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Biosensor to probe fibrous/not fibrous polypeptides

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The focus of this work is on the numerical investigation of the charge transport properties of the *de novo*-designed *alpha3* polypeptide, a 21-residue with three repeats of the seven-residue sequence Leu-Glu-Thr-Leu-Ala-Lys-Ala, as well as its variants (the so-called *5Q-alpha3* and *7Q-alpha3* peptides), all of them probed by gene engineering. The theoretical model makes use of a tight-binding Hamiltonian within the density functional theory approach.

We investigate if the biased alpha3 polypeptide and its variants can be identified by charge transport measurements through current-voltage (IxV) curves, as a pattern to characterize their fibrous assemblies. We found that, from their IxV profiles, the alpha3 peptide, that has the most fibrous assemblies, shows the smaller current saturation; the *5Q-alpha3* variant, which forms fibrous assemblies more attenuated than those of the alpha3 peptide, has a current saturation higher than alpha3, but smaller than *7Q-alpha3*; finally, the *7Q-alpha3* variant does not form fibrils and shows the highest current saturation, suggesting that charge transport in peptides can turn to be a useful tool for the development of biosensors to probe the onset of amyloidosis-like diseases. We hope that this biomedical application of the charge transport in proteins and polypeptides should stimulate experimental and engineering technological development.

Biography

U.L. Fulco is a Ph.D. student at the Department of Biophysics, Universidade Federal do Rio Grande do Norte, in Natal-RN, Brazil. The focus of his Ph.D. thesis is in the field of NanoBiotechnology, mainly with the investigation of charge transport in polypeptides and the development of biosensor devices.

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