Personalized Nutrition and how to Thrive after Cancer

Nutrition 2.0

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What is *Nutrition 2.0* after a diagnosis of cancer?

- Sees cancer as part of a larger system *(LeRoy Hood)*
- Builds on information from genomics to personalize, predict, prevent and remedy health issues including cancer
- ***Predictive, Preventive, Personalized and Participatory Health***
- Nutrition 2.0 sees "metabolic tune up" as a way to provide nutrients for DNA repair and to regenerate your health with specific ideas just for you and your particular cancer situation (*Bruce Ames*)

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What should I eat?

- Some foods have more benefit than others Identify and select those you like often

  Eat Smart

- Eat a variety of colorful vegetables, fruits and culinary herbs as these are rich in the 3 A's – cancer fighters/phyters *(phyto – Greek for plant)*
- The 3 A's

  Antioxidants
  Anti inflammatories
  Anticarcinogens

- Eat foods that support your immune system

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What are *Your* Personal Nutrition Health Issues?

- Do you know your family's medical history?
- Do you have a record of your adult weight and its fluctuations? Have you gained more than 20 lbs
- Do you know what you weigh today? Your BMI?
- What do you usually weigh? Have you gained or lost weight recently?
- ***Do you know your waist measurement?***
- ***Do you know your neck measurement?***

Have you ever had your body fat estimated?

Visit My Family History at www.hhs.gov

See hand out for personalized nutrition metrics

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Nutritionally Related Cancers

Site	Carcinogen	Promoter	Mechanism	Inhibitor
Esophagus	Pickled, salted foods, alcohol	Alcohol	Carcinogen activation	Yellow-green Vegetables, tea
Stomach	Pickled, smoked foods, nitrate	Salt, *H. pylori*	Atrophic gastritis	Yellow-green Vegetables, tea
Colon	Fried foods	Fats	Bile acids	Bran fiber Calcium ions & Vitamin D Vegetables
Rectum	Fried foods	Fats, alcohol	Bile acids, cytotoxicity	Vegetables Fruits
Breast	Fried foods	Fats	Hormonal balances	Vegetables Fruits
Prostate	Fried foods? Hydroxy radicals?	Fats	Hormonal balances	Vegetables Fruits
Endometrium & Ovary	Hydroxy radicals?	Fats	Obesity, estrogen	Vegetables Fruits

Source: American Cancer Society's Textbook of Clinical Oncology

The 3 A's of Cancer and Nutrition

- **Antioxidants** (*prevent free radical formation which if unchecked causes damage to DNA)*
- **Anti-inflammatories** *(prevent elevated rates of cell division which may increase "mistakes" in DNA)*
- **Anticarcinogens** *(prevent persistent and deleterious damage (mutations) to DNA)*

Good News!

MANY DELICIOUS FOODS PROVIDE ALL 3

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1. Antioxidant Nutrients

Antioxidants "quench" free radicals which, if unchecked, cause damage to DNA

- Carotenes including lycopene (guava, tomatoes, sweet potatoes and carrots)
- Coenzyme Q10 in many foods and supplements
- Vitamin E (as mixed tocopherols) in whole grains and natural, cold pressed oils
- Vitamin C in fruits and vegetables; berries, bell peppers, citrus and kiwi fruit
- Many phytonutrients (dark pigmented, aromatic)

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Antioxidant Activity of Fruits and Vegetables

Oxygen Radical Absorbance Capacity (ORAC)

In Trolox equivalents per gram

Blueberry	23
Blackberry	20
Garlic	19
Kale	17
Raspberry	15
Spinach	13
Brussels sprouts	10
Plum	9
Broccoli	9
Beet	8
Red grape	8
Kiwi	5
Pink grapefruit	5

Tufts University, 2001

Flavonoids and Antioxidant Activity

Proanthocyanidins, *e.g. blueberries*	5.0
Epicatechin, *e.g. green tea*	2.5
Resveratrol, *e.g. red grapes/wine*	2.0
Vitamin E *(as mixed tocopherols)*	1.0
Vitamin C	1.0

