



Potential Effects of Iodine Supplementation on Inflammatory Processes and Toxin Removal Following COVID-19 Vaccination

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To the Editor,

Iodine has been reported as a possible agent against COVID-19 infection, as well as a possible agent to limit vaccine adverse events. In this letter, we discuss the scientific support for these claims.

Iodine is an essential mineral supplied by the diet or supplements. It is used by the thyroid gland to make thyroid hormones. Iodine is a component of thyroid hormones and an antioxidant, anti-inflammatory, anti-proliferative, and differentiation agent. Iodine contributes to preserving the integrity of organs able to take up iodine, through effects mediated by many different mechanisms or pathways, with direct or indirect actions. It protects the thyroid. It strongly increases the mRNA decay rate.

Thyroid hormones control many functions in the body, which include growth and development, repairing damaged cells, and maintaining healthy metabolism [1] [2]. Iodine can also be used to detoxify toxic compounds and strongly increases the mRNA decay rate [3] [4]. Thus, it may prevent some of the damages caused by COVID-19 mRNA vaccines such as Pfizer or Moderna, both 2 shots, and non-replicating COVID-19 viral vectors vaccines such as Astra-Zeneca, 2 shots, or J&J's Janssen, 1 shot. The letter to the editor aims to discuss the role of iodine supplementation during the COVID-19 pandemic, with special emphasis on the potential effect on the adverse events from the administration of COVID-19 vaccines.

Mechanistically, iodine from food or supplements is transformed into the negatively charged iodide ion [5]. The human thyroid gland accepts correct amounts required for thyroid hormone preparation the moment iodine enters blood circulation. The excess amount is excreted through urine [6].

The average urinary iodine concentrations are 100–199 µg/L in children and adults, and 150–249 µg/L in pregnant women [7] [8]. Lower values than 100 µg/L indicate suboptimal iodine intake. Dietary sources of iodine are seaweed, seafood, dairy products, milk, beans, and eggs [9]. It is also present in breast milk as potassium iodide or sodium iodide, infant formula, and some multivitamins [10] [11] [12]. Selenium, carnitine, myo-inositol, flavonoids, omega-3 polyunsaturated fatty acids, and resveratrol each affect thyroid function [12]. But, iodine remains the most crucial essential element for thyroid hormones, thyroxine (T4), and triiodothyronine (T3). These hormones regulate protein synthesis, enzymatic activity, and metabolic activity.

Iodine deficiency causes an enlargement of the thyroid, known as endemic goiter [13]. Thyroid enlargement may transform to nodular changes. Molecular pathways in the nodular process proceed with DNA mutagenesis as evidenced by somatic mutations in iodine-deprived euthyroid goiters [14]. Molecular mechanisms to explain mutagenesis and the formation of nodules during iodine deficiency have not been fully explained.

Molecular iodine is particularly effective against viruses. More than 80 years ago, it was shown that the vaccinia virus can be killed with a 3% tincture of iodine and indeed it was the most efficient antiseptic identified to destroy the poliovirus when used topically. These studies and observations show the power of molecular iodine as an antiviral agent [15].

Iodine has shown virucidal activities against SARS-CoV-2. A few publications are available on the quick deactivating action of povidone-iodine (PVP-I) on COVID-19. Povidone-iodine has been observed to have rapid and efficient antiviral activity. This activity is believed to be sufficient as a preventive measure against COVID-19. It may deactivate the virus when it is used for hand-skin-oral sanitizing and oral-nasal cleaning [16] [17].

Oral and nasal sprays with antiviral activity against SARS-CoV-2 are being studied, with povidone-iodine being

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one of the more promising substances. Intranasal PVP-I spray is active against SARS-CoV-2, as well as SARS-CoV and the Middle East Respiratory Syndrome (MERS) (<https://www.news-medical.net/news/20210719/Iodine-derivative-kills-SARS-CoV-2-within-90-sec.aspx>). Povidone-iodine (PVP-I) 0.5% mouth rinse/gargle for 30 s can reduce SARS-CoV-2 virus infectivity to below detectable levels [18]. PVP-I can interrupt SARS-CoV-2 attachment to oral and nasopharyngeal tissues and lower the number of viral particles in the saliva and respiratory droplets [18].

Povidone-iodine mouthwash, gargle, and nasal spray have been shown to reduce nasopharyngeal viral load in patients with COVID-19 in other studies [19] [20].

Substantial reductions in the viral titer by iodine-V in essential iodine drops (EID) have been reported [21]. Iodine-V in EID is effective at inactivating the virus in vitro and therefore could be applied intra-nasally to reduce SARS-CoV-2 transmission from COVID-19-infected individuals. Iodine-V is likely to work better in vivo when compared with PVP-I against SARS-CoV-2 [21].

Use of povidone-iodine solution as SARS-CoV-2 prophylaxis for procedures of the upper aero-digestive tract has been suggested [22], as the nasopharynx and nasal and oral cavities act as a reservoir for SARS-CoV-2 shedding, and the application of viricidal agents to these surfaces reduce virus burden [22].

