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SARS-CoV-2 Survival on Surfaces and the Effect of UV-C Light

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Abstract: The aim of this study was to establish the persistence of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) on inanimate surfaces such as plastic, stainless steel, and glass during UV-C irradiation which is a physical means commonly utilized in sanitization procedures. The viral inactivation rate, virus half-life, and percentage of titer reduction after UV-C irradiation were assessed. Infectivity was maintained on plastic and glass until 120 h and on stainless steel until 72 h. The virus half-life was 5.3, 4.4, and 4.2 h on plastic, stainless steel, and glass, respectively. In all cases, titer decay was >99% after drop drying. UV-C irradiation efficiently reduced virus titer (99.99%), with doses ranging from 10.25 to 23.71 mJ/cm^2. Plastic and stainless steel needed higher doses to achieve target reduction. The total inactivation of SARS-CoV-2 on glass was obtained with the lower dose applied. SARS-CoV-2 survival can be long lasting on inanimate surfaces. It is worth recommending efficient disinfection protocols as a measure of prevention of viral spread. UV-C can provide rapid, efficient and sustainable sanitization procedures of different materials and surfaces. The dosages and mode of irradiation are important parameters to consider in their implementation as an important means to fight the SARS-CoV-2 pandemic.

Keywords: COVID-19; SARS-CoV-2; UV-C; surfaces; persistence; glass; steel; plastic

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1. Introduction

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is a coronavirus discovered in December 2019 in Wuhan City (the capital of Hubei province), China. It is the etiologic agent of the coronavirus disease 2019 (COVID-19) that was declared a global pandemic by the World Health Organization (WHO) in March 2020 [1].

SARS-CoV-2 is an enveloped RNA beta-coronavirus with a genome consisting of a non-segmented positive-sense, single-stranded ribonucleic acid (RNA). SARS-CoV-2 virions are spherical with a diameter ranging from about 60 to 140 nm and presenting the characteristic club-shaped spike (S, glycoprotein) projections from the surface. The surface is also formed by the envelope (E) and the membrane (M) glycoproteins. In the virion envelope, we found a helically symmetrical nucleocapsid (N) that contains the viral genome [2–4]. SARS-CoV-2 efficiently exploits the human angiotensin-converting enzyme 2 (ACE2) receptor for cells entry [4].