Electronic Supplementary Material (ESI) for Lab on a Chip.


# Supplementary materials

## A Dental Implant-on-a-Chip for 3D Modeling of Host-Material-Pathogen Interaction and Therapeutic Testing Platform

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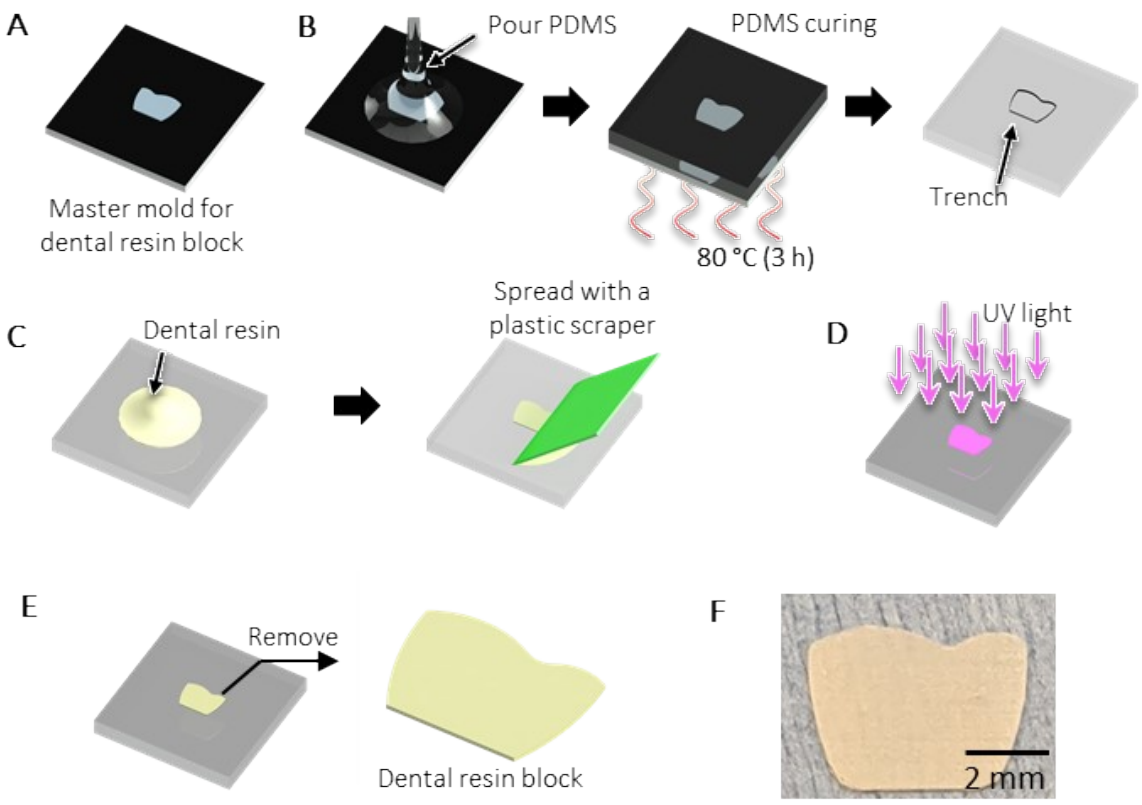


**Figure S1. Schematic for the fabrication of dental resin blocks.** (A) SU-8 master mold for dental resin block. (B) Addition of uncured PDMS to the master mold followed by curing and release of the PDMS layer. (C) Pouring uncured dental resin in the PDMS trench. (D) Curing of dental resin using UV. (E) Removal of dental resin block. (F) Picture of fabricated dental resin block.

