

The function of N-terminal domain in RadA/Rad51-DNA filaments

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RecA/RadA/Rad51 proteins form helical filaments on DNA, which play a critical role in homologous genetic recombination. While the RadA/Rad51-DNA filaments appear to be similar to the RecA-DNA filament, the N-terminal of RadA/Rad51 shows no homology with the C-terminal found in RecA. We demonstrated by electron microscope and the Iterative Helical Real Space Reconstruction (IHRSR) method that the RadA filaments can be trapped in either an inactive or active conformation, and that activation involves a large rotation of the subunit in the filament aided by the N-terminal domain. The G103E mutation within the yeast Rad51 N-terminal domain inactivates the filament by failing to make proper contacts between the N-terminal domain and the core. Our 3D EM reconstructions are very well matched with crystal X-ray data. These results show that the N-terminal domain plays a regulatory role in filament activation and highlight the modular architecture of the recombination proteins.