Measured as color change in Trolox Equivalents (TEAC) also called an ***ORAC score*** *- Açai, Goji and pomegranates all have very high ORAC scores*

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2. Anti-inflammatory Foods

Anti-inflammatories prevent elevated rates of cell division which may increase "mistakes" Cells in resting stage have more time to be "corrected" as DNA repair takes place preventing chronic illnesses

- Omega 3 fatty acids (EPA and DHA)
- Flaxseed, borage and blackcurrant seed oils beneficial fatty acids (GLA and ALA)
- Natural salicylates, e.g. turmeric, rosemary, thyme, apricots, broccoli
- Naturally occurring COX-Inhibitors green tea, cocoa and red wine

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Omega-6 and Omega-3 Fatty Acids

Omega-6		Omega- 3	
Vegetable oils, nuts and seeds	**LA (18:2)** *Linoleic Acid* Neutral	**ALA (18:3)** *Alpha Linolenic Acid*	**Green leafy vegetables, flax, walnuts**
Borage or Evening Primrose oil	GLA (18:3) *Gamma Linoleic Acid* Anti-inflammatory	EPA (20:5) *Eicosopentanoic Acid* Anti-inflammatory	**Fish**
Red Meat (especially processed meats)	**AA (20:4)** ***Arachadonic Acid*** **Pro-Inflammatory**	DHA (22:6) *Docohexanoic Acid* Anti-inflammatory	**Fish and fortified milk and other foods**

Table adapted from Simopolous, A (1998)

Lipid Supplements

- Fish oil or ethyl esters of omega-3 fatty acids
- Krill oil (from plankton); blue-green algae or chlorella (omega-3's and GLA)
- Lecithin and phospholipid supplements (phosphatidyl choline, inositol and serine)
- ***Chia seed oil is richest vegetable source of omega-3***
- Lycopene and turmeric require lipids for full absorption (take with olives, avocado or almonds for example)
- Vitamins A, D, E and K are fat soluble and stored in fat and liver (may become toxic if over consumed)
- Possible increased need for lipid supplements for those who are overweight

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3. Anticarcinogens

Anticarcinogens prevent DNA damage and Allow for time for DNA repair or apoptosis

- ***Curry powder*** **(a combination of turmeric, cumin and other spices)**
- ***Citrus fruits*** **(naringinin and limonene)**
- ***Green tea*** **(EGCG and other natural ingredients)**
- ***Pomegranates*** **(especially the oil from the seeds)**
- ***Brazil nuts*** **(excellent source of selenium)**
- ***Tomatoes*** **(excellent source of lycopene)**
- ***Saffron***

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Anticarcinogens
Vitamin D – New Findings

- Vitamin D is also a hormone when activated in the skin.
- Functions:
  - Calcium uptake and bone breakdown regulation
  - Carbohydrate and insulin regulation
  - Brain and nervous system function – mood and cognition
  - ***Suggested anticancer activity***
- Prostate, breast and colorectal cancer relationship thought to be associated with Vitamin D receptor genetic polymorphisms and UV light exposure
- Daily requirement for some may need to be higher

  RDA is 400 IU for 51-70 years; 600 IU for > 70 years

  Blood test of 25-hydroxy Vitamin D may be helpful

Source: Vitamin D status and cancer: new insights

Schwartz, GG and Skinner, HG CurrCurr Opin Clin Nutr Metab Care 10:6–11 2007

Food Sources of Vitamin D

Food	Serving Size	Vitamin D (IU)	Note
Sardines	3 ½ ounces (100g)	500	Canned in oil
Salmon	3 ½ ounces (100g)	360	Cooked
Mackerel	3 ½ ounces (100g)	345	Cooked
Tuna	3 ½ ounces (100g)	200	Canned in oil
Milk	1 cup	90	Fortified
Breakfast cereals	¾ - 1 cup	40	Usually fortified to 10% DRI
Egg	1 whole	20	Naturally occurring
Liver, beef	1 ounce	15	Naturally occurring
Swiss cheese	1 ounce	12	From fortified milk

