Research Highlight: A Spoonful of Sugar Helps the Silica Grow Round

Sarah Ratcliffe and Paul Curnow

School of Biochemistry, University of Bristol, School of Medical Sciences, University Walk, Bristol BS8 1TD, United Kingdom

Email: sarah.ratcliffe@bristol.ac.uk

Diatoms are single-celled aquatic algae that are involved in approximately one-fifth of photosynthesis globally and fix as much carbon as all of Earth's rainforests combined. One reason for this evolutionary success is that diatoms live within the confines of an intricate outer cell wall composed mainly of silica. Diatoms have been called 'nature's nanotechnologists' because they arrange these cell walls into spectacular nano-sized patterns. How diatoms create this intricate 'glass house' is not well understood, but it seems clear that there is a central role for organic macromolecules such as sugars and proteins in regulating and coordinating this process.

Writing in PLoS ONE, Tesson and Hildebrand now investigate how large chains of sugars, known as polysaccharides, are involved in silica synthesis. Using high-resolution imaging, they identified the presence of a complex network of polysaccharide on the inner surface of silica. Another type of polysaccharide – this time, an unusual polymer based largely on individual units of glucose - was observed in various locations across the cell wall and additionally, in some species, between daughter cells during formation of their silica shells. There was considerable variability in the composition of these sugars between the five diatom species studied, suggesting that the polysaccharide network could be an important source of variation in cell wall architecture between species. This work offers a substantial development in our understanding of silica mineralization.

Tesson B, Hildebrand M (2013) Characterization and Localization of Insoluble Organic Matrices Associated with Diatom Cell Walls: Insight into Their Roles during Cell Wall Formation. PLoS ONE 8(4): e61675. doi:10.1371/journal.pone.0061675