Functional Foods for Health and Wellness – Avenues of Entrepreneurship

Prof. Anwar H Gilani
Chairman
Pakistan Council for Science & Technology
Functional Foods

Functional foods are foods that have a potentially positive effect on health beyond basic Nutrition (Fat, Carbohydrates, Protein, Vitamins, Minerals, Fiber etc.)

Functional foods promote optimal health and help reduce the risk of disease
The Primary Law of Healing

“Let thy food be thy medicine”
Hippocrates (460-370 BC)
Disease pattern in olden days

Infectious diseases

Non-communicable diseases
Challenges of Modern Life

- Plenty of food/High caloric intake
- Dependence on impure and processed foods
- Sedentary life style
- Environmental Factors/pollutants
- Less distance/Global village
- Stress of material/competitive life
- Less time for relaxation and physical activity

↑ Obesity and Environment related Diseases
Hunting and gathering
A physically active life produced strong muscles and cardiovascular fitness.

No pollutants or pesticides meant no allergic reactions to them and life with fewer manufactured carcinogens.

Natural, untainted foods meant no added sugar or salt in the diet, hence less obesity and fewer salt-related circulatory problems and strokes.

Sometimes a poor, monotonous diet led to possible deficiencies, tooth and gum disorders and bone problems.

Dependence on natural resources may have led to seasonal deficiencies, malnutrition and starvation.

20th-century lifestyle
Modern methods of food preservation and storage mean few, if any, dietary deficiencies.

A highly stressful lifestyle and irregular periods of leisure and relaxation may contribute to many illnesses and disease.

A more sedentary lifestyle can lead to problems such as obesity and coronary heart disease.

Dependence on high-fat, high-sodium foods can lead to many disorders from skin complaints to heart disease.

Smoking tobacco and drinking alcohol can lead to cancers, liver problems and heart and lung disorders.
ECONOMIC GROWTH AND CHRONIC DISEASES

Courtesy: Sultan Meo

CULTURAL CHANGE
AND DIABETES MELLITUS

Courtesy: Sultan Meo
Overweight & Obesity

• Worldwide: 1.1 billion people overweight (BMI ≥ 25 kg/m²)
  312 million obese (BMI ≥ 30 kg/m²)¹
  155 million children overweight/obese²

• ≥ 60% UK & US adult populations overweight¹

• UK- 2004: 23.6%♂ 23.8%♀ obese
  1980: 6.0%♂ 8.0%♀ obese³

² International Obesity Task Force, 2005
Medical Complications of Obesity:
Almost every organ system is affected

- Pulmonary disease
  - asthma
  - obstructive sleep apnea
  - hypoventilation syndrome
- Nonalcoholic fatty liver disease
  - steatosis
  - steatohepatitis
  - cirrhosis
- Gall bladder disease
- Gynecologic abnormalities
  - abnormal menses
  - infertility
  - polycystic ovarian syndrome
- Osteoarthritis
- Skin
- Gout
- Idiopathic intracranial hypertension
- Stroke
- Cataracts
- Coronary heart disease
- Diabetes
- Dyslipidemia
- Hypertension
- Severe pancreatitis
- Cancer
  - breast, uterus, cervix
  - colon, esophagus, pancreas
  - kidney, prostate
- Phlebitis
  - venous stasis
BMI is an *Index* of Obesity

<table>
<thead>
<tr>
<th>Height</th>
<th>Weight</th>
<th>BMI</th>
</tr>
</thead>
<tbody>
<tr>
<td>6'0&quot;</td>
<td>225 lbs</td>
<td>31 kg/m²</td>
</tr>
<tr>
<td>5'4&quot;</td>
<td>180 lbs</td>
<td>31 kg/m²</td>
</tr>
</tbody>
</table>
Waist Hip Ratio
Relationship?

Obesity, Diabetes and Cardiovascular diseases
DIABETES MELLITUS

- Diabetes Mellitus is the sixth leading cause of death
- It costs $376 billion in 2010 (12% of world expenditures)
- Almost 3.8 million people die each year
- Two third of them are from developing countries
- 316666/month
- 10555/day
- 440/hour
- 7/minute

More than 87 countries involved
About 300,000 people died in Tsunami

Courtesy: Khalid Al Rubeaan

Venkat Narayan et al., CMAJ, 2006
GLOBAL PICTURE

- 1/3 deaths (> 17 million/yr\(^1\))
- 80% deaths due to CVD are in developing countries\(^3\)

FUTURE PREDICTIONS

- By 2030: 23.6 million/yr \(^2\)
- Largest increase in South Asia\(^4\) and the Middle-East ?

