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Two-protein modified gold nanoparticles for serological diagnosis of borreliosis

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In the nano-scale level of gold particles, the conduction electrons are triggered to collectively oscillate with a resonant frequency when certain wavelengths of electromagnetic radiation interact with its surface. This phenomenon is known as surface plasmon resonance (SPR). SPR is responsible for giving the gold nanoparticles its intense red colour that depends mainly on its size, shape and distance between nanoparticles. Decreasing distance between gold nanoparticles results in accumulation of them causing a change in colour from red to blue. This accumulation enables gold nanoparticles to be serving as valuable tool in colorimetricbio sensing methods. In the proposed work, gold nanoparticles were modified with two proteins, Borrelia antigen, variable lipoprotein surface-exposed protein (VlsE), and protein A. VlsE antigen induce a strong antibody response against Borrelia infection and can be detected from early to late phase during the disease. In addition it shows low cross-reaction with the other non-pathogenic Borrelia strains. The high specificity of VlsE antigen to anti-Borrelia antibodies simultaneously with the high specificity of protein A to the Fc region of all IgG human antibodies were utilized to develop a rapid test for serological diagnosis of Borreliosis that is characterized by its simplicity and its potential of point-of-care testing. The specific interaction of the two proteins immobilized on gold nanoparticles with the anti-Borrelia antibodies results in decreasing the interparticledistance causing accumulation of the gold nanoparticlesleading to a change in colour from red to blue in case of positive sample; in contrast the negative sample would remain red and no colour change would take place. Experiments showed the possibility to clearly distinguish between positive and negative sera samples using only the two-protein modified gold nanoparticles in a very short time, 30 minutes (Figure 1). The proposed work showed the potential of using such modified gold nanoparticles generally for the serological diagnosis.

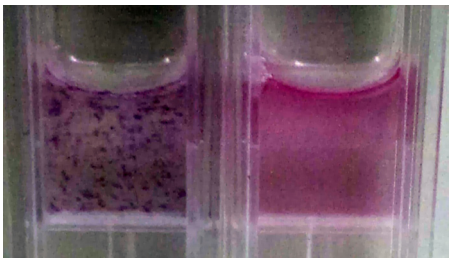

Figure 1. Positive serum (left) and negative serum (right) after adding the two modified gold nanoparticles

Biography:

Mohammed Alasel is a PhD student at Philipps University, Marburg. Mohammed is working in the group of Professor. Michael Keusgen, institute of pharmaceutical chemistry. Since 2012, Mohammed Alasel is involved in developing new platforms for rapid serological diagnosis; He is expecting to finish his PhD work by end of May 2016. He has finished his master degree in chemistry at University of Lund, Sweden. He obtained his bachelorwith chemistry major from Mansura University, Egypt. Mohammed is interested in and experienced in bio analytical chemistry.