

NAVIGATING THE UNCHARTED TERRITORY OF RHIZARIAN LIPIDS

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The microfossils of foraminifera, radiolaria and other rhizaria have been studied for well over a century and find utility as important stratigraphic markers. Yet hardly anything is known about their corresponding molecular fossils. Hydrocarbon fossils of microbial lipids can be diagnostic of a particular biosynthetic origin and can be preserved in sedimentary rocks for billions of years. The lipid inventory and molecular fossils of many eukaryotic algae are well studied and provide important insights into past ecosystems. Despite their abundance and ecological importance, however, very little is known about the lipids and sedimentary molecular signatures of rhizaria. The lipid inventory of a single foraminiferal species that has to date been analysed in culture, *Allogromia laticollaris*, yielded surprising results: the 24-*n*-propylidenecholesterol produced by these foraminifera had previously been considered unique to marine pelagophyte algae (Grabenstatter et al., 2013). The geologic hydrocarbon product 24-*n*-propylcholestane is a widely applied biomarker for pelagophytes and, by inference, marine depositional conditions (Moldowan et al., 1990). The biosynthetic production of similar lipids by other rhizaria may have important implications for the interpretation of the ancient biomarker record.

We have elucidated the lipid inventory of diverse foraminifera and other rhizaria including radiolaria, acantharia, gromia and cercozoa. Corresponding molecular fossil signatures have been produced through artificial maturation and low-temperature catalytic hydrogenation experiments. Characteristic lipids with stable hydrocarbon skeletons produced by some of the studied species may have the potential to be used as evidence for the source organisms even in the absence of body-fossil preservation. The inventory of rhizarian lipids has important implications for the diagnosticity of popular biomarkers. Our compilation of lipid biosynthetic capabilities across the rhizarian phylogenetic tree allows us to track the evolutionary emergence of rhizaria. This presentation will focus on novel insights into the rise of this ecologically relevant clade.

References

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