Preventing Cancer Recurrence

Nutrition and Supplement Toolbox
Peggy A Wright, PhD, RD, CNS
Martin P Albert, MD
Cancer Promoting Diets

- An estimated more than 30–40% of all cancers can be prevented by lifestyle and dietary measures alone.
- Contributors from Standard American Diet (SAD):
  - Excess calories
  - Impaired glucose metabolism (Obesity, nutrient-poor foods such as concentrated sugars and refined flour products)
  - Low fiber intake
  - Low fruit and vegetable intake
  - Consumption of red meat
  - Excess of omega-6 relative to omega-3 fats
When a diet is compiled according to the guidelines here it is likely that there would be at least a 60-70 percent decrease in breast, colorectal, and prostate cancers, and even a 40-50 percent decrease in lung cancer, along with similar reductions in cancers at other sites.

How diet affects our risk of cancer

- Cancer initiators (carcinogens)
- Cancer promoters
- Foods and nutrients that decrease risk
- Foods and nutrients for specific cancers
- Supplements
Alcohol
Broiled meats
Pickled foods
Smoked and preserved meats
High temperature baked or fried starchy foods

DIETARY CARCINOGENS
(CANCER INITIATORS)
A 2011 European study found that alcohol intake accounted for 1 in 10 cancer cases in men and 1 in 30 for women who tend to drink less.

Acetaldehyde, a product of alcohol metabolism, impairs a cell's natural ability to repair its DNA, resulting in a greater likelihood that mutations causing cancer initiation.

May result in overexpression of certain oncogenes in human cells, triggering cancer promotion.

Acts as a “co-carcinogen.”
Heterocyclic Amines and Poly Aromatic Hydrocarbons (PAHs)

- Formed naturally upon overcooking of meats, poultry and fish
- Formed in smoked and charbroiled meats
- Epidemiology suggests association with human breast, colon, and prostate cancer.
Acrylamide

- Formed when starchy foods are baked or fried at high temperatures
- Considered a cancer-causing chemical by the Office of Environmental Health Hazard Assessment
- Package warnings are required by law in California
- By how much do the chips exceed the level required by California for warning?
  - Cape Cod Robust Russet: 910 times
  - Kettle Chips (lightly salted): 505 times
  - Kettle Chips (honey dijon): 495 times
  - Pringles Snack Stacks (pizza-flavored): 170 times
  - Lay's Baked: 150 times
- Other sources are French fries and cigarette smoke.
Alcohol
Red meat (high heme iron)
Trans fats
Estrogens in full-fat dairy products
High glycemic diets (sugar and refined carbohydrates)
Low nutrient diets

DIETARY CANCER PROMOTORS
Alcohol

Breast
The Nurses' Health Study found that drinking as little as half a drink a day increased a woman's breast cancer risk by 30%.

Colon
2 drinks/day –64% increase risk in men; 84% increase in women.

Nutrient deficiencies
- Folic acid
  - Needed to detoxify harmful estrogen metabolites.
  - Need to repair DNA damage
- Zinc
  - Healthy immune system
Estrogens in U.S. Dairy Products

- Milk and dairy supply 60-70% total estrogen intake from food
- Increased estrogen intake due to change in farming practices
- 33x more estrone sulfate in milk from pregnant than non-pregnant cows.
- Goat milk contains less estrogen
- BGH given to cow’s to increase milk production
  - Adults with high milk intake showed 10-20% increase in circulating IGF-1
  - IGF-1 can function as a growth factor for cancers.
- Buttermilk has highest amount of estrogen and more active estrogen
- Skim milk has the least estrogen and less active “conjugated” form
- Butter has highest amount
- Even organic cow milk is high in estrogen.
Red & Processed Meats

Breast cancer
- Estrogen
  - Estradiol and estrone levels of USA beef (3.8, 1.0) were 600 times and 10 times, respectively, higher than those of Japanese beef (0.0, 0.1).
  - Eating meat increases the body’s production of estrogens
- Increased inflammatory omega-6 fats (arachidonic acid)
- Inflammatory proteins

Colon cancer
- Not entirely clear how promotes.
- Compounds that may damage lining of gut and promote cancer
- Increased inflammatory omega-6 fats (arachidonic acid)
- Meat changes the bowel flora, which may affect the colon
Foods containing artificial trans fats may contain up to 45% of fat as trans fat.

