



Managements of COVID-19 by Curcumin

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Curcumin, the polyphenolic compound in turmeric exhibited versatile biological effects such as anti-tumor, anti-inflammatory, immunomodulating, antioxidant and antimicrobial [1,2]. It exerted antiviral activities against diverse viruses, such as dengue [3], hepatitis B [4], Zika and chikungunya viruses [5].

Curcumin exerted many effects against COVID-19 infection. It has the ability to modify various targets on molecular base which participate in attaching of COVID-2 as well as its endocytosis in cardiovascular, hepatic, renal cells. It also modulates cellular signaling pathways as apoptosis, DNA replication and inflammation. It may also suppress fibrosis and pulmonary edema associated pathways in the infection of COVID-19. It also induces anti-inflammatory and immunomodulatory along with the anti-fibrotic and pulmonoprotective effects on the lung tissue [6].

Soni, *et al.* 2020 reported that curcumin could inhibit the entrance and replication of COVID-2. It also could repair COVID-19-associated damage of lung, kidney, cardiac cells and hematopoietic stem cells, etc. Curcumin is able to reverse the storm of cytokines as it induces a potential inhibitory effect on both proinflammatory cytokines and NF- κ B in severe infected COVID-19 patients [6].

It can also change the state of inflammation via modulation of its regulatory elements and inhibit the cytokine storm onset [7]. Other reported data showed that it binds highly to all selected proteases with highest binding free energy of -17.90 ± 0.23 kcal/mol for Cathepsin K, -18.21 ± 0.25 kcal/mol for COVID-19 main protease, and -9.67 ± 0.08 kcal/mol for SARS-CoV 3 C-like protease [8].

Preclinical studies using lethal pneumonia animal models in preclinical studies revealed that curcumin induces protection by

different mechanisms as promoting cells PMN apoptosis, regulating the expression IL-6, IL-8, IL-10, and COX-2 (pro- and anti-inflammatory factors), and reactive oxygen species scavenging, which increase the response of inflammation.

These mentioned reports conclude that curcumin can be used as a therapeutic agent for pneumonia in humans resulting from the infection of coronavirus [9].

A problematic issue accompanied with curcumin although of its high potent activities with safety profile is the limited oral bioavailability [10]. Many solutions were suggested to this problem. For example, administration of curcumin via intravenous route (10 mg/kg) resulted in better bioavailability (when compared to oral administration at a higher dose of 500 mg/kg). There are also different ways to improve the bioavailability of curcumin as formation complexes of liposomes, phospholipid manipulation of curcumin and its encapsulation into micelles, exosomes or formulation of polymeric nanocarrier as well as its usage in combination with a hydrophilic carrier, natural antioxidants and cellulosic derivatives [11,12].

Conclusion

Curcumin is considered as an antiviral agent. It can be used as prophylactic and therapeutic agents for coronavirus. However, clinical trials are needed to ensure its potential effect against covid-19 infection and to increase its bioavailability.

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