Cysteine-Mediated Intracellular Building of Luciferin to Enhance Probe Retention and Fluorescence Turn-On

Mengmeng Zheng, a Deju Ye, * a and Yan Zhang * a

a School of Chemistry and Chemical Engineering, Nanjing University, Nanjing, China.
E-mail: zhengmengmeng453@163.com

Sensitive and selective small molecular probes that enable real-time detection of endogenous cysteine (Cys) has become an attractive topic due to its essential roles in controlling cellular nitrogen balance and maintaining biological redox homeostasis. Herein, we report a Cys-specific probe CBTOA that showed not only fluorescence turn-on for sensitive detection of endogenous Cys but also enhanced probe retention inside cells for the real-time monitoring of Cys levels upon external stimulation. Cys-mediated intracellular building of luciferin from CBTOA was the key strategy leading to this new type of fluorogenic probe. CBTOA showed fast response to Cys in living cells and liver tissue slices with high sensitivity and selectivity. Using CBTOA as a real-time probe, we were able to monitor the change on Cys levels in living HeLa cells under ROS-induced oxidative stress as well as in human mesenchymal stem cells during adipogenic differentiation.

Figure 1. A strategy of using Cys-mediated intracellular uncaging of acryloyl group and in situ building of luciferin to enhance fluorescence and probe retention is demonstrated, allowing for real-time imaging of endogenous Cys with high sensitivity and selectivity in living cells.

References