

New complex offers potentially safer alternative for gene therapy delivery

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Spontaneous ordering of DNA fragments in a special matrix holds the key to creating non-toxic gene therapy delivery vectors, according to a study recently published in the *European Physical Journal E*.

Scientists from the CNRS Paul Pascal Research Centre, an institute of the University of Bordeaux, France, and colleagues from the Institute of Physics at the University of Sao Paulo, have created a complex system designed to hold DNA fragments in solution between the hydrophilic layers of a matrix of fatty substances (also known as lipids) combined with a surfactant (used to soften the layers' rigidity). One possible application that has yet to be tested is gene therapy.

Although gene therapy was initially delivered using [viral vectors](#), recent attempts at devising alternative vectors have exploited positively charged lipids to form complex structures holding DNA fragments with [electrostatic forces](#). However the positively charged ions, known as cations, used in this type of vector have proven toxic for [human cells](#).

Until now, only positively charged fatty substance were thought capable of holding DNA in a complex vector. The authors of this study have proved otherwise by creating an electrically neutral matrix, structured like a multi-layered cake, which holds the DNA fragments at a high concentration in solution between the layers.

The authors found that [DNA fragments](#) within the complex self-organise over time. These fragments spontaneously align parallel to one another

and form rectangular and hexagonal structures across the layers. The change of atomic-level interactions within the layers and the appearance of interactions at the interface between the layers and the [DNA molecules](#) may explain the emergence of ordered structures at high DNA concentrations.

The next step of this research involves elucidating the precise physical forces that hold the complex together. Applications of such technology go beyond [gene therapy](#) vector design, as the same principle can be applied for the delivery of other particles such as chemical drugs.

More information: Supramolecular polymorphism of DNA in non-cationic L_α lipid phases. *European Physical Journal E*. L. Navailles et al. Volume 34, Number 8, 83, [DOI: 10.1140/epje/i2011-11083-x](https://doi.org/10.1140/epje/i2011-11083-x)

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