1. Details of Module and its structure

Module Detail	
Subject Name	Food, Nutrition for Healthy Living
Course Name	Food, Nutrition for Healthy Living
Module Name/Title	Nutraceuticals and Functional Foods
Module Id	FNHL_101020
Pre-requisites	General knowledge about Nutraceuticals and Functional Foods
Objectives	After going through this lesson, the learners will be able to understand the following : • Health Supplements • Nutraceuticals • Food for special dietary use • Food for special medical purpose • Specialty foods containing plants or botanicals • Probiotic foods • Prebiotic foods
Keywords	Dietary fiber, Polyunsaturated fatty acids (PUFA), Prpbiotics, Prebiotics, Vitamins and Minerals, Polyphenols, Spices, Safety Concerns

2. Development Team

Role	Name	Affiliation
National MOOC Coordinator (NMC)	Prof. Amarendra P. Behera	CIET, NCERT, New Delhi
Program Coordinator	Dr. Mohd. Mamur Ali	CIET, NCERT, New Delhi
Course Coordinator (CC) / PI	Prof. Poonam Aggarwal Dr. Suniti Sanwal	DGS, NCERT New Delhi DEE, NIE, NCERT New Delhi
Course Co-Coordinator / Co-PI	Dr. Yash Paul Sharma	CIET, NCERT, New Delhi
Subject Matter Expert (SME)	Dr. Bani Tamber Aeri	Institute of Home Economics, New Delhi
Content Reviewer	Dr. Anita Malhotra	Lakshmibai College, University of Delhi

Table of Contents:

Nutritional Supplements, Nutraceuticals and Novel Foods

We are all aware of the important role that good and wholesome food plays in our health and well-being. Food not only gives us the required nutrition but also imparts us with natural immunity or the ability to ward off infection. In recent years, the importance of foods acting as protective agents in the diet has constantly been increasing. These food components which are acting as these 'agents' are gaining importance. The Food Safety and Standards Authority of India (FSSAI) has categorized these health foods into eight categories.

1. **Health supplements.**

Surveys carried out by the National Nutrition Monitoring Bureau (NNMB) indicate that :

- Daily intake of all foods except cereals and millets in Indian households is lower than RDA.
- The average consumption of pulses and legumes like dals, which are an important source of protein, is less than 50% of RDA.
- Consumption of green leafy vegetables and other vegetables which are rich sources of micronutrients like beta-carotene, folate, calcium, riboflavin and iron was also quite inadequate.
- Intake of visible fat was also less than 50% of the RDA. Energy deficiency in most households was about 70% and protein deficiency 27 percent.

Therefore, sometimes it may become important to consume Health Supplements which will help consumers meet their physiological needs of nutrients which are inadequate in their diet. Health supplements can be used by anyone above the age of 5 years to supplement their normal diet. The supplements contain concentrated sources of one or more nutrients namely, amino acids, enzymes, minerals, proteins, vitamins, plants or botanicals, substances from animal origin etc with known and

established nutritional or beneficial physiologic effect. These can be consumed either alone or in combination in the form of pills, capsules, sachets, gels, powders, liquids etc. However, health supplements are not drugs.

The quantity of nutrients in Health supplements must not exceed the recommended daily allowance (RDA) as specified by the Indian Council of Medical Research (ICMR). Therefore the supplements must be so designed that the nutrient amount is neither below nor over RDA but it should be according to the requirement needed on any particular day.

Since the Health Supplements are meant for people over the age of five years manufacturers must have nutrients that can fulfil the requirements of various age groups like children, adolescents, pregnant women, lactating mothers, and adult men and women taking into account their lifestyles which can be sedentary or active.

Eg: supplements used by sports persons and body builders, fish oil capsules, iron folic acid capsules, protinex, Horlics, Bounvita etc.

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Labelling requirements for health supplements, nutraceuticals, FSDU, Probiotics, Prebiotics, Plant foods and botanicals and Novel Foods

FSSAI regulations have also emphasised the need to have correct labelling which:

- specifies the target group the health supplement is meant for,
- what condition it will address
- duration of the usage
- each package must contain the words ‘Health Supplement’
- prominent display must mention ‘Not for medicinal use’
- state clearly a warning of any known side effects
- A statement which states that it must be stored out of the reach of children.

