

Vitamin C Effective in Targeting Cancer Stem Cells

Researchers measure the impact on cancer stem cell metabolism of 3 natural substances, 3 experimental pharmaceuticals and 1 clinical drug.

Vitamin C is up to ten times more effective at stopping cancer cell growth than pharmaceuticals such as 2-DG, according to scientists in Salford, UK.

The research, published in ***Oncotarget***, is the first evidence that Vitamin C (ascorbic acid) can be used to target and kill cancer stem cells (CSCs), the cells responsible for fuelling fatal tumours.

Dr Michael P. Lisanti, Professor of Translational Medicine at the University of Salford, said: "We have been looking at how to target cancer stem cells with a range of natural substances including silibinin (milk thistle) and CAPE, a honey-bee derivative, but by far the most exciting are the results with Vitamin C.

"Vitamin C is cheap, natural, non-toxic and readily available so to have it as a potential weapon in the fight against cancer would be a significant step."

Cancer stem-like cells are thought to be the root cause of chemotherapy resistance, leading to treatment failure in patients with advanced disease and the triggers of tumour recurrence and metastasis (regrowth).

The Salford team set out to assess the bioenergetics of cancer stem cells -- the processes which allow the cells to live and thrive -- with a view to disrupting their metabolism.

Focusing on energy-transfer, they measured the impact on cell lines in a laboratory of 7 substances, the clinically-approved drug stiripentol, 3 natural products -- caffeic acid phenyl ester (CAPE), silibinin and ascorbic acid -- and experimental pharmaceuticals, such as actinonin, FK866 and 2-DG.

While they found that natural antibiotic actinonin and the compound FK866 were the most potent, the natural products also inhibited CSC formation, with Vitamin C, outperforming 2-DG by tenfold in terms of potency.

Vitamin C has previously been shown to be effective as a non-toxic anti-cancer agent in studies by Nobel Prize winner Linus Pauling and was recently shown to reduce mortality by 25% on breast cancer patients in Japan. However, its effects on CSC activity have not been previously evaluated and in this context, it behaves as an inhibitor of glycolysis, which fuels energy production in mitochondria, the "powerhouse" of the cell.

Dr. Gloria Bonuccelli, lead author and another member of the Salford team added: "This is further evidence that Vitamin C and other non-toxic compounds may have a role to play in the fight against cancer.

"Our results indicate it is a promising agent for clinical trials, and a as an add-on to more conventional therapies, to prevent tumour recurrence, further disease progression and metastasis." **SOURCE: Science Daily – University of Salford – March 7, 2017**

Journal Reference:

1. Gloria Bonuccelli, Ernestina Marianna De Francesco, Rianne de Boer, Herbert B. Tanowitz, Michael P. Lisanti. **NADH autofluorescence, a new metabolic biomarker for cancer stem cells: Identification of Vitamin C and CAPE as natural products targeting “stemness”**. *Oncotarget*, 2015; DOI: ~~10.18632/oncotarget.15400~~