IRINA BORODINA

SUMMARY

- Professor in Yeast Metabolic Engineering
- Management of an independent research programme at Technical University of Denmark since 2014 (https://www.biosustain.dtu.dk/Research/Research-Groups/Yeast-Metabolic-Engineering)
- Co-founder and CSO of industrial biotech start-up BioPhero (www.biophero.com)
- Fundraising with national, EU and private foundations
- Coordinator, Technical manager, Training Manager in large EU projects
- Teaching and organization of university courses
- Supervision of PostDocs, PhD students, Master and Bachelor students, lab technicians and other personnel

EDUCATION

2007	PhD in Biotechnology, Technical University of Denmark, Denmark
2004	MSc in Biotechnology, Technical University of Denmark, Denmark
2001	Chemical Engineer, Kaunas University of Technology, Lithuania

CAREER

2020–present	Professor, Group Leader at Center for Biosustainability, DTU
2021–present	Co-Founder and CSO, BioPhero ApS
2018–2021	Co-Founder and CTO, BioPhero ApS
2016–2018	Co-Founder and CEO, BioPhero ApS
2014–2020	Group Leader at Center for Biosustainability, DTU
2011–2014	Project Leader at Center for Biosustainability, DTU
2008–2011	Postdoctoral Fellow at DTU & Rigshospitalet
2004–2007	PhD Fellow at the Center for Microbial Biotechnology, DTU

AWARDS & RECOGNITION

- EU Women Innovator, European Commission (2019)
- Equinor Prize, Equinor Foundation (2019)
- European Research Council Starting grant, European Commission (2017)
- Jay Bailey Young Investigator Award, Metabolic Engineering, International Metabolic Engineering Society (2016)
- 34 invited talks at large international conferences
- Associate Editor: Metabolic Engineering.
- Editorial Board member: Yeast, FEMS Yeast Research
- Scientific Advisor: BioMediCAN (USA)

- Research proposal reviewer: Austrian Science Fund, Research Foundation, Research Foundation - Flanders, French National Research Agency, Norwegian Research Council, Biotechnology and Biological Sciences Research Council, and other organizations
- Expert for European Commission (evaluator on various calls and mid-term reviews)
- PhD committee member for 7 PhD candidates (Chalmers University, Lund University, TU Delft, EPFL)
- Member of organizing committee for Cell Factories and Biosustainability 2015 and Data-Driven Biotechnology 2017. Session co-chair at Metabolic Engineering 2014, 2016, and 2021. Session co-chair at Federation of European Microbiological Societies (FEMS) Congress 2017. Workshop co-organizer at the 25th European Biomass Conference and Exhibition.

FUNDING (from 2016 onwards)

- **Borodina I** and 6 other PIs, PHERA, European Union's Horizon 2020 Bio-Based Industries Joint Undertaking (BBI JU), 6.3 mio EUR, (2020-2023)
- **Borodina I** and 3 other PIs, DTU Proof-of-Concept grant, 0.07 mio EUR, (2019-2020)
- **Borodina I**, NNF Center for Biosustainability (Group Leader Grant), Novo Nordisk Foundation, 1.12 mio EUR, (2014-2020)
- **Borodina I** (supervisor) and Wenning L, Marie Skłodowska-Curie Research Fellowship, European Union, 0.2 mio EUR, (2019-2021)
- **Borodina I** (supervisor) and Petkevicius K, Industrial PhD, 0.17 mio EUR, Innovationsfonden (2019-2022)
- Svendsen WE, Madsen J, and **Borodina I**, MagicBox, Biotechnology-based Synthesis and Production Research, 0.4 mio EUR, The Novo Nordisk Foundation (2019-2021)
- Soares S and **11 other PIs**, SHIKIFACTORY100, European Union's Horizon 2020 research and innovation programme, 8 mio EUR, (2019-2022) www.shikifactory100.eu
- **Borodina I** and 9 other PIs, OLEFINE, European Union's Horizon 2020 research and innovation programme, 5.4 mio EUR, (2018-2021) www.olefine.eu
- **Borodina I**, YEAST-TRANS, European Research Council, 1.4 mio EUR, (2017-2021)
- Martínez BM and **14 other PIs**, DAFIA, European Union's Horizon 2020 research and innovation programme, 6.4 mio EUR, (2017-2020) www.dafia-project.eu
- **Borodina I**, POC: Proof-of-Concept grant, Region Sjællands Vækstforum, 0.05 mio EUR, (2016-2017)
- **Borodina I**, Jensen MK, and 10 other PIs, PAcMEN: Horizon 2020 Marie Curie Initial Training Network, 3.97 mio EUR, (2016-2020) www.pacmen-itn.eu
- **Borodina I**, LipoFINE, Biotechnology-based Synthesis and Production Research, The Novo Nordisk Foundation, 0.31 mio EUR, (2016-2019)

