Dietary influences on prostate cancer chemoprevention

Diets deficient in polyphenols and other phytochemicals found in herbs, spices, fruit, teas, colourful vegetables and other healthy plant-based foods, have been linked with higher risks of various cancers, including that of the prostate. Men adopting healthy diets after prostate cancer diagnosis have also been reported to have slower progression of prostate specific antigen (PSA), an indicator of this disease\(^1,2\).

Polyphenol-rich foods such as pomegranate, green tea, broccoli and turmeric demonstrate anti-neoplastic effects in laboratory models involving different mechanisms of action upon angiogenesis, apoptosis and proliferation. A recent clinical trial sponsored by the Prostate Action and The Primrose Oncology Fund in the UK, evaluated the above combination of plant extracts in men with prostate cancer(3). The trial involved 199 men with an average age of 74 years, all of whom had localised prostate cancer. Of these, 60% were being managed with primary active surveillance and 40% with watchful waiting following previous interventions. The 137 men in the treatment group took a tablet three times daily containing:

- broccoli powder (Brassica oleracea) 100mg
- turmeric powder (Curcuma longa) 100mg
- pomegranate whole fruit powder (Punica granatum) 100mg
- green tea 5:1 extract (Camellia sinensis) 20mg equivalent to 100mg of green tea.
- bulking agent (di-calcium phosphate) and anti-caking agents (modified maize-based starch, maltodextrin and magnesium stearate).

The other 67 men in the placebo group took a tablet containing the same bulking and anti-caking agents with 10mg of watercress extract to provide identical colour and substance.

At the end of the 6 month treatment period, the median rise in PSA in the food supplement group was 14.7% (from 6.50 to 6.81µg l\(^{-1}\)), while that in the placebo group was 78.5% (from 6.50 to 10.98µg l\(^{-1}\)). A total of 46% of the men who took the food supplements had stable or lower PSA levels, compared to only 14% in the placebo group. No differences were measured between the two groups in cholesterol, blood pressure, blood sugar, C-reactive protein or adverse events.

While the 6 months duration of the intervention was relatively short, and other formal indicators of disease progression apart from PSA measurement were not undertaken, this trial provides evidence of the likely benefits to men with prostate cancer of consuming the above foods. Longer term trials evaluating other markers of disease progression, are planned.

Previous studies have found a green tea extract to reduce levels of several growth factors that promote cancer, as well as a beneficial effect on PSA\(^4\). Regular broccoli intake also downregulates cancer genes linked to cancer promotion and up-regulates genes linked to cancer suppression\(^5,6\). Curcumin found in turmeric, has been shown to slow prostate cancer cell growth, increase apoptosis and reduce markers of invasion and migration of cells\(^7,8\).

Studies in mice involving pomegranate extract have also demonstrated potent in vitro cytotoxicity in metastatic castration resistant prostate cancer cells, and inhibition of tumour growth and enhancement of the efficacy of the cytotoxic drug docetaxel\(^9\). Human Phase II studies have reported a prolongation of PSA doubling continued over page >
following pomegranate juice consumption\(^{(1)}\), and treatment with a pomegranate seed extract\(^{(2)}\).

Results from this latest trial suggest that consumption of relatively moderate amounts of a range of specific plant foods or supplements from different sources, each with a unique phytochemical profile of polyphenols and separate mechanisms of anti-cancer activities, may have benefits perhaps not achieved through supplementation with large doses of individual isolated plant compounds. It also adds to the growing amount of evidence for dietary factors contributing to prostate cancer risk and clinical outcomes.

Other recent reports include an Iranian study which found an increased risk of prostate cancer in those consuming a ‘western’ diet (high in sugar, organ meat, tea & coffee, French fries, salt, carbonated drinks, red or processed meat), as opposed to those on a ‘healthy diet’ high in legumes, fish, dairy products, fruits and fruit juice, vegetable, boiled potatoes, whole cereal and egg\(^{(3)}\). Dietary protein restriction has also been shown to inhibit prostate tumour cell growth in human xenograft cancer models\(^{(4)}\). Engaging in daily vigorous physical activity and consuming a diet high in vegetables (particularly tomato sauce and cruciferous) and healthy fats (including fish, nuts, vegetable oils, soybeans, avocados, and flaxseed), are increasingly being recognized as likely to reduce prostate cancer specific and overall mortality\(^{(5,6)}\).

A diet enriched in walnuts has been reported to reduce human prostate, breast, colon and renal cancer cell growth in studies on mice, although human clinical trials are lacking to date\(^{(7,8)}\). A recent meta-analysis of eleven cohort studies and six case-control studies found the odds ratio of incidence of prostate cancer among consumers of higher raw or cooked tomato intake was 0.81 and 0.85 respectively, although the influence of higher versus lower lycopene intake was less pronounced\(^{(9)}\). This suggests a modest role of tomato in prostate cancer prevention, and queries the benefits from lycopene supplementation, although low prostate concentration of lycopene is associated with development of prostate cancer in patients with high-grade prostatic intraepithelial neoplasia\(^{(10)}\).

Decreased prostate cancer risk has also been recently associated with carrot intake\(^{(11)}\), and rosemary (Rosmarinus officinalis), which has been shown to disrupt endoplasmic reticulum stress proteins and decrease prostate cancer cell viability in human prostate cancer cell lines, without affecting normal prostate epithelial cells\(^{(12)}\).

References