Baking shortenings generally contain 30% of fat as trans fat.

Margarines not reformulated to reduce trans fats may contain up to 15% trans fat by weight.

Look for “partially hydrogenated ________ oil”

Made from: Unbleached Enriched Wheat Flour (Flour, Niacin, Reduced Iron, Thiamine Mononitrate [Vitamin B1], Riboflavin [Vitamin B2], Folic Acid), Dark Chocolate (Sugar, Chocolate Liquor, Chocolate Liquor Processed with Alkali [Dutched], Cocoa Butter, Butter Oil, Soy Lecithin, Vanilla Extract), Sugar, Vegetable Oils (Palm and/or Interesterified and Hydrogenated Soybean and/or Hydrogenated Cottonseed), Eggs, Contains 2 Percent or Less of: Cornstarch, Egg Whites, Dehydrated Skim Milk, Salt, Soy Lecithin, Natural Flavors and Leavening (Baking Soda).
Sugar and High Refined Carbohydrates

- Mediated by
  - Insulin and IGF-1 (growth factors)
  - Inflammation
  - Increased estrogen production (more active aromatase)
  - Decreased nutrients
    - Fiber
    - B-vitamins
    - Chromium
    - Phytonutrients
    - Zinc
• Inflammation and Oxidative stress
• Growth factors (IGF-1)
• Angiogenic signals (VEGF, PDGF, HIF-1alpha)
• Hormone balance
• Supporting immunity
• Supporting detoxification

MODIFYING THE TERRAIN THROUGH FOOD, SPICES, AND HERBS
Farm-acy versus Pharmacy

Anand P, Harikumar K and Aggarwal BB; Pharmaceutical Research, 2009
The Natural Farm-acy

- In traditional foods and herbs, there are a wide variety of active phytochemicals, including:
  - flavonoids, terpenoids, lignans, sulfides, polyphenolics, carotenoids, coumarins, saponins, sterols, curcuminoids, and isothiocynates
- which possess important actions in health promotion and disease prevention.
Phytonutrients: Mechanisms of Cancer Prevention

- Protect DNA from oxidation and consequent DNA breakdown
- Detoxification and removal of carcinogens
- Anti-inflammatory
- Insulin regulation
- Interfere with tumor cell operations
- Induce normal cell death (apoptosis) when DNA breakdown occurs
Multi- versus Mono-tasking

Multi-targeted

Inflammatory cytokines
IL-1, IL-2, IL-5, IL-6, IL-8, IL-12, IL-10, MIP-1, MIP-2, MIP-3, MIP-4

Enzymes
ATPase, ATPase, Desaturase, FPTase, GST, GCL, HO-1, iNOS, MMPs, NQO-1, ODC, PhPD, TIMP-3, 5-LOX, Telomerase

Growth factors
TGF β, FGF, HGF, PDGF, TF

Receptors
AR, AHR, CXCR4, DR, EGFR, ER-α, FasR, H2R, IL-8R, ITPR, IR, LD-R

Adhesion molecules
ELAM-1, ICAM-1, VCAM-1

Anti-apoptotic proteins
Bcl-2, Bcl-1, BAX-1

Protein Kinases
IKK, AAPK, Ca2+ PK, EGFR, ERK, FAK, IL-1 RAK, JAK, JNK, MAPK, Phk, PK, Pka, PKB, PKC, pp60-csrc, TK, PTK

Transcriptional factors
AP-1, β Catenin, CDS, CCA 1, CCA, HIF-1, Notch-1, NF-2, NF-κB, PPAR-γ, STAT-1, STAT-3, STAT-4, STAT-5, WGA-1

