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Education and Professional Experience

1977-1984 graduate studies of Biology, major in Animal Physiology, Technical High-school (RWTH) Aachen and University of Freiburg (ALU): **Dipl. Biol.**
1984-1988 doctoral studies in Plant Physiology at RWTH Aachen and Max Planck Institute of Plant Breeding (MPIZ) Cologne: **Dr. rer. nat.** (Land NRW fellow)
1988 research visit at University of Stillwater, Oklahoma, USA (DAAD fellow)
1989-1990 post-doctoral studies in Biochemistry and Molecular Biology, University of Stillwater (OSU), Oklahoma, USA (NATO fellow)
1990-1994 Group Leader, Plant Physiology, RWTH Aachen
1993 Habilitation in Plant Physiology, RWTH Aachen
1994-1995 Professor of Biochemistry, RWTH Aachen
since 1995 Professor of Plant Biochemistry, University of Münster (WWU)
2000-2005 Dean of Studies, Department of Biology, WWU Münster
2000-2007 Director, Institute of Plant Biochemistry and Biotechnology, WWU Münster

Honors and Awards

1984-1988 doctoral fellow of Land Nordrhein-Westfalen and DAAD
1988 Ph.D. Award of Technical Highschool Aachen ("summa cum laude")
1989-1990 post-doctoral fellow of NATO
1990 Research Award of Land Nordrhein-Westfalen
2002 Teaching Award of University of Münster
2003 Best Practice Award "Reform-Studiengang" of "Stifterverband für die Deutsche Wissenschaft" for BSc Curriculum in Bio-Sciences
2004-2010 Bologna-Promotor of Bundesrepublik Deutschland
2005 "Goldener Hans" for Best Teacher at Fac. Biology of WWU Münster
2005-2013 Member of DAAD Selection Committee South and South East Asia
since 2005 Member of the Board of the European Chitin Society
2009-2013 Vice-President of the European Chitin Society
2009-2014 Member of the Accreditation Commission of ASIIN e.V.
2011-2013 Member of the Indo-German Intergovernmental Steering Committee on Biotechnology
2012-2017 Member of the Teaching Board of University of Münster
2017 "Goldener Hans" for Best Teacher at Fac. Biology of WWU Münster
2017 "Sybille Hahne" award for best biotech start-up "Evorion"
since 2017 President of the European Chitin Society

Student Supervision

current post-doctoral associates: 4
current PhD / graduate / undergraduate students: 16 / 4 / 3
total PhD / graduate / undergraduate students supervised: ca. 50 / 110 / 40

Research Projects (2000 – present)

CARAPAX – Chitosan Activates Resistance Against Pathogens After eXposure
2000-2005, European Union (5th Framework Research Program), ca. 2.5 Million Euro

Pyrogallolred, a new stain for the selective staining of allergenic pollen?
2004-2005, industry (podomedi, Germany), ca. 50,000 Euro

Chito-Oligosaccharides

2004-2008, DAAD/CAPES (Brazilian-German project), ca. 40,000 Euro +matching funds

Chitosan-Based Plant Protection

2005-2007, DAAD/DST (Indo-German project), ca. 30,000 Euro +matching funds

NanoBioSaccharides – Nanotechnologies for Bio-inspired polySaccharides

2005-2008, European Union (6th Framework Research Program), ca. 2 Million Euro

NanoBioSaccharideTTC

2006-2008, European Union (6th Framework Research Program), ca. 300,000 Euro

Chitinases from Tropical **Endophytes**

2007-2010, BMBF/DBT (Indo-German project), ca. 40,000 Euro + matching funds

Biochemical-molecular study of **Russian Wheat Aphid** resistance and control

2008-2011, BMBF/NRF (German-South African project), ca. 25,000 Euro +matching funds

PolyModE – Novel Polysaccharide Modifying Enzymes to optimise the potential of hydrocolloids for food and medical applications

2009-2013, European Union (7th Framework Research Program), ca. 6 Million Euro

prePhD-Modules

2010-2012, DAAD (Indo-German project), ca. 300,000 Euro

MCGS – Molecular and Cellular Glyco-Sciences - structure-function relationships of protein-carbohydrate interactions

2009-2015, DFG/UGC (first Indo-German International Research Training Group), ca. 4 Million Euro + matching funds

Prototypes of partially acetylated chitosan oligomers with non-random patterns of acetylation to reveal specific biological activities, e.g. in plant protection, food sciences, and biomedicine

2010-2011, BMBF, ca. 40,000 Euro

CuChi-BCA – Chitosan/copper-nanoparticles and biopesticides for knowledge-based plant protection

