UV-Raman spectroscopic identification of fungal spores important for respiratory diseases.

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Abstract

Fungal spores are one of several environmental factors responsible for causing respiratory diseases like asthma, chronic obstructive pulmonary disease (COPD), and aspergillosis. These spores also are able to trigger exacerbations during chronic forms of disease. Different fungal spores may contain different allergens and mycotoxins, therefore the health hazards are varying between the species. Thus it is highly important quickly to identify the composition of fungal spores in the air. In this study, UV-Raman spectroscopy with an excitation wavelength of 244 nm was applied to investigate eight different fungal species implicated in respiratory diseases worldwide. Here, we demonstrate that darkly colored spores can be directly examined, and UV-Raman spectroscopy provides the information sufficient for classifying fungal spores. Classification models on the genus, species, and strain levels were built using a combination of principal component analysis (PCA) and linear discriminant analysis (LDA) followed by evaluation with leave-one-batch-out-cross-validation (LBOCV). At the genus level an accuracy of 97.5% was achieved, whereas on the species level four different Aspergillus species were classified with

100% accuracy. Finally, classifying three strains of *Aspergillus fumigatus* an accuracy of 89.4% was reached. These results demonstrate that UV-Raman spectroscopy in combination with innovative chemometrics allows for fast identification of fungal spores and can be a potential alternative to currently used time-consuming cultivation.

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