Others
Cyclin D1, Cyclin E, HsP 70, MDR

Mono-targeted

COX-2
Celecoxib

EGFR
Erbitux

TNF
Remicade Humira Enbrel

HER-2
Herceptin

Bcr-Abl
Gleevec

VEGF
Avastin

Tubulin
Paclitaxel

Topoisomerase
Camptothecin

Curcumin Targets

Kunnanakkara et al, CL, 2018
Anti-cancer Superfoods

- Cruciferous vegetables
  - Broccoli sprouts
  - Broccoli, bok choy, cabbage, collards, kale, etc.
- Berries
  - Blueberries, cranberries, strawberries, blackberries, bilberries, etc.
- EPA sources: wild caught salmon, sardines, herring, etc.
- Flax and sesame seeds
- Garlic and onions
- Green tea
- Mushrooms (white button, shitake)
- Pomegranate (juice concentrate)
- Tomato (cooked)
- Soy foods, natural
- Spices
  - turmeric, ginger, black cumin, cardamon, cinnamon, citrus peel, fennel, fenugreek, holy basil, cayenne pepper, black pepper
- Nuts
- Whey protein
Anti-cancer Vitamins & Minerals

- Vitamin D
- Selenium
- Folic acid
- B-2/Riboflavin
- B-6/Pyridoxine
- Carotenoids (α-carotene, β-carotene, lycopene, lutein, cryptoxanthin)
- Tocopherols, especially tocotrienols
- Zinc
- Vitamin C
- Vitamin K
• Cancer stem cells
• Cell regulation and apoptosis (p53)
• Bcl-2

TWEAKING THE CANCER CELL
Potential inhibitors of Cancer Stem Cells

- Vitamin D3
- Genistein from soy
- Sulforaphane from cruciferous vegetables
- Curcumin from turmeric
- Silibinin from milk thistle
- Resveratrol (mostly from Japanese knotweed)
- Piperine from black pepper
- Pomegranate extract
- Low inflammatory load
- Oxygenation of blood and tumor
  - Exercise, soy, grapeseed extract, EGCG (green tea), guggulsterones, Panax ginseng
- Metformin
- Andrographis
- Parthenolide (feverfew)
How Phytonutrients Help Prevent Cancer Initiation: The p53 Protein

- Mutation of the p53 tumor suppressor gene is the most common genetic alteration in human cancer.
- The p53 protein is often called the guardian of the genome.
- p53 prevents replication of damaged DNA in normal cells and promotes suicide or apoptosis of cells with abnormal DNA.
Loss of (Mutation) of the p53

Caused by Stress/Chronic infection/IR (refined carbos & fats)

- Cell cycle arrest
- Apoptosis
- DNA Repair
- Angiogenesis inhibition

Tumor Inhibition
Chemo and radio-sensitivity

Loss of p53 can contribute not only to aggressive tumor behavior but also to therapeutic resistance.

Upregulation of p53 in adipose tissue caused an inflammatory response that induces IR

Mederi Foundation, Donald R. Yance, MH, CN, RH (AHG)
Natural Compounds that Inhibit p53 Mutation

Diets rich in refined sugars and starches, as well as rich in red meat promote p53 mutation.

- **Quercetin**
  - onions, apples, citrus fruits, dark berries

- **Resveratrol**
  - Peanuts, especially sprouted, mulberries, dark grapes, red wine, plums, dark berries

- **OPCs (Oligomeric Proanthocyanidins)**
  - Apples, maritime pine bark, grape seed, red wine, bilberry, cranberry, black currant, green and black tea, cocoa beans

- **Tocotrienols** (vitamin E)
  - Palm oil
  - Coconut oil
  - Annatto seed oil
  - Rice bran and rice bran oil
  - Whole grains, especially barley

- **Curcumin** (tumeric)
- **6-Gingerol** (ginger)
- **EGCG** (green tea)
- **Folate** (dark green leafy veggies, oranges, cantaloupe)
- **Ashwagandha**
Programmed Cell Death

Bcl-2

CELL LIFE

Bax

CELL DEATH
BCI-2 Down-regulation

- Curcumin
- EGCG green tea
- Chinese skullcap
- Hibiscus
- Rosemary
- Ginger
- Panax ginseng
- Grape seed extract
- Feverfew

