Improving COVID-19 Anti-viral Drug Delivery with Nanotechnology

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US approval of Pfizer's anti-Covid pill and studies indicating Omicron infections were less likely to result in hospitalisation have cheered markets.

While most of the global attention has been of vaccines to protect populations against the viral agent that causes COVID-19,research into anti-virals is also important for helping those with a severe infection (requiring hospitalization to recover).

Currently several drugs such as favipiravir and remdesivir are administered and remain under investigation. It appears that a combination of drugs serves as an effective treatment against COVID-19.

In January 2022, for example, a COVID-19 treatment called Paxlovid (PF-07321332 and ritonavir) was approved for use in the UK (as The Guardian reports). Of the two components, the first is novel; the second is a ‘resupposed’ medication. Ritonavir has been used alongside some HIV medicines for many years to ‘boost’ their activity.

While investigations into the nature of the anti-viral continue, parallel research is looking at improving the route of administration and this centres on nanotechnology.

For many years aerosol-based drug delivery systems have been used as the mainstay for treating pulmonary disorders. This method can be, according to new research, be utilized in the battle against the coronavirus (SARS-CoV-20 responsible for COVID-19.

The approach is based on intranasal delivery of theranostic nanoparticles carrying the therapeutic drug molecules presents as an efficient drug delivery system containing the

transmission of the COVID-19 virus.

The theranostic nanoparticle-based drug delivery system provides alternative routes for the administration of therapeutics against viral pulmonary diseases, in addition to the existing representative intranasal delivery routes.

These systems can be divided into three broad categories: organic, inorganic, and virus-like or self-assembling protein nanoparticles. The carrier system efficiently overcomes the drug delivery challenges linked to the mucosal route. It maintains a high effective concentration of the cargo drug at the infection site while expressing negligible adverse effects to the healthier cells and tissues.

Infectious viral particles, including the COVID-19 virus, mainly initiate their infection at the surface of the mucous membrane. This is why the mucosal treatment provides a viable strategy for containing the COVID-19 infection.

Another example is with Novochizol, an advanced drug delivery system comprising of a nanoparticle-based aerosol formulation (based on chitosan), offers potential advantages and holds considerable promise for the effective transport of potential COVID-19 drugs, and besides, maintaining optimal concentrations in the infected lungs.

The chitosan nanoparticles are fully biocompatible, strongly adhere to lung epithelial tissues and ensure sustained release, without systemic distribution.

This polysaccharide nanosystem constitutes fully biodegradable and biocompatible chitosan nanoparticles that adhere firmly to the lung epithelia while ensuring a sustained drug release. Moreover, the system also ensures the unwanted systemic distribution of the cargo drug.

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