

**HEPATITIS B TRANSMISSION IN A NURSING HOME  
LOS ANGELES COUNTY, 1999**

**BACKGROUND**

Hepatitis B is a bloodborne, viral disease of substantial public health consequence. With an estimated 140,000-320,000 new cases occurring each year in the United States, 140 to 320 cases die due to acute disease. Five to six thousand more cases die of complications of chronic hepatitis B. The main adult risk groups are sexually active heterosexuals, men who have sex with men, and intravenous drug users.

Acute hepatitis B is a reportable disease in Los Angeles County, and 92 cases were reported in 1998. Of these only three case-patients were 65 years of age or older. However, in October 1999, ACDC was notified of three cases-patients 80 years and older with acute hepatitis B. All had been residents of nursing home A (NHA) that had closed in July 1999 for financial reasons. The onset of Case 1 was August 18 and the onset of Case 2 was August 28, 1999. Both died in early September with hepatitis B listed on the death certificates as the cause of death. The local health district had investigated these cases but no risk factors, other than the common nursing home, were identified. When a third case of acute hepatitis B from the same nursing home was diagnosed in October, with an onset of September 28, the local health district notified ACDC. Since hepatitis B has an incubation period of 50 days-6 months, the first possible transmission date could have been as early as February 18, 1999.

**METHODS**

To assess the prevalence of hepatitis B in residents of NHA, ACDC sent letters to the administrators of the 18 different nursing homes where residents had been transferred after the closure of NHA to request that residents be tested for acute (anti-Hbc IgM), past (anti-HBc total), and chronic (HBsAg) infection with hepatitis B.

A case was defined as a former resident of the nursing home who tested positive for acute hepatitis B from February-December 1999. Residents were considered susceptible for acute infection with hepatitis B if all tests were negative. Residents were considered immune to acute infection with hepatitis B if they tested positive for past or chronic infection with hepatitis B.

To determine the risk factors for acquiring hepatitis B, ACDC performed a cohort study by reviewing the charts of all residents in this nursing home from February- July 1999. The

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following risk factors were analyzed: age, sex, underlying illness, length of stay in the nursing home, and number of blood draws, injections, IV lines, and hospital or outpatient medical visits.

To determine the method of hepatitis B transmission, ACDC made a thorough review of infection control practices in NHA and contacted the manufacturer of medical devices.

Epi Info 6.04c was used to calculate relative risks and determine p-values with Fisher's exact test. Analysis was limited to cases with acute hepatitis B and those susceptible for acute hepatitis B (N=33).

## RESULTS

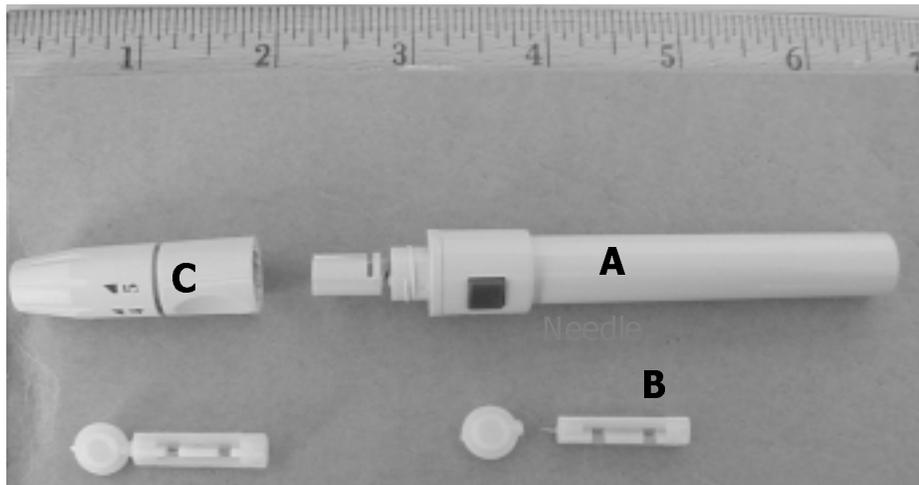
Fifty-nine persons were residents of NHA at some time between February 17 - July 21, 1999. Of the 59, 17 had died by the time of the investigation due to unrelated causes and we were unable to locate four. Of the remaining 38 residents, five had evidence of past infection with hepatitis B (anti-HBc total). These were considered immune to acute hepatitis B and we excluded them from our analysis. An asymptomatic acute case of hepatitis B was found on serosurvey; this made a total of four acute cases of hepatitis B when combined with the three previously reported cases. The serosurvey also revealed that the remaining 29 former residents had no markers of past infection. No one tested positive for chronic infection with hepatitis B.

On statistical analysis, the only risk factors associated with acute hepatitis B in these nursing home residents were having diabetes mellitus and having fingersticks (used to test the blood sugar of diabetics). Four of the nine residents with diabetes versus zero of 24 residents without diabetes had acute hepatitis B (RR=undefined,  $p < 0.004$ ). Furthermore, four of the five residents who received fingersticks, versus zero of 28 who did not have fingersticks, had acute hepatitis B (RR=undefined,  $p < 0.001$ ).

