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Experimental and theoretical cross-species analysis of coupled voltage and calcium dynamics in paced cardiac tissue CONNER HERNDON, ILIJA UZELAC, FLAVIO FENTON, Georgia Inst of Tech — Much theoretical, experimental, and clinical research has been devoted to investigating the initiation of cardiac arrhythmias by alternans, a beat-to-beat variation in the duration of cardiac action potentials produced by a period two bifurcation. Alternans results from a cellular level instability in the bidirectionally coupled dynamics of transmembrane voltage and intracellular calcium concentration. We performed simultaneous recordings of voltage and calcium signals using optical mapping on Langendorff perfused hearts of several species at a spatial resolution of 128x128 pixels and time resolution of 500Hz. In this talk we present experimental results detailing the mechanisms underlying the onset of alternans in zebrafish, rabbit, cat, pig, and alligator. Furthermore we provide a theoretical and computational model of alternans that more generally accounts for cross-species variation.

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