

Supplementary Material

Single molecule imaging on living bacterial cell surface by high-speed AFM

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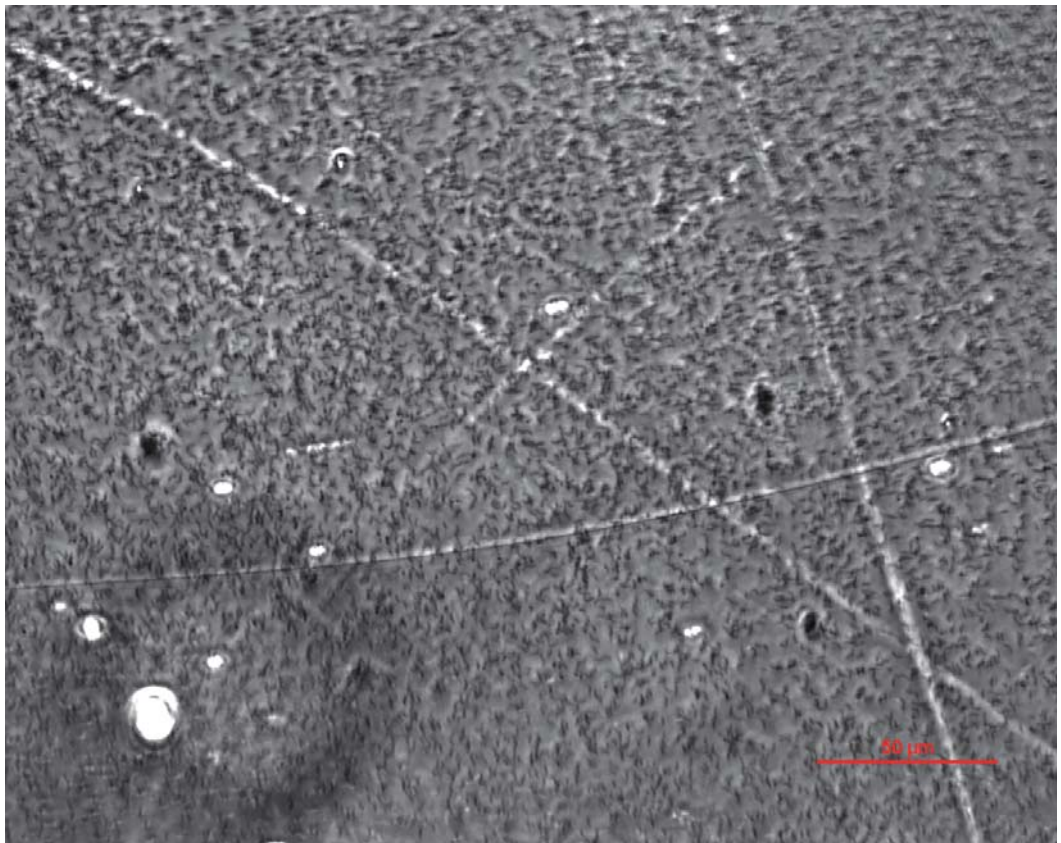
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Footnotes: ⁵ H.Y. and A.T. contributed equally to this work. ⁶ T.A. and Y.F. contributed equally to this work.

