



The Deleterious Systemic Effects of Common Oral Care Products: A Narrative Review

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Abstract

Introduction: Oral care products are essential for maintaining hygiene, but growing evidence suggests that certain ingredients in them may have systemic health effects.

Methodology: We conducted a narrative review of studies published in PubMed and Google Scholar from 2000 to 2024 on the systemic effects of common ingredients in toothpaste and mouthwash, their mechanisms of action, and their potential risks to human health, emphasising the need for greater consumer awareness and regulation.

Results: Key ingredients, including triclosan, fluoride, alcohol, SLS, parabens, artificial sweeteners, and titanium dioxide, have been linked with endocrine disruption, neurotoxicity, carcinogenicity, and other adverse outcomes.

Conclusion: Widespread use of these products raises concern. There is an urgent need for regulatory oversight and increased public awareness regarding ingredient safety in oral care products.

Keywords: Oral health; Oral care; Systemic health effects; Oral hygiene; Tooth brushing

Introduction

Brushing your teeth is an essential daily practice for maintaining good oral health. The quality of life is significantly impacted by oral health. Therefore, there has been a strong emphasis on affordable, secure, and effective oral hygiene practices. Brushing teeth and using the right toothpaste is the best way to remove biofilms from your teeth, improve oral health, and lower your risk of gingivitis [1]. Mouthwash, dental rinses, and toothpaste are examples of oral care products widely used in homes across the country and promoted as necessary for maintaining good dental health and breath. Choosing the right one becomes challenging with an array of oral care products available in the market. An additional concern is the increasing promotion of these products on social media platforms, which can lead to consumer confusion.

However, the literature presents a multifaceted view of oral hygiene products, acknowledging their essential role in maintaining oral health and raising concerns about their potential systemic health effects. Oral care products such as toothpaste, mouthwash, and dental rinses have become ubiquitous in households nationwide, marketed as essential tools for preventing dental diseases and ensuring fresh breath. Many dietary additives used in dental care products have the potential to cause allergic reactions, including urticaria,

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contact dermatitis, rhinitis, and angioedema, emphasising the need for awareness among dental professionals and patients regarding proper usage and possible adverse effects.

The oral mucosa, particularly the sublingual region, serves as an efficient and highly vascularized site for systemic absorption of bioactive compounds, making it a preferred route for the delivery of certain medications. Its thin epithelial barrier and rich blood supply facilitate rapid transport of substances directly into the bloodstream. However, this same physiological advantage also poses a risk when it comes to daily exposure to potentially harmful chemical additives present in commercial oral care products, such as toothpastes and mouthwashes. These substances, though not intended for systemic absorption, can enter the circulation through the mucosal surfaces during routine oral hygiene practices. Despite the widespread and repeated exposure, the long-term health implications of such absorption remain largely under-recognised and warrant greater scientific and regulatory attention.

Objectives

1. To review the commonly used chemicals used chemical ingredients in commercial oral care products.
2. To address the systemic health risks associated with prolonged exposure to these ingredients through daily oral hygiene practices.

Methodology

We included peer-reviewed journal articles, systematic reviews, and toxicological reports that discussed the systemic health effects of common ingredients in oral care products such as toothpaste, mouthwash and dental rinses. Studies published in English from 1990 to 2024 were considered. Articles were selected based on relevance to the research objective.

The search strategy was employed to identify existing literature relevant to the harmful effects of commonly used oral care products. The authors searched PubMed, Scopus, Web of Science and Google Scholar databases for studies published between 1994 to 2024, using MeSH terms such as “toothpaste,” “mouthwash,” “oral hygiene products,” “toxicity,” “fluoride,” “triclosan,” and “systemic health risk.”. Selected articles were reviewed by the authors based on their relevance to the topic. References within the selected publications were also examined to identify further pertinent studies.

Key Ingredients and Associated Systemic Risks

Triclosan

Triclosan, a broad-spectrum antimicrobial agent, is found in various oral care products. It is recognised for its efficacy

against oral pathogens without causing negative sensory features [2]. However, its membranotropic effects, which can destabilise cell membranes, raise concerns about its systemic impact [3]. Triclosan has been associated with endocrine disruption, particularly affecting reproductive hormones and thyroid function. Laboratory studies have provided strong evidence of triclosan's endocrine-disrupting effects, including interference with hormone metabolism, displacement from hormone receptors, and disruption of enzyme activity related to steroidogenesis [4,5]. According to the Food and Drug Administration (FDA), increased consumption of Triclosan has resulted in a drop in some thyroid hormones. Triclosan aids in the growth of antibiotic-resistant bacteria, disrupts thyroid hormones, and encourages cancer [5,6].

