Effect of Chlorine on Enterovirus RNA Degradation

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The primary mechanism of disinfection of waterborne pathogens by chlorine has always been believed to be due to the alteration of proteins by free chlorine and subsequent disruption of their biological structure. In the case of viruses, this is the disruption of the structure of the viral capsid proteins. However, Li *et al* (2002 and 2004) found that in chlorine demand-free buffer treated with chlorine, the viral RNA of hepatitis A virus (HAV) was degraded before the antigenicity of viral capsid proteins. Likewise, Simonet and Gantzer (2006) saw a similar effect with respect to chlorine dioxide disinfection of poliovirus 1. In both experiments, they saw that the inactivation of viral infectivity coincided with the degradation of the 5'-untranslated region (5'-UTR). To examine the effect of chlorine on viral RNA and infectivity, chlorine demand-free buffer was spiked with poliovirus 2, echovirus 7 or coxsackie B3. The samples were then subjected to chlorine disinfection over 30 minutes with samples taken at various time periods. These samples were analyzed by cell culture, real-time RT-PCR and sequencing to determine infectivity, virus detection and sequence degradation. Cell culture and real-time RT-PCR results show similar curves for both viral inactivation and RNA detection. However, viral RNA was still detectable by real-time RT-PCR for all three viruses after 30 minutes of disinfection.