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Vaping and Oral Health: Current Evidence on Teeth, Oral Tissues and Saliva: A Narrative Review

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ABSTRACT

The mouth is the first site of exposure in vaping, yet it remains one of the least discussed. Electronic cigarettes are frequently promoted as less harmful than combustible cigarettes, but less harmful does not mean harmless. The oral cavity absorbs the full chemical load of every puff, nicotine, propylene glycol, vegetable glycerin, flavoring chemicals, heated byproducts, and sometimes metals, before a single particle reaches the lungs. The lips, teeth, gums, and throat bear this exposure repeatedly with every use and warrant far more clinical attention than they currently receive. Current evidence links vaping with dry mouth, increased caries risk, gingival inflammation, periodontal concerns, oral microbiome changes, and molecular changes in oral epithelial cells, as well as potential tooth discoloration and oral mucosal changes. The evidence is strongest for association rather than long-term causal proof, as many studies are cross-sectional and many participants also smoke cigarettes. Even so, the pattern is consistent enough to support caution, particularly for frequent users, flavored-product users, and users of high-nicotine or high-power devices.

Keywords

Electronic cigarettes, Vaping, Dental caries, Periodontal disease, Xerostomia.

Introduction

E-cigarettes have become one of the most widely used nicotine products among youth and young adults. In 2024, the CDC reported that approximately 1.63 million U.S. middle and high school students were current e-cigarette users. Among them, 87.6% used flavored products, 38.4% had vaped on at least 20 of the past 30 days, and 26.3% used them daily [1]. These figures matter because vaping is not a distant or abstract exposure: every puff travels directly across the lips, teeth, tongue, gums, cheeks, palate, and throat. Traditional cigarette smoking remains more damaging to oral and general health overall, but vaping carries its own distinct risks. The more important clinical question is not whether vaping is identical to smoking, it is whether repeated exposure to aerosolized nicotine, solvents, flavorings, and heat-generated compounds causes meaningful harm to the oral environment. Current evidence says it does: vaping affects saliva, plaque, bacterial communities,

gingival inflammation, and caries risk [2,3].

Biological Mechanisms: Why the oral cavity is more vulnerable to the effects of vaping

The oral cavity depends heavily on saliva. Saliva rinses away food debris, buffers acids, supports early enamel repair, controls microbial growth, and keeps soft tissues comfortable. E-liquids commonly contain propylene glycol and vegetable glycerin, both of which reduce salivary flow and contribute to oral dryness. Dry mouth is not a minor inconvenience: it raises the risk of halitosis, plaque accumulation, caries, mucosal irritation, and fungal overgrowth. Nicotine compounds these concerns. Beyond its addictive properties, nicotine affects blood vessels, immune function, and inflammatory signaling throughout the gingival tissue. In the periodontium, altered blood flow can mask the normal clinical signs of disease, a patient may be experiencing significant periodontal damage while showing less visible bleeding than expected. Vape aerosols further alter the oral environment by changing bacterial communities and biofilm behavior. Recent laboratory and human-model studies report disruptions in oral biofilm structure, microbial activity, and epithelial cell responses following e-cigarette exposure [3,4].

Practical Concerns for Vape Users

Dental caries is one of the most immediate and practical concerns for vape users. A 2022 study in the Journal of the American Dental Association found a clear association between e-cigarette use and higher caries-risk levels among dental patients [5]. This does not establish that vaping alone causes caries in every case, but it makes a compelling argument for including vaping status in routine caries-risk assessments. The pathway is multifactorial. Vaping reduces salivary flow, promotes oral dryness, encourages sticky plaque formation, exposes teeth to flavored aerosol residues, and disrupts the bacterial balance of the mouth. Flavored aerosols may increase biofilm adhesion to enamel, particularly in patients who also consume soda, energy drinks, or frequent sugary snacks. For these individuals, vaping does not merely add one risk factor, it compounds several at once, creating a substantially more cavity-prone oral environment.

Vaping and its effects on Periodontal Disease and Periodontal Health

Periodontal disease encompasses gingivitis, gum pocketing, attachment loss, bone loss, and eventual tooth mobility. Among e-cigarette users, periodontal indicators are frequently worse than those of non-users, though combustible cigarette smokers typically present with the most severe outcomes [6,7]. A 2024 review in PLOS Global Public Health concluded that vaping contributes to periodontal disease by influencing inflammatory cytokines, host immune response, and the periodontal microflora [6]. A 2025 evidence review further found that electronic nicotine delivery systems (ENDS) negatively affect several periodontal parameters compared with non-smokers or former smokers, while noting that the evidence base still requires longer term studies to establish precise risk trajectories [7]. The picture that emerges is not one of alarm without basis, it is one of consistent, accumulating concern that warrants clinical attention now, ahead of the long-term data.

