CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
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Project Number
S0517

Project Title
Antioxidant Activities of Human Retinal Cell Lines under the Exposure of 2.4 GHz Electromagnetic Field

Abstract

Objectives/Goals
To see if the electromagnetic wave is a source of oxidative stress and the effects of it on antioxidant enzyme activities after the 2.4GHz exposure.

Methods/Materials
Method:
In the experiment, retinal ganglion cell line and retinal pigment epithelium cell line were used as two eye cell models. Both cells were cultured separately so that we obtained enough number of cells for this experiment. First, we separated these cells into EMF-group (experimental group) and Control group. The EMF group is placed in the Wave Pro Chamber and exposed under 2.4GHz electromagnetic wave for 4, 8, 16 and 20 hours, while the control is also placed in the Chamber but not in the path of the wave. The reason why we put both groups together in the chamber is because we want to make sure all the conditions are the same, in terms of temperature and humidity.

Results
Retinal pigment epithelium cell line (graphs will be displayed on my poster and report)
1. SOD, CAT, GPx and GST four antioxidant enzyme activities all decrease. However, there is an increase in GR activity.
Retinal Ganglion Cell line
1. SOD, GPx and GST activities all decrease after the EMF exposure.
2. CAT level increases.
3. GR stays the same.

Conclusions/Discussion
We can conclude that 2.4 GHz EMF exposure does cause more oxidative stress. Epithelium cells are less protective against oxidative stress than the RGC because the enzyme activity in the EMF groups of epithelium cells changes up and down more frequently. SOD, CAT and GST are all compensatory induced for a secondary defense system. In RGC cells, SOD、GPx and GST as the primary barrier (depleted); and induced CAT level for the secondary barrier . GR has no significant influence by the oxidative stress resulting from EMF radiation in our studies.
I suggest that the RPE cells is more sensitive as the RGC cells in retina, and therefore the antioxidant#SOD serves as a barrier to protect the body by evidence of depletion; if further oxidative stress continued to occur, the induced CAT and GST can help soothe and protect the retina.

Summary Statement
We are trying to see the effects of 2.4GHz electromagnetic wave exposure on retinal cells, especially oxidative stress.

Help Received
I received help from a lab in Chang-Gung University back in Taiwan and the professors for technical help. I also got help from Dr. Wenzel at Stevenson.