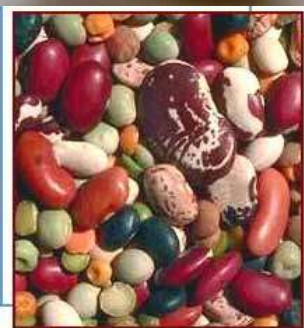
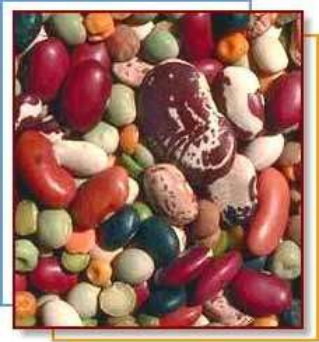


Functional Foods





Functional Foods are “Super Foods”

- Beans
- Berries
- Cruciferous vegetables
- Chocolate
- Citrus fruits
- Pumpkin
- Fish
- Soy
- Spinach
- Sweet Potatoes
- Tea
- Tomatoes
- Nuts
- Whole grains
- Yogurt

Which ones do you eat regularly?



Other Food Trends

Pomegranate
Quinoa
Chia Seeds
Tomatoes (lycopene)
Green Tea Extract
Raspberry Ketones
Coconut Water
Green Coffee Beans
Energy Drinks (e.g. Red Bull)
Ancient Grains
Kale
Gluten-Free Products
Acai Berries
Protein Shakes / Smoothies
Avocados
Coconut Oil
Stevia
Inulin
Dragonfruit
Flax Seeds
Greek Yogurt
Probiotic Yogurt
Flavoured Water (e.g Mio, Vitamin Water)
“All Natural” Lunchmeats (e.g Natural Selections)

**Which of
these have
you heard
about?**

**What have
you heard?**

Key Terms

Functional Food — a food that can help to promote health in humans

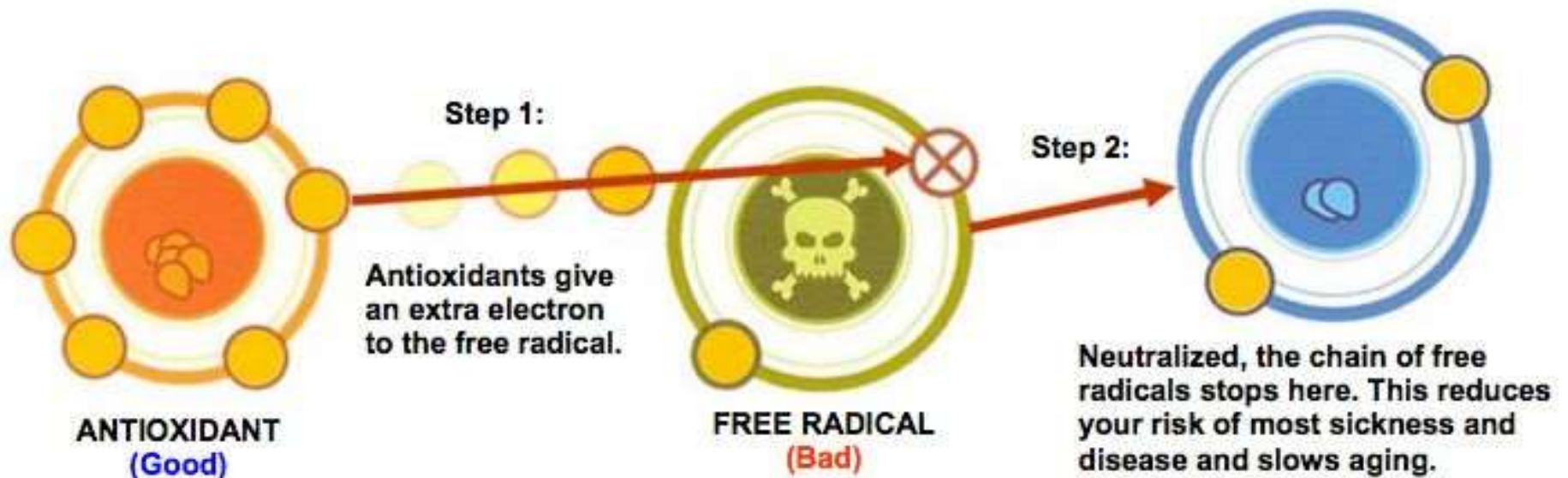
Polyphenols — chemicals found naturally in many plant products that act as antioxidants which prevent free radical damage in the body.

