

PERIODONTAL DISEASE

Kumar, colleagues uncover connection between smoking, periodontal risk

Fifty years after the surgeon general first reported on the harmful effects of tobacco, medical professionals continue to find more links between smoking and disease.

Recently, Purnima Kumar, an associate professor of Periodontology at The Ohio State University College of Dentistry, and her colleagues discovered a compelling cause-and-effect relationship between smoking and periodontal disease.

By combining advanced computational techniques and a novel scientific query, Kumar's research clarified the unusual composition of a smoker's biofilm, a collection of bacteria in the oral cavity that forms on moist surfaces in the body, including teeth and the spaces between teeth and gums. She also clarifies how the body recognizes and interacts with the novel bacteria. Kumar found that under their gingiva, smokers had many species that doctors did not know could be found in the oral cavity, and several species were systemic pathogens that usually cause diseases elsewhere in the body.

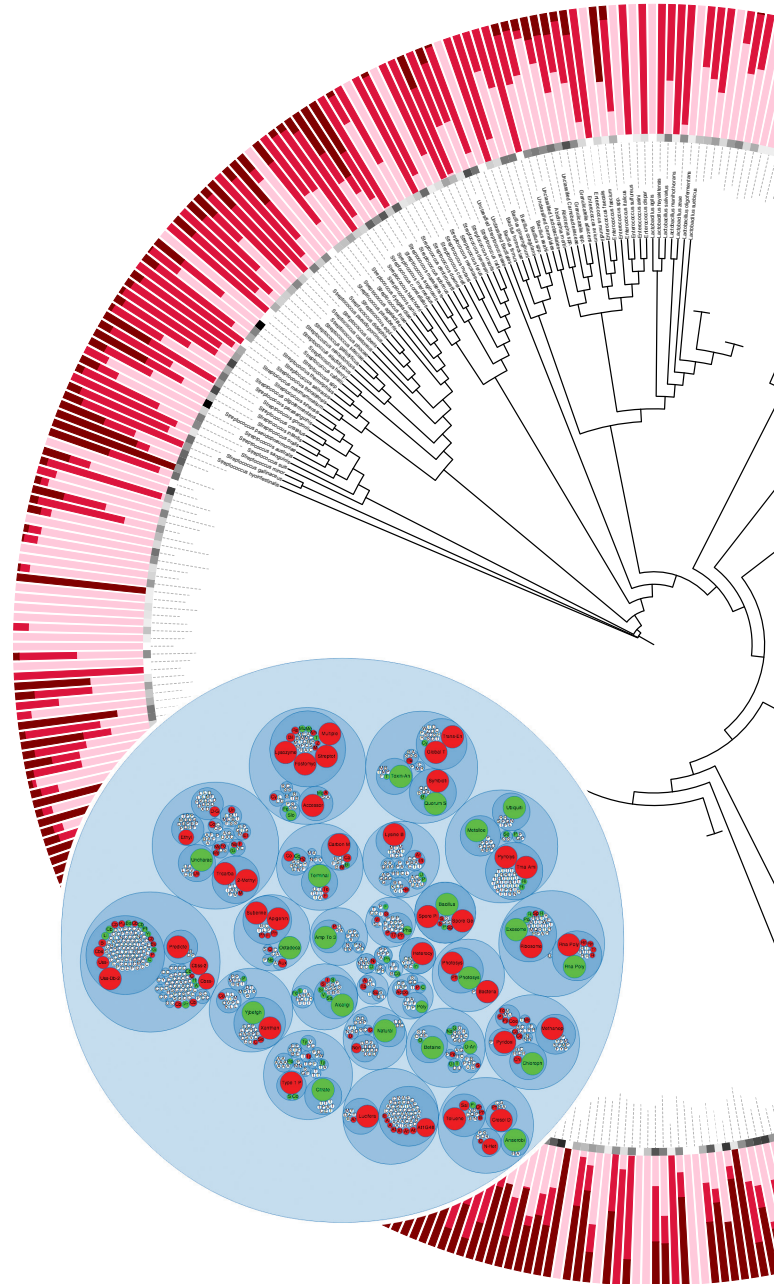
"We know that smoking increases your risk of getting severe periodontal disease and oral cancer," Kumar said. "Since bacteria outnumber human cells in our bodies by 10 to 1, and play such an important role in keeping us healthy, our research explores the ways that smoking can change the bacteria in the biofilm, from the moment they are acquired until the time the tooth is lost to disease."

As part of the initial research, the team investigated DNA and RNA sequences to identify the bacteria and learn what genes they express to survive and cause disease. The Ohio Supercomputer Center provided the computing power needed to analyze these immense datasets of molecular information.

Kumar is building on these preliminary investigations by combining large-scale clinical study designs with open-ended, as well as targeted, molecular approaches. This will bridge the gap between purely clinical studies and in vitro experiments, both of which have limited abilities to replicate disease in humans.

Patient samples will be processed for whole-cell genomic data using next generation shotgun sequencing and analyzed using a variety of computationally intensive tools. Ultimately, the results of this study will provide a timetable for administering periodontal therapy following smoking cessation.

"We have to be very aggressive in treating patients who smoke," Kumar added. "We need to see them more often and watch their periodontal tissue because they are high-risk individuals for periodontal disease. That's the message we carry to clinicians – these are our most vulnerable patients."



Above: To better understand the impact of smoking on gum disease, Kumar conducted DNA and RNA sequence analysis at the Ohio Supercomputer Center. These graphics illustrate the results.

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