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Mitochondrial DNA insertion into nuclear chromosomes of maize

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Every mitochondrion contains its own DNA separate from the nucleus. Over evolutionary time, most of the mitochondrial genes have moved to the nucleus so that now mitochondria require nuclear DNA to function. This type of transfer is an apparently ongoing process based on our observations that large pieces of the mitochondrial genome have been transferred to the nucleus. The focus of this study was to find the locations of mitochondrial DNA (mtDNA) on nuclear chromosomes in the B73 line of maize and compare these locations to other lines, using fluorescence in situ hybridization (FISH). First, cosmids previously made from a normal mtDNA genotype (NB) were maxi-prepped and then direct labeled with fluorescent tags. Next we prepared slides of B73 root tips and hybridized the labeled cosmids as well as marker probes to the cells. After hybridization, the slides were viewed and chromosome spread pictures were taken showing the location of the cosmids on the chromosomes. This process was then performed on root tip chromosomes from the Mo17, Black Mexican Sweet (BMS), and B37 lines. Twelve cosmids, representing about 71% of the mitochondrial genome, were examined and 8 different nuclear insertion sites were identified. These dispersed locations were predominantly near centromeres or telomeres on chromosomes 2 and 9. These new findings will make understanding the B73 nuclear genome sequence easier because now researchers will know what to expect at these locations and provide new information about the mechanism of mitochondrial genome transfer to the nucleus.