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PII: S0039-9140(18)30623-4
DOI: https://doi.org/10.1016/j.talanta.2018.06.018
Reference: TAL18760

To appear in: *Talanta*

Received date: 8 May 2018
Revised date: 5 June 2018
Accepted date: 6 June 2018

Cite this article as: Giorgia Giovaninni, Andrew J. Hall and Vladimir Gubala, Coumarin-based, switchable fluorescent substrates for enzymatic bacterial detection, *Talanta,* https://doi.org/10.1016/j.talanta.2018.06.018

# Coumarin-based, switchable fluorescent substrates for enzymatic bacterial detection

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**Abstract**

Enzymatically-switchable fluorescent substrates, such as the commercially available 4-methyl umbelliferones (4-MU) are used as standard indicators of enzymatic activity for the detection of various microorganisms and pathogens. However, a major disadvantage of 4-MU is its relatively high pKa leading to only partial dissociation of the fluorescent anion under the conditions where the enzymes are most effective (pH 6-6.5). Here we present a method for new, enzymatically-switchable, fluorescent substrates with improved photo-physico/chemical properties. The lead derivative, 4-AAU, shows excellent solubility in acqueous media (0.81mg/mL) when compared to 4-MU (0.16mg/mL), significantly improved quantum yield and wider dynamic range of its fluorescence properties. The corresponding bacterial substrate β-4-AAUG showed superior selectivity in the detection of clinically relevant amounts of E. coli, Enterococcus and K. pneumonia (1 CFU). The fluorescence intensity of β-4-AAUG was almost 5 times higher than that of the standard, the detection was possible in reasonably short time (~2.5 hours) and with excellent sensitivity.



**Graphical Abstract**