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Antiviral Drugs, Advanced Nanomaterials And Tools Conjugates For Intervention in Viral Infection and Future Prospective

Research Article

Rajiv Kumar*

NIET, National Institute of Medical Science, India.

Opinion

Based on recent advances in antiviral biomaterials science, various biomaterials have been suggested that displayed promising efficiencies against viral infection by inhibiting viral impact, interfering with viral nucleic acid replication, and blocking the viral release from infected cells.[1] A multi-target virtual screening strategy has been developed to detect the antiviral activity of compounds, as host-directed FDA-approved was testified and displayed an antiviral activity against sars-cov-2 were reported.[2] Mechanistically, nanodiscs rupture the viral envelope, via trapping viral RNAs inside the endolysosome for enzymatic decomposition and inhibit influenza virus infection.[3] Quantum and nanoscience enabled nanomaterials have been developed for virus detection, and vaccine design and their essential role in antiviral strategies for COVID-19 was elobrated.[4] Antiviral performance of nanomaterials with an emphasis on graphene and its derivatives, including graphene oxide, reduced graphene oxide, and graphene quantum dotshave been verified against COVID-19.[5] Antiviral potential of nanoparticles, including silver, gold, dendrimers, polymers, quantum dots, organic nanoparticles, and liposomes were testifiedfor detecting their antiviral potential, and the effects of nanoparticles on coronaviruses was judged and found applicable against against coronaviruses.[6] Carbon-based nanomaterials have displayed good biocompatibility and antiviral properties and thus carbon-based antiviral nanomaterials were mixed with graphene and fullerenes for enhancing their antiviral properties.[7] Furthermore, several other nanomaterials were described as delivery vehicles for the antiviral drugs and therefore, nanotechnology-based antiviral therapeutics were employed to inhibit concerned proteins of influenza, Ebola, Zika, dengue, HIV, herpes, and coronavirus during replication into the host cells.[8] Simultaneously, a review article has been published on a nanotechnology-based approach to inhibit SARS-CoV-2 and for their speedy mitigation.[9] Antiviral efficacy of drugs were testified against middle East respiratory syndrome coronavirus (MERS-CoV) to inhibit its replication, inflammatory cytokines, and chemokines for treating MERS-CoV pathogenesis.[10] Advances in antiviral material developments have been covered the research on advances in terms of innovative materials that can exhibit antiviral activities.These types of advantageson the fast-developing nanotechnology and biopolymer technology have been described in a review article that has already been published recently.[11]Radiolabeled antiviral drugs and antibodies were reported for virus-specific imaging probes.[12] Moreover, manotechnology offers versatile chemical functionalization to create advanced biomedical tools for prevention, detection, therapy, and immunomodulation that also provides insights on the applicability of nanotechnology for treating COVID-19.[13] Nanopores enabling label-free detection and measurements of RNA conformation have been done for probing the structure of various RNA motifs, and conformational analysis of a viral RNA drug target. [14] Icosahedral canvas and shells have been reported that carried viral trapping and antiviral properties and programmable triangular building blocks containing DNA applied for virus trapping. [15] The treatment of viral conjunctivitis with antiviral drugs was testified and interestingly, most of the antiviral drugs were found effective against herpesvirus infections.[16] Anti-viral potential of metallic nanoparticles was reported as drug carriers and diagnostic agents. These therapeutics are found sustainable and good in the targeted delivery of active anti-viral molecules. These nanotools and devices allowed rapid and sensitive diagnosis of viral infections against novel coronavirus disease-19 (COVID-19).[17] The role of nanotechnology and nanosized materials in the treatment of viral infections was reviewed [18] along with nanotechnology-based antiviral therapeutics.[8] Neoglycoproteins were described as carriers for treating antiviral drugs, and analysis of protein-drug conjugates were further elobrated.[19] Conjugation of adenine arabinoside 5'-monophosphate was developed and the synthesis, characterization, and antiviral activity were published accordingly.[20] Therapeutic potential of antiviral drugs was de-

***Corresponding Author**:
Rajiv Kumar,
NIET, National Institute of Medical Science, India.
Tel: 9810742944
Fax: 01234276530
E-mail: chemistry_rajiv@hotmail.com

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scribed for targeting chemorefractory colorectal adenocarcinoma cells and are useful in overexpressing endogenous retroviral elements. These antiviral compounds improve patient outcomes.[21] Moreover, the stimulation of innate immunity was observed by pattern-recognition receptor agonists that can lead towards the upregulation of antiviral cytokine expression and contribute to HBV containment. Immune checkpoint inhibitors and adoptive transfer of genetically engineered T cells were utilized to explore better understanding of HBV-specific T-cell responses. These illustrations are opening new avenues toward a new era of development of hepatitis B virus therapeutics that are capable of curing it.[22] Discovery of a novel specific inhibitor targeting influenza was testifiedas an antiviral drug for treating IAV infection and inhibitory effects on various steps of the viral life cycle was discussed.[23] For fighting against COVID-19, minimizing the risk of the infection, the development of the antiviral coating was reported and that should be necessarily applied on the surface to prevent the spread of the viral particles and also it is effective in inactivation of the transmission of the viruses.[24] Multifunctional dendritic sialopolymersomes were reported as potential antiviral agents and their lectin binding and drug release properties were conferred.[25] Antiviral efficacy of favipiravir has been reported and found effective for inhibiting viral replication induced by canine distemper virus infection.[26] Antiviral agents such as enzyme immunoassay havetestified to inhibit virus-specific, peroxidase-labeled monoclonal antibodies.[27] Antiviral drug resistance of human cytomegalovirus was elaborated in review article.[28] Therapeutic applications of nucleic acid aptamers were employed in treating microbial infections, and their promising antibiofilm and antimicrobial activities in microbial infections were also reported.[29] The published research and review articles are motivating further research and developments, yet overall investigated and up-to-date information on antiviral biomaterials are insufficient, and therefore by highlighting current research findings, emerging opportunities and bottleneck scan be marked.

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Availability Of Data And Materials

Wherever necessary, relevant citations are included in the reference section.

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