NUTRITION AND BRAIN TUMORS

Carolyn Katzin, MS, CNS, MNT
Medical Nutrition Therapist

© Carolyn Katzin, 2010
WHAT SHOULD I EAT?

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

© Carolyn Katzin, 2010
What should I eat now?

- Make your food choices with a fuller understanding of what your body and your brain needs.
- How foods provide Antioxidants, Anti inflammatories and Anticarcinogens (the 3 A’s).
- What other benefits foods provide such as dietary fiber to balance blood glucose levels.
- Specific drug nutrient advice.
- Symptom management with diet.
- Putting it all together.
WHAT ARE THE THREE A’S?
YOUR DNA INTEGRITY PROTECTORS

- **Antioxidants** reduce oxidation at the cellular level from metabolic or external radiation causes
- **Anti-inflammatories** reduce inflammation (redness, heat, swelling) often prevent metabolic “mistakes” that may lead to cancer
- **Anticarcinogens** reduce the overall risk of developing cancer

Cancer is the result of mutated or altered function of DNA

© Carolyn Katzin, 2010
1. **Antioxidant Nutrients**

Antioxidants prevent free radical formation which, if unchecked, causes damage to DNA. Also important in switching genes “on” and “off”

- Many **phytonutrients** (dark pigmented, aromatic)
- Important for brain, retina and nervous system health
- Coenzyme Q10 in fish, eggs, spinach, broccoli, wheat germ
- Vitamin E (as mixed tocopherols) in whole grains, nuts and seeds, wheat germ
- Vitamin C in fruits and vegetables; berries, bell peppers, citrus and kiwi fruit especially good sources
- Cocoa, avocado, nuts, tea also rich in antioxidants as **polyphenols**

©Carolyn Katzin, 2010
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

Recent clinical trial confirmed that consumed antioxidants raise blood levels of **protective polyphenols** (Koli, R et al, 2010)  
Brain health associated with berry consumption (Review by Joseph, J et al, 2009)

© Carolyn Katzin, 2010
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 found in oily fish (EPA and DHA)
- Flaxseed, chia seed, borage and blackcurrant seed oils beneficial fatty acids (ALA and GLA)
- Natural salicylates, e.g. turmeric, rosemary, thyme, apricots, broccoli, pineapple, loganberries
- Naturally occurring COX-Inhibitors green tea, cocoa, red wine and ginger
**Omega-6 and Omega-3 Fatty Acids**

**Omega-6**
- Linoleic Acid
  - Neutral
- GLA (Anti-inflammatory)
- Arachadonic Acid
  - Pro-Inflammatory

**Omega-3**
- Linolenic Acid
  - Anti-inflammatory
- EPA
  - Anti-inflammatory
- DHA
  - Anti-inflammatory

- Vegetable oils, nuts and seeds
- Borage or Evening Primrose oil
- Meat (especially processed meats)

- Green leafy vegetables, flax, walnuts
- Fish oil
- Fish oil and fortified products

*Table adapted from Simopolous, A (1998)*
LIPID AND OMEGA-3 SUPPLEMENTS

- **Fish oil** is an excellent source of EPA and DHA
- **Krill oil** (from plankton) provides low toxicity omega-3’s
- **Blue-green algae or chlorella** (rich in DHA)
- **Life’s Start DHA™** supplements (CVS, Walgreen’s etc.)
- **Lecithin** (phosphatidyl choline, serine and inositol)
- **Cod liver oil** Vitamins A, D, E and K are fat soluble and stored in fat and liver (can become toxic if too much consumed)
- Increased need for lipid supplements for those who are overweight or obese

© Carolyn Katzin, 2010
3. Anticarcinogens

Anticarcinogens prevent DNA damage and allow 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, turmeric and other yellow/brown spices

© Carolyn Katzin, 2010
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 polymorphisms and UV light exposure
- Daily requirement may be higher than earlier thought – 800 – 2000 IU (RDA is 40 IU) – a blood test of 25-hydroxy Vitamin D is valuable at identifying those with high needs

