Burst emergence of intracellular Ca$^{2+}$ waves evokes arrhythmogenic oscillatory depolarization via the Na$^+$-Ca$^{2+}$ exchanger.

Although a causal role of spontaneous SR Ca$^{2+}$ release events in triggering DADs in isolated cardiomyocytes is generally accepted, little is known about whether or how calcium waves within the heart actually produce arrhythmogenic membrane depolarizations. A study using simultaneous optical mapping of changes in [Ca$^{2+}$]$_i$ and membrane potential with cellular resolution in the intact, isolated perfused rat heart demonstrated that the occurrence of triggered activity requires the synchronous appearance of Ca$^{2+}$ waves in multiple, adjacent cardiomyocytes. In contrast, sporadic Ca$^{2+}$ waves in individual cardiomyocytes never gave rise to triggered activity (Fig. e33-10).