Fluoride

Since the 1930s, research on fluoride's cariostatic impact has been conducted. In 1969, fluoride was certified by the World Health Organisation (WHO) as a preventive measure against tooth caries [2], and in 1994 and 2010, the WHO advised its appropriate usage. Fluoride, while effective in preventing dental caries, has been associated with systemic toxicity when ingested in large amounts. Groundwater contamination with fluoride in India is a significant public health concern, with several states reporting high levels of fluoride in drinking water, which can lead to fluorosis [7,8]. Adding fluoride through toothpaste, particularly in regions with already high groundwater fluoride levels, could contribute to cumulative fluoride exposure. Studies have shown that toothpaste ingestion, especially in children, can be a substantial source of fluoride intake [9]. Many children's toothpastes state that they are suitable for use by children ages 0–6, which is inaccurate. For the most part, parents are not taught how much toothpaste is appropriate for their child's age, which leads to overuse. It is not advised to apply topical fluoride to children before the end of their first year of life.

Alcohol-based Mouthwashes

Alcohol-based mouthwashes are popular in India for their antimicrobial properties and breath-freshening effects. However, the high alcohol content in these products has been linked to an increased risk of oral cancers, especially among individuals who use tobacco or consume alcohol. This is particularly concerning in India, where the prevalence of tobacco use remains high, further compounding the risk. There are studies which have reported the antimicrobial effectiveness of various mouth rinses, including those with alcohol, against bacterial species involved in the initiation of dental biofilm [10,11]. However, Werner and Seymour (2009) discuss the potential risks associated with the use of mouthwashes containing high ethanol content, suggesting that frequent and prolonged use may contribute to an elevated risk of oral cancer [12].

Sodium Lauryl Sulphate (SLS)

Sodium lauryl sulphate, a detergent that lowers surface tension and acts as a foaming agent, can penetrate the mucosa, leading to minor systemic absorption. Sodium lauryl sulfate is among the most toxic components in the composition of toothpastes [13]. It has been documented that sodium lauryl sulphate can aggravate aphthous ulcers and cause skin irritation [14].

Artificial Sweeteners and Preservatives

Saccharin is used as a sweetener in many kinds of toothpaste and mouthwashes. This component has led to weight gain and obesity by disrupting fundamental homeostatic and physiological processes [15].

Aspartame, an artificial sweetener, gives toothpaste its flavour. However, this sweetener has come under fire for being carcinogenic. Some of the aspartame's components break down into formaldehyde with carcinogenic potential when they are ingested. Aspartame consumption can also cause mood disorders, mental stress, and depression. Maternal absorption of aspartame during pregnancy correlates with autism in children [16].

Parabens are added to extend toothpaste's shelf life. Parabens can interfere with hormone function because they exert estrogenic effects. Parabens can exert estrogenic effects by inhibiting 17 β -HSD2. Inhibition of 17 β -HSD2 prevents local inactivation of the active estrogen E2 [17].

Colorants and Binders

Titanium dioxide (TiO₂) is an inorganic compound widely used in toothpaste to give it a bright white appearance. Mechanistic toxicological research indicates that TiO₂ nanoparticles mainly lead to negative effects through the induction of oxidative stress, leading to cell injury, genotoxicity, inflammation, immune response, and more. The degree and nature of the damage are heavily influenced by the physical and chemical properties of TiO₂ nanoparticles, which determine their bioavailability and reactivity. According to animal inhalation study findings, TiO₂ nanoparticles are regarded as "possibly carcinogenic to humans" by the International Agency for Research on Cancer and as an occupational carcinogen by the National Institute for Occupational Safety and Health. [18].

Other Toxic Additives

Diethanolamine (DEA) and DEA-related ingredients serve as emulsifiers or foaming agents. It is a known hormone disrupter and reacts with other ingredients to form a potential carcinogen called N nitroso DEA, which is readily absorbed through the skin and has been linked with cancers of the stomach, oesophagus, liver, and bladder [19].

Propylene glycol is a synthetic compound used as an

emulsifier and foaming agent. At high doses, it may cause harm to the heart, liver, and central nervous system. These effects may be more severe in those with renal or liver problems due to impaired metabolism [20].

Perfluorohexane Sulfonic Acid (PFHxS)

Toothpaste is not the only dental care product with toxic ingredients. In a study, it was reported that women who used Oral-B Glide floss exhibited higher concentrations of a substance known as perfluorohexane sulfonic acid (PFHxS) in their bloodstream compared to women who did not use that specific floss. PFHxS belongs to a broad category of substances known as PFASs, which are present in various consumer items such as nonstick pans, water-resistant garments, food wrappers, and are additionally utilized in firefighting foams at airports and military facilities. These substances are associated with liver impairment, immune system damage, developmental concerns, and cancer, and they can remain in human bodies and the environment for extended periods [21].

Discussion

The review highlights mounting evidence of potential systemic health risks associated with common ingredients in oral care products. Substances such as triclosan, fluoride, sodium lauryl sulfate (SLS), alcohol, parabens, artificial sweeteners, titanium dioxide, and other chemical additives are commonly used in toothpaste and mouthwash formulations. While these ingredients serve antimicrobial or preservative roles, their absorption through the oral mucosa—a highly vascularized route—raises valid concerns about their unintended systemic effects.

Limitations

This narrative review has certain limitations. Many of the included studies vary in design, with a substantial portion relying on in vitro or animal models. These may not accurately predict human systemic outcomes. There is also a risk of bias due to selective reporting in the available literature. At the review level, publication bias and incomplete retrieval of relevant articles may have influenced the findings. Studies published in languages other than English may have been excluded.

