

## ENHANCING HEALTH THROUGH FOOD AND ITS ROLE TO IMMUNITY – A REVIEW

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### **ABSTRACT**

The immune system plays a crucial role in the body's ability to fight infection and reduce the risk of developing autoimmune and degenerative disorders. On the global scale it has been accepted that malnutrition, in its both forms under nutrition and over nutrition contributes to higher mortality and morbidity. Ayurveda, the ancient wisdom recommends various food items and behaviours for physical and mental well being. This work aims to reveal the hidden secrets of Ayurveda dietetics and immunity through comprehensive review of available literature. Taking leads from Ayurveda the effects of different food products with specific nutrient on immune response is discussed to give the clinical insight into the age old doctrines of Ayurveda related to diet for promoting and preserving health. This review has profound clinical and public health implication. This will

boost the idea of nutritional manipulation of immune system as an innovative powerful tool to reduce illness and death caused by different communicable and non communicable disease.

**KEY WORDS:** *Ayurveda*, Healthy life, Immunity.

## INTRODUCTION

Indian nutritionists have often raised a hue and cry against the growing inclination of public towards junk food and have been recommending the use of green, healthy and stable food. “Let food be your medicine and let medicine be your food” was advised by the father of medicine, Hippocrates, over two million ago. It’s still true today that “you are what you eat.” Extensive studies are being done to find novel food based approaches to lower the incidence and severity of diseases. Food (*Ahara*) is one of the tripods of life as per Ayurvedic classics<sup>[1]</sup>. The ancient classics food has been considered in the list of both cause and cure of diseases. Peoples of all ages and in all walks of life are interested in the relationship that this *Ahara* has to their state of health. They have been more cautious about the role of *Ahara* consumed in general and most efficient use of natural resources being utilised for this purpose.

*Vyaadhiksamatva*<sup>[2]</sup> (immuno competence) in Ayurveda implies a resistance against the loss of the integrity, proportion, and interrelationship amongst the individual's bioenergies (*doshas*) and tissues (*dhatus*). This homeostasis among the supporting elements of the mind and body is known as *dhaatusaamya*<sup>[3]</sup>, and is the key to healthy long life. The state of imbalanced *dhatus*(constituents) means their increase or decrease partially or wholly is responsible for disease or destruction. *Dhatus* of the body get increased by the prolonged use of the food substances having similar or mostly similar properties while they get decreased by the prolonged use of the food substances having contrary or mostly contrary properties.<sup>[4]</sup>

The role of nutritional factors as a contributor to mortality both for infectious and non infectious disease as a conditioning factor in the complex mosaic of a number of diseases, and as a hurdle to socioeconomic advancement, is widely recognised. But the present trend of placing emphasis on sufficiency of energy, protein, minerals and vitamins in the diet is no longer adequate. It is important here to address that under nutrition as well as over nutrition can alter immune responsiveness. Thus optimum nutrition is the key phrase for dietary influence to keep immune response within normal limits.

In this interpretative monograph, we have attempted to summarise and analyse critically the doctrine quoted in Ayurveda classics, to bring out the merits of age old science that emphasises the importance of food for good immune-competence and hence good health. The rising numbers of disease resulting from the excess of energy, fat, sugar, cholesterol are posing the threat to public health and thus dietary refinement should be mentioned.

## IMMUNITY IN AYURVEDA

The concept of immunity in *Ayurveda* is known as *Vyaadhiksamatva*, in *Ayurveda*, which literally means "resistance (ksamatva) against disease (vyaadhi). *Vyaadhiksamatva* (immunity) in *Ayurveda* is not immunity against a specific infectious agent or disease such as polio or rubella for which modern medicine provides "immunizations". This equilibrium is maintained by three *doshas*, seven *dhatu*s and *malas*. *Vyaadhiksamatva* implies a resistance against the loss of the integrity, proportion, and equilibrium amongst these individual physiological entities. Immunity from disease includes both reducing the strength of those already manifested as well as prevention of those as yet unmanifested.

*Vyaadhiksamatvam vyaadhibalavirodhitvam  
vyadyutpadapratibandhakatvamiti yavat*<sup>[5]</sup>

It follows then that the Ayurvedic concept of immunity is intricately interwoven with the concepts of nutrition, agni (digestive fire), and tissue formation. A synonym for *vyaadhiksamatva* which appears in the ancient texts is *bala*, generally translated as "strength" and both terms are used as synonyms<sup>[6]</sup>.