2011-2015, BMBF/DBT (first Indo-German Public Private Partnership “2+2”-project), ca. 1.2 Million Euro + matching funds

ChitoBioEngineering – Metabolic and enzyme engineering for the biotechnological production of partially acetylated chitosans

2011-2014, BMBF / Belgium / Spain (ERA-IB), ca. 0.8 Million Euro + matching funds

Nano3Bio – NanoBioEngineering for BioInspired BioPolymers

2013-2017, European Union (7th Framework Research Program), ca. 9 Million Euro

Xanthans – Enzymatic and Molecular Genetic Dissection of Xanthan Gum

2014, industry (DuPont, Denmark), ca. 80,000 Euro

ChitoGrow – Development of a Growth Stimulant for Energy Plants on Agriculturally Difficult Land and Arid Areas – Molecular Basis of Chitosan-Induced Growth Stimulation

2014-2017, BMWi (ZIM), ca. 175,000 Euro + matching funds

F2F – Adding Value to Fungal Fermentation Wastes by the Production of Fine Chemicals – Establishing Proof-of-Principle for the Production of Lysin and Dipeptides

2015-2018, BMWi (ZIM), ca. 175,000 Euro + matching funds

FunChi – Fungal Chitosans from Fermentation Mycelia for Plant Biostimulants

2016-2019, BMEL / the Netherlands / Spain (ERA-IB), ca. 500,000 Euro + matching funds

Evorion - Spin-off biotech start up foundation funds

2016-2017, BMWi, Exist - University-based start-up programme, ca. 300.000 Euro

2017-2018, MWIDE NRW, start-up NRW programme, ca. 240.000 Euro

grEEen - Grüne Elektrochemische Energiespeicher, NRW Graduate School
2017-2020, MWIDE NRW, ca. 300.000 Euro

Bex Biotec - Spin-off biotech start up foundation funds
2017-2018, BMWi, Exist - University-based start-up programme, ca. 300.000 Euro

smartBioS - Smart BioStimulants for Sustainable Plant Protection
2017-2020, BMBF / India, Bioeconomy International programme, ca. 650.000 Euro

Peer-Reviewed Publications (2012 – present)

full list at <http://www.uni-muenster.de/Biologie.IBBP/agmoerschbacher/publikationen/index.html>

- Richter C., M. E. Dirks, C. Schulze Gronover, D. Prüfer, B. M. Moerschbacher (2012)
Silencing and heterologous expression of *ppo-2* indicate a specific function of a single polyphenol oxidase isoform in resistance of dandelion (*Taraxacum officinale*) against *Pseudomonas syringae* pv. *tomato*.
Molecular Plant-Microbe Interactions **25**: 200-210
- Prabhu S. A., K. R. Kini, S. N. Raj, B. M. Moerschbacher, H. S. Shetty (2012)
Polygalacturonase-inhibitor proteins in pearl millet: possible involvement in resistance against downy mildew.
Acta Biochimica Biophysica Sinica **44**: 415-423
- Nampally M., B. M. Moerschbacher, S. Kolkenbrock (2012)
A novel genetically engineered chitosan affinity GFP-fusion protein to specifically detect chitosan in vitro and in situ.
Applied and Environmental Microbiology **78**: 3114-3119
- Dirks-Hofmeister M. E., J. K. Inlow, B. M. Moerschbacher (2012)
Site-directed mutagenesis of a tetrameric dandelion polyphenol oxidase (PPO-6) reveals the site of subunit interaction.
Plant Molecular Biology **80**: 203-217
- Oliveira E. N. J., N. E. El Gueddari, B. M. Moerschbacher, T. T. Franco (2012)
Growth rate inhibition of phytopathogenic fungi by characterized chitosans.
Brazilian Journal of Microbiology **43**: 800-809
- Brunel F., N. E. El Gueddari, B. M. Moerschbacher (2013)
Complexation of copper(II) with chitosan nanogels: towards control of microbial growth.
Carbohydrate Polymers **15**: 1348-1356
- Subha Narayan D., M. Jogi, P. V. S. R. N. Sarma, P. Pallinti, S. Katta, M. Kaur, R. Samudrala, N. E. El Gueddari, B. M. Moerschbacher, A. R. Podile (2013)
Biotechnological approaches for field applications of chitoooligosaccharides (COS) to induce innate immunity in plants.
Critical Reviews in Biotechnology **35**: 29-43
- Dirks-Hofmeister M. E., S. Kolkenbrock, B. M. Moerschbacher (2013)
Parameters that enhance the bacterial expression of active plant polyphenol oxidases.
PLoS ONE **8**: e77291
- Remoroza C., M. Wagenknecht, F. Gu, H. C. Buchholt, B. M. Moerschbacher, H. A. Schols, H. Gruppen (2014)
A *Bacillus licheniformis* pectin acetyltransferase is specific for homogalacturonans acetylated at O-3.
Carbohydrate Polymers **107**: 85-93
- Kool M. M., H. A. Schols, M. Wagenknecht, S. W. A. Hinz, B. M. Moerschbacher, H. Gruppen (2014)
Characterization of an acetyl transferase from *Myceliophthora thermophila* C1 able to deacetylate xanthan.
Carbohydrate Polymers **111**: 222–229

