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Fundamental properties of the bacterial SOS response: A theoretical background

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The current talk discusses fundamental properties of the bacterial SOS response on the basis of mathematical models developed by the author. Most attention is paid to the ability of the SOS system to bypass DNA damage via the error-prone trans-lesion synthesis pathway. The proposed model reproduces the basic features of the SOS response through simulation of the major steps leading to fixation of the primary DNA lesion as a point mutation. It reconstructs the basic regularities of the ultraviolet-induced mutagenesis and predicts time-courses of several intermediate protein complexes of the SOS system. With the use of this model, links between the SOS response and other DNA repair pathways are demonstrated. In particular, a theoretical study is performed of the possible role of the methyl-directed mismatch repair system in the ultraviolet-induced mutagenesis of bacterial cells. The model shows a possible mechanistic explanation of the hypothesis that the mismatch repair is responsible for attenuation of mutation frequency during the ultraviolet-induced SOS response via removal of nucleotides mis-incorporated by DNA polymerase V (the UmuD'2C complex). In general, the model summarizes a large number of recent findings on the machinery of radiation-induced mutagenesis in bacteria and provides a background for better understanding of its gene regulation.

Biography

Oleg V Belov has completed his PhD from M V Lomonosov Moscow State University. He is the Deputy Head of Radiobiology Department at Laboratory of Radiation Biology of Joint Institute for Nuclear Research, one of the leading research organizations in Russia that deals with fundamental problems of radiation biology. He also acts as the Associate Professor at Biophysics Department of Dubna International University. He has published more than 15 papers in reputed journals dealing with various aspects of radiation-induced effects in living organisms.

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