Source: Vitamin D status and cancer: new insights
# Food Sources of Vitamin D

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

- Glucose is the main fuel for the brain under normal conditions
- *Glucose is crucial for brain function and passes readily and rapidly into the brain*
- 4.6 grams glucose per hour burned by typical adult brain
- Brain glucose transporter GLUT 3 found in neurons
- GLUT 3 is not responsive to insulin but depends on blood glucose concentrations
- Brain tissue is only 2% body mass but consumes 20% dietary energy and 20% inhaled oxygen
- Ketones are secondary fuel (derived from fat) rarely used under normal conditions

© Carolyn Katzin, 2010
THE BLOOD-BRAIN BARRIER (BBB) AND HOW IT AFFECTS NUTRITION FOR THE BRAIN

- The brain is protected by a tight wall of endothelial cells and tile-like capillaries called the BBB
- Brain is sometimes called a sanctuary for tumor cells
- Brain tissue doesn’t require insulin to take up glucose unlike muscle and most other tissues; glucose is water soluble and is transported across (mediated transport)
- Some substances are fat soluble and slowly penetrate
- Many chemicals do not penetrate the barrier at all or do so very slowly (semi permeable)

Healthy Brain function depends upon glucose and oxygen

© Carolyn Katzin, 2010
CARBOHYDRATES: SUGAR AND STARCH

- Sugar (glucose and fructose) also forms starch as long chains. Refined grains (white flour, corn flour, etc.) are digested similarly to sugar – whole grains slow down absorption and maintain more even energy level.

- **Glycemic Index (GI) and Glycemic Load** describes glucose absorption rates – dietary fiber is a “good carb” reducing Glycemic Load of a meal.

- High fructose corn syrup, HFCS – 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.

- Smart choice is to restrict sugars to <30 g per day.

© Carolyn Katzin, 2010
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 and helps maintain healthy and steady blood glucose levels
- Dietary fiber promotes health colon environment – supports “friendly bacteria” such as Bifidus and Lactobacillus
- Greek style yogurt provides live culture or probiotics
- Probiotic supplements need dietary fiber to thrive
- Acceptable Intake (AI) is 38 grams for men; 25 grams for women

© Carolyn Katzin, 2010
HEALTHY BALANCE OF 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)

© Carolyn Katzin, 2010
**Tips for Adding Extra Protein**

- Add milk, yogurt or whey protein *(unflavored)* or dried milk powder to soups and or use as a base for sauces
- Include a protein smoothie in addition to your meals
- Keep hard boiled eggs in refrigerator and chop on top of salads or take peeled for quick snack
- Use nut butters as spreads (almond butter or Nutella which is made with hazel nuts are good, nutrient dense ones)
- Snack on low fat cottage cheese or string cheese
- Add cubes of firm tofu to steamed vegetables

© Carolyn Katzin, 2010
Taste and Texture

- Choose foods that are tasty and appealing to you
- Dysgeusia (taste distortion) is common during treatment
- Temperature affects taste – try cooler temperatures
- The sequence of foods order of eating often affects taste
- Some people find plastic utensils minimize metallic taste
- Eat in a relaxed environment, mindful of the experience
- Use garnishes and attractive place settings
- Bitter flavors may indicate foods that are beneficial for your liver – we often prefer bitter flavors as we age
- Salt enhances sweet flavors
- Texture is as important as taste

© Carolyn Katzin, 2010
**FOODS WITH SPECIAL VALUE**

- **Lemon grass** is much sought after as a rich source of CITRAL; citral induces apoptosis (programmed cell death) of cancer cells *in vitro*
- **Mushrooms** induce natural killer cells and are rich in potassium
- **Guava** as a good source of lycopene
- **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

