Reactivity of acrolein released from cancer cells: Application for selective cancer therapy and diagnosis

([1]*School of Materials and Chemical Technology, Department of Chemical Science and Engineering, Tokyo Institute of Technology*, [2]*Biofunctional Synthetic Chemistry Laboratory, RIKEN Cluster for Pioneering Research,* [3]*Biofunctional Chemistry Laboratory, A. Butlerov Institute of Chemistry, Kazan Federal University*) ○Ambara R. Pradipta,[1] Peni Ahmadi,[2] Katsunori Tanaka[1,2,3]

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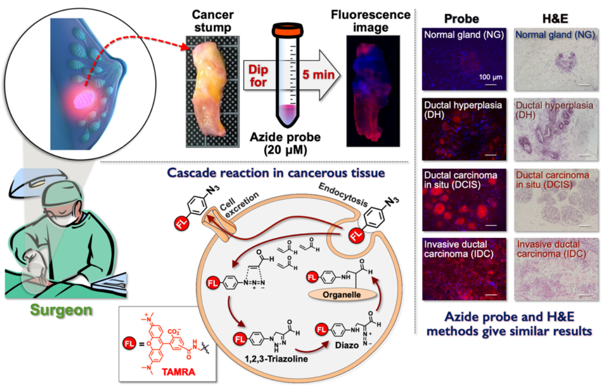
Acrolein, a highly toxic α,β-unsaturated aldehyde, occurs as a pollutant in the environment (*e.g.*, tobacco smoke and exhaust gas) and is ubiquitously generated in biosystems (*e.g.*, lipid peroxidation process and metabolism of polyamines). High accumulation of acrolein in biosystems is often linked pathologically with several diseases, including cancer and Alzheimer's disease. Accordingly, acrolein holds great potential as a biomarker, and its direct measurement in biological samples is essential to provide information for diagnosis and therapeutic purposes.

Recently, we discovered 1,3-dipolar cycloaddition reaction between aryl azide and acrolein, which proceeds without a catalyst to give 4-formyl-1,2,3-triazoline derivative. The reaction proceeds with high reactivity and selectivity even under physiological conditions. We have successfully utilized the acrolein-azide click reaction as a robust method for detecting and visualizing acrolein generated by live cells.[1] Furthermore, we found that a high level of acrolein is expressed in cancer cells, whereas only a negligible amount is expressed in healthy cells. Herein, we utilized the azide-acrolein click reaction to discriminate breast cancer lesion from the normal breast gland, which resected from breast cancer patients.[2,3] This method can be used not only to visualize the cancer tissues rapidly but also to distinguish morphology of the resected tissues. Thus, it has a potential clinical application for breast-conserving surgery. Furthermore, the ability to perform chemical reactions with cancer metabolites only at the desired cancer site is highly advantageous for cancer therapy.



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