CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)

Tanay Tandon

Project Number

S0531

Project Title

Novel Detection of Hematological Cancer: A Proposed Conductivity Based Analysis for Early Leukemia Cell Identification

Abstract

Objectives/Goals

The objective of this research was to define a novel method of detecting hematological malignancies (blood cancers) based on conductivity fluctuations within the blood. This study aimed to lower blood cancer detection costs, with focus on portable cancer detection devices. As opposed to current methods of detection (flow cytometry, cell cytogenetics), which are confined to laboratories; the proposed form of detection was aimed to function in home-based environments, and provide instantaneous blood readings. Such a method could revolutionize blood cancer detection, by simplifying the detection process, and reducing costs.

Methods/Materials

The research was conducted by isolating cell samples of healthy Canine White Blood Cells (WBCs), and diseased ML3 Leukemia Canine cells. Following this, the cells were separated and re-concentrated through centrifugal process into 4 experimental concentrations. The YSI-80 Conductivity Meter was then used to take milliSiemens/cm Conductivity readings for each of the experimental groups over various trials. The mS/cm Conductivity data was then consolidated to chart the conductivity values of ML3 Leukemia cells in comparison to healthy WBCs. Based on differences in conductivity readings; Leukemia would be distinguishable.

Results

The data showed a 2% drop in conductivity in Leukemia Cell groups in comparison to healthy WBC samples. The healthy blood cell groups maintained average conductivity readings of 13.7385 mS/cm, while the Leukemia test groups had a 13.57725 mS/cm average reading. This conductivity drop between the samples was proven as a statistically significant trend using T-Test analysis with a P-Value of .002. Furthermore, the data proved the CFU-GM Myeloblastic Absorption Theory, which explains the conjecture behind Leukemia cell conductivity drops, and validated the produced data trends.

Conclusions/Discussion

The research has shown that Leukemia is distinguishable from healthy blood samples based on Conductivity readings. This method of Leukemia detection reduces detection costs by 99.75%; and could maximize portability by operating in the format of a handheld conductivity meter. The proposed conductivity based method is comparable to a #thermometer# for blood cancer, by providing a low-cost preliminary detection method. Furthermore, the detection method could help Leukemia relapse victims monitor blood health from within their own homes.

Summary Statement

I created a novel method of detecting blood cancer based on Conductivity; that could eventually lower costs, and detect Leukemia earlier.

Help Received

Dr. Valerie Morris at the Fred Hutchinson Cancer Research Center gave access to lab facility and answered questions. Dr. Majeti from Stanford answered questions through email, and in person.