Open position for the LSM call of applications

Department/Institute: LMU Faculty of Biology, Microbiology

Subject areas/Research fields: Microbiology, Molecular Biology

Keywords: *Pseudomonas putida*, iron acquisition, siderophore production, tripartite efflux systems, membrane proteins, transport

Name of supervisor: Prof. Dr. Heinrich Jung

Project title: Role and mechanism of tripartite efflux pumps in pyoverdine secretion in *Pseudomonas putida* KT2440

Project description:

Iron is essential for most organisms, but often difficult for bacteria to acquire because iron ions have a low solubility in natural habitats or are bound to proteins in hosts. Bacteria of the genus *Pseudomonas* solve this problem by the synthesis, secretion and re-uptake of the iron scavenging siderophore pyoverdine (PVD). PVD synthesis and uptake of the PVD-iron complex are relatively well investigated, however, the mechanism of PVD secretion is only partially understood. This project explores the mechanism of PVD secretion using the soil bacterium *Pseudomonas putida* KT2440 as experimental model. The strain is the best studied saprophytic pseudomonad, a functional chassis for industrial biocatalysis, and it produces only one type of siderophore, PVD. Our preliminary results suggest that PVD secretion does not depend on a particular efflux system, but on several so-called tripartite efflux pumps, which are in part known to contribute to drug resistance. We plan (1) to identify the efflux pumps involved in PVD secretion in *P. putida* KT2440; (2) to investigate the specific role of these pumps in PVD-mediated iron acquisition and in the resistance against drugs and other toxic compounds; and (3) to characterize PVD transport for the first time at the biochemical level to test a direct involvement of tripartite efflux pumps in PVD transport and to obtain information on the mechanism of energy coupling, substrate specificity and kinetics. The results are expected to contribute to a better understanding of the physiology of pseudomonads under iron limitation and to shed new light on the physiological significance of tripartite efflux pumps.

Qualifications

Experience with microbiological techniques, *e.g.,* construction of mutants and reporter strains, and molecular and biochemical techniques, e.g., PCR, qRT-PCR, Western blotting purification and characterization of RNA and proteins, is helpful.

References

Stein, N.V., Eder, M., Burr, F. Stoss, S., Holzner, L., Kunz, H.-H.., and Jung, H. (2023) The RND efflux system ParXY affects siderophore secretion in *Pseudomonas putida* KT2440. *Microbiol. Spectr.,* in press

Stein, N.V., Eder, M., Brameyer, S., Schwenkert, S., and Jung, H. (2023) The ABC transporter family efflux pump PvdRT-OpmQ of *Pseudomonas putida* KT2440: purification and initial characterization. *FEBS Lett.* **597**, 1403-1414 https://doi.org/10.1002/1873-3468.14601

Henriquez, T. , Stein, N.V., and Jung, H. (2020) Resistance to bipyridyls mediated by the TtgABC efflux system in *Pseudomonas putida* KT2440**.** *Front. Microbiol.* **11**, 1974 doi.org/10.3389/fmicb.2020.01974

Henriquez, T., Stein, N.V., and Jung, H. (2019) PvdRT-OpmQ and MdtABC-OpmB efflux systems are involved in pyoverdine secretion in *Pseudomonas putida*KT2440. *Environ. Microbiol. Rep.* **11**, 98-106 doi: 10.1111/1758-2229.12708.

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