

## NUTRACEUTICALS: IMPORTANCE IN UNDER GRADUATES MEDICAL EDUCATION

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### ABSTRACT

Adequate diet play an important role in the maintenance of health and prevention of lifestyle diseases. Inadequate diet is responsible for the development of various non-communicable diseases. Nutraceutical is derived from two words “Nutrients” and “Pharmaceuticals”. It is a product isolated and purified from food products generally sold in medicinal forms. Nutraceuticals are classified as Traditional and Non-Traditional; they are different from food supplements. There are many food sources of Nutraceuticals and they act through different mechanism of action. Eg: inhibition of IL-8 secretion impairs NF-kappa-B signalling, decreasing level of PSA for prostate cancer. The future of Nutraceuticals is exciting and the treating doctor can match specific nutritional intervention on individual genetic profile. Doctors, Nutritionist, Regulatory Toxicologist should strategically work together to plan appropriate regulation and provide ultimate health and therapeutic benefit to mankind. Inclusion of knowledge and Practice about Nutraceuticals is essential to be included in CBME curriculum of MBBS undergraduate teaching, so that treating doctor can serve the society and also teach society about proper and safer use of Nutraceuticals.

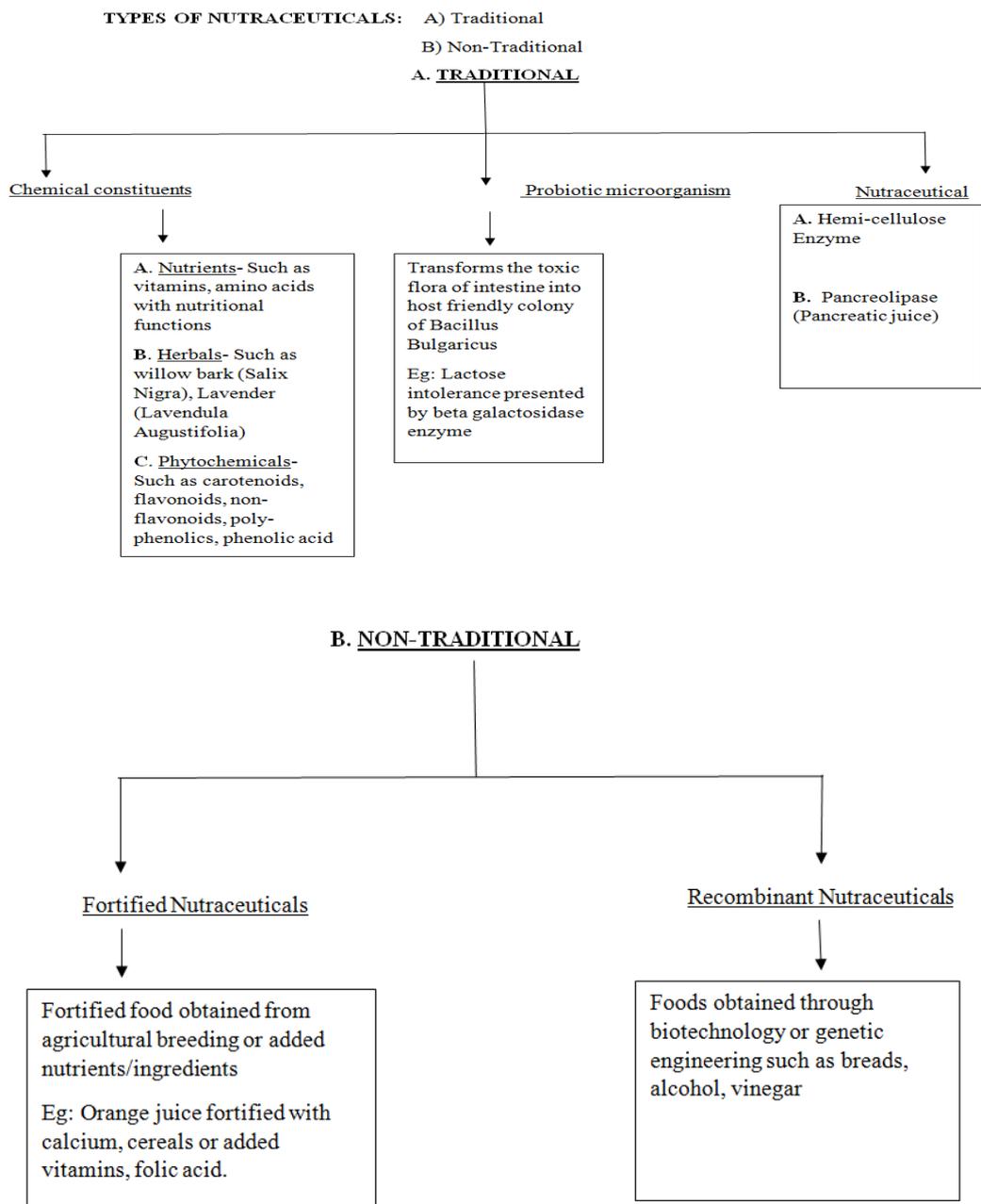
**KEYWORDS:** Nutraceuticals, Foods sources, Chronic Diseases, Patient care.

