

Engineering Innervated Multicellular Cardiovascular Models

Tracy Hookway

Abstract: A detailed understanding of the multicellular interactions that occur in the heart is a necessary, but challenging, aspect to improve the performance of engineered cardiac models when studying development and disease. As the heart develops the signals from supporting cell types promote differentiation, organization, and physiological activity of cardiomyocytes. Since the heart is a critical organ that relies on consistent electrical and mechanical signals for uniform and synchronized beating, the autonomic neurons are essential for proper heart function. Sympathetic innervation is responsible for the increase in heart rate whereas parasympathetic innervation slows down the heart and the resulting cardiac beat rate is a balance between signals from dual innervation. This talk will discuss our efforts to direct the differentiation of robust populations of autonomic neurons from human induced pluripotent stem cells and the functional and structural consequences of their incorporation into engineered multicellular cardiovascular tissues. The results of these studies suggest that cardiac innervation may be a key tool to studying healthy and pathological conditions in the heart.