Development of an Improved Concrete Testing Coupon for Recovery of Viruses in Quantitative Carrier and Decontamination Efficacy Tests

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Concrete is a common building material routinely encountered in environments where biological contamination events may occur, thus, validation of decontamination procedures for concrete surfaces is desirable. Efficacy tests designed to assess biological decontamination require recovery of infectious agent from untreated surfaces prior to evaluation of disinfectants. Unfortunately, recovery of viable virus from porous concrete has been a reported challenge. We investigated the use of induced rapid carbonation as a tool to lower the pH of homemade concrete testing coupons to compare viral recovery from high and low-pH porous concrete surfaces. Newly carbonated concrete coupons were used in quantitative carrier tests to determine the virucidal efficacy of a liquid chemical disinfectant against two livestock pathogens, Foot-and-mouth disease virus (FMDV) and African swine fever virus (ASFV). Neither FMDV nor ASFV were recovered from untreated concrete coupons unless the pH of the concrete was lowered to approximately pH 9. Viral recovery from carbonated concrete was similar to recovery values from non-porous stainless steel coupons. FMDV titers were reduced by 4-$\log_{10}$ after a 5-minute exposure to 1% Virkon® S on both concrete and stainless steel. Inactivation of ASFV required a 10-minute contact time with 1% Virkon® S on stainless steel, and a 10-minute contact time with 2% Virkon® S on concrete. This study outlines a reproducible method for generation of low pH concrete testing coupons that may be used in quantitative carrier tests to model efficacy of chemical and physical decontamination practices under controlled conditions, and further demonstrates recovery and disinfection of FMDV and ASFV from this challenging surface matrix.