



**CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY**

Name(s) Tathya V. Shah	Project Number 35905
Project Title Carbon Nanotubes for Targeted Drug Delivery in Cancer	
Objectives/Goals The objective is to enhance the medical drug delivery system using nanotechnology with Carbon Nanotubes so the treatment is targeted, and doesn't affect any healthy cells besides the targeted ones. Methods/Materials The materials that were used to perform the research in this project were medical journals, research papers for carbon nanotubes, cancer, protein synthesis, and RNAi. Having background knowledge in Molecular Biology is useful. An online Nanotechnology Class would help understand carbon nanotubes. As a seventh grader, the main goal is to understand cancer anatomies, nanotechnologies, and carbon nanotubes. In order to perform an experiment in this field, access to a highly sophisticated laboratory and ample of resources are required. To fill this gap, numerous research papers have been reviewed, and a justifiable experiment has been borrowed. In this experiment, three different mice have been injected with human cancerous cells, and have been observed over the course of 20 days. One of the mice were left untreated. The second mouse was treated with an anticancer drug Doxorubicin, and was applied NIR. The third mouse was injected with a single-walled carbon nanotube that had Doxorubicin inside. Once injected, NIR was implied on the nanotube. Results After reviewing the experiment, the mouse that had been untreated formed a rapidly growing tumor within the body. The mouse that had been treated with Doxorubicin and NIR does not show very much improvement. The tumor soon grew to the same size as the one in the untreated mouse. Finally, in the mouse that had been injected with a doxorubicin-loaded carbon nanotube and an applied NIR, the results were renowned because the tumor disappeared. This is because Carbon Nanotubes perform targeted drug delivery. This effect is amplified with a heat source (NIR) because carbon nanotubes have a property in which they are heat conductive. Conclusions/Discussion The advent of nanotechnology in biological systems heralds a new chapter in the field of translation medicine. The novel properties of CNTs allow them to be multifunctional therapeutic agents in cancer treatment. However, one major hurdle that needs to be addressed is the issue of toxicity. CNTs are promising carriers of both small drug molecules and synthesized genetical material. The use of CNT is very assuring with siRNA (small interference RNA) for gene silencing and killing cancerous cells.	
Summary Statement To cure cancer, the medical drug delivery system can be enhanced by targeted delivery, which is possible with nanotechnology using Carbon Nanotubes because the anticancer drug will directly attack the targeted cell.	
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