- Andrographis
- EPA from fish oil
- Yarrow
- Chelidonium alkaloids (Greater celandine-toxic in moderate doses)
• NFkB
• TNF-alpha
• ROS

ANTI-INFLAMMATORIES AND ANTIOXIDANTS
## Antiinflammatory Life Style

### Spices
- Asian ginger
- Cloves
- Fennel
- Fenugreek
- Gamboge
- Garlic
- Ginger
- Holy basil
- Onion
- Onion seed
- Poppy seed
- Pomegranate
- Red chili
- Sesame seed
- Turmeric

### Fruits & Vegetables
- Artichoke
- Cauliflower
- Grapes
- Mulberry
- Soybean
- Eggplant
- Goldenseal
- God of Thunder vine
- Indigo
- Lacquer tree
- Magnolia
- Smoke tree
- Song ginseng

### Traditional Chinese Medicine
- Eudora
- Goldenseal
- God of Thunder vine
- Indigo
- Lacquer tree
- Magnolia
- Smoke tree
- Song ginseng

### Ayurvedic Medicine
- Aloe
- Ashwagandha
- Berberis
- Butea
- Chilka
- Cinnamon
- Falsa pepper
- Guggulu
- Himalayan flax
- Indigo
- Neem
- Papaya
- Pineapple
- Rosehip
- Shikakai
- Valah grape
- Peacock ginger

### Others
- Cashew nut
- Cork bush
- Elephant's foot
- Fire lily
- Ginger lily
- Oregano
- Peppermint
- Hops
- Horse chestnut
- Palm
- Ocimum
- Tropical rose mallow
Spices as NF-κB Inhibitors

- *Curcuma longa* (Turmeric)
  - Curcumin

- *Capsicum annum* (Red chilli)
  - Capsaicin

- *Foeniculum vulgare* (Fennel)
  - Anethole

- *Eugenia caryophyllata* (Clove)
  - Eugenol

- *T. foenum-graecum* (Fenugreek)
  - Diosgenin

- *Ocimum sanctum* (Holi basil)
  - Ursolic Acid
Food reducers of inflammation

- Ginger
- Pomegranate
- Blueberries, cranberries, strawberries, bilberries
- Tart and bing cherries (muscle pain post-exercise)
- Dark purple and red grapes
- Broccoli and other dark green cruciferous vegetables (sulforaphanes)
- Tomato (lycopene)
- Soy protein
- Cold water, oily fish/Fish oil
- Walnuts
- Sesame oil
- Virgin coconut oil
- Extra-virgin olive oil
- Green tea
- Dark chocolate (polyphenols)
- Coffee
- Black tea (theaflavin)
Smoothies: an easy way to prepare healthy fruits and vegetables

- ½ to 1 cup water
- Handful of kale or spinach
- 1/2 peeled cucumber
- 2-4 celery stalks in 2” pieces
- 1 medium carrot, trimmed and quartered
- 1 apple or pear, stemmed and quartered (seeds in)
- ¾ cup frozen raspberries or blueberries (will change the color) (also try peeled kiwi)
- Small piece of peeled ginger
- Makes 2 large servings or 4 smaller servings
Herbal mediators of inflammation

- Curcumin (tumeric)
- Resveratrol (Japanese knotweed)
- Holy basil
- Rosemary
- Boswellia
- Chinese (Baikal) skullcap
- Magnolia bark
- Andrographis
- White willow bark
- Feverfew
- Celery seed extract

- Cat’s claw
- Pycnogenol (French maritime pine)
- Hops
- Bromelain (pineapple core)
- Nettles
- Borage oil, evening primrose oil
- Reishi mushroom
- Corydalis (Chinese)
- ASU (avocado-soy unsaponifiables)
- Green-lipped mussel extract
• VEGF
• PDGF
• HIF-1alpha