### INTRODUCTION

Appropriate diet plays an important role in the maintenance of good health and prevention of diseases and contained adequate amount of Nutrients, Vitamins and minerals.<sup>[1]</sup> Inadequate and irregular nutrition, physical activity, stress and other risk factors are responsible for the development of many non-communicable diseases.<sup>[2]</sup> Hippocrates, the father of medicine almost 2500 years back established the relation of foods and its importance for the treatment of various ailments in a very classical way by optimizing various benefits.<sup>[3]</sup> There is a large number of herbs and food which stimulate, support and nourish our body system. Some have been used by different traditional systems of several countries and are now being evaluated by modern research. The use of Antibiotics would build up tolerance and further resistance which makes it ineffective in the

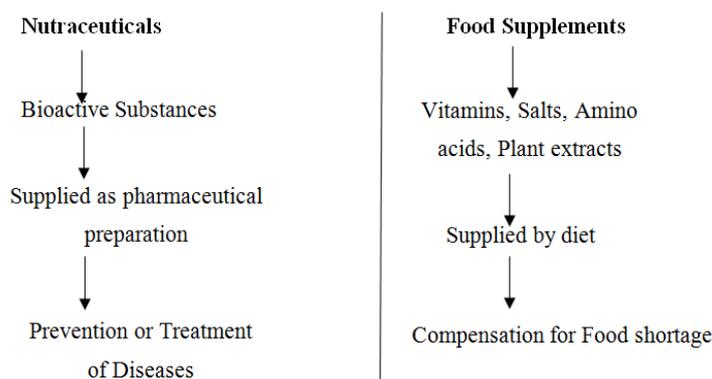
long term. So, it is a better to choose such herbs or Nutraceuticals and adequate balanced food in our daily life, which would not only be capable of normalizing our body functions even in diseased condition but also boost our immunity. One of the prominent approaches is to stay away from stress and lifestyle diseases.

The term Nutraceutical is derived from two words: Nutrient and Pharmaceuticals. Nutraceutical is a product isolated and purified from foods that is generally sold in medicinal forms. Nutraceuticals demonstrate physiological benefit or provide protection against chronic disease.<sup>[4]</sup> The term Nutraceuticals originally coined by Stephen De Felice in 1989, founder and chairman of the Foundation for Innovation in medicine, USA.



**How nutraceuticals differ from food supplements?**

Food Supplements are concentrated sources of Nutrients i.e Minerals and Vitamins or other substances with nutritional or physiological effects that are marketed in “Dose” form like pills, tablets, capsules. Food Supplements are intended to correct nutritional deficiency, maintain adequate intake of certain nutrients or to support specific physiological functions. They are not medicinal products and as such cannot exert a pharmacological, immunological or metabolic action, therefore their use is not intended to treat or prevent diseases or to modify physiological functions in humans.