© Carolyn Katzin, 2010
PUTTING IT ALL TOGETHER

- **Avoid mega-doses** of any nutritional supplement (*unless specifically prescribed by your physician or oncologist*)
- **Be cautious with herbal products.** Many affect drug detoxification pathway activities 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*

© Carolyn Katzin, 2010
DIET AND BRAIN TUMOR TREATMENTS

- **Accutane (isotretinoin)** - support bone health with exercise and mineral rich foods (non fat dairy, broccoli, etc.) Avoid high glycemic index (GI) foods (choose low sugar, high dietary fiber carbohydrates like oatmeal, whole grain cereal) Avoid sodas Don’t take extra Vitamin A (may increase negative side effects)
- **Temodar (temozolomide)** - avoid constipation by consuming prune juice, rhubarb and other mild laxatives. Drink plenty of fluids
- **Corticosteroids (Dexamethasone)** - low salt, high potassium. Emphasize protein and vegetables.
- **Anticonvulsants (Dilantin, Phenytoin)** – eat foods rich in Vitamins D, K and folate. Avoid megadoses of Vitamin B6 (decreases efficacy)
Diet and Brain Tumor Treatments

- **Matulane** (procarbazine) – avoid tyramine containing foods (aged cheese, soy sauce, etc.)
- **CCNU** (lomustine) – bland foods, e.g. avocado
- **Platinum chemotherapies** (vincristine, cisplatin or carboplatin) – avoid purine rich foods (sardines, anchovies, liver, etc.) Include magnesium and potassium rich foods. Drink extra fluids
- **Methotrexate** (Rheumatrex or Trexall) – drink extra fluids, avoid alcohol. Eat a bland diet and foods that increase pH (more alkaline). Consider having a MTHFR genetic test to optimize dosage levels

© Carolyn Katzin, 2010
Diet and Common Chemotherapies

- **Arimidex** (*anastrazole*) – a non steroidal aromatase inhibitor. Ensure adequate Vitamin D and bone building minerals (calcium, magnesium, zinc, boron and silica)

- **Avastin** (*bevacizumab*) – a targeted therapy used with other chemotherapy agents like CPT-11 or 5-FU. Eat small, easy to digest meals frequently

- **Tarceva** (*erlotinib*) – a tyrosine kinase inhibitor (TKI). Avoid grapefruit juice. Tell medical team of any herbs you may take. As with all medications supplements may affect dosage and possible toxicity

- **Rapamycin** (*sirolimus*) – IL-2 inhibitor. Avoid grapefruit and grapefruit juice which affects liver handling of this medication and may increase side effects

*This is only a partial list – please consult with your health care practitioner and pharmacist for more details and personalized advice*

© Carolyn Katzin, 2010
STEROIDS AND WEIGHT

- Reduce salt and sodium intake (mostly found in processed foods like potato chips, prepared meals, etc.)
- Increase potassium intake by eating more vegetables and fruits to improve fluid balance
- Lower simple sugar intake; chose foods with a low glycemic index/load (GI)
- Stay as active as possible; activity improves your metabolism and will help with possible weight gain side effects
- Drink plenty of water and other fluids to enhance overall health and detoxification processes

© Carolyn Katzin, 2010
What Should I 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 (include soups)
- During treatment you may become dehydrated quickly - Fatigue is often a 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 dehydration – use electrolyte replacement beverages. Always check with your medical team

© Carolyn Katzin, 2010
SYMPTOM MANAGEMENT WITH NUTRITION

- **Nausea**
  Choose whole grain crackers, melba toast, ginger (stem or crystallized is a good choice)

- **Constipation**
  Choose prune juice, dried or stewed pitted fruits, prunes, figs, apricots.
  Whole grains, wheat germ and wheat bran. Activia® yogurt may be helpful.

- **Headache**
  Avoid caffeine, chocolate, cheese and tyramine-containing foods (anchovies, processed meats, gravies)

- **Diarrhea**
  Choose bananas, cream of rice, apple sauce, toast.
  Align® probiotic may be helpful.

