Disrupting phosphoregulation leads to cytokinesis defects

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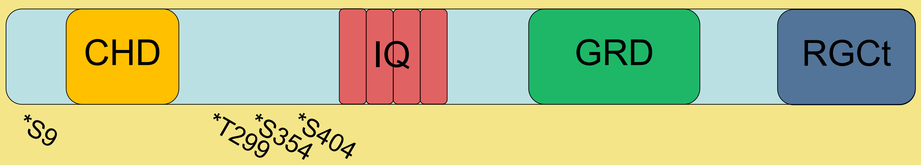
Abstract

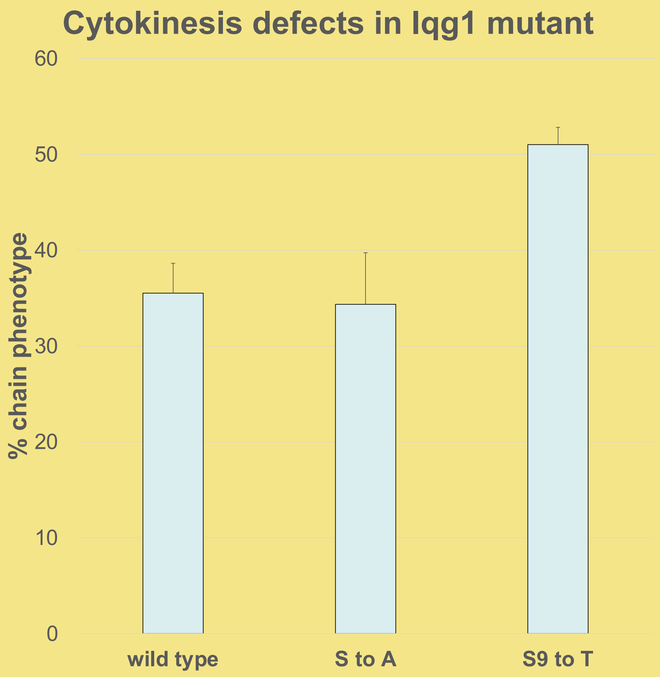
Cytokinesis is the process by which cells divide and split off from one another via a contractile actomyosin ring. Actomyosin ring formation is characterized by the recruitment of filamentous actin (F-actin) and myosin II. Budding yeast is a simple eukaryotic system to examine the molecular process of actomyosin ring assembly and contraction. Iqg1 is required for actin localization to the site of cytokinesis and is regulated by phosphorylation and dephosphorylation. A strain with a mutation in Iqg1 that prevents dephosphorylation causes cytokinesis defects. The mutant phenotype was further analyzed by examining actin ring formation. Since human homologs of Iqg1 are involved in cancer and cytokinesis failure can cause aneuploidy as seen in tumor cells, this research could ultimately lead to new targets for chemotherapy.

IQG1

Member of IQGAP Family

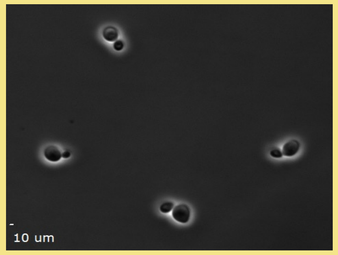


S9 was mutated to a threonine, which allows phosphorylation but not dephosphorylation.

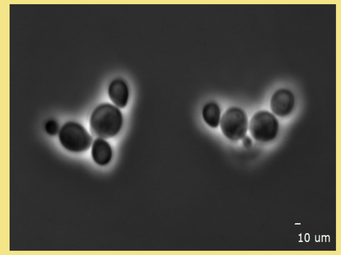


Applications to Cancer Research

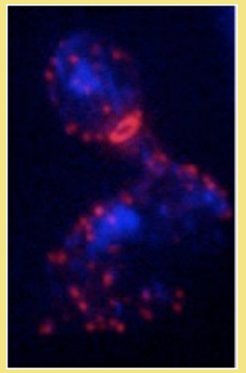
Research suggests IQGAP1 has numerous implications in cancer development. The main functions of this protein directly related to the progression of certain cancers include regulation of cytoskeletal arrangement and cell transformation. It is suspected to stimulate β-catenin- and ERK-dependent pathways. IQGAP1 is typically detected in the cell membrane, where it influences cell adhesion, migration, and growth signaling.



Wild type phenotype



Mutant phenotype



This image shows the actin ring that is formed at the bud neck between dividing yeast cells. In a typical yeast cell, the ring contracts and essentially pinches the area between the two cells to separate them from each other.

References

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