CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
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Project Number
S1408

Project Title
Strychnine Antagonism of Glycine Receptors Expressed in Xenopus laevis Oocytes

Abstract

Objectives/Goals
Alcohol, the major drug abused in the United States today, affects over 18 million people and is the leading cause of accidental deaths in the 15-24 year age group. Its effects on the body are well known, but how those effects are mediated is a mystery. Glycine has been found to be a main player in alcohol responsiveness in the spinal cord. It has been previously observed that increased atmospheric pressure has an inhibitory effect on alcohol response on glycine receptors. The purpose of my project is to establish a control mechanism for testing under pressure to show that when pressure inhibits ethanol responses at these receptors it is not actually altering the way glycine binds to the receptor or any other baseline receptor function. This shows that the data that is obtained in other pressure experiments are valid and not caused by pressure changing the physiology of the receptors themselves.

Methods/Materials
Experiments were conducted with hyperbaric two-electrode voltage clamps using the Xenopus expression system, which monitors the current flow through the Glycine receptors. Oocytes expressing alpha 1 homomeric Glycine receptors are clamped at #70mV and tested with EC10 concentrations of Glycine in the absence and presence of 50 nM and 100 nM Strychnine, which works by competitively antagonizing the effects of Glycine, at control and experimental atmospheric conditions.

Results
Strychnine caused a concentration dependent antagonism of Glycine receptor function. The 50 nM concentration of Strychnine antagonized the Glycine effect to 41.3±5.4% (n=8) of the EC10 Glycine response and the 100 nM concentration of Strychnine antagonized the Glycine effect to 24.8±6.2% (n=4) of the EC10 Glycine response. The two concentrations of Strychnine were then tested at air (1 ATA) and pressure (12 ATA) conditions. The results showed that 50 nM Strychnine antagonized the Glycine effect to 47.0±2.4% (n=3) and 48.1±0.5% (n=3) of the EC10 Glycine response at air and pressure respectively and 100 nM Strychnine antagonized the Glycine effect to 18.6±0.2% (n=2) and 19.2±0.8% (n=2) of the EC10 Glycine response at air and pressure respectively.

Conclusions/Discussion
The data shows that pressure does not have an effect on Strychnine binding on the Glycine receptor, therefore not actually altering the physiology of the receptor itself, which means that pressure can help find the binding site of alcohol.

Summary Statement
I am showing that pressure doesn't alter Glycine receptor function, which means that we can use pressure to help us find the binding site of alcohol in the central nervous system because pressure data is reliable.

Help Received
Used lab equipment at the University of Southern California under the supervision of Dr. Daryl Davies and Dr. Ronald Alkana