



Regulation and assembly of the cytochrome bc_1 - aa_3 supercomplex in *Corynebacterium glutamicum*

Cedric-Farhad Davoudi

Schlüsseltechnologien / Key Technologies

Band / Volume 199

ISBN 978-3-95806-416-4

Forschungszentrum Jülich GmbH
Institut für Bio-und Geowissenschaften
Biotechnologie (IBG-1)

Regulation and assembly of the cytochrome *bc*₁-*aa*₃ supercomplex in *Corynebacterium glutamicum*

Cedric-Farhad Davoudi

Schriften des Forschungszentrums Jülich
Reihe Schlüsseltechnologien / Key Technologies

Band / Volume 199

ISSN 1866-1807

ISBN 978-3-95806-416-4

Content

1	SUMMARY.....	1
1.1	Summary English	1
1.2	Summary German.....	2
2	INTRODUCTION.....	3
2.1	Aerobic respiration in bacteria	3
2.2	The respiratory chain of <i>C. glutamicum</i>	4
2.3	Environmental stimulus perception in <i>C. glutamicum</i>	8
2.3.1	One-component systems.....	8
2.3.2	Extracytoplasmic function σ factors	9
2.3.3	Two-component systems	9
2.4	Transcriptional regulation of terminal oxidases in <i>C. glutamicum</i>	12
2.5	Heme and copper homeostasis in <i>C. glutamicum</i>	12
2.6	Aims of this thesis.....	14
3	RESULTS.....	16
3.1	Author contributions	18
3.2	The copper-deprivation stimulon of <i>Corynebacterium glutamicum</i> comprises proteins for biogenesis of the actinobacterial cytochrome <i>bc₁-aa₃</i> supercomplex	20
3.3	Identification of Surf1 as an assembly factor of the cytochrome <i>bc₁-aa₃</i> supercomplex of <i>Actinobacteria</i>	33
3.4	HrrSA orchestrates a systemic response to heme and determines prioritisation of terminal cytochrome oxidase expression.....	48
4	DISCUSSION	68
4.1	Biogenesis of cytochrome oxidases	68
4.1.1	Essential function of CtiP as a cytochrome <i>bc₁-aa₃</i> supercomplex assembly factor	69
4.1.2	Role of CopC in the assembly of the cytochrome <i>bc₁-aa₃</i> supercomplex	70
4.1.3	Cg1883 and Cg0520 are putative Cu _A biogenesis chaperones	72
4.1.4	Surf1 is crucial for cytochrome <i>bc₁-aa₃</i> supercomplex assembly	73
4.2	Regulation of terminal oxidases	75
4.2.1	HrrSA-dependent heme distribution to terminal oxidases	75
4.2.2	How is the activity of the ECF σ factor σ^c controlled?.....	78

5	LITERATURE	83
6	APPENDIX.....	91
6.1	Supplement “The copper-deprivation stimulon of <i>Corynebacterium glutamicum</i> comprises proteins for biogenesis of the actinobacterial cytochrome <i>bc₁-aa₃</i> supercomplex”	91
6.2	Supplement “Identification of Surf1 as an assembly factor of the cytochrome <i>bc₁-aa₃</i> supercomplex of <i>Actinobacteria</i> ”	99
6.3	Supplement “HrrSA orchestrates a systemic response to heme and determines prioritisation of terminal cytochrome oxidase expression”	100
6.4	Supplementary materials – Further characterization of Surf1.....	120
6.5	Supplementary materials – Characterization of Cg2750 and σ^c	128

Schlüsseltechnologien / Key Technologies

Band / Volume 199

ISBN 978-3-95806-416-4

Mitglied der Helmholtz-Gemeinschaft