1. WHO (2008)
Cardiovascular Disease

- Type 2 DM
- Hypertension
- Dyslipidemia
- Age
- Gender

Obesity

CHD

CVA

? Independent effect
Phytotherapy to Modern Medicine

- Atropine
- Morphine
- d-Tubocurarine
- Physostigmine
- Quinine
- Reserpine
- Vinblastine
- Taxol

- Digitalis
- Aspirin
- (salicylic acid)
- Pilocarpine
- Colchicine
- Cocaine
- Vincristine
- Artemesinin
Phytomedicine to Modern Medicine

Most effective pain killer

Somniferous poppy $\Rightarrow$ opium $\Rightarrow$ morphine (1804)
  $\Rightarrow$ codeine (1832)
  $\Rightarrow$ papaverine (1948)
Phytomedicine to Modern Medicine

Willow

\( \text{O-Glc} \)

\[ \text{CH}_2\text{OH} \]

\[ \text{O-CO-CH}_3 \]

\[ \text{CH}_2\text{OH} \]

\( \text{Acétylsalicylic acid} \)

Willow \( \Rightarrow \) salicine (1830)

\( \Rightarrow \) salicoside (1838)

\( \Rightarrow \) aspirin (acetyl salt)
Drugs Development

- MNCs spend $1000-1500 million on the development of a single drug (public pays for this)
- 10-12 yrs on development of a drug
- 8 M people are hospitalized each year for the ailments caused by the ingestion and side effects of prescription drugs
Drug Therapy to Phytotherapy

Willow bark

↓ Pain  ↓ ulcers

↓ Pain  ↔ ulcer

↓ Pain  ↓ ulcer

↓ Pain  ↓ ulcer

↓ Cyclooxygenase (1 and 2 pathways)

Marz & Kemper (2002)

↓ Cyclooxygenase

↓ 5-lipoxygenase

↓ H. pylori, CC

Grazanna et al, 2005; Al-Yaha et, 1989,

Ginger
Herbals, Botanicals

- Garlic: Cardiovascular diseases
- Ginkgo: Old age dementia
- Ginseng: Adaptogenic
- Saw Palmetto: Prostate hyperplasia
- St. Johns Wort: Depression
- Turmeric: Wound healing
- Ginger: Stomach disorders
- Psyllium husk (ispaghhol): Constipation, Diarrhea, Amebic dysentery
Why Dietary Supplements are Considered Safer?

Contain Chemicals that possess Synergistic and/or side-effects neutralizing combinations of activities

A Journey from UAF to AKU

Ginkgo
Turmeric
Ginger
Olives
Garlic
Recognition of the concept at highest forum

Session 3
Multiple plant products: a matter of synergy
Chairpersons: Z. Lin & T. Fan

- Synergistic and/or side effects neutralizing combinations in natural products
  A.H. Gilani, Pakistan

- Danshen diwan
  H. Sun, China

- Danshen synergy with arsenic
  Z. Chen, China-TBC

- Choto-san and recognition behaviour
  K. Matsumoto, Japan
Natural Health

best maintained by:

Life Style change
[physical exercise, mental relaxation]

Nutritional measures/dietary habits
[know what, when and how you eat]

Functional Foods
[know medicinal value of food]

Natural Organic Food ?
Nothing is better than Ginger in Stomach disorders

Medicinal uses:
- Flatulence
- Delayed gastric emptying
- Anorexia
- Colic and Dyspepsia
- Constipation
- Diarrhea and Dysentery
- Travel sickness
- Nausea and Vomiting
- Rheumatism
- Airways disorders
- Hypertension
- Dementia

Ali & Gilani. Medicinal value of Ginger with focus on its use in nausea and vomiting of pregnancy *Int J Food Properties*; 2007; 10: 269-278
Zingiber officinale- Ginger

Prokinetic

- Cholinergic
- Calcium antagonist

- Onion
- Garlic

The Awesome Power of Garlic:
- Kills urinary tract infections
- Kills kidney infections
- Kills cancer cells
- Treats acne
- Kills strep throat
- Kills cold sores
- Lowers cholesterol
- Strengthens the immune system
- Removes heavy metals from the body
- Helps with weight control and weight loss
- Reduces and regulates blood sugar
- Increases insulin production
- Kills and expels worms
- Inhibits leukemia
- Kills athlete's foot
- Soothes sunburn
- Reduces high blood pressure
- Cures yeast infections
GARLIC
The Science and Therapeutic Application of Allium sativum L. and Related Species
Second Edition

Edited by
Heinrich P. Koch, Ph.D., M.Pharm.
Larry D. Lawson, Ph.D.
**Moringa oleifera**  
Africa, South Asia and America

