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Co-origin of Oligopeptide/Oligonucleotide/Membrane with an N-phosphoryl Amino Acid Model in Origin of Life

Yong-fei Yu,[1] Wan-yun Shu,[1] Yan Liu*,[1] Yufen Zhao*[1]

[1] College of Chemistry and Chemical Engineering, Xiamen University, Xiamen, Fujian 361005 (P.R. China)

*stacyliu@xmu.edu.cn, yfzhao@xmu.edu.cn

Introduction: In recent years, a new viewpoint has been concerned in origin of life that is focused on forming high-yield products, contrast with giving thousands of compounds in low yields. In other words, selectivity and efficiency are focused instead of diversity and complexity[1]. Lacking of enzymes, **high-selectivity reactions may be more favorable for initial life in prebiotic chemistry**.

Phosphorus compounds are active in transport processes and information conservation; energy conversion and transfer, membrane structures and signal transmission. Meanwhile, more evidence indicates that phosphorylation may also play in a centre role in the origin of life[2]. Since Miller experiment revealed the high possibility of bioactive molecules converted from inorganic molecules, Different kinds of amino acids, nucleotides and membrane precursors have been considered to be possibly exist in prebiotic period[3]. Herein, we are determined to establish a new model for the co-origin theory[4], which phosphorylation manifests significantly indispensable in origin of life.

Polyphosphates were found to be approached in prebiotic period. In recent years, focused on trimetaphosphate (P_3m), our group has successfully synthesized various essential life molecules, including ATP, oligopeptides, and membrane precursors.(Figure 1A) This reaction system provides the diversity of phosphonic derivatives. On the other side, unsatisfactory selectivity seems deficiency for primal lives. With this in hand, we proposed an *N*-phosphoryl amino acid model for deeply studying the importance of phosphorylation in life process[5]. In this article, we demonstrated a green and efficient pathway for the synthsis of phosphatidylserine (PS)[6] and Ser-His, an original molecule evolutionary model of modern protease[7] (Figure 1B). Notably, histidine shows reputably activity in this peptide reaction competing against other amino acids. We owe to selfcatalysis of Ser-His[8], which might suggest the origin of protease.

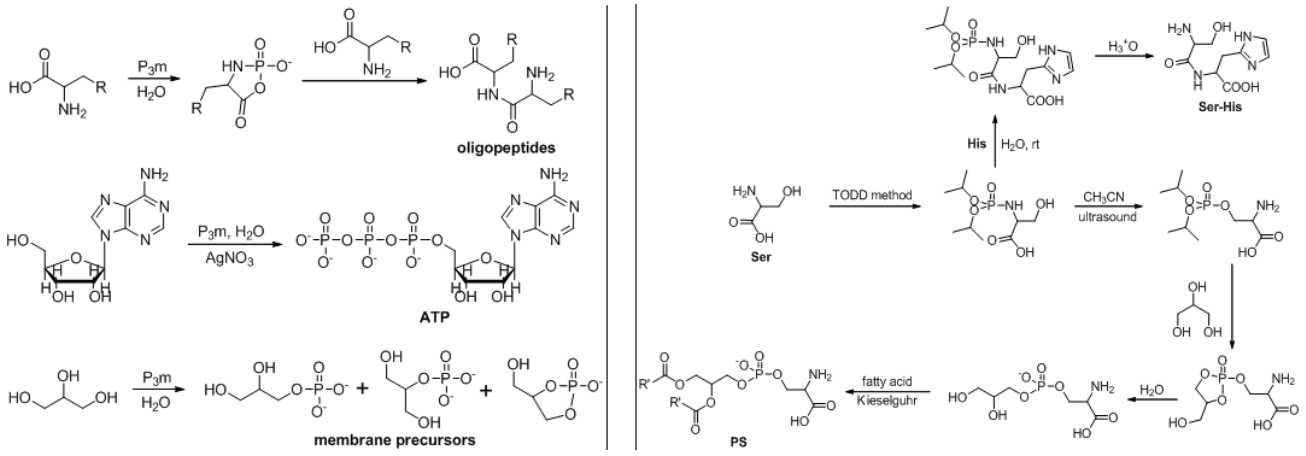

Figure 1 (A) Bioactive molecules treated by trimetaphosphate (B) *N*-DIPP-Ser-mediated formation of PS and Ser-His

References:

[1] J. W. Szostak (2016) *Medicina* 76:199-203. [2] A. W. Schwartz (2006) *Philos, Trans, R, Soc, Lond, B Biol*, 361:1743-1749. [3] J. D. Sutherland et al. (2015) *Nature Chemistry*, 7(4):301-307. [4] R. F. Service et al. (2015) *Science*, 347:1298-1298. [5] Y. F. Zhao et al. (2015) *Sci China Chem*, 58(3):374-382. [6] B. Marrapu et al. (2015) *Eur. J. Lipid Sci. Technol.* 117:1049-1055. [7] Y. Liu (2011) *Scientia Sinica Chimica*, 41:579-586. [8] J. W. Szostak (2013) *Nature Chemistry*, 5:495-501.

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