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“Tissue Engineering of Salivary Glands through Biofabrication”

Date Friday, September 20, 2024

Time Noon – 1:00 PM

Location SEC 201

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Abstract: Radiation therapy (RT) is a standard treatment for patients with head-and-neck cancers. Although highly effective at treating disease, RT inevitably causes secondary damage to the adjacent salivary glands (SG), leading to progressive and permanent loss of saliva production within weeks of treatment. The resultant sensation of xerostomia – or extreme “dry mouth” – and the measurable hyposalivation directly result from irrecoverable damage to the salivary acini, which generates both the fluid and enzymes in saliva. Impacts on speech, digestion, and oral cavity health significantly decrease quality of life. Restoration of a functional SG is a challenging target, as the glands are highly branched epithelia with multiple differentiated cell types and thin layers. The culture of primary SG cells in bulk hydrogels does not produce branched structures, and standard extrusion-based bioprinting methods lose spatial stability with soft hydrogels. Our laboratory has approached these issues through novel techniques, including coaxial microfluidic bioprinting, FRESH support bath printing, and multiphoton-based subtractive patterning. Employing these methods, with customized hydrogels and primary human cells, advances our opportunity to restore functional, organized systems to patients.

Dr. Harrington received his B.S. in Materials Science & Engineering from Northwestern University. Both during and after college, he worked in industrial Materials Science R&D groups at Motorola Corp and Dow Corning Corp., addressing issues of polymer stability and nanoscale silica use in industrial applications. He returned to Northwestern for his graduate work in Sam Stupp’s lab, creating self-assembling biomaterial systems. Dr. Harrington’s team studies themes of 3D cell culture within hydrogel platforms, with applications in cancer modeling, regenerative medicine, and bioprinting. He recently received NSF CAREER award funding, with only the second award in UTHealth’s history. In GSBS, he co-directs a CPRIT-funded fellowship in Innovation in Cancer Prevention and co-directs the Therapeutics & Pharmacology core course on drug design. He has mentored 5 PhD students to graduation from his laboratory and has served on over 25 dissertation committees. He is active in Houston’s startup community, co-founder of a company based on his research, and in leadership at the national level in the Society for Biomaterials.