Ancient teeth bacteria track disease evolution

'Modern mouth basically exists in permanent disease state'

DNA preserved in calcified bacteria on the teeth of ancient human skeletons has shed light on the health consequences of the evolving diet and behavior from the Stone Age to the modern day.

The ancient genetic record reveals the negative changes in oral bacteria brought about by the dietary shifts as humans became farmers, and later with the introduction of food manufacturing in the Industrial Revolution.

An international team, led by the University of Adelaide’s Centre for Ancient DNA (ACAD) in Australia, where the research was performed, published the results in Nature Genetics in February. Other team members include the Department of Archaeology at the University of Aberdeen and the Wellcome Trust Sanger Institute in Cambridge, United Kingdom.

“This is the first record of how our evolution over the last 7,500 years has impacted the bacteria we carry with us, and the important health consequences,” said study leader professor Alan Cooper, ACAD director. “Oral bacteria in modern man are markedly less diverse than historic populations, and this is thought to contribute to chronic oral and other disease in post-industrial lifestyles.”

The researchers extracted DNA from tartar (calcified dental plaque) from 34 prehistoric northern European human skeletons and traced changes in the nature of oral bacteria from the last hunter-gatherers, through the first farmers to the Bronze Age and Medieval times.

Dental plaque represents the only easily accessible source of preserved human bacteria,” said lead author Dr. Christina Adler, who conducted the research as a PhD student at the University of Adelaide and is now at the University of Sydney. “Genetic analysis of plaque can create a powerful new record of dietary impacts, health changes and oral pathogen genome evolution, deep into the past,” she said.

Cooper said, “The composition of oral bacteria changed markedly with the introduction of farming, and again around 150 years ago. With the introduction of processed sugar and flour in the Industrial Revolution, we can see a dramatically decreased diversity in our oral bacteria, allowing domination by caries-causing strains. The modern mouth basically exists in a permanent disease state.”

Cooper has been working on the project for the past 17 years with archaeologist and co-leader Keith Dobney, a professor at the University of Aberdeen. Dobney said, “I had shown tartar deposits commonly found on ancient teeth were dense masses of solid calcified bacteria and

ANTICIPATING THE NEXT 100 YEARS IN DENTISTRY

The Thomas P. Hinman Dental Meeting embarks on the ‘Next 100 Years’ in Atlanta, March 21–23, at the Georgia World Congress Center. The 101st Hinman features: more than 65 dental experts; more than 220 courses and hands-on workshops; all-day educational tracks for dentists, dental hygienists, assistants and office staff; and nearly 400 companies in the exhibit hall.

Photo/Provided by Georgia World Congress Center

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I enjoy attending and speaking at dental conferences as often as my schedule allows. The big, international events are especially enjoyable, because of the broadened perspectives gained by being able to interact directly with fellow professionals from across the globe and seeing firsthand some of the latest techniques and technologies in action, perhaps long before they're common practice here.

If you haven't made it yet to the International Dental Show held in Cologne, Germany, every other year, I'd strongly encourage you to plan on getting to it at least once. I've been able to attend a number of times over the years, and have always felt the effort delivered a strong return on investment. The IDS is the largest dental meeting in the world. More than 120,000 people representing all sectors of the dental field attend. Besides the most innovative, newest products, the standard and the durable are all on display in a touchable, congenial environment. It is always held in Cologne, and this year it’s the week of March 12 through 16. Probably a bit too late now to make a last-minute decision to attend this year — but I’d encourage you to pencil in the next one two years from now. The booths in the exhibit area are the largest, tallest and most imaginative you'll see anywhere, with several floors of highly creative displays in the individual booths. The broad range of products on display from around the world allows visitors to absorb an overview of global dentistry and its products and services. One has to be there and see it. All in the oral health field are welcome. Another meeting I've had the good fortune of attending many times is the Chicago Dental Society Midwinter Meeting, just held in late February. The Chicago Midwinter is preceded by the Oral Health America Gala, a major fund-raising event that supports Oral Health America’s efforts to improve access to oral health care and education in the United States, especially among our most vulnerable populations.

Many of you may not realize that this year’s Chicago Midwinter and the Oral Health America Gala carried some extra meaning because they mark the retirement of an esteemed colleague, Dr. Tony Volpe, from his position with Colgate-Palmolive Co., a Diamond-level sponsor of the gala. Tony most recently has been serving as vice president of clinical dental research and scientific affairs at the Colgate-Palmolive Technology Center in Piscataway, N.J. He has been a powerful, positive force for our profession for more than 50 years, earning many international honors — as well as the American Dental Association Distinguished Service Award in 2004. I’m hoping Tony remains active in the profession, continuing with his many other interests, roles and responsibilities, and I look forward to spending time with him at many meetings and conferences to come.
food, but couldn’t identify the species of bacteria. Ancient DNA was the obvious answer.”

The team was not able to sufficiently control background levels of bacterial contamination until 2007, when ACAD’s ultra-clean laboratories and strict decontamination and authentication protocols became available.

Researchers worked with a team of dentists at the University of Adelaide’s School of Dentistry to establish a picture of microbial diversity in modern-day mouths and the relationship between bacteria in plaque and calculus.

Adler wrote, “One common cause of gum disease, porphyromonas gingivalis, had been suggested to lie behind recent rises in heart disease. However, we were able to show it had not increased in prevalence over the past 7,000 years, suggesting it was not likely to be causative. However, it may contribute to the disease by stimulating a permanent state of inflammation.” The research team is now expanding its studies through time, and around the world, including other species such as Neanderthals.

(Source: The University of Adelaide)