The Role of the Human Translationally Controlled Tumor Protein (TCTP) in Mitosis

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Abstract
Mitosis is the complex process that results in division of DNA and other cellular components into two daughter cells. Successful cell division requires that microtubules of the mitotic spindle attach to the kinetochores of mitotic chromosomes. These attachments are used for both aligning chromosomes at the spindle equator and for the physical separation of sister chromosomes during anaphase. In the study of how microtubules and kinetochores work together during mitosis, researchers are searching for new proteins that may help to piece together this complex puzzle. The Translocationally Controlled Tumor Protein (TCTP) has been suggested to play a role in mitotic cell division, as it has been immuno-localized to the mitotic spindle; however, its precise function in mitosis remains unknown. The goal of my project is to determine the role of TCTP in mitosis. Thus far, my research has shown that TCTP is located at the microtubules during mitosis, and when knockdown by siRNA treatment, human HeLa H2B-GFP cells (GFP-tagged chromosomes) are either unable to complete mitosis or take an extended time to do so. Currently, I am undergoing procedures to pick the most suitable human cell line in which to study the role of TCTP during mitosis (HeLa-S3, HeLa-Kyoto, or HeLa H2B-GFP), and a mitotic index and characterization of the cell line. In the future, I plan to look in to the association between F-actin and TCTP, recently brought to light by Bazile et al., 2009.

Background: Mitosis
The process by which eukaryotic cells divide their genetic material and cellular components
- **Mitosis takes place in the following steps:**
  1. **Prophase:** Chromosomes condense
  2. **Prometaphase:** Begins with nuclear envelope breakdown; chromosomes line up at the cell center
  3. **Metaphase:** Chromosomes align at the metaphase plate
  4. **Anaphase:** Sister chromatids are pulled apart, one to each spindle pole
  5. **Telophase:** Chromosomes decondense; nuclear envelope re-forms

Methods Used:
- Live cell and fixed cell imaging of HeLa cells (Kyoto and H2B-GFP)
- Western blot analysis shows that TCTP can be detected in HeLa (human), U2OS (human), and PtK1 (rhesus monkey) cells
- Knock down accomplished with hTCTP siRNA (confirmed with Western Blot)

Summary, Conclusions, and Future Directions
- TCTP can play a significant role in microtubule function and mitosis.
- TCTP localizes independently of microtubules, however, its precise function in mitosis remains unknown.
- In the future, I plan to look into the association between F-actin and TCTP, recently brought to light by Bazile et al., 2009.

References
Bazile, et al. (2009): TCTP Publication

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