LumiSTAR
Biotech for revolution in *light*

www.lumistar.com.tw

Light Technology in Biology and Pre-clinical Research

Somatic cells from patients

hiPSC

Differentiation

Drug Screening

High Throughput Drug Screening Platform

Cardiomyocytes Hepatocytes Pancreatic β cells Neurons

- iPSC-derived cells
- Optogenetic tools
- CRISPR
- Genetically encoded tools
- AI, Machine learning

1. Drug Screening/ Clinical Trials in a Dish
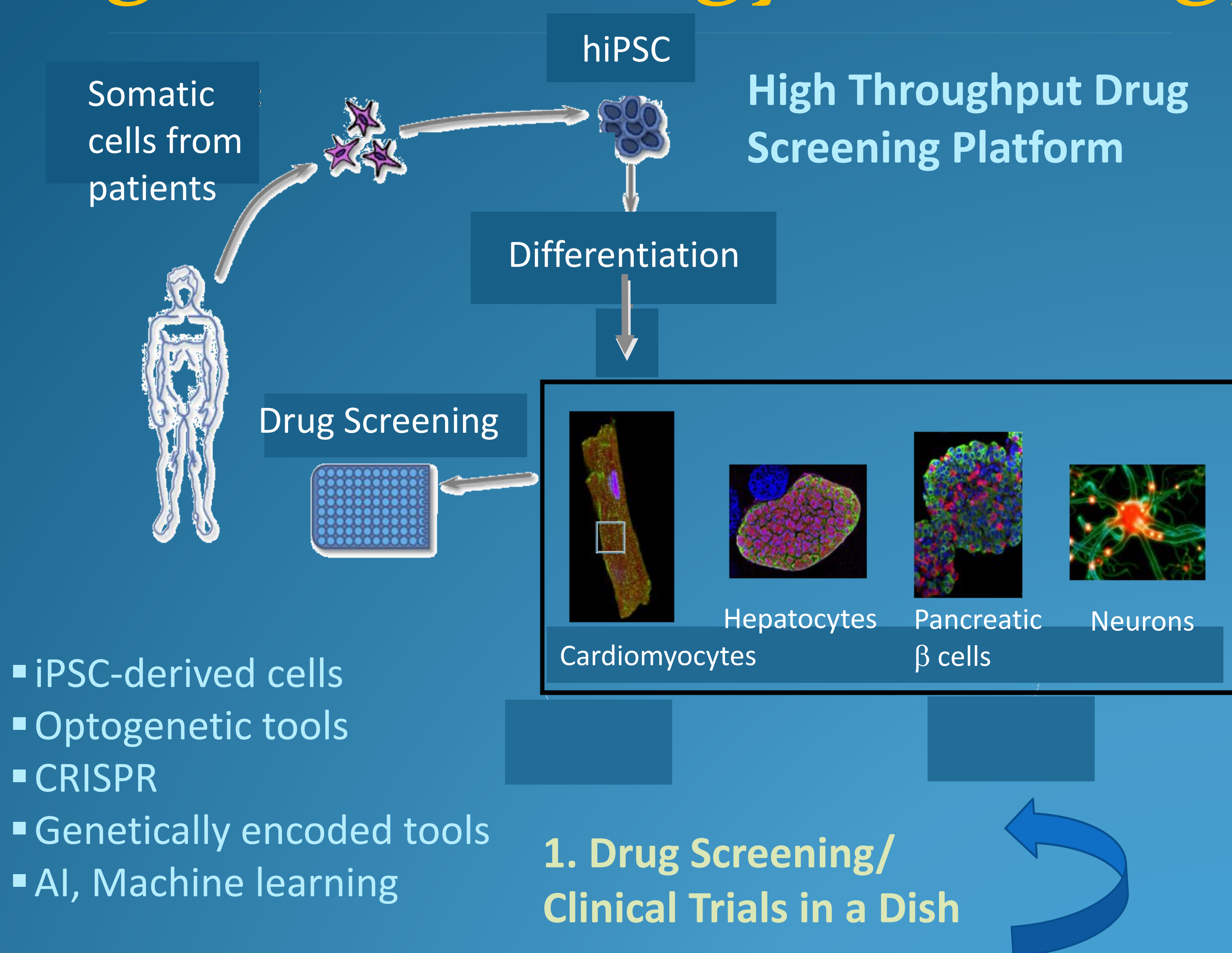
Auto-luminescent Plants

- Protein engineering
- Molecular cloning
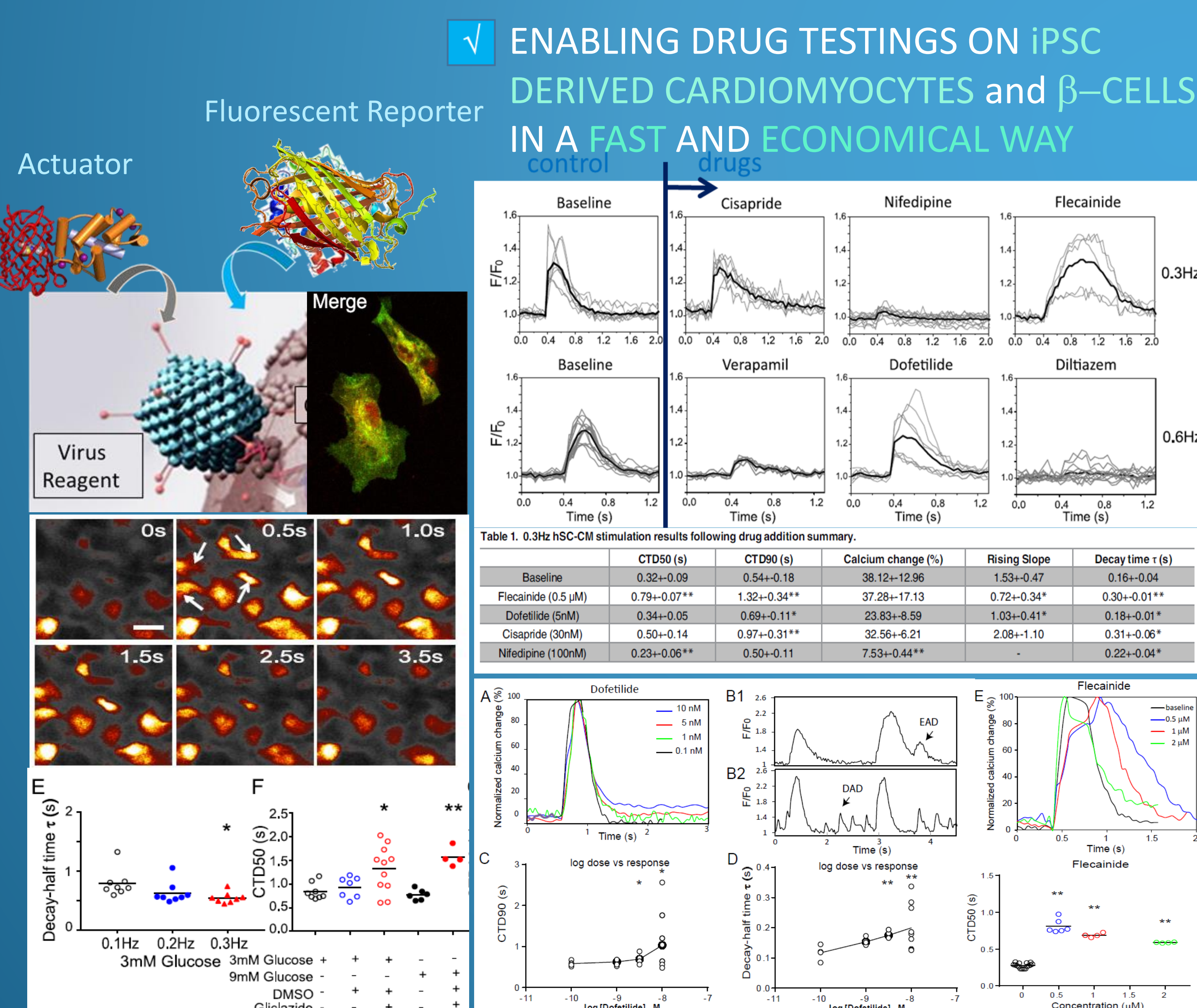- Transgenic technology
- Computational simulations

