Novel SARS-CoV-2 viability RT-qPCR assessment on complex matrices

Enric Cuevas-Ferrando[1]
Walter Randazzo[1], Irene Falcó[1], Alba Pérez-Cataluña[1], Gloria Sánchez[1]

[1] Department of Preservation and Food Safety Technologies, Instituto de Agroquímica y Tecnología de Alimentos – Consejo Superior de Investigaciones Científicas (IATA-CSIC), Valencia, Spain

enric.cuevas@iata.csic.es

The current COVID-19 pandemic situation and its ongoing epidemiological changes highlight the need for reliable and easy-to-use techniques for SARS-CoV-2 detection and quantification. In this context, molecular techniques (specially RT-qPCR but also digital PCR) have been shown to have excellent specificity, sensitivity, and reproducibility in both clinical and environmental samples. Even so, these molecular techniques alone cannot discriminate between potentially infectious viral particles and inactivated particles. For this reason, an easily applicable in situ evaluation tool for viral infectivity would complement the current routine molecular analysis, thus providing information on the spread of the virus, on the quantitative estimation of the risks of transfer and exposure, and in turn, facilitating the public health response. This study aimed to develop a viability RT-qPCR approach for SARS-CoV-2. For this, different viability markers have been evaluated, resulting in the first SARS-CoV-2 quantitative viability protocol according to our knowledge, based on platinum chloride sample pretreatment. Satisfactory results have been obtained in suspensions of SARS-CoV-2 genomic RNA, inactivated SARS-CoV-2 viral suspensions, and in artificially and naturally contaminated complex matrices samples (feces, urine and wastewater samples). This study sheds light on developing and optimizing protocols for detecting and quantifying potentially infectious SARS-CoV-2 particles, thus increasing our knowledge about the current pandemic and the ways to cope with it.

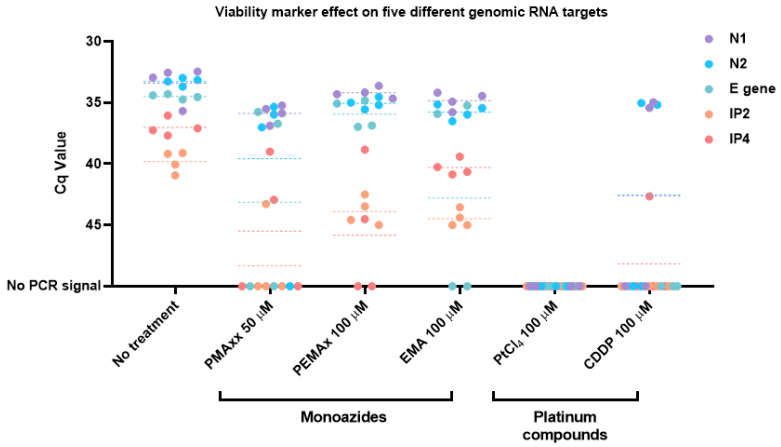

Figure 1: Viability markers effect comparison on five different SARS-CoV-2 genomic RNA targets.

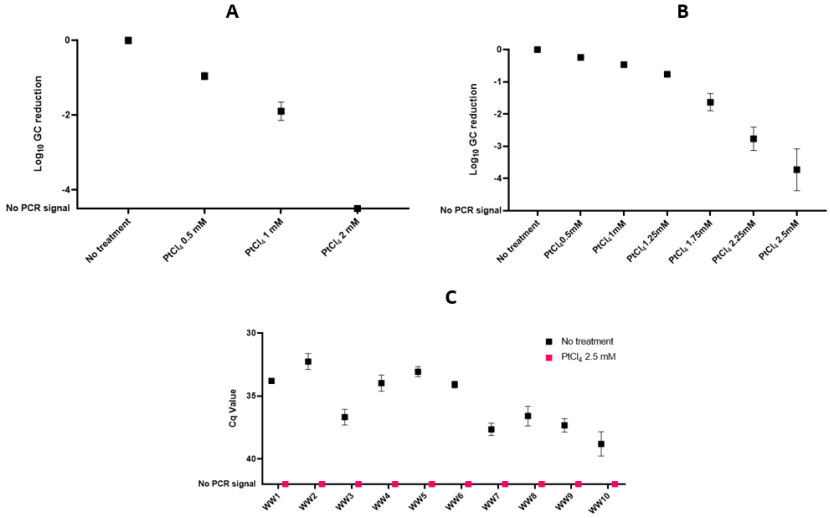

Figure 2: RT-qPCR SARS-CoV-2 signal reductions in spiked PBS suspension (A), faecal suspension (B) and naturally contaminated wastewater samples (C).