**Nutritional**
- Vitamin A
- Vitamin C
- Protein

**Medicinal**
- Cardiac stimulant
- Anticancer
- Antipyretic
- Antiepileptic
- Anti-inflammatory
- Antiulcer
- Antispasmodic
- Antihypertensive
- Antidyslipidemic
- Antioxidant
- Antidiabetic
- Antimicrobial
- Hepatoprotective
- Immune-stimulant

### Coriander
*(Coriandrum sativum)*

Food supplement in Asia, Middle East

Essential oil, Lipid rich Petrosenilic acid

<table>
<thead>
<tr>
<th>Medicinal uses</th>
<th>Biological activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dyspepsia</td>
<td>Antimicrobial</td>
</tr>
<tr>
<td>Indigestion</td>
<td>Antimutagenic</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>Anxiolytic</td>
</tr>
<tr>
<td>Flatulence</td>
<td>Sedative</td>
</tr>
<tr>
<td>Dysentry</td>
<td>Neuro-protective</td>
</tr>
<tr>
<td>Ulcer</td>
<td>Antihypertensive</td>
</tr>
<tr>
<td>Epptizer</td>
<td>Diuretic</td>
</tr>
<tr>
<td>Carminative</td>
<td>Antidiabetic</td>
</tr>
<tr>
<td>Cough</td>
<td>Gut modulatory</td>
</tr>
<tr>
<td>Bronchitis</td>
<td>Lead detoxifying</td>
</tr>
<tr>
<td>Aphrodisiac</td>
<td><em>Phytother Res 2013; 27:1439-5</em></td>
</tr>
</tbody>
</table>
**Piper nigrum (black pepper)**

**Medicinal Uses:** appetizer

- Constipation,
- Diarrhea,
- Indigestion
- Dyspepsia

**Acts through multiple pathways**

- ACh $\uparrow$
- CCB $\downarrow$
- Opioid agonist $\downarrow$

Mehmood & Gilani  
*J Medicinal Foods* 2010, 13:1086-1096
Curcuma longa (Turmeric) (Ammon & Wahl, 1991; Srimal, 1997; Khanna, 1999) (Gilani et al., 2005; *Life Science* 76: 3089-3105)

Scientific studies: (Curcumin)

- Wound Healing
- Antitumor, Antioxidant
- Antibacterial
- Antifungal
- Anti-inflammatory
- Hepatoprotective
- Antidiabetic
- Antiplatelet, Neuroprotective
- Bronchodilator
- Antispasmodic (CCB, PDEI)
*Nigella sativa* seeds (Kalonji) (Thymoquinone)

Antidiabetic, **Antihypertensive**, Diuretic, Antilipemic, Antifertility
**Antiasthmatic**, **Antispasmodic**
Antimicrobial, **Antifungal**, Anthelmintic Anticancer,
Antioxidant, Immun-omodulator,
Analgesic, **Anti-inflammatory**, Hepatoprotective, Renal protective,

Gilani et al., 2004; *PJBS* 7: 441-451
Black Seeds (0.9g) + Turmeric (1.6g)

TC, TG, LDL, HDL, FBG, CRP, BF %, weight

Nuts

Healthy Almond Nuts

- Benefits Diabetes
- Healthy Teeth
- Healthy Heart
- Strong Bones
- Increase Energy
- Improve Brain Function
- Nourish Nervous system
- Alkalize the body
- Prevent Gall Stones

Eat More Walnuts

- Expands memory retention
- Slows the progression of rheumatoid and osteoarthritis
- Fights breast and prostate cancer
- Lowers cholesterol levels
- Lowers risk of diabetes
- Protects against retinopathy and age-related macular degeneration
- Encourages production of serotonin to help you eat less
50 - 60% fat

30% carbohydrate

90% MUFA

Vitamin E

Fiber

Riboflavin

niacin

Flavonoids

Polyphenols

US-FDA (2002): “1.5 oz of almonds have potentials of significantly reducing CVD risk” **


Jamshed and Gilani, 2014

Journal of Nutrition 144:1768-74
This study of PhD student from AKU occupied place on the front page of Journal (top ranked in Nutrition with IF 4)
PhD Thesis at AKU - From Bench to Bed


Jamshed H, Sultan, FAT, Iqbal, R, **Gilani AH**. 2015. A randomized controlled clinical trial showing HDL-raising efficacy of almonds in Coronary Artery Disease patients. *Journal of Nutrition* 145 (10), 2287-2292
Flavonoids

Flavonoids, compounds that occur in a variety of foods could also possibly reduce the risk of cardiovascular diseases.