Specifications for ingredients in these special foods:

The health supplements/nutraceuticsls, FSDU, FSMP, Plants and Botanicals, Probiotics, Prebiotics and Novel Foods shall contain any of the ingredients specified in Schedule I or Schedule II or Schedule IV or Schedule VII or Schedule VIII or enzymes only of Schedule VI outlined in the new regulation.

- Schedule I lists vitamins and minerals like vitamin A, pro-vitamin A, Vitamin B, B2, B6, B12, Vitamin C, D and E, Vitamin Ki, K2 (MK-7) and K2 (MK-4). Biotin, Folic Acid, Niacin, Pantothenic acid. Minerals like calcium, chloride, chromium, copper, iodine, iron, magnesium, manganese, molybdenum, phosphorous, potassium, selenium, sodium, boron as appropriate for the health supplement and targeted consumer group.
- The regulation also specifies how much percentage of overage the supplements can contain. Overage is the amount of excess nutrients added above label claim during manufacture as a means of maintaining at least the claimed amount of the ingredient(s) for the normal shelf life of the product to compensate for the expected manufacturing / storage loss and to allow for variation in assay performance.
- Schedule II contains the list of essential amino acids and other nutrients
- Schedule IV List of plant or botanical ingredients
- Schedule VII List of strains as probiotics (live micro-organisms)
- Schedule VIII List of prebiotic compounds
- And Schedule VI only for enzymes

2. **Nutraceuticals**

Nutraceuticals are “any food or food ingredients that may provide a health benefit beyond the traditional nutrients it contains.” In other words, foods containing these ingredients (functional foods) are foods that have health promoting properties over and above their nutritional value. Thus nutraceuticals are foods that contain biologically active, non-nutrient compounds that provide health benefits. These compounds are also called *phytochemicals*. Based on this definition, all plant foods could be considered functional foods since they are all rich in phytochemicals or nutraceuticals

So, does that mean that, this particular food should be consumed in high amounts to be effective as a functional food? No, the level of consumption of the food that is required to achieve a beneficial effect on health should be such that it is possible to achieve this benefit within normal dietary patterns. Even the form of the functional food should be as it is normally expected for dietary purposes. Therefore, a food will be called a functional food only if it is providing the health benefits when consumed in its natural form and normal amounts. It cannot be in the form of a pill or a capsule.

Nutrients—which include protein, fats, minerals, and vitamins—are essential for life. Without these food components, we can develop deficiency diseases and a chronic deficiency may eventually

cause death. Nutrients are found in all of the food groups, some may have a concentration of a particular nutrient and some may not.

Nutraceuticals or Phytochemicals are not necessary for life but they help to promote optimal health by lowering risk for chronic diseases, such as cancer and heart disease. They are found majorly in plant foods, but bioactive compounds are also present in certain animal foods. Fruits and vegetables are among the best sources of these compounds. Phytochemicals are believed to have many health benefits.

In India, the ancient texts have ample evidence suggesting that foods can be effectively used as medicine to treat and prevent disease. Ayurveda, the 5000-year-old ancient Indian medicine, which is based on holistic healing emphasizes on use of food for therapeutic purpose.

Advantages of nutraceuticals or functional foods:

Nutraceuticals have a wide range of benefits and these foods have shown to prevent arthritis, cold and cough, sleeping disorders, osteoporosis, blood pressure, high cholesterol and diabetes. These foods act as pain killers, control depression, improve digestion and even prevent certain cancers.

Types of Nutraceuticals

We will now discuss about the different types of neutraceuticals. These can be classified in several ways i.e on the basis of food sources, mechanism of action, chemical nature etc. The most common way to classify them is on the basis of food sources. This way we can understand the role each food group plays not only in providing nutrition (which we are familiar with now) but also for these additional ‘health benefits’.