- **Borodina I** and Löfstedt C, Pre-seed Grant, Novo Seeds A/S, 0.33 mio EUR, (2016-2017)
- **Borodina I** and Löfstedt C, Exploratory Pre-Seed Grant, The Novo Nordisk Foundation, 0.1 mio EUR, (2014-2016)
- Forster J, **Borodina I**, and 8 other PIs, BioREFINE-2G, European Commission the 7th Framework Programme, 4.8 mio EUR, (2013-2017)

TEACHING & SUPERVISION (from 2016 onwards)

- Organizer: 5-ECTS course on Advanced Experimental Synthetic Biology for Cell Factories (2016) and 4-ECTS course on Genome Editing for Cell Factories (2018)
- University Level Teaching Diploma (2016)
- 7 PhD students completed; 6 PhD students currently active
- 7 postdoctoral fellows/researchers completed; 5 postdoctoral fellows/researchers currently active
- 11 research assistants or lab technicians trained
- 19 MSc thesis completed; 2 MSc thesis currently active
- 3 BSc thesis completed
- 29 special projects or traineeships completed
- 12 international guest researchers hosted; 1 currently active

TRANSLATION & COMMERCIALISATION

- 12 published patent families, of which several are licensed to industry
- BioPhero ApS spin-out, 17 mio EUR capital raised www.biophero.com

INVITED TALKS (only international conferences listed)

[34] European Forum for Industrial Biotechnology & the Bioeconomy (EFIB), 2020, digital. [Invited talk]
[33] European Summit of Industrial Biotechnology, 2019, Graz, **Austria**. [Invited talk]
[32] Living factories - Carbon Neutrality with Synthetic Biology, 2019, Espoo, **Finland**. [Invited talk]
[31] FEBS Advanced Course on Biosystem Design: Computational and Experimental Approaches, 2019, Spetses, **Greece**. [Invited talk]
[32] FEMS 8th Congress of European Microbiologists, 2019, Glasgow, **UK**. [Invited talk]
[31] 7th PYFF - European Federation of Biotechnology, 2019, Milan, **Italy**. [Invited talk]
[30] Symposium on microbial biotechnology AGRI, 2019, Moscow, **Russia**. [Invited talk]
[29] 46th Annual Conference on Yeasts, 2019, Smolenice, **Slovakia**. [Invited talk]
[28] Industrial Biotechnology at the Cell Membrane, 2019, Sheffield, **UK**. [Invited talk]
[27] The 10th International Symposium of Innovative BioProduction Kobe, 2019, Kobe, **Japan**. [Invited talk]

[26] International Transmembrane Transporter Society Innaugural Conference, 2018, Vienna, **Austria**. [Invited talk]
[25] 10th ÖGMBT Annual Meeting, 2018, Vienna, **Austria**. [Invited talk]
[24] CRISPRing conference, 2018, Budapest, **Hungary**. [Invited talk]
[23] Metabolic Engineering 12, 2018, Munich, **Germany**. [Invited talk]
[22] Biotechnology: Research and Industrial Applications, 2018, Wroclaw, **Poland**. [Plenary]
[21] Non-conventional Yeasts: from Basic Research to Application, 2018, Rzeshow, **Poland**. [Invited talk]
[20] International workshop "Synthetic Biology at Molecular, Cellular and Multicellular levels", 2017, Venice, **Italy**. [Invited talk]
[19] CBMNet: Import and Export of Small Molecules for Biocatalysis, 2017, Edinburgh, **UK**. [Invited talk]
[18] The 7th Congress of European Microbiologists FEMS 2017, 2017, Valencia, **Spain**. [Keynote, chairman of a session]
[17] The 25th European Biomass Conference and Exhibition, 2017, Stockholm, **Sweden**. [Invited talk]
[16] The 13th International Conference on Renewable Resources and Biorefineries, 2017, Wroclaw, **Poland**. [Invited talk]
[15] The COINS 2017, 2017, Vilnius, **Lithuania**. [Keynote]
[14] Genetics of Industrial Microorganisms, 2016, Wuhan, **China**. [Invited talk]
[13] Metabolic Engineering 11, 2016, Awaji, **Japan**. [Invited talk]
[12] The 14th International Congress on Yeast, 2016, Hyogo, **Japan**. [Invited talk]
[11] The 6th Conference on Physiology of Yeasts and Filamentous Fungi, 2016, **Portugal**. [Keynote]
[10] Enabling Technologies for Eukaryotic Synthetic Biology, 2015, EMBL Heidelberg, **Germany**.
[9] The 2nd Brazilian-Danish workshop on biorefineries, 2014, Copenhagen, **Denmark**.
[8] Nordic Yeast Research Community Meeting, 2014, Copenhagen, **Denmark**.
[7] 64th Annual Meeting of the Society for Industrial Microbiology & Biotechnology, 2014, St. Louis, MO, **USA**.
[6] 36th Symposium on Biotechnology for Fuels and Chemicals, 2014, Clearwater Beach, Florida, **USA**.
[5] Borregaard Research Conference, 2014, Sarpsborg, **Norway**.
[4] European Symposium on Biopolymers, 2013, Lisbon, **Portugal**.
[3] Tailor-made Fuels from Biomass, 2013, Aachen, **Germany**.
[2] Pichia, 2009, Tuscon, Arizona, **USA**.
[1] Genetics of Industrial Microorganisms, 2006, Prague, **Czech Republic**.

