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Development and capture optimization of a tear-based diagnostic stress sensor

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The medical device diagnostic industry has witnessed an increasing trend towards using tear-based technology for its wide array of potential biomarkers and the relative painlessness of acquisition compared to traditional blood-based methods. This project has aimed at creating a tear-based stress sensor that overcomes difficulties typically associated with tear acquisition and sensing. The device will monitor the levels of six biomarkers in the body that have shown promise as indicators of stress related trauma or illnesses using cutting edge electrochemical technology. The sensor will be a powerful diagnostic tool which simultaneously detects the presence, decrease, or increase of all six markers in the tear fluid. The markers evaluated by the sensor include cortisol, epinephrine, norepinephrine, dopamine, glucose, and lactate. The quantification of stress provided by the sensor will simultaneously aid health care professionals in their ability to rapidly respond to a trauma incident while also providing a new dimension to everyday healthcare and diagnosis. Device-side, LaBelle Labs at Arizona State University has developed a polyurethane-based tear capture mechanism that has demonstrated tear capture consistency. Furthermore, they have worked towards optimizing aqueous tear capture by selecting against the physiological mucin and lipid layers of the corneal tear fluid. This and other measures hope to mitigate the level of user error inherent in any diagnostic product. Future work, involves tailoring the sensor to support a more reproducible fluidic portion, and implementing all the stress biomarkers into one system.

Biography

Tina Hakimi is completing her B.S.E in biomedical engineering from Arizona State University. Her course of study and three years as a clinical scribe have given her the experience to spearhead the diagnostic and electrochemical sensing portion of this project. Combined, with her month-long stay in Ghana performing ophthalmic research and assisting in cataract surgeries, Tina has posited herself for a medical career geared towards uniting patient needs with up-and-coming research.

Neil Saez is completing his B.S.E. in Biomedical Engineering at Arizona State University. He is the team leader of the device concept optimization and implementation portion of the project. He has worked with the LaBelle lab group for the past two years, and continues to conduct research toward the completion of his undergraduate thesis. Additionally, Neil is the co-founder of the non-profit organization Camp H.O.P.E (Helping Orphans Prosper through Eduction) and enjoys running, cooking, and reading in his spare time.

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