



이름: 이길용/Keel Yong Lee

직위: 조교수/Assistant Professor

소속: 세종대학교 바이오융합공학과/

Department of bioscience and biotechnology, Sejong
University

강연제목: 줄기세포 기반 바이오하이브리드 로봇 개발 및 응용, Human Stem Cell-Based Biohybrid Robotics and Path Towards

Abstract: Biohybrid muscular systems have emerged as a valuable test platform for engineering and studying various physiological features, encompassing ion channels to system-level performance. The integration of muscle cells into simplified synthetic platforms has provided insight into the intricate mechanisms involved. However, the field of biohybrid technology is still in its nascent stages, encountering challenges in attaining system-level structure and performance comparable to their natural counterparts. This study presents a notable breakthrough in biohybrid technology through the development of a human stem cell-based biohybrid fish capable of self-pacing and self-sustaining coordinated locomotion. Taking inspiration from the structural attributes of the sinoatrial node and the multi-layered myocardium, our design incorporates a geometrically insulated cardiac tissue node and muscular bilayer muscle tissues into the biohybrid platform. This integration facilitates spontaneous activation and enables mechano-electrical signaling coupling between the muscular bilayer muscle tissues. The unique biohybrid design empowers the fish to exhibit spontaneous yet coordinated antagonistic muscle contractions, resulting in self-coordinated body-caudal-fin propulsion. Our autonomous biohybrid fish surpasses existing biohybrid muscular systems in terms of speed and longevity. By harnessing the potential of human stem cells and employing advanced biohybrid designs, we are paving the way for a new era of biohybrid systems that closely mimic and potentially surpass the capabilities of their natural counterparts. These advancements hold immense promise across diverse applications, including regenerative medicine, biomimetic robotics, and enhancing our understanding of the fundamental principles governing biological locomotion.

Brief Biosketch

Keel Yong (Gilyong Lee) is an Assistant Professor in the Department of Bioscience and Biotechnology at Sejong University. He specializes in biophysics, tissue engineering, organoids, and microphysiological systems to address biological and medical challenges. He earned his Ph.D. in 2017 from the Department of Energy Science at SungKyunkwan University. From 2017 until August 2022, he served as a research associate in the Disease Biophysics Group at Harvard University and Boston Children's Hospital before joining Sejong University