Do You Have Guts to Have Food

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ABSTRACT

Developing countries face problems such as aging populations, inadequate food supply, and unbalanced diets. Different factors lead to a clinical pattern of diseases in various parts of the world like racial and hereditary, climate, socio-financial condition, dietary habits and mode of living. The outline of gastrointestinal diseases in India differs remarkably from the western parts of the world because of dietary habits of Indian people. On one hand, the developed countries are fighting with diseases such as obesity, osteoporosis, cancer, diabetes, allergies and dental problems. The Asian countries population are hitching with issues such as intestinal ulcers, skin diseases, vector infections and much more. This varies from region to region also. Some of the diseases which are common in India are rarely seen in western countries and vice-versa. As a result, there is a market for new therapeutic medicine, nutrients production and consumption of these products. The role of these supplements in the daily diet is essential or decisive is still not known clearly due to the implausible literature and current approaches in research fields. The present review focuses on role of nutraceuticals on gut health.

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**Introduction**

The probable role of nutraceuticals/functional foods/food supplements in moderating health problems, specifically in the gastrointestinal tract, is imperative. Gut microflora (e.g., probiotic/protective strains) play an important role in the host health due to its involvement in nutrient uptake, providing immunity and physiological functions [1]. Non-vegan and vegan diet vary remarkably due to the differences in the type of food consumed. Hence in the population and diversity of these gut microflora.

The intakes of nutrients such as vitamins and minerals are ascertained by a daily diet based on plant and animal products. Diet can be classified as non-vegetarians if foods from plants and animals origin, including meat, fowl, eggs, milk and other dairy products, and fish are included in the diet; Lacto vegetarians if foods from plants and dairy products are included in the diet; Ovolactovegetarian if foods of plant origin, with milk and dairy products and eggs, are included in their diets. The amount of calorie, protein, fat, carbohydrate, iron, calcium, phosphorous, zinc, vitamin A, vitamin B1- B3, vitamin C differ in various diets considerably and the intake of nutrients is fully dependent on an individual lifestyle as well as on the capacity of the individual to absorb and digest nutrients through its micro gut environment [2].

**Diet and Gut Health**

Gastrointestinal tract works hard to keep us healthy and happy. When we compromise with its health, we have to face major health problems. So it is very important to use good nutrition to keep our digestion humming along.

Gerard E. Mullin, MD says “Heal the gut and you heal yourself.” Therefore it’s needed to know the healthy gut barriers. The dependence of these barriers is on balanced gut bacteria (our gut contains about 3-4 pounds of bacteria); healthy mucosa line (our gut lining replaces itself every 3-7 days); and a strong immune system (almost 70% of our immune system cells live in or around the gut) [3]. If any of these are unbalanced, our gut will not be happy – and neither will we.

Our gut bacteria show variation based on numerous factors like age, diet, geography, gender, hygiene, anxiety and medication [4]. On childbirth, delivery method (C-section vs. vaginal delivery) and first feeding (breast milk vs. formula) are important determinants for the bacteria population of our gut. In addition to this, breast milk is being an “immunological strength,” play a major role, as it generally increases the number of friendly bacteria [5].

**Difference in gut health with respect to diet**

Researchers have suggested substantial variations between the gut microorganism’s profiles of babies who are breastfed and those who are artificial formula-fed. This microbiome undergoes a dramatic shift when solid food is first introduced, and by the time a child reach the age of two or three, its flora has changed into a profile that largely similar to the adult gut [6]. Different species of bacteria flourish on different foods, so what we eat actually govern our intestinal makeup. More studies show that the Western diet is high in protein and fat and it has been related to a greater percentage of bacteria belonging to *Bacteroides* genus. High-carbohydrate, and high-fiber diet normally consumed by traditional rural populations has shown a good correlation with higher proportions of *Prevotella* bacteria.

**Discussion**

Diet and the intestinal microbial profile establishes a continuum. Most vegans display a gut microbiota which is distinct from that of omnivores. But it is not always different from that of vegetarians. Hitherto, the vegan gut profile appears unique in several characteristics. For example a reduced density of pathobionts and a greater density of protective species. It also favors reduced levels of inflammation. This is the key feature, linking the vegan gut microbiota with protective health effects. Still, it is unclear that therapeutic vegan diet has health benefits on the gut microflora [7].

