

## Hartmut Michel

### Publications 2006-2017

(last updated September 2017)

- Kohlstaedt M, Buschmann S, Langer JD, Xie H, **Michel H** (2017) Subunit CcoQ is involved in the assembly of the Cbb(3)-type cytochrome c oxidases from *Pseudomonas stutzeri* ZoBell but not required for their activity. *Biochim Biophys Acta-Bioenerg* 1858:231-238. <http://dx.doi.org/10.1016/j.bbabi.2016.12.006>
- Joedicke L, Trenker R, Langer JD, **Michel H**, Preu J (2016) Cell-free synthesis of isotopically labelled peptide ligands for the functional characterization of G protein-coupled receptors. *FEBS Open Bio* 6:90-102. <http://dx.doi.org/10.1002/2211-5463.12008>
- Kohlstaedt M, Buschmann S, Xie H, Resemann A, Warkentin E, Langer JD, **Michel H** (2016) Identification and characterization of the novel subunit CcoM in the cbb<sub>3</sub>-cytochrome c oxidase from *Pseudomonas stutzeri* ZoBell. *mBio* 7:DOI:10.1128/mBio.01921-15. <http://dx.doi.org/10.1128/mBio.01921-15>
- Kohlstaedt M, Buschmann S, Xie H, Resemann A, Warkentin E, Langer JD, **Michel H** (2016) Identification and characterization of the novel subunit CcoM in the cbb(3)-cytochrome c oxidase from *Pseudomonas stutzeri* ZoBell. *mBio* 7:9. <http://dx.doi.org/10.1128/mBio.01921-15>
- Melin F, Xie H, Meyer T, Ahn YO, Gennis RB, **Michel H**, Hellwig P (2016) The unusual redox properties of C-type oxidases. *BBA-Bioenergetics* 1857:1892-1899. <http://dx.doi.org/10.1016/j.bbabi.2016.09.009>
- Nie LY, Grell E, Malviya VN, Xie H, Wang JK, **Michel H** (2016) Identification of the High-affinity Substrate-binding Site of the Multidrug and Toxic Compound Extrusion (MATE) Family Transporter from *Pseudomonas stutzeri*. *J Biol Chem* 291:15503-15514. <http://dx.doi.org/10.1074/jbc.M116.728618>
- Safarian S, Rajendran C, Müller H, Preu J, Langer JD, Ovchinnikov S, Hirose T, Kusumoto T, Sakamoto J, **Michel H** (2016) Structure of a bd oxidase indicates similar mechanisms for membrane-integrated oxygen reductases. *Science* 352:583-586. <http://dx.doi.org/10.1126/science.aaf2477>
- Srinivasan L, Baars TL, Fendler K, **Michel H** (2016) Functional characterization of solute carrier (SLC) 26/sulfate permease (SuIP) proteins in membrane mimetic systems. *Biochim Biophys Acta-Biomembr* 1858:698-705. <http://dx.doi.org/10.1016/j.bbame.2016.01.006>
- Kohlstaedt M, von der Hocht I, Hilbers F, Thielmann Y, **Michel H** (2015) Development of a thermofluor assay for stability determination of membrane proteins using the Na<sup>+</sup>/H<sup>+</sup> antiporter NhaA and cytochrome c oxidase. *Acta Crystallogr Sect D-Biol Crystallogr* 71:1112-1122. <http://dx.doi.org/10.1107/s1399004715004058>
- Meyer T, Melin F, Richter OMH, Ludwig B, Kannt A, Muller H, **Michel H**, Hellwig P (2015) Electrochemistry suggests proton access from the exit site to the binuclear center in *Paracoccus denitrificans* cytochrome c oxidase pathway variants. *FEBS Lett* 589:565-568. <http://dx.doi.org/10.1016/j.febslet.2015.01.014>
- Padan E, **Michel H** (2015) NhaA: a unique structural fold of secondary active transporters. *Isr J Chem* 55:1233-1239. <http://dx.doi.org/10.1002/ijch.201500044>
- Buschmann S, Richers S, Ermiler U, **Michel H** (2014) A decade of crystallization drops: Crystallization of the cbb<sub>3</sub> cytochrome c oxidase from *Pseudomonas stutzeri*. *Protein Sci* 23:411-422. <http://dx.doi.org/10.1002/pro.2423>
- Kaur J, Olkhova E, Malviya VN, Grell E, **Michel H** (2014) A l-lysine transporter of high stereoselectivity of the amino acid-polyamine-organocation (APC) superfamily production, functional characterization, and structure modeling. *J Biol Chem* 289:1377-1387. <http://dx.doi.org/10.1074/jbc.M113.510743>