*Yuktikruta Bala*<sup>[7]</sup> is one among three types of *bala* mentioned in *Ayurveda*. It represents acquired immunity *Ayurveda* further advocates that those who maintain a regular, healthy routine and take wholesome food generally maintain good health. Wholesome, adequate and timely nutrition especially in during foetal development and childhood plays an important role in developing immunity<sup>[8]</sup>. The wholesome food in adequate amount maintains the equilibrium of bodily *dhatu*s gives us long life and youthfulness.

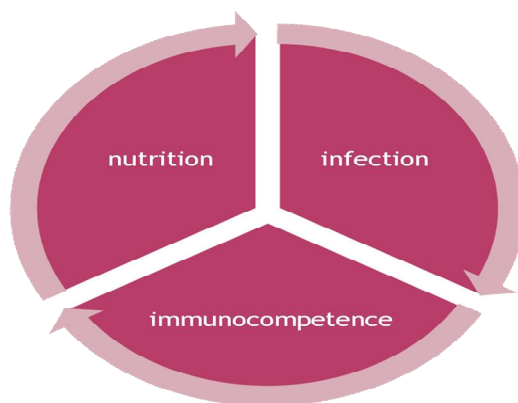
### Interrelation Ship of Nutrition, Immunocompetence And Infection

In present era fewer resources and tremendous increase in the world population has produced multitude of urban dwellers that were uprooted from their rural origin and crowded around factories in cities. The old traditions are being lost but replaced by education. The food which they buy is likely to be poor value for money and contaminated by pathogens. The problem is further compounded by alcoholism and violence. Spread of infections, gastroenteritis, respiratory tract infection and many infectious diseases may precipitate in poor diet. Poor nutrition is one aspect of urban poverty, all but important. It sets up vicious circle making its victim physically and mentally unfit for work and so driving him and his family deeper into poverty. Affluent society all over world, present with new set of challenges. The whole picture is different. In place of under nutrition they are worried by over nutrition. They are

more worried about their food being too refined or adulterated by fertilizers, insecticides and food additives. The disease like coronary heart disease, hypertension, diabetes mellitus and cancer may each be partly determined by diet.

There is an intimate relationship between nutritional status, immune response and disease. Clinicians have long observed that under nutrition predisposes the host to the risk of acquired infection and that the course, frequency of complications, severity and mortality of the infectious illness is augmented. It is likely that this is the result of impaired immune competence secondary to nutritional deficiency. Disease in turn frequently worsens the nutritional status, often precipitating overt signs and symptoms and causes immune suppression. The common concurrent existence of malnutrition and disease may symbolize a pathophysiologic interaction between the two to produce effects including decreased immune competence, the problem magnitude is more than the summed result expected from the two entities acting singly.

In economically less privileged nations, however the opportunities for combining mutually aggravating effects of under nutrition and infection continue to prevail and to pose a threat to the health of majority of their populations most particularly young children less than 5 yrs of age.



### Food for good health as advocated in Ayurveda

A thing which does not adversely affect the mind and body is regarded as wholesome<sup>[9]</sup>. In other way it maintains normal health and alleviates the various disease Adapting to wholesome substances and giving up unwholesome substances, to which the physiology has been addicted since birth, also promotes immunity. One should regularly take such articles which are conducive to maintenance of good health and are capable of preventing the attack of diseases<sup>[10]</sup>. It is emphasized in Ayurveda that certain foods are beneficial for everyone,

regardless of constitution, location, season or condition. List of immune enhancing foods in Ayurveda is given below as *Sastik, Sali, Mudga, Saindhav, Amalaka, Dugha, Ghirta, Ajamamsa* and *Madhu*<sup>[11]</sup>.

The Ayurvedic texts have described twelve categories of food sources reflecting the then available varieties of food in historical perspective<sup>[12]</sup>. A look at this classic information reveals that the whole range of food currently in use today remains the same as was originally identified during the classical age of Ayurveda. These 12 categories of food are as follows.