ANGIOGENIC SIGNALS
Modifying Gene Expression Potential
Agents: Angiogenesis

- VEGF (vascular endothelial growth factor)
  - flaxseed
  - curcumin
  - fish oil EPA
  - selenium
  - grape seed extract
  - green tea
  - Resveratrol
  - boswellia
  - Baikal skullcap (*Scutellaria baicalensis*)
Natural compounds that suppress PDGF (platelet-derived growth factor)

- Curcumin
  - causes an interruption of the PDGF and EGF signaling pathways
- Baicalein in Baikal (Chinese) skullcap
- EGCG, from green tea extract, inhibits PDGF-induced VEGF expression via blocking PDGF receptor.
Hypoxia-inducing growth factor is involved in cancer angiogenesis

Soy isoflavones
Salvia miltiorrhiza
Grape seed extract
Danshen or Red sage
Green tea EGCG
Guggulsterones
Silybinin
Panax ginseng

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Support Anti-Angiogenesis
Potential Agents

OTHER POTENTIAL ANTI-ANGIOGENIC AGENTS:

- Apigenin (mint and propolis)
- Selenium
- Vitamin D3
- Garlic
- Berry flavonoids

- Vitamin A
- Cordyceps sinensis
- Shark liver oil (squalene)
- Fresh/frozen shark cartilage
- Glycine
- Bindweed (*Convolvulus arvensis*)
Fish oil
From soybeans or supplement

Sardines
Garlic/onion
Ginger
Natto
Berries
Brazil nuts
Spices/curries
Jicama
Olive oil

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Copper & Angiogenesis

- Copper increases proliferation and migration of endothelial cells.
- Key pro-angiogenic compounds require copper for their synthesis / activation.
Support Anti-Angiogenesis

- **DIET:**
  - **Limit** high copper foods (and supplements)
    - Organ meats
    - Shellfish
    - Prepared chocolates
    - Water-soluble chlorella: "chlorophyllin copper complex"
    - Rooibos tea
  - Filter water if copper plumbing and water is acidic pH.
Support Anti-Angiogenesis
Potential Agents

- POTENTIAL COPPER LOWERING AGENTS:
  - Zinc
  - Molybdenum
  - Chlorella (regular)
  - Sulfur compounds (NAC, taurine)
  - Lipoic acid
  - Vitamin C
  - Rx: Tetrathiomolybdate (TM)
    - Must be carefully monitored
GROWTH FACTORS

- EGFR
- IGF-1
Modifying Gene Expression Potential
Agents: Growth Factors

- EGFR (epidermal growth factor receptor, her-1, Erb-B-1)
- Receptor for a cellular growth factor
- May play a role in the maintenance of cancer stem cells
- May play a role in bone metastases in breast cancer
- More important in ER-/PR-/Her2- breast cancer

- green tea
- grape seed extract
- licorice
- pycnogenol
- quercetin
- soy (genistein)
- vitamin D
### Inhibit Invasion and Metastasis

#### Potential Agents

<table>
<thead>
<tr>
<th>Inhibit Invasion and Metastasis</th>
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<tbody>
<tr>
<td><strong>Arabinogalactans</strong></td>
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<td><strong>Coriolus versicolor</strong></td>
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<td>(PSK/PSP)</td>
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<td><strong>Green Tea EGCG</strong></td>
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<tr>
<td><strong>Flaxseed</strong></td>
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<td><strong>Panax ginseng</strong></td>
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<tr>
<td><strong>Enzymes</strong></td>
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<tr>
<td>• <strong>Bromelain</strong></td>
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<td>• <strong>Nattokinase</strong></td>
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<td>• <strong>Lumbrokinase</strong></td>
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<td>• <strong>Butyrate-fiber and bifidus</strong></td>
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<tr>
<td><strong>Garlic</strong></td>
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<tr>
<td><strong>Vitamin C</strong></td>
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<tr>
<td><strong>Soy esp. genistein</strong></td>
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<tr>
<td><strong>Bioflavonoids</strong></td>
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<td><strong>Vitamin A</strong></td>
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<tr>
<td><strong>Alkylglycerols (in brain tumors)</strong></td>
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<tr>
<td><strong>Proanthocyanidins (GSE, PCO)</strong></td>
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<tr>
<td><strong>Fish oil EPA</strong></td>
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<td><strong>Melatonin (high dose)</strong></td>
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Low glycemic diet
Bone broths
Cultured foods
Garlic
Mushrooms
Brazil nuts
Astragalus

