FUNCTIONAL FOODS.

separating fact from fiction

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OBJECTIVES

1. To understand functional foods & their categories.
2. Regulation of functional foods
3. Examples of functional foods available in Pakistan and their mode of action.
4. Functional food health claims and review of research.
5. Take home message for dietetic professionals.
The Academy of Nutrition and Dietetics defines FUNCTIONAL FOOD as:

A food that provides additional health benefits that may reduce disease risk and/or promote good health.

The functional food term was introduced in Japan in the 1980’s- foods fortified with specific ingredients imparting certain health benefits.

Japanese people have the longest life expectancy in the world---Increase the cost of health care

Japanese society, being aware of the aging process, has become more concerned with the prevention of the lifestyle related diseases through daily diet.

Decrease the cost of health care.

Unmodified whole foods such as fruits and vegetables represent the simplest form of a functional food.

- Tomatoes,
- raspberries,
- broccoli are rich in bioactive components as
- Lycopene,
- Ellagic acid,
- Lutein,
- Sulforaphane
Include foods that have been modified through fortification, enrichment, or enhancement

- Iodized salt
- Milk fortified with vitamin D
- Foods enhanced with bioactive components, such as margarines containing plant sterol esters
- Beverages enhanced with energy-promoting ingredients such as ginseng, guarana, or taurine.
Medical foods

- Formulated for specific dietary management of disease.
- To be administered under the supervision of a health care professional.
- Include Phenylketonuria formulas, diabetic, renal, and liver formulations.
Foods for special dietary needs

- Include foods that fill special dietary needs that are due to specific health conditions, such as celiac disease, lactose intolerance, or obesity.

Examples: Infant foods, hypoallergenic foods such as gluten-free and lactose-free foods, and foods for weight reduction.

NUTRACEUTICALS

- Isolated or purified from foods
- Generally sold in medicinal forms
- Not usually associated with food
- Demonstrated to have a physiological benefit or provide protection against chronic disease

# Regulatory Authorities

<table>
<thead>
<tr>
<th>Japan</th>
<th>FOSHU 1991</th>
<th>Food for specified health use Approved by Ministry of Health and Welfare</th>
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<tbody>
<tr>
<td>United states</td>
<td>FDA 1993</td>
<td>1. Nutrient content claims. 2. Structure and function claims. 3. Health claims</td>
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### EXAMPLES OF SOME FUNCTIONAL FOODS

<table>
<thead>
<tr>
<th>FUNCTIONAL FOOD</th>
<th>ACTIVE FOOD COMPONENT</th>
<th>TARGET FUNCTION</th>
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<tbody>
<tr>
<td>TOMATOES WATERMELON</td>
<td>LYCOPENE</td>
<td>Antioxidant, may reduce risk of some cancers</td>
</tr>
<tr>
<td>GREEN TEA</td>
<td>CATECHINS FLAVONOLS</td>
<td>Antioxidants, may reduce risk of some cancers</td>
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<tr>
<td>YOGURT</td>
<td>Probiotics: Lactobacillus sp. Bifidobacteria sp Prebiotics: inulin and oligofructose.</td>
<td>Optimal intestinal function and intestinal microbial balance</td>
</tr>
<tr>
<td>FISH/FISH OIL OMEGA 3</td>
<td>Omega 3 fatty acids</td>
<td>Control of hypertension, lipids metabolism</td>
</tr>
<tr>
<td>OMEGA 3 ENRICHED EGGS</td>
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“Live microorganisms, which, when administered in adequate amounts, confer a health benefit on the host.”

Probiotic microorganisms can be found in both supplement form and as components of foods and beverages.

Certain yogurts and other cultured dairy products contain such helpful bacteria, particularly specific strains of *Bifidobacteria* and *Lactobacilli*. 
HEALTHY GUT FLORA HELPS IN THE ABSORPTION OF NUTRIENTS FROM FOOD AND WATER
FILTERS/ELIMINATE HARMFUL BACTERIA TOXINS CHEMICALS
HEALTHY GUT FLORA
HEALTH EFFECTS OF PROBIOTICS

- Balance the flora, increasing the number of helpful, and reducing (inhibiting the growth of) harmful bacteria, in the intestine.

- Modify the gut immune response and improve its barrier function. For example, specific probiotic species can shorten or reduce the risk of certain infections, and autoimmune disorders (ulcerative colitis, Crohn’s disease and rheumatoid), and infections (infectious diarrhea, Helicobacter pylori).

