

# An Integrative Review of the Role of the Oral and Gut Microbiome in Oral Health Symptomatology During Cancer Therapy

Hayley J. Dunnack, MS, RN, CMSRN, OCN®, Michelle P. Judge, PhD, RD, Xiaomei Cong, PhD, RN, FAAN, Andrew Salner, MD, FACR, Valerie B. Duffy, PhD, RD, and Wanli Xu, PhD, RN

**PROBLEM IDENTIFICATION:** Both chemotherapy and radiation therapy cause considerable symptom burden on patients' oral health, influencing nutritional status and quality of life. The role of the oral and gut microbiome in oral health alterations during cancer therapy is an emerging area of science in symptom management.

**LITERATURE SEARCH:** PubMed®, CINAHL®, and Scopus® were searched for articles published from January 2000 through July 2020.

**DATA EVALUATION:** Articles published in English that were focused on chemotherapy and/or radiation therapy were included in the review.

**SYNTHESIS:** Of the 22 identified studies, 12 described oral health symptoms during chemotherapy and radiation therapy for head and neck cancer. Ten studies assessed symptoms during treatment for a variety of solid tumors and blood cancers, with four of these describing microbial interventions for the management of oral mucositis. Interventions varied, but the results supported the benefits of probiotics and synbiotics in reducing mucositis severity. Overall, less diverse oral and gut microbiome environments were associated with increased severity of oral health symptomatology.

**IMPLICATIONS FOR PRACTICE:** Additional research is needed to determine how the oral and gut microbiome and microbial interventions may be used to improve oral health management during cancer treatment.

**KEYWORDS** microbiome; oral health; radiation therapy; chemotherapy; oral mucositis

**ONF, 48(3), 317-331.**

**DOI** 10.1188/21.ONF.317-331

Researchers expect there to be 29.5 million cancer cases per year globally by 2040 (International Agency for Research on Cancer, 2020). Incidence of cancer cases continues to increase because of the aging population, screening and treatment advancements, and increasing health inequities (Miller et al., 2019). Accompanied with advanced treatment protocols, concerns have been raised related to the side effects of systemic chemotherapy and radiation therapy (RT) directed near the oral cavity, particularly detrimental changes to oral health.

## Background

Systemic or cytotoxic chemotherapy damages rapidly dividing cells (e.g., normal cells lining the alimentary canal), causing inflammation and an inability to grow new cells in the oral cavity (National Cancer Institute, 2016). In turn, this creates oral health alterations in the form of cluster symptoms, including oral mucositis (OM), xerostomia, pain, and oral sensory alterations. Similarly, RT leads to direct cell damage and breakdown, so RT directed to the mouth or neck can cause injury to the cells in these areas, including salivary glands and sensory receptors (National Cancer Institute, 2016). Therefore, OM, xerostomia, and disturbances in oral sensations (e.g., true taste, retronasal olfaction, altered touch, temperature, pain sensations) are commonly related to cancer treatment (Murtaza et al., 2017). Although research is limited, the literature supports that OM occurs in about 40% of patients receiving chemotherapy (Elting et al., 2003). In addition, about 70% of patients receiving chemotherapy report oral sensory alterations (Zabernigg et al., 2010). Nearly all patients undergoing RT to the head and neck area develop OM (Villa & Sonis, 2015). Overlapping injuries from both chemotherapy and RT lead to increased severity of oral health symptoms