Abstract title (sample) Ionic Current-Based Mapping of Short Sequence Motifs in Single DNA Molecules using Solid-State Nanopores

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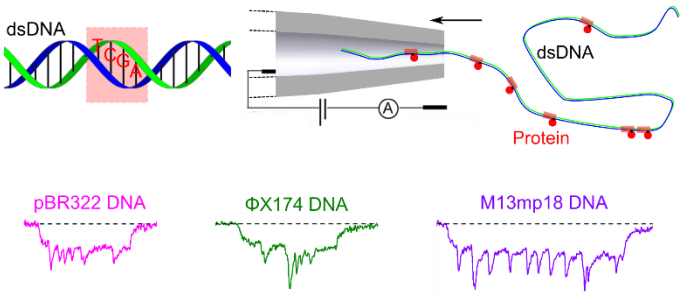
ABSTRACT: Fast DNA identification is crucial for clinical applications such as nucleic acid based diagnostics. Here, we develop an ionic current-based method for determining the positions of short sequence motifs in double-stranded DNA molecules with solid-state nanopores. Using the DNA-methyltransferase M.TaqI and a biotinylated *S*-adenosyl-L-methionine cofactor analogue we create covalently attached biotin labels at 5'-TCGA-3' sequence motifs. Monovalent streptavidin is then bound to the biotinylated sites giving rise to additional current blockade signals when the DNA passes through a conical quartz nanopore. We determine the relationship between translocation time and position along the DNA contour and find a minimum resolvable distance between two labelled sites of ~200 bp (~68 nm) with ~14 nm-diameter conical nanopores. We then characterize a variety of DNA molecules by determining the positions of bound streptavidin and show that two short genomes can be simultaneously detected in a mixture. Our method provides a simple, generic single-molecule detection platform enabling rapid characterization of DNA by solid-state nanopores suited for portable devices for potential diagnostic applications.



References

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