

Imaging Bacterial Inter-Species Chemical Interactions by SERS

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Microbes produce bioactive chemical compounds to influence the physiology and growth of their neighbors, and our understanding of the intricate microbial relationships may be enhanced by our ability to visualize such molecules *in-vivo*. We demonstrate here the application of surface-enhanced Raman scattering (SERS) for imaging quorum sensing-regulated pyocyanin and violacein metabolites produced by *Pseudomonas aeruginosa* and *Chromobacterium violaceum* colonies grown as a co-culture on agar-based plasmonic substrates (Au@agar). By combining SERS with molecular analysis of gene expression we provide insights into the chemical crosstalk between the interacting bacterial species. This highly sensitive, cost-effective and easy to implement plasmonic approach allows spatiotemporal imaging of cellular metabolites in live microbial colonies grown on agar with no need for sample preparation, thereby providing a powerful workflow for the analysis of microbial chemotypes.

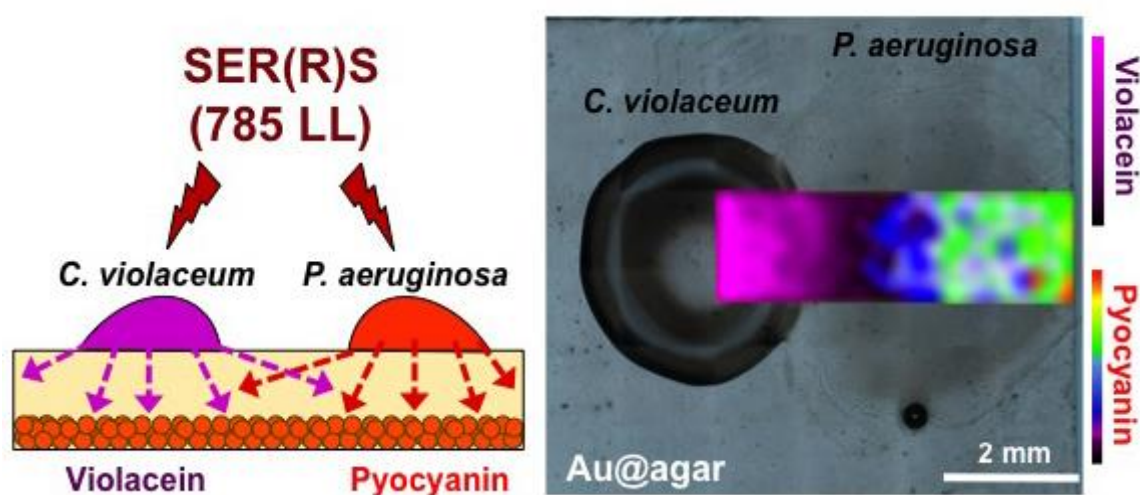


Fig. 1. SER(R)S imaging of violacein and pyocyanin bacterial metabolites on plasmonic agar-based substrate