Flavonoids — water-soluble plant pigments (from colourful vegetables and fruit) that are beneficial to human health.

Antioxidants — natural chemicals found in foods that helps to prevent degradation due to free radicals (rebellious ions).

Free radicals- unstable atoms that can damage cells, causing illness and aging. **Free radicals** are linked to aging and a host of diseases, but little is known about their role in human health, or how to prevent them from making people sick.

Bioavailability — the degree to which the human body can make use of a substance once it has been ingested.



<https://www.youtube.com/watch?v=IG3OOXIXvxw>

EAT A RAINBOW

For Health!

[Facebook.com/livelovefruit](https://www.facebook.com/livelovefruit)

RED

To improve heart & blood health & support joints



ORANGE

To prevent cancer & promote collagen growth



YELLOW

Helps your heart, vision digestion & immune system



GREEN

Powerful detoxers, fight free radicals, improve immune system



BLUE/PURPLE

Improve mineral absorption, powerful antioxidants



WHITE

Activate our natural killer cells & reduce cancer risk



Dr. Oz and Superfoods

- [Dr. Oz and Super Foods](#)
- <https://www.youtube.com/watch?v=6v47cZ769aQ>



Beans

Nutritional Value

- Dry beans or legumes are inexpensive and healthy
- Cooked beans are low in calories, loaded with complex carbohydrates, and contain little fat.
- In addition, beans are good sources of B vitamins, potassium, and fiber, which promotes digestive health and relieves constipation.

Introduce beans into your diet gradually.

Beans count as a substitute for meat.

A good tip would be to replace meat with a bean entrée twice a week.





Beans

- The demand for bean products is growing because of the presence of several health-promoting compounds in edible bean products known as **saponins**, which are naturally occurring compounds widely distributed in all cells of legume plants.
- Clinical studies have suggested that saponins have the ability to:
 - Help protect the human body against cancers
 - Lower cholesterol
 - Lower blood glucose responses

In epidemiological studies, **saponins** have been shown to have an inverse relationship with the incidence of kidney stones.



Berries

An Overview



- Berries are one of the nation's most well liked fruits.
- Berries are believed to have been first incorporated into the diets and lifestyles of Native Americans.
- Traditionally, when we think of berries, we think of things like blueberries, strawberries, raspberries, and blackberries, but there are also other varieties such as cranberries, boysenberries and gooseberries .

Berries

Nutritional Value

- Many berries are suitable to eat raw after rinsing and most types of berries vary from 50 to 100 calories per serving when eaten raw.
- Berries are loaded with: vitamin C, potassium, and fiber.
- All berries **with strong red** and **blue colors** have **phytochemicals** that can potentially reduce cancer rates and other chronic diseases.
- Oxygen radical absorptive capacity (ORAC), is a way to measure the antioxidant capacity of fruits and vegetables.
- **Berries have some of the highest antioxidant levels of any fresh fruits!**



Berries

Strawberries

- Because of the antioxidant power found in strawberries, regular consumption of this fruit has been shown to have the potential to lower one's risk of heart disease.
- In addition, studies have shown that strawberries are involved in inhibiting enzymes. This reduces the response that is involved in etiology of many diseases.

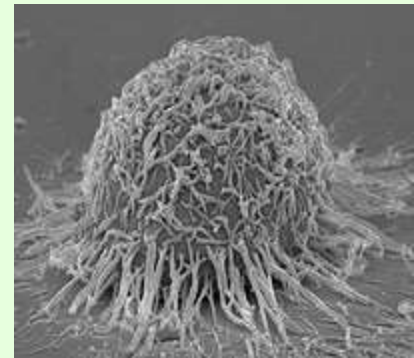




Strawberries

Recent Findings

- Studies on two antioxidant compounds in strawberries (**ellagic acid and quercetin**) have demonstrated that these substances:
 - Have anticancer activity
 - Work to block the initiation of **carcinogenesis**
 - Suppress progression and **proliferation of tumors**



Cruciferous Vegetables

Overview

- Cabbage, broccoli and Brussels sprouts are in the family of cruciferous vegetables.
- The health benefits associated with cruciferous vegetables has been attributed to their high concentration of **glucosinolates**.



