Surface Enhanced Raman Spectroscopy detection of \textit{p}-coumaric acid from cell supernatant using gold-capped silicon nanopillar substrates

Morelli, Lidia; Jendresen, Christian Bille; Burger, Robert; Rindzevicius, Tomas; Nielsen, Alex Toftgaard; Boisen, Anja

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The purpose of the project is to use Surface Enhanced Raman Spectroscopy (SERS) to discriminate between two different bacterial populations, based on their p-coumaric acid (pHCA) production. The pHCA concentration is measured in a droplet of diluted supernatant dried on SERS substrates, using a Raman microscope. By analyzing the SERS signal of pHCA from the supernatant, considering the peak height at the characteristic frequency (1169 cm\(^{-1}\)) it is possible to distinguish between a producing and control strain, as also confirmed by HPLC analysis.

**Aim of the Project**

**SERS: fabrication and working principle**

![Image showing SERS fabrication and working principle](image)

**Bacterial cultures and measurements**

![Image showing bacterial cultures and measurements](image)

**Salt dilution**

![Image showing salt dilution](image)

**Validation with HPLC**

![Image showing HPLC analysis](image)

**Outlook and conclusions**

In this work we demonstrated that SERS is a rapid and effective tool for qualitative screening of bacterial strains, based on the amount of synthesized secondary metabolites (e.g. pHCA). These results open up new possibilities for high-throughput quantitative analysis. Currently we are focusing on improving sensitivity by extracting pHCA in organic solvent and on integration of the assays on automated and high-throughput microfluidic platforms, such as lab-on-a-disc.

**References**
