LETTER TO THE EDITOR

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# Can the development of lung fibrosis be prevented after COVID-19 infection?

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Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) increases the expression of host cell surface receptors, either directly or through activation of host signaling. In this way, a cytokine storm can occur. It uses the ACE2 receptor for entry. ACE2 is the regulator of the renin-angiotensin system (RAS) and RAS is responsible for hemostatic balance through a balance of ACE and ACE2 activity. ACE produces angiotensin II as well as aldosterone release. Angiotensin II activates a wide variety of signaling pathways. Interleukin (IL)-6 can induce tumor necrosis factor-α (TNF-α) activation 6 and increased recruitment of neutrophils and macrophages as well as direct endothelial cell damage. It has also been shown to support collagen I gene activation through MAPK/ERK and transforming growth factor-β (TGF-β), which are critical factors in the fibrotic response. Thus, SARS-CoV-2 contributes to the activation of host profibrotic pathways [1].

Thymoquinone (TQ) is a bioactive component obtained from *Nigella sativa*. TQ has demonstrated antibacterial, anti-inflammatory, anti-oxidant, neuroprotective and anti-apoptotic effects [2]. In addition, it has been shown that opioid-active peptides such as hemorphins are activated by TQ and thus have an inhibitory effect on ACE receptors [3]. Therefore, TQ can block SARS-CoV-2 entry by blocking the ACE2 receptor. In experimental studies, it has been shown that TQ blocks cytokine release by inhibiting NF-κB, reduces oxidative stress, and thus protects against lung fibrosis [4]. The anti-inflammatory, immunomodulatory and antifibrotic effects of macrolide antibiotics by blocking the MAPK signal chain have been demonstrated in lung fibrosis models [5].

Treatment of patient groups with a high risk of developing lung fibrosis (advanced age, history of intensive care hospitalization, long-term oxygen need, etc.) after COVID-19 infection with TQ or macrolide antibiotics may be protective against lung fibrosis. For these reasons, further clinical studies are required.

## Disclosure

The authors report no conflict of interest.

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