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Nanosensor for real time measurement of caspase-1 activity in inflammation

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Abstract

Although caspase-1 is a key participant in inflammation, there is no sensitive assay to measure its enzymatic activity in real time in cells or animals. We have prepared a ratiometric nanosensor for the measurement of this enzyme's activity and demonstrated its functionality *in vitro* and *in vivo*. Our construct consists of CdSe(CdZnS) quantum dots functionalized by a fluorescently labeled short peptide containing the preferential substrate for the caspase-1, YVAD. Upon excitation, the transference of QD energy to the dye molecules (Rhodamine B), and the consequent emission is observed at the wavelength specific for the dye. After enzymatic cleavage of the peptide molecules, the rhodamine B (acceptor) molecules are liberated and the emission spectra changes back to that of the QDs. Monitoring the ratio between the emission peaks of QDs and fluorophores over time provides information on the rate of the enzyme activity. The nanosensor was successfully employed to assess caspase-1 enzymatic activity *in vitro* in microglia and *in vivo* in mice, during inflammation stimulated with lipopolysaccharides (LPS) and LPS-QD nanoparticles. Results from these studies highlight how the unique properties of QDs can be used to create versatile biotools in the study of inflammation in real time *in vivo*.

Biography

Eliza Hutter obtained an MD degree at the Medical Institute in Leningrad (now St.Petersburg), Russia in 1991 and a Ph.D degree in Chemistry in Clarkson University, USA (2001). She is a Research Associate at McGill University. Her research interests lie in the interdisciplinary field of nanobiotechnology, specifically, in the exploitation of localized surface plasmon of gold nanostructures for biological applications, such as sensing, imaging and drug delivery. She has published 23 papers in reputed journals.