

A DNA Double Strand Break (DSB), where both strands of the duplex are severed, is one of the most genotoxic types of DNA damage an organism can sustain. Accurate repair of DSBs is essential for genome stability and cancer avoidance. One method of repair, called Double Strand Break Repair (DSBR), relies on homologous recombination events that allow new DNA to be synthesized using the sister chromatid or homologous chromosome as a template. A key intermediate step in this process is the formation of a DNA structure called a D-loop, where single-stranded DNA (ssDNA) from the end of a processed DSB invades and anneals to a complementary region in the double-stranded DNA template. In this project an entirely synthetic D-loop structure has been constructed. Using the proteins from the T4 Bacteriophage model system, the ability of the D-loop to be unwound by the DNA helicase Gp41 and the ability of the DNA polymerase Gp43 to extend the invasive strand have been examined. The manner of the D-loop's unwinding by Gp41 has implications for the exact mechanism of the repair process and whether it will lead to a potentially deleterious crossover or not.