AMERICAN OTOLOGICAL SOCIETY

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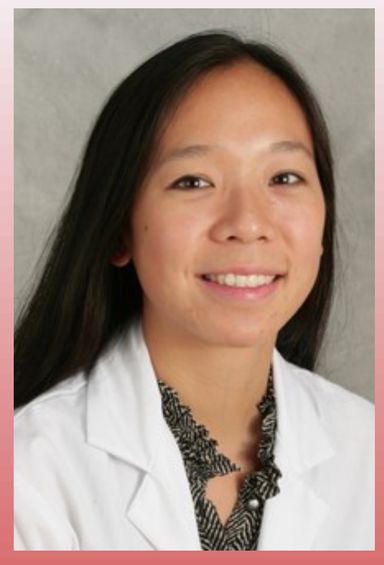


"Zwitterionic Substrates for Prevention of Fibrosis following Cochlear Implantation"

RESEARCH GRANT 2016

Amount Awarded by AOS: $50,000

Ongoing Funding: NIH 2018-2027, $5 Million

PUBLICATIONS:

Antifouling Photograftable Zwitterionic Coatings on PDMS Substrates.

Leigh BL, **Cheng E,** Xu L, Derk A, Hansen MR, Guymon CA.

Langmuir. 2019 Feb 5;35(5):1100-1110. doi: 10.1021/acs.langmuir.8b00838. Epub 2018 Aug 1.

PMID: 29983076

Photograftable Zwitterionic Coatings Prevent *Staphylococcus aureus* and *Staphylococcus epidermidis* Adhesion to PDMS Surfaces.

Shen N, **Cheng E,** Whitley JW, Horne RR, Leigh B, Xu L, Jones BD, Guymon CA, Hansen MR.

ACS Appl Bio Mater. 2021 Feb 15;4(2):1283-1293. doi: 10.1021/acsabm.0c01147. Epub 2021 Jan 22.

PMID: 35014480

Photopolymerizable Zwitterionic Polymer Patterns Control Cell Adhesion and Guide Neural Growth.

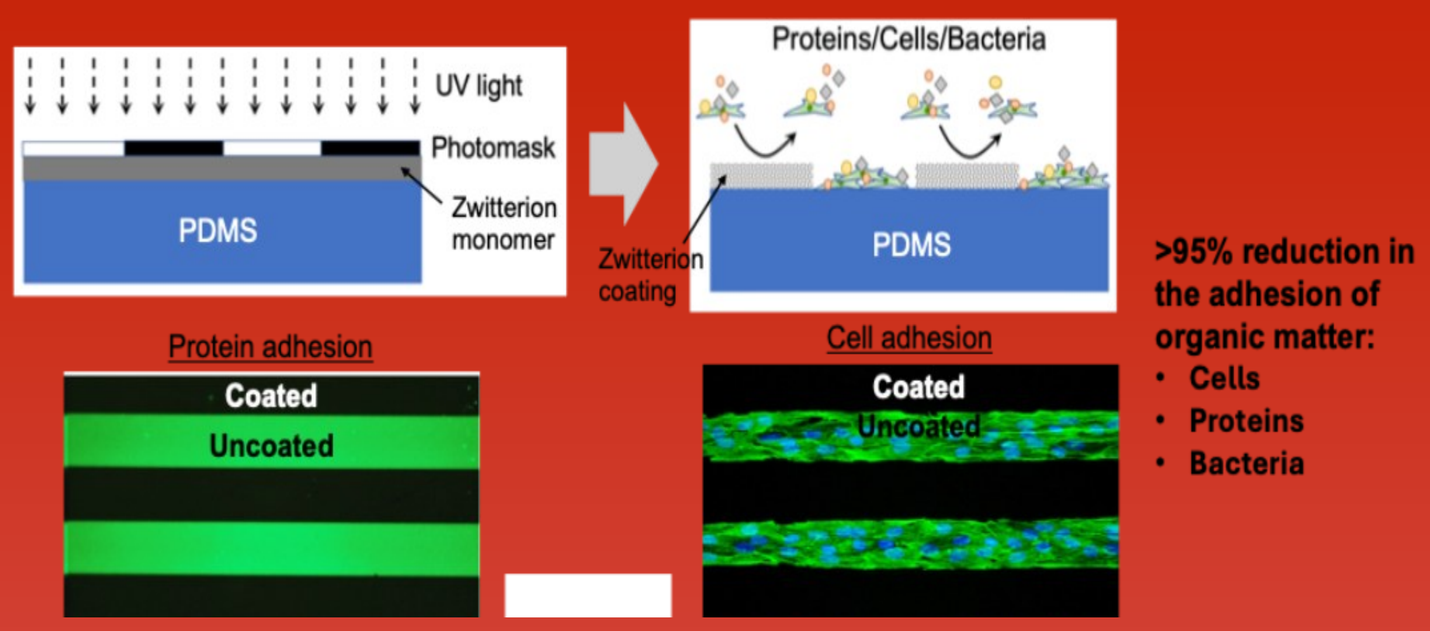
Leigh BL, **Cheng E,** Xu L, Andresen C, Hansen MR, Guymon CA.

Biomacromolecules. 2017 Aug 14;18(8):2389-2401. doi: 10.1021/acs.biomac.7b00579. Epub 2017 Jul 24.

PMID: 28671816

RESEARCH SUMMARY:

The inflammatory foreign body response (FBR) within the scala tympani following cochlear implantation has been associated with increase electrode impedance, loss of residual acoustic hearing, poorer hearing results, and rarely device failure in cochlear implant recipients. This inflammatory response is driven by cellular interaction with the surface properties of the implanted CI biomaterials. We developed a simple, single step process to covalently graft zwitterionic thin films to the silastic surface of CI electrode arrays. These ultralow fouling coatings show great promise in mitigating the FBR, an unpredictable factor in postoperative hearing outcomes.



OUTCOMES:

Zwitterionic thin film coatings dramatically reduced protein and cell adhesion of silastic surfaces. By using photomasks to control light exposure and the photografting process, were able to control film formation on a micron scale. This surface patterning precisely guided cultured spiral ganglion neurite extension across silastic materials. The technology has been patented through the University of Iowa Research Foundation and licensed to ZwiCoat Materials Innovations for further development in cochlear implants and other biomedical implants.

FURTHER FUNDING HAS ENABLED US TO EXPAND OUR RESEARCH TO:

Further improvement in cochlear implant materials. Zwitterionic coatings have also been found to dramatically reduce surface friction and insertion forces during electrode array insertion. Further, the coating enhance the electrode interface reducing electrode impedances by ~50%.

LAY SUMMARY OF FINDINGS AND IMPLICATIONS OF THIS RESEARCH:

The success of cochlear implantation has been limited in part by unpredictable formation of scar within the scala tympani following implantation. This technology may help to more reliably improve hearing outcomes in cochlear implant recipients.