Effects of Xylitol On Tumor Progression In Syngeneic Cancer Models

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Introduction

Xylitol is a well-known preventative product that has been used by dentistry for decades. Previously published research demonstrated the growth inhibition of cancer cell lines by systemically administered xylitol.

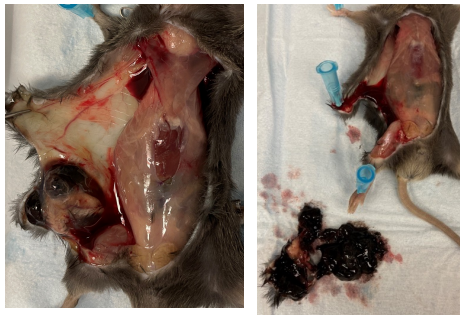
Purpose

The purpose of this study was to better understand the inhibitory mechanisms of xylitol administered both intratumorally and subcutaneously on two syngeneic mouse cancer models: 4T1 mammary carcinoma in BALB/c mice and B16F10 melanoma in C57BL/6 mice.

Methods

This study included two strains of humanized, immunocompetent female mice: 20 C57BL/6 and 20 BALB/c. The BALB/c group was injected with 4T1 mammary carcinoma cells, and the C57BL/6 group was injected with B16F10 melanoma cells. When the tumor size reached 50 to 100 mm^3, both treatment groups were injected daily with 20% xylitol solution intratumorally and subcutaneously. Control mice received sterile saline. Tumor tissue and terminal blood were collected for pharmacokinetic, metabolomic and histopathologic analyses upon mouse expiration.

Figure 1
Photos taken at tumor and lymph node collection , which were used for metabolic analysis and histopathology. Large black mass is the melanoma tumor.



Results

After 5 days of 20% xylitol injections, tumor volumes were reduced by 40% in the B16F10 cancer line and C57BL/c mice. Tumor stroma deteriorated resulting in a substantial xylitol leak. Thereafter, experimental and control tumor volumes would become clinically comparable by demise. Metabolomic analysis revealed clear differences between experimental and control tumor cellular metabolism. Lymph node histological analysis demonstrated metastasis in both groups by the time of euthanasia. The metabolomic analysis demonstrates that xylitol reduces tumor production of histamine, NADP+, ATP, and glutathione thereby improving host innate immune response with reactive oxidative species (ROS).

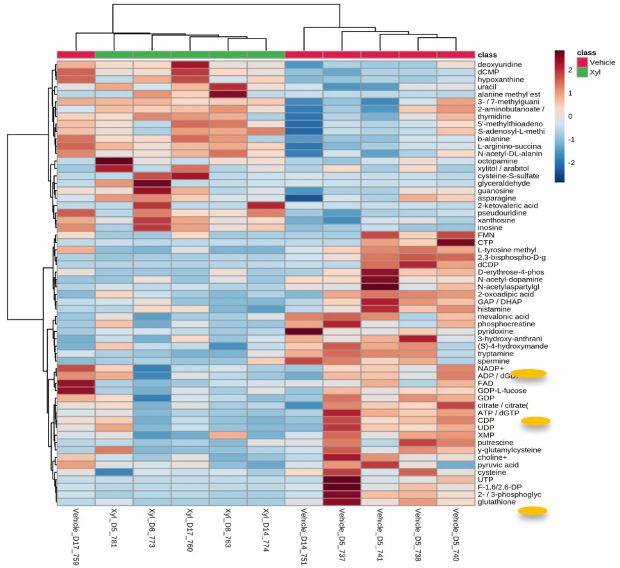


Figure 2
The metabolomic analysis demonstrates that xylitol reduces tumor production of histamine, NADP+, ATP, and glutathione.

Discussion

Data indicates that xylitol inhibits both cancer cell lines. Significant results were seen in the melanoma group. Cancer cell lines cannot utilize xylitol for energy, and xylitol enhances the innate immune system response to cancer cells. Furthermore, the metabolomics were different between vehicle and xylitol groups. Tumor cell production of glutathione and histamine were reduced by xylitol. This suggests that xylitol-exposed cancer cell lines become more sensitive to ROS produced by killer T-cells. Xylitol has many applications in the preventive care protocols for oncology and septic patients as well as those with stem cell transplants and respiratory disease. In a randomized clinical trial, xylitol has also been successfully utilized to prevent blood stream infections in patients following hematopoietic stem cell transplant. Xylitol tablets prevent dry mouth, increase salivation, and reduce decay, periodontal disease, and mucosal blisters. Augmenting oncology patients with xylitol products should have significant benefits, and more research is urgently needed with large, well-controlled clinical trials.

Conclusions

Treatment with 20% xylitol solution reduced growth of B16F10 melanoma tumor cell line until stroma deterioration. Results of this pilot study suggest that xylitol has potential as an adjunct to oncological treatment and is being further investigated along with improved methods of delivery.

References

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