

Understanding/Tuning the transport properties of biomolecules atom by atom

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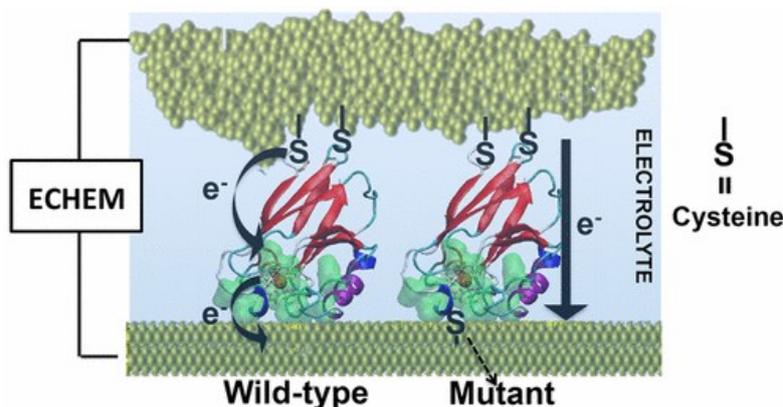
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Bioelectronics moves toward designing nanoscale electronic platforms that allow in vivo determinations. Such devices require interfacing complex biomolecular moieties as the sensing units to an electronic platform for signal transduction. Inevitably, a systematic design goes through a bottom-up understanding of the structurally related electrical signatures of the biomolecular circuit, which will ultimately lead us to tailor its electrical properties. Toward this aim, we show here the first example of bioengineered charge transport in a single-protein electrical contact. The results reveal that a single point-site mutation at the docking hydrophobic patch of a Cu-azurin causes minor structural distortion of the protein blue Cu site and a dramatic change in the charge transport regime of the single-protein contact, which goes from the classical Cu-mediated two-step transport in this system to a direct coherent tunneling. Our extensive spectroscopic studies and molecular-dynamics simulations show that the proteins' folding structures are preserved in the single-protein junction. This work is a direct evidence of charge transport control in a protein backbone through external mutagenesis and a unique nanoscale platform to study structurally related biological electron transfer.



References

1. Marta P. Ruiz, et al. J. Am. Chem. Soc., 2017, 139 (43), pp 15337–15346