Cancer Prevention: From Research To the Dinner Table
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October is Breast Cancer Awareness Month

Cancer Causes

- Smoking, 30%
- Reproductive Factors, 3%
- Environmental Pollution, 2%
- Excess Alcohol, 3%
- Poverty, 3%
- Sun Exposure, 2%
- Medical Procedures/Drugs, 1%
- Salt, Additives, Contaminants, 1%
- Inactivity, 5%
- Occupational Carcinogens, 5%
- Obesity and Diet, 30%
- Viruses, 5%
- Family Hx, 5%
- Body Size, 5%

Trends in Consumption of Five or More Recommended Vegetable and Fruit Servings for Cancer Prevention, Adults 18 and Older, US, 1994-2007


Trends in Obesity* Prevalence (%), By Gender, Adults Aged 20 to 74, US, 1960-2006†
Obesity and Cancer


- 20% cancer cases caused by obesity
- Complicates chemo dosing & tx toxicity
- Poor treatment outcomes
- Higher mortality rates
- Less disease free time for survivors
- Current Research
  - What is the underlying biology of the relationship between obesity and the various cancer sites?

Cancer Sites Linked to Overweight/Obesity

- Esophagus
- Gallbladder
- Pancreas
- Liver
- Colon
- Rectum
- Post-menopausal Breast
- Endometrial
- Aggressive Prostate
- Non-Hodgkin's Lymphoma
- Leukemia
- Multiple Myeloma
- Renal*
- Melanoma
- Thyroid

Hormones, Growth Factors, and Cytokines, Oh My!

- Blood glucose & Insulin (c-peptide)
  - ↑ Colon, Prostate, Endometrial
  - ? Kidney and Pancreatic
- Estrogen
  - ↑ Endometrial and Breast
  - ? Colon
- Leptin
  - ↑ Colorectal and Prostate
- TNF, Interleukin, C-RP
  - ↑ Pro-inflammatory factors produced by adipocytes
- Insulin-like growth factor

Table 1. RR for cancer per 5 kg/m2 higher BMI and most likely causal mechanism: Males

<table>
<thead>
<tr>
<th>Cancer Type</th>
<th>RR</th>
<th>Causal Mechanism</th>
</tr>
</thead>
<tbody>
<tr>
<td>Esophagus</td>
<td>1.52†</td>
<td>Reflux esophagitis and chronic irritation</td>
</tr>
<tr>
<td>Rectal</td>
<td>1.24†</td>
<td>Unknown</td>
</tr>
<tr>
<td>Liver</td>
<td>1.24†</td>
<td>Repair through hyperplasia</td>
</tr>
<tr>
<td>Kidney</td>
<td>1.51†</td>
<td>Simple fibrosis</td>
</tr>
<tr>
<td>Prostate</td>
<td>1.17†</td>
<td>Unknown</td>
</tr>
<tr>
<td>Endometrial</td>
<td>1.20†</td>
<td>Inflamatory pathways—IL-6</td>
</tr>
<tr>
<td>Breast</td>
<td>1.09†</td>
<td>Unknown</td>
</tr>
<tr>
<td>Gallbladder</td>
<td>1.09†</td>
<td>Chronic secretion-gallbladder and irritation</td>
</tr>
<tr>
<td>Colorectal</td>
<td>1.08†</td>
<td>Unknown</td>
</tr>
<tr>
<td>Prostate</td>
<td>1.07†</td>
<td>Prostate insulin pathway</td>
</tr>
<tr>
<td>Kidney</td>
<td>1.06†</td>
<td>Inflamatory pathways—IL-6</td>
</tr>
<tr>
<td>Leukemia</td>
<td>1.05†</td>
<td>Unknown</td>
</tr>
<tr>
<td>Leptin</td>
<td>0.76*</td>
<td>Somewhat leads to hormone and causes lung cancer</td>
</tr>
<tr>
<td>Estrogen</td>
<td>0.71*</td>
<td>Somewhat leads to hormone and causes squamous cell carcinoma</td>
</tr>
</tbody>
</table>

