Prostate Cancer Research Summaries: Promotion & Inhibition by Dietary Factors

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"Prostate cancer appears to possibly be more strongly linked to diet and nutrition than any other cancer the effect of dietary factors may be related not only to the likelihood of developing the disease but perhaps also to the rate at which the disease progresses." Saxe, G,(2003)

Plant Based Diet & Cruciferous Vegetables: Inhibit Prostate Cancer

- PSA doubling time was observed to increase from 6.5 to 17.7 months over the course of a 4 month plant based diet and stress management intervention
  - Saxe GA et a l, (2001), Can diet in conjunction with stress reduction affect the rate of increase in prostate specific antigen after biochemical recurrence of prostate cancer? *J Urol*, 166(12): 2202-2207
- Inverse associations between vegetable intake & prostate cancer
- Strongest protective effects: legumes, pulses, nuts, carrots, green leafies, cruciferous and tomatoes
  - Chan J, Gioovannucci EL, (2001), Vegetables, fruits, associated micronutrients and risk of prostate cancer, *Epidemiol Rev* 23(1): 82-86
- Men who consumed > 28 servings of veges weekly had a 35% decrease in prostate cancer compared to men eating < 14 serves
- There was a 41% decrease for men eating 3 or more cruciferous veges per week compared to those eating < 1 serve/week
  - Cohen JH et al, (2000) Fruit & vegetable intakes and prostate cancer risk
- Compounds in broccoli inhibit proliferation of prostate cancer cells
  - Singh Sv, et al. Sulforaphane-induced G2/M phase cell cycle arrest involves checkpoint kinase 2-mediated phophorylation of cell division cycle, 25C, *J Biol Chem*; 2004, Jun 11; 279(24):24813-22 Epub 2004 Apr 08

Omega 3 Fatty Acids: Fish Oils Decrease Prostate Cancer Risk

- Omega 3 fatty acids exert protective effects against breast, colon and prostate cancer
- Multiple mechanisms of anti-cancer action
  - Simopoulos AP, The traditional diet of Greece and cancer. *Eur J Cancer Prev*. 2004 Jun: 13(3):219-230.
- A diet high in fish oil slows growth of prostate cancer cells in in vivo
- Fish oil supplementation decreases inflammatory prostate markers (COX2, PEG2, 5-(S) HETE)
- Fish oil may exert an angiostatic action preventing metastasis (inhibits expression of VEGF receptors)
  - McCarty M, Integr Cancer Ther 2004;3:349

High Meat & Dairy intake: **Promotes Prostate Cancer**

- 16 of 22 studies reviewed found a positive association between meat intake and prostate cancer risk
- 9 of 16 case controlled studies found positive associations between total fat intake and risk of prostate cancer
  - Kolonel LN, et al (2001) Fat, meat and prostate cancer, *Epidemiol Rev*, 23(1): 87-92
- Consumption of both red meat and dairy products have been associated with increased risk of metastasis
  - Michaud DS, et al, (2002) A prospective study on intake of animal products and risk of prostate cancer, *Cancer Causes Control*, 12(6): 557-6
- A meta-analysis of 11 case-controlled studies found a positive association between milk consumption and prostate cancer. Suggested mechanisms included fat, hormones and other factors
  - Qin LQ, Xu JY, Wang PY, Kaneko T, Hoshi K, Sato A, Milk consumption is a risk factor for prostate cancer: meta-analysis of case-control studies. *Nutr Cancer*, 2004;48(1):22-7.

