

Pharmaceutical and nanotechnological contributions in The Ever-Changing World: COVID-19 Pandemic

Luis Castillo-Henríquez^{1,2,3}

¹Faculty of Pharmacy, University of Costa Rica (UCR), San José 11501-2060, Costa Rica

²National Laboratory of Nanotechnology (LANOTEC), National Center for High-Technology (CeNAT), San José 1174-1200, Costa Rica

³Faculty of Pharmacy, Universidad Internacional de Las Américas (UIA), San José 1447-1002, Costa Rica
Email: luis_casth@hotmail.com

Abstract. We are living exiting times in terms of scientific development. However, science is facing different challenges that force researchers to work harder and faster, such as seen in the global race for the COVID-19 vaccine due to the pandemic. Currently, nanotechnology is at the forefront of scientific innovation, where basically, all gained knowledge can apply to any research field. Electrospun nanofibers are a nanotechnological advance that will greatly contribute to different disciplines. These nanostructures/nanomaterials are obtained through the electrospinning technique and can be employed for biomedical and bioengineering applications, providing solutions as scaffolds for tissue engineering, spinal cord injuries, biosensing technologies, and to current drug delivery inconveniences as well. Additionally, these nanofibers are being studied for the development of filters to overcome SARS-CoV-2 capture limitations shown by N95 and N98 masks. Another relevant nanotechnological approach is based on gold and silver nanoparticles. These metal nanoparticles have exhibited antimicrobial activity suitable for the agricultural area, water treatment technologies, and delivery of nanopesticides, nanoherbicides, and nanofertilizers for more sustainable development of the agroindustry. Regarding the pharmaceutical industry, many companies are working along with biomedical and biotechnological institutions, supporting the development of biosensors for rapid detection of clinical pathogens (e.g., bacteria and virus) and infection diagnosis at the point-of-care. Furthermore, some companies are developing formulations based on remdesivir and dexamethasone, which have demonstrated to reduce the hospitalization time of COVID-19 patients. However, the remdesivir patent is still active, which has resulted in high prices for developing the treatment. Another active pharmaceutical ingredient under study is the favipiravir, although it is not approved by the FDA the initial studies suggest promising safety data. It is clear that the combination of pharmaceutical sciences and nanotechnology can speed up scientific research in the way of developing safer and higher quality treatments and diagnosis technologies.