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Tris-arene mediated gene delivery of *Escherichia Coli*, *Saccharomyces cerevisiae*, *Arabidopsis thaliana*, and Human Embryonic Kidney (HEK-293) cells

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Delivery of nucleic acids (DNA, RNA) into cells has become a staple in biomedical research representing a $4.3 billion per year DNA and RNA delivery reagents market. Legions of biomedical researchers use this laboratory procedure to conduct research related to gene therapy, genetic engineering, agricultural crop enhancement, protein production, and many more. However, the known methods do not typically transport large plasmids (>15 kilobases (kb)). With the use of large DNA molecules, the efficiency of gene delivery decreases and the cytotoxicity increases. In this abstract, we report the use of tris-arenes based either on isophthalic acid or 2, 6-dipicolinic acid, to transport nucleic acids into cells with greater efficiency and with no detected cytotoxicity. Recent studies have demonstrated their ability to transport various ions through membranes. In this report, we demonstrate three important properties of these simple diamides. First, tris-arenes transport plasmid DNA into *Escherichia coli*, *Saccharomyces cerevisiae*, *Arabidopsis thaliana*, and human embryonic kidney (HEK-293) cells. Second, we demonstrate here that transformation of large pVIB plasmids (up to 25 kb) into *E. coli* were enhanced over water controls by ~10-fold. These results are in striking contrast to the normal decrease in transformation with increasing plasmid size. Third, these tris-arenes do not exhibit any cytotoxicity or mutagenic effect at the concentrations at least 15-fold higher than used in the transformation procedures. A gel mobility shift assay supports the proposed mechanism of tris-arenes binding DNA and inducing a "histone-like" compression of relaxed plasmid DNA.

Biography

Jason Lee Atkins, a Molecular and Cell biologist, PhD student from University of Missouri St. Louis, conducted this research. He has published two articles in Chemical Communication and Journal of American Chemical Society. He is also the co-founder of Genetix Fusion, LLC, A biotechnology company commercializing innovative gene delivery products. He has received academic and entrepreneurial awards including graduate student of the year, inventor/entrepreneur of the year 2013 and has received grants from University of Missouri, Fast Track and Arch Grants. This work was conducted in the laboratory of Dr. George W. Gokel, a Distinguished Professor of Science and Director of the Center for Nanoscience at the University of Missouri, St. Louis.