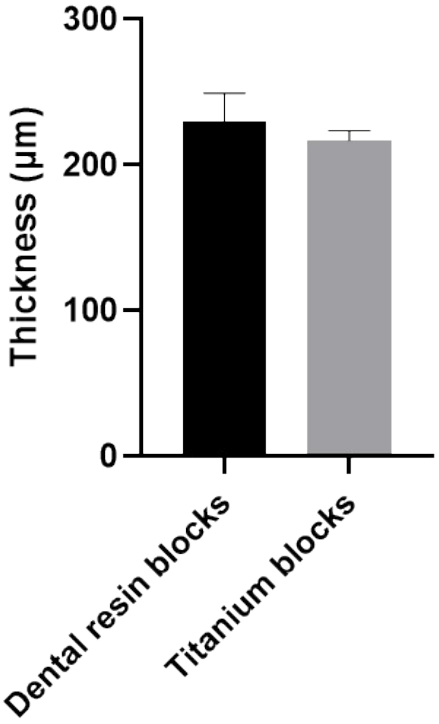


**Figure S2. Variation in thicknesses of dental resin and titanium blocks** (n=10).

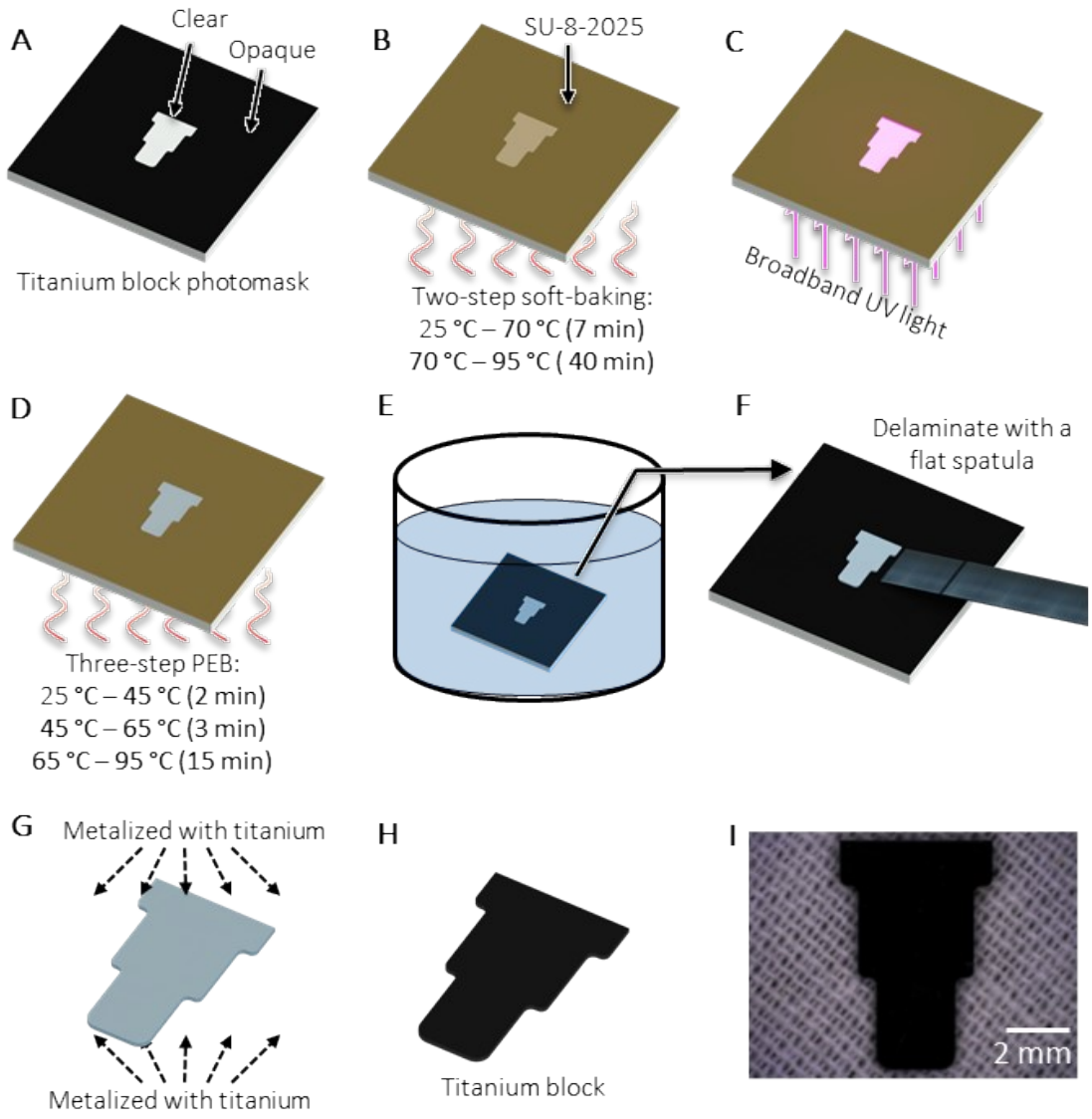


**Figure S3. Schematic diagram for master mold fabrication and the SU-8 master mold used to form titanium blocks.** (A) Chromium-coated photomask. (B) Soft-baking process. (C) Exposure to broadband UV. (D) Post exposure