



CALIFORNIA STATE SCIENCE FAIR 2008 PROJECT SUMMARY

Name(s) Otana A. Jakpor	Project Number S1509
Project Title Indoor Air Pollution: The Pulmonary Effects of Ozone-generating Air Purifiers and Other Household Devices	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Although air purifiers are advertised to improve breathing, some air purifiers emit harmful ozone. This study examines the hypothesis that ozone-generating air purifiers and other ozone-generating household devices may impair pulmonary function. Year 1 of this study focused on the pulmonary effects of ozone-generating air purifiers. In light of the alarming findings of Year 1, I expanded the study 4-fold in Year 2 in order to determine if other ozone-generating/ionizing household devices also pose a pulmonary hazard.</p> <p>Methods/Materials 8 experiments were conducted over 2 years. In the 2 ozone emissions experiments, the amount of ozone generated from several types of air purifiers, food purifiers, and assorted ionizing household devices was measured with an ozone sensor. In 6 pulmonary experiments, a microspirometer and a pulse oximeter were used to measure the pulmonary function of human subjects before and after exposure to various types of air purifiers, hair blow dryers, and a food purifier.</p> <p>Results Some air purifiers and a food purifier produced ozone concentrations far higher than a Stage 3 smog alert. A two-hour exposure to an ozone-generating room air purifier caused a statistically significant drop in pulmonary function among asthmatic subjects, but not for the whole study sample ($p < 0.05$). There was a mean decrease of 11% in the FEV1/FVC ratio among the asthmatics. A three-hour exposure to a personal air purifier caused a statistically significant reduction in pulmonary function among the whole study sample as well as the asthmatic subset by 9.6% and 22.8%, respectively ($p < 0.05$). One asthmatic individual experienced a 29% drop accompanied by an acute asthma attack. A food purifier caused a reduction in the FEV1/FVC ratio of 4.2% and 9.6%, respectively, among the whole study sample and the asthmatic subset.</p> <p>Conclusions/Discussion An ozone-generating food purifier produced ozone levels rivaling those of ozone-generating air purifiers. The ozone-generating air purifiers and food purifier tested had a negative effect on pulmonary function, especially among those with asthma and allergies. The new research on ozone-generating food purifiers further corroborates the pattern seen in my earlier findings with regard to air purifiers. This original research in Year 2 suggests that the California Air Resources Board should consider expanding their new regulation to include ozone-generating food purifiers.</p>	
Summary Statement This original research found that some ozone-generating air purifiers and a food purifier produced ozone in levels higher than a Stage 3 Smog Alert and reduced pulmonary function (FEV1/FVC ratio), especially among asthmatics.	
Help Received My mother, an asthmatic, lent me her pulse oximeter and her microspirometer. Eco Sensors, Inc. donated an ozone sensor. Mother helped with the cutting board and gave editorial assistance. Mr. Steve Kinney, Ms. Holly Hall, and Mrs. Karen Jakpor hosted parties and allowed me to test the guests.	