BUB1 encodes a non-essential protein kinase involved in the spindle checkpoint. The spindle checkpoint delays the onset of anaphase in cells with defects in mitotic spindle assembly or in the attachment of chromosomes to the spindle microtubules. The checkpoint works by inhibiting the activity of the anaphase promoting complex, thereby preventing the degradation of several cell cycle regulators. Bub1p binds to and phosphorylates another spindle checkpoint protein, Bub3p, and autophosphorylates. Like other spindle checkpoint mutants, bub1 loss-of-function mutants are sensitive to benomyl and cannot delay cell division in response to spindle depolymerization. Overexpression of a dominant mutant, BUB1-5, delays mitosis, as does overexpression of MPS1, which encodes another protein kinase involved in the spindle checkpoint. The BUB1-5 mitotic delay requires other spindle checkpoint components including Mps1p, Bub2p, Bub3p, Mad1p, Mad2p, and Mad3p. Bub1p, Bub3p, Mad1p, Mad2p, Mad3p, and Mps1p act in a branch of the spindle checkpoint pathway that may prevent premature chromosome disjunction. A second branch involves Bub2p and Bfa1p, and may prevent cytokinesis prior to chromosome segregation. Mad3p has sequence similarity to Bub1p, but the similarity does not include the kinase domain of Bub1p. Protein kinases related to Bub1p are involved in checkpoint control and timing of mitosis in several other species, including S. pombe, mouse, and human. Mutations in the human BUB1 homologsare associated with several types of cancer.