PUBLICATIONS

Total: 65 peer-reviewed papers, 3 book chapters, 1 monograph; *h*-index 30, *i10*-index 46, 3593 citations (Google Scholar).

[65] Kosiorowska KK, Połomska X, Wang G, **Borodina I**, Mirończuk M. "Efficient biodegradation of aliphatic polyester by genetically engineered strains of the yeast *Yarrowia lipolytica*." *International Biodeterioration & Biodegradation*, in press.

[64] Babaei M, Sartori L, Karpukhin A, Abashkin D, Matrosova E, **Borodina I**. "Expansion of EasyClone-MarkerFree toolkit for *Saccharomyces cerevisiae* genome with new integration sites." *FEMS Yeast Res*, in press.

[63] Petkevicius K, Koutsoumpeli E, Betsi PC, Ding BJ, Kildegaard KR, Jensen H, Mezo N, Mazziotta A, Gabrielsson A, Sinkwitz C, Lorantfy B, Holkenbrink C, Löfstedt C, Raptopoulos D, Konstantopoulou M, **Borodina I** (2021). "Biotechnological production of the European corn borer sex pheromone in the yeast *Yarrowia lipolytica*." *Biotechnol J*, 3:e2100004. doi: 10.1002/biot.202100004

[62] Kildegaard KR§, Arnesen JA§, Adiego-Pérez B, Rago D, Kristensen M, Klitgaard AK, Hansen EH, Hansen J, **Borodina I** (2021). "Tailored biosynthesis of gibberellin plant hormones in yeast." *Metab Eng*, 66:1–11. doi:10.1016/j.ymben.2021.03.010

[61] Wang G, Møller-Hansen I, Babaei M, D'Ambrosio V, Christensen HB, Darbani B, Jensen MK, **Borodina I** (2021). "Transportome-wide engineering of *Saccharomyces cerevisiae*." *Metab Eng*, 64:52-63. doi: 10.1016/j.ymben.2021.01.007

[60] Fathi Z, Tramontin LRR, Ebrahimipour G, **Borodina I***, Darvishi F* (2020). "Metabolic engineering of *Saccharomyces cerevisiae* for production of β-carotene from hydrophobic substrates". *FEMS Yeast Res*, foaa068. doi: org/10.1093/femsyr/foaa068

[59] Rzechonek DA, Szczepańczyk M, Wang G, **Borodina I**, Mirończuk AM (2020). "HOG-independent osmoprotection by erythritol in yeast *Yarrowia lipolytica*". *Genes,* 11(12): 1424. doi: 10.3390/genes11121424

[58] Holkenbrink C, Ding B-J, Wang H-L, Dam MI, Petkevicius K, Kildegaard KR, Wenning L, Sinkwitz C, Lorántfy B, Koutsoumpeli E, França L, Pires M, Bernardi C, Urrutia W, Mafra-Neto A, Ferreira BS, Raptopoulos D, Konstantopoulou M, Löfstedt C*, **Borodina I*** (2020). "Production of moth sex pheromones for pest control by yeast fermentation". *Metab Eng*, 62:312-321. doi: 10.1016/j.ymben.2020.10.001

[57] Sáez-Sáez J, Wang G*, Marella ER, Sudarsan S, Pastor MC, **Borodina I*** (2020). "Engineering the oleaginous yeast *Yarrowia lipolytica* for high-level resveratrol production". *Metab Eng*, 62:51-61. doi: 10.1016/j.ymben.2020.08.009

[56] Petkevicius K, Löfstedt C, **Borodina I** (2020). "Insect sex pheromone production in yeasts and plants". *Curr Opin Biotechnol*, 65:259-267. doi: 10.1016/j.copbio.2020.07.011

[55] van der Hoek SA, **Borodina I** (2020). "Transporter engineering in microbial cell factories: the ins, the outs, and the in-betweens". *Curr Opin Biotechnol,* 66:186-194. doi: 10.1016/j.copbio.2020.08.002

