A New Ally Against Tooth Decay: Arginine Offers Sweet Relief

New human clinical trial proves arginine, an amino acid, can modify plaque formation on teeth, thereby protecting against dental caries

New human clinical trial finds arginine can prevent caries due to bacterial plaques by reducing the acidity, altering the plaque structure and reducing harmful bacteria in the plaques

CHENGDU, SICHUAN, CHINA, January 8, 2026 /EINPresswire.com/ -- An interesting human trial by researchers from Aarhus University in Denmark compared dental plaques grown on customized dentures on both sides of the same participant's mouth. The team exposed both sides to sugar but treated only one with arginine to assess its benefits. Their findings showed higher pH, altered biofilm structure, and reduced harmful bacteria, highlighting arginine's potential in preventing dental caries.

Fermentation of sugars in our food by the numerous bacteria in our mouth produces acids that destroy our teeth to form caries cavities. These bacteria reside in plaque-like communities called "dental biofilms". Arginine, an amino acid naturally found in our saliva, has been shown to be helpful in preventing tooth decay. A few beneficial bacteria have an arginine deiminase system (ADS) that helps break down arginine to form alkali that can neutralize the acids. Increased availability of arginine helps in the multiplication of these beneficial bacteria, while at the same time inhibiting the growth of acid-producing bacteria. Recently, studies conducted outside the human body also showed that arginine availability changes the composition of dental biofilms.

To further prove these findings in the human mouth, a team of dentists and researchers led by Post.doc. Yumi C. Del Rey and Professor Sebastian Schlafer from Aarhus University in Denmark have conducted a clinical trial and published their findings in the International Journal of Oral Science.

They recruited 12 participants with active caries and prepared specialized dentures that allow for

the collection of intact biofilms, spanning both sides of the jaw. The participants were instructed to dip the dentures in a sugar solution for 5 minutes, immediately followed by distilled water (as placebo) or arginine for 30 minutes, one on each side. This was to be repeated three times a day, with arginine treatment done on the same side each time. “The aim was to investigate the impact of arginine treatment on the acidity, type of bacteria, and the carbohydrate matrix of biofilms from patients with active caries,” explains Sebastian Schlafer, professor at the Department of Dentistry and Oral Health. After 4 days, when the biofilm was developed, the dentures were removed for detailed analysis.

A special pH-sensitive dye called “C-SNARF-4” was used to analyze the acidity of the collected biofilms in different locations. Biofilms treated with arginine showed a significantly higher pH (lower acidity) at 10 and 35 minutes after a sugar challenge. “Our results revealed differences in acidity of the biofilms, with the ones treated with arginine being significantly more protected against acidification caused by sugar metabolism” says the first author, Yumi C. Del Rey.

Then, carbohydrate-binding proteins called lectins, tagged with a fluorescent dye, were used to stain two common carbohydrate components of the biofilms: fucose and galactose. These components make up a large portion of dental biofilms and may contribute to the creation of “acidic pockets” inside them. With arginine treatment, an overall reduction was seen in the amount of fucose-based carbohydrates, possibly making the biofilm less harmful. In addition, there was a change in the structure of the biofilm, with galactose-containing carbohydrates decreasing at the bottom and increasing at the top.

Further, to determine which bacteria were present in the biofilm, they sequenced all bacterial genomes using a technique called “16S rRNA gene sequencing”. Though biofilms treated with arginine and placebo were predominantly dominated by Streptococcus and Veillonella species, arginine significantly reduced the mitis/oralis group of streptococci, which produce acid but are not strong producers of alkali, and slightly increased streptococci with considerable arginine metabolism, thereby improving the pH. Overall, arginine made the biofilms less harmful by reducing their acidity, altering their carbohydrate structure, and reshaping the microbiome within them.

Dental caries, being prevalent across all ages and regions, could be combated using strategies such as supplementation of arginine in toothpastes or oral rinses for people who are more susceptible to them. Arginine, being an amino acid naturally produced in our body and present in dietary proteins, is harmless and could find application even in children.

***

Reference
Title of original paper: Arginine modulates the pH, microbial composition, and matrix architecture of biofilms from caries-active patients
Journal: International Journal of Oral Science

DOI: 10.1038/s41368-025-00404-5

About the University
Aarhus University in Denmark is a leading global research institution recognized for excellence in the health sciences, dentistry, and microbiology. The university fosters strong interdisciplinary collaboration between clinical researchers and molecular scientists, enabling high-impact studies that translate laboratory discoveries into real-world healthcare solutions. Within the Department of Dentistry and Oral Health at Aarhus University, researchers are internationally respected for advancing knowledge on oral microbiomes and caries prevention. With a robust translational research ecosystem and state-of-the-art facilities, Aarhus University continues to generate critical insights that shape modern dental care and improve oral health outcomes worldwide.
Website: https://dent.au.dk/about-us

About Professor Sebastian Schlafer from Aarhus University
Professor Sebastian Schlafer at Aarhus University leads research on dental biofilms, focusing on their extracellular matrix, composition, structure, and metabolic activity—key factors in oral diseases such as caries. He develops novel strategies to control harmful oral bacteria while preserving beneficial species. In addition to his research, he teaches cariology, operative and aesthetic dentistry, and dental materials.

About Post.doc Yumi Chokyu Del Rey from Aarhus University
Yumi C. Del Rey is a researcher at Aarhus University specializing in oral microbiology and dental biofilms. Her work focuses on how microbial communities, their architecture, and metabolic activity contribute to dental caries. Using techniques such as pH ratiometry, lectin-based imaging, and 16S rRNA sequencing, she investigates how treatments like arginine reshape biofilm acidity and composition. As first author of the recent clinical study, she contributes to advancing mechanism-based strategies for caries prevention.

Yini Bao
International Journal of Oral Science
+862885546461 ext.
ijos@scu.edu.cn
Visit us on social media:
X