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Editorial: The development of the oral microbiome in children

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Editorial on the Research Topic
The Development of the Oral Microbiome in Children

We now know that the oral microbiome is pivotal in the development of oral diseases, including oral cancer. We have witnessed an explosion of literature on the oral microbiome in adults and the role it plays in oral and systemic health. We have evidence of the stability of the oral microbiome in adults and how it reacts to internal and external stimuli. However, little is known about how the oral microbiome develops in children and changes over time as a child ages.

The goal of this Research Topic was to bring the latest research on the development of the oral microbiome in children and provide an invaluable resource for microbiome researchers. This collection of articles focused on the longitudinal development of the oral microbiome and/or response of the oral microbiome to external stimuli.

In one of the articles from this collection researchers used molecular tools to identify risk factors for dental caries with the goal of exploring potential interactions between oral microbial species and common genetic variants. Novel associations were significantly found between microbial species in the mouth and common genomic variants in the population that have been previously associated with dental caries. *Staphylococcus epidermidis* is facultative anaerobe gram-positive cocci bacteria and the most common coagulase-negative Staphylococcus species that live on the human skin. *Staphylococcus epidermidis* is an important pathogen in immunocompromised patients and patients who develop nosocomial bacteremia, however their role in dental caries has not been completely understood. *Staphylococcus epidermidis* may exist in the presence of certain genetic variation. For example, researchers have found that being positive for *Staphylococcus epidermidis* was associated with tuftelin *(TUFT* rs3828054). Furthermore, previous studies showed that *Candida albicans* was closely related to the caries states and depth, suggesting therefore its crucial role in caries pathogenicity. In addition, there is support in the literature that genetic variation impacts enamel formation, influences susceptibility to dental caries and future caries experience. In one of the featured articles, *Candida albicans* was associated with enamelin (*ENAM*

rs3796704) suggesting that variation in enamel conformation may increase dental caries susceptibility in the presence of *Candida albicans* colonization.

Early childhood caries (ECC) is present in all populations. ECC increases the risk for caries in the permanent dentition and is a substantial oral health challenge especially in ethnic minority groups. Since Mutans streptococci may be a potential indicator of ECC risk, the genotypic diversity of *Streptococcus mutans* is of interest both within and across families. Both identical and unique genotypic profiles were observed in mother-child dyads, when researchers compared two high ECC risk populations, one from Southeast Iowa and the other representing Northern Plains American Indian Tribe. The majority of the children exhibited different genotypes from those isolated from their mothers. In addition, the researchers observed a high rate of commonality between families. Thus, the genotypic diversity and fidelity of mother-child transmission display large variations and *S. mutans* may be acquired also from other members of the community.

Another study illustrated well the complexity of the oral microbiome in children and the shifts in composition that occur that lead to a cariogenic, dysbiotic microbiome. An intriguing finding from the American Indian population studied was the prevalence of *Streptococcus sobrinus* and 12 distinct genotypes across the mother-child dyads. Questions to be explored by further investigation include what is different about these genotypes? Would one find a different transcriptomic profile among the genotypes? What is the importance of associations of *S. sobrinus* with *S. mutans*—and *Candida albicans* and lactobacilli—in the development and progression of severe ECC? What environmental factors impact how these organisms become more dominant and thrive in a dysbiotic oral microbiome? Are there mechanisms like administration of new probiotic cocktails that could inhibit the shift within the oral microbiome that leads to caries? Another fact we must consider is that these data are from one American Indian Tribe. What about other Tribes? What about other populations experiencing significant oral health disparities and a high incidence of early childhood caries? It is the editors' opinion that further exploration into these questions is of paramount importance for the oral health—and systemic health—of these children as they grow into adulthood. Now is the time to heighten our focus on populations with high early childhood caries as what they experience in childhood likely will have a major impact on their oral health into adulthood.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.