Daily Recommended Intake (DRI) 10 micrograms or 400 IU for adults aged 51 – 70 years. Tolerable Upper Limit 2000 IU

Source: NIH Office of Dietary Supplements

Anticarcinogens

Lignans, Flaxseed and Health

- Lignans are anti-viral, anti-microbial and anti-cancer components of many plant foods including rye
- Refined linseed oil or flaxseed oil is a rich source of alpha linolenic acid (LNA or 18:3)
- Lignans, especially SDG may be beneficial in protection from prostate cancer
- Lignans are thought to be cardio protective
- Plasma enterolactone levels used to assess benefit with dietary lignans

Add 1 tablespoon crushed flaxseed to your oatmeal for healthy dietary fiber and lipid benefits

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Phytoestrogens and Lignans

- Phytoestrogens are botanicals called isoflavones found in soy and red clover with estrogen like activity
- Lignans are not flavonoids but act more like antioxidants and may help regulate estrogen and other steroid hormones
- Lignans are found in dark rye, flaxseed, pumpkin seeds, sesame seeds and the woody part of plants such as tree barks
- Lignans are acted on by intestinal bacteria to enterolactone and enterodiol
- ***Lignans are probably safe for estrogen receptor positive breast cancer patients***

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Food sources of Lignans

Food	Serving size	Lignans (mcg)	Notes
Flaxseed	100 grams	301,129	*secoisolariciresinol*
Sesame seeds	100 grams	29,331	
Wholegrain flaxseed bread	100 grams	12,474	
Curly kale	100 grams	2321	
Multigrain bread	100 grams	6744	
Broccoli	100 grams	1325	
Sunflower seeds	100 grams	891	
White cabbage	100 grams	787	
Cashew	100 grams	629	
Apricot	100 grams	450	
Strawberry	100 grams	334	
Dark rye bread	100 grams	320	
Red wine	100 milliters	91	

Source: USDA in J of Food Composition, 2000

Putting it all together

- ***Avoid mega-doses*** (more than twice RDI or Acceptable Intake) of any supplemental nutrient (*unless specifically prescribed by your physician or oncologist*)
- ***Be cautious with herbal products***. Many affect drug detoxification pathway efficiency and may interfere with other medications (reduce therapeutic dose or increase toxicity)
- ***Pharmacogenomics*** is a new field of personalized medicine. For example, grapefruit and Seville oranges may cause adverse drug reactions by inhibiting enzymes that metabolize medications
- Choose nutrient dense foods rather than take supplements and remember to ***tell your health team about EVERYTHING you take***

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What to Eat? Eat your water

- High water foods: Vegetables and Beverages
- Medium water foods: Meats, Eggs and Bananas
- We need about 3 liters of fluid a day
  1 – 1.5 liters from water and beverages
- During treatment you may become dehydrated quickly
- Fatigue is one symptom of dehydration
- Make sure you drink water between each meal
- Press top of your hand – it should bounce back – if not you may be dehydrated
- Don't ignore this – call your medical team immediately

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A Typical Healthy Daily Menu

- *Breakfast* Oatmeal or other whole grain cereal, non fat milk , berries or raisins

  Snack Apple, banana or other piece of fresh fruit

- *Lunch* Large salad with dark leafy vegetables (lettuces, spinach, etc.) topped with colorful vegetables. Parsley, chives and fresh herbs are good. Sprinkle slices of avocado, a few pine nuts and sunflower seeds for added benefit. Tuna, hard boiled eggs or lean chicken for protein

  Snack handful of walnuts, almonds, sunflower seeds OR 1 small square of dark chocolate (organic)

- *Dinner* Salmon or other fish, lean red meat (not more than once a week) or chicken or turkey or tofu or vegetarian protein (Quorn® for example), 2 or more steamed vegetables or stir fry in (small quantity) of sesame or olive oil, brown rice, baked potato, corn or whole wheat tortilla, fresh berries for dessert

- *Beverages* Iced green tea, water (1.5 – 3 liters a day all fluids)

