# Experimental report

13/09/2022

**Proposal:** 8-02-935 **Council:** 10/2020

**Title:** Utilizing neutron reflectivity to understand the biological function of the intrinsically disordered N-terminus of Magnesium transporter A

**Research area:** Chemistry

**This proposal is a resubmission of 8-02-926**


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**Samples:** POPS
POPC
KEIF

| Instrument | Requested days | Allocated days | From | To |
|---|---|---|---|---|
| D17 | 3 | 2 | 01/07/2021 | 03/07/2021 |
| FIGARO | 3 | 0 | | |


## Abstract:

Knowing your enemy is essential in war, and this also applies in the war against bacterial infections. In order to develop new antibiotics, it is necessary to not only understand the antibacterial agents, but also the bacteria it is supposed to work against. Magnesium transporter A (MgtA) is a protein found in the cell membrane of S. typhimurium and E. coli. Recent studies have discovered that the N-terminus of MgtA (amino acid 1-33, from hereon called KEIF) is intrinsically disordered, but the benefit of this unstructured part is not yet clear. Thus, the aim of this study is to figure out how the intrinsic disorder of Keif contributes to the biological function of MgtA. Bulk studies of Keif have been performed using two simulation techniques (MC and MD), in combination with CD and SAXS experiments. Investigation of surface interactions have also been done using QCM-D. To continue studying the membrane interactions of Keif we would like to expand our research to include neutron reflectivity (NR). By combining all these different methods, we hope to gain a holistic understanding of the biological function of KEIF in MgtA, which in the future might lead to new effective antibiotics.

# Experimental report for 8-02-935 on D17

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1-7-2021 to 3-7-2021

During experiment 9-02-935 performed on D17 we measured the interaction of the N-terminal region of MgtA, amino acid 1-33, hereafter referred to as KEIF, with model lipid membranes. Previously, adsorption of KEIF to a silica surface has been investigated using both QCM-D as well as NR (SuperADAM, September 2019). The aim of the current experiment was to investigate the interaction of KEIF with lipid bilayers. QCM-D results indicate the removal of lipids from the bilayer upon rinsing after interaction with KEIF, and we, therefore, wish to get a better understanding of the interaction.

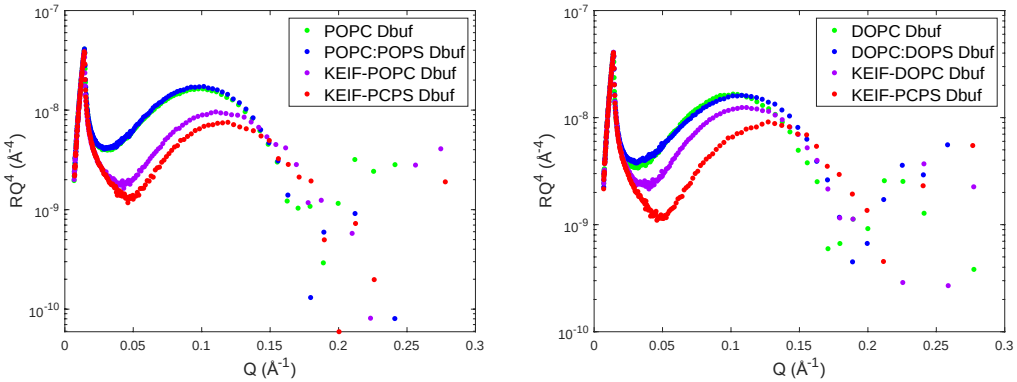


**Figure 1.** Reflectivity curves of bilayers before and after interaction with KEIF in Dbuffer, POPC/POPC: POPS 9:1 (left) and DOPC/DOPC: DOPS 9:1 (right).

In the reflectivity curves obtained, we can clearly see a difference in the bilayer before and after interaction with KEIF in all four cases. The change in reflectivity is larger for the bilayers containing 10% of the negatively charged lipid PS compared to the zwitterionic bilayers obtained with only PC. This is an ongoing project, and further analyses are needed as well as complementary computer simulations to achieve a better understanding of the underlying physics.