Breast Cancer and Weight

- Risk of breast cancer ↓ 50% in women who lost >10kg and maintained (Eliassen et al. 2006.)
- Nutrition goals during tx focus on avoiding weight gain
- Nutrition goals after tx focus on weight loss and building lean mass
- Physical activity and wt. loss reduce risk of recurrence

Behavior Change Goals

- Focus on behavior changes that result in creating an energy deficit
- Help individuals find motivation
- Maintain progress and motivation
- Wolin recommends applying the “Five A’s”
  - Assess, advise, agree, assist, arrange

Meet Sarah

- 26 year-old teacher with back pain
- Started with lunch…
- Next dinner and sweets…
- Exercise
- Reinforcements
  - Consistent weight loss and shopping
- Continuous maintenance required

AICR Recommendations for Cancer Prevention

1. Be as lean as possible within the normal range of body weight.
2. Be physically active as part of every day life.
3. Eat a plant-based diet.
   - Get at least 5 servings per day of non-starchy vegetables and fruits.
   - Eat unprocessed grains and beans with each meal.
**Eat a Plant Based Diet**

Vitamins + Minerals + Phytochemicals = Anti-cancer Effects

<table>
<thead>
<tr>
<th>Foods</th>
<th>Phytochemicals</th>
<th>Vitamins &amp; Fiber</th>
<th>Antioxidant Action</th>
<th>Enzyme Format</th>
<th>Cancer Inhibitor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cruciferous veg, broccoli, cauliflower, cabbage</td>
<td>Indoles, sulforaphane, isothiocyanate</td>
<td>Folate, Vitamins A &amp; C, Insoluble fiber</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Allium veg, garlic, onion</td>
<td>Organosulfur compounds</td>
<td>Soluble and insoluble fiber</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Berries, grapes, apples, nuts</td>
<td>Ellagic acid</td>
<td>Vitamins E &amp; C, beta-carotene, Soluble fiber</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Soybeans, beans, peas, lentils</td>
<td>Isoflavones (genistin), saponins, phytosterols</td>
<td>Soluble fiber</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Citrus fruit</td>
<td>Terpenes, coumarins, flavonoids</td>
<td>Vitamin C, folate, Soluble fiber</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

**Tomato and Broccoli Study**

- A lycopene supplement may not hurt you, but the whole tomato can help you more. A whole tomato may help you, but a tomato eaten with broccoli will help you more. Tomato with broccoli may help you, but a medley of different vegetables eaten together will bolster the body’s different defenses against chronic disease.”

   --Jeff Prince, Vice-President for Education at AICR

**AICR Recommendations for Cancer Prevention**

4. Limit consumption of energy dense foods, avoid sugary drinks, and fast foods.
5. Limit intake of red meat (<18oz per week) and avoid processed meats.
   - Men: 2 drinks or less per day
   - Women: 1 drink or less per day
7. Limit consumption of salt and avoid moldy grains and legumes.
8. Aim to meet nutrient needs through diet alone.
Recommendations for Special Populations
9. Mothers to breastfeed and children to be breastfed.
10. Cancer survivors should aim to follow the recommendations for nutrition, physical activity, and weight.

Physical Activity & Colon Cancer
- 488,720 Subjects age 50-71, 7 year follow up
- Observed 18% lower risk of colon cancer exercising 5x per week Vs. rarely/never
  - Men “significant decrease” (p= 0.001, 95% CI)
  - Women “suggested decrease” (p=0.376, 95% CI)
- Inverse relations with low and moderate-vigorous intensity
- Positive association with sedentary behavior and colon cancer

Study Conclusion
“Engaging in physical activity of any intensity is associated with reductions in colon and rectal cancer risk. Conversely, time spent sedentary is associated with increased colon cancer risk.”

Exercise as often as possible as intensely as possible.

Hot Topics: Vitamin D
- Research and Review of RDAs
  - Current RDA: adults 50-70 200 IU; >70 400IU
- Colon cancer risk reduced with adequacy
- Emerging evidence suggests protection against cancer, metabolic syndrome, diabetes, HTN, MS, and others
- Questions remain...
  - How much? For whom?
  - Consequences of high Vitamin D status?

Vitamin D: Where do we go from here?

References
American Institute for Cancer Research. www.aicr.org