The Oral Microbiome and Early Childhood Caries: Applications to the Education of Primary Care Physicians

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Background

- Overall goal of this portion of our project is to:
  Identify applications of oral microbiome knowledge to patients in the primary care setting and summarize applications of oral microbiome knowledge to an interprofessional approach to oral health and disease prevention
Research Overview

- Began as a narrative review in the spring of 2018
  - "Current Microbiological Basis of Early Childhood Caries (ECC) in the United States - A Narrative Review"

- The element of research we are presenting here today is rooted in framing the rapid advances in microbiome discoveries within the context of the diagnosis of the most common chronic disease of childhood in the United States – the 100% preventable diagnosis of Early Childhood Caries

- "Early Childhood Caries” = one or more cavitary lesions of the primary dentition up to 6 years of age

- The first US Surgeon General Report in the year 2000 reported a national prevalence of ECC at 24%; updated approximately 15 years later to report a prevalence of 28% nationally
• The genomic sequences of the oral microbiome members are being elucidated on a daily basis with a current taxa count of approximately 770.
The past decade has seen numerous monumental changes in basic science research based on the underpinnings of advancing molecular methods being utilized in biomedical research.

National Science Foundation definition of “basic science”:
- “Basic research is performed without thought of practical ends. It results in general knowledge and an understanding of nature and its laws.”

Microbiological basis of ECC relative to newly discovered taxa and newly discovered inter-microbial interactions producing pathologies associated with ECC (e.g., *Candida albicans* and *Streptococcus mutans* interactions, or newly discovered genera/species/strains of bacteria and their inter- and intra-species interactions).

The human oral microbiome is one such area that has experienced a meteoric rise in our understanding of the numbers and types of bacteria that colonize our oral cavities, as well as their role in developing a pathological state in the diagnosis of ECC.
The rapid expansion of knowledge over the past decade in oral microbiome studies raises the important question of how this knowledge (quantitatively and qualitatively) applies to patient care and clinical outcomes, thereby making it important to be translational in nature.

National Institutes of Health has more than one element in the definition of “translational research”:
- “…research aimed at enhancing the adoption of best practices in the community. Cost-effectiveness of prevention and treatment strategies is also an important part of translational science.”

National Center for Biotechnology Information (NCBI) MeSH entry for “translational research”: A second area of translational research concerns enhancing the adoption of best practices….overall intended/desired outcome of our work
During the bacteriology narrative review studies, the application of this work/knowledge to our fields became apparent:

- Characterization of the diversity of bacteria involved in the development of ECC
  - Updating the current understanding of the etiology of ECC
    - Affirming the role of *Streptococcus mutans* and *Lactobacillus*
      playing a key role in a majority of lesions
    - Adding *Capnocytophaga, Fusobacterium, Leptotrichia* among others
  - Newly identified microbes that in the absence of well-established players are responsible for ECC pathology; *Scardovia, Neisseria, Selenomonas, Candida*

- Importance of Homeostasis
  - Association with elevated levels of pathologic organisms and risk for developing cavities in the future
ECC – Current Understanding

- Association with socioeconomic status
- Current practice – not commonly addressed by PCP
  - Referral dental providers
- If unaddressed: can lead to systemic disease
- Need for PCPs to act as safety net for and collaborate with dental providers
  - “You can’t fix your way out of the problem with more dentists; you have to prevent tooth decay in the first place,” R. Michael Shirtcliff, D.M.D., president and CEO of Advantage Dental Plan
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R. Michael Shirtcliff, D.M.D., President and CEO of Advantage Dental Plan in Oregon

“Integrating Oral Health into Primary Care”
Public Health Application

- Dental medical home and 1\textsuperscript{st} visit by age 1 reduce incidence
- Mother/primary caregiver – to – child transmission on strain level
- Aged/staged prevention methods before primary eruption of primary teeth
- Congenital/transplacental microbiological/immunological
  - K00.81  Newborn Affected by Periodontal Disease in Mother
Interprofessional Practice: PCP’s role in Oral Health

- Coding exists
- Oral Fl supplementation/varnish application
- Emphasize standard oral care rather than OTC oral health supplements
  - Effects on overall Oral microbiome remain unknown.
- Due to vaccination requirements almost all children see a PCP before age 5
- SMILES for Life education program
Conclusions

- Vast database requires interpretation and translational research
- Continued education on advances and new developments in oral microbiome study
- Required PCP visits allow for early intervention and detection of ECC
- Remembering the importance of understanding the patient as a whole person
References

- **Smiles for life**
  - [http://www.smilesforlifeoralhealth.org/](http://www.smilesforlifeoralhealth.org/)

- **Human Oral Microbiome Database**
  - [http://www.homd.org/](http://www.homd.org/)

- **American Academy of Pediatrics**


THANKS!

Any questions?