Ponnusamy and associates highlighted (2011) [8] that most of the microorganisms in the human gut belong to the phyla Firmicutes (*Clostridium, Enterococcus, Lactobacillus*, and *Ruminococcus*) and Bacteroidetes (*Bacteroides and Prevotella* in proportions determined in part by diet). A study in *Nature* by Arumugam and his team (2011) [9] proposed three different enterotypes of human gut microbiome i.e. (1) abundant *Bacteroides*; (2) very few *Bacteroides* but abundant *Prevotella*; and (3) abundance of *Ruminococcus*. Power and his colleagues (2014) [10] stated that each of this genus is related to distinct nutrient-metabolism functions and thus they play a key role in long-term dietary influences. Wu and his team (2011) [11] found two enterotypes associated with diet; the enterotype dominated by *Bacteroides* is adjusted to diets high in protein and animal fats, while the *Prevotella* enterotype is adapted to carbohydrate metabolism and vegetarian diet. Ding and Schloss (2014) [12] from National Institutes of Health Human Microbiome Project (HMP) discovered that bacteria from stool samples fell into four community types represented by a cluster of numerous taxa. Others have concluded that although the HMP cohort is consistent with the two biome types found by Wu and associates [11], the data supports a gradient of microbial communities rather than distinct enterotypes.

A study demonstrated that the persons with low-fat vegan diet demonstrated that increased carbohydrate and fiber intake and decreased fat and cholesterol intake, suggests
that this diet has not only easily accepted but it has medical nutrition therapy application also. However, high drop-out rates are a concern in studies in which subjects are compelled to adopt a vegan or even a vegetarian diet [13]. While vegan diets have been shown to improve metabolic conditions in type 2 diabetes patients, similar improvements have been achieved with other diets including the Mediterranean diet, a low-carbohydrate/high protein diet, and a vegetarian diet. Thus a patient’s personal taste and cultural traditions may need to dictate whether a vegan diet is an ideal choice for medical nutrition therapy [14].

Role of Supplements to Improve Gut Health
Kalra, 2003 [14] described nutraceuticals as a functional food, which aids in the prevention and/or treatment of disease(s) and/or disorder(s) (except anemia). This definition clears distinction between functional foods, nutraceuticals, and dietary supplements. Approximately 70-80 percent of our nerves run through the digestive system. Therefore it is also called our “second brain” [15]. Therefore, stress-related issues can lead to upset a person’s stomach or prime to stress-related IBS. So, we should consider how the good bacteria in our digestive system play a major role in our immunity and brain health as well [16].

For example, serotonin (the feel good hormones) is produced in digestive tracts, but only if digestive tracts are well-taken care of. This is one reason when our digestive system isn’t working at top notch, it results in mood swings. This is also a reason, people who suffer depression usually have digestion problems or poor appetites. Hence, probiotics are being studied for their ability to raise serotonin, because they improve person’s digestive health. This, in turn, improves mood/brain health as a result. A good amount of beneficial bacteria in our bodies also help us to maintain the strong immune system [8, 9, 10, 11].

Before understanding the concept of nutrient supplement to improve the diet or gut microflora, it is important to know the potential offender which can create a problem in digestion [8, 10]. This can further help us to narrow down what causes the irritation and inflammation during a food allergy or intolerance. It’s also imperative to understand that processed foods and sugar both deplete your good bacteria (Cencic and Chingwaru, 2010). To enhancing immunity one should inculcate practices such as:

Eating plenty of fruits and vegetables, leafy green vegetables, fibrous grains if one can tolerate them (gluten-free oats, quinoa, millets, amaranths, Ragi) and healthy fats from various seeds like avocados, nuts, chia, flax, hemp, pumpkin seeds, almonds, raw coconut, and walnuts. These foods will reduce inflammation which increases hormones level that improves the digestion and helps in easy to digest.

To improve the gut microflora plant-based products like coconut yogurt, miso with yeast and sugar, sauerkraut or kimchi and vegan probiotic supplements can be used rather than depend on dairy products which can again cause digestive upset.

A plant-based diet is naturally alkaline to help assist the digestion. Along with consuming probiotics and eating foods, amino acid L-Glutamine that has been shown to alleviate digestive distress, and consuming plant-based sources of Omega 3 fatty acids (walnuts, hemp, chia, flax).

A probiotic must fulfill certain criteria such as good technological properties so that it can be manufactured and supplemented into food products with high viability and functionality. Also, it should not contain unpleasant flavors or textures. It should reach alive at its site of action, after passing through the gastrointestinal (GI) tract to show its maximum efficacy [17].

The human gut carries millions of bacteria in its intestinal tract more like a walking bioreactor which is ten times more than total cells making up the human body [18]. Micro-organisms are present all over the GI-tract, the majority are located in the large intestine. This is the site of active fermentation of the non-digestible diet components. A viable probiotic enhances the interaction between the microflora and the undigested components of food.

Gut bacteria biodegrade the dietary fibers, produce metabolites, such as short chain fatty acids. These metabolites mediate a number of important functions through their further metabolism in the liver.

The importance of gut microflora in bioconversions and absorption of plant-derived compounds, such as phenolics, has been observed already in the 1980s [19], but the current research is quickly increasing our understanding of the interactions between gut microbes and bioactive dietary phenols. It is obvious that the gut flora composition can be modulated by three different types of food ingredients: living micro-organisms, non-digestible carbohydrates and plant secondary compounds, and that the gut flora has an essential role in bioconversions and further absorption of metabolites of the plant-derived compounds Sources of plant-based therapeutics for gastrointestinal ulcers and related problems [15, 16].