One glass of juice lowers BP.
Eating Natural

“Eat of the good and wholesome things but indulge in NO excess therein”

Quran, Chapter 20, verse 81
Whole grains .. A University of Minnesota study suggests the more whole grains you eat, the lower your odds of death by 15%. Whole grains contain anticancer agents and help stabilize blood sugar and insulin, which may promote longevity. Whole-grain, Brown breads, cereals such as All Bran, and "old fashioned" oatmeal are an excellent source
Obesity and Traditional Diet


Adherence to the Traditional Mediterranean Diet is inversely Associated with Body Mass Index and Obesity in a Spanish Population (vegetables, fruits, pulses, nuts, fish Meat, Cereals, & Olive Oil)

*Journal of Nutrition*, 2004: 134: 3355
Olives in Cardiovascular Disorders

Olive oil is known to be useful in 
**hypertension** and **atherosclerosis**
and also **improves endothelial function** (Ruiz-Gutierrez et al. 1996; Ferrara et al., 2000; Herrera et al., 2001; Stark and Madar, 2002).

It is rich in **antioxidants and unsaturated fatty acids**

More recent studies revealed that the BP lowering effect of olives is linked with the presence of **calcium channel blocking** constituents (Gilani et al. 2005)

Vitamin C protects against hypertension and stroke (Ness et al., 1996)

It improves vascular endothelial function (Ettarh et al., 2002).

It also possess Lead Detoxifying Potential (Gilani et al., 2005)
Stevia rebaudiana

A non-caloric Sweetener

Stevioside
Palla AH, Iqbal NA, Minhas K, Gilani AH. 2016. Multiple cytokine modulation coupled with antioxidant and anti-inflammatory activities are the basis of Flaxseed’s effectiveness in acetic acid induced colitis in mice. *International Immunopharmacology*
Health Benefits of Bananas

- Anti-diarrheal (green bananas)
- Provide energy
- Help with hangovers
- Help circulation
- Fight infections
- Protect skin against damage from UV-light
- Anti-ulcer
- Suppress prostate-gland enlargement
- Suppress Oxalate kidney stones (stem extract)
- Anti-diabetic
- Enhance nutrient absorption
- Fight obesity
- Heartburn remedy

- Help maintain regular heartbeat
- Reduce risk of stroke
- Reduce symptoms of nicotine withdrawal
- Lower blood pressure
- Help body deliver oxygen to the brain
- Fights depression and anxiety
- Reduce menstrual pains
- Reduce itches and pains of bug bites (peel)
- Anti-inflammatory
- May prevent kidney cancer
- Help curb sugar cravings
- Prevent age-related macular degeneration
Tea .. Green tea is a rich source of flavonoids and antioxidants and helps to prevent many chronic diseases
- Chamomile Tea
- Hibiscus
- Cinnamon
- Apple Tea
- Mint Tea
- Thyme
- Green Tea
- Ginger Tea
Honey: Full of healing

Wound Healing
Antibacterial & Antifungal
Build Immunity and useful in:
Colds and Cough
GI & CVS Disorders
Obesity (morning drink with lemon)
Conjunctivitis, diarrhea
Debility, Fatigue and exhaustion
Insomnia (with Milk at bedtime)

Pipicelli1 and Tatti (2009) Health 1 (2): 281-283
MANUKA HONEY BENEFITS

- Anti-bacterial
- Anti-inflammatory
- Defends against infections
- Colds & Flus
- Promotes digestive health
- Soothes sore throat
- Reduces inflammation of stomach & intestines
- Reduces high cholesterol
- Minor wounds and burns
- Eye, ear and sinus infections
- Diabetes
- Gingivitis

The possible side effects of Manuka honey are:
- Allergic reaction, especially in people who are allergic to bees
- Risk of a rise in blood sugar
- Possible interaction with certain chemotherapy drugs
Legumes

Protein Requirement

10 Health Benefits of... Lentils
1. Lowers Cholesterol
2. Improves Heart Health
3. Stabilises Blood-Sugar
4. Protein Rich
5. Boosts Energy
6. Good for Weight-Loss
7. Low Fat
8. Low Salt Content
9. Alkalising
10. Easy To Digest

10 Health Benefits of... Red Beans
1. Iron Rich
2. Full of Fibre
3. Protein Rich
4. Anti-Oxidant
5. Boost Energy
6. Low GI Index
7. Protect Cells
8. Reduce Cancer Risk
9. Stabilises Blood-Sugar
10. Lowers Heart-Attack Risk