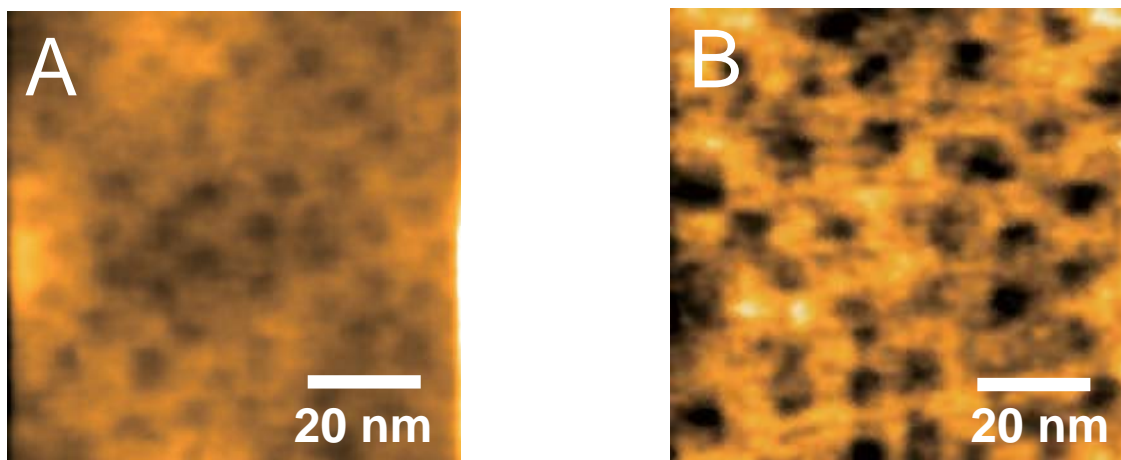
Supplementary figures

Supplementary figure 1

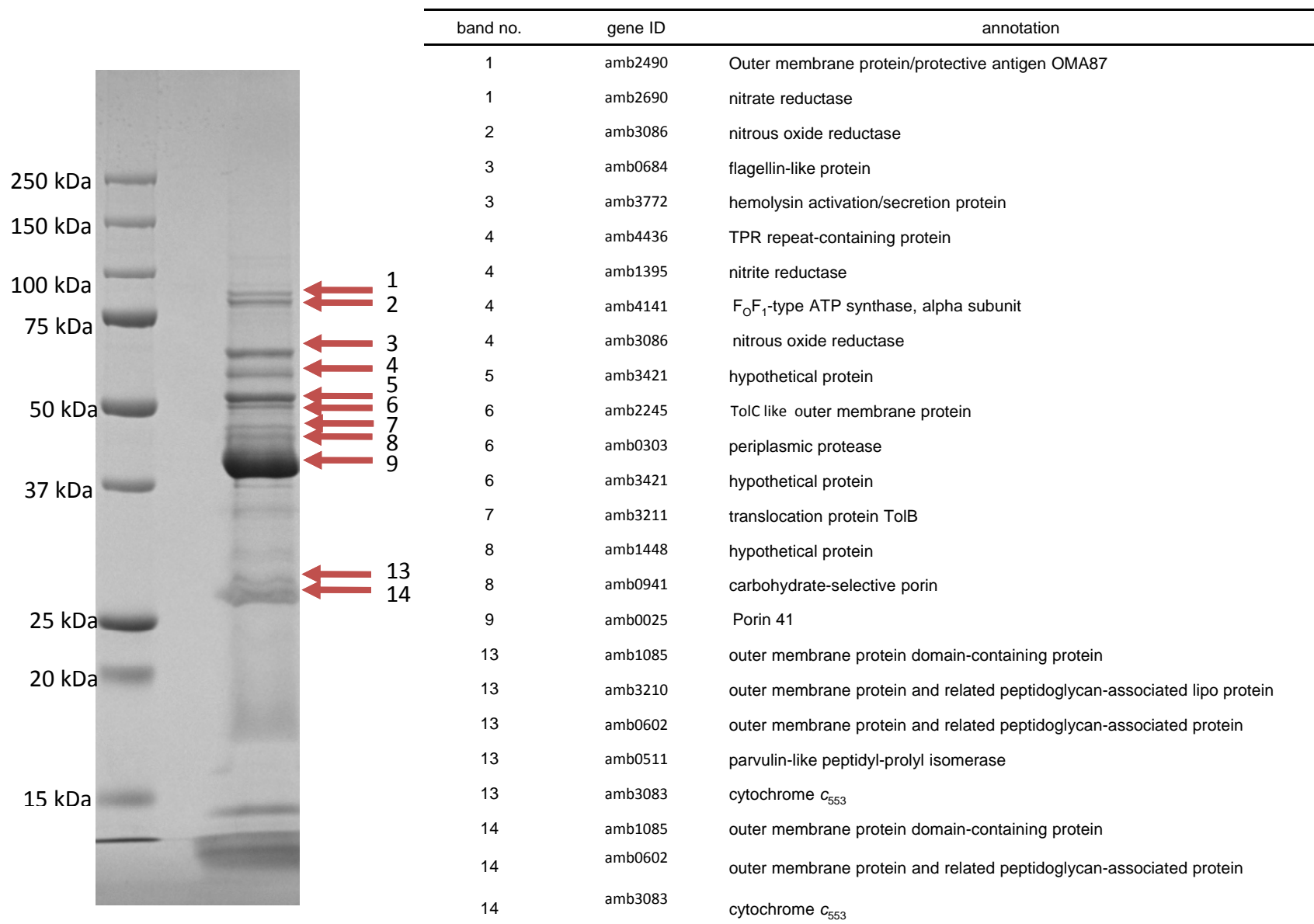


Supplementary figure 1: Phase contrast microscopic image of *M. magneticum* AMB-1 cells attached on mica treated with poly-L-lysine and glutaraldehyde.

Supplementary figure 2



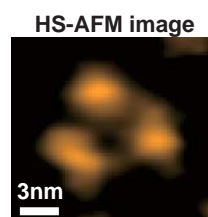
Supplementary figure 2: High magnification AFM images of cells surface of *M. magneticum* cultivated in high (21.8 mM) (A) and low (1.8 mM) (B) iron concentration media. AFM images were recorded at imaging rates of 2.0 s/frame (A) and 0.5 s/frame (B) with (A and B) 200 × 200 pixels.



