Abstract

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A glycan responsive in-situ colorimetric detection of bacteria by smart nanoglycocluster diagnostic platform

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Abstract

Carbohydrates are used widely for interaction studies like carbohydrate-carbohydrate (C-C) and carbohydrate-protein (C-P) interactions. Recently carbohydrates have been explored in conjugation with nanomaterials known as “Nanoglycoclusters”. These are functional nanomaterials used extensively to study different interactions. Carbohydrates with multiple valencies are known to offer greater binding with respect to their corresponding monovalent. Selective and sensitive bacteria/lectin interactions using nanotechnology are an emerging area of research. Nowadays sophisticated instruments are used for the detection of the different processes which limit their application in the field of the biosensor. Recently colorimetric biosensors gained importance in the field of biosensors for the detection of bacteria/lectins. Here in this study, we have explored the sensing ability of gold nanoparticles (AuNPs) based on their size, linker length, and carbohydrate density. We have used two different sizes AuNPs (20nm and 40 nm), two linker lengths (PEG1000 and PEG5000), and four different synthesized carbohydrates (mannose monopod, mannose tripod, galactose monopod, and galactose tripod). Different glycans have different specificity for lectins which are present on bacterial surfaces. The specific interaction of carbohydrate-lectin is the basis of our study which clearly shows that mannose monopod and tripod are specific to Escherichia coli and ConA lectin while galactose monopod and tripod are specific to Pseudomonas aeruginosa and PNA lectin. The interactions study was further confirmed by different techniques like TEM, FE-SEM, CLSM, and UV-Visible spectrophotometry. On the basis of this study we have designed a colorimetric diagnostic platform which can be used to detect the presence of bacteria in different samples

Biography

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