During the budding process, the mitotic spindle must move into the narrow neck between the mother cell and the bud in order to segregate duplicated chromosomes accurately. Since the nuclear envelope does not break down during mitosis in S. cerevisiae, the movement of the spindle occurs as part of nuclear migration into the neck region, and it occurs in two main steps. First the nucleus moves to a position adjacent to the neck, a process that involves cytoplasmic microtubules, Kip3p, Kar9p, and other proteins involved in Kar9p function. Second, the mitotic spindle is moved into the neck. This requires cytoplasmic microtubules from the spindle pole body, which slide along the bud cortex and pull the nucleus and elongating spindle. Sliding depends on the heavy chain of cytoplasmic dynein, the regulator dynactin complex, Num1p, and Ndl1p. Pac1p functions in this second step, aiding in recruitment of Dyn1p, a minus end-directed motor, to the plus ends of microtubules.The role of Pac1p in Dyn1p recruitment is supported by several lines of evidence. Localization studies indicate that both Pac1p and Dyn1p are found at the plus ends of micortubules; localization of Dyn1p requires functional Pac1p and Bik1p, but localization of Pac1p does not require Dyn1p. Localization of Pac1p does require Ndl1p, which is thought to help promote recruitment of dynein by Pac1p. pac1 null mutants do not exhibit efficient movement of the mitotic spindle into the bud neck because the cells are defective for microtubule sliding along the bud cortex; dyn1 null mutants have the same phenotype.PAC1 encodes the S. cerevisiae homolog of human LIS1, a protein required for nuclear migration in neurons during development. Mutations in LIS1 cause brain malformations referred to as lissencephaly. Pac1p homologs have been indentified in a number of other organisms, including S. pombe, A. nidulans, D. melanogaster, and C. elegans. These proteins have a predicted coiled-coil region in the amino terminus and seven tandem WD40 repeats in the carboxy terminal two-thirds of the protein. The human and A. nidulans homologs have been shown to localize to the plus ends of microtubules, similar to Pac1p.