



**CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY**

Name(s) Rishabh Mandayam	Project Number 36035
Project Title Mutations and Drug Response	
Abstract Objectives/Goals The objective of this big data project was to determine if gene mutations impact response to Atorvastatin. Hypothesis was that if the genes involved in the biological signaling pathways that Atorvastatin normally functions through, mutate, then these gene mutations will have an impact on the response. Methods/Materials A list of candidate genes, involved in the Pharmacodynamics (what drug does to body) and Pharmacokinetics (what body does to drug) pathways of Statins was compiled. For each of the candidate genes, its response to Atorvastatin, the rsID of the allele, whether it is an intron or exon, its DNA codon sequence change, its mRNA codon sequence change, its amino acid sequence change, and its effect were recorded using PharmGKB, NCBI websites and Codon charts into Microsoft Excel worksheets. Results On analyzing the data charts, of the 43 candidate genes, 16 had an impact on Atorvastatin response. This implies 37.2% of the candidate genes had impact on the response to Atorvastatin. It was also determined that single nucleotide polymorphism (SNP) in the exons of candidate genes has 46.67% impact on the efficacy of Atorvastatin. Conclusions/Discussion One of the reasons for why these mutations had an impact on the drug response is because in these cases there was a change in the codon sequence in the DNA, mRNA and the amino acid which effectively changed it from polar to non-polar or changed to uncharged amino acid. These seemingly small changes have large impact on response to the drug. These results may fuel targeted therapy for heart diseases. In conclusion, the mutations in the candidate genes have an impact on drug response and the hypothesis must be accepted.	
Summary Statement Examining and analyzing the effect of mutations in the candidate genes on Atorvastatin response, I found that gene mutations do impact drug response.	
Help Received My science teacher helped me with basic understanding of amino acids. For in-depth understanding, I researched NCBI and PharmGKB Web sites. Tiffany Anne Murray, PharmGKB and Stanford University gave me permission to use Atorvastatin/Lovastatin/Simvastatin Pathways diagram in my science fair	