TUB4 encodes the essential gene for gamma-tubulin. Gamma-tubulin is a conserved component of microtubule organizing centers and is essential for microtubule nucleation. Tub4p is a member of the tubulin superfamily, which includes alpha- and beta-tubulin, and the prokaryotic tubulin-like gene FtsZ. Compared to other members of the gamma-tubulin family, Tub4p is surprisingly divergent, sharing only 29-38% amino acid sequence identity. Tub4p is a component of the S.cerevisiae microtubule organizing center, called the Spindle Pole Body, which is embedded in the nuclear envelope. Tub4p localizes to both nuclearand cytoplasmicfaces of the SPB and is essential for nucleating microtubules from both faces. Pertubation of Tub4p activity, either by conditional mutations at the non-permissive temperature or by depletion, results in mitotic spindle and SPB defects, including failure to form microtubules. The carboxy terminus of Tub4p contains the highly conserved motif DYSLD and an acidic tail; mutational analysis has revealed a role for the carboxy terminus in the nucleation of cytoplasmic microtubules during spindle elongation. Tub4p is phosphorylated on several residues in vivoand the phosphorylation state of Tub4p is important for regulating both microtubule number and assembly. Phosphorylation of Tub4p is maximal at G1 in the cell cycle. Tub4p forms an evolutionarily conserved 2:1:1 stoichiometric complex with the SPB components Spc97p and Spc98p, in which one molecule of Tub4p binds one molecule of either component. In vitro, the Tub4p complex is able to bind pre-formed microtubules but has a low nucleation activity, suggesting that other SPB components may participate in microtubule nucleation. The Tub4p complex is targeted to the nuclear face of the SPB via the essential SPB component Spc110p that binds both Spc97p and Spc98p. Spc98p may direct the localization of the Tub4p complex to the nuclear face of the SPB via its nuclear localization sequence. The essential, outer plaque SPB component Spc72p likely anchors Tub4p complexes to the cytoplasmic side of the SPB, as it interacts with both Spc97p and Spc98p and mutations in SPC72 impair cytoplasmic microtubule formation.