**Fig. 1: Difference Between Nutraceuticals And Food Supplements.**

**Table 1: Food Rich in Nutraceuticals.**

S. No	Nutraceutical Substances	Foods of High Content
1.	Beta Glucan	Oat Barn
2.	Resveratrol	Grape, Red Wine
3.	Beta Carotene	Carrots, Citrus Fruits, Pumpkin
4.	Carnosol	Rosemary
5.	Catechins	Teas, Beans
6.	Adenosine Lignan	Garlic, onion, Flax seeds
7.	Curcumin	Turmeric
8.	Anthracenes	Red Wine
9.	Cellulose	Most Plants
10.	Psyllium	Psyllium Husk
11.	Inulin	Whole Grain, onion, garlic
12.	Catechins	Tea, Apple, Grapes
13.	Allyl Sulphur	Onion, Garlic
14.	Isoflavone	Soyabeans, Legumes
15.	Capsaicin	Pepper Fruits
16.	Lycopene	Tomato and Tomato Products
17.	Isothiocyanates	Cruciferous Vegetables, Cauliflower
18.	Indoles	Cabbage, Broccoli
19.	Ellagic acid	Grapes, Strawberries, Walnuts
20.	Lutein	Spinach, Corn, eggs, citrus fruits
21.	Lacto-bacilli	Yogurt, dairy
22.	Mono-Unsaturated Fats	True nuts, Olive

**Table 1**

Different Natural Nutraceuticals are available with established and evidence-based mechanism of action or activity for the treatment of not only the chronic diseases but also to maintain optimum health of society.

**Table 2: Natural Nutraceuticals Along With Mechanism.**<sup>[5]</sup>

S. No	Nutraceuticals	Mechanism / Activity
1.	Pro-anthocyanidin (chestnut fruits)	Inhibit IL-8 secretion →impairing NF-kappa-B signalling <sup>[6]</sup>
2.	Fish-based diet	Severe osteoarthritis and hip and elbow dysplasia. <sup>[7]</sup>
3.	Curcuma extract	Decrease the level of PSA for prostate cancer <sup>[8]</sup>
4.	Supplementation of live yeast fostered	Regulate inflammation and epithelial barrier in the rumen and express DFEB1 coding for an antimicrobial peptide <sup>[9]</sup>
5.	Inulin-type friction dietary fibre	Immune responses against Hepatitis-B. <sup>[10]</sup>
6.	Bovine milk-derived oligosaccharide: and B. lactis	Modulate gut microbiota and immune system <sup>[11]</sup>
7.	Lipid-based nutrient supplements	Prevent growth faltering in infants <sup>[12]</sup>
8.	Partially hydrolysed cow's milk proteins	Cow's milk allergy in children <sup>[13]</sup>

9.	Lactic acid bacteria (LAB) probiotic	Endometrial inflammation and infection <sup>[14]</sup>
10.	Lipid-based nutrient supplement (LNS)	Moderate acute malnutrition (MAM) <sup>[15]</sup>
11.	Vitamin D supplementation	Extra-skeletal benefits <sup>[16]</sup>
12.	Neutral amino acid supplements	Optimize neurocognitive function <sup>[17]</sup>
13.	Myo-inositol 19	Gestational diabetes <sup>[18]</sup>
14.	Lactobacillus fermentum CRL1446	Enhances metabolism and oxidative parameters <sup>[19]</sup>
15.	Dehydrozingerone and its dimer	Counteract the inflammation and oxidative stress <sup>[20]</sup>
16.	25-Hydroxy vitamin D	Cognitive status in older adults <sup>[21]</sup>
17.	Malic acid, a precursor of citrate	Antioxidant activity <sup>[22]</sup>
18.	Combined omega-3 fatty acids	Prevents atrophy in Alzheimer's Disease <sup>[23]</sup>
19.	Lactobacillus rhamnosus SP1	Insulin signalling and improves adult acne <sup>[24]</sup>
20.	Omega-3 fatty acid ethyl esters	Breast cancer <sup>[25]</sup>
21.	CoQ10 supplementation	Propofol inhibition on complex <sup>[26]</sup>
22.	Omega-3 fatty acids and high-dose cholecalciferol	Type 1 diabetes <sup>[27]</sup>
23.	Large neutral amino acid supplementation	Phenylketonuria (PKU) <sup>[28]</sup>
24.	Low-fat yoghurt supplemented with a rooster comb extract	Muscle and joint function <sup>[29]</sup>
25.	Lipid-based nutrient supplements	Home fortification in poor settings <sup>[30]</sup>
26.	Cholecalciferol supplementation (HYPODD)	Arterial hypertension <sup>[31]</sup>
27.	Omega-3 polyunsaturated fatty acid supplementation	Postmenopausal vascular disease <sup>[32]</sup>
28.	Omega-3 fatty acids	Breast cancer prevention <sup>[33]</sup>
29.	Myo-inositol supplementation	Gestational diabetes in obese pregnant women <sup>[34]</sup>

