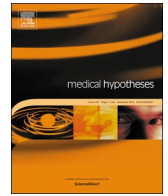




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## Letter to Editors

## Reposition of montelukast either alone or in combination with levocetirizine against SARS-CoV-2



## A B S T R A C T

It has been hypothesised that antiallergic medications (AAMs) like montelukast and levocetirizine both the two bitter chloro compounds could be repurposed either alone or combinedly as an antiviral against SARS-CoV-2, like chloroquine/hydroxychloroquine (CQ/HCQ), another two bitter chloro compounds. Both AAMs and CQ/HCQ are bitter tasted chloro compounds. Depending on their these two similar physical properties and the safety and efficacy of AAMs by controlling over post viral episodes as comparing with viral inhibitory activities including SARS-CoV-2 by CQ/HCQ, a reposition of AAMs either alone/combinedly could be rationalised as an antiviral approach to nCoV.

## To the editor

**COVID-19:** Commonly referred to as the “novel coronavirus” (nCoV) or simply the “coronavirus”, a new virus showing a respiratory illness like pneumonia, or severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2), is a causative agent for corona disease 2019 (COVID-19). WHO declared a highest global health emergency on COVID-19 on 30th January 2020, that time outside of the China only 98 case of positive were found [1]. But today, the 16th June 2020 the figure is totally opposite that the world is overwhelmed by more than 80.0 lacks infections and 4.3 lacks death. The rate curve of world confirmed cases of COVID-19 and confirmed death from COVID-19 showed still steeper. No flattening of the curves were observed (source: Johns Hopkins CSSE Note, data updated on yesterday, 15th June 2020) [2]. Medical professionals are facing direct challenge due to unprecedented power of spreadability of the virus. At this moment Humanity and world economy are totally paralysed by lockdown. There are no other ways except masking, hand washing and social distancing. Only the way to wait for a specific medication and or a vaccine to defeat the virus. Currently there are no FDA approved vaccines available for covid-19. Clinical trials and case reports have yield moderate results repurposing antiviral therapies used in unrelated viral infections, but further investigation is required [3].

**Antiallergic medications:** Antiallergic medications (AAMs), a combination of montelukast (MLK) and levocetirizine (LCZ) could be effective antiviral against COVID-19. Montelukast, a known antiasthmatic/antileukotriene/antiallergic drug may have some viral inhibitory role to control COVID-19, need to explore, as recently reported by Yongkang Chen et al., 2020, that it can irreversibly inhibit the infectivity of Zika like flavivirus [4] and reported by Ahmad A et al., 2018, that it can reduce dengue (like flavivirus) shock syndrome [5]. Levocetirizine may stop cytokine storm as it inhibits the production of intercellular adhesion molecule-1 (ICAM-1) and secretion of interleukin IL-6 and IL-8, which may have beneficial effects on the pathophysiologic changes related to human rhinovirus (HRV) infection in airway epithelial cells [6]. Flaviviruses, HRV and nCoV have common type of genetic material that is single stranded RNA. Both montelukast and levocetirizine, the two bitter [7] chloro compounds [8,9], like

chloroquine/hydroxychloroquine (CQ/HCQ) as CQ has bitter taste, that was described by Hans D Nothdurft and Kevin C Kain [10] and HCQ- it leaves a horrible bitter taste in the mouth, reported in India Today Insight [11]. CQ exerts direct antiviral effects inhibiting pH dependent steps of the replication of several viruses including members of the flaviviruses, retroviruses and coronaviruses [12]. Also montelukast, can treat recurrent respiratory symptoms of post-respiratory syncytial virus bronchiolitis in children [13]. Montelukast attenuates the frequency and severity of episodic wheezing in child patients due to upper respiratory tract infection caused by adenovirus, influenza, metapneumovirus, coronavirus [14]. Inventor, Bruce Chandler described in his European patent that combination of LCZ and MLK formulations are effective for treating influenza, common cold and associated acute inflammation [15]. Mi-Kyeong Kim et al., 2018 reported that a 4-week double-blind, randomized, multicenter phase 3 study was conducted to compare montelukast monotherapy vs combination therapy with montelukast plus levocetirizine in a cohort of patients with perennial allergic rhinitis and mild to moderate asthma. Resulting a fixed-dose combination of montelukast plus levocetirizine was found to be safe and effective for the treatment of perennial allergic rhinitis and asthma compared with montelukast alone, according to research [16]. SM Adsule et al., 2010 has reported in his review that the new generation antihistaminics are all safe, with negligible sedative effects, excellent tolerability and have no influence on cardiac parameters. Montelukast when used as monotherapy is efficacious and improves quality of life. Combination therapy (montelukast plus levocetirizine) is a more effective strategy than monotherapy in the treatment of persistent allergic rhinitis [17].

Since AAMs [7–9] and CQ/HCQ [10,11] both possess bitter taste and chloro group, depending on their these two similar properties, I would like to hypothesise that there is a chance for repositioning the these two bitter chloro MLK and LCZ compounds, alone or combinedly against SARS-CoV-2 like chloroquine/hydroxychloroquine as both CQ and HCQ can inhibit SARS-CoV (SARS-2003) and SARS-CoV-2 (2019-nCoV) before and after infection, which was reported by Katelyn A Pastick et al., 2020 [18]. It is pertinent to say, recently a hypothesis was reported by Cihan Fidan et al., 2020 where author has described that as a potential treatment of COVID-19, montelukast has an anti-

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inflammatory role [19]. Whereas in the present hypothesis I would like to clearly emphasize that repurpose possibility of AAMs either alone (MLK/LCZ) or combination (MLK + LCZ) as antiviral against SARS-CoV-2 with special reference to CQ/HCQ. Also combination (MLK + LCZ), another option of therapy may be more effective than monotherapy (MLK/LCZ) [15–17]. Further more it has been strengthening the hypothesis from the reported evidences [4–6,13–17] that as the individual components (MLK/LCZ) of AAMs either alone or in a combination posing positive role in controlling different post viral manifestations [4–6,13–17] showing significant safety and efficacy [15–17] resulting need to see what happens when alone/combedly it would be treated as preventive/prophylactic/curative of COVID-19.

#### Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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