Monitoring enteric viruses in water matrices, in Portugal

Objective:
This study aimed to survey a group of enteric viruses (Enterovirus, Norovirus genogroups I and II, hepatitis A virus and hepatitis E virus) in two surface water sources of drinking water, also intending to evaluate the extent of their elimination in the two water treatment plants (WTPs) involved in drinking water production.

Introduction:
- Water-related infectious diseases are some of the main causes of morbidity and mortality worldwide [1, 2].
- Monitoring quality of water is a requisite to prevent outbreaks related to waterborne diseases, mainly caused by pathogens like enteric viruses [2, 3].
- Enterovirus, Norovirus (NoV I and NoV II), hepatitis A virus and hepatitis E virus are, among the enteric viruses, major causative agents of disease [1, 2, 3].
- Enteric viruses are mainly transmitted from food and contaminated water through the oral-fecal route and are very resistant to the disinfection procedures in Water Treatment Plants (WTPs) [3, 4, 5].
- The preferred approach for detection of viral genomes is a molecular method - RT-qPCR (Reverse Transcription coupled to Real-time PCR). However, this sensitive method does not allow to assess infectivity, i.e. presence of viral particles with the capacity to infect and replicate in host cells [2, 6].
- The infectivity is generally assessed by cytopathic effects (CPE) in cultured cells, when inoculated with positive samples. CPE may be attributed to the replication of infectious viral particles [2, 6, 7].

Conclusions:
- Surface water samples → found genomic RNAs from the five viruses under survey.
- Drinking water samples → found genomic RNAs from HAV, HEV, and NoV II.
- HEV was found in an infectious state in surface water, as well as in drinking water.
- The results of infectious HEV in drinking water samples corresponded to concentrations that may not be enough to constitute a health risk.
- The remaining viruses under study did not seem to have replicated in Vero E6 cultures.
- The effectiveness of the WTPs in eliminating HEV and NoV II RNA was variable and not total in several situations.
- The treatment at WTP_R, appeared to be more effective in the elimination of viral RNA than the treatment of WTP_D, which uses neither ozone nor adsorption with coal.
- These results evidence the need of a permanent virological control of the water for human consumption.

References: