Food as medicine

We are what we eat...(and don’t eliminate)
In almost all countries worldwide, per capita healthcare spending is rising faster than per capita income.

No country can spend an ever-rising share of its output on health care, indefinitely. Spending growth must eventually fall in line with growth in per capita income.

Source: Frost & Sullivan.
Maths: Global Nutraceuticals Industry

Globally the market is growing at 7 – 22% 
Global market to be more that USD 170 billion by 2013

Source: Frost & Sullivan.
## Top 5 Functional Ingredients

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>Why is it Hot?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Omega-3</td>
<td>Positioned for key diseases / disorders that are on the increase (cancer, heart disease, inflammation, diabetes)</td>
</tr>
<tr>
<td>Probiotics</td>
<td>Positioned for digestive health disorders that form the basis for improving resistance to diseases; well-suited for the elderly; new research—obesity, immunity, psychology!</td>
</tr>
<tr>
<td>Natural Vitamins C, D, E</td>
<td>Most well established antioxidants; D has phenomenal research; near the top of growing supplement ingredients</td>
</tr>
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</tr>
<tr>
<td>Natural Vitamins C, D, E</td>
<td>Most well established antioxidants; D has phenomenal research; near the top of growing supplement ingredients</td>
</tr>
<tr>
<td>Soy Protein (Proteins &amp; Amino acids)</td>
<td>One of the best substitutes for dairy protein (with increasing incidence of lactose intolerance); products often have genistein</td>
</tr>
<tr>
<td>Phytosterols (Botanicals)</td>
<td>Well positioned scientifically &amp; commercially in the area of heart disease; genistein, very well-vetted ingredient for anti-cancer, hormone-regulating effects</td>
</tr>
</tbody>
</table>

Source: Frost & Sullivan.
Top 5 Functional Ingredients: Omega-3 Ingredients

- Well-positioned for cognitive & heart health, alleviating chronic inflammation
- New research areas include immune & bone & joint health
- Most important challenge is the flavour profile that decelerates penetration into many food applications
- Marine Oil Key Players: Pronova BioPharma ASA, EPAX AS, ONC; Algal Oil Key Player: Martek & Lonza
- Sources under development include: flax, soy

Revenue: $323.0 Million (CAGR – 10.2%)

**Volume Market Share by Application, (2009)**

- Dietary Supplement 53.3%
- Infant and Clinical Nutrition 10.2%
- Animal Feed 5.6%
- Functional Foods 26.8%
- Pharma 4.1%

Source: Frost & Sullivan.
Top 5 Functional Ingredients: Probiotics

- Well-positioned for digestive & immune health
- New research areas include oral care, obesity, diabetes, women health
- Most important challenge is stability issues that prevent penetration into applications other than dietary supplement & dairy
- heat-stable *Bacillus sporogenes* or *B. subtilis* have positive studies for relieving diarrhea in children

**Dairy and Yogurt drinks, 72.6%**

**Dietary Supplements, 21.4%**

**Other non-Dairy Food & Beverage, 5.5%**

**Others, 0.6%**

**Revenue: $102.5 Million**

*Source: Frost & Sullivan.*
Top 5 Functional Ingredients: Natural Vitamin E

- Vitamin E is classified as an antioxidant
- There are eight different varieties of this product including tocopherols, tocotrienols and tocopherol phosphates; In its natural form, vitamin E is designated d-, as in d-alpha-tocopherol, while its synthetic forms are designated dl-, as in dl-alpha-tocopherol.
- Applications of natural Vitamin E include food & beverages, cosmetics & dietary supplements
- Natural Vitamin E has been proved to have higher efficacy than synthetic alternatives.

Unit Consumption by Europe and Selected Market Share by Application, Metric Tons (2009)

- Dairy, 24.0%
- Meat & Poultry, 24.0%
- Non-Alcoholic Beverages, 8.0%
- Others, 44.0%

Source: Frost & Sullivan.
“A food or part of food or nutrient, that provides health benefits, including the prevention and treatment of a disease”
### EXAMPLES OF FUNCTIONAL COMPONENTS

<table>
<thead>
<tr>
<th>Class / components</th>
<th>Source</th>
<th>Potential benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Fatty acids</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CLA (conjugated linoleic acid)</td>
<td>Milk &amp; Meat</td>
<td>Improve body composition, reduce cancers, heart disease</td>
</tr>
<tr>
<td>n-3 FA (DHA, EPA)</td>
<td>Fish oils, algae, berseem &amp; maize fodder, mustard, linseed, rapeseed</td>
<td>Reduce CVD &amp; improve mental, visual function</td>
</tr>
</tbody>
</table>
EXAMPLES OF FUNCTIONAL COMPONENTS

<table>
<thead>
<tr>
<th>Class / components</th>
<th>Source</th>
<th>Potential benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Polyphenols</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anthocyanidins</td>
<td>Fruits</td>
<td>Nutralises free radicals, reduce risk of cancer; Inhibiting phase I enzymes &amp; inducing phase II detoxification enzymes in liver, provide protection to lung tissue.</td>
</tr>
<tr>
<td>Catechins</td>
<td>Tea, grapeseed, pomegranate, babul pods, mustard cake, rape seed, salseed</td>
<td></td>
</tr>
<tr>
<td>Flavonone</td>
<td>Citrus (limonene)</td>
<td></td>
</tr>
<tr>
<td>Flavones</td>
<td>Fruits, vegetables, soybean</td>
<td></td>
</tr>
<tr>
<td>proanthocyanidins</td>
<td>Cocoa, chocolate, tea, rape seed</td>
<td>Reduce CVD</td>
</tr>
</tbody>
</table>

Limonene
<table>
<thead>
<tr>
<th>3. Saponins</th>
<th>Soybeans, Groundnut cake, lucerne, chick pea</th>
<th>Lower cholesterol, anti-cancer</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>4. Probiotics</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Lactobacillus</em> spp.</td>
<td>Dahi, yogurt, fermented foods</td>
<td>Improve GI health, immunity, infections, inflammation, mood, many other uses</td>
</tr>
<tr>
<td><strong>5. Phytoestrogen</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Genistein, daidzein, Zenistein</td>
<td>Soybean, flax, lentilseed, maize, berseem, lucerne, subabul fodder</td>
<td>Reduce menopause symptoms, ↑ bone health; Exhibit anti-inflammatory, anti-neoplastic, anti-pyretic &amp; immune-modulating activity, decrease cholesterol</td>
</tr>
<tr>
<td>Lignans</td>
<td>Flax, rye, vegetables</td>
<td>Reduce cancer and heart diseases</td>
</tr>
<tr>
<td>6. Caroteinoids</td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>β-caroteine</strong></td>
<td>alfalfa, oat &amp; maize fodder, Carrots, vegetables, fruits</td>
<td>Nutralises free radicals, anti-aging; primary vitamin A source in the diet (literally a hormone-like substance that is essential to life): Antioxidants, protects against uterine, prostate, colorectal, lung and digestive tract cancers, and protection to other antioxidants.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Luteine</th>
<th>vegetables</th>
<th>Healthy vision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zeaxanthine</td>
<td>Eggs, citrus, corn, goji</td>
<td></td>
</tr>
<tr>
<td>Lycopene</td>
<td>Tomatoes</td>
<td>Reduces risk of prostate cancer</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>7. Dietary fiber</th>
<th>(beans are great source)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insoluble fiber</td>
<td>Wheat bran</td>
</tr>
<tr>
<td>β-glucan</td>
<td>Oats</td>
</tr>
<tr>
<td>Whole grain (fiber)</td>
<td>Cereal grains</td>
</tr>
</tbody>
</table>

Healthy vision

Reduces risk of prostate cancer

Reduce breast, colon cancer

Reduce CVD, immunomodulating
<table>
<thead>
<tr>
<th>(8. Prebiotics Fructo-oligosaccharides)</th>
<th>Inulin (fructose polymer) (eat at least 5 grams/day)</th>
<th>bulbs (garlic), onion, roots, tubers of dandelion, chicory, Jerusalem artichoke, dahlia</th>
<th>Promotes beneficial bacterial grown in the gut; increases complexity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheat bran</td>
<td>arabinoxylans</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rice bran</td>
<td>arabinoxylans</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oats</td>
<td>glucans (mixed-linkage (1→3), (1→4)-beta-D-glucan); glycolipids, phospholipids; avenalin, as the major (80%) storage protein, same high value as soy protein</td>
<td>reduces cholesterol; some varieties safe for those with celiac disease</td>
<td></td>
</tr>
<tr>
<td>Insoluble fiber</td>
<td>Wheat bran</td>
<td>Reduce breast, colon cancer</td>
<td></td>
</tr>
<tr>
<td>β-glucan</td>
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<td>Reduce CVD</td>
<td></td>
</tr>
<tr>
<td>Whole grain</td>
<td>Cereal grains</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------------</td>
<td>--------------------------</td>
<td>--------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>10. Glucosinolates</td>
<td>Cruciferous vegetables (especially broccoli, seed)</td>
<td>Activators of liver detoxification enzymes, inhibit the neoplastic effect of various carcinogens</td>
<td></td>
</tr>
<tr>
<td>11. Indoles</td>
<td>Indole supplements are widely being marketed as anti-cancer agent. Indoles may act directly on cancer cells or may influence the actions of immune cells inducing them to attack any abnormal cells. Indoles enhance natural killer cell (NK) activity and proliferation of immune cells</td>
<td>Reduces estrogen-dependent cancer risk,</td>
<td></td>
</tr>
</tbody>
</table>
Trace Minerals (great source, mushrooms, sea vegetables)

• **Cobalt**: component of Vit. B 12 and B 12 coenzymes,

• **Copper**: Hb and collagen production, function of heart, energy production, absorption of Iron,

• **Iodine**: proper function of Thyroid gland,

• **Chromium**: with insulin it helps in conversion of carbohydrate and fat into energy, treatment of diabetes
• **Selenium**: Antioxidant, functioning of heart muscle, part of GPX enzyme,

• **Zinc**: Essential for cell reproduction, for development in Neonates, wound healing, production of sperm and testosterone hormone

• Organic agriculture is much better (than non-organic) because trace minerals are often put back into the soils.

• But even then, they're often still not present in the densities necessary to replenish the missing trace minerals in the bodies of most consumers.

• Megafoods, Garden of Life, New Chapter

Conventional fertilizers contain virtually no trace minerals, so after just one decade of growing crops through conventional methods, **the soils are depleted of crucial trace minerals** that your body needs to function.

**Yeast-grown “Grow Nutrients”**
Phytochemicals:

Phytochemicals could provide health benefits as:

1. Substrate for biochemical reactions
2. Cofactors of enzymatic reactions
3. Inhibitors of enzymatic reactions
4. Absorbents that bind to & eliminate undesirable constituent in the intestine
5. Scavengers of reactive or toxic chemicals, $O_2$ radicals
• Prebiotics

1. Enhance the absorption and/or stability of essential nutrients
2. Selective growth factor for beneficial bacteria
3. Fermentation substrate for beneficial bacteria
4. Selective inhibitors of deleterious intestinal bacteria
Enhancing active components in food

- Manipulating the diet to get maximum level of active components (avoiding processed foods)
- **Juicing!** Dried juices
- Choosing foods rich in nutraceuticals
- Fortifying food with active ingredients
- Fermentation of food products
- Supplementation
Some Plants that Prevent Heart Disease

<table>
<thead>
<tr>
<th>Food</th>
<th>Chemical Element</th>
<th>Prevents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tomatoes</td>
<td>Lycopenes</td>
<td>Heart Disease</td>
</tr>
<tr>
<td>Soy</td>
<td>Isoflavones</td>
<td>High Cholesterol</td>
</tr>
<tr>
<td>Psyllium</td>
<td>Fiber</td>
<td>High Cholesterol</td>
</tr>
<tr>
<td>Vegetable Oils</td>
<td>Alpha-linolenic acids</td>
<td>Heart Disease</td>
</tr>
<tr>
<td>Grapes</td>
<td>Phenolic compounds and Flavanoids</td>
<td>Heart Disease</td>
</tr>
</tbody>
</table>
Figure 1. Possible Cancer-Preventive Foods and Ingredients

Over the past decade, more than forty foods have been identified as having cancer preventative properties. The six foods at the top of this pyramid are at the center of the National Cancer Institute’s Experimental Foods Program.

Ref: Food Technology, April, 1992
## High Micro Nutrient Contents in Rice

<table>
<thead>
<tr>
<th>Folk variety</th>
<th>Fe (mg/kg)</th>
<th>Zn (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kelas</td>
<td>13.8</td>
<td>35.5</td>
</tr>
<tr>
<td>Noichi</td>
<td>8.0</td>
<td>46.0</td>
</tr>
<tr>
<td>Parmai-sal</td>
<td>15.0</td>
<td>42.5</td>
</tr>
<tr>
<td>Kabiraj-sal</td>
<td>9.5</td>
<td>36.8</td>
</tr>
<tr>
<td>Kalabhat</td>
<td>39.3</td>
<td>26.8</td>
</tr>
<tr>
<td><strong>IET 7029</strong></td>
<td><strong>1.9</strong></td>
<td><strong>31.4</strong></td>
</tr>
<tr>
<td><strong>MS13</strong></td>
<td><strong>7.0</strong></td>
<td><strong>34</strong></td>
</tr>
</tbody>
</table>

Source: anandan (2011); Anandan & Debal Deb
# Nutrient composition of sorghum, millets and other cereals

(per 100 g edible portion; 12 percent moisture)

<table>
<thead>
<tr>
<th>Food</th>
<th>Protein (g)</th>
<th>Fat (g)</th>
<th>Ash (g)</th>
<th>Crude fibre (g)</th>
<th>Carbohydrate (g)</th>
<th>Energy (kcal)</th>
<th>Ca (mg)</th>
<th>Fe (mg)</th>
<th>Thiamin (mg)</th>
<th>Riboflavin (mg)</th>
<th>Niacin (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rice (brown)</td>
<td>7.9</td>
<td>2.7</td>
<td>1.3</td>
<td>1.0</td>
<td>76.0</td>
<td>362</td>
<td>33</td>
<td>1.8</td>
<td>0.41</td>
<td>0.04</td>
<td>4.3</td>
</tr>
<tr>
<td>Wheat</td>
<td>11.6</td>
<td>2.0</td>
<td>1.6</td>
<td>2.0</td>
<td>71.0</td>
<td>348</td>
<td>30</td>
<td>3.5</td>
<td>0.41</td>
<td>0.10</td>
<td>5.1</td>
</tr>
<tr>
<td>Maize</td>
<td>9.2</td>
<td>4.6</td>
<td>1.2</td>
<td>2.8</td>
<td>73.0</td>
<td>358</td>
<td>26</td>
<td>2.7</td>
<td>0.38</td>
<td>0.20</td>
<td>3.6</td>
</tr>
<tr>
<td>Sorghum</td>
<td>10.4</td>
<td>3.1</td>
<td>1.6</td>
<td>2.0</td>
<td>70.7</td>
<td>329</td>
<td>25</td>
<td>5.4</td>
<td>0.38</td>
<td>0.15</td>
<td>4.3</td>
</tr>
<tr>
<td>Pearl millet</td>
<td>11.8</td>
<td>4.8</td>
<td>2.2</td>
<td>2.3</td>
<td>67.0</td>
<td>363</td>
<td>42</td>
<td>11.0</td>
<td>0.38</td>
<td>0.21</td>
<td>2.8</td>
</tr>
<tr>
<td>Finger millet</td>
<td>7.7</td>
<td>1.5</td>
<td>2.6</td>
<td>3.6</td>
<td>72.6</td>
<td>336</td>
<td>350</td>
<td>3.9</td>
<td>0.42</td>
<td>0.19</td>
<td>1.1</td>
</tr>
<tr>
<td>Foxtail millet</td>
<td>11.2</td>
<td>4.0</td>
<td>3.3</td>
<td>6.7</td>
<td>63.2</td>
<td>351</td>
<td>31</td>
<td>2.8</td>
<td>0.59</td>
<td>0.11</td>
<td>3.2</td>
</tr>
<tr>
<td>Common millet</td>
<td>12.5</td>
<td>3.5</td>
<td>3.1</td>
<td>5.2</td>
<td>63.8</td>
<td>364</td>
<td>8</td>
<td>2.9</td>
<td>0.41</td>
<td>0.28</td>
<td>4.5</td>
</tr>
<tr>
<td>Little millet</td>
<td>9.7</td>
<td>5.2</td>
<td>5.4</td>
<td>7.6</td>
<td>60.9</td>
<td>329</td>
<td>17</td>
<td>9.3</td>
<td>0.30</td>
<td>0.09</td>
<td>3.2</td>
</tr>
<tr>
<td>Barnyard millet</td>
<td>11.0</td>
<td>3.9</td>
<td>4.5</td>
<td>13.6</td>
<td>55.0</td>
<td>300</td>
<td>22</td>
<td>18.6</td>
<td>0.33</td>
<td>0.10</td>
<td>4.2</td>
</tr>
<tr>
<td>Kodo millet</td>
<td>9.8</td>
<td>3.6</td>
<td>3.3</td>
<td>5.2</td>
<td>66.6</td>
<td>353</td>
<td>35</td>
<td>1.7</td>
<td>0.15</td>
<td>0.09</td>
<td>2.0</td>
</tr>
</tbody>
</table>
# B-Carotene in various plants

<table>
<thead>
<tr>
<th>Species</th>
<th>Edible part</th>
<th>B-Carotene (µg/100 g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mustard greens <em>(Brassica compestris)</em></td>
<td>Flower</td>
<td>16000</td>
</tr>
<tr>
<td>Kanta note (Amaranthus spinosus)</td>
<td>Leaf</td>
<td>10900</td>
</tr>
<tr>
<td>Edible Jute (Corchorus capsularis)</td>
<td>Leaf</td>
<td>10200</td>
</tr>
<tr>
<td>Drumstick (Moringa oleifera)</td>
<td>Leaf</td>
<td>7500</td>
</tr>
<tr>
<td>Red Amaranth (Amaranthus gangeticus)</td>
<td>Leaf</td>
<td>5100</td>
</tr>
<tr>
<td>Golden rice</td>
<td>Grain</td>
<td>160</td>
</tr>
</tbody>
</table>
The Art of Mixing & Matching Fruits & Vegetables

- Support retinal health
- Lower LDL cholesterol
- Boost immune system activity
- Support healthy digestion
- Improve calcium & other mineral absorption
- Fight inflammation
- Reduce tumor growth
- Act as an anti-carcinogen in the digestive tract
- Limit the activity of cancer cells

The Colour Wheel

- Reduce the risk of prostate cancer
- Lower blood pressure
- Reduce tumor growth & LDL cholesterol levels
- Scavenge harmful free radicals
- Support joint tissue in arthritis cases

- Reduce age-related macular degeneration & the risk of prostate cancer
- Lower LDL cholesterol & blood pressure
- Promote collagen formation & healthy joints
- Fight harmful free radicals
- Scavenge alkaline balance
- Provide magnesium & calcium to build healthy bones

- Reduce cancer risk
- Lower blood pressure & LDL cholesterol levels
- Normalize digestion time
- Support retinal health & vision
- Fight harmful free radicals
- Boost immune system activity

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Secunderabad-500 017

www.sahajaaharam.in
Facebook.com/gv.ramanjaneyulu
WHOLE GRAIN

- The **bran** is the outside layer where most of the fiber exists.
- The **germ** is the inside layer where many nutrients and essential fatty acids are found.
- The **endosperm** is the starchy middle layer.

- When grains are milled, you are left with only the **endosperm**. In doing this, you take out the majority of the nutrients.
CARBOHYDRATES

Refined grains
- Little nutritional value
- High glycemic index
- Linked to GI issues
- Linked to weight gain
- Less satiety

Whole Grains
- More nutrition: Unsaturated fatty acids, fiber, vit E, vit B6, magnesium, zinc, potassium, calcium, phosphorus, iron
- Lower glycemic index/help regulate blood sugars
- Promote a healthy GI tract
- Blood pressure and cholesterol lowering benefits
- Promote satiety
• Researchers found that consumption of an average 1.2 ounces (34 grams) of whole grains per 1000 kcal per day was associated with a 17% reduced risk of premature death
  – compared to those consuming an average of 0.13 ounces (3.98 grams) per 1000 kcal per day
  – Even when they accounted for factors such as health status, physical activity and obesity status the reduction remained the same.
  – They found that consuming an average of 0.4 ounces (10.22 grams) per 1000 kcal of cereal fibers a day was associated with a 19% reduced overall risk of death compared to those consuming an average 0.07 ounces (2.02 grams) per 1000 kcal per day (Cho & Lu Qi *BMC Medicine*, 2015)
BENEFITS OF WFPB/MEDITERRANEAN DIET