Vaping and its Effect on Tooth Discoloration

Although e-cigarettes are often perceived as a safer alternative to combustible tobacco, emerging evidence suggests their use may negatively affect dental esthetics through tooth staining and changes in dental surface properties. Available evidence suggests that staining from electronic nicotine products is generally less pronounced than staining from conventional cigarette smoke, but it is not absent [8,9]. E-cigarette aerosols contain nicotine, propylene glycol, vegetable glycerin, flavoring agents, aldehydes, and other thermal degradation products. Repeated exposure places these compounds in direct contact with tooth surfaces and the acquired pellicle. Combined with vaping-associated changes in saliva and biofilm, aerosol residues may contribute to conditions that favor extrinsic pigment retention [9,10].

Laboratory evidence also suggests that e-cigarette exposure can affect enamel and restorative materials. A 2025 in vitro study evaluating flavored e-cigarettes with different nicotine concentrations found significant reductions in enamel microhardness after exposure and measurable color changes at some concentrations; effects on surface roughness varied by material and nicotine concentration [11]. These findings support concern that repeated exposure may alter dental surface properties, though laboratory findings should not be interpreted as direct proof of an equivalent magnitude of change in patients. Xerostomia may further contribute to discoloration risk. Saliva helps cleanse tooth surfaces, buffer acids, and remove debris; reduced salivary protection can allow plaque and staining compounds to remain in contact with teeth for longer periods [9-10]. Overall, tooth discoloration in people who vape is best understood as a potentially multifactorial esthetic concern involving aerosol exposure, biofilm, salivary changes, and dental surface characteristics. Additional long-term clinical studies are still needed [8-11].

Oral Mucosal Lesions Associated with Vaping

Growing evidence suggests that e-cigarette use may be associated with pathological changes in the oral mucosa. Heated aerosols expose oral tissues to nicotine, solvents, flavoring chemicals, aldehydes, and reactive compounds that can contribute to oxidative stress, inflammation, cytotoxicity, and changes in the oral microbial environment [9,10,12]. Because much of the available literature is observational or laboratory-based, these findings support concern but do not establish that every lesion observed in a person who vapes was caused by vaping. Vaping has also been associated with xerostomia and changes in the oral microbial environment. Reduced salivary protection can compromise mucosal lubrication and antimicrobial defense, while microbiome changes may favor opportunistic organisms such as Candida species. Reviews of the literature report a range of oral tissue changes among e-cigarette users, though the quality and consistency of evidence vary across individual lesion types [9,10,12].

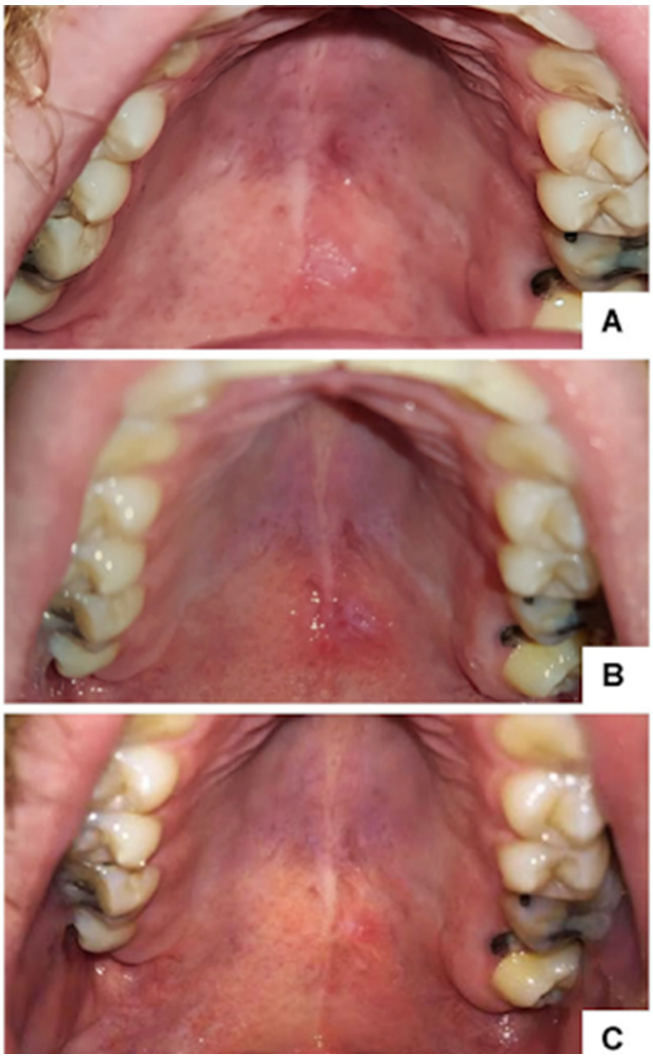


Figure 1: Clinical oral mucosal alterations in a patient who vaped. (A) Initial clinical presentation showing a white plaque in the posterior hard palate and palatal changes compatible with nicotinic stomatitis; (B) 1-month follow-up following excisional biopsy; and (C) 6-month follow-up. Reproduced from Carvalho et al. under the Creative Commons Attribution 4.0 International License (CC BY 4.0).

