

Increase in the number of circulating stem cells by StemEnhance® does not promote tumor growth

Introduction

While bone marrow stem cells have been shown to play an important role in tissue repair, the role of stem cells in tumor formation has also been intensely investigated. Some scientists have suggested that bone marrow-derived stem cells (BMDSCs) might be involved in the process of tumor formation. The link between chronic inflammation and cancer has long been recognized, as cancer has been called a “wound that never heals,” and a wound is known to attract stem cells.

It has been proposed that BMDSCs could become tumor cells or enhance the development of existing tumors by contributing to the formation of blood vessels in the tumor. If circulating stem cells were to contribute to tumor vasculature and tumor growth, then increasing the number of circulating stem cells should accelerate tumor growth.

StemEnhance® is a novel mobilizer of bone marrow stem cells that was shown to increase the number of circulating stem cells by 25%. Therefore, we investigated the effect of daily consumption of StemEnhance® on the growth of human breast tumor implanted in a mouse model.

Methods

In brief, fluorescent human MDA-MB-435 cancer cells were grown into tumors, which were later transplanted by surgical implantation into the mammary fat pad of forty female

mice. Twenty-one days after implantation, mice were randomly separated in two groups. For a duration of six weeks, experimental animals were fed with 300 mg/kg of StemEnhance while controls were fed placebo. Tumor growth was monitored using live whole body fluorescence imaging. At the end of the study, tumors were excised and weighed.

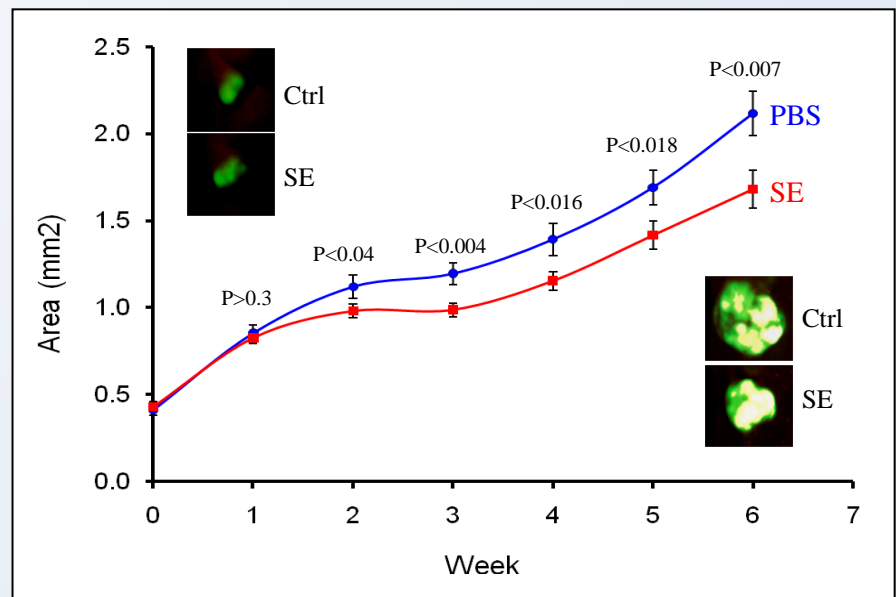
Results

There was no evidence of toxicity due to StemEnhance. Animals in both groups showed identical body-weight growth patterns and no visual or behavioral differences could be seen between the two groups.

At the start of the feeding trial, tumor areas for both control and experimental group were statistically identical. Changes in tumor area, and rates of increase from weeks 1 to 6, were determined using repeated measures analysis of variance.

Tumor growth was

approximately linear, as determined by orthogonal polynomial regression. Tumor growth rate was slower in the StemEnhance group ($P=0.014$) when compared to the control group. The reduction in tumor growth was significant by week 2 and at week 6 tumor areas were 40% larger in the control group (1.70 cm^2) than in the StemEnhance group (1.25 cm^2) ($P<0.01$). Metastasis was not seen in either group. At the end of the study, tumors were carefully excised and weighed. Mean tumor weight in the StemEnhance-treated-group (0.44 ± 0.21) was 35% smaller than in the control (0.68 ± 0.42) ($P < 0.03$).



These results for tumor mass are consistent with the analyses of tumor area.

Discussion

Animals received 300 mg/kg of StemEnhance , which is roughly 10 times the daily intake normally recommended for humans. Even at that high level, growth was normal and animals showed no signs of toxicity. Daily consumption of the stem cell mobilizer StemEnhance reduced the rate of human breast cancer growth without affecting growth pattern. No metastases were seen, at least in the conditions of this study.

Little data exist to suggest how circulating stem cells could contribute to reducing tumor growth. It is possible that after migrating in a tumor, attracted by cytokines, and after proliferating and differentiating in cells of the target tissue, stem cells could secrete cytokines inhibiting cellular division.

Other compounds in StemEnhance could have contributed to the effect observed in this study, such as phycocyanin and specific polysaccharides. Nevertheless, based on these results, increasing the number of circulating bone marrow stem cells does not promote the growth of breast cancer.