- Meyer T, Melin F, Xie H, von der Hocht I, Choi SK, Noor MR, **Michel H**, Gennis RB, Soulimane T, Hellwig P (2014) Evidence for distinct electron transfer processes in terminal oxidases from different origin by means of protein film voltammetry. **J Am Chem Soc** 136:10854-10857. <http://dx.doi.org/10.1021/ja505126v>
- Xie H, Buschmann S, Langer JD, Ludwig B, **Michel H** (2014) Biochemical and biophysical characterization of the two isoforms of cbb(3)- type cytochrome c oxidase from *Pseudomonas stutzeri*. **J Bacteriol** 196:472-482. <http://dx.doi.org/10.1128/jb.01072-13>
- Zhang CL, Allegretti M, Vonck J, Langer JD, Marcia M, Peng GH, **Michel H** (2014) Production of fully assembled and active *Aquifex aeolicus* F1FO ATP synthase in *Escherichia coli*. **Biochim Biophys Acta-Gen Subj** 1840:34-40. <http://dx.doi.org/10.1016/j.bbagen.2013.08.023>
- Hilbers F, von der Hocht I, Ludwig B, **Michel H** (2013) True wild type and recombinant wild type cytochrome c oxidase from *Paracoccus denitrificans* show a 20-fold difference in their catalase activity. **BBA-Bioenergetics** 1827:319-327. <http://dx.doi.org/10.1016/j.bbabi.2012.10.008>
- Jaehme M, **Michel H** (2013) Evaluation of cell-free protein synthesis for the crystallization of membrane proteins a case study on a member of the glutamate transporter family from *Staphylothermus marinus*. **FEBS J** 280:1112-1125. <http://dx.doi.org/10.1111/febs.12105>
- Kirchberg K, **Michel H**, Alexiev U (2013) Exploring the entrance of proton pathways in cytochrome c oxidase from *Paracoccus denitrificans*: surface charge, buffer capacity and redox-dependent polarity changes at the internal surface. **BBA-Bioenergetics** 1827:276-284. <http://dx.doi.org/10.1016/j.bbabi.2012.10.014>
- Kozuch J, von der Hocht I, Hilbers F, **Michel H**, Weidinger IM (2013) Resonance raman characterization of the ammonia-generated oxo intermediate of cytochrome c oxidase from *Paracoccus denitrificans*. **Biochemistry** 52:6197-6202. <http://dx.doi.org/10.1021/bi400535m>
- Ruehrer S, **Michel H** (2013) Exploiting *Leishmania tarentolae* cell-free extracts for the synthesis of human solute carriers. **Mol Membr Biol** 30:288-302. <http://dx.doi.org/10.3109/09687688.2013.807362>
- Zhang CL, Marcia M, Langer JD, Peng GH, **Michel H** (2013) Role of the N-terminal signal peptide in the membrane insertion of *Aquifex aeolicus* F1FO ATP synthase c-subunit. **FEBS J** 280:3425-3435. <http://dx.doi.org/10.1111/febs.12336>
- Gao Y, Meyer B, Sokolova L, Zwicker K, Karas M, Brutschy B, Peng GH, **Michel H** (2012) Heme-copper terminal oxidase using both cytochrome c and ubiquinol as electron donors. **P Natl Acad Sci USA** 109:3275-3280. <http://dx.doi.org/10.1073/pnas.1121040109>
- Goswami D, Kaur J, Surade S, Grell E, **Michel H** (2012) Heterologous production and functional and thermodynamic characterization of cation diffusion facilitator (CDF) transporters of mesophilic and hyperthermophilic origin. **Biol Chem** 393:617-629. <http://dx.doi.org/10.1515/hsz-2012-0101>
- Kirchberg K, **Michel H**, Alexiev U (2012) Net proton uptake is preceded by multiple proton transfer steps upon electron injection into cytochrome c oxidase. **J Biol Chem** 287:8187-8193. <http://dx.doi.org/10.1074/jbc.M111.338491>
- Rycovska A, Hatahet L, Fendler K, **Michel H** (2012) The nitrite transport protein NirC from *Salmonella typhimurium* is a nitrite/proton antiporter. **BBA-Biomembranes** 1818:1342-1350. <http://dx.doi.org/10.1016/j.bbame.2012.02.004>
- Thielmann Y, Koepke J, **Michel H** (2012) The ESFRI Instruct Core Centre Frankfurt: automated high-throughput crystallization suited for membrane proteins and more. **J Struct Funct Genomics** 13:63-69.
- Wang T, Langer JD, Peng GH, **Michel H** (2012) Isolation, functional characterization and crystallization of Aq\_1259, an outer membrane protein with porin features, from *Aquifex aeolicus*. **BBA-Proteins Proteom** 1824:1358-1365. <http://dx.doi.org/10.1016/j.bbapap.2012.07.004>

