

Leprosy- Control through Superfoods

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Abstract

Leprosy is a bacterial infection spread by inhalation of infectious droplets that arise from cough or sneeze. Although, various strategies have been implemented at government level to prevent the disease, it is still prevalent throughout the world and especially in the poor and developing nations. The main cause of prevalence is the low immunity probably as a result of mal-nutrition. Therefore, in this article, various superfoods have been suggested which can help to boost up the immunity to control and prevent leprosy.

Keywords: Superfoods; Leprosy; Sneeze

Introduction

Leprosy, also known as Hansen's disease is an infection caused by bacterial species, *Mycobacterium leprae* [1]. It affects the people of all the ages. Depending upon the bacillary load, the disease is classified as paucibacillary (PB) or multibacillary (MB) [2]:

- Paucibacillary- PB leprosy is a milder disease characterized by few skin lesions (pale or reddish)².
- Multibacillary- MB leprosy is characterized by multiple skin lesions, nodules, plaques, thickened dermis or skin infiltration [2].

Leprosy is a communicable disease which spreads from an infected person to a healthy person. When a person suffering from leprosy coughs or sneezes and a healthy person breathes in the droplets containing bacteria, the disease gets transmitted [4]. The disease can be cured with early diagnosis and treatment, but if left untreated, it results in damage to nerve, crippling of hands and feet, paralysis and blindness [1]. Thus, the symptoms of the disease include [5]:

Symptoms

- Skin
 - i. Discoloured patches and growth (nodules) on skin (Figure 1). Thick, stiff or dry skin and sometimes there is burning sensation on the skin.

- ii. Painless ulcers on the soles of feet and painless swelling or lumps on the face or earlobes.
 - Hair- Loss of eyebrow or eyelashes.
 - Muscles- Weakness or paralysis (especially in hands and feet).
 - Nerves- These become enlarged.
 - Eye- Eye problems leading to blindness.



Figure 1: Discoloured patches on skin.

Superfoods

Superfoods are the foods which contain all essential nutrients- proteins, vitamins, immune-stimulating polysaccharides, antioxidants, trace elements and essential fatty acids. These foods help in nourishing the organs and organ systems of the body, thus acting as medicines for the life [5]. There are certain superfoods which can help in controlling the leprosy disease by boosting up the immune system. Some of them are mentioned below:

