Exolymers and mucus in harmful algae: composition, properties and roles

Oral

Multidisciplinary Studies

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For millennia, mariners have observed coloured water and the calming of ripples and waves by oil. In 1774, Benjamin Franklin showed that ~5 mL of oil could suppress ripples across ~10,000 m². By the 1980s, natural surface slicks were found to be enriched in dissolved organic matter (DOM) and more viscous than surrounding waters. Viscosity and elasticity were also detected in the surface microlayer (SML). DOM in the SML can inhibit air–sea gas exchange, including that of CO_2 and CH_4, with implications for climate models and toxic aerosols (e.g., *Karenia*, *Ostreopsis*).

In freshwater, surface cyanobacterial scums are common, yet their physical properties remain largely unmeasured. In three dimensions, rare “mucus events” can smother marine life or clog fishing gear. Rheological studies in the 1980s revealed that some harmful algal cultures are elastic and up to 400 times more viscous than culture medium, suggesting these algae engineer local water flow via exopolymers. Viscosity is also generally positively correlated with phytoplankton abundance.

Disulphide linkages (DSLs) contribute both to gelling in harmful algal bloom (HAB) mucus and to the production of reactive oxygen, indicating that DSL-rich mucus can be a toxic agent or co-agent. Conversely, mucus secreted by affected organisms may serve as a protective shield. Some HAB dinoflagellates also produce sticky, toxic mucus to trap and ingest other protists. Looking ahead, rheological tools—particularly at sub-10 µm scales—offer new ways to study mucus and surface properties as engineered traits in harmful algae.

Palabras Clave

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