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@ccdz, 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@ccdz. 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 ccdz 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@ccdz possibly highlighted the promising screening test for diagnosis of lung cancer.

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