

Biofunctional organic molecules for diagnostic imaging and targeted therapy

Seyoung Koo

Department of Energy and Bio Sciences

Hanyang University ERICA

Diagnostic imaging and targeted therapy are essential for understanding the complex biology of disease and improving therapeutic outcomes. Small organic molecules that enable precise in vivo visualization of molecular events and selective activation of therapeutic functions at the desired site have long served as powerful tools in chemical biology and biomedicine. In this seminar, I will present our recent advances in two focused fields: (1) diagnostic imaging using activity-responsive fluorescent probes, and (2) cancer-targeted therapy using photosensitizers. First, I will highlight enzyme-activated fluorescent probes for in vivo imaging of cellular senescence and osteoclast-associated bone diseases, providing real-time readouts of key biochemical activities in living systems. Next, I will discuss phototherapeutic strategies that exploit tumor redox vulnerabilities by modulating intracellular antioxidant defenses, thereby enhancing reactive oxygen species (ROS)-mediated cytotoxicity upon light irradiation. Together, these examples illustrate the versatility and impact of biofunctional organic molecules in advancing biomedical research and therapeutic strategies.

References

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