



# Inclusion of Covimmunity Booster Foods in our Daily Diet: A Critical Decision (A Review)

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Healthy and balanced diet is quintessential in maintenance of normal metabolic status of our body as well as boosting our immune system. A daily diet packed with vitamins and minerals in appropriate amount can surely serve our purpose. This simplifies that we should keep on adding natural colorful sources in or plates to throw back infections. Inclusion of immunity booster foods in daily doses will definitely work as a fight back to the entry of antigens. With onset of sudden pandemic threat of Covid-19, people have started taking many supplements and dietary sources to enhance their defense mechanisms. As a result, there has been an unprecedented rise in the sale turnover of Vitamin A, Vitamin C, Vitamin D, Vitamin E, zinc, magnesium and herbal supplements. But a critical review is highly required at this time for food sources to be included so as to avoid their hyper toxicity and other long- lasting side effects on vital organs of our body. This review article aims to critically analyze the inclusion of immunity booster foods against corona virus and strengthening our immune system.

Key Words: immunity, boosters, food sources, supplements, immune system.

## Introduction:

Maintenance of adequate nutritional status is a key determinant for protection against pathogens. It is a known fact that optimum nutrition and physical activity can help maintain a healthy weight. But the benefits of balanced nutrition are far beyond. Adequate nutritional status reduces the onset as well as risk of many metabolic disorders including heart disease, diabetes, stroke, some cancers, and osteoporosis. Changed lifestyle, hectic working hours and increased frequency of eating out has given rise to a high toll on our health. Further situation is worsened by lack of sound sleep, meditation and exercise in the younger generations.

Our body has a natural defense mechanism to fight back these antigens in our immune system. Natural barriers like skin, mucous membranes, ear wax and the immune system offer protection to the body against pathogenic organisms. Whenever any antigen enters our body, our white blood corpuscles especially the T cells come into action for the production of antibodies. These in turn act like the soldiers for our body to fight back the pathogenic antigen.

Corona virus pandemic outbreak has emerged as a global concern for the past year. To overcome the tussle with this hazardous virus, our body's immune warriors need to be strong enough. This would be possible by inclusion of adequate immunity boosting food sources in our daily diet. However, we all know that the only nutrients which enhance our immunity are vitamins and minerals in addition to proteins for rectifying the breakdown tissues. This infers that we should eat a diet packed with vitamins and minerals on a daily basis. The simple formula is to get added maximum naturally coloured foods to our routine plate for getting the immunity benefits.

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### **Inclusion of Immunity Boosting Foods:**

#### **Vitamin A RICH FOODS**

Vitamin A is essential to normal immune function and regulation. Vitamin A is essential for the integrity of the mucosal membranes. It also maintains the health of epithelial cells that line internal and external surfaces of the lungs, intestines, stomach, vagina, urinary tract and bladder, eyes and skin. These cells act as important barriers to pathogens.

Vitamin A or retinol is found only in foods of animal origin, such as milk, cheese, cream, butter, ghee, egg, fish, kidney and liver, liver oils of fish such as halibut, cod and shark. Pro-vitamin A or  $\beta$ -carotene is found primarily in plant foods, which contain orange or yellow-coloured pigments called carotenoids. Palm fruit and red palm oil are the richest source of beta-carotene and dark green leafy vegetables, ripe fruits such as mango, papaya, apricots and yellow orange vegetables like carrot, pumpkin and sweet potato are also loaded with this form.

Our daily dietary intake rarely results in toxicity of vitamin A. Taking high dose of oral Vitamin A supplements over long periods of time typically results in Hypervitaminosis A or vitamin A toxicity. This excessive vitamin A is then stored in the liver and leads to symptoms like changes in vision, bone inflammation, skin dryness & roughness, ulceration of mouth and confusion. In order to avoid possible birth defects, pregnant women should be especially careful regarding this toxicity.

## VITAMIN C RICH FOODS

Vitamin C is a powerful natural antioxidant. It acts as an effective scavenger against the superoxide radical anion, hydrogen peroxide, the hydroxyl radical, and singlet oxygen which could damage DNA, proteins or membrane structures thus delaying the signs of ageing.

Vitamin C plays a crucial role of improving immunity for people of all ages ranging from infants to elderly. Hence, there should be focus on inclusion of citrus fruits like oranges, lime, lemons, gooseberries, papaya, kiwi, and guava in our daily diet. Vitamin C is also present in some vegetables like brinjal, bell peppers, beetroots, cauliflower and green leafy vegetables like spinach & broccoli, mushrooms, and even kale. All berries i.e. gooseberry, strawberry, cranberry, blue berry, mulberry, raspberry also contain substantial amount of ascorbic acid and can be incorporated in the diet along with foods rich in omega-3 fatty acids like beans, pumpkin seeds, sunflower seeds, flax seeds, and even some nuts. These super foods act as rapid immunity boosters.