- Dietary Fiber
- Polyunsaturated fatty acids
- Antioxidant vitamins
- Polyphenols
- Spices

Dietary fiber

Dietary fibre as we all know is that food material, which is not hydrolyzed by enzymes secreted by the digestive tract. Foods rich in fibre include fruits, vegetables, whole cereals and whole pulses like oats, barley and beans. Dietary fibres may be divided into two forms: -

- Insoluble dietary fiber (IDF), which includes celluloses, some hemicelluloses and lignins which is fermented to a limited extend in the colon.
- Soluble dietary fiber (SDF), which includes β-glucans, pectins, gums, mucilages and hemicelluloses that are fermented in the colon.

The IDF and SDF compounds are collectively known as non-starch polysaccharides (NSP).

Benefits of Dietary Fiber:

- The soluble components of dietary fibre has bulking properties and increase the viscosity of the stomach contents. This retards the gastric emptying, affects the rate of digestion and the uptake of nutrients thereby creating a feeling of satiety.
- Soluble fibre also lowers serum LDL cholesterol (bad cholesterol) and improves glucose tolerance (preventing diabetes). Oat products are a widely studied dietary source of the cholesterol-lowering soluble fiber B-glucan. There is now significant scientific agreement that consumption of this particular plant food can reduce total and low density lipoprotein (LDL) cholesterol, thereby reducing the risk of coronary heart disease (CHD).
- Fiber also promotes the growth of Bifidobacteria in the gut (the good bacteria).
- Persons consuming generous amounts of dietary fibre, compared to those who have minimal fibre intake, have a low risk of heart disease, blood pressure, stroke, diabetes, obesity and certain gastrointestinal disorders.
- Research reveals that certain soluble fibres enhance the immunity in humans

Disadvantages:

Some potential negative effects of dietary fibre include reduced absorption of vitamins, minerals, proteins and calories. It is recommended that dietary fibre intake for adults generally fall in the range of 20–35 g/day. The recommended dietary fibre intake for children and adults are estimated to be 14 g/1,000 kCals.

Polyunsaturated fatty acids (PUFA)

As you have studied in previous modules (05 and 06), fatty acids are of two types: essential and non-essential. Non-essential can be made by the body itself, however, the essential ones we need to consume from our diet. PUFAs are essential fatty acids and are basically of two types:

a. omega-3- (n-3) fatty acids: The major omega-3-fatty acids are α-linolenic acid (ALA), eicosapentanoic acid (EPA), docosahexanoic acid (DHA). ALA is the precursor of EPA and DHA. EPA and DHA are found mainly in fatty fishes such as mackerel, salmon, herring, trout,

blue fin tuna and in fish-oils. Principal sources of ALA are mainly flaxseed, soybeans, canola, some nuts (e.g. walnuts). https://goo.gl/Lo9Dnn

b. omega-6-(n-6) fatty acids: Omega-6-PUFAs mainly consist of linoleic acid (LA), γ-linolenic acid (GLA) and arachidonic acid (ARA). LA occurs mainly in vegetable oils e.g. corn, safflower, soyabean and sunflower. ARA is found in animal products such as meat, poultry and eggs.

Benefits of omega -3 fatty acids

- These fatty acids are beneficial for heart health. They decrease LDL (bad cholesterol) and control lipid concentrations in the blood; decrease atherosclerosis and maintain the rhythm of the heart. E.g consumption of flaxseed which has a high concentration of omega -3 fatty acids has been shown to decrease total and LDL cholesterol.
- Consumption of fish has been associated with cardio-protective benefits due to the abundance of omega-3 fatty acids.
- They are shown to be beneficial in controlling depression, bipolar disease etc. They have also been shown to enhance brain development.

Vitamins and Minerals

Vitamins like vitamin C, vitamin E and vitamin A work as antioxidants in the body. These prevent oxidative reactions leading to several degenerative diseases including cancer, cardiovascular diseases, cataracts etc. These vitamins exert their protective action by free-radical scavenging mechanisms.

Benefits of Antioxidant Vitamins:

- These vitamins prevent lipid peroxidation by scavenging the free oxygen radicals. In this manner Vitamins A, C and E have a well established antioxidant mechanism.
- Tomatoes contain lycopene, the primary carotenoid found in this fruit and its role in cancer risk reduction.
- The antioxidant function of lycopene may also explain the inverse relation between levels in body and risk of myocardial infarction.

