The recent article by J. Cha et al. provided for highly interesting reading [1]. Vitamin C may attenuate tumor growth in a number of other systemic malignancies. Vitamin C has a negative impact on tumor growth in breast cancers. Similarly it mitigates tumor metastasis. It mediates this effect in part by attenuating IL-6 levels [2]. Similar effect is seen on VEGF levels. Interestingly, intravenous ascorbic acid has been shown to significantly improve the quality of life in breast cancer survivors during chemotherapy [3]. For instance, symptoms such as depression and nausea are markedly decreased. Enhanced anti-proliferative effects are seen when vitamin C is administered in conjunction with agents such as retinoic acid [4]. In one recent study, the reported synergistic ratio of retinoic acid and vitamin C was 1.72. Vitamin C also augments the anti-neoplastic activity of chemotherapeutic agents such as cisplatin [5]. Similarly it increases the sensitivity of breast cancer cells to agents such as doxorubicin.

Similar effects are seen in gastric malignancies. Vitamin C tends to augment intra-tumoral apoptosis. It mediates this effect by down-regulating 14–3–3σ via a mitochondrial dependent pathway [6]. Part of these pro-apoptotic effects are also mediated via p38-MAP kinase-dependent up-regulation of transferrin receptor [7]. It also increases the Bax/ Bcl-xL ratio. These effects are dose dependent. Administration of vitamin C also augments superoxide dismutase activity. Vitamin C also enhances MHC class I expression by the cancerous cells [8]. At the same time Fas (CD95) expression is markedly augmented. As a result the sensitivity of cancer cells to anti-Fas antibodies is significantly accentuated.

Similarly, decreased RBC vitamin C levels have been noted in patients with prostate carcinomas. In fact, recent studies indicate that vitamin C markedly attenuates tumor growth in hormone refractory prostate cancers [9]. It also has a negative impact on tumor metastasis. Part of these effects are mediated via VEGF inhibition. At the same time vitamin C has an inhibitory effect on MMP-9 [10].

The above examples clearly highlight the significant anti-neoplastic effects of vitamin C.

REFERENCES