Classification of Nutraceuticals
DEFINITION

The term nutraceutical was coined by Stephen Defelice

“A NEUTRACEUTICAL is any substance that is a food or a part of food and provides medical or health benefits, including the prevention and treatment of disease”.

CLASSIFICATION

Neutraceuticals can be classified based on:

- Natural source
- Pharmacological conditions
- Chemical constitution
### Classification Based on Chemical Groups

<table>
<thead>
<tr>
<th>s.no</th>
<th>Class</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Inorganic mineral supplements</td>
<td>Minerals</td>
</tr>
<tr>
<td>2</td>
<td>Probiotics</td>
<td>Helpful bacteria</td>
</tr>
<tr>
<td>3</td>
<td>Prebiotics</td>
<td>Digestive enzymes</td>
</tr>
<tr>
<td>4</td>
<td>Dietary fibres</td>
<td>Fibres</td>
</tr>
<tr>
<td>5</td>
<td>Antioxidants</td>
<td>Natural antioxidants</td>
</tr>
<tr>
<td>6</td>
<td>Phytochemicals</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fatty acids</td>
<td>Omega 3 fatty acids</td>
</tr>
<tr>
<td></td>
<td>Phenolics</td>
<td>Tea polyphenols</td>
</tr>
<tr>
<td></td>
<td>Isoprenoids</td>
<td>carotenoids</td>
</tr>
<tr>
<td></td>
<td>Lipids</td>
<td>Sphingolipids</td>
</tr>
<tr>
<td></td>
<td>Proteins</td>
<td>soyaproteins</td>
</tr>
<tr>
<td>7</td>
<td>Herbs as functional food</td>
<td>--------</td>
</tr>
</tbody>
</table>
INORGANIC MINERAL SUPPLEMENT

- Calcium,
- Magnesium
- Manganese
- Boron
- Copper
- Zinc
- Phosphorus
PROBIOTICS

Live microorganisms which, when administered in adequate amounts, confer a health benefit on the host

- Species of *Lactobacillus*
- *Bifidobacterium*
- *yeast Saccharomyces cerevisiae*
- *some E. coli and Bacillus species are also used as probiotics*
PREBIOTICS

Nondigestible substances that provide a beneficial physiological effect for the host by selectively stimulating the favorable growth of a limited number of indigenous bacteria.

Commonly known prebiotics are:

- Oligofructose
- Inulin
- Galacto-oligosaccharides
- Lactulose
DIETARY FIBRES

Dietary fibers are of two types:

- Water insoluble fibers
- Water soluble fibers

Daily recommended intake is 30-40 gms.

SOURCES:

Whole grain cereals, wheat products.
Oats, dried beans, legumes.
ANTIOXIDANTS

➤ Antioxidants are of 3 Categories:

1. True antioxidants
2. Reducing agents
3. Antioxidant synergists

➤ Deficiency causes diseases like cancers, rheumatoid arthritis, alzheimers disease, cardiovascular diseases.
<table>
<thead>
<tr>
<th>ANTIOXIDANT</th>
<th>SOURCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>VITAMINS</td>
<td></td>
</tr>
<tr>
<td>vitamin C</td>
<td>Citrus fruits, vegetables</td>
</tr>
<tr>
<td>vitamin E</td>
<td>Grains, nuts, oils</td>
</tr>
<tr>
<td>CAROTENOIDS</td>
<td></td>
</tr>
<tr>
<td>Lycopene</td>
<td>Tomatoes</td>
</tr>
<tr>
<td>Beta carotene</td>
<td>Carrots, sweet potato</td>
</tr>
<tr>
<td>XANTHOPHYLLS</td>
<td></td>
</tr>
<tr>
<td>Beta cryptoxanthin</td>
<td>Mango, papaya, oranges</td>
</tr>
<tr>
<td>FLAVANOIDES</td>
<td></td>
</tr>
<tr>
<td>Rutin</td>
<td>Tobacco, eucalyptus species</td>
</tr>
<tr>
<td>Luteolin</td>
<td>Lemon, red pepper, olive</td>
</tr>
<tr>
<td>Quercitin</td>
<td>Onion, apple skin, black grapes</td>
</tr>
<tr>
<td>Kaempferol</td>
<td>Grape fruit, tea</td>
</tr>
<tr>
<td>Liquiritin</td>
<td>Liquorice</td>
</tr>
</tbody>
</table>
HERBS AS FUNCTIONAL FOODS

FLAX SEEDS

SOURCE: *Linum usitatissimum*.

