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Magnetic Microcapsule Robots for Targeted Biofilm Treatment in Oral Environments

Alexandria, VA – A study introducing a novel robotic platform of magnetic microcapsules that deliver or activate therapeutic agents, such as antimicrobial drugs and reactive oxygen species (ROS), for precise and targeted biofilm treatment. was presented at the 54th Annual Meeting of the AADOCR, which was held in conjunction with the 49th Annual Meeting of the Canadian Association for Dental Research, on March 12-15, 2025 in New York, NY.

The abstract, “Magnetic Microcapsule Robots for Targeted Biofilm Treatment in Oral Environments” was presented by Hong Huy Tran of the University of Pennsylvania during the “Biomaterial Strategies for Restorative and Regenerative Applications” Poster Session that took place on Thursday, March 13, 2025 at 11 a.m. EDT (UTC-4).

Oral biofilm infections in irregular soft-tissues of the oral mucosa or confined anatomical spaces present major therapeutic challenges. Current antimicrobial treatments struggle to achieve localized, effective delivery at infection sites. This study introduced a novel robotic platform of magnetic microcapsules that delivered or activated therapeutic agents, such as antimicrobial drugs and reactive oxygen species (ROS), for precise and targeted biofilm treatment.

The study found that a microrobotic system using magnetic microcapsules with high drug loading capacity form dynamic collectives, capable of navigating complex physical and biological barriers to target biofilms. By integrating robotic control and retrieval, this system achieves precise and efficient antibiofilm treatment, significantly advancing current drug-delivery approaches in dental medicine.

About AADOCR

The American Association for Dental, Oral, and Craniofacial Research is a nonprofit organization with a mission to drive dental, oral, and craniofacial research to advance health and well-being. AADOCR represents the individual scientists, clinician-scientists, dental professionals, and students based in academic, government, non-profit and private-sector institutions who share our mission. AADOCR is the largest division of the International Association for Dental, Oral, and Craniofacial Research. Learn more at www.aadocr.org.