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Molecular-Level Architecture of a Microalgal Cell Wall

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Abstract:

Recent progress in in-cell solid-state NMR (ssNMR) has allowed the *in situ* structure determination of starch (1), but also order determination of membranes in living bacteria (2) or red blood cell ghosts (3). Studying the cell wall of microorganisms brings new challenges to structural biology, especially since polysaccharides are organized as polymers with no unique sequence or structure.

Precise glycan composition of *Chlamydomonas reinhardtii* has been determined using mostly ssNMR, following a protocol recently described (4). A similar protocol was applied to the amino-acid composition determination of the microalga. The first Dynamic Nuclear Polarization study of a microalga also allowed us to detect preferential contacts within and between amino acids and glycans.

We further identified a strong heterogeneity in flexibility and hydration, depending on the nature of the glycan or amino-acid, providing hints towards molecular organization and biophysical properties of *C. reinhardtii* polysaccharides and glycoproteins in the cell wall, that can be compared to extensins in higher plants.

References :

(1) A. Poulhazan, A. A. Arnold, D. E. Warschawski and I. Marcotte "Unambiguous Ex Situ and in Cell 2D 13C Solid-State NMR Characterization of Starch and Its Constituents" *Int. J. Mol. Sci.* **19**:3817 (2018)

(2) Z. Bouhleb, A. A. Arnold, J.-S. Deschênes, J.-L. Mouget, D. E. Warschawski, R. Tremblay and I. Marcotte "Investigating the action of the microalgal pigment marennine on *Vibrio splendidus* by in vivo 2H and 31P solid-state NMR" *Biochim. Biophys. Acta Biomembr.* **1863**:183642 (2021)

(3) K. Kumar, M. Sebastiao, A. A. Arnold, S. Bourgault, D. E. Warschawski and I. Marcotte "In situ solid-state NMR study of antimicrobial peptide interactions with erythrocyte membranes" *Biophys. J.* **121**:1512-1524 (2022)

(4) A. Poulhazan, M. C. Dickwella Widanage, A. Muszyński, A. A. Arnold, D. E. Warschawski, P. Azadi, I. Marcotte and T. Wang "Identification and Quantification of Glycans in Whole Cells: Architecture of Microalgal Polysaccharides Described by Solid-State Nuclear Magnetic Resonance" *J. Am. Chem. Soc.* **143**:19374-19388 (2021)

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Session

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