baking process. (E) Immersion into SU-8 developer. (F) Delamination fo SU-8 structure. (G) Metallization of SU-8 structures with titanium. (H) Final titanium block. (I) Picture of fabricate titanium block.

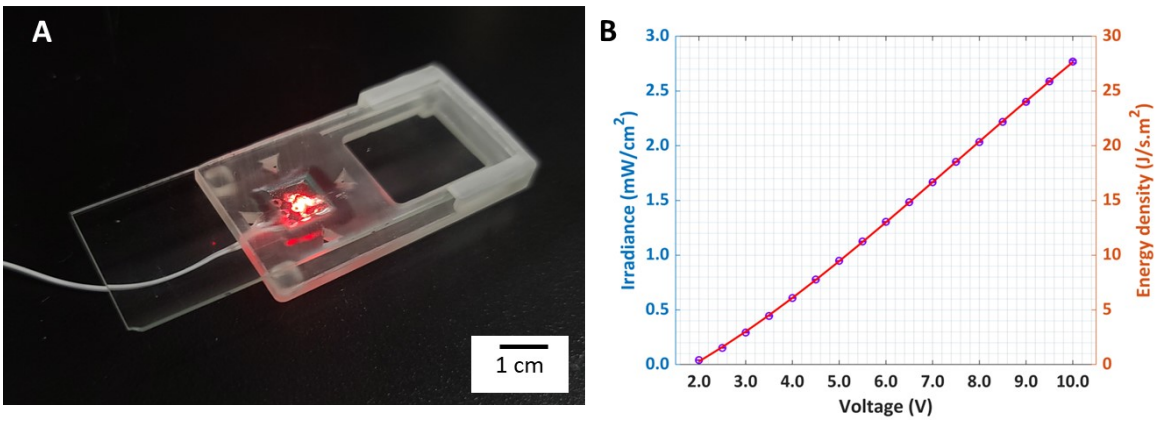


**Figure S4. LED Platform used for PBM therapy.** (A) Glass slide in our custom-chip holder with Red LED. (B) Irradiance profile of platform.

