At LMU Munich, Faculty of Biology, for the Chair of Quantitative Organismal Networks, we are looking for a

PhD researcher in Cnidarian Cell Biology

We are looking for a motivated researcher to fill a PhD position with a background in cell/molecular biology, genetics, and/or biochemistry who has interest in coral symbiosis establishment. You will work on a project entitled "**The role of integrins in symbiont uptake by Aiptasia"** using interdisciplinary approaches and the sea anemone Aiptasia as a model organism. For more information on our research visit www.guselab.de

Project background: Coral reef health depends highly on the symbiotic relationship between corals and dinoflagellate algae, *Symbiodinaceae*. In shallow, nutrient poor waters, the algae that live inside corals undergo photosynthesis and transfer essential nutrients to the host. Unfortunately, this delicate partnership is threatened by climate change and other anthropogenic factors, which leads to coral bleaching, the loss of symbionts, and eventual starvation of the corals. However, corals are capable of taking symbionts up again after a bleaching event, and as coral larvae are born without symbionts, they inherently possess mechanisms to determine appropriate symbiotic partners and phagocytose them to form a stable relationship. However, the molecular mechanisms of symbiont recognition and uptake are poorly understood.

To determine molecular mechanisms of symbiosis establishment the Guse lab uses the sea anemone *Exaiptasia diaphana,* commonly referred to as Aiptasia, as a model organism. Aiptasia are much easier to grow and maintain in the lab than corals and more reliably and consistently produce offspring for experiments. By using Aiptasia larvae, members of the Guse lab found that symbionts alter the expression of multiple Aiptasia integrins. Integrins are heterodimeric cell-surface receptors that are best known for their function of binding cells to the extracellular matrix. However, they have also been known to bind to foreign particles and facilitate phagocytosis in vertebrate immune cells. Using a combination of cell culture and pharmacological approaches, we found evidence that suggests integrins bind specifically to symbionts to enhance phagocytosis. However, we still do not know which integrins are involved in this process, and what the ligand is on the symbiont cell that facilitates this interaction. As symbiont uptake is the first step to a successful symbiotic partnership it is paramount we uncover the molecular mechanisms that govern this process to better guide reef restoration efforts and understand symbiotic relationships.

Project Aims: During this project you will use multiple approaches to determine the role of specific integrins in symbiont uptake by Aiptasia and identify the ligand on the symbiont cell that facilitates this interaction. To determine which integrins are required for symbiont uptake you will use CRISPR/Cas9 to generate integrin mutants and measure symbiont uptake in mutant Aiptasia larvae. Alternatively, fluorescently labelled integrins will be expressed, purified and added to symbiont culture. If a specific integrin binds to the symbiont you would expect to see an accumulation of fluorescent signal around the symbiont. As an additional method, Aiptasia integrins will be expressed in cell culture and symbiont uptake by the cell will be quantified to determine which integrins facilitate phagocytosis.

The second aspect of this project involves the identification of the ligand on the symbiont cell that binds to integrins to facilitate phagocytosis. Using a bioinformatics approach, you will generate a list of candidate

ligands that are predicted to localize to the symbiont cell wall and contain the protein motif required for integrin binding. At the same time, plates will be coated with integrins and an extract of symbiont cell wall will be added, washed and cell wall proteins that bind to the integrins will be determined via mass spectrometry. These two methods will give a list of candidate genes that you can then test more directly in *vitro*/*vivo*. Candidate ligands will be tested by multiple approaches. A Yeast-2-Hybrid screen will be performed to determine if the integrin and potential ligand interact. Additionally, inert beads will be coated with ligands and bead uptake will be monitored in Aiptasia larvae. Plates may be also coated with ligands and the binding of fluorescent or HRP conjugated integrins will be analyzed. Finally, if potential ligands are identified using any of the above techniques, these ligands will be mutated in the symbiont and uptake by Aiptasia larvae will be assayed. Together, this project will elucidate the integrins and ligands required to enhance phagocytosis of symbionts by Aiptasia larvae.

Your Background: This position is available to researchers with a master's degree in science. As this project is multidisciplinary and takes on multiple approaches, ideally the successful candidate would have a strong background in cell biology, molecular biology, genetics, bioinformatics and/or biochemistry. Above all, a willingness to develop and learn new techniques for this emerging model system is a must. Our working language is English, and we expect good communication skills and the ability to working independently as well as part of a diverse research team.

What do we offer: This position offers the opportunity to work in a diverse, international and motivated team, dedicated to advancing our understanding of coral symbiosis. Our research is highly topical, and we seek to actively contribute to a sustainable world. Accordingly, we offer to complement your basic research activities with opportunities for further training and with participation in transfer and outreach activities including ¡vamos, symbiosis¡ (https://vamossimbiosis.org/). The laboratory is well-funded, and researchers are supported by an excellent laboratory infrastructure at the HighTechCampus Planegg-Martinsried, which is part of the largest German university. We value good communication, a pleasant working atmosphere and personal responsibility. We are also dedicated to contribute to open and reproducible science. If applicable, you will participate in coral reef field work in Okinawa (Japan) and interact with international collaboration partners.

This is a full-time position and remuneration is up to 65% TV-L E13, depending on qualifications. LMU has signed the "Diversity Charter" and is committed to the diversity of its employees. We therefore actively promote gender equality. Severely disabled applicants will be given preference if their qualifications are otherwise essentially the same.

We look forward to receiving your application including a motivation letter, CV and names of 3 references via email (one PDF, max. 5 MB) by 12/31/2023 to:

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