Cruciferous Vegetables

Nutritional Value

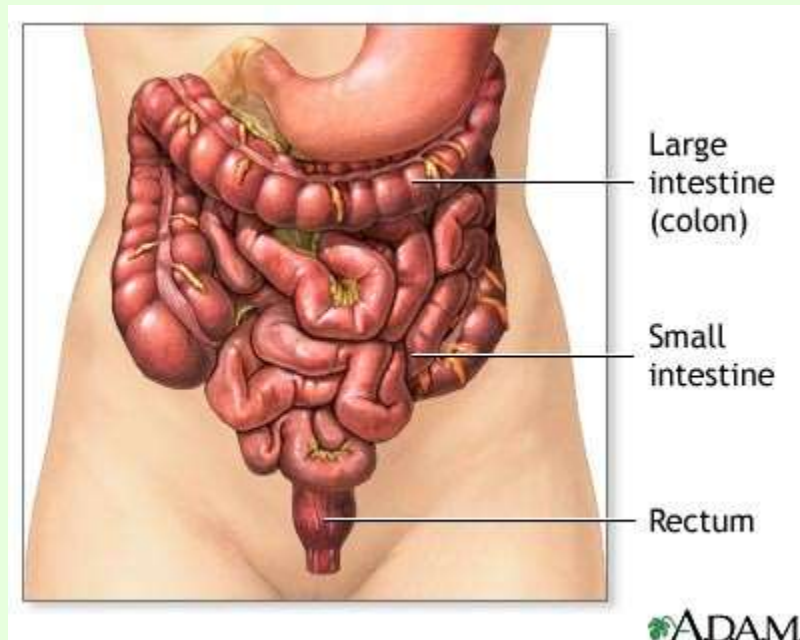
- Cabbage is one of the oldest vegetables around. It continues to be a dietary staple for many and is an inexpensive source of **vitamins A and C, and fibre.**
- Broccoli is a good source of:
vitamins A and C, potassium, folacin, iron, and fiber.
- It has as much calcium per ounce as milk!
- Brussels sprouts contain significant amounts of the **antioxidants vitamins A and C** and is a good source of fiber. This vegetable is also a good source of vegetable protein. However, this protein is not complete protein, and should be combined with whole grain and other protein foods.



Cruciferous Vegetables

Health Benefits

The consumption of cruciferous vegetables has been associated with a reduced risk of cancer of the lung, stomach, colon, and rectum.



Chocolate

An Overview

- Cocoa and chocolate are food products made **from cocoa beans**.
- Although consumed by the Olmecs, Mayans, and Aztecs long ago, cocoa beans were first introduced to the Old World in 1502 by Christopher Columbus when he brought them back to Spain.
- Over the past three decades, chocolate has been viewed more as a confectionary rather than as a medicine. In 2001-2002, the average world cocoa consumption was 1.17 pounds per person, with approximately \$73.2 billion dollars going to the confectionery market globally.





Antioxidant Capacity



- Cocoa powder and cocoa extracts have been shown to exhibit a high **antioxidant capacity**.
- When compared to several other flavanol-rich foods and food extracts, cocoa powder and cocoa extracts were found to exhibit a higher antioxidant capacity than:
 - Green and black tea
 - Red wine
 - Blueberries
 - Garlic
 - Strawberries



Cocoa Antioxidants & Disease

- The antioxidants found in cocoa enhance vascular function and decrease platelet stickiness and therefore influence the cardiovascular system beneficially.
- Several studies support the suggestion that the consumption of flavanol-rich foods, such as cocoa powders and dark chocolates, may be associated with a reduced risk for vascular disease.



Oranges



- Oranges are highly valued for their vitamin C content.
- They are the primary source of vitamin C for most Americans.
- However, oranges are also a good source of:
folacin, calcium, potassium, thiamin, niacin, and magnesium.
- The juice contains more vitamin C per serving than does the whole fruit.
- However orange juice does not contain fibre, whereas the fruit does.
- Oranges belong to a class known as “citrus fruits.”