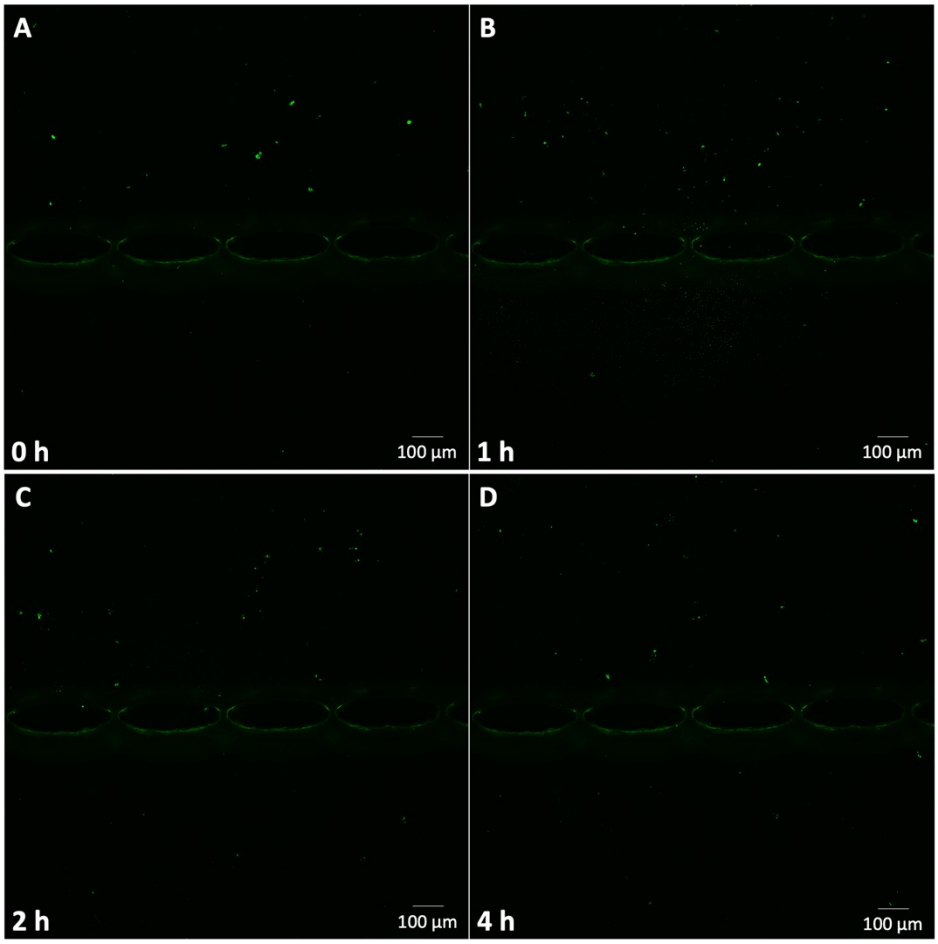


**Figure S5. Validation of small particle transport within IOC.** GFP-labeled *S. mutans* flowing through the upper chamber (meant for keratinocytes) with minimal diffusion into the lower chamber (meant for fibroblasts). Images represent snapshots taken at (A) 0 h (B) 1 h (C) 2 h and (D) 4h.

