Bidomain equations are widely used in studying the propagation of electrophysiological waves in the myocardium. One of the main applications of this model is to understand, and, consequently, improve the mechanism of heart defibrillation. During defibrillation, various regions of heart tissue are in different, usually random, phases of electrical activity (excited, refractory, partially recovered etc), and the purpose of defibrillation is to give an electric impulse that stimulates the entire heart and returns it to its normal (e.g. stationary) state. Therefore, understanding long time behavior of reaction-diffusion equations with bidomain operators is crucial in order to understand whether such recovery can take place, and how quickly it happens. The major mathematical challenge of this model is that the bidomain operator is nonlocal. In my talk, I will describe the well posedness and the existence of stationary solutions for randomly perturbed reaction-diffusion models involving the bidomain operator. (Received July 09, 2018)