# Anti-Human DNA-PKcs

DNA-PKcs (DNA-dependent protein kinase catalytic subunit) is a critical component of the Non-Homologous End Joining (NHEJ) pathway, which is a crucial mechanism for repairing double-strand breaks (DSBs) in DNA.

Complex Formation with Ku70/Ku80: DNA-PKcs is recruited to DSBs by the Ku heterodimer (Ku70/Ku80), which binds to DNA ends. This intricate interaction between Ku and DNA-PKcs forms the DNA-PK complex, marking the initial and complex step in the NHEJ process.

Protein Kinase Activity: As its name suggests, DNA-PKcs is a protein kinase, meaning it can phosphorylate other proteins. This kinase activity is vital for regulating the NHEJ pathway. DNA-PKcs phosphorylates various substrates, including Artemis, XRCC4, and DNA Ligase IV, which are involved in end processing and ligation.

Endonuclease Regulation: DNA-PKcs activates Artemis through phosphorylation, enabling it to function as an endonuclease. This activation allows Artemis to process complex DNA ends, such as hairpins, and prepare them for ligation.

Role in End Processing: DNA-PKcs's kinase activity regulates DNA end processing, coordinating the actions of different enzymes involved in making DNA ends compatible for ligation. This regulation ensures that end trimming, gap filling, and other modifications are done accurately and in the correct sequence.

Bridging and Stabilizing DNA Ends: The DNA-PK complex helps stabilize the broken DNA ends, preventing further degradation and ensuring they remain in close proximity. This stability is crucial for successful ligation and repair.

Coordination of NHEJ Repair: DNA-PKcs serve as a central coordinator in the NHEJ pathway, bringing together various proteins and orchestrating their functions. Its kinase activity regulates the timing and order of the repair steps.

Ligation and Resolution: Once the DNA ends are processed, DNA-PKcs coordinates the recruitment of the ligase complex, including DNA Ligase IV, XRCC4, and XLF. This step completes the NHEJ process by ligating the DNA ends and restoring genome integrity.

Role in Genomic Stability: DNA-PKcs is critical for maintaining genomic stability through its function in NHEJ. It helps prevent chromosomal abnormalities and influences cellular responses to DNA damage, influencing processes like apoptosis and cell cycle regulation.

In summary, DNA-PKcs is a central player in the NHEJ pathway, responsible for kinase activity, end processing, stabilization of DNA ends, and coordination of the repair process. Its role in activating Artemis and recruiting other NHEJ proteins is critical to ensuring efficient and accurate repair of double-strand breaks.

## References:

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