Citation

Wang, M., Cao, R., Zhang, L. et al. Remdesivir and chloroquine effectively inhibit the recently emerged novel coronavirus (2019-nCoV) in vitro. Cell Res 30, 269–271 (2020).

Summary of Article

- Tested the efficacy of different drugs against 2019-nCoV **in vitro**
  - 5 FDA-approved drugs (*ribavirin, penciclovir, nitazoxanide, nafamostat, chloroquine*) **Vs.**
  - 2 broad-spectrum antiviral drugs (*Remdesivir and Favipiravir*) against a clinical isolate
- Assessed 3 different parameters to determine the efficacy of the drug against coronavirus (2019-nCoV)
  - Cytotoxicity
  - Virus Yield
  - Infection Rates
- RESULT- Remdesivir and Chloroquine *more* effective to inhibit 2019-nCoV. The EC90 value of **Remdesivir = 1.76 uM** and **Chloroquine = 6.90 uM** against 2019-nCoV in Vero E6 cells signifies that these can further be applicable for clinical drug development against 2019-nCoV. The other reason that the drugs are safer to be developed further for 2019-nCoV is because these drugs have previously been tested in human patients with safety track record for other viral ailments.

Additional Notes

- **2019-nCoV**, MERS-CoV and SARS CoV- all 3 belong to the same **Betacorona** virus family
- Ribavirin, inteferon, lopinavir-ritonavir, and corticosteroids used in past to target SARS and MERS
- **What each drug treated in the past?**
Drug	Function
Ribavirin+Penciclovir+Favipiravir	Viral infection
Favipiravir	100% effective for mice EBola
Nafamostat	Inhibitor of MERS-CoV
Nitazoxanide	Antiprotozoal agent/Inhibitor of human and animal coronavirus

Drug	Function
Remdesivir	RNA Viruses- SARS/MERS-CoV in mice/cells/nonhuman primates + Under clinical development for Ebola infection
Chloroquine	Anti-malarial and used in autoimmune disease + Antiviral

- **How does Remdesivir and Chloroquine act against 2019-nCov and with what efficiency?**
    - Remdesivir-
        - Function post viral entry
        - Inhibited virus infection in Vero E6 cells and human cell line Huh-7
    - Chloroquine-
        - Function both at viral entry and post entry stages in Vero E6 cells
        - Immune modulating effect also helps its antiviral property invivo
- **METHODS**
    - Cells used- **Vero E6 Cells**
PARAMETER	ACCESSMENT METHOD	PROCESS
Cytotoxity	CCK-8 Assays	Vero E6 infected with 2019-CoV and diff doses of antivirals for 48hrs- assessed cytotoxicity% and inhibition%
Viral Yield	qRT-PCR	Quantification of viral copies in cell supernatant via *qRT-PCR*. Vero E6 Cells were treated with 2019-CoV and virus yield in the infected supernatants quantified by qRT-PCR and NP expression analyzed using Western Blot
Virus Infection	Immunoflurescence Microscopy	Visualization of virus NP expression 48hrs post treatment with Remdesivir and Chloroquine