

Antioxidant supplements to avoid during cancer treatment

Richard Béliveau

Translated from Le Journal de Montréal, September 25th, 2023.

A recent study reports that supplements containing high amounts of antioxidants like vitamin C promote the formation of blood vessels necessary for tumor progression.

Oxidative stress caused by reactive oxygen species (free radicals) plays an important role in the development of all chronic diseases, particularly cancer.

These very unstable molecules can cause significant damage to the DNA, proteins and membranes of cells and thus create abnormalities favoring the development of tumors. Since certain vitamins (C and E, in particular) are able to neutralize this destructive action of free radicals, some have suggested that the administration of massive doses of these vitamins could have a positive effect on health.

DISTURBED BALANCE

Research over the past few decades, however, has clearly shown that this is not the case. Not only do high doses of antioxidants have no protective effect on the risk of cancer, but some of them, such as β -carotene and vitamin E, have on the contrary been associated with an increase in the risk of certain cancers, particularly those of the lung and prostate, and premature mortality.

It appears that this negative effect is caused by a disruption in the biochemical balance that exists between the levels of free radicals normally generated by cells and the body's natural antioxidant defenses.

For example, it is well established that free radicals are essential for the elimination of emerging tumors by the immune system and recent studies have also noted that oxidative stress helps reduce the risk of metastases (1).

By interfering with these natural anti-cancer defense mechanisms, massive doses of antioxidants in supplements can therefore prove to be much more harmful than useful in the fight against cancer.

FEED THE TUMOR

A recent study on the effect of another antioxidant, vitamin C, on the progression of lung cancer is another example of the potential dangers associated with the use of these antioxidant supplements (2).

In this study, researchers grew lung cancer cells in the form of organoids, three-dimensional micro tumors that have characteristics very similar to the original tumor and are increasingly considered an excellent model for studying the biochemistry of the cancer.

They observed that exposure of these micro tumors to vitamin C caused significant changes in the expression of several genes, particularly those involved in the formation of new blood vessels through the process of angiogenesis.



This effect can have serious repercussions on the progression of cancer, because angiogenesis helps supply cancer cells with nutrients and oxygen, essential for their growth.

Moreover, researchers observed that the administration of high doses of antioxidant supplements to animals carrying tumors caused a marked increase in the level of vascularization of these tumors: this is a harmful proangiogenic effect.

More detailed analysis of the phenomenon revealed that this effect of vitamin C is caused by the activation of a protein called BACH1 that alone controls the expression of several proangiogenic genes.

A similar phenomenon may occur in patients, as analysis of lung cancer biopsies has shown that increased levels of this BACH1 protein correlate with those of several genes involved in angiogenesis.

All of this is complex at the biochemical level, but the take-home message remains very simple: for cancer patients, high-dose antioxidant supplements are products that are of no use and may even prove dangerous by promoting the progression of the disease.

- (1) Piskounova E et al. Oxidative stress inhibits distant metastasis by human melanoma cells. *Nature* 2015; 527:186-91.
- (2) Wang T et al. Antioxidants stimulate BACH1-dependent tumor angiogenesis. *J. Clin. Invest.*, 2023 Aug 31;e169671. doi: 10.1172/JCI169671. Online ahead of print.