High caloric intake: Promotes Prostate Cancer

- It may not be fat per se but high energy intake that is the critical factor
- Obesity is associated with lower sex hormone binding globulin and higher free testosterone in circulation
- Obesity is linked to insulin resistance and increased insulin like growth factor levels
  - Nomura AMY, (2001) Body size and prostate cancer. *Epidemiol Rev*, 23(1): 126-131

Omega 6 Fatty Acids: Promote Prostate Cancer

- Omega 6 fats lead to synthesis of arachidonic acid (AA) which is also found preformed in animal cell membranes
- AA stimulates both androgen sensitive and insensitive prostate cancer cell lines

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- AA is as effective as testosterone in stimulating hormone sensitive cell lines
  - Ghosh J et al, (1997), Arachidonic acid stimulates prostate cancer cell growth: critical role of 5-lipoxygenase. *Biochem Biophys Res Commun. 233:418-423*
- Prostate cancer risk was increased in the highest compared to the lowest quartile of alpha linolenic acid concentrations
- There were also positive associations with higher levels of linoleic acid and total omega 6 fatty acid concentrations
  - Newcomer L et al, 2001, The association of fatty acids with prostate cancer risk, *The Prostate, 47(4): 262-268*

Lycopene & Carotenoids: Inhibit Prostate Cancer

- Major source is cooked tomatoes, also found in watermelon other vegetables
- Hi tomato intake is linked with lower levels of ICF-1 (insulin like growth factor)
- Lycopene with Vitamin E has been demonstrated to inhibit prostate cancer cells
  - Barber NJ, Barber J. (2002) Lycopene and prostate cancer. *Prostatic Di*s. Mar;5(1):6-12
- Lycopene is inversely related to the presence of prostate cancer
  - Gann PH et al, (1996) Prospective study of sex hormone levels and risk of prostate cancer, *J Natl Cancer Inst 88(16): 1118-26*

Quercetin: Inhibits Prostate Cancer

- Quercetin inhibits expression of prostate cancer cell androgen receptors in vitro
  - Xing N et al (2001) Quercetin inhibits the expression and function of the androgen receptor in LNCaP prostate cancer cells. *Carcinogenesis,* 22(3):409-14

Sunlight, Vitamin D: Inhibits Prostate Cancer

- Risk of prostate cancer is inversely proportional to sunlight exposure
- Risk of prostate cancer is greater in men with lower levels of vitamin D
- Vitamin D absorption declines with age
- Hi intake of calcium may increase risk of prostate cancer by lowering Vit D levels
- High calcium intake (which lower vitamin D levels) associated with <u>increased</u> prostate cancer incidence
  - 7% <u>increase</u> risk of localised prostate cancer
  - 200% <u>increase</u> in risk of advanced prostate cancer
    - Kristal et al (2002)

Zinc: Inhibits Prostate Cancer

- Normal prostate cells accumulate high levels of zinc which is used needed for citrate production
- Depletion of zinc is thought to lead to increased oxidation of citrate
- Prostate cancer cells are characterised by low levels of citrate
  - Singh KK et al, (2006) Mitochondrial aconitase and citrate metabolism in malignant and non malignant human prostate tissues. *Mol Cancer, April 4(5): 14*

Green Tea: Inhibits Prostate Cancer

- Green tea has EGCG (epigallocatechin-3-gallate)
- EGCG "remarkable" effects inhibiting cancer growth in vitro and in vivo
- EGCG anti-cancer gene and causes cell cancer death
  - Gupta S, HussainT, Mukhtar H. Molecular pathway for EGCG induced cell cycle arrest and apoptosis of human prostate carcinoma cells, Arch Biochem Biophys. 2003 Feb 1:410(1): 177-85

Curcumin: Induces prostate cancer cell death

- Curcumin is a potent inducer of apoptosis in both androgen dependent and independent prostate cancer cells
  - Dorai T et al (2000), Therapeutic potential of curcumin in human prostate cancer. Curcumin inhibits tyrosine kinase activity of epidermal growth factor receptor and depletes the protein. *Molecular Urology*, 4(1):1-6.

Pomegranate Juice: Inhibits Prostate Cancer

- Pantuck and colleagues have now demonstrated that pomegranate juice markedly slows the progression of prostate cancer. - *Nature Clinical Practice Urology* (2006) 3, 458-59
  - P Pantuck AJ et al, (2006) A Phase 11 Study of pomegranate juice for men with prostate cancer and increasing PSA, *Current Urology Rep*7(1)

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