Citrus Fruits

- Citrus fruits contain **phytochemicals** called **flavonoids**.
- The flavonoid hesperidin was first described about two centuries ago.
- Research throughout past years has confirmed that hesperidin is an anti-inflammatory agent used to treat many conditions. Hesperidin blocks an enzyme involved in an inflammatory reaction such as the release of histamine.



Citrus Flavonoids & Cancer



- Research has shown that citrus flavonoids and their metabolites are potent antioxidants. It is believed that they are able to suppress many of the events of cancer and inflammation which involve reactive oxygen species.
- Some of the flavonoids in citrus fruits such as **tangerine** and **orange** are the most potent cancer fighting compounds, particularly against **lung and prostate cancer cells**.

Pumpkin

Benefits



- Pumpkins are loaded with an important **antioxidant, beta-carotene**, and are a good source of **potassium**.
- Beta-carotene is one of the plant carotenoids converted to vitamin A in the body.
- Foods high in beta-carotene are believed to:
 - Offer protection from the development of cancer
 - Offer protection against heart disease

Pumpkin

Benefits

- Pumpkin seeds and oil are also dietary sources of the **omega-3 fatty acid**, alpha-linolenic acid.
- There is strong evidence which supports the beneficial effects of alpha-linolenic acid in the prevention of **cardiovascular disease (CVD)**.



Fish

Overview

Omega-3 fatty acids are found in oily fish like salmon and flaxseed and canola oils



- Over 30 years ago, Danish researchers found that the lower rates of heart disease found in Greenland Eskimos were associated with their higher intake of seafood, particularly cold water fish.
- There are two classes of essential fatty acids: **omega-3** and **omega-6**.
- Fish oil is the most significant source of dietary omega-3 fatty acid, and it consists of both: **eicosapentaenoic acid (EPA)** and **docosahexaenoic acid (DHA)**.

Which Kinds and How Much?

Fatty Fish have the highest levels of omega-3 FA

- Fish is a good source of protein and low in saturated fat. The following types of fish are especially good sources of omega-3 fatty acids:



- **Mackerel**
- **Lake trout**
- **Herring**
- **Sardines**
- **Albacore tuna**
- **Salmon**

The American Heart Association recommends eating fish (particularly fatty fish) at least two times per week.

Fish Oil & CVD

- Numerous observational studies have shown that omega-3 FA enriched diets are associated with a reduction of:
 - **Cardiovascular mortality**
 - **Heart attack**
 - **Sudden death**
- In several studies, a higher fish intake was associated with a decreased incidence of **coronary artery disease (CAD) and cardiovascular mortality.**



Overall, it has been shown that a minimum of one fish meal per week translates to a 52% reduction in sudden cardiac death.

Fish Oils & Rheumatoid Arthritis

- Over 15 clinical trials and 2 meta-analyses favor the use of fish oil in patients with rheumatoid arthritis (RA).
- A double-blind placebo controlled trial showed that fish oil supplementation of 130 mg/kg of body weight each day decreased the following in the control group:

- **Number of stiff joints**
- **Duration of morning stiffness**
- **Pain**
- **Global arthritis activity**



Increased fish oil intake allows some with RA to reduce or even eliminate the use of non-steroidal anti-inflammatory drug (NSAID) use.

Soy

An Overview

- There is a growing recognition of the health effects of soy on cholesterol levels.
- A recent U.S. survey revealed that 76 percent of consumers considered soy products to be healthy.
- In 1999, the Food and Drug Administration (FDA) approved a health claim for the cholesterol-lowering properties of soy protein.
- One year later, the American Heart Association (AHA) recommended that patients with elevated cholesterol should include soy protein foods in their diets.



Adding Soy into the Diet

- **A daily intake 25 grams of soy protein per day is considered beneficial.**
- Most don't realize it, but a lot of foods that are eaten every day contain soy.
- The ingredient lists of several commonly consumed food items show that soybean oil is high on the list: mayonnaise, margarines, salad dressings, and vegetable shortenings.