- |                                    |   |
|------------------------------------|---|
| 1. <i>Shukadhanya</i> (corn)       | 7. <i>Madya Barga</i> (wines)                             |
| 2. <i>Shamidhanya</i> (pulses)     | 8. <i>Ambu Barga</i> (water)                              |
| 3. <i>Mamsa Varga</i> (meat)       | 9. <i>Gorasa Barga</i> (milk and milk products)           |
| 4. <i>Shaka Varga</i> (vegetables) | 10. <i>Ikshu Vikara</i> (sugar cane and related products) |
| 5. <i>Phala Barga</i> (fruits)     | 11. <i>Kritanna Barga</i> (cooked products)               |
| 6. <i>Harita Barga</i> (greens)    | 12. <i>Aharayoni</i> (food adjuvants)                     |

The foremost food article is considered as best among the series hence the properties of some important food substances given in different classical texts as Charaka Samhita Sutra Sthana 4 and Bhavprakash have been compared here as given below

DRAVYA	RASA	GUNA	VIRYA	VIPAKA	KARMA	DOSHA PRABHAV
Yava	Madhur	Ruksha, laghu	Sheetal	Madhur	Vayu-mala vardhak, sishirtakarak,	Kapha shamaka
Godhuma	Madhur	Guru, Shigdha	Sheetal	Madhur	Jivaneeya, brimhana, Virshya, asthisandhanakrita	Vata shamaka
Sastika/ Sali	Madhur	Shigha, Laghu	Sheetal	Madhur	Sisthirtakarak	Tridosha shamaka
Mudga	Madhur, kashya	Ruhsha, vishada	Sheetal	Katu	Unctuous	Kapha-pitta shamaka
Tila	Madhur, katu, tikta, kashya	Shingha, ushana	Ushana		Twacha, keshya balya	Kapha-pitta varghaka
Aja mamsa		Snighda, guru	Nati- sheetal		Adoshakar, sharer-dhatu samanya, brimhana	
Palakya	Madhur	Guru	Sheet		Unctuous	
Alabu	Madhur	Guru	Sheet		Ununctuous, aphrodisiac, nourishing, cardiac tonic, purgative	
Rason	Katu	Snigdha, guru	Ushana	Katu	Krimi-kustha-kilas nasak	Vata shamaka
Adrak	Katu	Guru	Ushana		Rochana, dipan, virsya	Vata-kapha nasak
Draksha	Madhur	Snigdha	Sheetal	Madhur	Mamsa vardhak, jwara, raktapitta, kshya, kshat nasak	Vata-pitta nasak
Amalki	All 5 rasa except lavana	Ruksha	Sheetal	Madhur	Unctuous, aphrodisiac, rejuvenator, anti diabetic, laxative	Kapha pitta hara
Go-dugha	Madhur	Snidha, bhal, Picchal, guru	Sheetal	Madhur	Jivneeya, rasayan	Vata – pitta hara
Dahi	5 rasa except amla	Guru	Ushana	Amla	Unctuous, aphrodisiac, cures infection	Vata nasaka

The extensive research has been done in recent years to reveal the benefits of different food articles. The various scientific researchers are mentioned here to support and justify the ancient views on the importance of Ahara for health. The food items mentioned above are discussed here in brief.

### **Wheat**

Wheat is probably the most common cereal available all over the world and widely used as staple food in every country, it is excellent source of insoluble fibres. This high-fibre food helps in boosting the metabolic rate and thus, contributes to keeping the body weight under control. Whole wheat flour protects the body against the risk of insulin resistance. It has high amounts of betaine and choline, which are likely to have lesser chances of acquiring chronic inflammation by almost 20%. The long term consumption of these nutrients have been shown to prevent cardiovascular disease mortality by decreasing inflammation and blood lipid profile<sup>[13]</sup>. Diets low in betaine and choline lead to elevated serum homocysteine levels, a risk factor for chronic disease. (Craig, 2004; Stead et al., 2006)

### **Yava (barley)**

According to National Barley Foods Council it is an excellent source of fibres particularly beta-glucan soluble fibres. The insoluble and soluble fibre helps to promote gastrointestinal health. For five weeks adults with mildly high cholesterol were fed diets supplemented with whole grain food containing 0, 3 or 6 g beta-glucan/d from barley. The USDA researchers concluded that addition of barley to a healthy diet significantly lowered total and LDL cholesterol in both men and women<sup>[14]</sup>. It is cholesterol-free and low in fat it can lessen the risk of cardiovascular diseases by its cholesterol lowering properties. It is a great source of several vitamins, particularly, vitamin B1 (thiamin) and vitamin B3 (niacin) & minerals like selenium, iron, magnesium, zinc, phosphorus and copper. The glycemic index of boiled pearled barley is 35, which is lowest among all the common cereal grains. In a randomised cross over design USDA scientist studied the effects of 5 different breakfast test meals involving 17 obese women at risk for insulin resistance. They found that consumption of 10g of barley beta-glucan is able to induce physiologically beneficial effects on post prandial insulin response in obese women at risk for insulin resistance<sup>[15]</sup>