The virucidal effect of PVP-I on COVID-19 replication in the nasopharynx has been reported in other studies such as [23] [24].

PVP-I studies do not support any supplementation with dietary iodine to help against infection and disease, which is presently an unstudied area of research.

Thyroid nodules (TNs) are distinct lesions present in the thyroid itself, separate from the surrounding parenchyma [25]. TNs are 4 times more common in women than men. Their frequency increases with age and low iodine intake. Most TNs are benign, but about 5% are cancerous [26].

A healthy thyroid depends on the optimal intake of dietary iodine which is necessary for the synthesis and metabolism of hormones produced by the thyroid. Sufficient thyroid hormone accumulation requires the action of hydrogen peroxide. Peroxide serves as the starting compound to produce reactive oxygen species (ROS). Production of hydrogen peroxide (H_2O_2) is certainly hampered by the presence of iodide in vivo and in vitro [27] [28]. H_2O_2 is a unique general toxin, stable in abiotic environments at ambient temperature and neutral pH, but able to quickly eradicate cells by manufacturing highly reactive hydroxyl radicals. Thyrocytes have an excellent ability to control oxidative stress. A high concentration of antioxidant enzyme, e.g., esp superoxide dismutase (SOD)-3, can protect the thyroid from the toxic effect of metabolites that originate from hydrogen peroxide. Significant iodine deficiency can impair thyroid hormone

production and results in ROS-induced DNA damage. Iodine promotes thyroid health, reduces the risk for some goiters, manages the overactive thyroid gland, may improve cognitive function, and protects the thyroid gland from radiation injuries. It may also help treat fibrocystic breast disease [29]. Dietary iodine controls its absorption through the regulation of the sodium/iodide (NIS) symporter [30] [4] which protects the functions of the thyroid gland [31].

The link between vaccines and their impact on thyroid disorders is poorly investigated and limited to very few studies [32–35].

Vaccines may trigger local and systemic inflammatory responses (examples, myocarditis and pericarditis after mRNA COVID-19 vaccination). Vaccines may also have toxic effects caused by the presence of synthetic nucleosides and delivery components [36]. Specifically, some COVID-19 mRNA vaccines [37] [38] use lipid or polymer-based nanoparticles to protect and stabilize the mRNA and improve uptake. The toxicity of mRNA, non-replicating viral vectors, and other vaccines are only marginally assessed. In Australia [39], there have been 22,031 communications of adverse events from the administration of 3,613,053 shots of Pfizer and Astra-Zeneca vaccines (0.61%). In between the adverse events, there have been 210 fatalities following vaccinations (0.01%). These are non-negligible numbers and much larger than those of other vaccines such as the flu vaccine. Smaller numbers, based on a much larger database, but still non-negligible, are provided by the British Government (<https://www.gov.uk/government/publications/coronavirus-covid-19-vaccine-adverse-reactions/coronavirus-vaccine-summary-of-yellow-card-reporting>).

In addition, the efficacy of vaccines decreases with time and against variants.

The data on vaccinations and infections in Israel from December 2020 to July 2021, one of the countries with wider and quicker vaccinations with an mRNA vaccine, show that the vaccine's protection against infection and disease dropped from above 90% in the early months to about 40% with the delta variant a partial explanation [40] [41] (https://www.gov.il/BlobFolder/reports/vaccine-efficacy-safety-follow-up-committee/he/files_publications_corona_two-dose-vaccination-data.pdf) [42]. While vaccines are still effective in reducing hospitalizations, undoubtedly there is a reduced efficacy. This efficacy is greater with inactivated-virus vaccines (such as Seychelles) than DNA and mRNA vaccines [40]. Deployment of boosters [40] is a clear acknowledgment that the efficacy of vaccines is much less than 100%, variable between vaccines, and decreases with time and variants. Therefore, there is a need for more attention toward different therapies.

Iodine binds well to toxins. Iodine also binds to metals such as aluminum and mercury. Iodine also helps thyroid functions, thus further contributing to detoxification. Iodine

may be considered as one substance necessary to mitigate the adverse events from COVID-19 vaccines that could help also against COVID-19 infection. While the detoxification activity may in principle also limit the efficacy of vaccines, it is not expected that dietary supplementation to sufficiency could be an issue. The use of iodine supplements against viral effects has not been studied.

It is concluded that iodine-based products for mouthwash, gargle, and nasal spray may be useful to reduce nasopharyngeal viral load in patients with COVID-19.

Regarding iodine oral supplementation, there is no evidence supporting virucidal activity against COVID-19 infection, reduction of vaccine adverse events because of iodine supplementation, or reduction of the efficacy of vaccines because of iodine supplementation.

In lack of any contraindication, it is suggested to monitor the iodine level, by the simple and fast urine test, the more accurate blood test, or even the iodine patch test, and in case of deficit, adopt iodine supplementation.

Similarly to be considered is the use of iodine-based products for mouthwash, gargle, and nasal spray if and as directed by a physician.

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Declarations

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Conflict of Interest The authors declare that they have no conflict of interest.

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