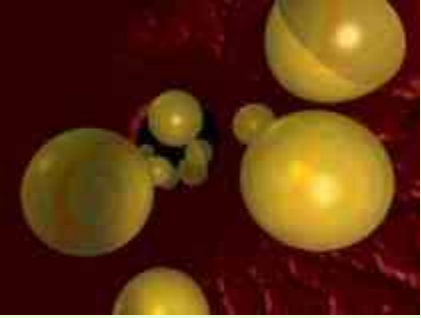




Soy Isoflavones

Benefits

- Soy has **phytoestrogens** called isoflavones. Two of the most common ones are **daidzein and genistein**.
- Soy isoflavones are believed to play a role in prostate cancer, where supplementation with isoflavones has shown a reduction **in prostate cancer** risk in studies.
- Soy **isoflavones**, and possibly soy proteins as well, are believed to play a role in bone health.



Soy Protein

Benefits

- There is also the biologically active non-isoflavone component of soy that has received much attention in past years— soy protein.
- The protein part is believed to be responsible for the additional benefits seen from soy consumption, which are:
 - **Cholesterol-lowering effects**
 - **Blood pressure-lowering effects**
 - **Reduction of cancer risks**
 - **Favorable effects on kidney function**



Spinach

- Spinach is one of the most important antioxidative vegetables and is consumed either fresh or cooked.
- Spinach is composed of various active compounds, such as **flavonoids** and **other polyphenolic active** ingredients. These compounds are believed to act in combination with one another as:

- **Anti-inflammatory agents**
- **Antioxidative agents**
- **Anticancer agents**



Spinach

Active Components

- The active compounds are believed to be highly available to the body.
- A powerful, water-soluble, **natural antioxidant mixture (NAO)** was identified in spinach leaves, which contains its main active compounds.
- NAO is stable at high temperatures and is nontoxic. It is used in studies of chemoprevention and dietary intervention in humans.





Sweet Potatoes

- Sweet potatoes are believed to have been first cultivated in 1648 in the U.S.
- Today, in the South sweet potatoes are generally preferred to Irish potatoes as a staple food. In the North, the reverse is true.
- The sweet potato blends with herbs, spices and flavorings producing delicious dishes of all types. From processed baby foods to the main dishes, casseroles, salads, breads and desserts, sweet potatoes add valuable, appetizing nutrients and color to any meal.



