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Mini Review

Nutraceuticals - A Nutritional Perspective against COVID-19

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Abstract

The tendency to use nutraceuticals to strengthen the immune system has increased of late years. A suggested diet plan helps regulate inflammation and nutraceuticals can block viral entry. Therefore, I gathered the literature on antiviral nutraceuticals that act against coronaviruses. Coronavirus disease 2019 (COVID-19) for the whole world has been a disaster that caused a global devastation and caused many people to die. Unfortunately, immunocompromised people in populations are more susceptible to serious COVID-19 complications. This review highlights the importance of nutraceutical consumption in order to strengthen immune function for the COVID-19 pandemic.

Keywords: *Nutraceuticals; COVID-19; Immune system; Nutritional Therapy*

Introduction

The recent coronavirus disease 2019 (COVID-19) outbreak, caused by the severe acute respiratory syndrome (SARS) coronavirus 2 (SARS-CoV-2), originated in China before becoming a global pandemic [1] and with dramatically high morbidity and mortality, this virus started to become pervasive worldwide. Thus, this unexpected pandemic, caused by a coronavirus SARS-CoV-2, has affected the population globally and has raised the urge to develop either an antiCOVID-19 vaccine or an anti-COVID-19 therapeutic drug [2,3]. In addition to clinical studies, it is mandatory to attain and maintain good nutritional status to fight against virus. Especially recent studies have also highlighted the influence of both, an adequate nutritional status and the appropriate intake of specific nutrients in COVID-19 [4].

The various dietary ingredients are determinants of gut microbial composition and subsequently shape the immune responses in the body [5,6]. It has been suggested that nutraceuticals can stimulate the immune system of patients with COVID-19 because they increase the efficiency of the immune system and reduce virus virulence by limiting its replication [7-11]. It is extremely important to use nutraceuticals such as quercetin, astaxanthin, luteolin, glycyrrhizin, lactoferrin, hesperidin and curcumin to prevent or treat the symptoms of pandemic infection. Table 1 mentions the details of a few nutraceuticals that have been tested against the earlier coronaviruses SARS-CoV and MERS-CoV [12]. It is given in table 1 details some of the nutraceuticals that have been studied against the previous coronavirus SARS-CoV and MERS-CoV.

Compounds	Target	Type of Study/Techniques Used	Results	References
Luteolin	SARS-CoV S2 protein	✓ Frontal-affinity chromatography-mass spectrometry, ✓ HIV-luc/SARS pseudotype virus assay, ✓ MTT assay with wild-type SARS-CoV.	✓ Luteolin-inhibited SARS-CoV infection in a dose-dependent manner. ✓ EC_{50} was 10.6 µM. CC_{50} was 0.155 mM. LD_{50} in mice was 232.2 mg/kg.	[13]
Quercetin		✓ HIV-luc/SARS pseudotype virus assay ✓ Expression of recombinant 3CLPro in Pichia pastoris and its inhibition. ✓ Molecular docking ✓ Gene silencing ✓ Expression studies ✓ Transgenic mouse models	✓ EC_{50} of 83.4 µM and CC_{50} of 3.32 mM ✓ 80% inhibition at 200 µM. ✓ IC_{50} of 23.8 µM. ✓ Binding energy -10.2 kcal/mol ✓ Quercetin affected ACE2 expression. ✓ In addition, it was found to alter the expression of 98 of 332 (30%) genes encoding human proteins that serve as target for the SARS-CoV-2.	[13] [14] [15]
GCG (gallocatechin gallate)	SARSCoV 3CLPro	✓ Expression of recombinant 3CLPro in Pichia pastoris and its inhibition. ✓ Molecular docking	✓ 91% inhibition by 200 µM. ✓ IC_{50} of 47 µM. ✓ Binding energy of -14 kcal/mol	[14]
EGCG	SARSCoV 3CLPro	✓ Expression of recombinant 3CLPro in Pichia pastoris and its inhibition. ✓ Molecular docking ✓ 85% inhibition at 200 µM.	✓ IC_{50} of 73 µM ✓ Binding energy -11.7 kcal/mol	[14]
Resveratrol	MERSCoV NP	✓ MTT assay using vero-E6 cell line ✓ Nucleocapsid protein staining	✓ Found to be effective in the 125 - 250 µM range on viral titre as well as viral RNA amount. ✓ Inhibits caspase 3 cleavage.	[16]
Hesperetin	SARSCoV 3CLPro	✓ Cell free and cell-based cleavage assays	✓ IC_{50} of 60 µM in cell free assay, IC_{50} of 8.3 µM in cell-based assay and a CC_{50} of 2718 µM	[17]

Table 1: *Some nutraceuticals against coronavirus and host proteins.*

Nutraceuticals and dietary supplements are related but distinct nonpharmaceutical products. Nutraceuticals are classified as supplements with health benefits beyond their basic nutritional value [18-20]. Nutraceuticals include active phytochemicals isolated from plants, dietary supplements, and functional foods with medicinal properties [21,22]. Among nutraceuticals, vitamin E, vitamin C, carotenoids, and some minerals (Zn, Mn, Cu, Se) and polyphenols (flavonoids, phenolic acids, stilbenes, lignans) provide medical or health benefits by a synergistic effect, maintaining a proper redox homeostasis [23]. Nutraceuticals such as epigallocatechin gallate (EGCG), gallocatechin gallate (GCG), hesperetin, quercetin, which were previously shown to be effective against SARS-CoV 3CLPro can be tested for their efficacy in SARS-CoV-2 infection [24].

Current evidence and expert opinion encourage the consumption of fresh and unprocessed plant foods such as vegetables, fruits and whole grain products. Moreover, they highlight the importance of vitamins and minerals such as zinc, vitamin C, D, A and the maintenance of adequate hydration, while they suggest a moderate consumption of fat, preferring unsaturated fats, and avoiding sugar and salt intake [25]. At the same time, in many countries, over-consumption and dietary imbalances are contributing to epidemics of obesity and diet-related chronic diseases, such as diabetes, cancers and cardiovascular disease, as well as stressing the carrying capacity of food and nutrition systems. For healthy life, bioactive compounds should be taken from nutraceutical products in healthy foods.

Conclusion

In conclusion, since accumulating evidence suggests that nutraceuticals exert beneficial effects against vascular diseases counteracting oxidative stress and inflammation. It is reasonable to investigated their possible use in the setting of COVID-19. A proper and healthy diet can ensure a robust immune system that can resist any onslaught by the virus. The having a healthy diet could be an important factor, but one of many, in determining outcome in individuals should they become infected with coronavirus. Except this, highlights the fundamental impact of nutraceuticals and diet on inhibition of viral entry and provides a new perspective on the prevention and treatment of COVID-19.

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