Symmetric activity of DNA polymerases at and recruitment of exonuclease ExoR and of PolA to the *Bacillus subtilis* replication forks

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DNA replication forks are intrinsically asymmetric and may arrest during the cell cycle upon encountering modifications in the DNA. We have studied real time dynamics of three DNA polymerases and an exonuclease at a single molecule level in the bacterium *Bacillus subtilis*. PolC and DnaE work in a symmetric manner and show similar dwell times. After addition of DNA damage, their static fractions and dwell times decreased, in agreement with increased reestablishment of replication forks(1).

Only a minor fraction of replication forks showed a loss of active polymerases, indicating relatively robust activity during DNA repair. Conversely, PolA, homolog of polymerase I, and exonuclease ExoR were rarely present at forks during unperturbed replication but were recruited to replications forks after induction of DNA damage (2,3). Protein dynamics of PolA or ExoR were altered in the absence of each other during exponential growth as well as during DNA repair, indicating overlapping functions. Purified ExoR displayed exonuclease activity and preferentially bound to DNA having 5' overhangs *in vitro*.

Reporting on the dynamics of PolC, DnaE, PolA and ExoR proteins within live cells and within regard to the replication machinery, we provide *in vivo* evidence that *B. subtilis* replication forks present unusual features not known from replication machineries in *E. coli* and eukaryotic systems. Our analyses support the idea that two replicative DNA polymerases work together hand in hand at the lagging strand while only PolC acts at the leading strand, and that PolA and ExoR perform inducible functions at replication forks during DNA repair(4).

References

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