### **Sastika (rice) / Sali**

It has low glycemic index with high Fe and Zn and helps in bioavailability of Fe. High biological values of amino acids, high content of essential fatty acids, mineral content,



starchy quality, glycemic index and antioxidants have made it unique among grains. Studies have shown that in comparison to other sources of starch rice is completely absorbed in human body<sup>[16]</sup>. Rice can play an important part in helping to achieve a healthy diet as it contains practically no fat and all whole grain rice are good sources of B vitamins. These vitamins are an extremely important component to support and increase the rate of metabolism, enhance immune and nervous system function. Rice is good source of manganese, other the trace minerals that helps produce energy from protein and carbohydrates and is also a critical component of very important antioxidant enzyme called superoxide dismutase (SOD) which provides protection against free radicals<sup>[17]</sup>.

### **Mudga (*phaseolus mungo*)**

The Mung or Moong bean is the seed of *Vigna radiate*, it has significant amounts of protein (240 g/kg) and carbohydrate (630 g/kg) and a range of micronutrients. Mung bean sprouts contain rich quantities of vitamin A, B, C and E. Its protein and carbohydrate are easily digestible. The legume storage proteins are relatively low in sulphur-containing amino acids, methionine, cysteine and tryptophan, but the amounts of another essential amino acid, lysine, are much greater than in cereal grains<sup>[18]</sup>. The legume high fibre content, their low glycaemic index and the presence of minor components, such as phytosterols, saponins, oligosaccharides, etc., are considered the main agents responsible for lipid homeostasis and anticancer property<sup>[19]</sup>. Intake of pulses, with their low glycaemic index and mineral content, has favourable effects on blood pressure, glycaemic regulation and weight management<sup>[20]</sup>. Scientist in China have verified the antioxidant capacities of the Mung bean soup mainly derived from vitexin and isovitexin, these flavonoids accounted for the most of total DPPH radicals scavenging, ferric reducing and ABTS(+) reducing scavenging activities in Mung bean soup<sup>[21]</sup>.

### **Tila (*sesamum indicum*)**

It is rich in unsaturated fatty acids where the fatty acids composition is 14% saturated, 39% mono-unsaturated, and 46% poly-unsaturated fatty acids (Toma and Tabekhia, 1979). Carbohydrates in sesame seed are composed of 3.2% glucose, 2.6% fructose and 0.2% sucrose while the remaining quantity is dietary fibers. They have desirable physiological effects including antioxidant activity, blood pressure and serum lipid lowering potential as proven in experimental animals and humans (Sirato-Yasumoto et al., 2001). Sesame is rich in sulfur containing amino acids and limited in lysine. Sesame oil is very rich in polyunsaturated



fat used in margarine production and cooking oils. Sesame seeds contain two unique substances, sesamin and sesamol, whence during refinement the two phenolic antioxidants, sesamol and sesaminol, are formed. Both of these substances belong to lignans and have been shown to possess cholesterol-lowering effect in humans (Ogawa et al., 1995; Hirata et al. 1996) and to prevent high blood pressure and increase vitamin E supplies in animals (Yamashita et al., 1992; Kamal-Eldin et al., 1995). Sesame seeds are an excellent source of copper and calcium. It is also rich in phosphorous, iron, magnesium, manganese, zinc and vitamin B1. It has sesamin, is proven to protect the liver from oxidative damage. It is an excellent source of phytosterols, that enhances the immune response and decrease risk of certain cancers<sup>[22]</sup>.

### **Aja Mamsa (Goat meat)**

It is leaner has lesser quantity of calories than others. Lower cholesterol levels and lower saturated fats compared with other meat. It has all the amino acids needed by the body along with a high level of iron. Goat meat has been established as a lean meat with favourable nutritional qualities, and it's an ideal choice for red meat consumers. Goat meat is lower in calories, total fat, saturated fat, and cholesterol a relatively high proportion of total unsaturated fats than traditional meats. These findings support the claim can be made that goat meat reduces the risk for atherosclerosis and coronary heart disease. Unsaturated fats (good fats) improve blood cholesterol levels, ease inflammation, stabilize heart rhythms, and play a number of other beneficial roles. Goat meat provides good amount of iron, potassium, vitamin B-12, which is essential for healthy red blood cells, and niacin, which promotes energy metabolism<sup>[23]</sup>.

