BRN1 is an essential gene that encodes the yeast homolog of Drosophila Barren and Xenopus XCAP-H. XCAP-H is a component of the condensin complex, a complex originally identified in Xenopus egg extracts that is required for chromosome condensation. Condensin complexes have been identified in many eukaryotes; in addition to Barren and XCAP-H, Brn1p homologs include human BRRN1, mouse BRRN1, S. pombe Cnd2, and a predicted protein in Arabidopsis. Smc2p, Smc4p, Ycg1p and Ycs4p are the other yeast condensin subunits; overexpression of YCG1, but not SMC2, suppresses brn1 temperature-sensitive mutations. Temperature-sensitive brn1 mutants show defects in chromosome condensation and segregation, and some brn1 mutations cause cells to arrest growth in S phase. Sister chromatid cohesion appears normal in brn1 mutants. Although the Drosophila Barren protein interacts physically with, and may regulate, topoisomerase II, the phenotypes of yeast brn1 mutants do not resemble those of top2 mutants, suggesting that in yeast Brn1p is not an essential regulator of topoisomerase II activity.