## VITAMIN D RICH FOODS

Vitamin D is made under the skin from its precursor (7-dehydrocholesterol) by exposure to sunlight or can be provided pre-formed in the diet. The version made in the skin is referred to as vitamin D<sub>3</sub> whereas the dietary form can be either vitamin D<sub>3</sub> or a closely-related molecule of plant origin known as vitamin D<sub>2</sub>. The other name of Vitamin D is sunshine vitamin because it is easily manufactured in the skin from 7-dehydro cholesterol on exposure to sunlight.

Small amounts are present in dairy products such as milk, cheese, butter, margarine and cream, egg yolk, liver, oysters and certain varieties of fish.

Immune responses that are mediated by T-cells can be inhibited by the large doses of calcitriol i.e. 1,25 dihydroxycholecalciferol. It is a natural steroid hormone formed in the healthy body as the biologically active form of vitamin D. A deficiency of vitamin D also interferes with the T-cell mediated immunity. Supplementation with vitamin D also improves the production of anti-oxidation related genes. According to Center for Disease Control and Prevention, the increased production of glutathione as a result of vitamin D supplementation spares the use of ascorbic acid (vitamin C), which also has antimicrobial properties, and has been suggested for COVID-19 prevention and treatment (Holick, 2007).

The adverse effects resulting from high vitamin D intakes include hypercalciuria (excessive urinary calcium excretion) and hypercalcaemia (high concentration of calcium in blood). Available dietary sources are not enough to supply vitamin D in excess hence vitamin D intoxication cases are very rare. Nevertheless, toxicity may occur in individuals who consume regular vitamin D supplements in excessive amounts for example sportspersons, players etc. who drink milk fortified with inappropriately high levels of vitamin D<sub>3</sub>. Anorexia, nausea and vomiting, followed by polyuria, polydipsia, weakness, nervousness and pruritis (itchiness) are the signs and symptoms associated with it. This can also be associated with impairment of renal function and occurrence of metastatic calcifications particularly in the kidneys.

## VITAMIN E RICH FOODS

Vitamin E is a fat-soluble vitamin with several forms  $\alpha$ ,  $\beta$  and  $\gamma$ , but human body uses only alpha-tocopherol. Vitamin E is the generic term for tocopherols and tocotrienols that have a phenolic functional group on a chromane ring system with an isoprenoid side chain. The main function of this vitamin is to act as an antioxidant and scavenger of free radicals which damage cells. It also boosts immunity and prevents atherosclerosis.

Vitamin E is present in almost all foodstuffs. The richest sources of vitamin E include wheat germ, corn, nuts, seeds, olives, spinach, asparagus and other green leafy vegetables and vegetable oils like groundnut, soy, cotton seed and safflower. Higher the amount of polyunsaturated fatty acid content of the oils, higher is the vitamin E content of edible oils.

Vitamin E is relatively non-toxic. The tolerant doses for adults may range between 100 to 1,000 IU per day. However, adverse effects such as muscle weakness, fatigue, nausea, diarrhoea, double-vision, elevation of serum lipids, impaired blood coagulation and reduction of serum thyroid hormones occur due to indiscriminate administration of excessive amounts of vitamin E over prolonged periods.

Vitamin E is quintessential for boosting immunity and maintaining the overall health of the aged. Vitamin E also acts as a powerful antioxidant against lipid peroxidation thereby protects us from various pathogenic infections and hazards of ageing. With an intention to take recommended amounts, inclusion of soaked almonds, peanut butter, sunflower seeds and even hazelnuts should be consumed daily. This vitamin is a radical peroxy scavenger that protects the polyunsaturated fats in plasma membranes and lipoproteins (Liang et al., 2003).

## ZINC RICH FOODS

Zinc is an essential micronutrient which cannot be made on its own in our body. It plays a great role in our growth and development, synthesis of DNA, protein synthesis, gene expression, strengthening of immune function, wound healing, and many more vital metabolic functions. Zinc is an essential micronutrient is used in DNA synthesis and cell proliferation (Fuhrman, 2020). It is also involved in the regulation of innate and adaptive immune responses, cell signaling, and production of immune cells (Wessels, Maywald, & Rink, 2017).

Zinc is found naturally in many animal and plant foods thus making it available for most people. Foods highest in zinc include shellfish, meat, poultry, fish, legumes, nuts, seeds, dairy products, whole grains and certain vegetables like mushrooms, kale, peas, asparagus and beet greens. Since there is no production of zinc in our body, we need to include food sources or supplements for this. Foods that contain zinc include red meat and shellfish (West, 2018).

Too much supplemental intake of zinc can result in both acute and chronic symptoms of zinc toxicity. Nausea and vomiting, loss of appetite, diarrhea, abdominal cramps, headache, reduced immune function and decreased HDL cholesterol levels are the repercussions of zinc toxicity. Ingestion of high amounts of zinc can result in deficiencies of other nutrients too.



