California Science Center

CALIFORNIA STATE SCIENCE FAIR
2001 PROJECT SUMMARY

Your Name (List all student names if multiple authors.)
Danielle M Gilbert

Science Fair Use Only

S1812

Project Title (Limit: 120 characters. Those beyond 120 will be ignored. See pg. 9)
Dopamine as a Growth-Promoting Substance in Echinaster spinulosus: A Two-Part Study

Division
_ Junior (6-8) _X_ Senior (9-12)

Preferred Category (See page 5 for descriptions.)
18 - Zoology

Abstract (Include Objective, Methods, Results, Conclusion. See samples on page 14.)
Use no attachments. Only text inside these boxes will be used for category assignment or given to your judges.

1. Problem Statement: My project focuses on two questions: What is the effect of supplementary dopamine on the regeneration rate of E. spinulosus, the orange ridged sea star? and What is the effect of a dopamine antagonist...? My objective is to formulate a distinct conclusion on the role of dopamine as a growth-promoting substance by studying the effects on regeneration rate of both supplementary dopamine and those of a dopamine antagonist, haloperidol.
2. Hypothesis: My hypothesis is that the supplementary dopamine will increase the regeneration rate of E. spinulosus and that the dopamine antagonist will decrease the regeneration rate.
3. Procedure:
A. Create three groups of six specimens: the Control Group, Experimental Group A, and Experimental Group B. Remove 1.5 cm from an average-length arm of each specimen.
B. Administer 20mg supplementary dopamine to Experimental Group A and 25mg dopamine antagonist to Experimental Group B. Set all other variables (water chem., temp., light, food) equal to those of the control group.
C. Record the length of the regenerating arm of each sea star (6 per group, 3 groups, 18 total) every other day for 20 days, measuring from the center of the specimen to the regenerating tip.
D. Calculate the regeneration rate by determining the growth per day, then find the average growth rate for each group. Analyze using a complete ANOVA (analysis of variance) with 2 two-sample T statistic tests and 2 probability tests.
4. Results: The regeneration rates were: Control Group - 0.192 mm per day, Exp. Group A (supplementary dopamine) - 0.250 mm per day, and Exp. Group B (dopamine antagonist) - 0.084 mm per day. A statistical analysis revealed that the T statistic value between the Control Group and Exp. Group A is 2.15 and the value between the control and Exp. Group B is 4.79; both are significant at the 0.05 level with four degrees of freedom. The probability is 2.86% and 0.163%, respectively, that the differences occurred by chance; this is also statistically significant.

Summary Statement (In one sentence, state what your project is about.)
I studied the influence of dopamine, a neurotransmitter, on the limb regeneration rate of the orange ridged sea star, Echinaster spinulosus.

Help Received in Doing Project (e.g. Mother helped type report; Neighbor helped wire board; Used lab equipment at university X under the supervision of Dr. Y; Participant in NSF Young Scholars Program) See Display Regulation #8 on page 4.
Dr. Floyd Culler, an endocrinologist with the UCI Medical Center, assisted me in obtaining the dopamine and haloperidol. He also reviewed the project in its entirety, along with my teacher, Mrs. Harvey.