Assessment of Thirdhand Exposure to Nicotine from Electronic Cigarettes

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Purpose: Electronic cigarettes (e-cigarettes) are new battery-powered devices that resemble tobacco cigarettes and convert nicotine solutions into inhalable vapors. Thirdhand exposure occurs when nicotine particles settle on indoor surfaces and react to form carcinogenic compounds. Exposure can continue long after smoking has ceased and is a serious health concern. We assessed the possibility of the deposition of nicotine on various surfaces as a marker of thirdhand exposure from e cigarettes. Methods: Three brands of e-cigarettes were refilled with varying nicotine concentrations and then vaped with a syringe in an exposure chamber in four experiments. Surface wipe samples were taken from several indoor 100 sq. cm surfaces (window, walls, floor, wood and metal). Nicotine was extracted with methanol from the wipes and analyzed using gas chromatography with a selective nitrogen-phosphorus detector (GC-NPD). Blank samples were collected from each surface before the experiments to estimate background exposure. ¬ Results: Three out of four experiments showed significant increase in the amount of nicotine on all five surfaces. Nicotine stuck more easily to certain surfaces. The floor and glass windows had the greatest increases in nicotine, on average by a factor of 28 and 4, respectively, whereas wood had the lowest deposition rate of nicotine. Conclusion: Our work indicates that nonsmokers can be exposed to nicotine released from e-cigarettes and deposited on surfaces. Thirdhand exposure levels differ depending on the surface, creating the potential danger of e-cigarettes exposing people to carcinogens. Future research should explore the risks of thirdhand exposure to carcinogens from e-cigarettes.

Awards Won:
Fourth Award of $500