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The Staphylococcus aureus Exotoxin Recognition Using Nanobiosensor Designed by an Antibody-Attached Nanosilica Method

Authors : Hamed Ahari, Behrouz Akbari Adreghani, Vadood Razavilar, Amirali Anvar, Sima Moradi, Hourieh Shalchi

Abstract : Considering the ever increasing population and industrialization of the developmental trend of humankind's life, we are no longer able to detect the toxins produced in food products using the traditional techniques. This is due to the fact that the isolation time for food products is not cost-effective and even in most of the cases, the precision in the practical techniques like the bacterial cultivation and other techniques suffer from operator errors or the errors of the mixtures used. Hence with the advent of nanotechnology, the design of selective and smart sensors is one of the greatest industrial revelations of the quality control of food products that in few minutes time, and with a very high precision can identify the volume and toxicity of the bacteria. Methods and Materials: In this technique, based on the bacterial antibody connection to nanoparticle, a sensor was used. In this part of the research, as the basis for absorption for the recognition of bacterial toxin, medium sized silica nanoparticles of 10 nanometer in form of solid powder were utilized with Notrino brand. Then the suspension produced from agent-linked nanosilica which was connected to bacterial antibody was positioned near the samples of distilled water, which were contaminated with Staphylococcus aureus bacterial toxin with the density of 10-3, so that in case any toxin exists in the sample, a connection between toxin antigen and antibody would be formed. Finally, the light absorption related to the connection of antigen to the particle attached antibody was measured using spectrophotometry. The gene of 23S rRNA that is conserved in all Staphylococcus spp., also used as control. The accuracy of the test was monitored by using serial dilution (l0-6) of overnight cell culture of Staphylococcus spp., bacteria (OD600: 0.02 = 107 cell). It showed that the sensitivity of PCR is 10 bacteria per ml of cells within few hours. Result: The results indicate that the sensor detects up to 10-4 density. Additionally, the sensitivity of the sensors was examined after 60 days, the sensor by the 56 days had confirmatory results and started to decrease after those time periods. Conclusions: Comparing practical nano biosensory to conventional methods like that culture and biotechnology methods(such as polymerase chain reaction) is accuracy, sensitiveness and being unique. In the other way, they reduce the time from the hours to the 30 minutes.

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