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In search for doubly uniparental inheritance signature of mitochondrial DNA in NGS transcriptome databases

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In DUI species, two, potentially very divergent, mitochondrial DNA lineages exist within single male individuals. Contrary to the common, strictly maternal inheritance of, males in these species transmit their mtDNA to the male offspring. Despite more than two decades of research the phenomenon remains a mystery and even the very taxonomic distribution is unclear, although it seems to be limited to some dioecious bivalves. Its potential association with sex determination system(s) is to be confirmed. PCR with "universal" primers amplifying genomic DNA was employed so far in screening for DUI. This approach suffers from certain technical limitations: it depends on the apriori knowledge of sequences and is very sensitive to large sequence divergences: the DUI can easily be missed or falsely implied in the context of numts. The next generation transcriptome sequencing technology is capable of overcoming these problems. Raw data obtained from male gonadal tissues can be assembled and searched for mitochondrial transcripts using HMM profiles. This allowed identification of divergent sequences without any prior knowledge; the presence of two highly divergent sets of transcripts hinted at DUI. Obtaining the complete mtDNA sequences was then relatively straight forward, using combination of Long Range PCR and direct sequencing of re-PCR products. Here we present the preliminary analysis of transcriptomic data from several important bivalve species, showing the usefulness of the approach. The interplay of the two approaches: comparative transcriptomics and mitogenomics will hopefully lead to elucidation of the nature of DUI in particular and better understanding of mitochondrial inheritance in general.

Biography

Artur Burzynski has completed his PhD at the age of 30 from Jagiellonian University, (Cracow, Poland) and postdoctoral studies from Vanderbilt University School of Medicine (Nashville, TN, USA). He is currently the Head of Molecular Biology Lab at IOPAN, a premiere Polish research organization and is also engaged in teaching genetics, bioinformatics and biotechnology at Pommeranian University in Slupsk, Poland. He has published more than 20 papers in reputed journals and is serving as an editorial board member in some of them.

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