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Biography

El Ayachi Houda, have been a dentist since 2015, graduating from the Faculty of Dental Medicine of Rabat. She completed her specialization in Periodontology in 2022, and She currently an assistant professor of Periodontology at the Faculty of Medicine, Pharmacy, and Dental Medicine of Fez. She also the author of many articles published in indexed journals

Oral Dysbiosis and Cancer Initiation: A Systematic Review of Mechanistic Pathways Linking Periodontal Pathogens and Oncogenesis

Abstract:

Introduction: Oral dysbiosis and periodontal pathogens have emerged as key contributors in the complex landscape of cancer biology. While associations between the oral microbiome and malignancies have been increasingly reported, the underlying mechanistic pathways remain scattered across disciplines. This systematic review aims to integrate current evidence on how specific oral pathogens contribute to cancer initiation and progression through defined molecular and immunological mechanisms.

Methods: A systematic search was conducted in PubMed, Scopus, and Web of Science up to March 15, 2025, targeting original studies published since 2012. Eligible studies included in vitro, in vivo, combined in vitro/in vivo, clinical observational, and integrative or translational research that explored causal or associative links between oral pathogens and oncogenesis. Risk of bias was assessed using validated tools appropriate to each study type (SYRCLE, JBI, NOS). Due to methodological heterogeneity, no meta-analysis was performed; instead, a structured narrative synthesis was conducted based on recurrent mechanistic themes.

Results: A total of 28 original studies were included: 11 in vitro, 3 in vivo (animal only), 6 combining in vitro and in vivo models, 5 clinical observational, and 3 translational or integrative studies. The most frequently studied pathogens were *Porphyromonas gingivalis* and *Fusobacterium nucleatum*, with documented associations to oral, colorectal, pancreatic, and esophageal cancers. Four principal oncogenic mechanisms were consistently reported across studies: Immune evasion and chronic inflammation, epithelial-mesenchymal transition (EMT), inhibition of apoptosis, and activation of pro-oncogenic signaling pathways, such as NF- κ B, PI3K/Akt, Wnt/ β -catenin, and MAPK.

Discussion: This review consolidates experimental and translational evidence highlighting the active role of oral pathogens in modulating carcinogenic pathways. Despite the predominance of preclinical studies and some methodological heterogeneity, the reproducibility of these mechanistic axes

across diverse models strengthens their biological plausibility. Limitations include moderate risk of bias in several studies and the need for standardized protocols in microbiome-oncology research.

Conclusion: The evidence synthesized underscores a paradigm shift: the oral microbiome is not merely a bystander but a potential modifiable factor in cancer development. Targeted microbial screening and periodontal care may offer novel avenues for early detection and prevention strategies. Future longitudinal and interventional studies are warranted to validate causal relationships and evaluate therapeutic opportunities aimed at dysbiosis-driven oncogenesis.