Single-cell-identification of different Streptococcus species by micro-Raman spectroscopy

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Invasive bacterial infections are a serious health care problem. Fast identification of the causing pathogens can help to choose an appropriate therapy, to milden the progress of disease, to decrease mortality rates and sequelae.
For example in cases of Sepsis, which is a complex systemic inflammatory response syndrome with a suspected or proven infection, the mortality rate increases dramatically if there is no adequate treatment within the first hours after the onset of a septic shock. [1]
The aim is to provide a fast and non-destructive method to identify Sepsis relevant pathogens, where some *Streptococcus* species belongs to the important ones. We use a Raman spectrometer which is coupled with a microscope so that the spatial resolution is below one micrometer. The advantage is that it can be worked on a single cell level. Micro-Raman spectroscopy provides a spectroscopic fingerprint of the chemical composition of single bacterial cells and in combination with chemometrical methods it can be utilized for fast identification of pathogens. [2-4]
By applying a micro-Raman setup with a 532 nm excitation wavelength we investigated five species out of the genus *Streptococcus*. By using various chemometrical methods like principal component analysis and linear discriminant analysis it is possible to distinguish between different species of this genus. The accuracies for classification to validate a model system and also for identification of independent samples are over 97%.
Our study shows that we can identify the investigated Sepsis relevant pathogens by using micro-Raman spectroscopy. This suggests that the results can be transferred to other genera.

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