
Imaging Physiology: New Chemiluminescent probes for Luminescent Live Cell Imaging

Ori Green¹, Michal Roth-Konforti¹, Tal Eilon¹, Nir Hananya¹, Jerome Bosset², Doron Shabat¹, and Christoph Bauer^{*†2}

¹Tel Aviv University [Tel Aviv] (School of Chemistry, Raymond and Beverly Sackler Faculty of Exact Sciences) – P.O. Box 39040, Tel Aviv 6997801, Israel

²University of Geneva [Switzerland] (Bioimaging Center) – 30, Q. E. Ansermet, CH-1211 Geneva 4, Switzerland

Abstract

Chemiluminescence imaging results are highly specific and quantifiable: In distinction to fluorescence microscopy where autofluorescence and light scattering contribute to signal intensities, chemiluminescence can be directly correlated to molecular events.

Here we describe the development of a new class of small-molecule probes that can produce chemiluminescence signal of high enough intensity to allow microscopical imaging at the single cell level.

The new turn-ON chemiluminescence dioxetane probes can be used under physiological (aqueous) conditions. They are based on incorporation of a substituent on the benzoate species obtained during the chemiexcitation pathway of Schaap's adamantylidene-dioxetane probe (1). Striking improvement of the chemiluminescence efficiency was obtained when acrylate and acrylonitrile electron-withdrawing groups were installed. By masking the phenols with a triggering substrate suitable for activation by β -galactosidase obtain high-quality chemiluminescent images of β -galactosidase were obtained in a stable transfected cell line (2).

In our last project, we developed a probe for cathepsin B. This was of additional interest as this probe allowed imaging of a natively expressed endogenous enzyme in cancerous leukemia and colon cells (3).

We anticipate that the strategy presented here will lead to development of efficient chemiluminescence probes allowing to observe and measure cell physiological events in living cells and organisms.

REFERENCES:

Hananya N, Eldar-Boock A, Bauer CR, Satchi-Fainaro R, Shabat D. (2016) Remarkable Enhancement of Chemiluminescent Signal by Dioxetane-Fluorophore Conjugates: Turn-ON Chemiluminescence Probes with Color Modulation for Sensing and Imaging. *J Am Chem Soc*

*Speaker

†Corresponding author: Christoph.Bauer@unige.ch

Green O, Eilon T, Hananya N, Gutkin S, Bauer CR, Shabat D (2017). Opening a Gateway for Chemiluminescence Cell Imaging: Distinctive Methodology for Design of Bright Chemiluminescent Dioxetane Probes., ACS Cent Sci

Roth-Konforti ME, Bauer CR, Shabat D (2017) Unprecedented Sensitivity in a Probe for Monitoring Cathepsin B: Chemiluminescence Microscopy Cell-Imaging of a Natively Expressed Enzyme. Angew Chem Int Ed Engl

Keywords: Chemiluminescent Probes, Chemiluminescence Microscopy, Live Cell Imaging, Dioxetane Probes