- **Cardiovascular Disease**
  - Lifestyle Heart Trial, Ornish D et al. JAMA, 1998 (6)
  - PREDIMED trial, Ramon et al. New England Journal of Medicine, 2013. (8)

- **Obesity**

- **Diabetes**
Sea Vegetables as Functional Foods

- Marine ACE-inhibitory peptides
  - help maintain healthy blood pressure

- Algal polysaccharides
  - help to lower cholesterol
  - antihypertensive effects

- Astaxanthin
  - protects against atherosclerosis
  - strong antihypertensive effects
  - reduces inflammation

- n-3 PUFAs from fish oil
  - antihypertensive effects
  - reduce hyperlipidemia
  - protect against atherosclerosis
  - reduce inflammation

- Soluble fibre from seaweed
  - aid the removal of cholesterol, glucose and toxins from the body
Exceptional Wisdom: Food as Medicine

Heart Prevention

Eat like a fish (sea vegetables, other fish)
1. Blocks platelet aggregation
2. Reduces blood vessel constriction
3. Increases blood flow
4. Lowers fibrinogen
5. Increases fibrinolytic activity
6. Lowers triglycerides
7. Raises antioxidant rich HDL
8. Increases cell membrane flexibility
9. Lowers blood pressure
Exceptional Wisdom: Food as Medicine

Foods that fight clots

Garlic’s effect is heat stable
Cornell – Red wine’s resveratrol (red grapes too)
Zhejian Medical University of China – Green tea’s tannin (catechin) blocked platelet clumping as strongly as ASA
Swedish Study – Fruits / Vegetables lowers fibrinogen
Balancing Blood Pressures

University of Naples, Italy
12 months on high K Diet
81% cut meds use in half
38% cut meds out completely

Low K = High Na = High Water = HTN

HIGH potassium
(more than 225 milligrams per 1/2 c. serving)

Apricots
Avocado
Banana
Cantaloupe
Honeydew
Kiwi
Lima beans
Oranges and orange juice
Potatoes Prunes
Spinach
Tomatoes
Vegetable juice
Winter squash

Exceptional Wisdom: Food as Medicine
Balancing Cholesterol (NOT LOWERING)

Foods that help:

- Oats
- Apples
- Carrots
- Olive oil
- Avocados
- Almonds
- Beans
- Walnuts
- Garlic
- Onions
- Fruits
- Vegetables
- Vitamin C
- Beta Carotene Rich Foods
- Grains High in Soluble Fiber
Exceptional Wisdom: Food as Medicine

Balancing Cholesterol

Goals:

- Raise HDL
- Prevent LDL Oxidation

Beans are the cheapest, most widely available, fastest acting, and safest medicine to balance cholesterol.
Exceptional Wisdom: Food as Medicine

You are not genetically designed to have cancer!

You are causing cancer through diet and environmental toxins.
Exceptional Wisdom: Food as Medicine

The amount of carbohydrate in the reference and test food must be the same.
Cancer Rates
Incidence, Mortality

Figure 2. Estimated age-standardised rates per 100,000 for cancer in the world (IARC, 2014) and Vavilov’s eight centers of crop origin (Ladizinsky, 1998)
Cancer-prevention in Africa

• Ethiopia in Africa is not only top choice for cradle of modern humans (McDougall et al., 2005; Li et al., 2008), but also center of origin for 38 species in crop (Vavilov, 1951; Ladizinsky, 1998)

• Consumption of flaxseed and flax bread were associated with a significant reduction in breast cancer risk (Lowcock et al., 2013).

• Bioactive compounds for barley anticancer include β-Glucans, tocotrienols, poly-phenol, lunasin

• Flaxseed contents of α-linolenic acid, lignans, and fiber, which have potential health benefits such as reduction of cancer, diabetes, osteoporosis, atherosclerosis, autoimmune, arthritis, cardiovascular disease, and neurological disorders (Goyal et al., 2014).

