Carboxyhemoglobin Levels in Smokers vs. Non-Smokers in a Smoking Environment.

**Background**
Carbon monoxide, found in cigarettes, has 245 times more affinity for hemoglobin than oxygen. Carboxyhemoglobin (COHb) is hemoglobin combined with carbon monoxide. A normal COHb level for non-smokers is <1.5%. Cigarette smokers can have COHb levels between 3-15%.[1] We were curious to see how non-smokers exposed to cigarette smoke were affected by this affinity of hemoglobin for carbon monoxide.

**Method**
We visited four establishments where cigarette smoking was not prohibited and measured COHb levels in both smokers and non-smokers. Because none of the locations had a “No Smoking” section, the smell of cigarette smoke was very noticeable. We used the Rad-57 Pulse CO-Oximeter (Masimo Corporation, Irving, CA) for all of our measurements. This is a fairly new and popular device that measures COHb in whole numbers. Using the Rad-57, we tested 15 people at each location and at the end of the study we had measured COHb levels on 33 smokers and 27 non-smokers. Each COHb level was measured for one minute using a digital sensor while the participant was seated and resting comfortably. Prior to starting our study, we obtained a control value by measuring COHb levels on fifty non-smoking college students and professors in a well-ventilated, non-smoking environment. All fifty subjects in our control group had a COHb level of one percent.

**Results**
The average COHb of the 33 smokers was 5.04%, while the average value for the 27 non-smokers in a smoking environment was 2.49%. COHb levels ranged from 1-6% in the non-smokers and 1-14% in the smoking group.

**Conclusion**
Non-smokers in a smoking environment had a COHb level that was nearly two and one half times higher than that of our control group, indicating that non-smokers are not exempt from the effects of cigarette smoke in the atmosphere. We found it interesting that there was an increased disparity in COHb levels between smokers and non-smokers at the third and fourth locations compared to the first two locations. There are many variables that could have caused the greater disparity, including how long the non-smoker was at the location, cubic footage of the establishment, whether or not there was an adequate ventilation system, proximity of the smoker to the non-smoker, and total number of smokers at the site.