

**Supplementary Figure S1.** HAADF-STEM images and elemental maps of ultrathin sections prepared on days 1–3. **(a-c)** TEM images of a bacterial cell and surrounding sheath across the intervening space in the sections prepared on days 1–3, with globular and/or slender forms of exudates from the cell surface. **(d-f)** Enlarged images of the structures in (a-c). Note the immature sheath composed of intermingled fibrils. **(g-i)** Bi-distribution map showing intense signals in the cell and the immature sheath in (d-f). Note the presence of carbohydrates in the cell and surrounding fibrous materials. **(j-l)** Fe distribution map showing intense signals, particularly in the sheath fibrils but not in the cell. Scale bars = 500 nm, but 100 nm in (d-l). BC, bacterial cell.