## MAGNESIUM RICH FOODS

Another very beneficial mineral for our immune system is magnesium. It is an important electrolyte that helps our body strengthen our immune system's natural killer cells and lymphocytes. It is also a key source of energy packets for our cells called adenosine triphosphate (ATP). This ATP is very crucial component of human body failing which our cells cannot function properly. Magnesium helps in the formation of oxyhemoglobin in our blood which is responsible for supplying oxygen from our lungs to the entire human body. This function of zinc has also found associated with COVID-19 infection since the virus attacks the respiratory system (Sanderson, 2020).

Magnesium is widely distributed in a variety of foods and beverages. Green leafy vegetables are considered as excellent sources of magnesium because of its association with chlorophyll. Most green vegetables, legume seeds, beans, tea, coffee, cocoa and nuts are rich in magnesium, as are some shellfish, spices, and soya flour, all of which usually contain more than 500 mg/kg fresh weight. Foods rich in magnesium are dark chocolate, black beans, avocados, and whole grains (Spritzler, 2018).

## HERBS

Indian herbs are the real treasure of Indian cuisine as well as medicine. Ayurveda exploits the maximum out of these immunity storehouses for the treatment of a number of diseases. Other alternative therapies also make use of the bio-compounds present in herbs for treatment. There is a long list of these herbal immunity boosters including garlic, ginger, mint, tulsi, fennel, giloy, cinnamon and liquorice. Their inclusion in the tea and diet of the elderly will not only enhance their immunity but also help in their gut vitality.

Herbal treatment known as Traditional Chinese Medicine has an old history and is an essential part of the treatment or prevention of certain outbreak diseases. During the onset of SARS epidemic (2003), the TCM intervention had attained impressive therapeutic effects on recovery patients. During the COVID-19 recovery period, the TCM program was included in COVID-19 Testing and treatment Guideline, and TCM specialists were fully involved in the entire rescue process (Wu et al., 2020).

## LIFESTYLE

Stress negatively alters the immune system responses within the body (Salleh, 2008). One needs to maintain a suitable distance from mass as well as social media so as to be away from fake news. Don't be too much freaky & panicky about the daily statistical data about anything.

Sound sleep plays an integral role in the improvement of one's immunity. At least six to eight hours of sleep is recommended for people of all ages. Sleep gives the body an opportunity to heal and rest, especially in critical illnesses (Kamdar, Needham, & Collop, 2012). Furthermore, sleep was considered extremely important by doctors in the recovery of their patients during the Spanish Flu Pandemic (Abascal & Yarnell, 2006).

Regular exercise is also an important requisite for strengthening our immune system. Exercising helps to elevate the levels of white blood cells and antibodies that fight off pathogenic infections (Join & Calendar, 2020). Exercise is especially important after a critical illness to improve muscle mass, strength, and resiliency

(Heyland et al., 2016). Exercise can also help with the prevention of blood clots, which have been a symptom for some people who contracted COVID-19 (Clerkin et al., 2020).

Healthy and balanced diet is quintessential in maintenance of normal metabolic status of our body as well as boosting our immune system. A daily diet packed with vitamins and minerals in appropriate amount can surely serve our purpose. This simplifies that we should keep on adding natural colorful sources in or plates to throw back infections. Inclusion of immunity booster foods in daily doses will definitely work as a fight back to the entry of antigens. The next best thing is including fermented or frozen foods in our daily diet. These items are normally picked at the peak of the season and then frozen or fermented straight away (Join & Calendar, 2020).

## CONCLUSION AND FUTURE PERSPECTIVE

People with weaker immune systems are more vulnerable targets for all diseases. Covid -19 like pandemics also find it easier to trap these soft targets in large numbers. Vegetarian foods play a pivotal role as immunity boosters by promoting the growth of beneficial bacteria in the body. A daily diet packed with vitamins and minerals in appropriate amount can surely serve our purpose. This simplifies that we should keep on adding natural colorful sources in or plates to throw back infections. Vitamins A, C, D and E have been proven beneficial and effective in the improvement of immunity. Green leafy vegetables and citrus fruits are therefore termed as covimmunity boosters. In addition to these, dietary intake of adequate amounts of herbal decoctions has also found to be effective for the prevention of Covid-19. Further researches on the changes in lifestyle attitudes are the need of the hour. New normal adaptation needs to be sinked in amongst all of us. Abiding by the government as well as WHO guidelines should be taken very seriously. There is an urgent attention to be driven on justified usage of natural immunity boosters and toxicity issues of supplementation thus preventing Covid-19 aspects. A critical review is highly required at this time for food sources to be included so as to avoid their hyper toxicity and other long- lasting side effects on vital organs of our body. More research is needed to know about the behavior and mutation patterns of coronavirus to establish the efficacy of covimmunity booster foods in its prevention.

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