

Intact polar lipids: their distribution in the marine environment and a critical look at their value as a biomass proxy

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Polar lipids are the basic constituents of cell membranes and comprise a significant fraction of the carbon in microbial cells. There is a large variety in the molecular structures of these lipids, which are commonly subdivided according to their headgroup moiety. Many of these headgroups contain elements such as phosphorous, nitrogen or sulfur, and it is likely that their synthesis is related to the availability of these nutrients to the organism. However, our knowledge of the origin, distribution and turnover of intact polar lipids (IPLs) in the natural environment is still very limited.

In the first part of this colloquium, we will present the first comprehensive study of IPLs in marine surface waters from the North Sea. Samples were obtained during the MICROVIR cruise (summer 2007), as well as in a one-year time series at the Marsdiep jetty (2007-2008). A large variety of IPLs was detected, including different phospholipids, sulfolipids and betaine lipids, each with a range of fatty acid tails. Contrary to common perception, our samples were dominated by IPLs with headgroups containing sulfur, rather than phosphorous or nitrogen. The sulfolipids appear to derive primarily from photoautotrophic organisms, whilst the phospholipids and betaine lipids have more mixed origins.

The second part of the colloquium will focus on the value of intact phospholipids as a proxy for living microbial cells. It is postulated that phospholipids degrade rapidly upon cell death, and accordingly they are widely used to quantify microbial biomass in environmental samples. However, our understanding of phospholipid degradation remains relatively poor. We studied the phospholipid composition of decaying diatom cultures to gain new insights into degradation rates and the processes influencing it, and show that the possibility of 'fossilized' intact phospholipids cannot be excluded. Therefore a reassessment of the value of intact phospholipids as biomarkers for living microbial biomass appears necessary.