[54] Babaei M, Borja Zamfir GM, Chen X, Christensen HB, Kristensen M, Nielsen J, **Borodina I** (2020). "Metabolic engineering of *Saccharomyces cerevisiae* for rosmarinic acid production". *ACS Synth Biol,* 9(8):1978-1988. doi: 10.1021/acssynbio.0c00048

[53] Arnesen JA, Kildegaard KR, Pastor MC, Jayachandran S, Kristensen M, **Borodina I** (2020). "*Yarrowia lipolytica* strains engineered for the production of terpenoids". *Front Bioeng Biotechnol*, 8:945. doi: 10.3389/fbioe.2020.00945

[52] Wang G, Øzmerih S, Guerreiro R, Meireles AC, Milne N, Jensen MK, Ferreira B, **Borodina I** (2020). "Improvement of *cis,cis*-muconic acid production in *Saccharomyces cerevisiae* through biosensor-aided engineering." *ACS Synth Biol,* 9(3):634-646. doi: 10.1021/acssynbio.9b00477

[51] Milne N, Thomsen P, Knudsen NM, Rubaszka P, Kristensen M, **Borodina I** (2020). "Metabolic engineering of *Saccharomyces cerevisiae* for the production of psilocybin and related tryptamine derivatives". *Metab Eng*, 60:25-36. doi: 10.1016/j.ymben.2019.12.007

[50] **Borodina I**, Kenny LC, McCarthy CM, Paramasivan K, Pretorius R, Roberts TJ, van der Hoek SA, Kell DB (2020). "The biology of ergothioneine, an antioxidant nutraceutical." *Nutr Res Rev*, 33(2):190-217. doi: 10.1017/S0954422419000301

[49] Milne N, Tramontin LRR, **Borodina I** (2020). "A teaching protocol demonstrating the use of EasyClone and CRISPR/Cas9 for metabolic engineering of *Saccharomyces cerevisiae* and *Yarrowia lipolytica*." *FEMS Yeast Res,* 20(2):foz062. doi: 10.1093/femsyr/foz062

[48] Marella ER, Dahlin J, Dam MI, Ter Horst J, Christensen HB, Sudarsan S, Wang G, Holkenbrink C, **Borodina I** (2020). "A single-host fermentation process for the production of flavor lactones from non-hydroxylated fatty acids". *Metab Eng,* 61:427-436. doi: 10.1016/j.ymben.2019.08.009.

[47] Babaei M, Kildegaard KR, Hosseini M, Ebrahimi S, Niaei A, Angelidaki I, **Borodina I** (2019). "Engineering oleaginous yeast as the host for fermentative succinic acid production from glucose." *Front Bioeng Biotechnol,* 7:361. doi: 10.3389/fbioe.2019.00361

[46] Borja GMZ, Rodriguez A, Campbell K, **Borodina I**, Chen Y, Nielsen J. (2019) "Metabolic engineering and transcriptomic analysis of *Saccharomyces cerevisiae* producing *p*-coumaric acid from xylose." *Microbial Cell Factories,* 18:191. doi: 10.1186/s12934-019-1244-4

[45] Tramontin LRR, Kildegaard KR, Sudarsan S, **Borodina I** (2019). "Enhancement of astaxanthin biosynthesis in oleaginous yeast *Yarrowia lipolytica* via microalgal pathway". *Microorganisms,* 7(10):472. doi: 10.3390/microorganisms7100472

[44] Tiukova I, Møller-Hansen I, Belew ZM, Darbani B, Boles E, Nour Eldin HH, Linder T, Nielsen J, **Borodina I** (2019). "Identification and characterization of two high-affinity glucose transporters from the spoilage yeast *Brettanomyces bruxellensis*". *FEMS Microbiol Lett*, 366(17):fnz222. doi: 10.1093/femsle/fnz222

[43] van der Hoek SA, Darbani B, Zugaj KE, Prabhala BK, Biron MB, Randelovic M, Medina JB, Kell DB, **Borodina I** (2019). "Engineering the yeast *Saccharomyces cerevisiae* for the production of L-(+)-ergothioneine". *Front Bioeng Biotechnol*, 7:262. doi: 10.3389/fbioe.2019.00262

[42] Dahlin J, Holkenbrink C, Marella R, Wang G, Liebal U, Lieven C, Weber D, McCloskey D, Ebert BE, Herrgård MJ, Blank LM, **Borodina I** (2019). "Multi-omics analysis of fatty alcohol production in engineered yeasts *Saccharomyces cerevisiae* and *Yarrowia lipolytica*." *Front Genet,* 10:747. *doi:10.3389/fgene.2019.00747*