- Modulate/adjust the activity of the immune system, helping to control or reduce the development of certain allergies.
CROHN DISEASE

- No proven role in inducing or maintaining remission in Crohn disease.

IRRITABLE BOWEL SYNDROME

- Studies report amelioration of symptoms such as bloating, abdominal pain or colonic transit.
- Many of the studies were fairly short and do not reflect improvement in the quality of life.
ULCERATIVE COLITIS

Efficacy suggested with E. coli to be equivalent to mesalamine in some studies.

ANTIBIOTIC ASSOCIATED DIARRHEA

- Meta-analyses suggest a reduction in AAD by approximately 60%.
- Not all strains are effective.
- S. boulardii and Lactobacillus GG
Beneficial effects in mild to moderate infectious diarrhea.

Overall reduction in the duration of diarrhea by about 1 day.

Lactobacillus GG showed consistent benefit.

No demonstrable benefit reported in children with more severe diarrhea.
CLINICAL PRACTICE GUIDELINES

- Modestly beneficial
- When prescribing probiotics, the probiotic formulation, including live, dead, compounded preparations, the effective dose to use and the type of disease targeted must be considered.
- FDA does not currently regulate probiotic products.
- No quality control governing agency - actual number of viable organisms may be different from what is being advertised.
Prebiotics are defined as “nondigestible food ingredients that beneficially affect the host by selectively stimulating the growth of one or a limited number of bacterial species in the colon, such as *Bifidobacteria* and *Lactobacilli*, which have the potential to improve host health.”

Types of Prebiotics

- Fructo-oligosaccharide (FOS)
- Inulin
- Poly dextrose
- Lactulose
- Resistant starch

Inulin and oligofructose are amongst the most studied and well established.

Sources

- Whole grains – oat meal, flax barley
- Garlic
- Onion
- Honey
- Legumes
- Green leafy vegetables
- Berries
- Bananas
Promote the growth and proliferation of beneficial bacteria in the intestinal tract, and thus enhance the effect of probiotic bacteria.

Increase calcium absorption, thus improve both bone mineral content and bone mineral density (BMD)

They influence the regulation of blood glucose, and reduce the levels of cholesterol and serum lipids

(Bosscher et al., Journal of Nutrition 2006).

Dietary synbiotics reduce cancer risk factors in polypectomized and colon cancer patients

A large study sponsored by the EU found that a mix of both probiotics and prebiotics largely modified the composition of the colonic bacterial ecosystem, and could in this way diminish the amount of cancer-promoting bacteria.

The number of Clostridium perfringens, a bacterial strain thought to convert dietary substances to carcinogenic compounds, decreased notably in participants given the synbiotic product.

Use of synbiotics may be chemoprevention of colon cancer in humans.

Clinical evaluation of a new starter formula for infants containing live Bifidobacterium longum BL999 and prebiotics:

- A study by Nestle found that formula with Bifidobacterium longum and the prebiotics GOS and FOS was beneficial to the general health of infants.

- Study covered 138 infants, each of them given either a synbiotic mix (with both prebiotics and probiotics) in their formula, or a placebo control.

- The conclusion was that children with the synbiotic mix had less incidences of constipation, as well as less infections of the respiratory tract.
OMEGA 3 FATTY ACIDS

- are long-chain, polyunsaturated fatty acids

POLYUNSATURATED FATTY ACIDS (PUFAs)

OMEGA-3 fatty acids
ALA-alpha-linolenic acid

OMEGA-6 fatty acids
LA-linoleic acid
Health claims of Omega-3

- Help lower elevated triglycerides levels.
- Reduce the blood tendency to clot which may reduce atherosclerosis.
- Reduce the inflammation involved in Rheumatoid arthritis.
- Improved symptoms and mental health disorders.
LA-0mega 6 fatty acid

DHA

Brain development & Function

EPA

EICOSANOIDs includes

(prostaglandins, thromboxanes, leukotrienes)

cell division, growth, blood clotting, muscle activity, secretion of digestive juices and hormones, and movement of substances like calcium into and out of cells

ALA-0mega 3 fatty acid

AA
Eicosanoids formed from AA (series-2 prostaglandins & series-4 leukotrienes) are released in the body in response to injury, infection, stress, or certain diseases. They increase platelet aggregation and enhance vasoconstriction and the synthesis of substances involved with the inflammatory process.

