values, and the 2.6% rate that would have been observed if all 117 HCV-positive needlestick injuries were evaluated and no additional infections were found, are within our reported 95% confidence interval (1.3% to 16.6%). The authors are correct in advising caution in the interpretation of the risk of non-A, non-B hepatitis in healthcare workers using active surveillance compared with passive surveillance in the community.

There are a number of potential reasons for the differences in rates of HCV transmission in published reports. For example, there appear to be geographic and time-period differences in published studies that found higher rates of transmission compared with those that found lower rates of transmission[1-8] (Table). It is plausible that the studies cited by Puro et a1,[4-8] which examined exposures that were more recent than the studies showing a higher rate of transmission, and often included healthcare workers from high-risk settings, are more likely to include healthcare workers who were wearing gloves or who reported needlestick injuries that were superficial. The transmission rate of HCV probably is dependent on the depth of injury, the dose or inoculum, and whether the needle first penetrated a latex barrier.[9] Finally, a variety of assays that appear to have different screening characteristics were used in these studies.[10]

We all agree that the solution is a prospective trial involving larger numbers of healthcare workers using a standard assay and PCR. These prospective studies will need to attempt to define things such as the depth of percutaneous injury, the size of the inoculum, and whether the needle first penetrated a latex glove(s). Until then, it is likely that the observed disparity in transmission rates of HCV following an HCV-positive needlestick injury will remain unresolved.

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