## Targeted Colorimetric Assay for Rapid Detection of *Moraxella catarrhalis* through Spectroscopic Analysis

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## Abstract

Moraxella catarrhalis (M. catarrhalis) is a  $\beta$ -lactam resistant respiratory pathogen posing diagnostic challenges and lacks an available vaccine. This study introduces a rapid molecular and colorimetric assay, which is essential for timely diagnosis and improved infection management. The *ompCD* gene, encoding an outer membrane protein, was targeted as a nucleobiomarker in M. catarrhalis and compared with 9 other Gram-positive and Gram-negative bacteria. M. catarrhalis and the other strains were cultured in BHI and TSB media at 36°C, respectively. Following incubation, DNA was extracted using the boiling method and PCR-amplified with specific primers. The amplicons were confirmed by gel electrophoresis and assessed using a colorimetric method through spectrophotometry with the Neutral Red indicator. The sensitivity of the method was evaluated using a decimal serial dilution of the extracted M. catarrhalis DNA. M. catarrhalis was harvested at the stationary phase after 48 h, while the other strains were harvested after overnight incubation. Gel electrophoresis of the PCR amplicons revealed a distinct band in the range of 200-300 bp specific to *M. catarrhalis*, which was not observed in the other strains. In the colorimetric assay, M. catarrhalis exhibited a distinct orange-red color, contrasting with the deep red observed in the other strains. Optical density (OD) was measured at the range of 400-700 nm. Spectroscopic analysis revealed distinct peaks at 450 nm and 570 nm for *M. catarrhalis*, showing higher absorbance at 450 nm (0.358) and lower absorbance at 570 nm (0.249). In contrast, the other strains exhibited the opposite pattern, with lower absorbance at 450 nm and higher absorbance at 570 nm. The specificity for the tested bacteria was 100 percent. The sensitivity of the method was measured as 0.05 ng/µL. In conclusion, the colorimetric assay for *M. catarrhalis* detection is more effective than conventional methods, enabling the possibility of faster therapeutic prescriptions.

Keywords: Moraxella catarrhalis, Respiratory Pathogen, ompCD gene, Colorimetry Detection