Secondary metabolites such as phenolic compounds impart a major diversity for various food components in fruits and vegetables. They play an important role in various metabolic and regulation processes as a precursor of various vitamins and enzymes. Therefore, they have been considered necessary from the nutritional point of view now. The earlier investigation described their
mutagenic and genotoxic activity. Their potent biological properties and extensive studies proved their effects on human health. Epidemiological studies have suggested their role in human health and prevention of several diseases which are very common in western countries. Flavonoids and phytoestrogens are the components of major significance [20].

Flavonoids are found in many food products of plant origin such as vegetables, fruits, berries, tea and wine. More than 4000 flavonoids have been identified so far and they have been categorized according to several subclasses. Flavonols (quercetin and kaempferol) and flavones (apigenin and luteolin) are abundantly found in various plant-based foods. Flavanones are typically present in citrus fruit, catechins in green tea and anthocyanins in red berries. In the human body, flavonoids act as effective antioxidants mainly due to their phenolic hydroxyl groups.

Health-promoting effects of flavonoids are based on antioxidant efficacy. In addition, flavonoids exhibit various physiological activities which help to reduce inflammation, allergy, hypertension, arthritis, cancer and microbial infections [21].

Various scientist indicated that phytochemicals have anticarcinogenic and cardioprotective effects [20, 21, 22, 23]. Phytoestrogens are hormone containing di-phenolic compounds, present in various edible plants. There are two main subgroups: isoflavones and lignans. A more restricted plant flavonoids, Isoflavones are a very distinctive subclass of the flavonoids. They are found almost only in legumes, especially in soybean. Lignans are the building blocks of the secondary cell wall in plants. They exist as minor constituents of many plants. Flax products are good sources of lignans.

These components are metabolized to form estrogen-like molecules which assist many functions in plants, for example, cell proliferation, hormonal action, enzymatic activity, protein synthesis, cell differentiation and angiogenesis. High urine or plasma concentrations of mammalian metabolites help lower the risk of cancer or heart disease [24].

Therefore, the gut microflora and its diversity, play a crucial role in the metabolism of plant phenolics. Drugs, for intestinal treatment, remarkably change the intestinal microflora. This might disturb the metabolism of these compounds also. Colonic microflora determines the amount of lignin metabolites produced by individuals. The capacity to produce more lignans from precursors in plants is different in various individuals. Some plant phenolics suppress the growth of some intestinal bacteria. They influence the population and diversity of gut microflora [22,23].

Traditional Finnish diet contains various berries, which provide antimicrobial activities. These berries are good sources of various phenolic compounds. They are rich in flavonoids, such as flavonols. For example, cranberry, blackcurrant, and lingonberry comprise of high flavonol as phytochemical constituents. The Higher amount of flavonols is present in wild berries and blackcurrant than vegetables and fruits commonly used. Berries like strawberry, raspberry, cloudberry and arctic bramble are found with few flavonols, but very rich in ellagitannins which are polymers of ellagic acid [25]. Ellagitannins are rare to found in the daily diet, so these berries remain the most important sources of phytochemicals Bojarska et al., 2011 [25].

Other important phytochemicals are anthocyanin, the predominating group of flavonoids present in berries. Red and blue berries, such as strawberries, raspberries, bilberries and red and black currants contain these pigments. Lignans are found in ample quantities in berries like lingonberry, strawberry and cranberry [26].

The antimicrobial activities of the naturally occurring phenolics from coffee, tea, olives and wine have been widely stated [27]. Recent reviews also highlight the information about the antimicrobial capacity of phenolics present in berries like in cranberry [28]. The antibacterial properties of cranberry juice and its effect in associated with inhibition of E. coli adherence to mucosal surfaces is well known [29]. The presence of proanthocyanidins (condensed tannins) which are responsible for this adherence effect was suggested by Howell and co-workers (1998) [30].

Such antimicrobial and inhibition activities were also reported in blueberry juice by Ofek et al., 1996. Rauha et al. (2000) [31,32] reported antimicrobial effects of some berry extracts against food spoilage and poisoning bacteria [33].

**Conclusion**

Market is flooded with various kind of food supplement products, but to choose the appropriate supplement is the biggest challenge due to the misleading advertisement on various platforms including social media. Despite having a large pool of scientific information is available in research papers, people are ignorant and untroubled about their gut health and associated consequences. Our daily diet can provide the essential nutrients but nutrient bio-availability and their synergistic effect with gut microbiota is still an area of further research. As mentioned,
the second brain of the body has to correlate with many components of gut microbes as well the diet, an individual is having. The phenomena is an individual entity as the gut microbes develops after child’s birth and depends on many environmental and as well as on diet patterns. Advance research is needed in developing models for diet patterns, their effects on individual, community and population. Neutraceuticals’ bio-availability and their interactive effect on gut microbes should be another area of nutrition.

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Reference
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