Dr. Bingshuang Zou
2026 Biomedical Research Award
The University of British Columbia

I bring extensive expertise, leadership, and motivation to successfully carry out the proposed research project. As a full-time faculty member for over 20 years, I have established a solid foundation in orthodontic research, with specialised training in biofilm formation and its connection to orthodontic appliances, especially clear aligners. My work covers material properties to clinical outcomes, supported by AAOF and university grants. I have developed effective methods to evaluate biofilm features relevant to 3D direct-printed aligners and formed collaborations with material scientists, engineers, and microbiologists. To advance this project, I secured material transfer agreements with two leading aligner manufacturers. I have successfully managed multiple funded projects, published peer-reviewed articles, and presented at international conferences. My research interests also include 3D digital imaging and airway studies, resulting in over 60 articles and seven book chapters. Recent investigations focus on the biological and physical properties of aligners and attachment materials, with a particular emphasis on sustainability in orthodontics. As a mentor, I supervised postgraduate students whose work has led to impactful publications, including a thesis on antibiofilm attachment materials and a dissertation assessing the accuracy of 3D tooth movement with Invisalign. I also co-authored a review on aligner materials, highlighting future directions in direct printing and environmental responsibility. Through strong collaborations with experts in dental materials and biofilms, as well as interdisciplinary links at UBC, I am well-positioned to lead this project. With a clear plan, timeline, and budget, I am confident it will produce high-quality publications and valuable training opportunities for graduate residents.

This study received approval from the ethics board at the University of British Columbia, Vancouver, Canada (H25-00584). We expect the following outcomes from this project: 1). Significant differences exist in both biovolume and the percentage of killed bacteria between the biofilm models using thermoformed aligners and 3D-printed aligners. 2). Prolonged exposure to a simulated oral environment reduces the material's resistance to biofilm formation. 3). Changes in the surface features of various materials are linked to their antimicrobial effects. 4). There are notable differences in the microbial composition of supragingival and subgingival biofilms among the three clear aligner groups.

Our prior research in developing biofilm models on dentin and resin structures closely relates to our current work. We have also demonstrated our capability to employ various methods to assess the antimicrobial properties of resins, with surface property evaluation techniques being well-established. However, since we are examining a newly introduced aligner material, there is inherent uncertainty in our findings, and they may not meet our initial expectations. If the antimicrobial properties of the new 3D-printed materials are similar to or less effective than those of traditional aligners, this indicates a need for modifications to enhance their performance. Conversely, if the aligners' surface properties do not correlate with their antimicrobial efficacy, it suggests that we have not yet identified the key factors affecting antimicrobial performance, necessitating further investigation into additional critical factors.