© Carolyn Katzin, 2010
MORE SYMPTOM MANAGEMENT WITH NUTRITION

- **Weight loss** - choose avocado, high calorie smoothies, Greek style yogurt, high quality ice cream
- **Tendency to bleed easily** - choose oranges, lemons, limes (especially the white pithy parts)
- **Vision loss** - choose dark green leafy vegetables, blueberries and bilberries, apricots
- **Cold sensitivity** – avoid spicy foods

© Carolyn Katzin, 2010
Fatigue Management

- *Maintain a healthy weight* Carrying around extra weight is tiring - some body fat is pro-inflammatory (not helpful)
- *Regular physical activity* can improve mood and fatigue levels. Activity is also helpful for insomnia – try T’ai Chi or yoga, going to the park or a museum
- *Regular mental stimulation* helps brain function and minimizes fatigue
- *Protein*, iron, zinc, B vitamins and Vitamin C all important for red cell production to minimize anemia
- *Eat dark chocolate or drink organic green tea as healthy sources of stimulants* some people are sensitive to caffeine and similar stimulants
PROACTIVE NUTRITION – HOW TO THRIVE

- Keep a personal record of your nutrition related health data with Your Personal Nutrition Health Check
- Share diet information with your health care team
- Optimize your health span by balancing the 3 A’s
  - Antioxidants
  - Anti-inflammatories
  - Anticarcinogens
- Choose fresh, locally grown, organic food
- Maintain your resilience and energy with a consistent intake of nutrient rich foods balanced with an active lifestyle and regular sleep

© Carolyn Katzin, 2010
A Typical Healthy Daily Menu

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

- **Snack**
  Apple, tangerine, banana or other 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 (as butters if your digestive system is sensitive or you are going through chemotherapy) OR 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)

© Carolyn Katzin, 2010
Foods best selected as Organic to minimize pesticide residues

- Peaches
- Apples
- Bell Peppers
- Celery
- Nectarines
- Strawberries
- Cherries
- Kale
- Lettuce
- Grapes (Imported)
- Carrots
- Pears

Source: Environmental Working Group
www.ewc.org
Healthy Food Choices
– Nutrition to Thrive

- Choose fish at least 3 times a week
- Choose fruit 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
- Seek professional nutrition advice to help you craft an eating plan that works for you and your family

© Carolyn Katzin, 2010
BALANCING THE 3 A’S FOR HEALTH

- **Antioxidants**
  - Increase intake if exposed to tobacco smoke or other environmental pollutants
  - Increase intake if traveling long distances (natural radiation exposure) or if having X-rays

- **Anti-inflammatories**
  - Increase intake if your waist to height ratio is above 0.5
  - Increase intake if you suffer from an autoimmune disorder

- **Anticarcinogens**
  - Increase intake if you are a cancer survivor
  - Important for all to reduce risk of cancer and stay healthy

© Carolyn Katzin, 2010
WHAT YOU REALLY NEED TO KNOW TO THRIVE

- **Work with the 3 A’s**
  - Antioxidants
  - Anti-inflammatories
  - Anticarcinogens

- **Enhance your natural immunity and resilience**
  - Choose foods that balance the 3 A’s
  - Mushrooms, berries and cherries

- **Maintain a healthy weight/waist**
  - Moderate your calories to match your activity level
  - Assess your current waist to height ratio (ideally less than half or < 0.5)
  - Watch stress related eating with mindfulness

© Carolyn Katzin, 2010
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 if you can

- Culinary herbs (rosemary, oregano, thyme, etc.) are easy to grow on a windowsill or in pots on a deck outside – fight cancer with a fork!

- Stay as active as you can and Be Well!

© Carolyn Katzin, 2010
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)
FOR MORE INFORMATION AND SUPPORT

Carolyn Katzin, MS, CNS, MNT

www.cancernutrition.com

(310)471-0529