

Synthesis of Molecular Sensor Based on the Curcumin Dye Extracted From *Curcuma longa* L. To Detect Long Chain Aldehydes as the Lung Cancer Biomarker

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This project synthesis and design of a molecular encapsulating particle EC@ccd_z, as a novel approach for screening diagnosis of lung cancer to reduce mortality rates and the complexity of advanced diagnostic techniques. The system enhances specificity for detecting long-chain aldehydes, particularly nonanal (C₉), which serves as a biomarker for lung cancer. The detection mechanism is based on a reaction between hydrazine groups and curcumin, which acts as a binding site and an optical signaling unit, respectively. The reaction produces a hydrazone product, leading to enhance fluorescence signal due to the inhibition of Photo-induced Electron Transfer (PET) processes. Dye-encapsulated ethyl cellulose (EC) further improves specificity for long-chain aldehydes through hydrophobic interactions, inducing the tight packing of the aldehyde chain ends and EC@ccd_z. This results in a tightly bound structure that allows visual differentiation between long-chain aldehydes and other aldehydes, accompanied by a significant increase in fluorescence intensity at a wavelength of 409 nm. Interestingly, a simple optical detection kit on paper coated with molecular sensors of ccd_z to detect nonanal in artificial sweat has been developed and investigated. The photo images of optical changes on dye-doped paper gave the gray values to calculate the excellent limits of detection (LOD) and quantification (LOQ) of 0.898 µg/mL and 2.994 µg/mL, respectively. This protocol by using EC@ccd_z possibly highlighted the promising screening test for diagnosis of lung cancer.

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