2 Multiple C-terminal tails within a single E. coli SSB homotetramer coordinate DNA replication and repair.

Antony E, Weiland E, Yuan Q, Manhart CM, Nguyen B, Kozlov AG, McHenry CS, Lohman TM:
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Antoine van Oijen
F1000 Structural Biology
University of Groningen, Groningen, Netherlands.

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Andrew Robinson
F1000 Structural Biology
University of Groningen, Groningen, Netherlands.

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New Finding

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The tetrameric single-stranded DNA-binding protein (SSB) is a protein interaction hub. Its four C-terminal tails participate in specific interactions with approximately 15 proteins involved in the replication and repair of DNA. In this notable work, C-termini were systematically removed from SSB tetramers and the effects on replication and repair examined. The authors found that a minimum of two tails (out of four) are required for DNA replication in vitro and in vivo, indicating that SSB must recruit multiple proteins simultaneously during the course of coordinated DNA synthesis.

Disclosures
None declared

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Abstract:

E. coli single strand DNA binding protein (SSB) plays essential roles in DNA replication, recombination and repair. SSB functions as a homotetramer with each subunit possessing a DNA binding domain (OB-fold) and an intrinsically disordered C-terminus, of which the last nine amino acids provide the site for interaction with at least a dozen other proteins that function in DNA metabolism. To examine how many C-termini are needed for SSB function we engineered covalently linked forms of SSB that possess only one or two C-termini within a four OB-fold "tetramer". Whereas E. coli expressing SSB with only two tails can survive, expression of a single tailed SSB is dominant lethal. E. coli expressing only the two-tailed SSB recovers faster from exposure to DNA damaging agents, but accumulate more mutations. A single-tailed SSB shows defects in coupled leading and lagging strand DNA replication and does not support replication restart in vitro. These deficiencies in vitro provide a plausible explanation for the lethality observed in vivo. These results indicate that a single SSB tetramer must interact simultaneously with multiple protein partners during some essential roles in genome maintenance.

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