- Several epidemiological studies have shown that citrus fruits are protective against a variety of human cancers. Oranges, lemons, limes, and grapefruits are a principal source of such important nutrients as vitamin C, folate, and a class of phytochemicals known as the limonoids.
- There is no doubt that dairy products are functional foods. They are one of the best sources of calcium, an essential nutrient which can prevent osteoporosis and possibly colon cancer.

Polyphenols

Polyphenols form a large group of phytochemicals, which are produced by plants as secondary metabolites to protect them from photosynthetic stress, reactive oxygen species. There are approximately 8,000 different classes of polyphenols, the most important being flavonols, flavones, flavan-3-ols, flavanones and anthocyanins. The most commonly occurring polyphenols in food include flavonoids and phenolic acids.

Benefits of Polyphenols:

Polyphenols possess antioxidant, anti-inflammatory, anti-microbial, cardioprotective activities and play a role in the prevention of neurodegenerative diseases and diabetes mellitus. In fact, some research shows that polyphenols are more effective antioxidants in vitro than vitamin E and C.

Polyphenols also have anticarcinogenic properties. E.g Tea, mainly consumed in the form of black tea and green tea has been found to have cancer-preventing activities. Tea is a rich source of polyphenols, such as catechins, and flavonols like quercetin and myricetin.

Green tea has also been found to be associated with lower risk of cardiovascular diseases through decreased serum cholesterol and triglyceride and provides protection against peroxidation of lipids in kidney.

Red wine due to the presence of phenolic substances prevents the oxidation of LDL, and thereby slows down atherogenesis.

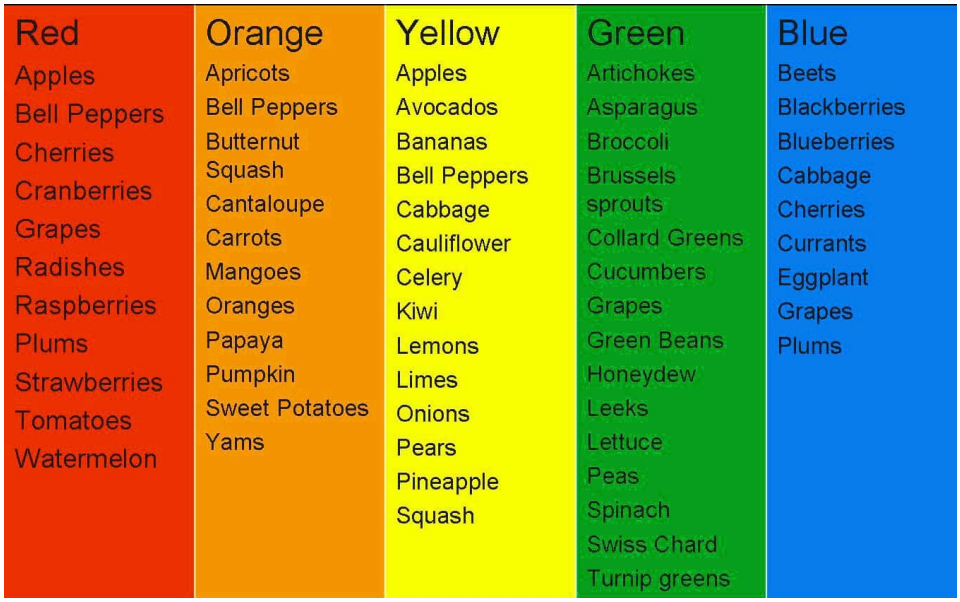
Legumes like soyabean also supply the diet with polyphenols like flavonoids, isoflavones and lignans. Soyabean also contains phytoestrogens. These compounds have been shown to inhibit the growth of most hormone-dependent and independent cancer cells, especially breast, prostate and skin cancer in mouse models. Hence they can play an active role in combating degenerating diseases along with their traditional role of preventing malnutrition. Soy may also benefit bone health

Epidemiological evidence has associated the frequent consumption of cruciferous vegetables like cabbage, broccoli, cauliflower, and Brussels sprouts with decreased cancer risk. The

anticarcinogenic properties of cruciferous vegetables have been attributed to their relatively high content of glucosinolates. Glucosinolates are a group of glycosides stored within cell vacuoles of all cruciferous vegetables. Myrosinase, an enzyme found in plant cells, catalyzes these compounds to a variety of hydrolysis products, including isothiocyanates and indoles.

