



**CALIFORNIA STATE SCIENCE FAIR  
2004 PROJECT SUMMARY**

<b>Name(s)</b> Gina C. Chien	<b>Project Number</b> <b>S0805</b>
<b>Project Title</b> <b>Testing CO Levels During Car Warm-Up</b>	
<b>Objectives/Goals</b> To find out whether the level of Carbon Monoxide emitted from car warm-up is hazardous to health.	
<b>Abstract</b> <b>Methods/Materials</b> MATERIALS: Safety Gas Mask; Carbon Monoxide Detector; Garage; 3 Test cars with Valid California Smog Certificates; Timer. METHOD: PART I # Open Garage vs. Closed Garage 1. The CO level of each car was obtained right after the car was started (before engine has warmed up), and after the car has warmed up. The CO concentration was obtained by placing the Carbon Monoxide detector about 4 inches away from the exhaust pipe. 2. The results were obtained from the three test automobiles in a closed garage environment, and an open garage environment. PART II # Simulation of a human next to a car during warm-up in a closed garage 1. The carbon monoxide levels in the engine exhausts of each test cars were measured by holding the CO Detector about four inches away from the engine exhaust pipe. 2. The CO detector was placed on the front passenger side roof. 3. The car engine was started from a cold engine to simulate a typical warming up. 4. The CO concentration and engine temperature were recorded as time elapsed. These same steps were repeated to each test automobile.	
<b>Results</b> Carbon monoxide emitted from a warming up car in a closed garage is very dangerous to human health. The Standards of California Smog Emission Check apparently has not put human health into its consideration. Results showed that the amount of CO generated from a warmed up engine running for twenty-four hours is less than the amount of CO generated from a cold started engine running for five minutes. The amount of Carbon Monoxide emitted relates to how fast the engine warms up.	
<b>Conclusions/Discussion</b> Results showed that Carbon Monoxide emission from car engine (especially in a closed garage) is very dangerous to human health. However, a way to minimize this health risk is by opening the garage door before starting up the car engine, or even better, not warming up car in a closed garage. Since the Catalytic Converter can only convert Carbon Monoxide to Carbon Dioxide when the engine reaches the temperature of 500 degrees Celsius, it is recommended for car manufactures to include a pre-heater for the catalytic converter so the mass emission of CO can be reduced at the beginning of car warm-up.	
<b>Summary Statement</b> Finding the method to avoid dangerous Carbon Monoxide level during car warm-up.	
<b>Help Received</b> Father bought materials, and supervised during the process of the experiment.	