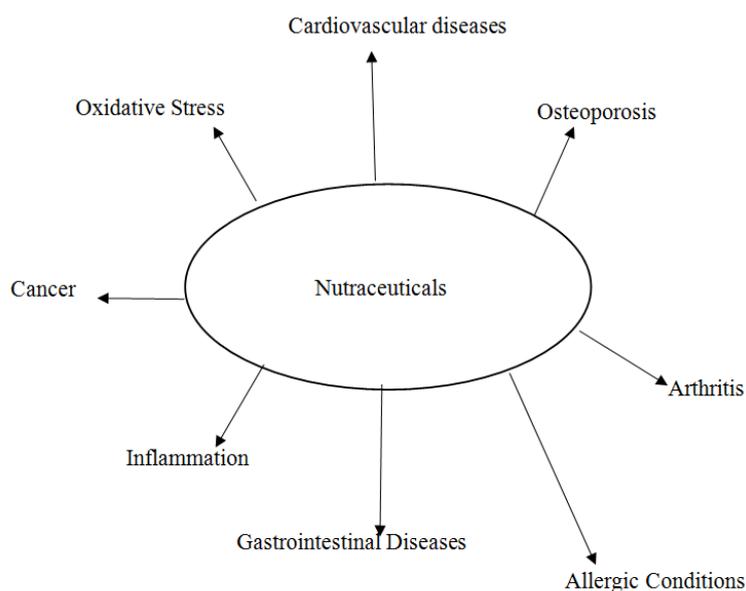


Fig. 2: Scope of Nutraceuticals In Various Diseases.

### The Future of Nutraceuticals

End users are seeking minimally processed food with extra Nutritional benefits and organoleptic value. Many scientists believe that enzymes represent exciting frontier in Nutraceuticals and fermentation technology using microbes to create new food products. Nutraceuticals supplied through oral or transdermal delivery systems would provide well targeted health benefits with optimal bioavailability. So, in future, evolution of Smart Nutraceuticals will help the treating doctor match specific Nutritional Interventions if they have information on individual genetic profile.

### CONCLUSION

Although Nutraceuticals have significant role in the maintaining good human health and disease prevention. Doctors, nutritionist and regulatory toxicologist should strategically work together to plan appropriate regulation to provide the ultimate health and therapeutic benefits to mankind. It is well known and documented that the nutrients found in many foods, fruits and vegetables are responsible for health benefits. Evidence indicates that the mechanism of action of Natural Compounds involved in a wide range of biological processes, including activation of antioxidant defences, signal transduction pathways, cell survival-associated gene expression, cell proliferation and differentiation and preservation of

mitochondrial integrity. It appears that their properties play a crucial role in the protection against the pathologies of numerous age related or chronic diseases. In current scenario people want not only to treat their diseases by improving their health with the help of Nutraceuticals but also to maintain health by Nutritional supplement or Nutraceuticals. Inclusion of knowledge and fact about Nutraceuticals in CBME based MBBS curriculum is today's need. So, the treating doctor can serve the society and can spread awareness about Proper and Safer use of Nutraceuticals.

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