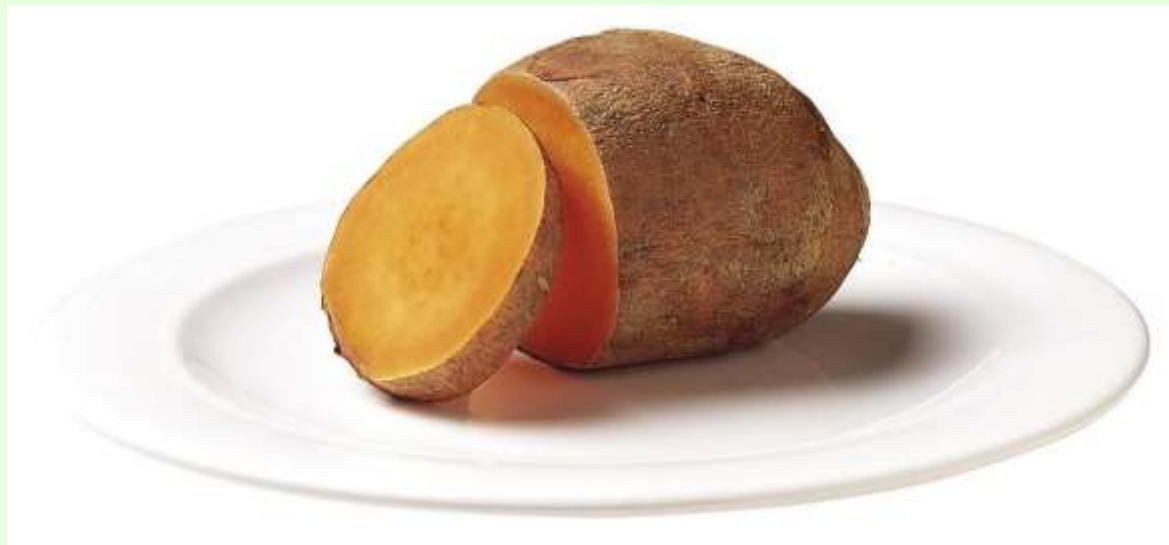
Sweet Potatoes

Nutritional Value

- One baked sweet potato (3 ½ ounce serving) provides about twice the recommended daily allowance for vitamin A.
- One baked sweet potato contains only about 140 calories and this nutritious vegetable provides:
 - **42 percent of the Recommended Daily Allowance (RDA) for vitamin C**
 - **6 percent of the RDA for calcium**
 - **10 percent of the RDA for iron**
 - **8 percent of the RDA for thiamine for healthy adults.**

Sweet Potatoes

- It is low in sodium and is a good source of fiber and other important vitamins and minerals.
- Because sweet potatoes are a good source of **beta carotene**, consumption of this food is likely to help reduce your risk of **certain cancers**.



Tea

- Tea, in the form of green or black tea, is **one** of the most widely consumed beverages in the world.
- Although its consumption does vary from place to place, it is believed to be second only to water.
- Black tea is consumed predominantly in Western countries, along with some Asian countries, **whereas green tea is consumed predominantly in China**, Japan, India, and a number of countries in north Africa and the Middle East.



Green Tea

Overview



- Green tea comes from the mature leaves of the plant and is sold as either fresh or dried unfermented leaves.
- The very early shoots are highly sought after and from these, white tea is made.
- Total **polyphenols** in these early shoots comprise about 20-30% by weight, 60 to 80 percent of which are catechins.
- Mature leaves naturally contain lesser amounts of catechins than do the early leaves, and with the processing of green tea, the concentration is further decreased (~15%).

Black Tea

Overview

- Unlike green tea, the preparation of black tea requires fermentation.
- During this process, catechins in black tea are partially converted to **theaflavins**.
- A less extensive fermentation leads to a lighter flavored tea, called oolong tea.
- Therefore, of the teas mentioned, **white tea has the highest concentration of catechins** (an antioxidant), followed by green tea, oolong tea and, lastly, black tea.



Green Tea

Health Effects

- The catechins found in green tea have been shown to possess biological activity which may be beneficial in the **prevention and treatment of various forms of cancer.**

Green tea is also believed to exhibit beneficial effects on the following:

Arthritis Bone Density Stress

In addition, it has also found to exhibit:

**Antiviral properties
Anticariogenic effects (protects
bones and teeth)
Ultraviolet skin protection**





Tomatoes

Overview

- **Lycopene** is the pigment principally responsible for the **deep-red color** of ripe tomato fruits and tomato products.
- Tomato products, including ketchup, tomato juice, and pizza sauce, are the richest sources of lycopene in the U.S. diet, accounting for > 80% of the total lycopene intake of Americans.
- The consumption of tomatoes and tomato products containing **lycopene** have been shown to be associated with decreased risk of chronic diseases like **cancer and cardiovascular diseases** in several recent studies.

Tomatoes and Prostate Cancer

HPFS Study

- In 1995, a study was conducted examining the relationship between the intake of various carotenoids, fruits, and vegetables and the risk of prostate cancer.



- Of the 46 fruits, vegetables, and related products that were analyzed in the study, only four were significantly associated with a lower prostate cancer risk.



- Of these four, tomato sauce, tomatoes and pizza sauce, but not strawberries, were primary sources of **lycopene**.



Processed or Fresh Tomatoes?



- Studies have found that tomato paste and other processed products are even more effective than fresh tomatoes preventing **prostate cancer**. This seems to be in contrast to the messages that we hear, of consuming fresh fruits and vegetables whenever possible for maximum health benefits.
- However, numerous studies have revealed that tomato processing actually increases the bioavailability of lycopene to humans. This is because processing converts much of the trans-form of lycopene found in fresh tomatoes into the cis- form, which is much more readily taken up in humans.



