PENN CENTER FOR INNOVATION

Discovery of diazaxanthylidenes for live cell molecular imaging, cell activation, and binding disease-relevant nucleic acids

Synthesis of organelle-specific photoactivatable fluorescent probes for live cell imaging

Inventor

David M. Chenoweth, Assistant Professor of Chemistry

STATE OF DEVELOPMENT

Proof of concept and in vitro testing

INTELLECTUAL PROPERTY

UP application (US2015021793 A1)

REFERENCE MEDIA

Tran MN et al. *Chemical Science* 2015, 6, p. 4508-4512.

Tran MN et al. *Angew. Chem. Int. Ed.* 2015, *54*, p. 6442-6446.

Rarig, R-A F et al. *J. Am. Chem. Soc.* 2013, *135*, p. 9213-9219.

APPLICATIONS

- Organelle-specific fluorescent dyes for live cell imaging and tracking via fluorescence microscopy
- Spatiotemporally controlled sequential photoactivation of single cells
- Photoconvertable dye can track pre-excitation state in addition to post-excitation state

DESIRED PARTNERSHIP

License

Co-development

LEARN MORE

Sarah Johnson

johnsa@upenn.edu

215-746-7253

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Technology

The Chenoweth lab has uncovered a synthetic route to generate fluorescent compound libraries from a diazaxanthilidene scaffold of the azaxanthone family that can be used for organelle-specific staining, live cell molecular imaging, and cell activation. Xanthones and azaxanthones are classes of natural products that bind nucleic acids and have been implicated in therapeutic applications, including cancer, cardiovascular disease, and infectious diseases. The compounds discovered by the Chenoweth lab are also able to specifically bind disease-relevant DNA and RNA sequences.

Novel derivatives of 2,2'-diazaxanthylidine, with desirable properties for live cell imaging, were generated after photolysis and N-alkylation. Both the excitation and emission wavelengths are tunable, so different parts of the light spectrum can be exploited. Single cells can be easily activated and tracked, in addition to sequentially activated. Both mitochondria and lysosome stains have shown excellent specificity, reduced cytotoxicity, and greater protection against photobleaching compared to commercially available compounds.

Advantages

- Subcellular specificity and binding of nucleic acids
- Reduced cytotoxicity
- Greater resistance to photobleaching
- Water soluble and cell permeable
- Tunable excitation and emission maxima with large Stokes shifts

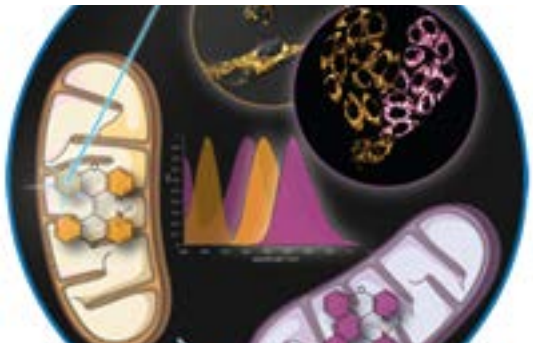

Image Caption:

From Tran MN et al. *Angew. Chem. Int. Ed.* 2015, *54*, p. 6442-6446.