Poster C-5

Generation and evolutionary fate of insertions of organelle DNA in the nuclear genome of rice and Arabidospsis

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Short Abstract: Nuclear genomes are exposed to a continuous influx of DNA from mitochondria and plastids.Transfer of DNA from mitochondria and/or plastids to the nucleus is a ubiquitous, ongoing evolutionary process, which has markedly influenced the evolution of eukaryotic genomes.

Long Abstract:
Nuclear genomes are exposed to a continuous influx of DNA from mitochondria and plastids. We have characterized the structure of approximately 750 kb of organelle DNA, distributed among 13 loci, in the nuclear genomes of Arabidopsis and rice. These segments are large and migrated to the nucleus quite recently, allowing us to reconstruct their evolution. Two general types of nuclear insertions coexist; one is characterized by long sequence stretches that are colinear with organelle DNA, the other type consists of mosaics of organelle DNA, often derived from both plastids and mitochondria. The levels of sequence divergence of the two types exclude their common descent, implying that at least two independent modes of DNA transfer from organelle to nucleus operate. The post-integration fate of organelle DNA is characterized by a predominance of transition mutations, associated with the gradual amelioration of the integrated sequence to the nucleotide composition of the host chromosome. Deletion of organelle DNA at these loci is essentially balanced by insertions of nonorganelle DNA. Deletions are associated with the removal of DNA between perfect repeats, indicating that they originate by replication slippage