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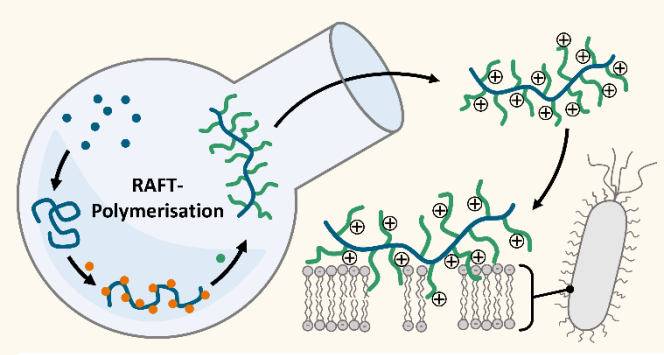
Antimicrobial Bottle Brush Copolymers

Description



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The development of antibiotic resistance in bacteria is a growing problem in our society, making the development of effective alternatives increasingly important. One possible solution are antimicrobial polymers. The main focus of our research is the synthesis and analysis of antimicrobial bottle brush copolymers. It has been shown that bottle brush copolymers have higher antimicrobial activities and lower toxicity towards red blood cells compared to linear chains, resulting in improved biocompatibility. Antimicrobial copolymers are not only effective against normal bacteria, but can also prevent growing of antibiotic-resistant bacteria.[1]
For the synthesis of antimicrobial polymers, efficient polymerization techniques are necessary to control parameters such as chain length or dispersity.

Reversible-addition-fragmentation chain-transfer (RAFT) polymerization is excellent for the synthesis of defined macromolecules. In order to access complex macromolecular architectures even faster and easier, new polymerization techniques based on photoiniferter RAFT polymerization[2] are being developed in our group (Polymer Biomaterials Group of Dr. Matthias Hartlieb, www.uni-potsdam.de/polybio). By using mixtures of chain transfer agents (CTA), highly complex polymers can be prepared in short reaction times, without the use of specialized equipment.[3]
The synthesis of antimicrobial polymers using this method is part of our current research.

Spectrum of Methods

(PI-)reversible-addition-fragmentation chain-transfer (RAFT) polymerization; size exclusion chromatography (SEC); hemolysis test; minimum inhibitory concentration (MIC) test

Literature

- Lehnen, A.-C., et al., *Shape Matters: Highly Selective Antimicrobial Bottle Brush Copolymers via a One-Pot RAFT Polymerization Approach.* Biomacromolecules, 2022. **23**(12): p. 5350-5360.
- Lehnen, A.-C., J.A.M. Kurki, and M. Hartlieb, *The difference between photo-iniferter and conventional RAFT polymerization: high livingness enables the straightforward synthesis of multiblock copolymers.* Polymer Chemistry, 2022. **13**(11): p. 1537-1546.
- Lehnen, A.-C., et al., *Xanthate-supported photo-iniferter (XPI)-RAFT polymerization: facile and rapid access to complex macromolecules.* Chem Sci, 2023. **14**(3): p. 593-603.

Applications
- Polymer chemistry
- Antimicrobial applications
- Biomaterials
- Surface coatings

Keywords
- RAFT polymerization
- Antimicrobial bottle brush polymers
- Size exclusion chromate-graphy

Interest in cooperation
- Research-based collaboration
- Contract research
- Industry-sponsored research

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