Synthesis and Application of Single-Chain Polymer Nanoparticles from a Consecutive ROMP-RCM Process

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Linear polymer from ring-opening metathesis polymerization can be facilely and efficiently functionalized by allyl groups, and intramolecularly crosslinked by ring-closing matethesis to yield single-chain polymer particles controllably with valency control. The particles serve as excellent carriers as functionalities of interest can be loaded in any stage during synthesis, and the particles themselves can be tuned water-soluble through dihydroxylation. Wide application of such particles can be anticipated. For example, the particles showed to be excellent protective carriers for unstable fluorophores such as Fluorescein. Aminated particles showed capability of gene delivery. Dihydroxylated particles can serve as templates for metal nanoparticle formation. We are still actively searching for the capabilities of this material in light harvesting and antimicrobial fields.

Engineering Unnatural Variants of Plantazolicin Through Codon Reprogramming

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To simultaneously establish the structure-activity relationship of the natural product plantazolicin (PZN) and the substrate tolerance of the biosynthetic pathway, a heterologous expression strain was engineered to produce PZN analogs. Unlike other studied thiazole/oxazole-modified microcins, the biosynthetic machinery appeared to be finely tuned towards the production of PZN. The modifying enzymes were exquisitely selective, installing heterocycles only at pre-defined positions within the precursor peptides while leaving neighboring residues unmodified. No variants containing additional heterocycles were detected, although several peptide sequences yielded multiple PZN variants. Eleven PZN variants were produced in sufficient quantity to facilitate assessment of their antibacterial activity, providing insight into the structure-activity relationship of PZN.