Selenium

Selenium is an essential trace element that is involved in the defence against the toxicity of reactive oxygen species, the regulation of the redox state of cells and in the regulation of thyroid hormone metabolism. Brazil nuts are the richest known source of selenium; 30 g contains approximately 200 mcg. Its deficiency has caused serious health effects in human, such as Keshan's disease, a potentially fatal form of cardiomyopathy (disease of the heart muscle) that affects young women and child.



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Benefits of Selenium:

- The most important role of selenium is in the form of antioxidant selenoproteins or selenoenzymes such as glutathione peroxidase, thioredoxin reductase. These enzymes play a significant role in protecting cells against oxidative damage from reactive oxygen species (ROS) and reactive nitrogen species (RNS), which include superoxide, hydrogen peroxide, hydroxyl radicals and nitric oxide and peroxynitrite.
- The pentose phosphate pathway assists glutathione peroxidase, an enzyme that contains selenium as the trace element, in protecting erythrocytes against haemolysis.
- The antioxidant activity of selenium aids in prevention of cardiovascular diseases and helps in maintenance of proper immunity. It has been reported that the antioxidant activity of selenoenzymes may prevent the formation of oxidized LDL and hence reduce the incidence of heart diseases.

- Epidemiological studies have increasingly indicated an inverse relationship between Se status and cancer risks in human populations.
- Se also plays an important role in the immune system by increasing the activity of natural killer (NK) cells, the production of interferonγ, and stimulating vaccine-induced immunity. Recommended dietary allowances for Se for Indians is 40 μg per day.

Spices

Spices are food adjuncts that have been used for thousands of years to enhance the sensory quality of foods. The quantity and the variety of the spices consumed in Indian cuisine is particularly extensive. These impart characteristic flavor, aroma, or piquancy and colour to foods, stimulating our appetite as well as modify the texture of food.

Recent research reveals that dietary spices in their minute quantities has an immense influence on the human health by their antioxidative, chemopreventive, antimutagenic, anti-inflammatory, immune modulatory effects on cells and a wide range of beneficial effects on human health by the action of gastrointestinal, cardiovascular, respiratory, metabolic, reproductive, neural and other systems. The United States Code of Federal Regulations has considered spices and herbs as "GRAS", i.e. generally recognized as safe for human consumption.

Benefits of consuming Spices

- Most of the spice components are terpenes and other constituents of essential oils. They have been found to be effective in different forms. For instance, about 50 g of onion and 5–6 cloves of garlic in their raw form are adequate for lowering of cholesterol in human body.
- Fenugreek seeds (25–50 g), garlic (5–6 cloves), onion (50 g) and turmeric powder (1 pinch) in the daily diet of diabetics prevent and manage long-term complications of diabetes.
- Regular intake of curcuminoids at about 0.5 g reduces blood lipid peroxide level upto about 33% due to their antioxidant activity.
- The purported health benefits of garlic are numerous, including cancer chemopreventive, antibiotic, antihypertensive, and cholesterol-lowering properties.
- A more recent review of 20 epidemiological studies suggests that allium vegetables, including onions, may confer a protective effect on cancers of the gastrointestinal tract.

3. Food for special dietary use (FSDU)

According to FSSAI, these are foods which are specially processed or formulated to satisfy particular dietary requirements which may exist or arise because of certain physiological or specific health conditions namely:

a) Low weight, obesity, diabetes, high blood pressure etc.
b) Pregnant and lactating women.
c) Geriatric (elderly) population and celiac disease and other health conditions.

These foods can be sold as formula, pills, capsules, sachets, granules etc and must contain the labeling that they are not for medicinal purposes.

Details of energy and protein specifications in FSDU by FSSAI

FSSAI has mandated that all formula sold for slimming purposes and are used for replacement of meals for the entire day should not contain less than 800 Kcals and more than 1200 Kcals of energy. In case only a meal has to be replaced, it should provide between 200-400 kcals of energy. The protein content should be not less than 125g/day and it should provide 25-50% of the total energy. It should from a high biological value source. Fats should not provide more than 30% of the energy and at least 3% from essential fats. All minerals and vitamins should be 100% of the RDA and adequate fiber.

