

Submission Date: 05/27/2024

2023 Academic Year Bio-SPMs Collaborative Research Research Report Summary

Title of the research project		Pore formation of alpha-toxin from <i>Staphylococcus aureus</i> and its toxoids investigated by Atomic Force Microscopy	
PI (Person in charge of the research project)	Name	Assoc. Prof. Dr. Nguyen Duc Hoang	
	Affiliated Institution and Department/Division/etc.	University of Science, Ho Chi Minh City, Vietnam (Vietnam National University, Ho Chi Minh City) / Center for Bioscience and Biotechnology	
	Position	Director	
Bio-SPMs that you used (Check the boxes)		<input type="checkbox"/>	Atomic resolution/3D-AFM
		<input checked="" type="checkbox"/>	High-speed AFM
		<input type="checkbox"/>	SICM
		<input type="checkbox"/>	AFM for Cell Measurement
Collaborative NanoLSI Faculty Members		Dr. Ngo Xuan Kien	
Describe the summary of the research project			
<p><i>Staphylococcus aureus</i> is a dangerous pathogen with many virulence factors, the most prominent of which is alpha-toxin (also known as alpha-hemolysin, Hla). Hla is the first bacterial exotoxin identified as pore-forming in lipid membranes. The research project aims to elucidate the pore formation of Hla on bilayer lipids. This project used biochemical experiments and High-speed AFM. Hla and its mutants (W179A/R200A) were successfully constructed, purified, and available for all experiments. We made liposomes composed of different lipid compositions to investigate the pore formation of Hla in lipid membranes. The mechanism of Hla pore formation includes three steps: (i) association of monomers to a lipid bilayer; (ii) oligomerization into pre-pore on the lipid bilayer; and (iii) transition from the pre-pore to the pore state. We have elucidated the pore formation process of Hla in lipid membranes and shown that the pre-pore structure forms with beta-barrel before insertion into the membrane to form the pore structure. Additionally, the dependence of pore formation by Hla on cholesterol was demonstrated. We are also developing a data analysis method to analyze big data acquired by HS-AFM.</p>			

*This form (Form 3) will be open on the NanoLSI website in the following academic year.

*Note that this form should be prepared in one A4-size paper.

*Submission Deadline: May 10, 2024 (Friday). **Submit it as a PDF file.**

*Submission Destination: the person in charge of Bio-SPMs collaborative research at WPI-NanoLSI, Kanazawa University

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