Chemical probes for cancer imaging and super-resolution imaging

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KEY WORDS: Fluorescent probes, cancer imaging, super-resolution imaging.

Fluorescent probes have played a fundamental role for real-time imaging of a variety of intracellular processes in living cells, tissues, and animals. So far, we have established a rational design strategy of a series of activatable fluorescent probes based on the mechanism of intramolecular spirocyclization or photoinduced electron transfer. For examples, in order to achieve rapid and sensitive in situ detection of cancers, we developed activatable fluorescence probes for cancer-associated enzymes which show significant fluorescence activation upon reaction with the target enzymes. These include probes for γ-glutamyltranspeptidase (GGT)[1], dipeptidylpeptidase-IV (DPP-IV)[2], or prostate-specific membrane antigen (PSMA)[3], which allowed us to visualize certain types of cancers in the resected clinical specimens from the patients, thus can be used as an imaging guidance during surgery for efficient cancer detection. We also developed first-in-class spontaneously blinking fluorophores for single-molecule localization microscopy (SMLM)[4-5], which is one of the most widely used super-resolution imaging techniques. Since our fluorophores show spontaneous blinking in the intracellular environment without prior laser irradiation or additives, live-cell super-resolution imaging could be achieved with minimal photo-damage and photo-toxicity. In this symposium, I would like to introduce the molecular design and application of our activatable fluorescence probes, together with our recent effort.

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