Although these foods can be used to manage specific physiologic conditions, these cannot be used in place of medical treatment and must therefore be used under the guidance of a certified nutritionist/medical practitioner.Foods for special dietary use can be beneficial because (unlike medical foods) they are widely available. They also may have fewer side effects than pharmaceuticals, and the body digests them similarly to the way it digests conventional food.

Most importantly, food for special dietary use is *food*. Therefore, one can feel more comfortable consuming it and giving it to the family.

Eg: A very important example in this category are the gluten free food products available in the market especially for celiac patients.

https://goo.gl/XN5H3m

4. Foods for special medical purpose (FSMP)

Foods for special medical purpose include foods specially prepared for a special medical condition. These special foods are intended for people whose nutritional requirements cannot be met by normal foods.

These are nutritionally complete foods and are used as a replacement of the meals for the intended persons. In foods for medicinal purposes nutrients may be added at levels higher than the RDA's but not exceeding the limits mentioned in schedule III. The food label of such foods should have details about the formulation, methods to reconstitute, appropriate warnings and other instructions.

Food for special medical purposes can include formulated dietary products intended for use as the only source of nutrition, and also some formulated products that can supplement a person's food intake. Some of these products can be taken orally, whereas others need to be taken through a feeding tube (e.g. a naso-gastric tube). They are to be used under the supervision of a medical practitioner and other appropriate health professionals.

FSMP help patients in the dietary management of a wide variety of medical conditions, for example food allergies, inborn errors of metabolism, weight loss during cancer treatment, stroke and neurological disorders.

There are three different kinds of foods for special medical purposes:

- Nutritionally complete foods with a standard nutrient formulation, which can be used as a sole source of nutrition in patients to provide the total daily nutritional requirement. They may be administered via a feeding tube where patients are unable to take foods orally.
- Nutritionally complete foods with a nutrient-adapted formulation which can be used to meet the specific nutritional requirements of a disease, disorder or medical condition. They can be used as a sole source of nutrition in patients to provide the total daily nutritional requirement. They may be administered via a feeding tube where patients are unable to take foods orally.
- Nutritionally incomplete foods which are not suitable to be used as the sole source of nourishment. The "nutritionally incomplete FSMP" are products that cannot be used for total diet replacement for the patient but provide specialised nutritional support– for example FSMP for use in inherited metabolic disorders. They are an essential part of management by Healthcare Professionals to tailor dietary management to address individual patient needs.

e.g As part of its "Diet4Life initiative", FSSAI will facilitate the import of Food for Special Medical Purposes (FSMP) products. These products are made by companies such as Nestle, Danone and Abbott. These disorders, which impact a small section of consumers, especially babies, occur due to single gene defect leading to abnormalities in the synthesis of

proteins, carbohydrates and fats. FSSAI has identified 15 In born errors of metabolism (IEM) conditions under this project like MSUD, PKU etc.
https://goo.gl/5MQ3tc

5. Specialty food containing plant or botanical ingredients with safe history of usage

Under this category come all those foods which have been described in the preceding categories i.e health supplements, nutraceuticals, food for special dietary use, foods for medical purpose derived from plants or botanicals which are specified and categorized as safe by the FSSAI. The regulatory body has listed 400 such plants/botanicals which can be used in these special foods. It has also specified the amounts (dosage) of the botanical for adults and children which can be added to a food. Some examples are: Bael, Neem, Til, Ajwain, Methi, harad, Amla, Isabgol, nuts like almonds and cashew, Tulsi, ratanjol, Jaiphal, kaali mirch, Pudina, mahua, kapoor, mulethi, soyabean, guggal vegetables like carrot and ghia, green tea etc.

6. Probiotics Foods

A probiotic can be defined as live microbial food supplement, which when administered in adequate amounts beneficially affects the host animal by improving its intestinal microbial balance. We usually think of bacteria as something that causes diseases. But our body is full of bacteria, both good and bad. Probiotics are often called "good" or "helpful" bacteria because they help in keeping our gut healthy. Some examples are: Lactobacilli such as *L. acidophilus, L.casei.*

Nowadays, probiotics are available in various forms in the market: as powder form, liquid form, gel or paste or granule forms, capsule forms etc.

