IOSR Journal Of Pharmacy And Biological Sciences (IOSR-JPBS)
e-ISSN:2278-3008, p-ISSN:2319-7676. Volume 15, Issue 3 Ser. II (May –June 2020), PP 54-55
www.Iosrjournals.Org

The Mechanism of Action of Chloroquine on the Novel Coronavirus (Sars - Cov - 2)

Mustapha Ali Adamu
Molecular Medicine, University of Sussex, UK.

Date of Submission: 18-05-2020 Date of Acceptance: 03-06-2020

I. Introduction

Chloroquine works on the coronavirus via multiple pathways. It predominantly inhibits the process of coronavirus endocytosis (importation into the cell). During endocytosis, the virus forms an envelope using the cell membrane of the host cell. This envelope containing the virus inside it is called an endosome. For the virus to reach its target, the endosome has to travel into the cell plasma, and then enters another subcellular organelle called lysosome. It exits the lysosome and then proceeds to its final destination within the cell, where viral multiplication and absolute tragedy occurs.

Now when chloroquine is administered, it disturbs this process in a number of ways, ultimately sabotaging viral replication and stopping the infection.

Firstly, chloroquine enters the cell, it locates that envelope I mentioned earlier (endosome). it enters inside the endosome and increases its PH. It does the same to the lysosome. Now both lysosome and endosome require an acidic PH in order to fuse together and function properly. However, when chloroquine increases their PH levels, they become alkaline, destabilized and dysfunctional, there by inhibiting the virus from successfully proceeding further into the cell.

In addition to these findings, there are other studies indicating that Chloroquine hinders a certain protein called V-ATPase. This is a protein that also acidifies the lysosome. With Chloroquine, the acidification process is potentially brought to a halt. This in turn prevents the lysosome from being able to carry out its required function.

Furthermore, Chloroquine works as a zinc ionophore. It enables the entry of zinc into the human cell, which normally bounces off the cell membrane. In case you are wondering what the importance of zinc is, zinc discourages coronavirus infection by inhibiting a protein called RDRP (RNA dependent RNA polymerase). This protein helps the virus reproduce it's genetic material and multiply within the cell.

Lastly, the most effective means through which Chloroquine prevents the coronavirus from infecting a cell is by attaching itself unto a sugar residue called Syalic acid. Syalic acid is a molecule that sits upon the cell membrane, very close to a receptor called ACE 2 receptor. This ACE 2 receptor is certainly the most important part of coronavirus infection. That is because it is the main point of entry for the coronavirus to get inside the cell, using a spike protein that comes with the virus. However, When the Chloroquine molecule latches unto the Syalic acid, it inhibits the coronavirus spike proteins from being able to bind to the ACE 2 receptor. By so doing, the virus becomes unable to get inside the cell entirely.

By and large, Chloroquine inhibits Coronavirus cellular infection by blocking endocytosis via alkalinization of the lysosome and endosome. It also blocks the viral spike proteins from binding to the ACE 2 by binding to Syalic acid on the cell membrane.

These results were predominated on findings in vitro (in a lab, on a Petri dish).
Chloroquine use in the fight against Covid19 could play a pivotal role in altering the course of history, as we witness and document the development of this gruesome pandemic.

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Mustapha Ali Adamu. "The Mechanism of Action of Chloroquine on the Novel Coronavirus (Sars - Cov - 2)". *IOSR Journal of Pharmacy and Biological Sciences (IOSR-JPBS)*, 15(3), (2020): pp. 54-55.