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Vitamin B2 deficiency puts cancer cells into hibernation

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Cancer stem cells can be put into "hibernation" by a little-known drug called diphenyleneiodonium (DPI) according to researchers from the University of Salford, UK. DPI effectively switches off the cancer stem cells, preventing their proliferation.

"It's extraordinary; the cells just sit there as if in a state of suspended animation," explains Professor Michael Lisanti, Chair of Translational Medicine and lead investigator.

The discovery is significant because the drug halts the propagation of cancer stem cells without causing the toxic side-effects normally associated with more conventional chemotherapy.

Reporting their laboratory findings in the journal Aging, the team observed that addition of DPI to a mixed population of cells eliminated the tumour initiating cancer stem cells. However, the drug was non-toxic for "bulk" cancer cells, which are not thought to be cancer-forming. The authors describe how DPI targets more than 90 protein enzymes which feed mitochondria and help generate the cell's energy. Specifically, DPI works as an inhibitor of vitamin B2 – riboflavin – starving the cells of the energy.

"Our observation is that DPI is selectively attacking the cancer stem cells, by effectively creating a vitamin deficiency," explained Professor Lisanti. "In other words, by turning off energy production in cancer stem cells, we are creating a process of hibernation.

"The beauty of this is that DPI makes the cancer stem cells metabolically-inflexible, so they will be highly susceptible to a many other drugs".

Chemotherapy produces many nasty side-effects, because it helps create toxic free radicals. However, DPI did not increase free radicals.

The Salford team – which specialises in the discovery new non-toxic therapies – and has published substantially on the anti-cancer impacts of vitamin C and antibiotics—is calling the discovery the start of a new type of chemotherapy, and they even have a name for it—"mitoflavoscins."

"In terms of chemotherapies for cancer, we clearly need something better that what we have at present, and this is hopefully the beginning of an alternative approach to halting cancer stem cells," said Professor Federica Sotgia, a co-author of the study.

More information: Bela Ozsvari et al. Targeting flavin-containing enzymes eliminates cancer stem cells (CSCs), by inhibiting mitochondrial respiration: Vitamin B2 (Riboflavin) in cancer therapy, *Aging* (2017). DOI: 10.18632/aging.101351

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