Conclusion

While oral care products are essential for maintaining dental hygiene, many contain chemical ingredients that may have unintended systemic health effects. In the age of social media, persuasive marketing strategies often mislead consumers by highlighting benefits while downplaying potential risks. Given the wide range of available options, making informed choices becomes increasingly difficult for consumers. This underscores the need of strict regulatory frameworks. It must address advertising standards and ensure

that products with active chemical agents are used under appropriate prescription- based guidance, particularly in the case of medicated mouth washes and therapeutic toothpastes.

There is critical need to raise public awareness regarding appropriate usage, potential risks, and the importance of evidence based selection of oral care products. Regulatory bodies must also prioritize research into safer, natural alternatives and the long term effects of commonly used chemical ingredients. Moreover, misconceptions regarding prolonged toothbrushing with more toothpaste need to be corrected through awareness.

Dental professionals have a pivotal role in counselling patients about the risks associated

With prolonged or inappropriate use of certain ingredients, especially among vulnerable populations such as children. Their guidance is vital in ensuring that oral hygiene practices remain both effective and safe.

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References

1. Binney A, Addy M, Newcombe RG. The plaque removal effects of single rinsings and brushings. *Journal of Periodontology* 64 (1993): 181-185.
2. Brading M, Cromwell V, Green A, et al. The role of triclosan in dentifrice formulations, with particular reference to a new 0.3% triclosan calcium carbonate-based system. *International Dental Journal* 54 (2004): 291-298.
3. Villalaín J, Mateo CR, Aranda FJ, et al. Membranotropic effects of the antibacterial agent triclosan. *Archives of Biochemistry and Biophysics* 39 (2001): 128-136.
4. Wang CF, Tian Y. Reproductive endocrine-disrupting effects of triclosan: Population exposure, present evidence and potential mechanisms. *Environmental Pollution* 206 (2015):195-201.
5. Ha NY, Kim DH, Ryu JY. Relationship between triclosan exposure and thyroid hormones: The second Korean National Environmental Health Survey (2012-2014). *Annals of Occupational and Environmental Medicine* 31 (2019).
6. Tuncer Budanur D, Yaş MC, Sepet E. Potential hazards due to food additives in oral hygiene products. *Journal of Istanbul University Faculty of Dentistry* 50 (2016).
7. Mukherjee I, Singh UK. Groundwater fluoride contamination, probable release, and containment mechanisms: A review on Indian context. *Environmental Geochemistry and Health* 40 (2018): 2259-2301.
8. Shueb M, Akhtar MA, Khan WM, et al. Analyzing the relationship of fluoride contamination with groundwater temperatures in India. *Architecture Engineering and Science* 3 (2022): 198.
9. Casaglia A, Cassini MA, Condò R, et al. Dietary fluoride intake by children: When to use a fluoride toothpaste? *International Journal of Environmental Research and Public Health* 18 (2021): 57-91.
10. Wright JT, Hanson N, Ristic H, et al. Fluoride toothpaste efficacy and safety in children younger than 6 years. *The Journal of the American Dental Association* 145 (2014): 182-189.
11. McGrath C, Clarkson J, Glenny AM, et al. Effectiveness of mouthwashes in managing oral diseases and conditions: Do they have a role? *International Dental Journal* 73 (2023).
12. Werner CW, Seymour RA. Are alcohol containing mouthwashes safe? *British Dental Journal* 207 (2009).
13. Hasani TM, Sadeghi MF, Asgari N, et al. Cytotoxicity of the ingredients of commonly used toothpastes and mouthwashes on human gingival fibroblasts. *Frontiers in Dentistry* 29 (2020).
14. Panadan JJ. Chemical constituents used in toothpaste formulations and their adverse effects on systemic health. *Int J Pharm Sci Rev Res* 67 (2021): 45-53.
15. Hong QY, Huang Y, Yang J, et al. Food sweeteners: Angels or clowns for human health? *Current Research in Food Science* 10 (2025): 101032.
16. Czarnecka K, Pilarz A, Rogut A, et al. Aspartame—true or false? narrative review of safety analysis of general use in products. *Nutrients* 13 (2021): 1957.
17. Engeli R, Rohrer S, Vuorinen A, et al. Interference of paraben compounds with estrogen metabolism by inhibition of 17β-hydroxysteroid dehydrogenases. *International Journal of Molecular Sciences* 18 (2017): 2007.

18. Skocaj M, Filipic M, Petkovic J, et al. Titanium dioxide in our everyday life; is it safe? Radiology and Oncology 45 (2011).
19. Thawani V, Mani A. Are all additives of toothpastes rational? Journal of Mahatma Gandhi Institute of Medical Sciences 24 (2019): 71.
20. Lim TY, Poole RL, Pageler NM. Propylene glycol toxicity in children. The Journal of Pediatric Pharmacology and Therapeutics 19 (2014): 277-282.
21. Boronow KE, Brody JG, Schaidler LA, et al. Serum concentrations of pfas and exposure-related behaviors in African American and non-Hispanic white women. Journal of Exposure Science Environmental Epidemiology 29 (2019): 206-217.



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