Synopsis of Original Research Paper

Structural conversion and functionalization of self-assembled structures induced by photoirradiation

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Controlled release systems induced by external stimulation have attracted great attention, because these systems enable spatiotemporal regulation of active drugs in target organs. Furthermore, the drug efficacy could be enhanced, and thus the dosage could be reduced. Until now, several strategies for controlled release have been proposed. As the external stimulation, temperature, pH, light, etc. have been used. Especially, controlled release by light is very promising, because light irradiation does not need complex instruments and can be concentrated on the small area. Additionally, laser devices are clinically used in photodynamic therapy. However, there are almost no practical photo-controlled drug release systems. Therefore, we started to develop a novel drug release system triggered by light irradiation. We focused on the membrane-damaging properties of antimicrobial peptides (AMPs) such as magainin. AMPs are attracting increased attention as novel types of antibiotics. Their target is the lipid bilayer of bacterial membrane, and they kill bacteria by disrupting their membranes. We synthesized an AMP mimic foldamer modified with (6-Bromo-7-hydroxycoumarin-4-yl) methoxycarbonyl (Bhc) groups, which are photocleavable protective groups. The caged group is deprotected by irradiation UV light around 365 nm. When the caged molecule was treated, the AMP mimic foldamer was reproduced. Then, we applied the caged compound to the controlled drug release system. After several kinds of liposomes containing fluorescence dyes were treated with the caged compound. Only when the samples were treated with UV light, fluorescence dyes were released.