Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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Letter to the Editor

Use of sulforaphane in COVID-19: Clinical trials are needed

A B S T R A C T

We read with interest the narrative review authored by Kiser et al. (2021), which discussed extensively the antioxidant effect and anti-inflammatory effect of sulforaphane, a dietary supplement found in high amounts in cruciferous vegetables that ais orally accessible and well-tolerated. Notably, in their review, the authors also discussed the potential use of sulforaphane in patients with coronavirus disease 2019 (COVID-19). Sulforaphane mediates the inhibitory effect on NLRP3 inflammasome activation and we believe that this could be the main mechanism where sulforaphane is useful for patients with COVID-19.

We read with interest the narrative review authored by Kiser et al. (2021), which discussed extensively the antioxidant effect and anti-inflammatory effect of sulforaphane, a dietary supplement found in high amounts in cruciferous vegetables that is orally accessible and well-tolerated. Notably, in their review, the authors also discussed the potential use of sulforaphane in patients with coronavirus disease 2019 (COVID-19). We believe such discussion is useful since the researchers are still searching for potential drugs to be repurposed for the treatment of COVID-19 to expand our armamentarium against this deadly disease.

In their review, the authors suggested that sulforaphane can be beneficial to patients with COVID-19 via its two notable mechanisms of action, namely activation of nuclear factor-erythroid factor 2-related factor 2 (NRF2) and inhibition of nuclear factor kappa B (NF-κB) (Kiser et al., 2021). Indeed, given that a previous study (Olagnier et al., 2020) has reported that the expression pathway of the NRF2 antioxidant gene was found to be suppressed in the lung biopsies obtained from patients with COVID-19, sulforaphane as a potent NRF2 inducer therefore could improve the prognosis of this population of patients. In addition, NF-κB activation and the consequent release of associated cytokines contribute to the development of cytokine storm in patients with COVID-19, and thus the inhibitory effects of sulforaphane on the NF-κB pathway appear salutary to patients with COVID-19 (Su et al., 2021).

Nevertheless, while the authors acknowledge the inhibitory effects of sulforaphane on NLR family pyrin domain-containing 3 (NLRP3) inflammasome activation, it has not been discussed as one of the potential mechanisms where sulforaphane can be useful for patients with COVID-19. Sulforaphane mediates the inhibitory effect on NLRP3 inflammasome activation independent of the NRF2 pathway, through decreased miR-155 expression and increased miR-223 expression (Tufekci et al., 2021). We believe that this could be the main mechanism where sulforaphane is useful for patients with COVID-19 since the N protein of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which is the causative pathogen of COVID-19, has been found to directly interact and promote NLRP3 inflammasome activation to induce inflammatory responses in patients with COVID-19 (Pan et al., 2021). Hence, targeting the NLRP3 inflammasome with sulforaphane appears to be a promising intervention against COVID-19. In fact, in the cultured IB3-1 bronchial cells, sulforaphane has been found to inhibit the gene expression of interleukin (IL)-6 and IL-8, which are the downstream cytokines of NLRP3 inflammasome activation involved in the cytokine storm of COVID-19 (Gasparello et al., 2021).

Most importantly, sulforaphane also demonstrates antiviral activity against SARS-CoV-2, inhibiting in vitro replication of four strains of SARS-CoV-2. Indeed, administration of sulforaphane to K18-hACE2 mice prior to intranasal SARS-CoV-2 infection significantly reduced the viral load in the respiratory tract (Ordonez et al., 2021). All in all, the anticytokine and antiviral effects of sulforaphane should be utilized in the combat against COVID-19. We look forward to the performance of clinical trials to validate the clinical efficacy of sulforaphane in patients with COVID-19.

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Competing interest

All authors declare no conflicts of interest.

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Chia Siang Kow[a,b,*], Dinesh Sangarran Ramachandram[b], Syed Shahzad Hasan[c,d]

[a] *School of Pharmacy, International Medical University, Kuala Lumpur, Malaysia*

[b] *School of Pharmacy, Monash University Malaysia, Bandar Sunway, Selangor, Malaysia*

[c] *School of Applied Sciences, University of Huddersfield, Huddersfield, United Kingdom*

[d] *School of Biomedical Sciences & Pharmacy, University of Newcastle, Callaghan, Australia*

[*] Corresponding author at: School of Pharmacy, International Medical University, Kuala Lumpur, Malaysia.
E-mail address: chiasiangkow@imu.edu.my (C.S. Kow).