Benefits:

- Specific probiotics are generally used to treat gastrointestinal (GI) conditions such as lactose intolerance, acute diarrhea and antibiotic-associated GI side effects.
- Further, studies indicate that administration of probiotics decreases the risk of systemic conditions, such as allergy, asthma, cancer and several other infections of the ear, urinary tract.

7. Prebiotics Foods

Prebiotic is a specialized plant fiber that beneficially nourishes the good bacteria already present in the large bowel or colon. While probiotics introduce good bacteria into the gut, prebiotics act as a fertilizer for the good bacteria that’s already there. They help our good bacteria to grow, improving

the good-to-bad bacteria ratio. This ratio has been shown to have a direct correlation to our health and overall wellbeing, ranging from stomach to the brain.

These are short-chain polysaccharides that have unique chemical structures that are not digested by humans. These are in the form of fructose-based oligosaccharides that exist naturally in food or are added in the food. The prebiotic consumption generally promotes the Lactobacillus and Bifidobacterial growth in the gut, thus helping in metabolism. Vegetables like chicory roots, banana, tomato, alliums (garlic, onions) are rich in fructo-oligosaccharides. Some other examples of these fructo-oligosaccharides are raffinose and stachyose, found in beans and peas.

Benefits of Prebiotics:

- Prebiotics improve lactose tolerance and maintain a good bacterial gut balance
- Have antitumor properties and neutralize toxins
- They stimulate the intestinal immune system
- Help in the reduction of constipation and providing digestive health
- Control blood lipids and blood cholesterol levels
- Play a role in mental health. Individuals who consume prebiotics on a daily basis have fewer issues with anxiety, depression, and stress.

A daily intake of 5–20 g of inulin and oligosachharides promote the growth of bifidobacteria. However, consumption of large amounts of such oligosaccharides causes diarrhoea, abdominal distension and flatulence.

8. Novel Foods

A novel food is one which

- Has no history of human consumption
- May have any ingredient used in it which or the source from which it has been derived may not have a history of human consumption.
- A food ingredient obtained from new technology with innovative engineering which alters the original food in view of its nutritional content or level of any (undesirable) material.

Examples of Novel Food include new sources of vitamin K (menaquinone) or extracts from existing food (Antarctic Krill oil rich in phospholipids from *Euphausia superba*), agricultural products from third countries (chia seeds, noni fruit juice), or food derived from new production processes (UV-treated food (milk, bread, mushrooms and yeast).

https://ec.europa.eu/food/safety/novel_food_en

Conclusion

We can now say that foods provide us nutrients as well as other agents (nutraceuticals) which enable us to lead healthy lives. However, safety is a critical issue. The optimal levels of the majority of the biologically active components currently under investigation have yet to be determined. In addition, a number of animal studies show that some of the same phytochemicals (e.g., allyl isothiocyanate) beneficial in their cancer-preventing properties have been shown to be carcinogenic at high concentrations Thus, Paracelsus' 15th century doctrine that "All substances are poisons . . . the right dose differentiates a poison from a remedy" is even more pertinent today given the proclivity for dietary supplements.

The benefits and risks to individuals and populations as a whole must be weighed carefully when considering the widespread use of physiologically-active functional foods.

Increasing evidence supports the observation that functional foods containing biologically-active components, either from plant or animal sources, may enhance health. But we should keep in mind a very important thing: that functional foods are not magic bullets or a solution to our poor health habits. There are no short cuts in achieving good health. Emphasis must be placed on overall wholesome dietary pattern—one that follows the Indian Dietary Guidelines, and is plant-based, high in fiber, low in animal fat, and contains 5-7 servings of fruits and vegetables per day.

Further, it is very important to highlight the importance of overall healthy lifestyle pattern. This includes abstaining from smoking, increased physical activity to about 150 minutes in a week, and managing stress through yoga, pranayama, playing with pets, spending time with children et. There is no replacement for wholesome meal and an active healthy lifestyle. Let's aim for one!