Metagenomics, Digital & qPCR Molecular Analysis of Bed-Time Oral Brushing

Chhaliyil, Pranav

Everybody knows that cleaning the oral cavity is good for oral hygiene. However, not everyone knows that during the night sleep, when our mouth doesn't do saliva flushing, bacteria grows a lot, causing many deadly diseases. This study tested specific dental damaging bacteria, using 3 different bedtime oral cleaning methods. 1.Toothpaste Brushing + Tongue-cleaning (BT) 2. Gum and tooth Inner Finger rubbing + Tongue-cleaning (GIFT) 3. Rice-husk Charcoal Powder Finger rubbing + Tongue-cleaning (CT) To reduce variations in the testing methods, 70 subjects performed all 3 cleaning methods (Repeated Measures Design). The subjects ate raw cane sugar cubes before going to bed and without cleaning their mouth, for 2 nights (control). They did all 3 cleaning methods separately for 2 nights each. Every morning, saliva was spit in a DNA extraction tube. A second trial was done after a gap of one week. DNA from 960 saliva samples were analyzed in 5,184 qPCR, 92 Droplet Digital PCR & 20 Metagenomic Sequencing reactions using universal & specific dental damaging bacterial primer probes. ANOVA & posthoc statistical analysis showed a significant decrease in dental damaging bacterial counts in all 3 methods. However, CT has additional advantages of removing bad-breath and whitening teeth. Charcoal obtained by activating rice husk in 3 novel ways, showed adsorption differences in Isotherm studies, in general & dental damaging bacteria in saliva. This study successfully developed a simple, healthy, cost-effective ($0.0019/year), microbiome and eco-friendly technology for recycling abundantly available rice-husk into a highly adsorbing charcoal, which can reduce plastic usage by both developed and developing countries, for better oral hygiene to enjoy good health.

Awards Won:

Fourth Award of $500