### **Palankya (Spinacia Oleracea)**

Spinach is a leafy green vegetable that is scientifically it is known as *Spinacia oleracea* Linn. (Family-Chenopodiaceae) *Spinacia oleracea* contains high concentration of vitamin A, E, C, and K.<sup>24</sup> and also folic acid, oxalic acid and magnesium, manganese, calcium, phosphorus, iron, zinc, copper and potash<sup>[25]</sup>. Spinach has a high nutritional value and is extremely rich in antioxidants. Spinach is also rich in the carotenoids, beta-carotene and lutein. It is a good source of the bioflavonoid quercetin with many other flavonoids which exhibits, antiproliferative, antiinflammatory, antihistaminic, CNS depressant, protection against gamma radiation, hepatoprotective properties<sup>[26]</sup>. Another study demonstrated for the first time the

presence of both flavonoids and p-coumaric acid derivatives as antioxidant components of the aqueous extract of spinach leaves<sup>[27]</sup>.

### **Alabu (*Lagenaria siceraria*)**

*Lagenaria siceraria* (Cucurbitaceae) is an important food and medicinal plant species found throughout Asia. In India, the fruits of this plant species are used for medicinal and culinary purposes. Medicinally, fruits are also used in the treatment of diabetes (unpublished data) and treatment of cough, asthma, jaundice, kidney stone, colds and measles (Jain & Sharma, 1967; Han et al., 1984; Okoli, 1984; Al-khalil, 1995). Furthermore, the fruits have laxative and diuretic properties (Al-khalil, 1995). Taking fresh or dried fruits of *L. siceraria* may relatively give similar antioxidant effects. A study exhibited that elevated levels of blood cholesterol, triglycerides, LDL, were significantly reduced and decreased HDL was significantly increased by the administration of fractions of *L. siceraria* fruit juice<sup>[28]</sup>.

### **Lasuna (Garlic)**

Garlic can detoxify carcinogens by stimulation of cytochrome P<sub>450</sub>enzymes, antioxidant activity or sulfur compound binding. Studies demonstrate a direct toxic effect of garlic to sarcoma and gastric, colon, bladder and prostate cancer cells in tissue culture. The most likely explanation of this effect is immune stimulation. It stimulates proliferation of lymphocytes and macrophage phagocytosis, induces the infiltration of macrophages and lymphocytes in transplanted tumors, induces splenic hypertrophy, stimulates release of interleukin-2, tumor necrosis factor- $\alpha$  and interferon- $\gamma$ , enhances natural killer cell, killer cell and lymphokine-activated killer cell activity. These activities represent effective stimulation of the immune response<sup>[29]</sup>. Thus it is suggested that garlic may be useful in preventing the suppression of immune response. Allicin is the compound present in garlic responsible for antioxidant, was found to scavenge hydroxyl radicals<sup>[30]</sup> inhibit superoxide production by phorbol ester-activated human granulocytes<sup>[31]</sup>.

### **Adrak (Ginger)**

Ginger or ginger root is the rhizome of the plant *Zingiber officinale*, consumed as a delicacy, medicine, or spice. Ginger has been found to be helpful in blocking the harmful effects of prostaglandin, a substance that can lead to inflammation of the blood vessels in the brain and even cause migraines. The anti-inflammatory properties of ginger make it effective in alleviation of the pain associated with rheumatoid arthritis. Ginger increases the motility of gastrointestinal tract and has sedative, analgesic, anti-inflammatory and anti-bacterial

properties. A study has demonstrated the also had a dose-dependent antimicrobial activity of ginger against *Pseudomonas aeruginosa*, *Salmonella typhimurium*, *Escherichia coli* and *Candida albicans* and decreased the elevation in the lipid peroxidation and depletion of GSH in mice on day 31 post irradiation with gamma rays there by confirming its antioxidant property<sup>[32]</sup>.

