CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)

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Project Number

S1305

Project Title

Know Your AGE: Measuring Advanced Glycation End-products in Your Skin

Abstract

Objectives/Goals

Advanced glycation end-products (AGEs) are lipids or proteins that become glycated due to exposure to sugars which buildup in cells due to aging and life style. They can be predictive markers of degenerative diseases such as diabetes or cardiovascular disease and can be used to differentiate between chronological and biological age. For example, Hemoglobin becomes glycated and is used by doctors to monitor diabetes, but this test requires taking blood and so cannot be performed at home. It was our objective to build a small, affordable, and non invasive device which can be easily used to measure AGEs in the user's skin, and thus predict degenerative diseases, by measuring a specific AGE fluorescence on exposure to ultraviolet light

Methods/Materials

In order to measure AGEs in a user's skin we constructed a lightweight device which uses an ultraviolet LED and a raspberry pi computer to record the autofluoresce of a subject's forearm. The UV excitation had a narrow range of 370 nm and was contained in a light-tight box. A python script on the pi inside triggers the LED to turn on via a basic circuit and proceeds to take a picture with the camera module attached under an opening where the user places their forearm. The image is analyzed on the pi itself for the AGE specific 450 nm excitation. The results are displayed on a screen connected to the device

Results

Our raspberry pi powered device was able to make accurate measurements of the excited AGE molecules in a user's skin which can be used as early predictors to diabetes and cardiovascular disease. We compared old and young volunteers to determine that the skin autofluorescence was reflective of age

Conclusions/Discussion

We were able to achieve our goal of building a small affordable device which can detect AGEs in vivo. The results show that the degree of autofluorescence intensity for skin at 370 nm can be measured and, with more studies, this measurement could be used as a biologic marker of cellular aging in vivo and assess the risk of degenerative diseases

Summary Statement

We designed, built, and tested a simple and affordable device capable of assessing advanced glycation end-products in the skin of human volunteers as a way to determine the risk of age related illnesses such as diabetes

Help Received

No help was received, we designed and tested the device ourselves