

Field Potential Changes in E-4031-Treated iCell Cardiomyocytes² Using the CFPS-32 System

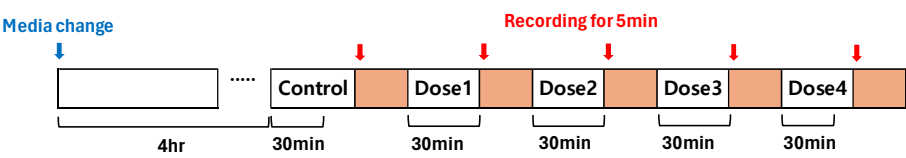
Purpose

The purpose of this experiment is to analyze field potential changes in iCell cardiomyocytes² treated with E-4031, a selective hERG potassium channel blocker.

Experiment Overview

Cell Name	iCell Cardiomyocytes ²	Seeding quantity	35,000 cells
System	CFPS-32	Cell chip	CFPS-ITO-16W2E
Coating	Fibronectin 50µg/mL	Treatment	E-4031 (0.003, 0.01, 0.03, 0.1 µM)

Workflow

DIV0-7	DIV8 – Drug Treatment and recording protocol
<ul style="list-style-type: none"> - Plate iCell Cardiomyocytes² on Fibronectin-coated plates. - Replace half of maintenance media every 48 hours until DIV7 	 <ul style="list-style-type: none"> - 20 µl/well of the 10X compound solutions were rapidly transferred to the MEA plate, followed by gentle mixing by pipetting 3~5 times. After 30 minutes, measurements were recorded for 5 minutes.

Results

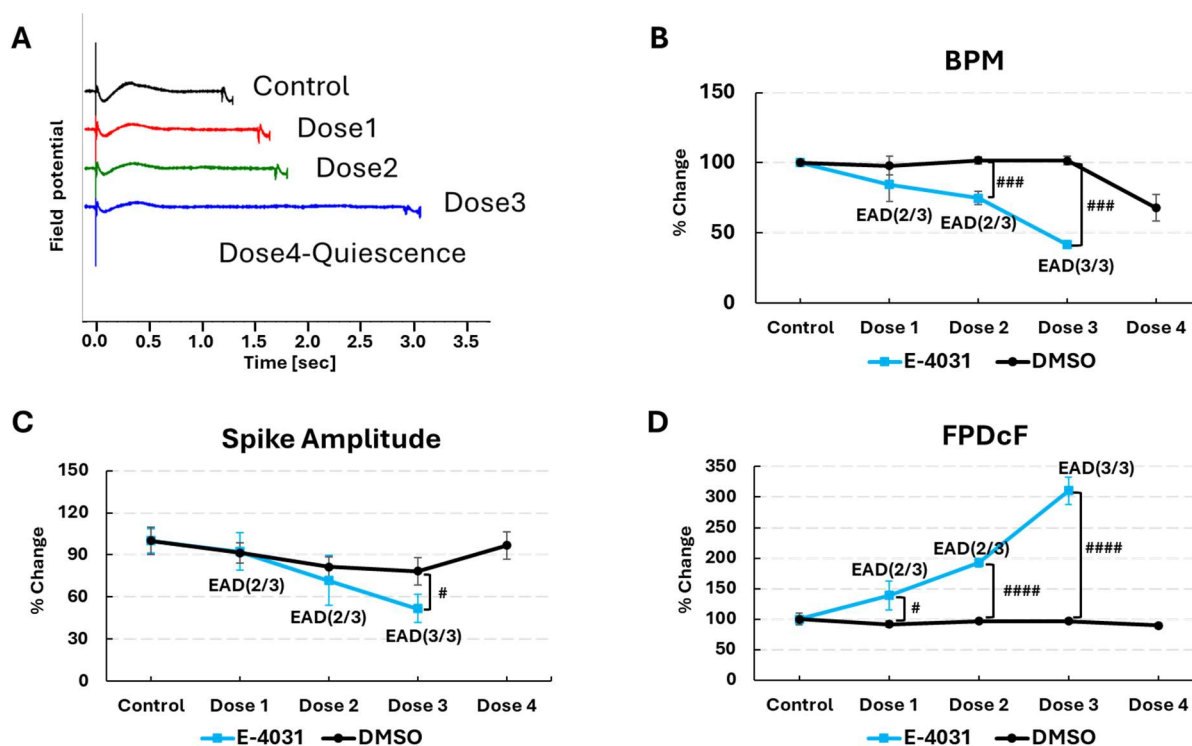
Drug and concentration selection

Drug	Concentration (mM)			
	Dose1	Dose2	Dose3	Dose4
E-4031	0.003	0.01	0.03	0.1

Table1. The treatment concentrations of the E-4031

- ✓ Field potential duration (FPD) is indicative of the activity of Ca²⁺ channels and hERG channels. A decrease in FPD indicates inhibition of the Ca²⁺ channels, whereas an increase in FPD suggests the inhibition of hERG channels. In this study, the selective hERG potassium channel blocker E-4031 was used to observe changes in the field potential waveform, and the alterations in parameters such as BPM, spike amplitude, and FPD were analyzed.
- ✓ The treatment concentrations were selected (**Table1.**) based on those recommended by CiPA and the literature (J.R. Green et al., 2011, J Pharmacol Toxicol Methods).





T-test, GraphPad Prism (ver.10)

Statistical significance was considered at $p < 0.05$ (#), $p < 0.01$ (##), $p < 0.001$ (###), $p < 0.0001$ (####) and all p-values are reported accordingly.

Analysis of Field Potential Changes in iCell Cardiomyocytes² with E-4031

A total of 35,000 iCell cardiomyocytes² per well were cultured on CFPS-ITO-16W2E cell chip until DIV8, and field potentials before and after E-4031 treatment were compared and analyzed.

(A) The field potential waveform showed an increase in the beat period with higher doses of E-4031. At the highest dose (Dose 4), quiescence, indicating cardiac arrest, was observed.

(B) BPM decreased in a dose-dependent manner following E-4031 treatment. Compared to the control group, BPM was reduced by approximately 13.4% at Dose 1, 26.9% at Dose 2, and 59.8% at Dose 3.

(C) Spike amplitude decreased after E-4031 treatment, with a reduction of approximately 26.6% at Dose 3 compared to the control group.

(D) FPDcF was prolonged at higher doses of E-4031. EADs were observed in all tested wells (3/3) at Dose 4. Compared to the control group, FPDcF was prolonged by 47.1% at Dose 1, 95.7% at Dose 2, and 213% at Dose 3.

Summary

- ✓ E-4031 treatment of iCell Cardiomyocytes² cultured on CFPS-ITO-16W2E cell chips using the CFPS-32 system resulted in a dose-dependent increase in field potential duration, with reductions in BPM and spike amplitude, and prolonged FPDcF, while quiescence and EADs were observed at higher doses.