[41] Darbani B, Stovicek V, van der Hoek SA, **Borodina I** (2019). ”Engineering energetically efficient transport of dicarboxylic acids in yeast *Saccharomyces cerevisiae*.” *Proc Natl Acad Sci U S A*, 116(39):19415-19420. doi: 10.1073/pnas.1900287116

[40] Jessop-Fabre MM, Dahlin J, Biron MB, Stovicek V, Ebert BE, Blank LM, Budin I, Keasling JD, **Borodina I** (2019). “The transcriptome and flux profiling of Crabtree-negative hydroxy acid producing strains of *Saccharomyces cerevisiae* reveals changes in the central carbon metabolism.” *Biotechnol J,* 14(9):e1900013. doi: 10.1002/biot.201900013

[39] Kildegaard KR, Tramontin LRR, Chekina K, Li M, Goedecke TJ, Kristensen M, **Borodina I** (2019). ”CRISPR/Cas9-RNAi system for combinatorial metabolic engineering of *Saccharomyces cerevisiae*.” *Yeast*, 36(5):237-247. doi: 10.1002/yea.3390

[38] **Borodina I** (2018). Understanding metabolite transport gives an upper hand in strain development. *Microb Biotechnol*, 12(1):69-70. doi: 10.1111/1751-7915.13347

[37] Darvishi F, Ariana M, Marella ER, **Borodina I** (2018). “Advances in synthetic biology of oleaginous yeast *Yarrowia lipolytica* for producing non-native chemicals.” *Appl Microbiol and Biotechnol*, 102(14):5925-5938. doi: 10.1007/s00253-018-9099-x

[36] Maury J, Kannan S, Jensen NB, Öberg FK, Kildegaard KR, Forster J, Nielsen J, Workman CT*, **Borodina I*** (2018). ”Glucose-dependent promoters for dynamic regulation of metabolic pathways.” *Front Bioeng Biotechnol*. doi: 10.3389/fbioe.2018.00063

[35] Darbani B, Kell DB, **Borodina I** (2018). “Energetic evolution of cellular transportomes.” *BMC Genomics,* 19:418. doi: 10.1186/s12864-018-4816-5

[34] Holkenbrink C, Dam MI, Kildegaard KR, Beder J, Dahlin J, Doménch D, **Borodina I** (2018). “EasyCloneYALI: CRISPR/Cas9-based synthetic toolbox for engineering of the yeast *Yarrowia lipolytica*”. *Biotech J, in press.* doi: 10.1002/biot.201700543

[33] Rodriguez A, Chen Y, Khoomrung S, Özdemir E, **Borodina I***, Nielsen J* (2017). “Comparison of the metabolic response to over-production of *p*-coumaric acid in two yeast strains”. *Metab Eng*, 44:265-272. doi: 10.1016/j.ymben.2017.10.013

[32] **Borodina I**, Zhao ZK. (2017) Editorial: Yeast Cell Factories for Production of Fuels and Chemicals. *FEMS Yeast Research,* 17(8). doi: 10.1093/femsyr/fox082

[31] Kildegaard KR§, Adiego-Pérez B§, Doménch Belda D, Khangura JK, Holkenbrink C, **Borodina I**. (2017) “Engineering of *Yarrowia lipolytica* for production of astaxanthin”. *Synthetic and Systems Biotechnology,* 2(4):287-294. doi:10.1016/j.synbio.2017.10.002

[30] Marella ER, Holkenbrink C, Siewers V, **Borodina I**. (2017) ”Engineering microbial fatty acid metabolism for biofuels and biochemicals”. *Current Opinion in Biotechnology,* 50:39-46. doi:10.1016/j.copbio.2017.10.002

[29] Rodriguez A§, Strucko T§, Stahlhut SG, Kristensen M, Svenssen DK, Forster J, Nielsen J, **Borodina I**. (2017) “Metabolic engineering of yeast for fermentative production of flavonoids”. *Bioresource Technology*, 245B:1645-4654. doi:10.1016/j.biortech.2017.06.043

[28] Stovicek V, Holkenbrink C, **Borodina I**. (2017) ”CRISPR/Cas system for yeast genome engineering: advances and applications”. *FEMS Yeast Research*, 17(5), doi:10.1093/femsyr/fox030

[27] Li M, Schneider K, Kristensen M, **Borodina I**, Nielsen J. (2017) “Engineering yeast for high-level production of stilbenoid antioxidants”. *Sci Rep*, 6:36827. doi:10.1038/srep36827

[26] Skjoedt ML, Kildegaard KR, Snoek T, Arsovska D, Goedecke TJ, Rajkumar AS, Zhang J, Kristensen M, Eichenberger M, Siedler S, **Borodina I**, Jensen MK, Keasling JD. (2016) ”Engineering prokaryotic transcriptional activators as metabolite biosensors in yeast”. *Nature Chem Bio,* 12(11): 951-958. doi:10.1038/nchembio.2177.