IMMUNE SUPPORT
Astragalus
Dang shen root
Low GL diet
Low glycemic load diet
Bone broths
Cultured foods
Garlic
Mushrooms
Brazil nuts

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Breast
Endometrial
DIET AND NUTRITION FOR SPECIFIC CANCERS
Breast Cancer: Diets Associated with Higher Risk

- Red meats
- Well-done and charbroiled meats
- Saturated fat
- Full fat cow dairy (estrogens)
- High glycemic diet (sugar and refined carbs)
- Total calories
- Alcohol
- Low beta-carotene (marker of low veggie intake)
Breast Cancer: Diets Associated with Decreased Risk

- Fish, especially those rich in omega-3 fatty acids
- Eggs
- Fruits, especially citrus fruits and cranberries
- Olive oil
- Whole grains
- Soy and other legumes
- Cruciferous vegetables: cabbage, broccoli, etc.
- Vegetables
  - Higher folate intake associated with reduced breast cancer risk
Omega 3’s: wild salmon
Breast Cancer Treatment Efficacy & Adipose Fatty Acids

Bar chart showing the percentage of patients developing metastasis (mets) for different fatty acids:
- α-Linolenic ω-3: 28%
- DHA: 25%
- Linoleic ω-6: 15%
- Arachidonic: 19%


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The BAD: Too much omega-6

- Animal, dairy and many vegetable oils (cottonseed, grapeseed, regular safflower, corn, peanut, sunflower, soy)

<table>
<thead>
<tr>
<th>OMEGA-6 FAT</th>
<th>OMEGA-3 FAT</th>
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<tr>
<td>Linoleic acid</td>
<td>Linolenic acid</td>
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<tr>
<td>GLA (gamma linolenic acid)</td>
<td>EPA (eicosapentanoic acid)</td>
</tr>
<tr>
<td>AA (arachidonic acid)</td>
<td>DHA (docosahexaenoic acid)</td>
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<tr>
<td>pro-inflammatory prostaglandins and leukotrienes</td>
<td>anti-inflammatory prostaglandins and leukotrienes</td>
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Phytoestrogens modulate estrogen

- Phytoestrogens are plant-based chemicals, found in trace amounts in many foods, and plant-medicines, which can harmonize the actions of the body's own estrogen.

- More than 300 foods have been shown to contain phytoestrogens and most are sufficiently consumed in a healthy and balanced diet and therefore generally don’t need to be supplemented.

- The estrogenic properties of these biochemicals are thought to be due to their structural similarities to the hormone estradiol, of they act about 1/300-1/400 the potency of estradiol.

- Most food-based phytoestrogens come from one of three chemical classes: the isoflavonoids, lignans, or coumestans.
  - Food sources high in coumestans include split peas, pinto beans, lima beans, and especially alfalfa and clover sprouts.
Phytoestrogens inhibits cancer via a number of mechanisms

- Interaction with estrogen receptors (ER) to modulate the expression of estrogen-responsive genes
- Inhibition of enzymes involved in estrogen biosynthesis and metabolism
- Modulation of insulin
- Inhibition of protein kinases and interaction with components of the cell cycle as well as proliferation, differentiation, and apoptotic pathways
- Elevate PTEN - a cancer suppressor gene
- Inhibition of topoisomerase (involved in DNA replication)
- Proteasome inhibition (to promote death in tumor cells)
- Redox balance (reduce oxidative stress)
Phytoestrogens

- Intake is associated with a reduced risk of breast, prostate, colon, endometrial, and other cancers.

- Has shown to inhibit many age-related diseases including osteoporosis, diabetes, and heart disease.

- The majority of studies have shown that phytoestrogens have a beneficial effect on relieving menopausal symptoms.

