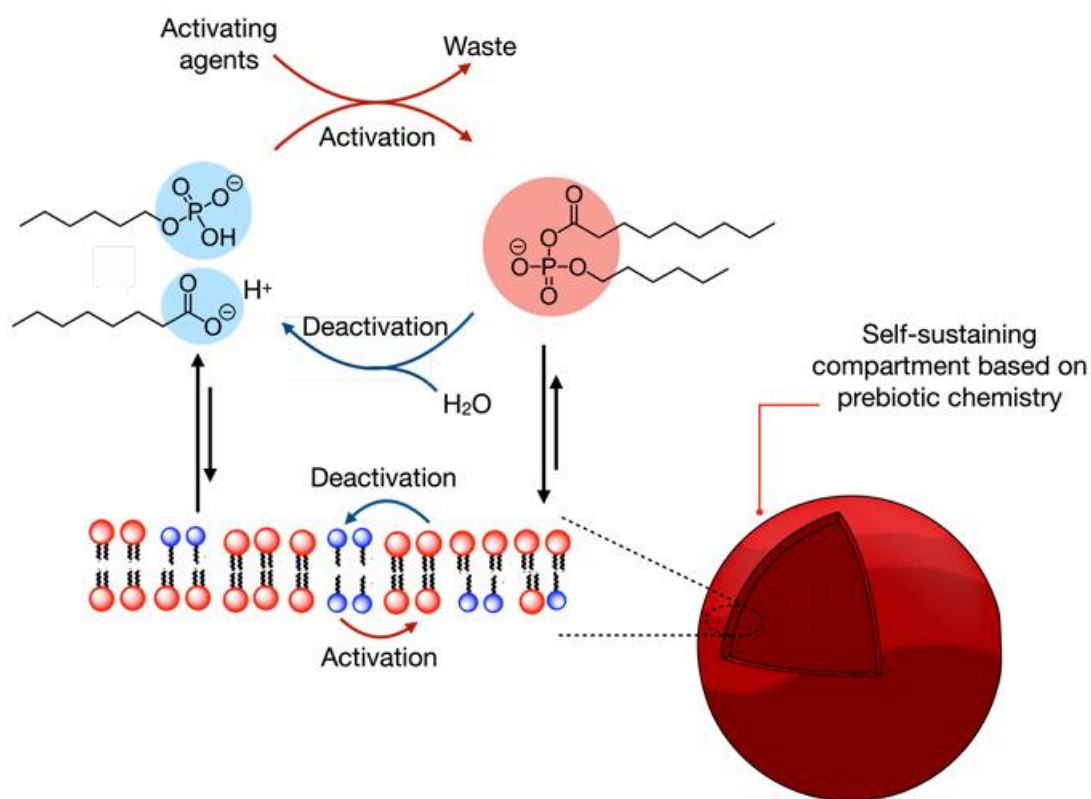


Acyl phosphates as chemically fueled building blocks for self-sustaining protocells

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Who are the corresponding authors and what are their research areas?

Job Boekhoven:

He and his group is famous for developing the carbodiimide-fueled reaction cycle. They applied this reaction cycle in many aspects like self-assembly or phase separation.

What is the main claim of the article?

In this article, the authors developed self-sustaining transient vesicles out of equilibrium using fatty acids and alkyl phosphates, with activating agents as fuel. This vesicle system has the potential to be used in prebiological studies.

How is it demonstrated?

HPLC and LCMS were used to identify compounds and investigate the kinetic profile.

The presence and concentration of vesicle were tested by MC540 assay and cryo-TEM. Critical vesicle concentration is also decided by MC540 assay.

To understand the nature of the vesicles, confocal fluorescence microscopy was used.

The vesicles were separated from solution by centrifugation and were then examined by HPLC and ^{31}P -qNMR to understand the composition.

What are the typical experimental conditions?

They used C_6 and C_8 as carboxylate and synthesized C_6P and C_8P as the alky phosphate. By adding activating agents like EDC, acyl phosphates were produced.

The experiment is in water with MES buffer 200mM, containing pyridine 100 mM. The pH is kept at 6 and temperature 37 degree.

20 mM of EDC was added to 40 mM C_6P and 40 mM C_8 . And this amount of EDC was consumed in around one hour. The half-life of $\text{C}_8\text{C}_6\text{P}$ is about 16 hours. Vesicles start to be detected by cryo-TEM after 6 hours of adding EDC.

Which are the key related papers?

Bonfio, C.; Caumes, C. c.; Duffy, C. D.; Patel, B. H.; Percivalle, C.; Tsanakopoulou, M.; Sutherland, J. D., Length-selective synthesis of acylglycerol-phosphates through energy dissipative cycling. *J. Am. Chem. Soc.* **2019**, 141 (9), 3934-3939.

Bergmann, A.M., Bauermann, J., Bartolucci, G., Donau C., Stasi M., Holtmannspötter A.-L., Jülicher F., Weber C. A. , Boekhoven J., Liquid spherical shells are a non-equilibrium steady state of active droplets. *Nat Commun* **2023**, 14, 6552.

Andreas Englert, Felix Majer, Jannik L. Schiessl, Alexander J.C. Kuehne, Max von Delius, Acylphosphates as versatile transient species in reaction networks and optical catalyst screenings, *Chem*, **2023**, ISSN 2451-9294, <https://doi.org/10.1016/j.chempr.2023.11.015>.

Caren Wanzke, Alexander Jussupow, Fabian Kohler, Prof. Dr. Hendrik Dietz, Prof. Dr. Ville R. I. Kaila, Prof. Dr. Job Boekhoven. Dynamic Vesicles Formed By Dissipative Self-Assembly. *Chemsyschem.* **2020**, 2 (1), e1900044.