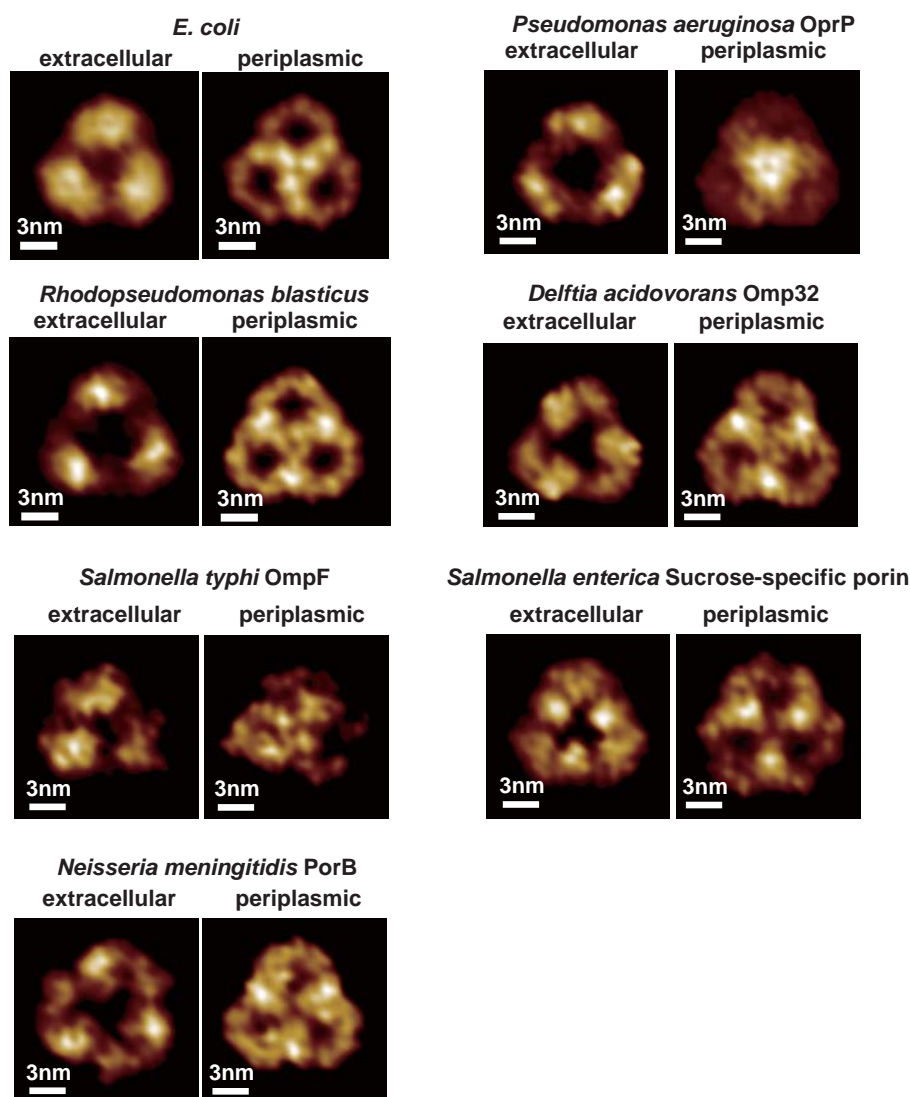
Supplementary figure 3: List of proteins identified in the outer membrane fraction of *M. magneticum* AMB-1 by using MS/MS analysis.

Supplementary figure 4

Observed image



Simulation



Supplementary figure 4: Comparison of observed triangular outer membrane protein by AFM (left) with simulated images (middle and right) constructed from crystal structural data of the known porins: *Escherichia coli* OmpF (PDB: 2OMF), *Rhodopseudomonas blasticus* porin (PDB: 2POR), *Salmonella typhi* OmpF (PDB: 3NSG), *Neisseria meningitidis* PorB (PDB: 3A2R), *Pseudomonas aeruginosa* OprP (PDB: 2O4V), *Delftia acidovorans* Omp32 (PDB: 2FGQ) and *Salmonella enterica* Sucrose-specific porin (PDB: 1OH2).

SUPPLEMENTARY MOVIE

Movie S1

Cell surface imaging by HS-AFM. Images were obtained at 1.0 s/frame with number of pixels of 200×200 .

Movie S2

HS-AFM observation of molecular dynamics on living cell surface. Images were obtained at 0.5 s/frame with number of pixels of 200×200 .

Movie S3

HS-AFM observation of cell surface immobilized with glutaraldehyde. Images were obtained at 0.5 s/frame with number of pixels of 150×150 .

Movie S4

Nano-dissection procedure of honeycomb-like structure in isolated outer membrane patch by a HS-AFM scanning. After dissection honeycomb-like structure was dissociated to triangular molecules. Images were obtained at 1.0 s/frame with number of pixels of 100×100 .