Oral Manifestations of Vaping

Leukoedema

Leukoedema is a benign, grayish-white, opalescent change that most commonly affects the bilateral buccal mucosa. Similar mucosal changes have been reported among e-cigarette users, but current evidence is not sufficient to establish vaping as a direct cause. Chronic exposure to heat and chemical irritants has been proposed as a possible contributor to epithelial changes [9,10,12].

Smoker's Melanosis

Smoker's melanosis is characterized by brown oral pigmentation related to increased melanin production and is classically associated with combustible tobacco. Pigmentation changes have also been described in e-cigarette users. Nicotine exposure provides a biologically plausible mechanism, but the evidence specific to vaping remains more limited than the evidence for conventional smoking [9,10,12].

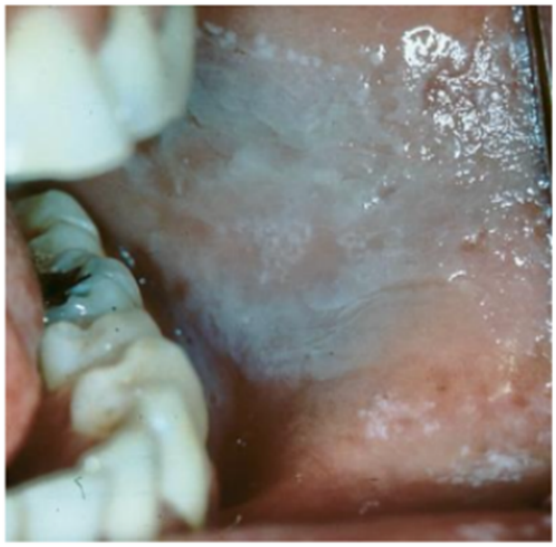


Figure 2: Leukoedema of the buccal mucosa. Image contributed by Heather Olmo, DDS, MS. Reproduced from McKinney et al., Benign Chronic White Lesions of the Oral Mucosa, StatPearls, under the Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 (CC BY-NC-ND 4.0) License.

Oral Candidiasis

Candida-related changes are a recurring concern in the vaping literature. Altered saliva, changes in the oral microbiome, and impaired local defenses may increase susceptibility to Candida overgrowth, and hyperplastic candidiasis has been reported among e-cigarette users [9,10,12]. However, the available studies do not yet establish a precise long-term incidence or causal risk attributable to vaping alone.



Figure 3: Hyperplastic candidiasis at the lateral border of the tongue. Reproduced from Patil et al. under the Creative Commons Attribution (CC BY) License.

Leukoplakia-related Lesions

White, plaque-like, or leukoplakia-like lesions have been described in e-cigarette users. Chronic exposure to heat and chemical irritants has been proposed as a possible mechanism for epithelial hyperkeratinization or other tissue changes, but evidence remains limited. Additional longitudinal studies are needed before the malignant potential of vaping-associated white lesions can be defined or reliably compared with conventional tobacco-associated leukoplakia [9,10,12].



Figure 4: Oral leukoplakia of the left buccal mucosa. Reproduced from Tolentino et al. under the Creative Commons Attribution 4.0 (CC BY 4.0) License.

How Vaping Frequency and Dose affect Oral Tissues: Does Heavier Vaping Cause More Harm?

Available evidence suggests that frequency matters considerably. More frequent vaping means more repeated exposure of oral tissues to nicotine, drying agents, heat, flavoring chemicals, and aerosol residues. Daily or near daily use gives the mouth less opportunity to recover between exposures, and CDC data confirm this pattern is common rather than exceptional among current student users [1]. A recent gene-expression study of oral epithelial cells found that regular vapers showed measurably altered gene activity compared with non-users. The study evaluated cumulative e-liquid exposure, cumulative nicotine exposure, years vaped, and cotinine levels [13]. Notably, device type and flavor chemistry accounted for a significant share of the molecular differences observed. This finding reframes the risk question: it is not only about how often a person vapes, but also about what they are vaping, how much nicotine the device delivers, what flavor compounds it contains, and how the device heats the liquid.