### **Mrdvika**

Grapes is fruit that contains numerous polyphenols, including the stilbene resveratrol, the flavanol quercetin, catechins, and anthocyanins that have shown potential for reducing hyperglycemia, improving beta-cell function, and protecting against beta-cell loss. Therefore, with a low mean GI and GL, grapes or grape products may provide health benefits to type 2 diabetics<sup>[33]</sup>. Several grape phytonutrients are now believed to play a role in longevity. Resveratrol (a stilbene phytonutrient present mostly in grape) has recently been shown to increase expression of three genes all related to longevity. (These three genes are SirT1s, FoxO3s, and PBEFs.)<sup>[34]</sup>. Proanthocyanidin consumption might reduce the risk of developing several pathologies, such as inflammation, oxidative stress and cardiovascular diseases. The beneficial effects of proanthocyanidins are attributed to their antioxidant properties, although they also can modulate gene expression at the transcriptional level<sup>[35]</sup>. In vivo study suggests that grape seed-derived polyphenolics may be useful agents to prevent or treat AD. The naturally derived grape seed polyphenolic extract can significantly inhibit amyloid  $\beta$ -protein aggregation into high-molecular-weight oligomers in vitro. Thus it significantly attenuates AD-type cognitive deterioration coincidentally with reduced HMW soluble oligomeric A $\beta$  in the brain<sup>[36]</sup>.

### **Amalaki**

The eminence of Amla is well recognised in Ayurveda. All the famous ancient texts have discussed its preventive, restorative and curative usefulness and extolled its extraordinary medicinal qualities. It promotes iron absorption and hence can combat anaemia which is a common nutritional problem prevalent in the population. It is also helpful in curing skin problems, hair problems acidity, diabetes, asthma, cholesterol and cholesterol induced atherosclerosis. Charaka has specifically mentioned it as a great rasayana that helps protect people from disease and keeps away the manifestations of premature ageing. The fresh fruit contains more than 80 per cent water besides proteins, minerals, carbohydrates and fibre. The mineral and vitamin contents include calcium, phosphorus, iron, carotene and vitamin B

complex. Experiments conducted at the Niwa Institute of Immunology in Japan have shown Amla to be a potent scavenger of free radicals. The studies showed that Amla preparations contained high levels of the free-radical scavenger, superoxide dismutase (SOD), in the experimental subjects<sup>[37]</sup>. Amalaki's cascading antioxidant power makes it one of today's hottest super-fruits. With an ORAC (Oxygen Radical Absorbance Capacity) value of 1770, Amalaki has almost twice the antioxidant power of acai and about 17 times that of pomegranate<sup>[38]</sup>.

## Milk

Milk is considered "nature's wellness drink", is naturally nutrient-rich and balanced with a unique proportion of carbohydrates and proteins - in addition to the bone-boosting calcium, phosphorous and vitamin D. Low-fat or fat-free varieties provide a lot of nutrients for very modest amount of calories. Reduced-fat fresh milk can help to decrease body fat and accelerate the burning of fat stores as a fuel source. Milk is also naturally low in sodium, and also contains potassium and plays a role in healthy blood pressure. The proteins in fresh milk are especially helpful because they contain all the essential amino acids, the protein building blocks that are not synthesised in body and must therefore include in diet. In addition, the two predominant milk proteins – casein and whey – play important roles in muscle building. Human gut digests and absorbs casein relatively slowly, allowing for a steady release of amino acids into bloodstream to nourish growing muscles, while whey proteins enter your system fairly quickly. Milk protein peptides may promote development of neonatal immune competence. Milk contains a variety of components that provide immunological protection and facilitate the development of neonatal immune competence. Two main categories of milk compounds are thought to be associated with immunological activity. The first category includes cytokines; Cytokines present in milk are thought to be protected against intestinal proteolysis and could alleviate immunological deficits, aiding immune system maturation (Kelleher & Lonnerdal, 2001; Bryan et al., 2006). The second category of milk compounds includes milk protein peptides. Milk peptides may affect mucosal immunity possibly by guiding local immunity until it develops its full functionality (Baldi et al., 2005)<sup>[39]</sup>. Bioactivities in milk include modulators of digestive and gastrointestinal (GI) functions, hemodynamics (GI blood flow, hypertension), along with hormones and growth factors (mammary or infant development) probiotic microbial growth control, immunoregulation, nonimmune disease defense<sup>[40]</sup>. Pancreatic and trypsin digests of  $\alpha$ S1-casein protein of milk significantly inhibited the proliferative responses of murine splenic lymphocytes and rabbit

