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Pros and Cons of Ascorbic Acid (Vitamin C) Use In Cancers

Editorial

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For decades, ascorbic acid (*aka* vitamin C), has been popularly prescribed by alternative and complementary health care practitioners and used by individuals or patients with various health conditions, including cancer progression [1], due to its renowned antioxidant property [2], which consists to neutralize free radicals such as superoxide (H_2O_2) and hydroxyl (OH) radicals, as well as its capacity to protect and repair normal cells that are damaged by chemotherapy or radiation therapy [3]. Surprisingly, the mechanism of anti-tumor effect of ascorbic acid, especially used at high dose, has been proposed to be mediated by generation of H_2O_2 and secondary metabolite[4].

Interestingly, a number of studies have reported the benefits of ascorbic acid in preventing and treating cancers [5]. Thereby, in some preclinical studies led *in-vitro* and *in-vivo*, ascorbic acid induced tumor cells apoptosis and even enhanced the anti-tumor effects of chemotherapy [6-7], acting then as a potentially good therapeutic adjuvant. Conversely, evidence from other studies and randomized trials[8] suggested that ascorbic acid during chemotherapy or radiation therapy may protect tumor cells and reduce the treatment efficacy.

Besides, a meta-analysis published this year and which aimed to associate dietary ascorbic acid supplement intake and survival in breast cancer patients, showed that the relative risk (RR) of breast cancer-specific mortality can be lowered with 100 mg intake per day of ascorbic acid, [9]. However, it is important to point out the fact that the experimental conditions of the studies used in this meta-analysis differed notably in terms of dosage, formulation and administration type and schedule, causing these confounders difficult to control. Besides, it is noteworthy that in sub-analysis of Women's Health Initiative (WHI) study, dietary intake of ascorbic acid was not associated with a reduction in ovarian cancer risk [10].

Therefore, the challenging issues still concern: (i) which dose (high or low) and administration setting are really beneficial for a patient suffering from cancer? (ii) which cancer is prone to ascorbic acid therapy based on efficacy/toxicity risk ratio? (iii) which are the fully clear molecular mechanisms mediated by ascorbic acid in cancers?; (iv) which are the benefits or risks of using nano encapsulated ascorbic acid, considering the systemic bioavailability of such compound?; (v) which are the benefits or risks of combining (nano-)ascorbic acid with (nano-) anti-cancer agents (chemical drugs and/or bio therapeutics)?

In light of these few observations from inconsistent studies, it is difficult to state that ascorbic acid is an anti-cancer agent, and many issues still need to be accurately and promptly addressed first from a holistic point of view before prescribing it in a personalized manner. Ongoing studies certainly provide new interesting insights about ascorbic acid effects on cancers.

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