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**TITLE:** Laying a trap to kill cancer cells: PARP inhibitors and their mechanisms of action

**ABSTRACT:** PARP inhibitors represent the most advanced cancer therapeutic agents based on the targeting of the DNA damage response, with one inhibitor already an approved medicine and several others in late stage development. Understanding the mechanism(s) of action of PARP inhibitors is key to the successful deployment of these agents. In the last few years it has become apparent that ‘PARP trapping’ is an integral component of these inhibitors. We will review the DNA damage response roles of PARP1, PARP2 and PARP3 (the targets of PARP inhibitors currently in clinical development), and differences in the molecular mechanisms of action between PARP inhibitors with respect to PARP trapping and what this means for both monotherapy activity and combination with chemotherapeutic agents.