Valentine's Day   Mother's Day
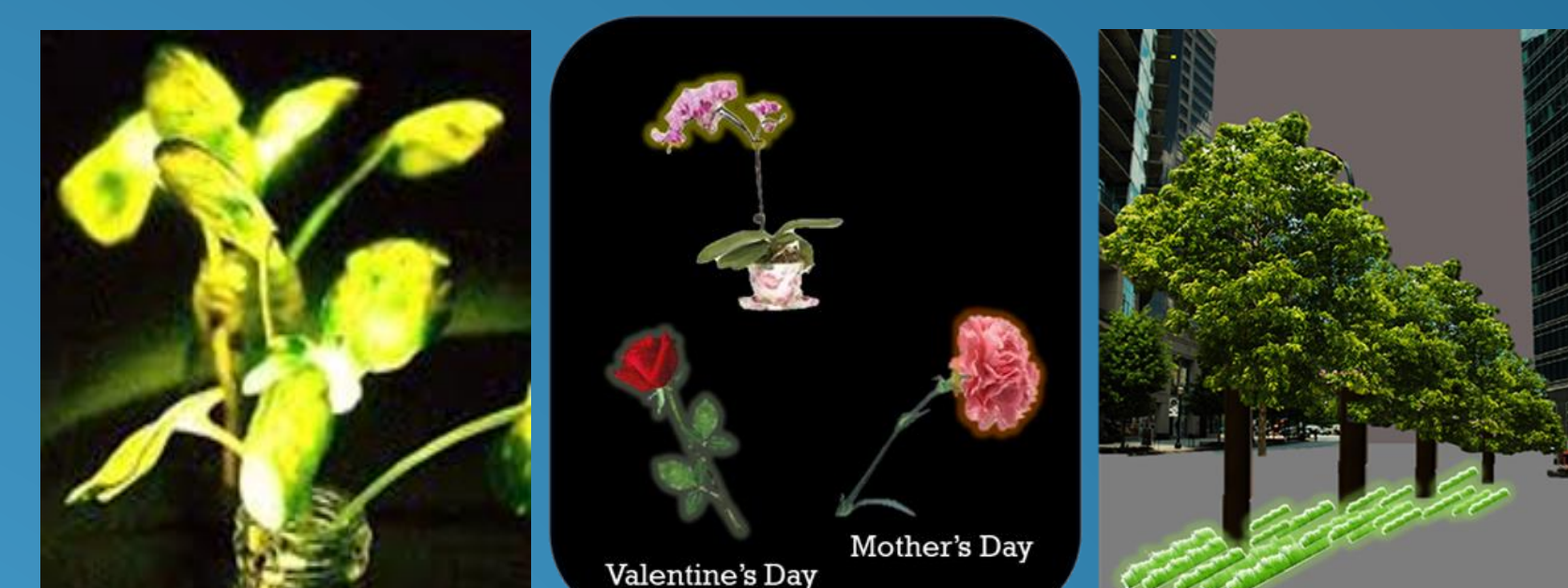
2. Light Up the Street in a Natural Way

All-optical high throughput screening assays for phenotyping and safety assessment

√ ENABLING DRUG TESTINGS ON iPSC DERIVED CARDIOMYOCYTES and β−CELLS IN A FAST AND ECONOMICAL WAY

Actuator Fluorescent Reporter

Virus Reagent

Merge

Baseline Cisapride Nifedipine Flecainide 0.3Hz
Baseline Verapamil Dofetilide Diltiazem 0.6Hz

Table 1. 0.3Hz hSC-CM stimulation results following drug addition summary.

	CTD50 (s)	CTD90 (s)	Calcium change (%)	Rising Slope	Decay time τ (s)
Baseline	0.32±-0.09	0.54±-0.18	38.12±-12.96	1.53±-0.47	0.16±-0.04
Flecainide (0.5 µM)	0.79±-0.07**	1.32±-0.34**	37.28±-17.13	0.72±-0.34*	0.30±-0.01***
Dofetilide (5nM)	0.34±-0.05	0.69±-0.11*	23.83±-8.59	1.03±-0.41*	0.18±-0.01**
Cisapride (30nM)	0.50±-0.14	0.97±-0.31**	32.56±-6.21	2.08±-1.10	0.31±-0.06*
Nifedipine (100nM)	0.23±-0.06**	0.50±-0.11	7.53±-0.44***	-	0.22±-0.04*

Improved version for all-optical assays (K-GECO)
√ BRIGHTER, MORE SENSITIVE, NO PHOTOACTIVATION

K-GECO1 Control Nifedipine Verapamil

iPSC-CMs

Primary neuronal culture

Brain slice

1 Action potential

K-GECO1   Photoactivation NO

R-GECO1   YES

Comparisons - Electrophysiology *vs.* All-optical Screening

700X cost Saving

Consumables Cost

Screening Assays — No need

Number of Cells Required for Testing — > 30,000 per well

Yes !

