Waterborne viruses in drinking water in Korea: survey 1999 for enteric virus contamination in treated water and its source water

Jeong YS, Rhie KT, Yoon JD, Chung HM, and Kim HS

Dept. Biology and Global Environment Research Institute, Kyung Hee Univ.
Dept. Viral Disease, National Health Institute of Korea
Dept. Water Quality, National Institute of Environmental Research of Korea.

A national survey for enteric virus contamination in treated water and its source water was performed from March to November 1999. The water samples were subjected to virus filtration at the major water plants producing over 10^5 tons treated water per day. Twenty surveyed sites encompass most of heavily populated residential area except for Seoul and Pusan. Information Collection Rule (ICR) of the United States Environment Protection Agency was adapted for this study and Total Culturable Virus Assay (TCVA) was employed for enterovirus detection. Antibody neutralization, RT-PCR, and sequence analysis were used in combination for virus identification. In this site-based study, 7 of 24 source water samples were contaminated with 3 different enteroviruses including poliovirus Sabin, coxsackievirus B, and echovirus 30. Contamination level of the virus was estimated as a most probable number (MPN) and ranged none-24.0 MPN/100L depending upon sampling sites. One of 7 contaminated source water was appeared repeatedly positive for enterovirus. We could not detect enterovirus contamination in 20 samples of treated water and 40 samples of tap water in residential area. In summary, about 30% of tested source water was contaminated with different enteroviruses during the survey period. Virus contamination level of the same source water may be different up to 20-fold depending upon the specific timing of sample collection. It appeared that there was a limited correlation between fecal coliform bacterial contamination and virus contamination. However it may be too early to accept the fecal coliform as a biological indicator for enteric virus contamination since the virus contamination was obvious occasionally while the level of coliform bacteria was not significant. Taken together, the water-borne virus contamination is limited in the source water only but neither in the treated nor the tap water, at least for tested areas in this survey. These results, however, do not assure that the tested area may be free of water-borne virus contamination problem in drinking water since hundreds of small-scale water plants and other minor sources providing drinking water at daily basis have not been monitored yet. In addition to the necessity for much more study results in this field, careful review of the ICR method regarding its detection limit in terms of detectable virus species and sensitivity should be followed in order to set out adequate policies for the appropriate virus control and management for safe drinking water.

<책임연구자>
성 명: 정 용 석
주 소: 서울특별시 동대문구 회기동 1 경희대학교 생물학과
연락처: 전화 (02-961-0829), 팩스 (02-964-1131), E-mail (ysjeong@khu.ac.kr)