DNA Amplification in Double Emulsion Templated Vesicles

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Abstract

The emerging field of synthetic biology applies a vision inherited from engineering to create gene circuits that mimic the genetic pathways of living cells. The encapsulation and proper functioning of these gene circuits within aqueous compartments or vesicles constitute a first step towards the development of artificial cells [1]. Unfortunately, the production of these artificial cells remains as a proof-of-concept due to the poor encapsulation efficiency of conventional methods for vesicle production. Here, we propose to use microfluidic technologies to fabricate thousands of identical vesicles, efficiently encapsulating a gene amplification system within their cores [2]. Using this approach, we recreate a DNA amplification process that utilizes the phi 29 DNA polymerase [3]. We quantify this DNA amplification from the fluorescence emission of Evagreen®, a fluorophore that only emits if bound to double-stranded DNA. This engineered system may help understand gene evolution since it enables the study of the role of stochasticity in DNA amplification.

References

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