BioNanoScience 2017 vol.7 N2, pages 294-299

A Novel Antiviral Strategy against MERS-CoV and HCoV-229E Using Binase to Target Viral Genome Replication

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Abstract

© 2016, Springer Science+Business Media New York.RNA viruses cause most of the dangerous communicable diseases. Due to their high mutation rates, RNA viruses quickly evade selective pressures and can adapt to a new host. Therefore, new antiviral approaches are urgently needed, which target more than one specific virus variant and which would optimally prevent development of viral resistance. Among the family of coronaviruses (CoV), several human pathogenic strains (HCoV) are known to cause respiratory diseases and are implied in enteric diseases. While most strains contribute to common cold-like illnesses, others lead to severe infections. One of these viruses is the newly emerged (2012), highly pathogenic Middle East respiratory syndrome coronavirus (MERS-CoV) of zoonotic origin. MERS-CoV causes a severe respiratory infection with a high mortality rate of 35 %. There is no specific treatment or infection prevention available. Here, we show that the bacterial ribonuclease Binase is able to inhibit the replication of MERS-CoV and of the low-pathogenic human coronavirus 229E (HCoV-229E) in cell culture. We demonstrate that at non-toxic concentrations, Binase decreased the titers of MERS-CoV and HCoV-229E. On a molecular level, Binase treatment reduced (i) the viral subgenomic RNAs and (ii) the viral nucleocapsidprotein (N) and non-structural protein 13 (nsp13) accumulation. Furthermore, we show that the quantity of the replication/transcription complexes within the infected cells is diminished. Thus, the data obtained might allow further development of new anti-coronaviral approaches affecting viral replication, independent of the specific virus strain.

http://dx.doi.org/10.1007/s12668-016-0341-7

Keywords

Antiviral agent, Binase, Coronavirus, Ribonuclease

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