Jiali Li et al., J Biotechnol Biomater 2019, Volume 9
DOI: 10.4172/2155-952X-C2-115

Protein aggregation characterized by nanotechnology

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In this work, we analyze the process of protein aggregation with a nanopore device combined with AFM and DLS. Our model proteins used are ß-lactoglobulin variant A (βLGa) and a neuronal Tau protein. The main component of a nanopore device is a nanometer size pore, 5 to 20 nm in diameter, fabricated in a free-standing silicon nitride membrane supported by a silicon substrate which separates two PDMA chambers containing salt solution. A stable ionic current is established by applying a biased voltage on a pair of silver chloride (AgCl) electrodes across the nanopore membrane. When a charged protein molecule or a protein aggregate passes through a nanopore, a protein aggregate which has larger volume than a single protein molecule would block larger amount of current or generate a greater current drop amplitude, therefore a nanopore device can be used to characterize protein aggregation in salt solution at single molecule level. The volume of translocating protein molecules or aggregates are estimated using a calibrated nanopore by a standard that has known geometry such as a dsDNA molecule. We show that by using a reference dsDNA molecule, solid state nanopore method is capable of measuring protein aggregation number and the aggregation number distribution in the conditions that is close to their native aqueous solution environment. The nanopore experiments were performed under applied voltages from 60-210 mV at different pH, temperature and salt concentration. We present data of βLGa and Tau self-association and aggregation measured by nanopore method, AFM and DLS.

Biography

Jiali Li has completed her PhD in Physics at the City University of New York in 1999 and Postdoctoral studies from Depertment of Physics, Harvard University. She is a Physics Professor at the University of Arkansas since 2002. She has been one of the pioneers in developing solid-state nanopore technology and its applications in single DNA and protein analysis. She has published more than 30 papers in reputed journals. In recent years, she has been working on protein aggregation, detection and characterization with solid-state nanopore device combined with other nanotechnologies.

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