



Substrate import at work: single-molecule studies of ABC transporters

Fact Sheet

Project Information

SM-IMPORT

Grant agreement ID: 638536

[Project website](#)

DOI

[10.3030/638536](https://doi.org/10.3030/638536)

Project closed

EC signature date

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Start date

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End date

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Funded under

EXCELLENT SCIENCE - European Research Council (ERC)

Total cost

€ 1 500 000,00

EU contribution

€ 1 500 000,00

Coordinated by

LUDWIG-MAXIMILIANS-
UNIVERSITAET MUENCHEN



Germany

Objective

ABC (ATP Binding Cassette) transporters represent the most abundant and diverse family of transport proteins known that play crucial roles in numerous cellular processes. Despite their importance, all proposed molecular models for transport are based on indirect evidence due to the inability of classical biophysical and biochemical techniques to directly visualize dynamic structural changes. To solve this problem, I suggest a novel approach that can decipher the molecular mechanisms of transport, with the ultimate goal to use this knowledge against pathogenic bacteria,

for treatment of ABC-related diseases or multi-drug resistance of cancer cells. I propose to use single-molecule fluorescence microscopy for the study of conformational states of an ABC model system in vitro, and thus to observe directly how elementary transport steps are coordinated. This will open up a virtually unexplored biophysical research area and provide a detailed understanding of the molecular mechanisms of ABC transporters. The key questions of this proposal are:

Aim 1: What is the mechanism of substrate binding in ABC transporters? The conformational equilibrium (open vs. closed state) of ABC-associated substrate-binding proteins will be studied to understand the molecular mechanism of binding, i.e. induced fit vs. conformational selection.

Aim 2: What are relevant conformational states and changes for substrate translocation? The time- and length-scales of conformational changes in transmembrane and nucleotide binding domains as well as interactions with other domains will be characterized using the osmoregulator OpuA as a model system.

Aim 3: How are substrate binding, energy utilization and translocation coordinated in ABC transporters? Finally, a complete model of transport will be developed to decipher the coordination of transport events, i.e. how substrate binding and ATP-hydrolysis are coupled and transferred into conformational changes that drive substrate transport.

Fields of science (EuroSciVoc)

[natural sciences](#) > [biological sciences](#) > [microbiology](#) > **[bacteriology](#)**

[natural sciences](#) > [biological sciences](#) > [biochemistry](#) > [biomolecules](#) > **[proteins](#)**

[natural sciences](#) > [physical sciences](#) > [optics](#) > **[microscopy](#)**

[natural sciences](#) > [biological sciences](#) > [biochemistry](#) > [biomolecules](#) > **[lipids](#)**

[natural sciences](#) > [biological sciences](#) > [genetics](#) > **[nucleotides](#)**



Programme(s)

[H2020-EU.1.1. - EXCELLENT SCIENCE - European Research Council \(ERC\)](#)

MAIN PROGRAMME

Topic(s)

Call for proposal

[ERC-2014-STG](#) 

[See other projects for this call](#)

Funding Scheme

[ERC-STG - Starting Grant](#)

Host institution



LUDWIG-MAXIMILIANS-UNIVERSITAET MUENCHEN

Net EU contribution

€ 500 000,00

Total cost

€ 500 000,00

Address

**GESCHWISTER SCHOLL PLATZ 1
80539 MUNCHEN**

 **Germany** 

Region

Bayern > Oberbayern > München, Kreisfreie Stadt

Activity type

Higher or Secondary Education Establishments

Links

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Beneficiaries (2)



LUDWIG-MAXIMILIANS-UNIVERSITAET MUENCHEN

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Total cost

€ 500 000,00



RIJKSUNIVERSITEIT GRONINGEN

 Netherlands

Net EU contribution

€ 1 000 000,00

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**Broerstraat 5
9712CP Groningen** 

Activity type

Higher or Secondary Education Establishments

Links

[Contact the organisation](#)  [Website](#) 

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Total cost

€ 1 000 000,00

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European Union, 2025