Tomatoes and Other Effects

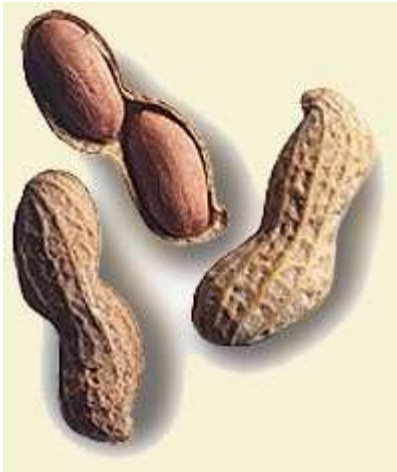


- The evidence suggests that the anti-proliferative properties of lycopene **extend it's effects to other types of cancer**, beyond just that of prostate cancer.
- In addition, lycopene may be useful in **preventing heart disease**.
- Studies have shown that lycopene inhibits cholesterol synthesis and enhances the breakdown of the bad cholesterol, low-density lipoprotein (LDL).

Nuts

Overview

- In 2003, the U.S. FDA approved this package label:
 - “Scientific evidence suggests but does not prove that eating 1.5 ounces per day of most nuts, as part of a diet low in saturated fat and cholesterol, may reduce the risk of heart disease.”
- According to FDA, “Types of nuts eligible for this claim are restricted to almonds, hazelnuts, peanuts, pecans, some pine nuts, pistachio nuts and walnuts..”



Nuts

Nutritional Value

- Nuts are important for what they don't offer:
 - 1. Nuts do not contain cholesterol.
 - 2. Nuts only contain trace amounts of sodium.(Unless it has been added to the nuts during processing)



- Nuts are usually thought of as a high fat food. Although, this is true—
nuts are high in fat-- it is not the same as animal fat. Nuts are mostly high in heart-healthy unsaturated fats, the fats that lower your bad cholesterol.



The Importance of Specific Nuts

- **Walnuts**
 - One ounce of walnuts (about 14 shelled walnut halves) is all that is needed to meet the 2002 dietary recommendations for **omega-3 FA**. The type of omega-3 FA found in walnuts is **alpha-linolenic acid**, which can be transformed into either EPA or DHA in humans and animals.
- **Almonds**
 - One ounce of almonds (about 20-24 shelled whole almonds) provides 35% of the daily value for **vitamin E**.
- **Peanuts**
 - Although it is often discussed with nuts, peanuts are actually a legume, along with dry beans, peas and lentils. One ounce of roasted peanuts provides about 10% of the daily value for **folate**.





The Importance of Specific Nuts

- As discussed earlier, **omega-3 fatty acids** (alpha-linolenic acid found in walnuts and other sources included) help to decrease one's risk for CVD.
- **Vitamin E** is an antioxidant and is important in that it is believed to help promote healthy aging. A recent study has also suggested that a diet rich in foods containing vitamin E may help protect some against the development of Alzheimer's disease.
- **Folate** is a B vitamin that has been recognized for some time now, particularly for women of childbearing age, as it is believed to help reduce the incidence of birth defects and lower the risk of heart disease.



Whole Grains

An Overview

•As defined by the 2005 Dietary Guidelines for Americans, a whole grain is a grain that contains the entire grain kernel:

- Outer bran layer
- Endosperm
- Inner germ layer

The *outer bran layer* is rich in B vitamins and phytonutrients such as flavonoids and indoles, along with a small amount of protein. The *endosperm* is predominantly carbohydrate, and the *germ layer* is concentrated with minerals such as iron and zinc, along with the antioxidant vitamin E.

Grains

The Milling Process

- The milling process, which removes both the bran and the germ, determines how much of the whole grain is retained. It impacts the nutritional value of the end product.
- A *refined grain* is a grain that has been milled. Milling has negative effects in that it takes dietary fiber, iron, and many B vitamins from the grain.
- To make up for this loss of nutrients during the milling process, most refined grains are *enriched* after processing, where certain B vitamins (such as thiamin, riboflavin, niacin, and folic acid) and iron are added back. However, the fiber content of the original grain is not restored.

Whole Grains

How Much?

- Benefits associated with whole wheat foods can be achieved at relatively low levels of intake (between 2 and 3 servings/d).
- However, the consumption of whole wheat foods in some Western countries has been noted to be *less than one serving per day*, which is equivalent to less than one slice of whole wheat bread per day.



