Dr. Dimitrios Michelogiannakis
2026 Biomedical Research Award
University of Rochester

1) a short biography

Dr. Dimitrios Michelogiannakis, DDS, MS, FACD, is an Associate Professor and Program Director in the Department of Orthodontics at the Eastman Institute for Oral Health, University of Rochester. He earned his dental degree from the National and Kapodistrian University of Athens in 2012 and completed his orthodontic specialty training and Master of Science degree at the Eastman Institute for Oral Health in 2017. He is currently pursuing a PhD at the National and Kapodistrian University of Athens.

Dr. Michelogiannakis is a diplomate of the American Board of Orthodontics, a fellow of the American College of Dentists, and a member of the Edward H. Angle Society of Orthodontists. He has held national leadership roles, including Chair of the Section on Orthodontics of the American Dental Education Association and President of the Society of Educators of the American Association of Orthodontists, and serves as an orthodontic site visitor for the Commission on Dental Accreditation.

Dr. Michelogiannakis has contributed more than 80 peer-reviewed publications and two book chapters and has lectured nationally and internationally. He has received several academic awards and competitive research funding from organizations including the American Association of Orthodontists Foundation, the American Association of Orthodontists, and the American Dental Education Association, as well as industry-supported awards such as the Align Research Award, supporting his ongoing research and educational initiatives.

2) a brief description of the project

This project will examine the release of microplastic particles from clear orthodontic aligners under controlled in vitro conditions that simulate intraoral wear. As aligner therapy continues to expand globally, there is limited evidence regarding the degradation behavior of thermoplastic aligner materials and their potential contribution to microplastic exposure.

In this study, commercially available thermoformed and direct three-dimensional (3D)-printed aligners will be fabricated from a standardized digital dental model to ensure geometric consistency across groups. Aligners will be subjected to a 14-day simulated wear protocol using a reciprocating linear wear system designed to replicate masticatory forces in a physiologic artificial saliva environment maintained at 37°C. Samples will be collected at predefined time points to evaluate time-dependent particle release.

Microplastic emissions will be quantified and characterized using a two-tier analytical approach. Microparticles ≥1 μm will be captured and analyzed using the Silicon Nanomembrane Analysis Pipeline (SNAP), incorporating fluorescence microscopy, scanning electron microscopy, and Raman spectroscopy. Submicron particles will be analyzed by pyrolysis–gas chromatography/mass spectrometry to determine polymer composition.

This study will generate a comparative dataset on microplastic release from thermoformed versus 3D-printed aligners under simulated clinical wear conditions, providing important insights into material performance, potential patient exposure, and the long-term sustainability of clear aligner therapy.

3) a statement of how orthodontic education will benefit from your award

The findings of this study will help determine whether clear orthodontic aligners release microplastic particles during clinically simulated wear and whether there are differences between thermoformed and 3D-

printed materials, including how these outcomes may vary with wear time and cumulative masticatory friction over a typical 14-day aligner cycle. This will highlight the potential need to incorporate material selection, patient counseling, and environmental health considerations into orthodontic education and clinical decision-making, both before and during aligner therapy. It may also inform evidence-based refinements to aligner wear protocols and support the development of future clinical studies in patients undergoing clear aligner therapy.

4) why the Foundation is important to your project

Support from the American Association of Orthodontists Foundation (AAOF) will be instrumental in conducting this research by providing the resources needed to apply advanced microplastic characterization techniques and perform rigorous in vitro laboratory analyses. In addition, this award will support my growth as an independent researcher in translational and cross-disciplinary research with broader implications for human health. More broadly, AAOF support will help translate emerging scientific findings into teaching, mentorship, and future research initiatives within the specialty.

5) how Foundation funding is expected to or has benefitted your career

Previous support from the American Association of Orthodontists Foundation (AAOF), including two Orthodontic Faculty Development Fellowship Awards (OFDFA) in 2020 and 2022, has been fundamental to my academic development. These awards supported my progression from junior to senior faculty, culminating in my current role as Associate Professor on the tenure track and orthodontic Program Director. This sustained support has also enabled the development of a strong scholarly portfolio, including impactful scientific publications and several presentations at national and international conferences.

Building on this foundation, AAOF support has been pivotal in my development as an independent investigator, allowing me to establish and lead research initiatives as a principal investigator and contribute to larger, collaborative, cross-disciplinary projects. Continued AAOF funding will further strengthen this trajectory by supporting the expansion of my independent research program, enhancing my leadership in orthodontic education, and advancing my role as a clinician-scientist within the specialty.