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Sheath genes in the iron-oxidizing bacteria Leptothrix cholodnii SP-6 and relatives.

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To make a living via iron oxidation, iron-oxidizing bacteria (FeOB) generate large quantities of insoluble iron oxides. To avoid becoming entombed, some iron oxidizing bacteria secrete extracellular polysaccharides that provide a scaffold for the solid iron-oxides. The polysaccharides can be organized into microstructures including tubular-sheaths or a twisted stalks. Cells grow in the sheaths forming long filamentous chains or at the terminal end of the twisted stalk as individuals. Classically in freshwater systems *Leptothrix* and relatives and Gallionellaceae generate sheaths and stalks, respectively. Despite a basic understanding of the sheath and stalk composition in the literature, including hints of the genes involved, a complete model for sheath or stalk formation has not been established. We used recently developed genetic system in the sheath forming *Leptothrix cholodnii* SP-6. Using mutants containing gene disruptions and deletions in several polysaccharide associated genes, we saw mutant cells with shorter cell filament lengths and altered growth phenotypes in liquid culture relative to wild type cells. We conclude that multiple polysaccharide export systems are likely linked to sheath production.