10 Health Benefits of... Peas
1. Prevents Stomach Cancer
2. Good Source of Protein
3. Regulates Blood Sugar
4. High in Micronutrients
5. Aids Liver Function
6. Immune Booster
7. Low Calories
8. High in Fibre
9. High Energy
10. Anti-Aging

EatHealthyLiveFit.com
FIGS HEALTH BENEFITS

- Reduce the risk of breast cancer & colon cancer.
- Reduce cholesterol.
- Prevent high blood pressure and heart attack.
- Help cure diabetes.
- Reduce fatigue, improve brain memory and prevent anemia.
- Helpful for treating chronic constipation.
- Hemorrhoids cure.
- Mashed figs acts as an excellent skin cleanser and helps in preventing and curing acne.
- Rich in calcium.
- Treat sexual weakness.
- Helps get rid of sleep disorders such as insomnia.
Health Benefits of Dates

- Home remedy for heart
- Home remedy for constipation
- Home remedy for Intestinal Disorders
- Home remedy for over stimulating
- Home remedy for bones
- Home remedy for sexual weakness

Here's Why Dates are Good for Your Health

**Nutrients**
- Dietary Fiber: 32%
- Carbohydrate: 25%
- Calories: 14%
- Protein: 5%
- Fat: 1%

**Vitamins**
- Vitamin B6: 8%
- Niacin: 6%
- Folate: 5%
- Riboflavin: 4%
- Vitamin K: 3%

**Minerals**
- Potassium: 19%
- Magnesium: 13%
- Copper: 10%
- Magnesium: 11%
- Iron: 6%

- Prevent abdominal cancer
- Maintain healthy weight
- Promote healthy bowel movements & control diarrhea
- Great energy booster
- Strengthen the bones
- Boost the nervous system & increase sexual stamina
- Provide energy for anemic patients
- Reduce the risk of stroke
- Diminish allergic reactions
- Lower night blindness

* % Daily Value per 100g. For e.g. 100 g of dates provides 22% of daily requirement of Dietary Fiber.
Dairy Products: Are they Harmful?
Organic Foods and Entrepreneurship

% LDL > % LDL
Using waste for Organic Purpose

Nothing is purposeless

- Kitchen Garbage – for Kitchen Gardening
- peel/Skin of different fruits/vegetables
  - Onion
  - Apple
  - Almonds
  - Wheat Bran (more than a fiber)
  - Oranges
  - Save Sewerage Water (underground Tank)
Gross Comparison

Kelvin Carter

1994 Sudan Pulitzer Prize
A habit of overeating is a slow poison, as it leads to OBESITY, a root cause of multiple diseases.

“All substances are poison; there is none which is not a poison. The right dose differentiates a poison and a remedy"

Paracelsus (1493-1541)
Health in Islamic Perspective

Islam encourages Muslims to ensure that they are mindful of their health.

The blessed Prophet said:

Take care of health, before illness afflicts you.

He also encourages Muslims to adopt a Healthy Life Style that includes:

A balanced food, regular mental and physical exercise and keep balance between material and spiritual needs.
Prophet Mohammad said: Eat Less

*Stop eating before stomach is full*

“The children of Adam fill no vessel worse than their stomach. Sufficient for them is a few morsels to keep his back straight. If he must eat more, then one third should be for his food, third for drink and third left for air”

Bukhari
FASTING: A Perfect Way to address Obesity

If observed in its true sense it ensures what is required to control obesity and maintain good health:

- Self discipline
- Diet control
- Physical activity
- Relaxation [high spiritual connections]
- Charity [power of giving]

(Caloric restriction sharpens memory & prolongs life)
Learn from Animals
They eat only when hungry
THANK YOU

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www.pcest.org.pk

“Have faith in your own ideas, even if everyone tells you they are wrong”

Abrham Lincoln
(16th President of USA, 1861 – 1865)
Plants to Medicine

University of Agriculture, Faisalabad 1970-78

- Faculties of Sciences (F.Sc) 1970-72
- Agriculture (B.Sc Hon) 1972-75
- Animal Husbandary (Major) 1975-76
- Veterinary Sciences (MSc Hon) 1976-78
  (Member UAF Football Eleven) (1973-76)
- Pharmacy (Lecturer, BZ Univ. Multan) 1979-86

- Univ. of Sydney, Australia (PhD-Pharmacology 1981-85)

- Medical College (Aga Khan University) 1986-date
  (Senior Instructor, Assistant Professor 1986-1997
  Associate Professor, Full Professor)
- HEJ Res Inst Chem (Adjunct Professor) 1995-date
- HEC Distinguished National Professor 1994-date
Herbal Formula

- Lemon
- Ginger
- Honey
- A glass of luke-warm water empty stomach
Believe in old saying

Prevention is better than Cure