

Colorimetric quantification of glucose and cholesterol using a composite entrapping cerium oxide nanoparticles and oxidases

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A microscale well-plate colorimetric assay for the multiplexed detection of glucose and cholesterol in clinical human serum samples has been developed. This system utilized an agarose-based composite entrapping cerium oxide nanoparticles and glucose oxidase (GOx)/cholesterol oxidase (ChOx) to detect glucose and cholesterol in blood samples. The sensing mechanism involves the generation of H₂O₂ by the catalytic action of an immobilized oxidase on the target molecules in the sample. This subsequently activates the cerium oxide nanoparticles entrapped in an agarose gel, thereby leading to the color changes of the nanoparticles from white into yellow/orange. This strategy is used to detect the target glucose or cholesterol molecules in the concentration range of 0.05–2 mM with a lower detection limit of 20 μM. The aforementioned colorimetric assay is extremely convenient, and it exhibits a high degree of linearity, precision, and reproducibility when employing real human serum samples. Therefore, this assay can be used in clinical practice for the multiplexed and reliable quantification of glucose and cholesterol.