Post-modifications of recombinant elastin-like polypeptides towards bioactive materials and self-assemblies

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Elastin-like polypeptides (ELPs) are thermo-responsive biopolymers whose primary sequence is derived from a natural extracellular matrix protein (elastin). Genetically-engineered and produced recombinantly in heterologous hosts (typically *Escherichia coli* bacteria to ensure reasonable production yields), they are perfectly monodisperse macromolecules. Although powerful to yield ELPs with exact primary structures and lengths, protein engineering techniques present however some limitations, in particular lengthy bacterial cloning steps and limited chemical diversity due to few possible post-translational modifications in *E. coli* bacteria. We are therefore exploring a dual biotechnological and chemical approach, combining recombinant technologies and biosynthesis of ELPs with orthogonal bioconjugation techniques to enlarge the diversity of relevant ELP-based macromolecules for subsequent self-assembly and biological applications. Chemoselective modifications at the thioether side chain of methionine residues are in particular explored to access monosaccharide- or lipid-grafted ELPs to access multivalent glycoconjugates and amphiphilic lipopolypeptides self-assembling into vesicular structures. Modifications at the *N*-terminal chain end of ELPs are also applied to access bioactive and thermo-responsive diblock copolymers for the design of tumor targeting nanoparticles.