

Watercress may “Turn Off” Breast Cancer Signal

New scientific research has revealed that a plant compound in watercress may have the ability to suppress breast cancer cell development by “turning off” a signal in the body and thereby starving the growing tumour of essential blood and oxygen.

The research, which was unveiled at a press conference at the Royal Society of Medicine’s Chandos House on 14 September 2010 was conducted by the University of Southampton. It shows that the compound, phenylethyl isothiocyanate (PEITC), is able to interfere with the function of a protein called Hypoxia Inducible Factor (HIF), which plays a critical role in cancer development. As tumours develop they rapidly outgrow their existing blood supply and further development isn’t possible until they are able to obtain enough oxygen and nutrients to maintain the growth of cancer cells. To get past this roadblock, the cancer cells send out signals which cause the surrounding normal tissues to grow new blood vessels into the tumour which then supply oxygen and nutrients. HIF is at the heart of this process of inducing new blood vessel growth. However, PEITC, of which watercress is the richest natural source, was shown in laboratory tests to have the ability to block the function of HIF.

The research team, which was led by Professor Graham Packham of the University of Southampton’s School of Medicine at Southampton General Hospital, then went on to show that PEITC may “turn off” HIF by changing the function of a second protein called 4EBP1. Importantly, this provided a measurable readout that could be used to find out whether eating watercress could be affecting the HIF pathway. Working with Barbara Parry, Senior Research Dietician at the Winchester and Andover Breast Unit, Prof Packham performed a pilot study in which a small group of breast cancer survivors, underwent a period of fasting before eating 80g of watercress (a cereal bowl full) and then providing a series of blood samples over the next 24 hours.

The research team was able to detect significant levels of PEITC in the blood of the participants following the watercress meal, and most importantly, could show that the function of 4EBP1 was also measurably affected in the blood cells of the women.

The two studies, which have been published in the British Journal of Nutritionⁱ and Biochemical Pharmacologyⁱⁱ provide new insight into the potential anti cancer effects of watercress, although more work still needs to be done to determine the direct impact watercress has on decreasing cancer risk.

Prof Packham commented: “The research takes an important step towards understanding the potential health benefits of this crop since it shows that eating watercress may interfere with a pathway that has already been tightly linked to cancer development.”

PEITC is the phytochemical which gives watercress its unique peppery taste. Watercress is the richest natural source. PEITC has previously been shown in many *in vitro* and *in vivo* animal studies to have strong anti cancer properties. Pioneering work by Professor Stephen Hecht in 1995 demonstrated that the compound could neutralise a cancer causing chemical found in the blood of smokers. But until now no clinical investigations have been undertaken to demonstrate the mechanism for dietary watercress to exert its protective influence on humans.

The Southampton research was funded by The Watercress Allianceⁱⁱⁱ, a consortium of British watercress farmers. It follows research they funded with the University of Ulster, Coleraine, in 2007^{iv} which found that watercress increased the ability of cells to resist DNA damage caused by free radicals and that daily intake of watercress significantly reduced levels of DNA damage found in blood cells. DNA damage is considered to be an important trigger in the early stages of cancer.

Watercress Alliance member Dr. Steve Rothwell commented: “We are very excited by the outcome of Prof. Packham’s work which builds on the body of research which supports the idea that watercress may have an important role to play in limiting cancer development. It is fitting that the latest project is being carried out in Hampshire which is at the centre of UK watercress production.”

Prof. Packham added: “Understanding the risk factors for cancer is a key goal and studies on diet are an important part of this. However, relatively little work is being performed in the UK on the links between the foods we eat and cancer development. Support from organisations such as the Watercress Alliance makes a strong contribution to research in this very complex area.”

A summary of the research has been accepted for inclusion in the Breast Cancer Research Conference which is taking place at the University of Nottingham from 15 to 17 September. Breast cancer is the most common cancer in women in the Western world and currently affects approximately 1 in 9 women during their lifetime.

Grown in mineral rich spring water, drawn from deep under the chalk downs of Hampshire, Dorset and Wiltshire, watercress packs a powerful nutritional punch, gram for gram containing more iron than spinach, more vitamin C than oranges and more calcium than milk. It is brimming with Vitamin A (converted from beta carotene) with 80g providing a whopping 42% of the recommended daily allowance. Its curative properties have been revered down the centuries; Hippocrates, the father of medicine, is said to have located his first hospital close to a spring to ensure fresh watercress to help treat his patients, Greek soldiers were given it as a tonic before going into battle and the 16th Century herbalist Culpepper claimed it could cleanse the blood.

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ⁱ Br J Nutr. 2010 Jun 15:1-9. [Epub ahead of print]PMID: 20546646

In vivo modulation of 4E binding protein 1 (4E-BP1) phosphorylation by watercress: a pilot study.

[Syed Alwi SS](#), [Cavell BE](#), [Telang U](#), [Morris ME](#), [Parry BM](#), [Packham G](#).

ⁱⁱ Wang X-h, Cavell BE, Alwi SSS, Packham G, Inhibition of hypoxia inducible factor by phenethyl isothiocyanate, *Biochemical Pharmacology* (2008), doi:10.1016/j.bcp.2009.04.010

ⁱⁱⁱ The Watercress Alliance is made up of Alresford Salads, Vitacress Wight Salads Group and The Watercress Company

^{iv} Gill CIR, Haldar S, Boyd LA, Bennett R, Whiteford J, Butler B, Pearson JR, Bradbury I and Rowland IR (2007) Watercress supplementation in diet reduces lymphocyte DNA damage and alters blood antioxidant status in healthy volunteers. *American Journal of Clinical Nutrition* 85 (2), 504-510