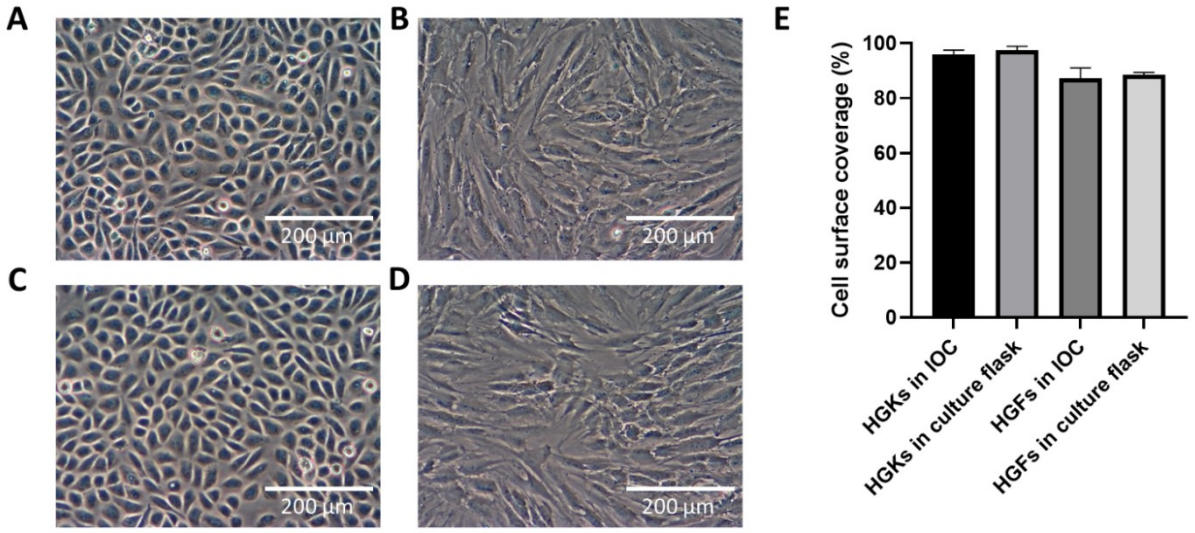


**Figure S6. Comparison of cell surface coverage in the IOC vs. in traditional culture flasks.** Representative images of (A) HGKs and (B) HGFs cultured in a flask and (C) HGKs and (D) HGFs cultured in the IOC. (E) Quantified cell surface coverage of HGKs and HGFs in the IOC and culture flask. Culturing cells in the IOC led to no significant differences in the surface coverage vs. traditional culture flasks.

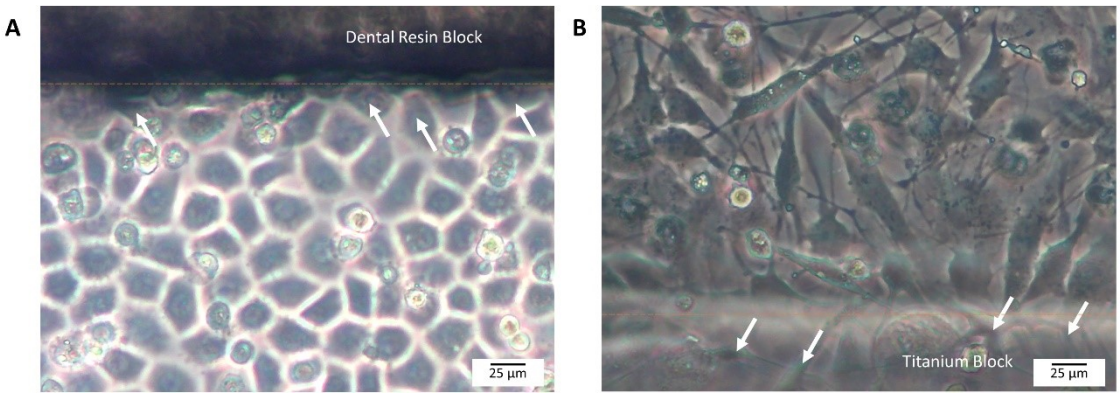


**Figure S7. Interactions of HGKs and HGFs with dental resin and titanium blocks, respectively.** White arrows indicate cells that are in contact with the material. Orange dashed lines indicate the boundary of the materials. (A) HGKs interacting with dental resin. (B) HGFs interacting with titanium. Images are artificially brightened to show cells that are in contact with the blocks.

