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Stability and transmission of hepatitis C virus in different anesthetic agents

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Stability and Transmission of Hepatitis C Virus in different Anesthetics

Dear Editor:

In May 2012 Branch-Elliman et al. reported in the American Journal of Infection Control an outbreak of HCV infections due to contamination of multidose medication vials [1]. The New York City Department of Health and Mental Hygiene was informed of a cluster of 4 patients treated at an outpatient gastroenterology center who developed acute hepatitis C virus infection. A detailed investigation identified a total of 12 clinic-associated HCV transmissions within a period of 8 days which were traced back to unsafe handling of multidose medication vials and possible re-use of contaminated needles during anestheatic procedures.

Hepatitis C is a blood-borne viral infection transmitted mainly through intravenous drug use, blood transfusions, accidental needle sticks, and other parenteral exposures, including nosocomial transmissions. With the introduction of routine testing for HCV in blood products, transfusion-transmitted infections became rare [2]. However, outbreaks in healthcare settings have been consistently noticed primarily attributed to contaminated medications or equipment and breaches in aseptic techniques in the United States, Europe and Japan [3-5]. The recent investigation by Branch-Elliman et al. [1] is another example for such an HCV outbreak. The administered anesthetics were a combination of midazolam, fentanyl, propofol and ketamine. The authors suspect a contamination of the fentanyl vial on day 3 which was subsequently used on the next 18 patients, leading to the 12 HCV transmissions. Among anaesthesiologists, saving of drugs, supplies, and time have been reported as reasons for re-use of syringes during anesthesia.

We have recently shown that the anesthetic propofol provides an good environment for the maintenance of infectious HCV [6]. To test the stability and infectivity of HCV in

the other medication used as anesthetics (midazolam, fentanyl and ketamine), we incubated HCV for several weeks in either optimal cell culture medium condition containing 10% fetal calf serum or in the different pharmaceuticals for up to 35 days. At different time points, virus infectivity was determined by a limiting dilution assay [7]. HCV infectivity in standard cell culture medium decreased over time to undetectable levels after 4 weeks (Figure 1). In the presence of midazolam and ketamine, viral titers were initially lower and compared to the medium control decreased earlier to undetectable levels after 11 and 14 days, respectively. Interestingly, in the case of fentanyl HCV infectivity declined only slightly with higher viral titers than the medium control at day 20. Overall, the stability in fentanyl was comparable to the optimal cell culture medium (Figure 1). These results indicate that in contrast to midazolam and ketamine, HCV is very stable and stays infectious in a fentanyl solution. Therefore, transmission of HCV may occur for a prolonged period of time from fentanyl single-use vials contaminated with HCV.

In summary, we could show that HCV infectivity is maintained over relatively long periods of time in the anesthetic fentanyl, whereas viral half-life was lower in case of midazolam or ketamine. This observation could explain the reported outbreaks of HCV in health care settings by drugs used during anesthesia as the one by Branch-Elliman et al [1]. The CDC and Association for Professionals in Infection Control and Epidemiology (APIC) recommend the use of a sterile, single-use, disposable needle and syringe for each injection given that these transmission can be prevented [8, 9].

Figure legend

Figure 1: Stability of hepatitis C virus (HCV) in different anesthetics. HCV was generated by transfection of Huh7.5 cells and harvest of viral supernatant 72 h later. Virus supernatant was stored for up to 35 days in standard cell culture medium

(control) or indicated anesthetics in a dilution of 1:10 at room temperature. Every seven days viral titers were determined by a limiting dilution assay to determine the tissue culture dose 50 ($TCID_{50}$/ml).

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