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| Title: | Role for DNA double strand end-resection activity of RecBCD in control of aberrant chromosomal replication initiation in Escherichia coli |
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| Abstract: | Replication of the circular bacterial chromosome is initiated from a locus oriC with the aid of an essential protein DnaA. One approach to identify factors acting to prevent aberrant oriC-independent replication initiation in Escherichia coli has been that to obtain mutants which survive loss of DnaA. Here, we show that a ΔrecD mutation, associated with attenuation of RecBCD's DNA double strand end-resection activity, provokes abnormal replication and rescues ΔdnaA lethality in two situations: (i) in absence of 5′-3′ single-strand DNA exonuclease RecJ, or (ii) when multiple two-ended DNA double strand breaks (DSBs) are generated either by I-SceI endonucleolytic cleavages or by radiomimetic agents phleomycin or bleomycin. One-ended DSBs in the ΔrecD mutant did not rescue ΔdnaA lethality. With two-ended DSBs in the ΔrecD strain, ΔdnaA viability was retained even after linearization of the chromosome. Data from genome-wide DNA copy number determinations in ΔdnaA-rescued cells lead us to propose a model that nuclease-mediated DNA resection activity of RecBCD is critical for prevention of a σ-mode of rolling-circle over-replication when convergent replication forks merge and fuse, as may be expected to occur during normal replication at the chromosomal terminus region or during repair of two-ended DSBs following 'ends-in' replication. |
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