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Foods of Special Benefit

- **Lemon grass** is much sought after as a rich source of CITRAL; citral induces apoptosis (programmed cell death) of cancer cells *in vitro* – delicious flavoring in Thai dishes
- **Mushrooms** are a rich source of beta glucans. Mushrooms (cooked) induce natural killer cells and are rich in potassium
- **Guava** as a good source of lycopene an oil soluble antioxidant thought to protect prostate cells
- **Black Raspberries** – highly effective at killing cancer cells *in vitro* and in animal studies. Recent studies indicate Black Raspberries modify expression of 100 human genes consistent with anticarcinogenic activity (Ohio State, USDA)
- **Pomegranates** are rich in all three of the 3 A's

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Resveratrol

- Resveratrol is found in the skins of grapes and berries (blueberries, blackberries, cranberries and others of Vaccinium species)
- ***Red wine and red grape juice are good sources*** – widely variable amounts depending on grape variety, region grown and fungal exposure; highest concentration in grapes grown in cold and sunny climates
- Peanuts are also a fairly good source
- Plants produce this and other flavonoids called stilbenes as a protective mechanism
- <200 mg per day probably safe

Soy and Soy Isoflavones

- Soy is a bean (legume) and often fermented for increased digestibility – tofu, Natto, tempeh, etc.
- Most oncologists recommend ***avoiding soy isoflavones if you have ER +ve cancer*** (no more than 10 grams per day or 1 cup of soy milk)
- Be aware that soy and "Women's Formulas" contain isoflavones with (weak) estrogen activity
- Genistein and Daidzein are the predominant isoflavones. Equol is present in smaller amounts
- Soy's health benefits later in life are likely due earlier life exposure (*in utero* and at puberty)

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Soy and Soy Isoflavones in Food

Food	Amount	Isoflavones (mg)
Roasted soybeans	½ cup	167
Edamame	½ cup	70
Soy isolate	1 oz	57
Tofu, firm cooked	3 oz	52
Tempeh, cooked	3 oz	47
Soy sausages	1	35
Soy milk	1 cup	35
Soy yogurt	1 cup	30
Soy burger	1	9
Soy oil	1 fl oz	0
Soy sauce	1 fl oz	0

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Carbohydrates: Sugar and Starch

- Sugars are found alone or in the form of starch Refined wheat or corn flour are digested similarly to sugar – whole grains due to dietary fiber slow down absorption
- Glycemic Index (GI) and Glycemic Load describes glucose absorption rates – dietary fiber is a "good carb" reducing GI
- High fructose corn syrup, HFCS – is sweeter than sugar with slightly more fructose than table sugar. Used in sodas and many other food products. HFCS is a recent addition to our diets – not helpful for healthy insulin levels and contributes to obesity – AVOID
- ***Smart choice is to restrict sugars to <30 g per day***

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Nutrition for Immune Health

- **Medicinal Mushrooms**

  Agaricus bisporus (white button)
  Agaricus blazei
  Maitake
  Cordiceps
  Reishi
  Shiitake
  Lion's Mane (*Hericium erinaceus*)

- **Curry**

  Turmeric (curcumin and curciminoids)

- **Green Tea**
- **Culinary herbs**

  Mint (Scutelleria *aka Quan jin*)

Dietary Fiber

- Good carbs! These are carbohydrates from plants that are not fully digested but promote colon health
- Dietary Fiber improves the Glycemic Load of a meal
- Dietary fiber promotes health colon environment – supports "friendly bacteria" such as Bifidus and Lactobacillus species
- ***Probiotic supplements need fiber to thrive***
- ***Inulin is a soluble fiber added to some foods***
- ***Soluble fibers are Prebiotics (provide food for probiotics)***
- **Acceptable Intake (AI) of dietary fiber is 38 grams for** men; 25 grams for women – have *some at each meal* for colon health