- Andrés E., D. Albesa-Jové, X. Biarnés, B. M. Moerschbacher, M. E. Guerin, A. Planas (2014)
Structural basis of chitin oligosaccharide deacetylation.
Angewandte Chemie Int. Ed. Engl. **53**: 6882-6887
- Hamer S. N., B. M. Moerschbacher, S. Kolkenbrock (2014)
Enzymatic sequencing of partially acetylated chitosan oligomers.
Carbohydrate Research **392**: 16-20
- Fuenzalida, J. P., T. Weikert, S. Hoffmann, C. Vila-Sanjurjo, B. M. Moerschbacher, F. Goycoolea, S. Kolkenbrock (2014)
Affinity protein-based FRET tools for cellular tracking of chitosan nanoparticles and determination of the polymer degree of acetylation.
Biomacromolecules **15**: 2532-2539
- Prabhu S. A., R. Singh, S. Kolkenbrock, S. Neerakkal, N. E. El Gueddari, B. M. Moerschbacher, R. K. Kini, M. Wagenknecht (2014)
Experimental and bioinformatic characterisation of a recombinant polygalacturonase-inhibitor protein from pearl millet and its interaction with fungal polygalacturonases.
Journal of Experimental Botany **65**: 5033-5047
- Dirks-Hofmeister M. E., R. Singh, C. M. Leufken, J. K. Inlow, B. M. Moerschbacher (2014)
Structural diversity in the dandelion (*Taraxacum officinale*) polyphenol oxidase family results in different responses to model substrates.
PLoS ONE **9**: e99759
- Subha Narayan D., M. P. Jogi, P. V. S. R. N. Sarma, P. Pallinti, S. Katta, M. Kaur, R. Samudrala, N. E. El Gueddari, B. M. Moerschbacher, A. R. Podile (2015)
Biotechnological approaches for field applications of chitooligosaccharides (COS) to induce innate immunity in plants.
Critical Reviews in Biotechnology **35**: 29-43
- Remoroza C., M. Wagenknecht, H. C. Buchholt, B. M. Moerschbacher, H. Schols, H. Gruppen (2015)
Mode of action of *Bacillus licheniformis* pectin methylesterase on highly methylesterified and acetylated pectins.
Carbohydrate Polymers **115**: 540-550
- Stöveken J., S. Kolkenbrock, M. Zakrzewski, D. Wibberg, F. G. Eikmeyer, A. Pühler, A. Schlüter, B. M. Moerschbacher (2015)
Successful heterologous expression of a novel chitinase identified by sequence analyses of the metagenome from a chitin-enriched soil sample.
Journal of Biotechnology **201**: 60-68
- Leufken C. M., B. M. Moerschbacher, M. E. Dirks-Hofmeister (2015)
Dandelion PPO-1/PPO-2 domain-swaps: the C-terminal domain modulates the pH optimum and the linker affects SDS-mediated activation and stability.
BBA - Proteins and Proteomics **1854**: 178-186
- Madhuprakash J., N. E. El Gueddari, B. M. Moerschbacher, A. R. Podile (2015)
Catalytic efficiency of chitinase-D on insoluble chitinous substrates was improved by fusing auxiliary domains.
PLoS ONE **10**: e0116823
- Prabhu S. A., M. Wagenknecht, P. Melvin, G. Kumar B.S., M. Veena, S. Sekhar, B. M. Moerschbacher, R. K. Kini (2015)
Immuno-affinity purification of PglPGIP1, a polygalacturonase-inhibitor protein from pearl millet: studies on its inhibition of fungal polygalacturonases and role in resistance against the downy mildew pathogen.
Molecular Biology Reports **42**: 1123-1138
- Hamer S., S. Cord-Landwehr, X. Biarnés, A. Planas, H. Waegeman, B. M. Moerschbacher, S. Kolkenbrock (2015)
Enzymatic production of defined chitosan oligomers with a specific pattern of acetylation

