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The Dip in the Anodal Strength-Interval Curve in Cardiac Tissue

SUNIL KANDEL, BRADLEY J. ROTH, Oakland University — Heart disease – specifically ventricular fibrillation – is the leading cause of death in the United States. The most common treatment for this lethal arrhythmia is defibrillation: application of a strong electrical shock that resets the heart to its normal rhythm. The goal of this project is to obtain a better understanding of how anodal (hyperpolarizing) shocks affect the heart by using numerical simulations. To accomplish this goal, we will test four hypotheses to find the response of refractory tissue to an anodal shock. We will use bidomain model; the state-of-the-art mathematical description of how cardiac tissue responds to an electric shock. The innovative feature of this proposal is to integrate the bidomain model with an ion channel model (Luo-Rudy model, 1994) that includes intracellular calcium dynamics to get a detailed calculation of the mechanism of the excitation and to understand the electrical behavior of the heart, which is important for pacing and defibrillation.

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