2005 Dietary Guidelines for Americans

“Make Half Your Grains Whole”

The new recommendations for Americans tell us that half of the grains we consume daily should be *whole grains*.

Why is this Important?

Because regular consumption of whole grain foods has been associated with a reduction in:

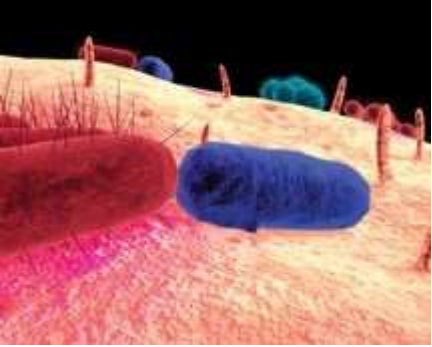
- Incidence of cardiovascular disease
- Incidence of diabetes
- Cancer mortality at certain sites
- Premature death



Yogurt

In recent years, many studies have been published on the health effects of yogurt and the bacterial cultures used in the production of yogurt.

- The lactic acid-producing bacteria (LAB) used in the U.S. include **Lactobacillus and Streptococcus species**.
- Dairy products are generally considered an excellent source of **high-quality protein, calcium, potassium, phosphorus, magnesium, zinc, and the B vitamins riboflavin, niacin, vitamin B-6, and vitamin B-12**. However, the final nutritional value of yogurt depends on several factors.



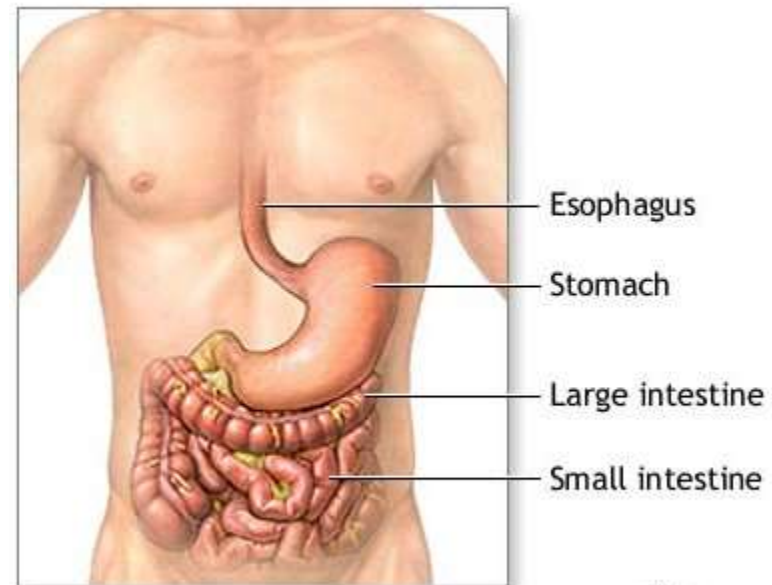
Yogurt as a Probiotic?

- In 2002, a definition was proposed by the Joint Food and Agriculture Organization/World Health Organization Working Group. They state that a probiotic is a:
 - “Live microorganism which when administered in adequate amounts confer a health benefit to the host.”
- Current scientific concepts agree that yogurt cultures are probiotics if two criteria are met:
 - 1. A beneficial physiological effect can be obtained by consumption of the live cultures
 - 2. The benefit has been sustained appropriately in human studies.



Benefits of Yogurt

- The benefits of yogurt and LAB on gastrointestinal health have been explored mainly in animal models and, occasionally in human subjects as well.
- In some studies using yogurt, individual LAB species, or both, promising health benefits were found for individuals with:
 - Lactose Intolerance
 - Constipation
 - Diarrheal diseases
 - Colon Cancer
 - Inflammatory Bowel Disease (IBD)
 - *Helicobacter pylori* infection
 - Allergies



Can You Imagine...



Conclusion

Functional foods need to become the "pharmacy" for disease prevention as well as management to extend and complement our current health-care system, with the added benefit of dramatic reductions in costs. Government leadership in launching evidence-based functional foods with natural nutraceutical components into our health-care system is desperately needed in Canada.

-Bruce Holub, University of Guelph