An Effort to Making a Colorimitric Nano-Biosensor for Vibrio cholera Detection

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Abstract: Background: Today, nanoparticles hold great promise in biomedical researches and applications including bacteria detection. The rapid and sensitive outcomes of bacteria detection strategies using nanoparticle conjugates become determinative especially in bacterial outbreaks. In the current research, we focused on detecting V. cholera bacteria and its toxin using a thiocyanate/Au nanoparticle. Thiocyanate adsorbed strongly on the surface of gold nanoparticles and changed the surface by enhancing surface plasmon resonance of gold nanoparticles.

Objective: This method is tried to introduce a simple and fast procedure to assay vibrio cholera. So, it is observed by the naked eyes as well.

Method: We used two antibodies (Ab) for V. cholera detection: a) a primary antibody conjugated to magnetic nanoparticles (MNPs) for trapping V. cholera bacterial cells, and b) a secondary Ab-conjugated thiocyanate-GNPs as a colorimetric detector. Then, an immuno-magnetic separation system connected to a colorimetric assay was designed based on the GNPs. The results were measured by ultraviolet-visible (UV-Vis) spectroscopy.

Results: The results showed that gold nanoparticles are an appropriate optical assay for detecting biological samples in a minimum concentration and also it can be easily seen by the naked eyes. The linear range of this biosensor is 3.2×104 to 28×104 cells per ml.

Conclusion: In this research, a colorimetric immune assay based on gold nanoparticles was designed to improve the sensitivity of V. cholera detection. Also, this method can be used to detection of other biological agents.