Stilbene derivative as a photosensitive compound to control the excitability of neonatal rat cardiomyocytes

S. R. Frolova[1], S. G. Romanova[1], Agladze K.I.[1]*

[1]*Moscow Institute of Physics and Technology, Dolgoprudny, Russian Federation*
**Corresponding author*
E-mail: agladze@yahoo.com

The aim of the present work is to study the effect of stilbene derivative c-TAB (2-{4-[(E)-2-(4-ethoxyphenyl) vinyl] phenoxy} ethyl) trimethylammonium bromide) [1] on the voltage-gated ion channels in cardiac cells. C-TAB is a structural analogue to AzoTAB [2], reported as a photoswitch for cardiac and neural cells. However, while AzoTAB reversibly enables the tuning of cardiomyocyte excitability to the desired degree [3], it seems to be toxic to the cells due to azobenzene group.
A replacement of the azobenzene moiety by a stilbene grouping makes c-TAB less toxic to living cells. C-TAB successfully inhibits excitation in cardiac cells in both *trans*- and *cis*- forms. It was shown that the nature of the excitability blockage on membrane is in the modulation of voltage-gated ion channels. Under the action of c-TAB, the fast sodium and calcium currents are suppressed, while the slow potassium currents and Ito increase. The inhibition under *trans*- c-TAB is reversible and can be overturned easily by washing out. The irradiation with near-UV, when we get the *cis*- form, changes reversible inhibition to a permanent one that cannot be overturned by a washout.
C-TAB as a photosensitizer can be very helpful in modeling excitation in membrane or a cardiac tissue culture and may have prospective use in the temporary and permanent ablation of unwanted excitation sources in the heart.

[1] Patent: MIPT, RU Pat., RU 2515502 C1 (2012)

[2] Frolova SR, Gaiko O, Tsvelaya VA, Pimenov OY, Agladze KI, PLoS One, 11(3): e0152018 (2016)

[3] Magome N., Kanaporis G., Moisan N., Tanaka K., Agladze K., TISSUE ENGINEERING: Part A. V.17 #21 and 22. (2011)