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Vitamin C Inhibits Anti-Myeloma Activity Of Velcade

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More recent studies show that vitamin C can counteract the activity of certain cancer chemotherapy agents

Vitamin C (ascorbic acid) significantly reduces the activity of Velcade (bortezomib) in treatment of multiple myeloma, according to a recent article published in Nature.

Several preclinical studies suggest that vitamin C, which is one of the most common dietary supplements for cancer patients, increases the efficacy of cancer drugs and decreases treatment-related side effects. However, more recent studies show that vitamin C can counteract the activity of certain cancer chemotherapy agents, including Velcade, in the body.

Velcade, the first proteasome inhibitor approved for the treatment of multiple myeloma, blocks the activity of enzymes (proteasomes) that break down important proteins in cancer cells.

In vitro studies, which are those performed in controlled environments like test tubes or Petri dishes, have shown that a hydroxyl group (-OH) in vitamin C directly binds to boronic acid in Velcade. This significantly reduces the affinity of Velcade for the proteasome, decreasing its destructive activity toward myeloma cells.

The article published in Nature examines the in vivo study of how vitamin C affects Velcade activity in mice. Dr. Paul Richardson, a physician at Dana Farber Cancer Institute and Associate Professor at Harvard Medical School, said that a study testing the effect of vitamin C on Velcade's efficacy in myeloma patients is in the planning phase.

For the Nature study, mice were orally administered 40 mg/kg vitamin C for four days; their vitamin C plasma levels were measured after the last intake. The mice were then separated into three groups, which either received an intravenous saline solution, intravenous Velcade, or intravenous Velcade plus vitamin C. As seen in previous studies, vitamin C significantly reduced the activity of Velcade, and the degree of inhibition was dose-dependent.

In order to test whether vitamin C selectively inhibits Velcade by a direct binding between vitamin C and boronic acid, the authors of the article examined if vitamin C inhibited other classes of proteasome inhibitors. Vitamin C significantly blocked the activity of MG-262, which is also a boronic acid proteasome inhibitor, but it did not inhibit NPI-0052, lactacystin, or MG-132, which all belong to other classes of proteasome inhibitors. These results suggest that vitamin C selectively inhibits proteasome inhibitors containing boronic acid.

Based on these results, the authors of the article suggest that myeloma patients receiving therapy with proteasome inhibitors, particularly Velcade, should avoid taking vitamin C supplements at the same time as their proteasome inhibitor. Vitamin C should be specifically avoided at least 12 hours before and after Velcade treatment. Furthermore, the authors advise that all antioxidant supplements, which contain hydroxyl (-OH) groups that bind and inhibit Velcade, be avoided in patients receiving treatment with Velcade and other boronic acid proteasome inhibitors.

In a follow-up conversation with Dr. Richardson, he specified that patients taking Velcade only need to avoid antioxidant supplements, not fruit juices that contain vitamin C. Additionally, he emphasized that supplements only need to be avoided on days when Velcade is taken.