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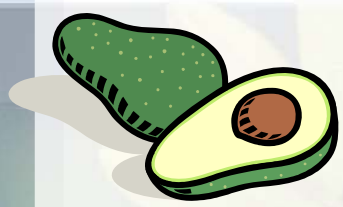
Oils and fat

Recommended Fatty Acid Balance Omega 6:3 of ~4:1

(*typical American diet is 15 to one)*

- **1 part Omega-3** (DHA and EPA from oily fish like salmon and sardines, walnuts and pine nuts)
- **3 parts mono unsaturated** (olive oil, almonds and avocado)
- **1 part saturated** fat (cocoa butter, palm oil or coconut or other plant source)
- Supplement with 100 mg DHA and 500 mg borage or blackcurrant seed oil (as a source of GLA)



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Tips for Adding Extra Protein

- For those undergoing treatment or recovering from surgery – increase usual intake by one serving a day to reduce loss of muscle mass
- Keep hard boiled eggs in refrigerator and chop on top of salads or take ready-shelled in a baggie as a snack
- Use nut butters as spreads (almond butter or Nutella which is made with hazel nuts are good, nutrient dense ones)
- Add milk, yogurt or whey protein (*unflavored*) or dried milk powder to soups or use as a base for sauces
- Snack on low fat cottage cheese or string cheese
- Add cubes of firm tofu to steamed vegetables

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Nutrition Advice for Typical Symptom Management during Treatment

- *Nausea*

- whole grain crackers, melba toast

- drink cool, clear beverages and soups

- *Constipation*

- prune juice, dried fruit or fruit compote, Activia® yogurt wheat bran or Benefiber®

- *Headache*

- avoid caffeine, chocolate, cheese, anchovies and other tyramine containing foods

- *Difficulty swallowing*

- try drinking with a straw and moving position use mashed potato and other single texture foods

Nutrition Advice for Typical Symptom Management -*Part Two*

- *Fatigue and general malaise*
  -tea, dark chocolate, cocoa
- *Weight loss*
  -avocado, Greek style yogurt, protein smoothies made with DHA fortified organic milk
- *Tendency to bleed easily*
  - oranges, lemons, limes (pith and zest)
- *Visual loss*
  - dark green leafy vegetables, blueberries, apricots
- *Cold sensitivity*
  - warm temperature foods and spicy foods

Choose food for TASTE and Texture, not just nutrients

Choose foods that are tasty and appealing

- **TASTE** distortion, heightened sense of smell and bad taste in the mouth is common side effect of cancer treatment
- altered taste perception *(chemosensory dysfunction)* is very individual and may persist for a while

You may also be more sensitive to **TEXTURE**

- to maintain a healthy weight choose foods that are nutrient dense (more nutrients per gram of food)
- try different flavors, temperatures and textures

Eat in a relaxed environment, ventilate kitchen well

Use garnishes and attractive place settings

Eat most when you have the most energy

– structure your meals and snacks so you eat when you feel best

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Healthy Food Choices

– *Nutrition to Thrive*

- Choose **fish** at least 3 times a week
- Choose **fruit** (especially berries) for breakfast, dessert and snacks
- Choose **2 or more vegetables for lunch and dinner**
- Take a multivitamin and mineral supplement daily
- **Cook often with herbs, curry and spices**
- Think of food as sustenance – make healthy food your friend not a dietary restriction
- You may wish to seek professional nutritional advice to help you craft an eating plan that works for you and your family *(a graduate level nutritionist is ideal – RD or CNS)*

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Summary

- **Eat well to give you the 3 A's of Health**
  - **Antioxidants (*citrus fruits*)**
  - **Anti-inflammatories (*culinary herbs*)**
  - **Anticarcinogens (*berries*)**
- Enjoy food that is fresh, locally grown and seasonal
- Grow your own food or visit your local farmers' market
- Become as physically active as possible. Walk often and enjoy our local, natural beauty
- Culinary herbs are easy to grow on a windowsill or in pots on a deck outside – fight your cancer with a fork!

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Miracles

"There are only two ways to live your life. One is as though nothing is a miracle. The other is as though everything is a miracle"

Albert Einstein (1879-1955)