Hedderich T, Marcia M, Kopke J, **Michel H** (2011) PICKScreens, a new database for the comparison of crystallization screens for biological macromolecules. **Cryst Growth Des** 11:488-491. <http://dx.doi.org/10.1021/cg101267n>

MacMillan F, Kacprzak S, Hellwig P, Grimaldi S, **Michel H**, Kaupp M (2011) Elucidating mechanisms in haem copper oxidases: The high-affinity Q(H) binding site in quinol oxidase as studied by DONUT-HYSCORE spectroscopy and density functional theory. **Faraday Discuss** 148:315-344. <http://dx.doi.org/10.1039/c005149g>

von der Hocht I, van Wonderen JH, Hilbers F, Angerer H, MacMillan F, **Michel H** (2011) Interconversions of P and F intermediates of cytochrome c oxidase from *Paracoccus denitrificans*. **P Natl Acad Sci USA** 108:3964-3969. <http://dx.doi.org/10.1073/pnas.1100950108>

Buschmann S, Warkentin E, Xie H, Langer JD, Ermler U, **Michel H** (2010) The structure of cbb3 cytochrome oxidase provides insights into proton pumping. **Science** 329:327-329. <http://dx.doi.org/10.1126/science.1187303>

Clason T, Ruiz T, Schägger H, Peng G, Zickermann V, Brandt U, **Michel H**, Radermacher M (2010) The structure of eukaryotic and prokaryotic complex I. **J Struct Biol** 169:81-88.

Marcia M, Ermler U, Peng GH, **Michel H** (2010) A new structure-based classification of sulfide:quinone oxidoreductases. **Proteins** 78:1073-1083. <http://dx.doi.org/10.1002/prot.22665>

Marcia M, Langer JD, Parcej D, Vogel V, Peng G, **Michel H** (2010) Characterizing a monotopic membrane enzyme. Biochemical, enzymatic and crystallization studies on *Aquifex aeolicus* sulfide:quinone oxidoreductase. **BBA-Biomembranes** 1798:2114-2123.

Rajendran C, Ermler U, Ludwig B, **Michel H** (2010) Structure at 1.5 angstrom resolution of cytochrome c(552) with its flexible linker segment, a membrane-anchored protein from *Paracoccus denitrificans*. **Acta Crystallogr D** 66:850-854. <http://dx.doi.org/10.1107/s0907444910019396>

Baier J, Gabrielsen M, Oellerich S, **Michel H**, van Heel M, Cogdell RJ, Kohler J (2009) Spectral diffusion and electron-phonon coupling of the B800 BChl a molecules in LH2 complexes from three different species of purple bacteria. **Biophys J** 97:2604-2612. <http://dx.doi.org/10.1016/j.bpj.2009.07.052>

Koepke J, Olkhova E, Angerer H, Muller H, Peng GH, **Michel H** (2009) High resolution crystal structure of *Paracoccus denitrificans* cytochrome c oxidase: New insights into the active site and the proton transfer pathways. **BBA-Bioenergetics** 1787:635-645. <http://dx.doi.org/10.1016/j.bbabi.2009.04.003>