Peyer's patch cells. Opioid peptides residues of casein, such as b-endorphins, have been demonstrated to exert in vitro and in vivo immunomodulating activities by enhancing lymphocyte proliferative responses, natural killer cell activity and neutrophil locomotion (Migliore-Samour & Jolles, 1988; Elitsur & Luk, 1991). It is possible that absorbed milk peptides with opioid-like activities may be involved in the development of T cell functions and natural killer cell cytotoxicity (Samour & Jolles, 1988). Purified casein derivatives up-regulated interleukin- 4 (IL-4) and interferon-g (IFN-g) production, whereas Lactobacillus GG-degraded casein down-regulated the IL-4 production with no effect on IFN-g. These results clearly demonstrate that intestinal bacteria may modify the immunomodulatory properties of native food proteins<sup>[41]</sup>

### Curd

Is a product produced by bacterial fermentation of milk by *Lactobacillus bulgaricus* and *Streptococcus thermophilus*<sup>[42]</sup>. Yogurt is one of the best-known of the foods that contain probiotics. Probiotics are defined as “living microorganisms, which on ingestion in sufficient numbers, exert health benefits beyond inherent basic nutrition”<sup>[43]</sup>. The protein content of commercial yogurt is generally higher than that of milk because of the addition of nonfat dry milk during processing and concentration, which increases the protein content of the final product. It has been argued that protein from yogurt is more easily digested than is protein from milk, as bacterial predigestion of milk proteins in yogurt may occur. This argument is supported by evidence of a higher content of free amino acids, especially proline and glycine, in yogurt than in milk. *Lactobacilli* are among the components of microbial flora in both the small and large intestines. The ability of non-pathogenic intestinal microflora, such as LAB, to associate with and bind to the intestinal brush border tissue is thought to be an important attribute that prevents harmful pathogens from accessing the gastrointestinal mucosa. The mucosal lymphoid tissue of the gastrointestinal tract plays an important role as a first line of defense against ingested pathogens. The interactions of LAB with the mucosal epithelial lining of the gastrointestinal tract, as well as with the lymphoid cells residing in the gut, have been suggested as the most important mechanism by which LAB enhances gut immune function<sup>[44]</sup>

### DISCUSSION

Eating for most people is one of life's great pleasures; however the foods that we choose to include in our diets are extremely important for many reasons. Healthy eating from an early

age encourages good eating habits for life, and will ensure that the high nutrient requirements for growth and development would be fulfilled. Studies also indicate that consuming a healthy balanced diet from early childhood can significantly reduce the risks of developing diseases in later life. Consumption of a healthy diet in adulthood is also essential to provide the recommended levels of nutrients needed to maintain the functions of our bodies and to protect us from disease and illness.

Ayurveda is a highly respected form of health care in India. In Ayurvedic perspective, proper nutrition is one of the main keys to maintain optimal health as well as to support the healing process. It helps the body eliminate toxins and to re-establish constitutional balance. Ayurveda emphasizes the importance of proper nutrition through proper food choices, food combining and cooking methods, as well as herbal nutrition, all based on the specific needs of the individual and any current imbalance of the doshas. In Ayurveda food, drinks, and spices are categorized according to their taste (sweet, salty, sour, bitter, pungent and astringent) and the energetic effect they have on the doshas, as well as their post-digestive effect on the tissues. Food taken in various forms eaten, drunk, licked and devoured– which is wholesome for the person, being consumed properly by the respective agnis, participating in the nonstop process of conversion of all dhatus (metabolism) like time and “which does not affect dhatuwagnis, Vata and srotas” (channels), “endows the entire body with development, strength, lustre and happy life and provides energy to the body tissues”<sup>[45]</sup>

In classics food items have been divided in 12 groups along with the best ones in the each category. The properties of foods and drinks, consideration of heaviness and lightness and their effect on doshas and srotas are well documented.<sup>[46]</sup>

A healthy balanced diet should be organic, fresh to provide the correct amount of proteins, carbohydrates, fats, vitamins, minerals and fluids to meet the nutritional requirements appropriate for age. No single food can provide all the nutrients we need, therefore in order to meet our requirements it is important to eat a wide variety of different foods. However, some foods should be eaten in greater quantities and more regularly than others. This category of food includes the items that are widely used by the people as the staple food. Recent studies have unveiled a number of unknown properties of food stuffs which have been used as the part of daily diet in ancient Indian Ayurvedic literature. The review of these textual facts proclaims that these food articles maintain optimum functions of the body through various mechanisms including the effect on endocrine, immune and digestive systems. Ayurveda

