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On Demand Vesicle Formation From Vesicle Precursors

Tech ID: 25118 / UC Case 2015-406-0

BRIEF DESCRIPTION

UC Irvine researchers developed a safer method of spontaneously generating giant unilamellar vesicles (GUVs) that increases the life span and durability of the GUVs.

FULL DESCRIPTION

Giant unilamellar vesicles (GUVs) are spherical vesicles comprised of a single lipid bilayer that are used as vehicles for drug delivery. Microfluidic methods to make GUVs in bulk solution are widespread, but suffer from significant disadvantages, including low encapsulation efficiency, non-uniformity of distribution, unwanted multiple lipid layers, and storage limitations.

There are two microfluidic primary methods to form GUVs that have overcome many of these limitations: (1) microfluidic jetting of a preformed lipid bilayer, and (2) utilizing post-processing to convert double emulsion templates into vesicles. However, these methods utilize volatile non-biocompatible organic solvents, which are not ideal. In addition to raising safety concerns for researchers, these organic solvents cause encapsulation problems and make the GUVs more fragile. Additionally, GUVs made by converting double emulsions into vesicles during post-processing produce GUVs that have a short life span in solution and begin to degrade.

Researchers at UC Irvine developed a safer method using a microfluidic device to form GUVs through double emulsion without the use of these harmful volatile solvents, wherein double emulsions (precursors) spontaneously form into vesicles upon introduction of an electrolyte solution. This method enables researchers to mass-produce precursors and store them for more than a year, increasing vesicle life span by preventing degradation and greatly reducing cost.

ADVANTAGES

- § Method is safer for researchers due to the use of biocompatible oils rather than volatile organic solvents.
- § GUVs exhibit a longer life span and increased durability.
- § GUVs can be mass-produced in precursor form at a central facility, greatly reducing cost.
- § Precursor double emulsions can conveniently be stored with a patient or customer for up to a year and spontaneously form into vesicles upon introduction of an electrolyte solution.

STATE OF DEVELOPMENT

The researchers are currently working on optimizing this process to remove the oil caps on the vesicles, and are currently looking for a commercial partner to further develop this invention.

PATENT STATUS

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OTHER INFORMATION

CATEGORIZED AS

- » **Biotechnology**
- » Other
- » **Materials & Chemicals**
- » Biological
- » **Medical**
- » Delivery Systems

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2015-406-0

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2015-406

» Lee, A. et al., “Generation of Multisomes and Giant Unilamellar Vesicles from Storable Double Emulsion Templates,” 20th International Conference on Miniaturized Systems for Chemistry and Life Sciences (MicroTAS 2016), Dublin, Ireland, October 9 – 13, 2016. - 10/09/2016

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