[25] Jessop-Fabre MM§, Jakočiūnas T§, Stovicek V, Dai Z, Jensen MK, Keasling J, **Borodina I**. (2016) “EasyClone-MarkerFree: A vector toolkit for marker-less integration of genes into *Saccharomyces cerevisiae*”. *Biotechnology J*, doi: 10.1002/biot.201600147.

[24] Kildegaard KR§, Jensen NB§, Schneider K, Czarnotta E, Özdemir E, Klein T, Maury J, Ebert BE, Christensen HB, Chen Y, Kim I-K, Herrgård MJ, Blank LM, Forster J, Nielsen J, **Borodina I**. (2016) “Engineering and systems-level analysis of *Saccharomyces cerevisiae* for production of 3-hydroxypropionic acid via malonyl-CoA reductase-dependent pathway”. *Microb Cell Fact,* 15:53. doi: 10.1186/s12934-016-0451-5.

[23] Maury J, Germann S, Jacobsen SAB, Jensen NB, Kildegaard KR, Herrgård M, Schneider K, Koza A, Forster J, Nielsen J, & **Borodina I** (2016) “EasyCloneMulti: a solution for simultaneous multi-genomic insertions of expression cassettes in *Saccharomyces cerevisiae*”. *PLOS One*. doi: 10.1371/journal.pone.0150394.

[22] Germann S, Jacobsen SAB, Schneider K, Harrison S, Jensen NB, Chen X, Stahlhut SG, **Borodina I**, Luo H, Zhu J, Maury J, & Forster J (2016) “Glucose-based microbial production of the hormone melatonin in yeast *Saccharomyces cerevisiae*”. *Biotechnol J*, 11. doi: 10.1002/biot.201500143.

[21] Kildegaard KR, Wang Z, Chen Y, Nielsen J, **Borodina I** (2015) “Production of 3-hydroxypropionic acid from glucose and xylose by metabolically engineered *Saccharomyces cerevisiae*”. *Metab Eng Commun*, 2:132-136. doi: 10.1016/j.meteno.2015.10.001.

[20] Stovicek V, Borja GM, Forster J, & **Borodina I** (2015) “EasyClone 2.0: Expanded toolkit of integrative vectors for stable gene expression in industrial *Saccharomyces cerevisiae* strains”. *J Ind Microbiol Biotechnol,* 42(11):1519-1531. doi: 10.1007/s10295-015-1684-8.

[19] Li M, Kildegaard KR, Chen Y, Rodriguez A, **Borodina I**, & Nielsen J (2015) “*De novo* production of resveratrol from glucose or ethanol by engineered *Saccharomyces cerevisiae*”. *Metab Eng*, 32:1-11. doi:10.1016/j.ymben.2015.08.007.

[18] Rodriguez A, Kildegaard KR, Li M, **Borodina I**, & Nielsen J (2015) “Establishment of a yeast platform strain for production of *p*-coumaric acid through metabolic engineering of aromatic amino acid biosynthesis”. *Metab Eng*, 31:181-188. doi: 10.1016/j.ymben.2015.08.003.

[17] Ronda C, Maury J, Jakočiūnas T, Jacobsen SAB, Germann SM, Harrison SJ, **Borodina I**, Keasling JD, Jensen MJ, & Nielsen AT (2015) “CrEdit: CRISPR

mediated multi-loci gene integration in *Saccharomyces cerevisiae*". *Microb Cell Fact*, 14:97. doi: 10.1186/s12934-015-0288-3.

[16] Jakočiūnas T, Rajkumar AS, Zhang J, Arsovska D, Rodriguez A, Jendresen CB, Skjødt ML, Nielsen AT, **Borodina I**, Jensen MK, & Keasling JD (2015) "CasEMBLR: Cas9-facilitated multiloci genomic integration of *in vivo* assembled DNA parts in *Saccharomyces cerevisiae*". *ACS Synth Biol*, doi: 10.1021/acssynbio.5b00007.

[15] Jendresen CB, Stahlhut SG, Li M, Gaspar P, Siedler S, Förster J, Maury J, **Borodina I**, & Nielsen AT (2015) "Highly active and specific tyrosine ammonia-lyases from diverse origins enable enhanced production of aromatic compounds in bacteria and *Saccharomyces cerevisiae*". *Appl Environ Microbiol*, 81(13):4458-4476. doi: 10.1128/AEM.00405-15.

[14] Stovicek V, **Borodina I**, & Forster J (2015) "CRISPR-Cas system enables fast and simple genome editing of industrial *Saccharomyces cerevisiae* strains". *Metab Eng Commun*, 2:13-22. doi: 10.1016/j.meteno.2015.03.001.

