CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)

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Project Number

S0415

Project Title

Effects of PUFA on Oxidative Stress in Aged Rats

Abstract

Objectives/Goals

It is commonly known that fish oil, rich in n-3 PUFA (polyunsaturated fatty acids), is beneficial to the living body, and that safflower oil, rich in n-6 PUFA, is not. The higher the oxidative stress, the higher the risk of cancer. Oxidative stress levels are highest in the brain and heart organs. The objective is to see whether n-3 PUFA or n-6 PUFA will increase or lower oxidative stress in rat heart and brain.

Methods/Materials

Rats were categorized into four groups: basal group; Menhaden oil diet (M-group); Safflower oil diet (S-group); and a 1:5 ratio (Menhaden/Safflower) oil diet (M/S-group). Rat heart and brain tissues extracted from a previous research experiment funded by the Texas Tech University Seed Grant 2002-2003 were isolated of its DNA. After DNA was tested of its purity using a Spectro Photometer, it underwent DNA digestion and preparation for DNA 8-OHdG adducts. Using HPLC system, 8-OHdG was detected and was analyzed using one-way ANOVA.

Results

It turned out that the rats fed with Menhaden oil diet tends to decrease the oxidative stress levels in the heart but tends to increase the oxidative stress levels in the brain. On the other hand, rats fed with the Safflower oil diet tends to increase the oxidative stress levels in the heart yet tends to decrease the oxidative stress levels in the brain.

Conclusions/Discussion

Although the findings are not statistically significant, this experiment demonstrates that the Menhaden oil diet (or fish oil diet), 19% fish oil + 1% corn oil (rich in n-3 poly-unsaturated fatty acids, PUFA) has a tendency to reduce DNA damage in rat heart. And safflower oil diet has a tendency to lower levels of DNA adduct formation in brain of middle-aged rats. Because of budget consideration, the Basal group was 5 months younger than the other two groups. Proven in a previous research, the older the subjects, the higher the oxidative stress levels. This 20 week difference would have increased the statistical significance between the Basal group and the other groups.

Summary Statement

This project is an investigation to determine the effects of n-3 and n-6 polyunsaturated fatty acids, PUFA, on oxidative stress in rat heart and brain tissues.

Help Received

Used tissue samples, chemicals, and lab equipment at Texas Tech University Health Sciences Center, Department of Pathology under the supervision of Dr. Chwan-Li Shen.