There was a wide range of fingersticks that the residents received, from a low of 20 to a high of 304 over a period of 9-22 weeks. While increasing number of fingersticks seemed to be associated with acute hepatitis B, one resident acquired the disease after only 20 fingersticks (over 20 weeks). The resident who had fingersticks, but did not test positive for markers of hepatitis B, received a total of 21 fingersticks over a 21-week period.

NHA used a pen-like spring-loaded fingerstick device (Figure 1). **A** is the main body of the pen and is where disposable lancets are mounted. **B** is an example of such a lancet. **C**

**Figure 1. Pen-like spring-loaded fingerstick device**



is the cap that is screwed over the lancet after it is mounted. The end of the cap is held against the patient's skin and the spring-loaded mechanism is released so that the lancet is propelled through the tip of the cap into the skin and then it is fully retracted into the device. After use, the cap is removed and the lancet is discarded.

The nursing policy and procedure manual specified that the fingerstick devices should be disinfected according to manufacturer's instructions. Since hepatitis B can be resistant to decontamination with alcohol, the manufacturer's instructions are to never re-use caps between patients. However, in NHA, according to interviews, the nurses re-used the caps, cleaning them with alcohol between patients.

## **CONCLUSION**

This cluster of four cases of acute hepatitis B in NHA was most likely caused by the improper re-use of the caps of the fingerstick devices. This is the first report of fatal hepatitis B associated with pen-like fingerstick devices. Ironically, the nursing procedure manual warned of an association of hepatitis B and fingerstick devices.

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## DISCUSSION

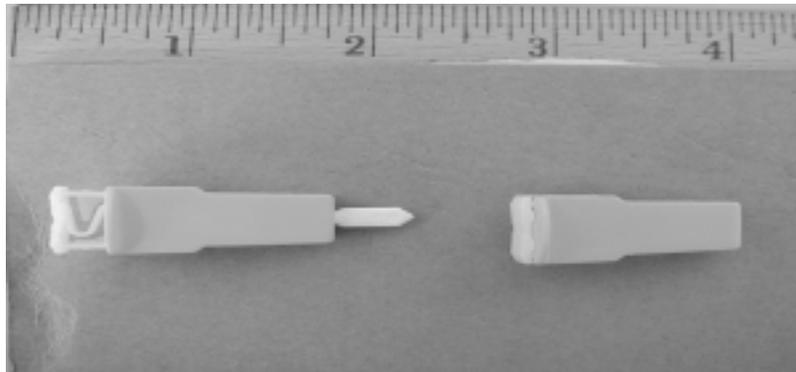
There have been several reports of non-fatal hepatitis B transmission in diabetics who receive fingersticks. In 1990, there was a report in the *MMWR* of 23 diabetic patients with acute hepatitis B who stayed on the same medical ward with a known hepatitis B carrier who was diabetic.<sup>1</sup> No other risk factor was identified except the re-use of the disposable platforms of another kind of spring-loaded fingerstick device. Consequently, the FDA issued a safety alert concerning the re-use of these disposable platforms. In 1997, *MMWR* reported two separate investigations of acute non-fatal hepatitis B associated with the re-use of caps in the pen-like spring-loaded fingerstick devices.<sup>2</sup>

There were four main limitations to our study. We were unable to serologically test 21 patients. However, we were able to get the death certificates of 17 patients who died and none cited hepatitis B as a cause of death. We have no information on the four patients who we were unable to locate. Because we did not test for hepatitis B surface antibody, which is a marker of hepatitis B vaccination, some of those that we classified as "susceptible" might have been immune if they had received the hepatitis B vaccine. Some of the "immune" cases might have been acute cases but had already cleared their IgM and their surface antigen by the time of our investigation. If so, this would change our analysis since none of the immune cases were diabetic. However, the immune cases do not differ significantly from controls in any of the other risk factors. Finally, we were unable to find a source for this outbreak. All five of the diabetics who received fingersticks had been in the nursing home for more than one year except case-patient 3 who may have been the source. She had been in and out of other hospitals and nursing homes before coming to this nursing home in May 1999. She might have gotten acute hepatitis B iatrogenically elsewhere. Nursing personnel responsible for fingersticks denied any signs or symptoms of acute hepatitis B. Many claimed previous vaccination with the hepatitis B vaccine. None were serologically tested for hepatitis B.

Had the nursing home remained open, our recommendations would have been threefold: each person should have their own fingerstick device; or each person should have their own cap for the device; and the staff should receive training about hepatitis B transmission with multi-use spring-loaded fingerstick devices.

However, California passed a bill that became effective in July of 1999 that makes these recommendations moot (Figure 2). It requires that all needle and needle-like devices have "engineered sharps injury protection." In other words, all sharp devices must be fully retractable or sheathed, and in no way reusable, so that health-care workers are protected from injury and disease. However, in the case of this nursing home the bill might have

Figure 2. Single use, fully retractable, fingerstick device



“Engineered Sharps Injury Protection”

protected patients from disease spread by health-care workers.

## REFERENCES

1. Centers for Disease Control and Prevention. Epidemiologic notes and reports nosocomial transmission of hepatitis B virus associated with a spring-loaded fingerstick device—california. *MMWR* 1990;39:610-613.
2. Centers for Disease Control and Prevention. Nosocomial hepatitis B virus infection associated with reusable fingerstick blood sampling devices – Ohio and New York City, 1996. *MMWR* 1997;46:217-221.