Eicosanoids derived from EPA (series-3 prostaglandins), in contrast, decrease excessive series-2 prostaglandin production. As a result, adequate production of EPA-derived series-3 prostaglandins may help protect individuals against heart attacks and strokes as well as certain inflammatory diseases such as arthritis, and asthma.

Dietary Supplement Fact Sheet : NIH
ods.od.nih.gov/factsheets/Omega3FattyAcidsandHealth-HealthProfessional/
Omega-3 Fatty Acids Dietary Sources

- ALA: flax seeds, flaxseed oil, linseed oil, rapeseed oil, canola oil, soybean oil, pumpkin seeds, and walnuts

- EPA and DHA: fish oils, and fish particularly from cold-water such as salmon, rohu, trout, gulfam, and mahaseer.
Effects of Ecosapentaenoic acid on Cardiovascular events in Japanese patients with cholesterolemia (JELIS-2005)

<table>
<thead>
<tr>
<th>Subjects</th>
<th>No prior history of coronary artery disease</th>
<th>High purified fish oil capsules (1800mg) + Statins (5mg)</th>
<th>Statins (5mg)</th>
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<tr>
<td>15000</td>
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**PRIMARY ENDPOINT** of major coronary events (sudden cardiac death, fatal or nonfatal myocardial infarction (MI), unstable angina pectoris, and coronary artery bypass graft/ percutaneous coronary intervention (CABG/PCI)
Mean total and (LDL)-cholesterol levels in the JELIS participants at baseline were 275 mg/dl and 180 mg/dl.

At the end of the study, total cholesterol and LDL-cholesterol levels were reduced equivalently in both treatment groups, by 19% and 26%, respectively.

Triglycerides were reduced by 10% in the EPA group vs 5% in the control group.

High-density lipoprotein (HDL)-cholesterol remained stable throughout the study.
In the 3664 subjects with a history of CAD, EPA was associated with a significant 19% reduction in major coronary events compared with the control group. Unstable angina was also significantly reduced in the EPA group by 28%.

In the 14,981 subjects with no history of coronary artery disease (CAD), major coronary events were reduced by 18% in the EPA group compared to the controls.

There was no significant difference in all-cause mortality between the 2 treatment groups.
The American Heart Association recommends 500 milligrams of DHA and EPA per day, the equivalent of two servings of fish per week.

For those with allergies or a distaste for fish, an omega-3 supplement could help maintain and improve heart health.
SOYA FOODS

- Belongs to legume family
- Isoflavones
- Phytoestrogens
- Highest protein content among legumes
- Contains all 8 essential amino acids
- Low in saturated fat
- Omega 3 & 6 fatty acids
HEALTH CLAIMS OF SOY PRODUCTS

- Reduce risk of heart disease
- Reduce risk of certain types of cancer
- Reduce vasomotor symptoms (hot flashes) in menopausal women.
In 2006 the AHA Nutrition committee released results of 22 randomized trials.

- Soya proteins & isoflavones have not been shown to lesson vasomotor symptoms of menopause.

- Show no significant effects on HDL cholesterol or triglycerides.
EFFECT OF SOYA PROTEIN ON THYROID HORMONE

- Moderate intake do not cause hypothyroidism.
- Soy isoflavones may take up some of the iodine that the body would normally use to make thyroid hormone.
- Increase iodine in diets.
- Reduce the absorption of medicines used to treat hypothyroidism.

Subjects: 5,042 women previously diagnosed with breast cancer
Duration: 4 yrs

Information on cancer diagnosis/treatment/lifestyle exposures after cancer diagnosis and disease progression was collected at 6 months after cancer diagnosis and was reassessed at 3 follow-up interviews conducted at 18, 36, and 60 months after diagnosis.

Medical charts were reviewed to verify disease and treatment information.

Main Outcome Measures: Total mortality and breast cancer recurrence or breast cancer–related deaths.

Soy food intake was measured by food frequency questionnaire.

444 deaths & 534 recurrence deaths were documented in 5033 surgically treated breast cancer patients.

Soy food consumption was significantly associated with decreased risk of death and recurrence.

- 32% lower risk of recurrence
- 29% decreased risk of death
TAKE HOME MESSAGE FOR FOOD AND NUTRITION PROFESSIONALS

- Stay informed
- Consumer Education
- Research
Functional foods may enhance health but they are not a magic bullet.

There are no "good" or "bad" foods, but there are good or bad diets. Emphasis must be placed on over-all dietary pattern.

Field of functional foods, however, is in its infancy.
THANK YOU