Matrix-free single-cell LDI-MS investigations of the diatoms Coscinodiscus granii and Thalassiosira pseudonana.

Jaschinski T, Helfrich EJ, Bock C, Wolfram S, Svatoš A, Hertweck C, Pohnert G (2014) Matrix-free single-cell LDI-MS investigations of the diatoms Coscinodiscus granii and Thalassiosira pseudonana. *J Mass Spectrom* 49(2), 136-144.

Abstract

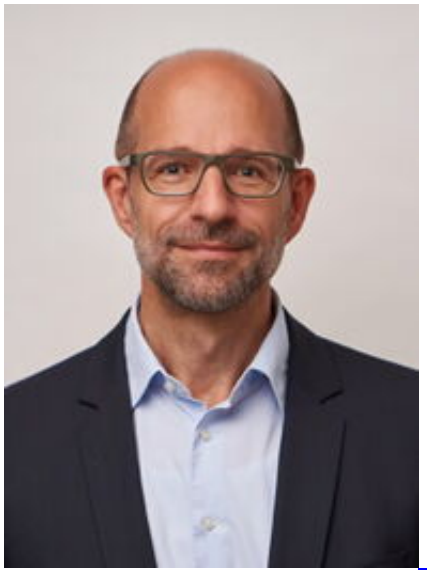
Single-cell investigations of the diatoms Coscinodsicus granii and Thalassiosira pseudonana were performed using laser desorption/ionization (LDI)-MS without the addition of chemical matrices. The unique cell wall architecture of these microalgae, more precisely the biomineralized nanostructured surface, supported the ionization of cellular as well as surface-related metabolites. In model experiments with purified diatom cell walls of eight species C. granii and T. pseudonana proved to promote the ionization of the polymer polyethylene glycol most efficiently. These species were therefore chosen for further experiments. Without any additional workup, living diatom cells can be washed, can be placed on the LDI target and can immediately be profiled using LDI-MS. Characteristic signals arising from the two species were assigned to common metabolites known from diatom metabolism. Among others, chlorophyll, phospholipids and amino acids were detected. Using these fingerprint signals, we were able to perform species-specific MS imaging down to a single-cell resolution of 20 by 20 µm. The larger C. granii cells can be directly visualized,

while more than one of the smaller T. pseudonana cells is needed to generate high-quality images. The introduced technique will pave the way toward a chemotyping of phytoplankton that will enable the automated annotation of microalgal species. But also, an assignment of metabolic plasticity on a single-cell level that could answer fundamental questions about plankton diversity is now in reach.

Beteiligte Forschungseinheiten

Biomolekulare Chemie Christian Hertweck Mehr erfahren

Leibniz-HKI-Autor*innen



Christian Hertweck

Details

Identifier

doi: 10.1002/jms.3316

PMID: 24677306