e! Science News

New data obtained on liposomes employed in drug encapsulation and gene therapies

Published: Tuesday, February 8, 2011 - 10:40

University of Granada scientists and the Spanish Higher Institute for Scientific Research (CSIC) have made significant progress in understanding lipid membranes, which are extensively employed in the development of cosmetic and drug products, and which have potential application in the field of nanotechnology. Phospholipid vesicles (liposomes) are colloidal systems that arise considerable interest from the pharmaceutical, cosmetic and food industry, since they are biocompatible in protein, nucleic acid, drug, etc encapsulation. Further, from a scientific perspective, liposomes are considered a model system of cell membranes that have been implemented in the study of biological transport processes through cell membranes, as well as in the study of aggregation processes induced by biological substances, etc.

To develop products of biotechnological interest, understanding thoroughly the electrostatic properties of these membranes is necessary. This was the purpose of **Alberto Martín Molina** and **César Rodríguez Beas**, from the Department of Applied Physics of the University of Granada, and **Jordi Faraudo** from the Instituto de Ciencias de Materiales in Barcelona (CSIC), authors of a study recently published in the journal *Physical Review Letters* (Vol. 104; pp 168103 (2010). 104, pp 168103 (2010)).

Inverting its Electrostatic Charge

This study discloses why certain lipid membranes can invert their surface electrostatic charge, that is, why these membranes have negative charge, but they can function as positive charge material in specific circumstances. This type of membranes are extensively employed in gene therapies.

Such behaviour is due to the fact that the interphase of these membranes in water is soft, permeable and highly hydrated. "Such environment attracts small objects with significant electric charge. These membranes tend to gather in large groups acquiring electric charge", researchers state. For the purpose of this study, electrophoresis experiments and computer-based simulations were conducted. Such trials were made using a supercomputer belonging to the Spanish Supercomputing Centre, since these trials required a long time and high calculation performance.

After a sustained period of several months, researchers obtained revealing results from simulations, which allowed them to prepare a new inversion mechanism for their experimental system. This mechanism is as follows: phospholipid membranes have the ability to absorb lanthanum cations, which go from being associated to the solution water molecules to associating to the membrane atoms.

Source: University of Granada