recognises this as equilibrium state of doshas, dhatus and malas. The agni( internal fire) including dhatvagni depends on food and drinks for its fuel. The appropriate nutrients of mentioned food articles aid in the digestion process and help in optimum formation of dhatus and updhatus(body tissues and their supporting structures) finally the ojus .The food essence ('rasa') and the food wastes ('malas') are all carried by the channels ('srotas')<sup>[47]</sup>. As long as the srotas are normal, the body is not inflicted with any disorder<sup>[48]</sup>. Food and behavior which are similar to Doshas and dissimilar to Dhatus in properties cause morbidity in srotas<sup>[49]</sup>. Food which has the same qualities as the dhatus and is easily digestible is soft, warm temperature, predominantly sweet rasa, virya and vipaka, and light on digestion is beneficial for competence of srotas. Foods possessing these qualities maintain the healthy structure and function of the body(*dhaatusaamyā*) free from diseases , hence good health and well being.

To see the other side of the fact some scientific research data on the above said food items has been collected that decipher the hidden facts about the significance of incorporating these in daily diet for restoring and maintaining health. It is observed that under nutrition predisposes the host to the risk of acquired infections. It also augments the course, frequency of complications, severity and mortality of the infectious illness .The reason behind impaired immunocompetence is reduced intake of energy-protein and also the deficiency of individual nutrients such as iron, folates, pyridoxine etc.

The role of polymorphonuclear leukocytes (PMNS) and macrophages in the primary defence against microbes is well recognised. The good nutritional status derived from these food articles helps to maintain the number and morphology of PMNS within normal range. Initial studies from India and Ghana showed that the frequency of T cells in the peripheral blood was much reduced in malnourishment. Among nutrients Iron and folates are believed to have the direct effect on humoral, cell-mediated and nonspecific immunity and the activity of cytokines.<sup>[50]</sup> and convincing evidence links folate deficiency to DNA stability. If folate is limited, there occurs imbalances in the DNA precursor pool , and uracil may be misincorporated into DNA. This subsequent misincorporation and repair may lead to double strand breaks, chromosomal damage and cancer<sup>[51]</sup>.

Good nutrition also improves lysosyme activity as under nutrition reduces lysozyme activity in plasma and neutrophil.<sup>52</sup> Proper nutrition may enhance complement activity by general increase in protein synthesis or enhance the synthetic ability for production of urgently required antibodies directed against the invading pathogens. Good nutrition also has a great



impact on endocrinal balance. Many hormones including pituitary growth hormones, corticosteroids and thyroxine play an important role in modulating the development & magnitude of immune response. The body is normally under a dynamic equilibrium between free radical generation and quenching. The various diseases due to free radical in the physiological defence systems to counteract free radicals encompass endogenous enzyme system such as catalase, glutathione reductase and superoxide dismutase, as well as exogenous factors( $\beta$ -carotene, vitamin C, vitamin E and selenium) which are present in these food items. They have an antioxidant effect due to their ability to transform ROS into stable and harmless compounds and protect the body's cells and tissues through damage on proteins, DNA and lipids. Thus modifying radical species-dependent injury, either when considering the organism as a whole, or a specific integrated function, such as the immune response. The immune cells are also sensitive to external ROS, due to their high polyunsaturated fatty acids (PUFA) content. Moreover, it has been demonstrated that a micronutrient deficiency can be the cause of suppression of immune function affecting both innate Tcell-mediated immune response and adaptive antibody response, thus altering the balanced host response. Therefore, an adequate intake of vitamins and antioxidant elements through these diet portions seem to be essential for an efficient function of the immune system.

## CONCLUSION

*“Aahara(Food) is considered as the first pillar among three (Nidra and Abrahmacharya being other two)”* Ayurveda proposes an entirely different approach to food, diet, and nutrition that is in strong contrast to the conventional western approach. Ayurvedic dietetics places greater emphasis on foods that have health promotive and also therapeutic *value*. Ayurveda, despite being one of the oldest systems of life science and health care, possesses a fairly well-developed knowledge base on food science with a range of hitherto unknown dimensions of food science on the one hand and a number of other unique principles and practices on the other, which, if combined with today's nutrition biology, could provide significant benefits to contemporary food science and nutrition. The preferred food items should be used routinely, as it is evident by different scientific findings mentioned here. Hence due attention should be paid to this section for decreasing incidence and prevalence of both infectious and non-communicable disease, for health promotion of people and development of the country in an extended sense.

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