[13] Li M & **Borodina I** (2015) "Application of synthetic biology for production of chemicals in yeast *Saccharomyces cerevisiae*". *FEMS Yeast Res*, 15(1):1-12. doi: 10.1111/1567-1364.12213.

[12] **Borodina I**, Kildegaard KR, Jensen NB, Blicher TH, Maury J, Sherstyk S, Schneider K, Lamosa P, Herrgård MJ, Rosenstand I, Öberg F, Forster J, & Nielsen J (2015) "Establishing a synthetic pathway for high-level production of 3-hydroxypropionic acid in *Saccharomyces cerevisiae* via □-alanine". *Metab Eng,* 27:57-64. doi: 10.1016/j.ymben.2014.10.003.

[11] Kildegaard KR, Hallström BM, Blicher TH, Sonnenschein N, Jensen NB, Sherstyk S, Harrison SJ, Maury J, Herrgård MJ, Juncker AS, Forster J, Nielsen J, & **Borodina I** (2014) "Evolution reveals a cyclic glutathione-dependent mechanism of 3-hydroxypropionic acid tolerance". *Metab Eng,* 26C:57-66. doi: 10.1016/j.ymben.2014.09.004.

[10] **Borodina I** & Nielsen J (2014) "Advances in metabolic engineering of yeast *Saccharomyces cerevisiae* for production of chemicals". *Biotechnol J,* 9(5):609-620. doi: 10.1002/biot.201300445.

[9] Jensen NB, Strucko T, Kildegaard KR, David F, Maury J, Mortensen UH, Forster J, Nielsen J, & **Borodina I** (2014) "EasyClone: method for iterative chromosomal integration of multiple genes in *Saccharomyces cerevisiae*". *FEMS Yeast Res*, 14(2):238-248. doi: 10.1111/1567-1364.12118.

[8] Chen X, **Borodina I**, Nielsen KF, Kielland-Brandt MC, Karhumaa K (2011) "Increased isobutanol production in *Saccharomyces cerevisiae* by overexpression of genes in valine metabolism." *Biotechnol Biofuels*, 28:4-21. doi: 10.1186/1754-6834-4-21.

[7] **Borodina I**, Jensen BM, Wagner T, Hachem MA, Søndergaard I, Poulsen LK (2011) "Expression of enzymatically inactive wasp venom phospholipase A1 in *Pichia pastoris*." *PLoS One* 2011, 6(6):e21267. doi: 10.1371/journal.pone.0021267.

[6] Pedersen MH[§], **Borodina I**[§], Moresco JL, Svendsen WE, Frisvald JC, Søndergaard I (2011) "High-yield production of hydrophobins RodA and RodB from *Aspergillus fumigatus* in *Pichia pastoris*." *Appl Microbiol Biotechnol*, 90(6):1923-32. doi: 10.1007/s00253-011-3235-1.

[5] **Borodina I**, Jensen BM, Søndergaard I, Poulsen LK (2010) "Display of wasp venom allergens on the cell surface of *Saccharomyces cerevisiae*." *Microb Cell Fact*, 9:74. doi: 10.1186/1475-2859-9-74.

[4] **Borodina I**§, Siebring J§, Zhang J, Smith CP, van Keulen G, Dijkhuizen L, Nielsen J (2008) "Antibiotic overproduction in *Streptomyces coelicolor* A3 2 mediated by phosphofructokinase deletion." *J Biol Chem*, 283(37):25186-25199. doi: 10.1074/jbc.M803105200.

[3] **Borodina I**, Nielsen J (2005) "From genomes to *in silico* cells via metabolic networks." *Curr Opin Biotechnol*, 16(3):350-355. doi: 10.1016/j.copbio.2005.04.008.

[2] **Borodina I**, Krabben P, Nielsen J (2005) "Genome-scale analysis of *Streptomyces coelicolor* A3(2) metabolism." *Genome Res*, 15(6):820-829. doi: 10.1101/gr.3364705.

[1] **Borodina I**, Scholler C, Eliasson A, Nielsen J (2005) "Metabolic network analysis of *Streptomyces tenebrarius*, a *Streptomyces* species with an active Entner-Doudoroff pathway." *Appl Environ Microbiol*, 71(5):2294-2302. doi: 10.1128/AEM.71.5.2294-2302.2005.

§ Equal contribution
* Co-corresponding authors

MONOGRAPHS AND BOOK CONTRIBUTIONS

[4] Dahlin J, Holkenbrink C, **Borodina I**. "EasyCloneYALI: Toolbox for CRISPR-Mediated Integrations and Deletions in *Yarrowia lipolytica*". Book chapter in "Yarrowia lipolytica: Methods and Protocols". Editors: Ian Wheeldon and Mark Blenner. ISBN: 978-1-0716-1414-3.