Vaping Device Type, Nicotine Strength, and Flavors

No vaping product can honestly be described as beneficial to oral health, but products differ in risk profile. Disposable vapes, pod systems, refillable tank devices, and high-powered mods vary considerably in nicotine concentration, heat output, aerosol volume, flavor chemistry, and metal exposure. Higher-power devices tend to generate more aerosol and more heat-related byproducts; high-nicotine devices promote dependence and more frequent use, which in turn increases cumulative oral exposure. Flavors deserve particular clinical attention. In 2024, 87.6% of current youth e-cigarette users reported using flavored products [1]. A 2026 oral epithelial gene-expression study found that device type and flavor were among the strongest predictors of vaping-associated molecular changes, with different flavor groups producing distinct biological patterns [13]. Sweet, fruit, mint, menthol, and dessert flavors do not behave identically in the oral environment, some may be more irritating to tissue, more likely to encourage repeated use, or more damaging to the biofilm structure of the mouth.

Vaping Before or After Meals

Controlled studies comparing the oral effects of vaping before versus after meals remain limited, and it would be premature to assign specific risk levels to either pattern. What dental science does offer is a plausible and clinically reasonable framework for understanding why timing may matter. After eating, particularly after sugary or acidic foods and drinks—oral bacteria produce acids that threaten enamel. Saliva is the mouth's primary defense during this window, working to neutralize acids and begin remineralization. Vaping after meals may worsen dryness precisely when saliva is needed most, and may deposit aerosol residue onto plaque already primed by dietary carbohydrates.

Vaping before meals presents its own considerations, including dry mouth, throat irritation, and altered taste that may affect eating comfort. A practical harm-reduction approach includes avoiding vaping immediately before or after meals, rinsing with water after vaping, avoiding pairing vaping with acidic or sugary drinks, and maintaining consistent brushing and flossing. When acidic foods or drinks have been consumed, rinsing with water and waiting before brushing is preferable to brushing immediately on softened enamel.

Clinical and Practical Recommendations for Vape Users

Vaping status should be part of every dental health history. Many patients who report that they do not smoke will vape daily without considering the two equivalents. A thorough history includes product type, nicotine strength, frequency of use, flavor preferences, disposable versus refillable devices, symptoms of dry mouth, bleeding gums, new caries, halitosis, and concurrent use of cigarettes or cannabis products. For current vape users, clinical management may include more frequent caries-risk review, fluoride varnish application, prescription fluoride toothpaste where appropriate, periodontal monitoring, saliva-support strategies, oral cancer screening, and cessation counseling. Patients who have switched from cigarettes to vaping should understand that while some combustion-related exposures may be reduced, vaping is not without consequence for the teeth and gums. For non-smokers and young people especially, the clearest oral-health recommendation remains not to start.

Conclusion

Vaping is not harmless to oral health. Current studies and reviews consistently associate e-cigarette use with dry mouth, higher caries risk, periodontal inflammation, oral microbiome disruption, and molecular changes in oral epithelial cells, while newer evidence also raises concern about tooth discoloration, changes in dental surface properties, and oral mucosal lesions. More frequent use likely increases exposure and risk, but device type, nicotine delivery, and flavor chemistry are also meaningful variables. Evidence about vaping timing around meals remains limited, though the biological rationale for caution is sound. The best oral-health advice is to avoid vaping altogether; for current users, the priorities are reducing exposure, seeking cessation support, and ensuring dental providers are informed so that risk can be identified and monitored early.

Frequency matters because more frequent vaping means more repeated oral exposure. Daily and near-daily use are common among current youth users [1]. Device characteristics also appear to influence potential effects. Device type, heat output, nicotine delivery, and aerosol volume all vary, and higher-generation devices and mods may produce stronger molecular changes [13]. Flavors are another important factor because they dominate youth use and appear to affect oral cells and bacteria differently. Fruit, sweet, mint, menthol, and multiple-flavor use may not share the same biological profile [1,13]. Evidence regarding vaping before or after meals is limited, but vaping around meals may worsen dry mouth and interfere with saliva-assisted acid recovery, particularly when sugary or acidic foods are involved. Vaping may also affect tooth color. Reviews and laboratory studies suggest that vaping can contribute to staining or changes in dental surface properties, although long-term clinical evidence is still developing [8-11]. Vaping can also affect the oral mucosa. Oral tissue changes and lesions have been reported in e-cigarette users, including Candida-related changes and white or pigmented mucosal changes; however, evidence for specific lesions and long-term causality remains limited [9,10,12].

Note: This article is an educational summary and is not a substitute for advice from a dentist, physician, or tobacco cessation professional.

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