

5th International Conference on

GLYCOBIOLOGY & GLYCOPROTEOMICS

&

3rd International Conference on

MOLECULAR BIOLOGY & NUCLEIC ACIDS

August 27-28, 2018 | Toronto, Canada

Insight into stalled DNA replication fork rescue in *E.coli*

Piero R Bianco

University at Buffalo, USA

Genome duplication is inherently accurate, highly processive and relies on the close interplay between the genetic recombination and DNA repair machinery. This follows because the replication machinery frequently encounters roadblocks that have the potential to stall or collapse a replication fork. Stalled replication forks can be regressed or directly restarted. During the process of regression, the fork is moved in a direction opposite to that of replication and away from the site of damage to a region where the nascent, replicated genome is undamaged. This enables the repair machinery to have access to the damage and facilitate repair. This process is analogous to the clearing of train tracks following a derailment/collision. Replication fork regression in *E.coli* is complex and is catalyzed by the DNA helicase RecG in a reaction that is facilitated by SSB protein. RecG is a unique but powerful enzyme that once loaded onto the DNA by SSB, catalyzes an efficient unidirectional regression reaction, and couples DNA unwinding to duplex rewinding. In addition, during the process of regression, RecG generates sufficient force to clear the fork of bound proteins including SSB. RecG-loading and the displacement of SSB by the advancing DNA helicase requires the presence of functional SSB-linker domains. In addition to its interaction with RecG, SSB plays additional key roles in fork rescue reactions, including dictating substrate specificity, inhibiting the RuvAB and Rep helicases while enhancing the activity of RecG. Once regression has taken place and repair and/or removal of the roadblock has occurred, the replisome is re-loaded and replication restarted, initiating from within the undamaged region of the genome.

Biography

Piero Bianco has expertise in mechanistic studies of protein-nucleic acid interactions. He has focused his expertise on the field of prokaryotic recombination and DNA repair for over 25 years. He uses a combination of approaches ranging from *in vivo* imaging of live cells, to bulk-phase biochemistry and a combination of single molecule techniques. He was the first to visualize translocation and DNA unwinding mediated by a DNA helicase, here the RecBCD enzyme. He now focuses attention on the DNA helicases mediating the various steps of stalled DNA replication fork rescue, and the role the single strand DNA binding protein plays in mediating fork transactions.

pbianco@buffalo.edu

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