

Surveillance of COVID-19 outbreak in local community through quantitative analysis of SARS-CoV-2 in wastewater

Md Ariful Islam Juel, Visva Bharati Barua, Mariya Munir

Abstract

Wastewater base epidemiology (WBE), a new line of research that has already drawn a significant attention to the environmental science and engineering academic community, can be implement as an early warning tool using COVID-19 wastewater surveillance data and public health data. However, precise and accurate viral copies quantification in wastewater and data normalization prior to correlating with COVID-19 cases which are pre-requisite for making that tool successful. The purpose of this paper is to quantify SARS-CoV-2 concentration in wastewater and correlating this data with local COVID-19 cases in purpose of implementing WBE for preventing community level outbreak in Charlotte area. Electronegative membrane filtration (EMF) has been used for virus concentration and Nucleocapsid gene (N1 and N2) based primers and probe set used for the SARS-CoV-2 RNA viruses quantification through RT-qPCR. A known concentration of the Bovine Corona Virus, a surrogate of Human corona virus, was spiked in the wastewater for the overall process control of the system. Most of the samples showed the prevalence of SARS-CoV-2 viruses in wastewater in the range of 10^3 to 10^6 copies/L which was resulted due to the recent COVID-19 case surges in the community. An average of 8 to 15 % of Bovine Coronavirus recovered as an overall process control while 40 – 50% hepatitis G virus recovered from the RNA extraction process which implies that a significant portion of viruses is lost during the sample processing and that can be considered for the normalization SARS-CoV-2 quantification in wastewater.