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Sommario	ABSTRACT An accurate DNA replication is essential to prevent genome instability events, such as mutations and chromosomal rearrangements that are hallmarks of neoplastic transformation and cancer onset. A dedicated branch of the DNA damage checkpoint maintains the integrity of replicating chromosomes by stabilising replication forks in the presence of genotoxic agents, thus ensuring cell viability. Upon fork collapse, budding yeast checkpoint mutants experiencing replication stress accumulate aberrant replication intermediates, such as gapped and hemireplicated molecules, as well as four-branched structures known as reversed forks. Aberrant replication intermediates are potentially harmful for the cells since they are thought to trigger unscheduled recombination events that cause genome rearrangements. In this PhD thesis, I examined checkpoint-dependent mechanisms controlling fork stability, and I provide in vivo evidence that positive supercoiling accumulating ahead of replication forks is the main mechanical force driving fork reversal. Thus, DNA topology is a critical determinant of replication fork stability in vivo. Furthermore, a 2D-gel screening for enzymatic activities involved in the metabolism of collapsed forks, revealed a novel role for the Sae2 and Dna2 endonucelases in replication intermediates processing.