- **Broccoli:** Broccoli is the rich source of vitamin C (ascorbic acid) [6] which is an anti-oxidant, which leads to improvement in lymphocyte transformation and neutrophil chemotaxis. Hence, vitamin C boosts up the immune response and prevents the skin from damage [7]. Broccoli also consists of vitamin B₂ (riboflavin) [8] and some amount of sodium [9] which helps in growth and development of the skin and protects the skin from dryness [10]. Also, vitamin C helps in scavenging free-radicals generated in the eyes due to some bacterial or viral infection, thus also protecting the eyes from damage.
- **Wheat germ:** Wheat germ is the richest source of vitamin E (tocopherol) [6]. Vitamin E is an antioxidant which due to some infectious microbes shows neuroprotective activity against free-radicals generated by 6-hydroxydopamine, a neurotoxin which lowers the effect of dopamine (neurotransmitter) in the nervous system [11]. Wheat germ is also high in minerals, mainly selenium. Selenium is essential for the formation of selenoproteins like glutathione peroxidase within the lens of the eye. Glutathione peroxidase acts as an antioxidant preventing the formation of free radicals that damage the eye lens. Thus, consumption of wheat germ can control cataract disorder which can lead to blindness in the eye as vitamin E and selenium combine with the enzyme in the lens of the eye [12].
- **Spinach:** Spinach is the richest source of vitamin B₂. It is also a good source of vitamin B₆ (pyridoxine) [8], vitamin A (retinol) and vitamin E [6]. Vitamin B₂ and vitamin B₆ which helps in the growth and development of the skin [10] and protects the skin from allergic reactions [10,13]. Vitamin A builds healthy skin and mucous lining that acts as protective barrier against viruses and bacteria [8]. Spinach containing vitamin E is an anti-oxidant which helps in the prevention of dryness of the skin [14]. Spinach is also a good source of vitamin C [6] which leads to improvement in lymphocyte transformation and neutrophil chemotaxis, thereby boosting the immune response and thus preventing the skin from allergy from food [7]. Spinach also has high amount of pigments like β-carotene [12] (fat soluble anti-oxidant [5]) and lutein (anti-oxidant). Therefore, presence of all these anti-oxidants in spinach helps to prevent macular degeneration in the eyes which is caused mainly due to formation of free radicals leading to blindness [12].
- **Spirulina:** Spirulina has the highest concentration (65-71%) of protein, contains all 8 essential amino acids. The highest protein source helps in building muscle strength and strong bones. It is rich in vitamin A, vitamin B₁ (thiamine), B₂, B₆, E, pigments β-carotene and zeaxanthin which acts as anti-oxidants thus helps in improving vision and nourishing the skin. The pigment zeaxanthin helps in production of antibiotics and cytokines, including interferons and interleukins. This accelerates the production of B-cells, T-cells and macrophages, thus, protecting from bacterial and viral infections. Zeaxanthin also helps to heal the membrane of the eyes. Spirulina is the best source of γ-linolenic acid (GLA), an anti-inflammatory essential fatty acid which helps in building strong skin and hair; heals the nervous system and also fights the inflammatory symptoms of arthritis⁵.
- **Fish:** Fish is the richest source of omega-3-fatty acids [15]. Omega-3-fatty acids in fish are extremely important in maintaining the structure and function of every cell in the body and therefore increases the cell immune system [16] which directly prevents the skin from exposing to food allergies and hence to dryness. Fish also contains vitamin B₂ and vitamin B₆ [8] which helps in the growth and development of the skin [13]. Vitamin D present in fish [8] acts as immunomodulator as it helps in the release of cathelicidin (an antimicrobial protein which is released in the skin as the first line of defence against pathogens) and hence protects the skin from leprosy [17]. Fish also contains high quality protein which helps in improving vision.
- **Coconut:** Coconut consists of fatty acids like caprylic acid, capric acid, lauric acid and myristic acid. These fatty acids disrupt the lipid membranes of virus, bacteria, yeast and fungi, thus, having anti-bacterial, anti-viral and anti-fungal properties. Coconut contains vitamin E, preventing the drying of the skin and strengthening hair [5].
- **Soy foods:** Soy foods like soy milk, soy protein and soy isolates are a good source of minerals like zinc. Since zinc activates the retinol by reacting with the enzyme retinal dehydrogenase, it mainly helps in the prevention of diseases like night blindness, thus protecting the eyes [12].
- **Goji berries:** Goji berries contain nineteen different amino acids. They contain anti-oxidants like vitamins B₁, B₂, B₆ and vitamin E, highest concentration of zeaxanthin and lutein pigments. This combination of anti-oxidants prevents free-radicals that attack the eye during an infection and also protects the skin from dryness. The pigments lutein and zeaxanthin are present in the centre of the retina and protect the eyes from loss of sight. Zeaxanthin also helps to heal the membrane of the eyes. Goji berries also contain a pigment

β -carotene which increases interferon's stimulatory action by immune system. It is a powerful immune enhancing compound that plays a protection against viral and bacterial infection. Goji berries contain β -sitosterol (an anti-inflammatory agent), linoleic acid (essential fatty acid) and polysaccharides like D-rhamnose, D-xylose, D-arabinose and D-fructose (stable- blood sugars) which fortifies the immune function and protects eyes and skin [5].

Conclusion

The right blend of nutrients in the diet in the form of superfoods not only help in controlling the infectious disease like leprosy but will also benefit the overall health and reduce the burden of taking multiple drugs against infection. These superfoods are the natural medicine in the form of foods. So, take care of the health, as "Health is Wealth".

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