

Research Institutes | Chemical Insights

TECHNICAL BRIEF

A Strategic Research Initiative for Extended Research on Periodontal Disease and Electronic Nicotine Delivery Systems (ENDS) Usage

Expansion of Research on Early Onset Periodontal Disease Due to ENDS Usage

Introduction

Electronic nicotine delivery systems (ENDS) are battery-powered devices that use an electric current to vaporize flavored liquids.[1] Since their introduction to the U.S. in 2007, ENDS designs and features have rapidly evolved, making it difficult for tobacco regulatory scientists to assess their safety.[2] Current evidence indicates that e-liquids and ENDS aerosol constituents are oral health hazards that may increase risks of periodontal disease.[3] Vegetable glycerin and propylene glycol are highly viscous carrier solvents within e-liquids that are heated to form an inhalable aerosol. ENDS aerosols derived from these liquids are extremely adherent to soft and hard tissues of the oral cavity, which may enable bacterial adhesion promoting gingival inflammation and periodontal disease.[4] ENDS usage is not without health consequences. A study of ENDS users showed that 11.4% self-reported cracked or broken teeth in the last 12 months and 18.5% reported gingival pain and/or bleeding.[5] ENDS aerosols contain oral hazards including tobacco-specific nitrosamines, aldehydes, metals, volatile organic compounds, phenolic compounds, tobacco alkaloids and polycyclic aromatic hydrocarbons (PAHs).[6] ENDS usage remains an emerging exposure with insufficient research on its oral health effects.

Study Objectives

This research expansion will define the relationship between oral microbiome alterations and ENDS usage patterns. The specific research objectives are to:

1. Determine oral health/hygiene and ENDS usage patterns via questionnaires and real-time puff topography for never-established tobacco users and current exclusive ENDS users.
2. Examine in vitro ENDS usage-related cell changes and bacterial invasion that could enhance susceptibility to periodontal disease.
3. Identify alterations in saliva metabolites and microbe populations related to oral health due to ENDS usage.

Scientific Outcomes

1. Correlation of ENDS usage patterns and oral epithelial layer integrity and bacterial invasion.
2. Characterization of individual susceptibility to ENDS-induced toxicity and health effects in the complex oral environment.

© 2023 Underwriters Laboratories Inc.

References

1. Canistro, D., et al., *E-cigarettes induce toxicological effects that can raise the cancer risk*. Scientific reports, 2017. 7(1): p. 2028-2028.
2. Bhatnagar, A., et al., *New and Emerging Tobacco Products and the Nicotine Endgame: The Role of Robust Regulation and Comprehensive Tobacco Control and Prevention: A Presidential Advisory From the American Heart Association*. Circulation, 2019. 139(19): p. e937-e958.
3. Atuegwu, N.C., et al., *Association between Regular Electronic Nicotine Product Use and Self-reported Periodontal Disease Status: Population Assessment of Tobacco and Health Survey*. Int J Environ Res Public Health, 2019. 16(7).
4. Rouabhia, M., *Impact of Electronic Cigarettes on Oral Health: A Review*. J Can Dent Assoc, 2020. 86(k7).
5. Cho, J.H., *The association between electronic-cigarette use and self-reported oral symptoms including cracked or broken teeth and tongue and/or inside- cheek pain among adolescents: A cross-sectional study*. PLoS One, 2017. 12(7): p. e0180506.
6. National Academies of Sciences, E., and Medicine, Health and Medicine Division, *Toxicology of E-Cigarette Constituents., in Public Health Consequences of E-Cigarettes*, E. DL, K. LY, and S. K, Editors. 2018, National Academies Press (US): Washington (DC).

NIH/NIDR Grant Funding Number: 1R56DE031814-01

Research Partners

Emory University

Georgia State University

M&B Sciences

Purdue University

Soft Smiles, LLC

© 2023 Underwriters Laboratories Inc.