CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
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Project Number
22355

Project Title
Effect of Age on Brain Cell Vulnerability to Apoptosis

Abstract

Objectives/Goals
Astrocytes are central to the brain#s defense against different kinds of injuries. Cells can die by apoptosis or necrosis. Vulnerability to apoptosis is thought to be developmentally regulated. However, the age at which astrocytes are most susceptible to apoptosis is unclear. The purpose of this study is to examine whether young astrocytes are more vulnerable to apoptotic injury, using serum deprivation to induce apoptosis. Through observations of astrocytes at different stages of their lives, we will determine whether mature astrocytes or young astrocytes are more susceptible to apoptotic injury using serum deprivation.

Methods/Materials
Astrocytes cultures were deprived of serum. To characterize DNA fragmentation, Terminal deoxynucleotidyl transferase-mediated dUTP labeling (TUNEL) staining was performed. To identifyt apoptotic or necrotic cells in cultured cell population, Hoechst and Propidium Iodide (PI) staining were performed. Astrocytes injury was quantified through lactate dehydrogenase (LDH) assay. All data are analyzed by one-way analysis of variance (ANOVA), followed by two-tailed Student#s t-test.

Results
There were far less TUNEL-positive cells in mature astrocytes in comparison with those of young astrocytes ($p<0.01$). The amounts of PI-positive cells were higher in young astrocyte cultures than those of mature astrocyte cultures ($p<0.01$). LDH release in young astrocytes was significantly higher than release in mature astrocytes at each time point ($p<0.01$).

Conclusions/Discussion
This study demonstrates that a major portion of cell death in primary cultured young astrocytes was due to apoptosis. Mature astrocytes were found to undergo necrosis rather than apoptosis.

Summary Statement
Young cells die more than older cells when suffering from an apoptotic injury.

Help Received
Drs. Giffard, Qiao, and Xu for help on the designation of experiment, supervision for all methodology, discussions of results, and critical comments.