• Contemporary cancer incidence in Africa is the lowest in the world, i.e. Eastern Africa is (1.40‰) > Northern Africa (1.33‰) > Middle Africa (1.02‰) > Western Africa (0.97‰)
Traditional anti-cancer foods--Asia

• pomegranate, hawthorn fruit, cherry (middle east)
• grape, mung bean, spinach, carrot, onion, garlic, mustard, apple, flax, Chinese yams, and sesame (Asia)
• rice, buckwheat, tea, millet, soybean, adzuki bean, Chinese yam, radish, onion, cucumber, Chinese apple, peach, apricot, walnut, litchi, hemp, cabbage, hullless barley and cherry (Korea)
• Japan: gobo, miso, fish, sea vegetables, Adzuki exhibited the strongest antiproliferative properties in a dose-dependent manner against all digestive system, ovary and breast cancer cell lines (Xu et al., 2012)
Cancer-preventing foods in Myanmar, Malay

- **Indo-Burma**: for main center includes Assam in India and Burma, some functional foods with anticancer including mango, orange, tangerine, tamarind, safflower, black pepper, bamboo, rice, mung bean, cucumber, yam, radish, sesame and hemp
- The extract of waterlily mango (*Mangifera indica* L.) has potential activity against breast cancer cells (Abdullah et al., 2014)
- Malay Archipelago, some functional foods with anticancer including mangosteen, clove, nutmeg, black pepper
Mediterranean anti-cancer foods

- olive, turnip, asparagus, celery, rhubarb, caraway, oats, flax, and cabbage
- Oleocanthal from extra virgin olive oil showed antiproliferative and antimigratory activity against different cancer cell lines
- All compounds in turnip exhibited high inhibitory activity against the growth of human cancer lines (Wu et al., 2013)
- asparagus polysaccharide exhibited significant anticancer activity, indicating that it is a potential therapeutic agent for liver cancer therapy (Xiang et al., 2014)
- People use roots of rhubarb (*R. Turkestanicum*) as an anticancer, anti-diabetic and anti-hypertensive agent (Shiezadeh et al., 2013)
Functions of Vitamins, Minerals
Health Benefits of different common nutrients
Vitamins

Fat Soluble Vitamins

• **Vitamin A**: Acts as antioxidant, essential for growth and development, maintains healthy vision, skin and mucous membranes, may aid in the prevention and treatment of certain cancers and in the treatment of certain skin disorders

• **Vitamin D**: Essential for formation of bones and teeth, helps the body to absorb and use calcium; acts like a hormone

• **Vitamin E**: Antioxidant, helps to form blood cells, boosts immune system

• **Vitamin K**: Essential for blood clotting
Water Soluble Vitamins

- **Vitamin C**: Antioxidant, necessary for healthy bones, gums, teeth and skin. Helps in wound healing, prevent from common cold

- **Vitamin B₁**: Helps in carbohydrate metabolism, essential for neurological function.

- **Vitamin B₂**: Energy metabolism, maintain healthy eye, skin and nerve function.
• **Vitamin B 3**: Energy metabolism, brain function

• **Vitamin B 6**: Helps to produce essential proteins, convert proteins to energy

• **Vitamin B 12**: Help in producing genetic material, formation of RBC, maintenance of CNS, synthesis of amino acids, involved in metabolism of protein, fat and carbohydrate.
• **Folic acid**: Helps in RBC formation, formation of genetic material of cell, very much essential during pregnancy
  - vs. methylated form, methylfolate and also methylcobalamin

• **Pantothenic acid**: Aids in synthesis of cholesterol, steroids, and fatty acids, crucial for intraneuronal synthesis of acetylcholine
Vitamin-like Compounds, amino acids

- **L- Carnitine**: Helps in oxidation of fatty acids, role in oxidative phosphorylation,

- **Choline**: Lipotropic agent, used to treat fatty liver and disturbed fat metabolism,

- **Inositol**: For amino acid transport and movement of Potassium and sodium,

- **Taurine**: Helps in retinal photoreceptor activity, bile acid conjugation, WBC antioxidant activity, CNS neuromodulation, platelet aggregation, cardiac contractibility, sperm motility, insuline activity,
Minerals:

- **Calcium**: essential for bone and teeth, maintaining bone strength, nerve, muscle and glandular function, blood clotting,

- **Iron**: energy production, Hb, oxygen transport,

- **Magnesium**: for healthy nerve and muscle function, bone formation,

- **Phosphorous**: energy production, phosphorylation process, bone and teeth, for genetic material,