- using a combination of chitin oligosaccharide deacetylases.
Scientific Reports **5**: 8716
- Kaiser M., S. Pereira, L. Pohl, S. Ketelhut, B. Kemper, C. Gorzelanny, H. J. Galla, B. M. Moerschbacher, F. M. Goycoolea (2015)
Chitosan encapsulation modulates the effect of capsaicin on the tight junctions of MDCK cells.
Scientific Reports **5**: 10048
- Nampally, M., M. B. G. Rajulu, D. Gillet, T. S. Suryanarayanan, B. M. Moerschbacher (2015)
A high diversity in chitinolytic and chitosanolytic species and enzymes and their oligomeric products exist in soil with a history of chitin and chitosan exposure.
BioMedical Research International 2015: 857639
- Langner T., M. Ozturk, S. Hartmann, S. Cord-Landwehr, B. Moerschbacher, J. D. Walton, V. Gohre (2015)
Chitinases are essential for cell separation in *Ustilago maydis*.
Eukaryotic Cell **14**: 846-857
- Kleine-Brueggenehy H., G. K. Zorzi, T. Fecker, N. E. El-Gueddari, B. M. Moerschbacher, F. M. Goycoolea (2015)
A rational approach towards the design of chitosan-based nanoparticles obtained by ionotropic gelation.
Colloid Surface B **135**: 99-108
- Santos-Carballal B., L. J. Aaldering, M. Ritzefeld, S. Pereira, N. Sewald, B. M. Moerschbacher, M. Götte, F. M. Goycoolea (2015)
Physicochemical and biological characterization of chitosan-microRNA nanocomplexes for gene delivery to MCF-7 breast cancer cells.
Scientific Reports **5**: 13567
- Madhuprakash J., K. B. Bobbili, B. M. Moerschbacher, T. P. Singh, M. J. Swamy, A. R. Podile (2015)
Inverse relationship between chitobiase and transglycosylation activities of chitinase-D from *Serratia proteamaculans* revealed by mutational and biophysical analyses.
Scientific Reports **5**: 15657
- Madhuprakash J., N. E. El Gueddari, B. M. Moerschbacher, A. R. Podile (2015)
Production of bioactive oligosaccharides from chitosans using hypertransglycosylating chitinase-D of *Serratia proteamaculans* and its mutant W114A.
Bioresource Technology **198**: 503-509
- Fuenzalida J. P., P. K. Nareddy, I. Moreno-Villoslada, B. M. Moerschbacher, M. J. Swamy, S. Pand, M. Ostermeier, F. M. Goycoolea (2016)
On the role of alginate structure in complexing with lysozyme and application for enzyme delivery.
Food Hydrocolloids **53**: 239–248
- Santos-Carballal B., M. J. Swamy, B. M. Moerschbacher, F. M. Goycoolea (2016)
SYBR gold fluorescence quenching is a sensitive probe of chitosan-microRNA interactions.
Journal of Fluorescence **26**: 37-42
- Melcher R. L. J., B. M. Moerschbacher (2016)
An improved microtiter plate assay to monitor the oxidative burst in monocot and dicot plant cell suspension cultures.
Plant Methods **12**: 5
- Das S. N., M. Wagenknecht, P. K. Nareddy, B. Bhuvanachandra, R. Niddana, R. Balamurugan, M. J. Swamy, B. M. Moerschbacher, A. R. Podile (2016)
Amino groups of chitosan are crucial for binding to a family 32 carbohydrate binding module of a chitosanase from *Paenibacillus elgii*.
Journal of Biological Chemistry **291**: 18977-18990

