The influence of dead bacteria on the 3D motion and adhesion of live bacteria

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Abstract: In the marine environment, microorganisms like bacteria rapidly adhere to the substrate surface and result in the microbiologically induced corrosion (MIC), contributing to about 20% of total corrosion loss in the world. Various of antibacterial agents are used to inhibit the adhesion of bacteria. However, residual dead bacteria on the surface still interact with surrounding live bacteria with a long-term effect[1]. In this study, the interaction between the surface decorated with dead *lactobacillus rhamnosus* (LGG) and planktonic live *Pseudomonas aeruginosa* (PAO1) was explored. DHM and cantilever modulated atomic force microscopy (CM-AFM) were both used to observe the 3D motions, adhesion, biofilm, and responsive behaviors of *P. aeruginosa* on dead LGG coated surfaces, which were treated with different sterilization methods. RNA-seq and metabonomics were used to explore the molecular mechanisms. Both the presence of live and dead LGG leads to the downregulation of the chemotaxic pathway and the upregulation of the flagellum assembly pathway, which decreases the frequencies of flick and reverse motions and increased the velocity and dispersion of the swimming PAO1 near the dead LGG surfaces. Compared with live LGG, the adhesion force between *P. aeruginosa* and dead LGG are lower accompanied by more downregulation of the biofilm formation pathway. This study proved that the inhibition effect of dead probiotics originated from the release of cellular lysate[2]. The rate of release depends on the integrity of the membrane, which results form the sterilization method This work provides a novel strategy for designing antifouling materials.

Key words: Antifouling surfaces; Dead bacteria; Multispecies interactions; Postbiotics.

Reference

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