Ludwig B, **Michel H**, Brandt U (2009) Structures and mechanisms in molecular bioenergetics preface. **BBA-Bioenergetics** 1787:561-562. <http://dx.doi.org/10.1016/j.bbabi.2009.05.004>

Marcia M, Ermler U, Peng GH, **Michel H** (2009) The structure of *Aquifex aeolicus* sulfide:quinone oxidoreductase, a basis to understand sulfide detoxification and respiration. **P Natl Acad Sci USA** 106:9625-9630. <http://dx.doi.org/10.1073/pnas.0904165106>

Olkhova E, Kozachkov L, Padan E, **Michel H** (2009) Combined computational and biochemical study reveals the importance of electrostatic interactions between the "pH sensor" and the cation binding site of the sodium/proton antiporter NhaA of *Escherichia coli*. **Proteins** 76:548-559. <http://dx.doi.org/10.1002/prot.22368>

Dürr KL, Koepke J, Hellwig P, Muller H, Angerer H, Peng G, Olkhova E, Richter OMH, Ludwig B, **Michel H** (2008) A d-pathway mutation decouples the *Paracoccus denitrificans* cytochrome c oxidase by altering the side-chain orientation of a distant conserved glutamate. **J Mol Biol** 384:865-877. <http://dx.doi.org/10.1016/j.jmb.2008.09.074>

Lopez JJ, Shukla AK, Reinhart C, Schwalbe H, **Michel H**, Glaubitz C (2008) The structure of the neuropeptide bradykinin bound to the human G-protein coupled receptor bradykinin B2 as determined by solid-state NMR spectroscopy. **Angew Chem Int Edit** 47:1668-1671.

- Rimon A, Hunte C, **Michel H**, Padan E (2008) Epitope mapping of conformational monoclonal antibodies specific to NhaA Na<sup>+</sup>/H<sup>+</sup> antiporter: Structural and functional implications. **J Mol Biol** 379:471-481. <http://dx.doi.org/10.1016/j.jmb.2008.03.067>
- Roy A, Shukla AK, Haase W, **Michel H** (2008) Employing Rhodobacter sphaeroides to functionally express and purify human G protein-coupled receptors. **Biol Chem** 389:69-78. <http://dx.doi.org/10.1515/BC.2008.001>
- Xia HY, Liu LH, Reinhart C, **Michel H** (2008) Heterologous expression of human Neuromedin U receptor 1 and its subsequent solubilization and purification. **BBA-Biomembranes** 1778:2203-2209. <http://dx.doi.org/10.1016/j.bbamem.2008.05.017>
- Chillakuri CR, Reinhart C, **Michel H** (2007) C-terminal truncated cannabinoid receptor 1 coexpressed with G protein trimer in Sf9 cells exists in a precoupled state and shows constitutive activity. **FEBS J** 274:6106-6115. <http://dx.doi.org/10.1111/j.1742-4658.2007.06132.x>
- Klammt C, Srivastava A, Eifler N, Junge F, Beyermann M, Schwarz D, **Michel H**, Dötsch V, Bernhard F (2007) Functional analysis of cell-free-produced human endothelin B receptor reveals transmembrane segment 1 as an essential area for ET-1 binding and homodimer formation. **FEBS J** 274:3257-3269. <http://dx.doi.org/10.1111/j.1742-4658.2007.05854.x>
- Olkhova E, Padan E, **Michel H** (2007) The influence of protonation states on the dynamics of the NhaA antiporter from *Escherichia coli*. **Biophys J** 92:3784-3791.
- Shukla AK, Haase W, Reinhart C, **Michel H** (2007) Heterologous expression and characterization of the recombinant bradykinin B-2 receptor using the methylotrophic yeast *Pichia pastoris*. **Protein Expres Purif** 55:1-8.
- Shukla AK, Haase W, Reinhart C, **Michel H** (2007) Heterologous expression and comparative characterization of the human neuromedin U subtype II receptor using the methylotrophic yeast *Pichia pastoris* and mammalian cells. **Int J Biochem Cell B** 39:931-942.
- Srinivasan V, Netz DJA, Webert H, Mascarenhas J, Pierik AJ, **Michel H**, Lill R (2007) Structure of the yeast WD40 domain protein Cia1, a component acting late in iron-sulfur protein biogenesis. **Structure** 15:1246-1257.
- Wedemeyer U, Peng GH, **Michel H**, Hartung K (2007) Protein AQ\_1862 from the hyperthermophilic bacterium Aquifex aeolicus is a porin and contains two conductance pathways of different selectivity. **Biophys J** 93:2667-2677.
- André N, Cherouati N, Prual C, Steffan T, Zeder-Lutz G, Magnin T, Pattus F, **Michel H**, Wagner R, Reinhart C (2006) Enhancing functional production of G protein-coupled receptors in *Pichia pastoris* to levels required for structural studies via a single expression screen. **Protein Sci** 15:1115-1126. <http://dx.doi.org/10.1110/ps.062098206>
- Farver O, Grell E, Ludwig B, **Michel H**, Pecht I (2006) Rates and equilibrium of CuA to heme a electron transfer in *Paracoccus denitrificans* cytochrome c oxidase. **Biophys J** 90:2131-2137. <http://dx.doi.org/10.1529/biophysj.105.075440>
- Lundstrom K, Wagner R, Reinhart C, Desmyter A, Cherouati N, Magnin T, Zeder-Lutz G, Courtot M, Prual C, André N, Hassaine G, **Michel H**, Cambillau C, Pattus F (2006) Structural genomics on membrane proteins: comparison of more than 100 GPCRs in 3 expression systems. **J Struct Funct Genomics** 7:77-91.
- MacMillan F, Budiman K, Angerer H, **Michel H** (2006) The role of tryptophan 272 in the *Paracoccus denitrificans* cytochrome c oxidase. **FEBS Lett** 580:1345-1349. <http://dx.doi.org/10.1016/j.febslet.2006.01.054>
- Olkhova E, Hunte C, Screpanti E, Padan E, **Michel H** (2006) Multiconformation continuum electrostatics analysis of the NhaA Na<sup>+</sup>/H<sup>+</sup> antiporter of *Escherichia coli* with functional implications. **P Natl Acad Sci USA** 103:2629-2634. <http://dx.doi.org/10.1073/pnas.0510914103>

