CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

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Project Number

S0503

Project Title

Cancer Targeting Activity of Salmonella Invasion Protein A

Abstract

Objectives/Goals

Due to the fact that current conventional cancer treatments, such as chemotherapy and radiation therapy, lack specificity, the development of new forms of therapy is essential to decreasing negative impacts of the treatment on patients. Past research shows that Salmonella typhimurium is able to affect metastases and also preferentially colonize 2,000-fold more in tumors, than in liver, spleen, lung, heart, and skin. However, the precise mechanisms of the attractive interaction between bacteria and cancer cells are still unknown. In this research, Salmonella Invasion Protein A (SipA), known to change actin filament activity in the host cell, was tested for its potential role in cancer specific drug delivery.

Methods/Materials

In combination with SipA, a DNA restriction endonuclease (RE) fused with nuclear localization sequences (RE-NLS) was used as the toxic therapeutic agent. The NLS was hypothesized to deliver the RE-NLS fusion protein to the nucleus of the cancer cells, where the restriction enzyme would cut the cancer cell's genomic DNA and kill the cell. SipA and RE-NLS proteins were mixed with a protein transfection agent to initiate intracellular delivery of the proteins into normal and lung cancer cells from humans and mice.

Results

Toxicity assays of the proteins showed a decrease in the number of cancer cells in a dose-dependent manner, while the number of normal cells stayed relatively consistent. Tests using different combinations of SipA and RE-NLS proteins were able to show specifically SipA's cancer targeting activity.

Conclusions/Discussion

Thus, this study gives positive evidence that the SipA protein could potentially be a useful mediator for cancer specific drug delivery in the future.

Summary Statement

In this research, Salmonella Invasion Protein A (SipA), known to change actin filament activity in the host cell, was tested for its potential role in cancer specific drug delivery.

Help Received

Used lab equipment at Thermo Fisher Scientific and AntiCancer under the supervision of Dr. Katzen and Dr. Miwa respectively