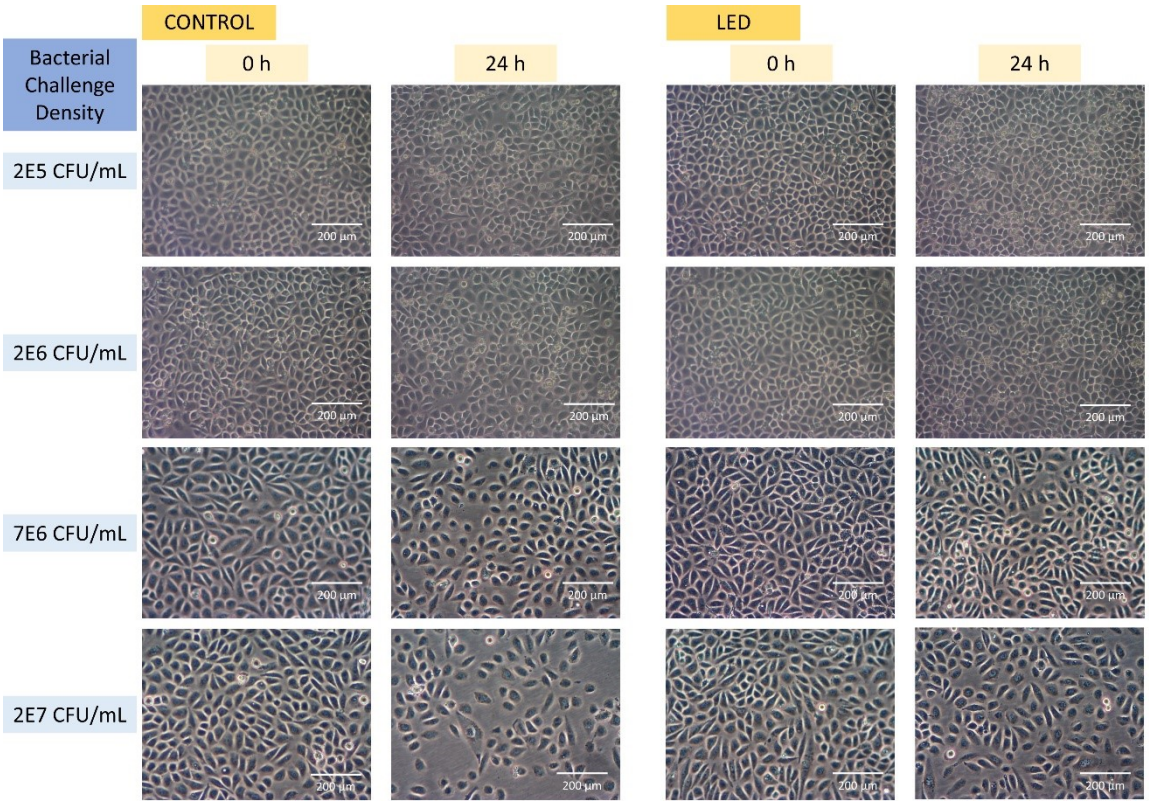


**Figure S8. Bacterial challenge to the HGK layer at different densities.** Bacterial challenge with seeding densities 1E6 CFU/mL led to no significant damage to the HGK layer. Significant damage to the HGK layer was seen at a seeding density higher than 7E6 CFU/mL.

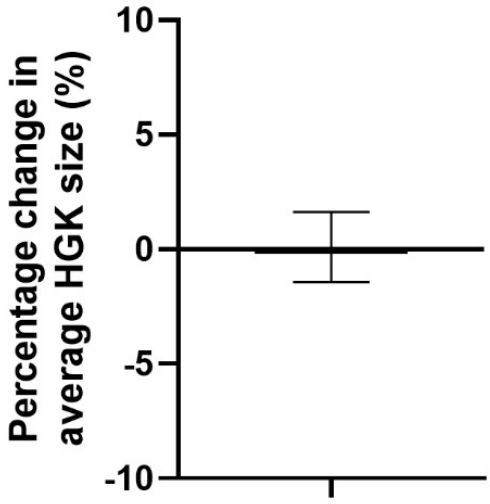


**Figure S9. Percentage change in average HGK cell size before and after infection with *S. mutans*.**

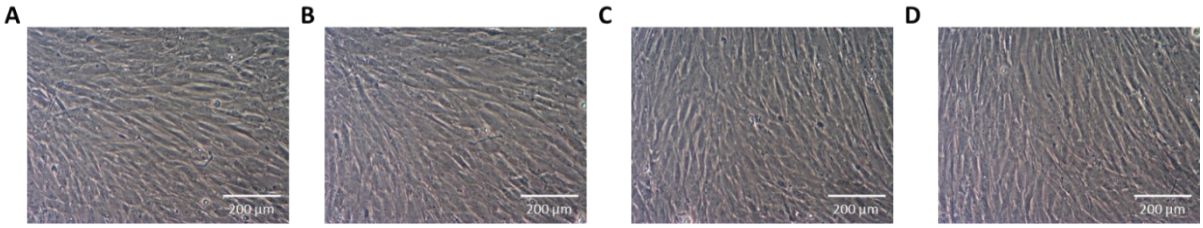


**Figure S10. Bacterial challenge to the HGK layers does not affect the HGF layers in the IOC**. *S. mutans* was used to challenge HGK layers of control and LED treated chips. Representative images of HGFs in control chips at (A) 0 h and (B) 24 h. Representative images of HGFs in LED treated chips at (C) 0 h and (D) 24 h.