**FAMILY**: *Linaceae*.

**CHEMICAL CONSTITUENTS**:
- Gamma linolenic acid
- Alpha linolenic acid
- Secoisolariciresinol (SDG)
- Lignans, proteins.
FLAX SEEDS

USES:

- Prevents mammary, colon and rectal cancers.
- Reduces BP in hypertensive patients.
- Reduces diabetes and coronary heart diseases.
BILOBA

FAMILY: Ginkgoaceae

CHEMICAL CONSTITUENTS:
- Bilobelin,
- ginkgetin,
- isoginkgetin,
- flavanols,
- ginkgolides A, B, C.

USES:
- In treating asthma,
- impairment of memory.
- Leaves are able to alleviate the adverse effects of PAF.
MECHANISM OF ACTION

During Aging
Decreased blood flow to all parts of body.
Decreased O2 tension

Formation of disease

Impaired brain function due to decreased blood supply to brain
Impaired claudication due to decreased blood supply to extremities
Raynaud's disease due to poor peripheral circulation
Impotency due to decreased blood supply to sexual organs.
Tinnitus and vertigo due to decreased blood supply to ear

Action of drug

Increased blood supply and circulation and O2 tension in all parts.

Ginkgo biloba
SPIRULINA

SOURCE:
*Spindina platensis* or *s.maxima*

FAMILY:
*Oscillatoriaceae*

CHEMICAL CONSTITUENTS
Gamma linoleic acid,
Oleic acid,
Glycolipids and sulpholipids.
Rich in vitamin B and
betacarotenes.
Phycocyanin.
SPIRULINA

USES:
- Immunostimulant activity.
- Management of HIV and other viral infections such as herpes, cytomegalovirus, influenza, mumps.
- To treat arthritis, atherosclerosis, diabetes and aging process.
KARELA

SOURCE:
Momordica charantia

FAMILY:
Cucurbitaceae

USES:
- Hypoglycemic effect
- Extract of karela increases rate of glycogen synthesis by 4-5 fold in liver.
TURMERIC CURCUMINOIDS

SOURCE: *Rhizomes of Curcuma longa*

**FAMILY:** Zingiberaceae

**CHEMICAL CONSTITUENTS:**

- Curcumin, desmethoxy curcumin, bisdesmethoxy curcumin

**USES:**

- Antimicrobial activity
- Recent findings indicate that it has integrase enzyme inhibitor activity
SOYA PRODUCTS

SOURCE: *Glycine max*

FAMILY: *Leguminoseae*

CHEMICAL CONSTITUENTS:
- Daidzein,
- Genistein

USES:
- Prevents estrogen–dependant cancers
- Geinstein inhibits protein tyrosine kinase and DNA topoisomerase-II
GARLIC

SOURCE:
Bulbs of *Allium sativum*

*FAMILY: Liliaceae*

CHEMICAL CONSTITUENTS:
Allicin, allin, ajoene

USES:
- In treatment of hyperlipidaemia.
- It shows antihypertensive, hypoglycemic, anti spasmodic activity.
- Prevents colon and lung cancers.
TOMATO LYCOPENES

SOURCE : *Lycopersicon esculentum*

FAMILY: *Solanaceae*

CHEMICAL CONSTITUENTS : Lycopene

USES :

- Prevents prostate cancer
- Reduces risk of cancers of digestive tract, pancreas, cervix, bladder and skin.
FENUGREEK

SOURCE:
*Trigonella foenum-graecum*

FAMILY: *Leguminoseae*

CHEMICAL CONSTITUENTS:
- Alkaloids (gentianine and trigonelline)
- Flavanoids,
- Coumarins,
- Proteins, amino acids,
- Steroid saponins.
FENUGREEK

USES:

- In treatment of anorexia, gastritis.
- Fenugreek possess laxative, expectorant, demulcent properties.
- Shows hypoglycemic and hypocholesterolemic properties.
GINSENG

SOURCE:  *Panax ginseng*

*FAMILY:* Araliaceae

*CHEMICAL CONSTITUENTS:*
- Protopanaxadiol
- Polysaccharides
- Starch, sterols
- Polyacetylenes, choline,
- Vitamins B1, B2, B12,
- Pantothenic acid, biotin.
GINSENG

USES:
- Ginseng helps the body to cope with stress and fatigue
- In treatment of hypertension and hypoglycemia
- Modifies liver function and metabolism.
EXAMPLES OF NUTRACEUTICALS CURRENTLY AVAILABLE IN MARKET

VITAMIN AND MINERAL SUPPLEMENTS:
Vitamin A (Beta-Carotene)

ADDITIONAL SUPPLEMENTS:
cod liver oil, primrose oil,
glucosamine, garlic etc.

SPORTS PRODUCTS-
Glucon-D (Heinz),
Glucose D (Dabur)
MARKETED PREPARATIONS
REFERENCES

- Probiotics: Applications in Gastrointestinal Health & Disease Presented in conjunction with the American College of Gastroenterology’s 72nd Annual Scientific Meeting, Autumn 2007)
Thank You