Peng GH, Bostina M, Radermacher M, Rais I, Karas M, **Michel H** (2006) Biochemical and electron microscopic characterization of the F1F0 ATP Synthase from the hyperthermophilic eubacterium *Aquifex aeolicus*. **FEBS Lett** 580:5934-5940. <http://dx.doi.org/10.1016/j.febslet.2006.09.062>

Screpanti E, Padan E, Rimon A, **Michel H**, Hunte C (2006) Crucial steps in the structure determination of the Na<sup>+</sup>/H<sup>+</sup> antiporter NhaA in its native conformation. **J Mol Biol** 362:192-202. <http://dx.doi.org/10.1016/j.jmb.07.019>

Shukla AK, Haase W, Reinhart C, **Michel H** (2006) Biochemical and pharmacological characterization of the human bradykinin subtype 2 receptor produced in mammalian cells using the Semliki Forest virus system. **Biol Chem** 387:569-576. <http://dx.doi.org/10.1515/bc.2006.073>

Shukla AK, Haase W, Reinhart C, **Michel H** (2006) Functional overexpression and characterization of human bradykinin subtype 2 receptor in insect cells using the baculovirus system. **J Cell Biochem** 99:868-877. <http://dx.doi.org/10.1002/jcb.20976>

Shukla AK, Reinhart C, **Michel H** (2006) Comparative analysis of the human angiotensin II type 1a receptor heterologously produced in insect cells and mammalian cells. **Biochem Bioph Res Co** 349:6-14. <http://dx.doi.org/10.1016/j.bbrc.2006.07.210>

Shukla AK, Reinhart C, **Michel H** (2006) Dimethylsulphoxide as a tool to increase functional expression of heterologously produced GPCRs in mammalian cells. **FEBS Lett** 580:4261-4265. <http://dx.doi.org/10.1016/j.febslet.2006.05.064>

Surade S, Klein M, Stolt-Bergner PC, Muenke C, Roy A, **Michel H** (2006) Comparative analysis and "expression space" coverage of the production of prokaryotic membrane proteins for structural genomics. **Protein Sci** 15:2178-2189. <http://dx.doi.org/10.1110/ps.062312706>