Christine Kiel (née Lembke)

Email: christine.lembke@uni-jena.de

Diatom pheromones – structure and function of communication mediators of unicellular algae

Diatoms shape the marine environment as major primary producers and are the basis of aquatic food webs. The chemical cues that mediate their life cycle and mating are poorly understood. A first attraction pheromone was identified in the pennate diatom *Seminavis robusta*. This proline derived diketopiperazine L-diproline mediates the chemoattraction of the mating partners. However, it is obvious that it is not the only signa ling molecule of relevance in sexual reproduction. In this project we further investigate the pheromone system that regulates mating in *S. robusta*. We found signaling molecules that induce a cell-cycle arrest in the pairing cells and the production and perception of the attraction pheromone. The identification of these sex-inducing pheromones was done using a metabolomics approach. The exometabolomes of the two mating types of *S. robusta* were analyzed by LC-MS and upon comparison of their metabolic profiles candidate molecules were found and verified in bioassays. A sulfated, polyhydroxylated compound was identified as the L-diproline inducing pheromone, which structure will be elucidated by NMR spectroscopy and high resolution mass spectrometry. Furthermore, the identity of the second sex-inducing pheromone will be determined using the same metabolomics-assisted approach. To get insights into the diversity and mode of action of the identified pheromones, structure- activity relationship studies with L-diproline derivatives, as well as identification of the pheromones of other mating groups of *S. robusta* will be accomplished.

Publications

Lembke C, Stettin D, Speck F, Ueberschaar N, De Decker S, Vyverman W, Pohnert G (2018) Attraction Pheromone of The Benthic Diatom *Seminavis robusta*: Studies on Structure-Activity Relationships. *J Chem Ecol* 44(4), 354-363. Details PubMed

V Bondoc KG, Lembke C, Vyverman W, Pohnert G (2018) Selective chemoattraction of the benthic diatom *Seminavis robusta* to phosphate but not to inorganic nitrogen sources contributes to biofilm structuring. *Microbiologyopen* , e00694. Details PubMed

Bondoc KG, Lembke C, Vyverman W, Pohnert G (2016) Searching for a Mate: Pheromone-Directed Movement of the Benthic Diatom *Seminavis robusta*. *Microb Ecol* 72(2), 287-294. Details PubMed

Moeys S, Frenkel J, Lembke C, Gillard JT, Devos V, Van den Berge K, Bouillon B, Huysman MJ, De Decker S, Scharf J, Bones A, Brembu T, Winge P, Sabbe K, Vuylsteke M, Clement L, De Veylder L, Pohnert G, Vyverman W (2016) A sex-inducing pheromone triggers cell cycle arrest and mate attraction in the diatom *Seminavis robusta*. *Sci Rep* 6, 19252. Details PubMed

Wolfram S, Würfel H, Habenicht SH, Lembke C, Richter P, Birckner E, Beckert R, Pohnert G (2014) A small azide-modified thiazole-based reporter molecule for fluorescence and mass spectrometric detection. *Beilstein J Org Chem* 10, 2470-2479. Details PubMed

Supervisor

Georg Pohnert

Co-Supervisors

Jonathan Gershenzon

Start of PhD

October 1, 2013

Doctoral Disputation

December 19, 2018