



**CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY**

Name(s) Megan Harris	Project Number S1409
Project Title Bonds Away: A Study of the Effects of Ammonium Thioglycolate and Sodium Hydroxide on the Disulfide Bonds in Human Hair	
Abstract Objectives/Goals Millions of people across the world use chemicals to alter their hair. These chemicals damage the hair structure and make it weaker by reducing ,or eliminating, the disulphide (S-S) bonds within the keratinized amino acids of which each strand is built. This project compares the difference between the strength of hair treated with Ammonium Thioglycolate (ATG), which reduces S-S bonds, and Sodium Hydroxide (NaOH), which eliminates them, through the carefully controlled observation of 80 separate hair samples when treated with both chemicals. Methods/Materials This 6 week project consisted of 720 separate hair strands organized into 80 groups and 240 subgroups with each group containing hair from a separate individual, thereby controlling the variables. Each 9 hair group was organized and labeled by securing both ends between two sheets of thick adhesive plastic. Each group was then separated into 3 subgroups of 3 hairs with each subgroup labeled and measured by durability in Newtons as either; ATG treated, NaOH treated, or control (not treated). The ATG and NaOH groups were then compared to their control and each other and this information was used with the combined results of the 80 individual groups to reach a conclusion. Results Hairs treated with ATG were on average (mean) -.53138, or about one half Newton weaker than untreated hair. Hair treated with NaOH was on average even weaker at -.6935or about -.7 Newton difference between the two. Overall ATG treated hair was .12613 Newtons stronger than hair treated with the NaOH. Conclusions/Discussion These findings supported the initial hypothesis which states... Hair when treated with Sodium Hydroxide, which eliminates the disulfide bonds in amino acids, will have a decrease in the overall structural integrity of keratin structures more than those treated with Ammonium Thioglycolate which simply reduces these bonds.	
Summary Statement The elimination of disulfide bonds reduces the integrity of keratin structures more than the reduction of these bonds.	
Help Received Little sister and mother helped record some measurement information. Father and Mother assisted in some chemical treatments. Transportation for the purchase of materials and financial aid from parents.	