- Phytoestrogens have a great safety profile.
Soy and Isoflavones

- Most population studies show a decreased risk and some no change of risk for both premenopausal and postmenopausal breast cancer incidence and recurrence.

- Postmenopausal: Reduced risk recurrence with roughly 2 servings natural soy foods daily (tofu, tempeh, soy milk, edamame).

- Premenopausal: Mostly a reduced risk or no change. Should not use isolated soy extracts.

- Tamoxifen: 60% decreased risk recurrence with high intake of soy in American women.

- Aromatase Inhibitors: 35% risk reduction in women at 2 servings soy/day.
Natural Soy Servings

- 1 cup of soy milk
- 3 ounces of tofu
- 1/2 cup of edamame
- 3/4 ounce of dry roasted soybeans
- 6-8 ounces soy yogurt
- 2-3 ounces of tempeh.
- Soy is best taken in small amounts on a consistent basis, as a constant intake appears to help change the dynamics of the cancer cells.

- Until we have further information avoid soy extract powders with high isoflavone content (more than the usual 20-40 mg per serving) and capsules containing high amounts of genistein and or daidzein.
- Do NOT start eating a lot of soy products if you are at the beginning stages of hypothyroidism. However, people who are already hypothyroid should not experience any problems with soy.
Flax: the magical seed

- Lignans: phytoestrogens (plant estrogens).
  - structure similar to human estrogen.
- Flaxseed increased urinary 2-OHEstrogen excretion and the urinary 2/16 alpha-OHE1 ratio dose-response fashion.
- Flaxseed, in mice with human breast tumors reduced tumor growth and metastasis.
  - decreased extracellular levels of Vascular endothelial growth factor VEGF (angiogenic)
- Omega-3 fats associated with a decreased risk of breast cancer metastases in humans.
What’s so special about flax, anyway?

- Serving size: 1 oz (2 TBS)
- Calories: 152
- Protein: 5.3 grams
- Calcium: 72 mg
- Magnesium: 111 mg
- Potassium: 232 mg
- Fat: 12 grams
- Omega 3’s: 6515 mg
Cruciferous Vegetables

- Protective effect from attributed to
  - isothiocyanates present in these vegetables, including sulforaphane
  - indole-3-carbinol (I3C)

- Protect through multiple mechanisms
  - Increase detoxification enzymes protect cell from oxidative damage and promote the removal of carcinogens, including estrogens
  - Interferes with cancer cell metabolism and induces apoptosis
  - Anti-inflammatory
  - Inhibit tumor from forming own blood supply (angiogenesis),
Cruciferous Vegetables

- Associated with a reduced risk in the occurrence of cancer at various sites, including the prostate, lung, breast and colon.
- Broccoli, kale, collards, Chinese broccoli, cabbage (regular, Chinese, napa), Brussels sprouts, broccoflower, cauliflower, bok choy, turnip greens, rutabaga, mustard seeds, daikon, horseradish, wasabi, watercress
Summary: Breast Cancer Dietary Recommendations

Avoid
- High glycemic foods
- High red meat intake
- Preserved meats
- High omega-6 oils, such as corn, peanut, cottonseed, sunflower, grapeseed
- High-fat cow dairy (U.S.)
- Alcohol

Include
- Flax & sesame seeds
- Soy
- Cruciferous veggies
- Berries
- Low glycemic foods
- Wild caught salmon, sardines
- Olive oil
- If using dairy, fat-free cow or use goat’s milk
Supplements to Consider

General
- Vitamin D
  - especially important with aromatase inhibitors
- Fish oil
- Curcumin
- Resveratrol and/or grape seed extract
- Green tea
- Silymarin (milk thistle)
- Multivitamin
  - Iron and copper free
  - Natural folates

If on Tamoxifen
- CoQ10- 100mg/day
- Tocotrienols
- Garlic or nattokinase
- GLA (gamma linoleic acid) from evening primrose, borage, or black currant oils
- B-complex
  - if not taking a more potent multivitamin
WHOLE FOODS PLANT BASED ARE BEST