- Matano C., S. Kolkenbrock, S. Hamer, E. Sgobba, B. M. Moerschbacher, V. F. Wendisch (2016)
Corynebacterium glutamicum possesses β -N-acetylglucosaminidase.
BMC Microbiology **16**: 177
- Cord-Landwehr S., R. L. J. Melcher, S. Kolkenbrock, B. M. Moerschbacher (2016)
A chitin deacetylase from the endophytic fungus *Pestalotiopsis* sp. efficiently inactivates the elicitor activity of chitin oligomers in rice cells.
Scientific Reports **6**: 38018
- Naqvi S., B. M. Moerschbacher (2017)
The cell factory approach towards biotechnological production of high-value chitosan oligomers and their derivatives: an update.
Critical Reviews in Biotechnology **37**: 11-25
- Thimoteo S. S., A. Glogauer, H. Faoro, E. M. de Souza, L. F. Huergo, B. M. Moerschbacher, F. O. Pedrosa (2017)
A broad pH range and processive chitinase from a metagenome library.
Brazilian Journal of Medical and Biological Research **50**: e5658
- Melcher R. L. J., M. Neumann, J. P. Fuenzalida Werner, F. Gröhn, B. M. Moerschbacher (2017)
Revised domain structure of ulvan lyase and characterization of the first ulvan binding domain.
Scientific Reports **7**: 44115
- Wattjes, J., B. Schindler, S. Trombotto, L. David, B. M. Moerschbacher, I. Compagnon (2017)
Discrimination of patterns of N-acetylation in chitooligosaccharides by gas phase IR spectroscopy integrated to mass spectrometry.
Pure and Applied Chemistry **89**: 1349-1357
- Muños I., C. Rodríguez, D. Gillet, B. M. Moerschbacher (2017)
Life cycle assessment of chitosan production in India and Europe.
International Journal of Life Cycle Assessment <https://doi.org/10.1007/s11367-017-1357-0>
and: Erratum to: Life cycle assessment of chitosan production in India and Europe.
International Journal of Life Cycle Assessment <http://dx.doi.org/10.1007/s11367-017-1290-2>
- Cord-Landwehr S., P. Ihmor, A. Niehues, H. Luftmann, B. M. Moerschbacher, M. Mormann (2017)
Quantitative mass-spectrometric sequencing of chitosan oligomers reveals cleavage sites of chitosan hydrolases.
Analytical Chemistry **89**: 2893-2900
- Sreekumar S., P. Lemke, B. M. Moerschbacher, S. Torres-Giner, J. M. Lagarón (2017)
Preparation and optimization of submicron chitosan capsules by water-based electrospinning for food and bioactive packaging applications.
Food Additions and Contaminations Part A **34**: 1795-1806
- Kohlhoff M., A. Niehues, J. Wattjes, J. Bénateau, S. Cord-Landwehr, N. E. El Gueddari, F. Bernard, G. R. Rivera-Rodriguez, B. M. Moerschbacher (2017)
Chitinase: a fungal chitosan hydrolyzing enzyme with a new and unusually specific cleavage pattern.
Carbohydrate Polymers **174**: 1121-1128
- Niehues A., J. Wattjes, J. Bénateau, G. R. Rivera-Rodriguez, B. M. Moerschbacher (2017)
Chitosan analysis by enzymatic/mass spectrometric fingerprinting and in silico predictive modeling.
Analytical Chemistry **89**: 12602-12608
- Gonçalves Barbosa, H. F., M. Attjioui, A. P. Garcia Ferreira, E. R. Dockal, N. E. El Gueddari, B. M. Moerschbacher, É. T. Gomes Cavalheiro (2017)
Synthesis, characterization and biological activities of biopolymeric Schiff bases prepared

with chitosan and salicylaldehydes and their Pd(II) and Pt(II) complexes.
Molecules **22**: 1987

Weikert, T., A. Niehues, S. Cord-Landwehr, M. J. Hellmann, B. M. Moerschbacher (2017)
Reassessment of chitosanase substrate specificities and classification.
Nature Communications **8**: 1698

Hembach, L., S. Cord-Landwehr, B. M. Moerschbacher (2017)
Enzymatic production of all fourteen partially acetylated chitosan tetramers using different
chitin deacetylases acting in forward or reverse mode.
Scientific Reports **7**: 17692

Hoßbach J., F. Bußwinkel, A. Kranz, J. Wattjes, S. Cord-Landwehr, B. M. Moerschbacher
(2018)
A chitin deacetylase of *Podospira anserina* has two functional chitin binding domains and
a unique mode of action.
Carbohydrate Polymers **183**: 1-10

Prexler, S. M., R. Singh, B. M. Moerschbacher, M. E. Dirks-Hofmeister (2018)
A specific amino acid residue in the catalytic site of dandelion polyphenol oxidases acts as
'selector' for substrate specificity.
Plant Molecular Biology **96**: 151-164

Regel, E. K., T. Weikert, A. Niehues, B. M. Moerschbacher, R. Singh (2018)
Protein-engineering of chitosanase from *Bacillus* sp. MN to alter its substrate specificity.
Biotechnology and Bioengineering (doi: 10.1002/bit.26533)

Sreekumar, S., G. R. Rivera-Rodriguez, F. M. Goycoolea, B. M. Moerschbacher (2018)
Parameters influencing the size of chitosan-TPP nano- and microparticles.
Scientific Reports

Bußwinkel, F., O. Goñi, S. Cord-Landwehr, S. O'Connell, B. M. Moerschbacher (2018)
Endochitinase 1 (Tv-ECH1) from *Trichoderma virens* has high subsite specificities for
acetylated units when acting on chitosans.
International Journal of Biological Macromolecules