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CURCUMIN AS A POTENTIAL PROPHYLACTIC AND THERAPEUTIC AGENT FOR COVID-19

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COVID-19, a destructive respiratory illness caused by SARS-associated coronavirus-2, has already affected over 64 million people and caused more than million deaths. The pathogenesis of COVID-19 is highly complex and involves suppression of host innate immune response, induction of oxidative stress followed by hyper inflammation described as the «cytokine storm», causing the acute lung injury, tissue fibrosis and pneumonia. Phytonutrients may help to boost the immune system, prevent virus spread, preclude the disease progression to severe stage, and further suppress the hyper inflammation providing both prophylactic and therapeutic support against COVID-19.

Curcumin is extracted from the roots of the plant *Curcuma longa* and structurally is a hydrophobic polyphenol. Also, curcumin, a bioactive compound in turmeric (Indian saffron), a much appreciated spice, and is widely used in foods and traditional medicines. A world map of the coronavirus disease reveals that countries, which are the largest producers and consumers of curcumin, have shown a very low number of deaths attributed to SARS-CoV-2 infections.

Curcumin exerts antiviral activity against many types of enveloped viruses, including SARS-CoV-2, by multiple mechanisms: direct interaction with viral membrane proteins; disruption of the viral envelope; inhibition of viral proteases; induce host antiviral responses.

So, the biological activities of curcumin include antioxidant, antiinflammatory, and antimicrobial effects. Mechanisms of action are related to its antioxidant activity, able to neutralize oxygen and nitrogen reactive species, antiinflammatory properties, by decreasing activation of NF- κ B and inhibiting inducible nitricoxide synthase (iNOS), leukotrienes (LT), cytochrome P450 isoenzymes and fibrogenesis, and also to its immunosuppressive capacity, able to modulate cytokine and chemokine production. Curcumin does not only inhibit lipooxygenases (LOX), it also inhibits cyclooxygenase (COX-2). COX-2 synthesizes series-2 prostaglandins (PGE₂, PGF₂- α), which contribute to inflammation, swelling and pain. PGE₂ promotes production of IL-10, a potent immunosuppressive cytokine produced especially by lymphocytes and macrophages, and suppression of IL-12.

One of the characteristic features of COVID-19 disease is the associated coagulopathy, such as thrombosis. Two hypotheses can explain the hypercoagulable state in vivo leading to coagulopathies during COVID-19 infection. One is the elevated proinflammatory cytokines (IL-6, IL-1, and TNF- α), leading to microvasculature damage and endothelial dysfunction in the lungs, causing hemostasis derangements and pulmonary thrombi. The other alternative hypothesis is the direct or indirect effect of the virus on coagulation pathways causing systemic thrombosis. The previous studies in the literature support the positive activity of curcumin in hemostasis, anticoagulation, and fibrinolysis. Investigators have explored the antithrombotic activities of curcumin and mitigating effect on thrombosis by modulating platelet numbers, D-dimer and plasminogen activator inhibitor – 1. These results suggest that curcumin possess antithrombotic activities and daily consumption of the curcumin might help maintain anticoagulant status.

In conclusion, evidence indicates that curcumin may be a potential prophylactic therapeutic for COVID-19.