CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)

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Project Number

S0517

Project Title

Assessing a Targeted Heptapeptide as a Molecular Imaging Agent for Colorectal Cancer Screening

Abstract

Objectives/Goals

The heptapeptide VRPMPLQ was previously isolated as a targeting ligand for early-stage colon adenomas and subsequently validated in vivo in a pilot trial involving 30 patients undergoing colonoscopy. In our present work, we undertook to examine the peptide's performance in vitro as a first step to develop the molecular imaging strategy.

Methods/Materials

We employed the M13 bacteriophage clone from which the peptide was isolated; using this phage as a vehicle, we performed a variety of assays to evaluate binding to an established colon cancer cell line (HT-29 colon adenocarcinoma cell line). Methods included ELISA-based assays, fluorescence microscopy, and flow cytometry.

Results

After exhausting the available analytic techniques, we found through a series of troubleshooting tests that the phage displayed the wrong peptide sequences due to frameshift mutations in the phage genome. We were finally able to isolate a small sample with the correct DNA sequence and determined that a short (5-hour) replication time produces a stable phage sample.

Conclusions/Discussion

The challenges encountered in working with the phage system illustrate the need for a positive control; establishing this positive control phage library is currently in progress. We have developed a detailed plan to interrogate the in vitro properties of the heptapeptide VRPMPLQ to gain a full understanding of the peptide's behavior and we hope to present these results in the future.

Summary Statement

We attempted to assess the binding properties of the heptapeptide VRPMPLQ to an established colon cancer cell line; however, after numerous troubleshooting assays we determined that the bacteriophage containing the peptide mutated readily.

Help Received

Mentored by Dr. Jonathan Hardy and Prof. Chris Contag in Contag Lab at Stanford University. Received help from Dr. Tobi Schmidt in using flow cytometer.