The Biochemical Interactions of Cardiac Ion-Blocking Agents and Optical Coherence Tomography in vivo for Cardiovascular Diseases

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Optical Coherence Tomography (OCT) is a novel 3D-imaging modality, however there has been limited research utilizing OCT to study physiological impacts of ion-blocking drugs, namely Class I, III, and IV antiarrhythmics. An OCT drosophila model was developed for live non-invasive analysis of cardiovascular disease and pharmaceutical testing. With extensive drug delivery protocol optimization, Ca^{2+}, K^{+}, and Na^{+} channel blockers were dissolved into sugar based food at 0.1% and 0.01% of standard human dosage, Amlodipine Besylate, Dofetilide, and Flecainide Acetate, respectively. 108 samples' heart rate and area were processed through a Segmentation and Python algorithms at Instar Stage III and adult. Ultimately, Amlodipine suppressed chronotropy while proarrhythmic characteristics were surprisingly observed in Dofetilide and Flecainide treated samples, signaling potential cardiotoxicity. Combining chemical therapeutics with bio-optics yields novel implications for potential of optogenetics in cardiotherapy for major chronic heart diseases with 3-dimensional live graphics and enhances understanding of the antiarrythmic biochemical agents currently used to treat them. The drosophila optical model is an effective way to analyze the chronotropic properties of antiarrythmics to easily test the biomechanical effects of drugs before experimenting on mammalian species or human populations. This reduces the cost and time of developing drugs by quickly identifying experimental molecules with cardiotoxic effects, enhancing general physiological understanding of the drugs to begin with.

Awards Won:

First Award of $5,000

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