[3] Arnesen JA, Hoof JB, Kildegaard HF, **Borodina I**. "Genome editing of Eukarya". Book chapter in "Metabolic Engineering". Editor: Jens Nielsen. Wiley-VCH Verlag GmbH & Co. ISBN: 9783527346622.

[2] **Borodina I**, Poulsen LK, Larsen JN, Søndergaard I. "Display of wasp venom allergens on the surface of yeast". In "Hymenoptera venom allergy". The European Academy Allergy Monographs. 2009. Editor Ollert M.

[1] **Borodina I**, Eliasson A, Nielsen J: Metabolic Engineering of *Streptomyces*. Book chapter in *"The Metabolic Pathway Engineering Handbook"*; editor Christina Smolke. CRC Press. 2009. ISBN-10: 0849339235

PATENTS

[12] Borodina I, Ding B, Holkenbrink C, Kildegaard KR, Löfstedt C, Petkevicius K, Wenning L. Methods and cell factories for producing insect pheromones. WO2020169389A1.

[11] Armetta JCD, Borodina I, Milne N, Sommer MOA, van der Hoek S. "Yeast cells and methods for production of tryptophan derivatives". WO2021052989A1.

[10] Borodina I, Kell DB, van der Hoek S, Darbani B. "Methods for production of ergothioneine". WO2020221795A1.

[9] Borodina I, Holkenbrink C, Dam M, Löfstedt C. ”Methods For Producing Fatty Alcohols And Derivatives Thereof In Yeast”. WO2018109163A1.
[8] Borodina I, Holkenbrink C, Dam MI, Löfstedt C, Ding Baojian, Wang Holg-Lei. ”Production of desaturated fatty alcohols and desaturated fatty acyl acetates in yeast”. WO2018109167A1.
[7] Borodina I, Holkenbrink C, Dam MI, Löfstedt C, Ding Baojian, Wang Holg-Lei. ”Method for production of moth pheromones in yeast”. WO2016207339A1.
[6] Stahlhut SG, Siedler S, Neves AR, Maury J, Förster J, Gaspar PL, Borodina I, Prado EAR, Strucko T. ”Microbial production of the flavonoids garbanzol, resokaempferol and fisetin”. WO2016071505A1.
[5] Andersen MR, Borodina I, Do DD, Lund AM. ”Native Chinese hamster ovary cell secretion signal peptides for production of recombinant polypeptides”. EP 3323826A1.
[4] Zhu J, Jensen NB, Chen X, Förster J, Borodina I. ”Microorganisms for efficient production of melatonin and related compounds”. WO2015032911A1.
[3] Jensen NB, Borodina I, Chen Y, Maury J, Kildergaard KR, Förster J, Nielsen J. ”Microbial production of 3-hydroxypropionic acid”. WO2014198831A1.
[2] Kildergaard KR, Borodina I, Förster J, Nielsen J. ”3HP tolerance”. WO2014198841A1.
[1] Borodina I, Kildergaard KR, Förster J, Öberg F. “Genetically engineered yeast”. WO2014057036A1.

Popular press and videos _____

[14] https://www.youtube.com/watch?v=HAht5VM8nL8&feature=emb_logo
[13] https://www.berlingske.dk/business/novo-nordisk-fonden-giver-750-millioner-kroner-til-dtu-til-at-forske-i
[12] https://www.biosustain.dtu.dk/nyhedsbase/Nyhed?id={9693FEFB-6FB7-4113-9FF0-4AC3C475D11C}
[11] https://www.biosustain.dtu.dk/danish/nyhedsbase/2019/11/ergothioneine ?id=c124725a-53d8-4c36-8992-1c8efb6fe1c2
[10] https://www.labiotech.eu/industrial/carbios-bioplastics-recycling/
[9] https://www.biosustain.dtu.dk/nyhedsbase/2019/09/why-transporters-really-matter?id=76b7ba8d-0314-4092-a1c9-c7baaceb9df8
[8] https://www.naturli.dk/artikel/din-medicin-mad-og-benzin-er-levende/
[7] https://www.technologist.eu/we-can-revolutionise-pest-management/
[6] http://www.kemifokus.dk/wp-content/uploads/sites/7/DAK2-2019-s8-9.pdf
[5] https://www.biosustain.dtu.dk/nyhedsbase/nyhed?id=E33C98C5-FCFE-4B08-BC5B-506F496241C4
[4] https://novonordiskfonden.dk/da/nyheder/gaer-giver-baeredygtig-plastik/
[3] https://www.avisen.dk/danske-biophero-aps-gennemfoerer-seed-investering-pa_516231.aspx
[2] https://pubsecure.lucidpress.com/synapserelease10/#7mvU2Ey35-jW
[1] https://www.youtube.com/watch?v=YDJJYVbm21M