SOUTHWESTERN NEWS

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RESEARCHERS DISCOVER PATTERN OF INHERITANCE OF NON-CHROMOSOMAL DNA

DALLAS – September 11, 1998 – Moms and dads contribute equal amounts of DNA to their baby – almost. Each parent donates one chromosome from each of the 23 pairs humans have. But all cells also contain thousands of non-chromosomal DNA molecules located in small energy factories called mitochondria. And only mitochondrial DNA (mtDNA) from the mother passes to the fetus.

Researchers at UT Southwestern Medical Center at Dallas have shown for the first time that the multiple copies of mtDNA in a single cell are transmitted in an organized and finite fashion and not in a random fashion as was previously thought. The research, using yeast as a model organism, was published in the Aug. 10 issue of the *Journal of Cell Biology*. Dr. Ron Butow, professor of molecular biology and oncology, and colleagues believe their results may directly apply to humans.

"Studies over the last 10 to 15 years have demonstrated that many genes in yeast are present in animals, and that you can swap them out," said Butow. "Basic biological processes are well-conserved between yeast and humans. That has been borne out over and over again."

Genetic disorders caused by mutations in mtDNA include a variety of neuromuscular lesions and muscle-tissue diseases, and they are inherited from the mother. However, the mother passes only a minority of her thousands of mtDNA copies to the fertilized egg, which develops

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into a fetus. She may have only a small proportion of mutant mtDNA molecules and not show signs of illness. But her offspring may have the disease, depending on the ratio of mutant to normal mtDNA they receive.

"The proportion of mutant to normal mtDNA accounts for disease severity – this is a segregation issue," said Butow, holder of the Beatrice and Miguel Elias Distinguished Chair in Biomedical Science. "Our work has a direct bearing on some human diseases where normal mtDNA fails to be inherited efficiently in the face of mutant mtDNAs. The results in yeast clearly say segregation of mtDNA is not a random process; there is a scaffold, an apparatus to explain the patterns we see."

Dr. Koji Okamoto, a postdoctoral fellow in molecular biology and oncology, was the article's lead author. Dr. Philip Perlman, UT Southwestern professor of molecular biology and oncology and associate dean of the Southwestern Graduate School of Biomedical Sciences, also contributed to this study. It was funded in part by grants from the National Institutes of Health and The Robert A. Welch Foundation.

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