√ Cheaper and Easier

√ Good S/N for high throughput screening

Arbitrary Quantity per well (**Single cell** signal is achievable)
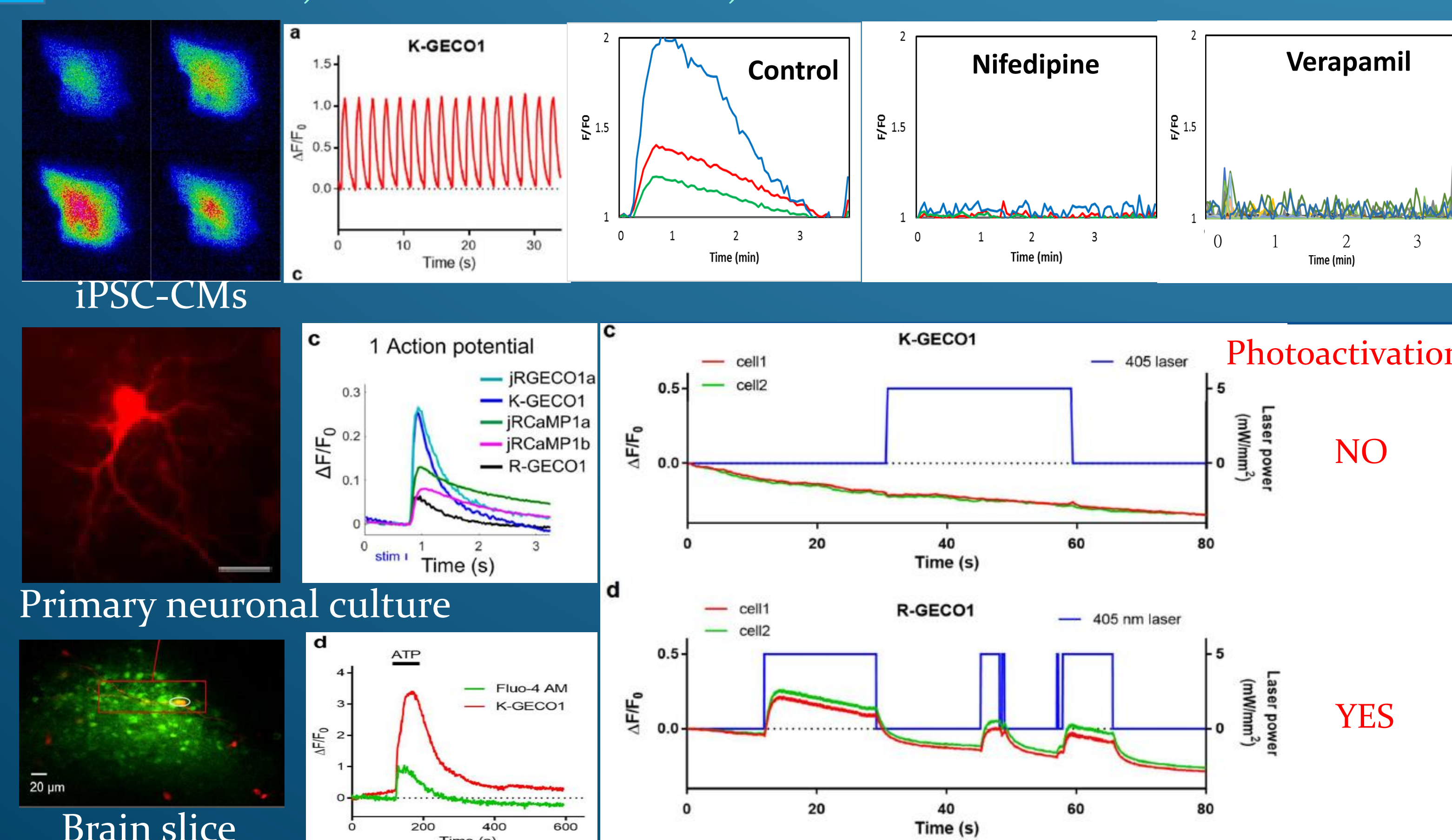
Reference

1. Zhao Y, Araki S, Wu J, Teramoto T, **Chang YF**, Nakano M, Abdelfattah AS, Fujiwara M, Ishihara T, Nagai T, Campbell RE. An expanded palette of genetically encoded Ca²⁺ indicators. Science. 2011 Sep 30;333(6051):1888-91.
2. Saito K*, **Chang YF***, Horikawa K, Hatsugai N, Higuchi Y, Hashida M, Yoshida Y, Matsuda T, Arai Y, Nagai T. Luminescent proteins for high-speed single-cell and whole-body imaging. Nat Commun. 2012;3:1262.
3. **Chang YF**, Broyles CN, Brook FA, Davies MJ, Turtle CW, Nagai T, Daniels MJ. Non-invasive phenotyping and drug testing in single cardiomyocytes or beta-cells by calcium imaging and optogenetics. PLoS One. 2017 Apr 5;12(4):e0174181.
4. Shen Y, Dana H, Abdelfattah AS, Patel R, Shea J, Molina RS, Rawal B, Rancic V, **Chang YF**, Wu L, Chen Y, Qian Y, Wiens MD, Hambleton N, Ballanyi K, Hughes TE, Drobizhev M, Kim DS, Koyama M, Schreiter ER, Campbell RE. A genetically encoded Ca(2+) indicator based on circularly permutated sea anemone red fluorescent protein eqFP578. BMC Biol. 2018 Jan 16;16(1):9.

SIGN UP FOR BETA VERSION TESTING !!
Disease modelling, Functional assay or Drug testing-

Cardiovascular Disease, Parkinson's and Alzheimer's Disease, Diabetes Cancers

We offer A. K-GECO (+ChR2)
B. NIR-GECO (+ChR2)
C. Mitochondria or ER/SR Calcium sensors