Molecular basis and biological reasons of hyper-recombinogenic activity of *Pseudomonas aeruginosa* RecA protein

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RecA protein promotes DNA strand exchange by forming filaments on single-stranded DNA (ssDNA) followed by uptake of the duplex substrate. RecF, O, and R proteins help to RecA to polymerize on ssDNA covered by SSB proteins. A distinguishing characteristic of RecA protein from *Pseudomonas aeruginosa* (RecAPa) is its constitutive hyper-rec activity in *E. coli* cells which is manifested through a 6-8 fold increase in the frequency of recombination exchanges per DNA unit length. Relative to RecAEc (RecA from *E. coli*), RecAPa displaces SSB-Ec and SSB-Pa proteins (SSB from *E. coli* and *P. aeruginosa*, respectively) from ssDNA more rapidly, forms more salt stable and temperature stable presynaptic filaments, and possesses a greater affinity for ssDNA at its primary DNA binding site. In DNA strand exchange reactions, RecAPa promotes joint molecule formation more efficiently but is less effective in the generation of final products, reflecting its propensity to initiate DNA pairing rather than to complete strand exchange. RecAPa is also less dependent on the mediator activity of *E. coli* RecF, O, and R proteins and does not possess a 3' end bias in initiation of recombination by its presynaptic filament. All these properties suggest an enhancement of both ssDNA gap- and dsDNA break repair mechanisms promoted by RecAPa.
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