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Mini Review

Iodine, an Effective Substance against the COVID-19 Pandemic

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Abstract

In addition to being an essential element in the production of thyroid hormones, iodine also has many biological functions. A potential benefit of iodine if consumed adequately includes increasing and improving immune function. Iodine can support the innate immune system in fighting bacterial and viral infections. The leukocyte myeloperoxidase enzyme uses iodine in cell-induced immunity. Like thyroid cells, this peroxidase uses hydrogen peroxide to oxidize tyrosine to the tyrosyl radical, and its inactivity causes immunodeficiency. *In vitro*, iodine has been shown to increase Immunoglobulin-G synthesis in human lymphocytes. Suppression and weakening of the immune system, which includes cytokine dysfunction and the acute phase response to infections, have a negative effect on inflammatory diseases. Therefore, iodine can play a significant role in the effective response to inflammatory diseases by strengthening the immune system. Another aspect of the effective use of iodine against contaminants, especially viral contaminants, is its use as an effective agent in disinfectants. So that, Povidone Iodine (PVP-I) is now widely used in dentistry and even surgery. At present, due to the widespread prevalence of COVID-19 and the low production and availability of vaccines in all countries, finding and providing appropriate, low-cost and affordable solutions to strengthen the immune system and combat COVID-19 is of great importance. Therefore, based on the information obtained, we hypothesize that adequate iodine intake, especially through dairy consumption, can strengthen the immune system in people and due to its antiviral and inflammatory properties, iodine can be used as a preventive agent against COVID-19.

Keywords: COVID-19; Dairy products; Iodine

Introduction

Iodine (I) is an essential trace element for humans and animals and its deficiency can affect basal metabolism and immune system function [1,2]. People with I deficiency, in large numbers around the world, suffer from physical illnesses and weakened immune systems [3]. Iodine deficiency is considered by the World Health Organization (WHO) and the United Nations Children's Fund as one of the most important nutritional factors that have a decisive impact on the health status of the population, especially children at all stages of their development [4]. Tay et al. reported that leukocyte myeloperoxidase enzyme uses iodine in cell-mediated immunity, where iodine is used to produce iodine-free radicals. The concentration of myeloperoxidase enzyme is strongest in granulocytes and weakest in lymphocytes, and, as in thyroid cells, this peroxidase oxidizes tyrosine to a tyrosyl radical using hydrogen peroxide, and its inactivity predisposes to immune deficiency [1]. The immune suppression, which includes impaired cytokine function and a diminished acute-phase response to infections, negatively affects the natural history of inflammatory diseases [5]. In 2013 it was shown in newborn lambs inoculated with respiratory syncytial virus (RSV) that iodine treatment resulted in less lung lesions and less pulmonary expression of RSV antigen. Also, in 3-week-old lambs it was demonstrated that iodine supplementation reduced the severity of RSV-infection [6]. Studies have also shown the unique properties of iodine germicide [7]. Moreover, many researchers reported that Tasco-Forage, an (iodine-rich) extract from the brown seaweed *Ascophyllum nodosum*, has increased antioxidant activity and immune system in grazing animals [8,9]. Due to the essential role of iodine in strengthening the immune system, fighting the virus and its subsequent anti-inflammatory properties, it may have an effective and positive effect on fighting COVID-19. Therefore, the aim of this study is to provide a useful, low-cost, and affordable solution for the prevention and treatment of COVID-19 prior to vaccine high production.

COVID-19 and the Turmoil of the World

The Covid-19 pandemic is currently infecting and resulted in death large populations around the world and is spreading rapidly. The vaccine produced in some countries has been very effective in immunizing the body against COVID-19 and positive results have been reported in their use. But the point is that 1) It is not yet available to all countries and achieving this goal is very time consuming; 2) There is the least access in densely populated countries with low facilities, while the highest prevalence has been reported in these countries and 3) The rate of spread of the virus has greatly increased due to the mutations created in it. Therefore, finding and presenting appropriate, low-cost and affordable solutions to combat the outbreak of COVID-19 before vaccine high production is one of the most important measures.

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Fortunately, governments and public health agencies around the world have taken effective steps to combat the virus by providing methods to prevent the transmission of the virus, including washing and disinfecting hands, maintaining physical distance, using face masks, and so on. However, according to the daily reports of the statistics of the infected and the lost people in the world, it can be said with certainty that, unfortunately, these solutions are insufficient in this struggle. So the main question in this article is: What to do now? In the following, we will deal with this issue from two perspectives regarding the use of the effective substance iodine.

Use of iodine as a food component and Amplifier the immune system

According to previous research, iodine consumption can strengthen the immune system in livestock [10]. Weetman et al reported that iodine could increase Immunoglobulin-G synthesis in human lymphocytes *in vitro* [11]. Pathophysiological research also shows that iodine can support the innate immune system in fighting bacterial and viral infections [6]. According to reports, Japanese people consume more iodine than other countries, and according to statistics, a much lower percentage of COVID-19 virus prevalence and deaths in this country than in other countries, according to High population density is observed in this country [12,13]. Therefore, due to the fact that iodine has very limited side effects and rapid absorption, and is also reported to be an effective element in strengthening the immune system, it can be used as a low-cost and available golden solution to optimal prevention and treatment of COVID-19.

Iodine needs are met through the consumption of iodine-containing foods. In the past, the side effects of iodine deficiency (goiter, mental retardation, and weakened immune system) were provided by the consumption of iodized salt [14]. But the effects of excessive salt consumption led researchers to find an alternative. Currently, most developed countries use dairy products as the main source of iodine needed by the body [15]. According to recent research, consuming 250ml (1.5 glasses) of raw milk per day can meet 29 to 30% of the iodine needs of adults. [16,17]. Therefore, consumption of dairy products, especially milk, can be effective in preventing and treating COVID-19 by strengthening the immune system due to the presence of an effective substance iodine.

External use of iodine as a disinfectant

Studies have shown that povidone iodine (PVP-I) has better antiviral activity than other antiseptic drugs such as chlorhexidine [18] and has previously been shown to be an effective *in vitro* antiviral against similar viruses (SARS-CoV and MERS-CoV) [19] although these results have not been directly tested and reported in relation to COVID-19. PVP-I has been introduced as a preventative and safe agent used as a mouthwash or nasal spray. PVP-I can be used in a variety of applications, including dentistry and even surgery. To increase protection, surgeons and dental assistants should use this solution every two hours during the treatment of patients during this epidemic and up to four times a day [19].

Conclusion

Finally, considering the role of iodine in strengthening the immune system, reducing inflammation and its antiviral and antiseptic properties, it can be assumed that the use of this effective substance can be an effective, low-cost and affordable tool against COVID-19. Also in line with this goal and due to iodine deficiency in a large number of people, the use of dairy products, especially milk can provide a significant part of iodine needs. More research is needed in this area.

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