

Intracellular Gene Transfer from the Mitochondrion to the Nucleus in *Toxoplasma gondii*

Erica M. Hall {Chih-Horng Kuo, Abhijeet A. Bakre}, (Jessica C Kissinger), Department of Genetics, University of Georgia, Athens, GA 30602

Toxoplasma gondii is a unicellular, eukaryotic apicomplexan parasite that causes toxoplasmosis, a widespread disease capable of causing serious health problems in immunocompromised individuals and pregnant women. *T. gondii* is a model protist parasite because of its genetic accessibility, ease of experimental use, and available genome sequences.

Toxoplasma gondii presents a unique opportunity to study the phenomenon of intracellular gene transfer between organellar and nuclear compartments. The *T. gondii* nuclear genome contains ~7,200 assorted fragments of its mitochondrial genome, accounting for up to one percent, depending upon the level of conservation, of the nuclear genome sequence. The focus of my research is to elucidate the mechanism(s) by which NUMTs (nuclear sequences of mitochondrial origin) arose in *T. gondii*. Our hypotheses include a mechanism of continual transfer of fragments over evolutionary time, or a few original transfers followed by subsequent fragmentation and multiplication within the nuclear genome.

My computational research supports the former since NUMT sequence containing a 60-100% gradation of conservation with mitochondrial genome sequence are observed. Genomic Southern blots confirmed the large number of NUMTs. My sequence analyses have discovered multiple 40-200bp repetitive elements encoded by the mitochondrial genome that may be facilitating transfer; however, this remains to be verified via analysis of the target insertion sites in the nuclear genome. The completion of this project will increase our understanding of genome evolution in this organism and the process of intracellular gene transfer.