

SANDRA LOESGEN, Ph.D.
Associate Professor of Chemistry



Dr. Sandra Loesgen is focused on understanding the diversity and bioactivity of the chemicals produced by microorganisms. She employs a multi-disciplinary approach to isolate compounds produced by terrestrial and marine microbes to identify chemicals with functions in the microbiome and the ecosystem but also can serve as drug leads for medical applications. Recent projects in the Loesgen lab have surveyed the chemicals produced by endophytic fungi and rare actinomycetes, which have yielded several novel and highly active compounds with anti-cancer, antibacterial, and anti-viral activity. Ongoing research examines the chemicals produced by marine microbiomes, microbial strains derived from aquatic environments, the chemistry involved in symbioses, and the pharmacology of newly identified compounds.

Education:

2007 Ph.D. Organic Chemistry, Georg-August Universität Göttingen, Germany
2004 Diplom Chemistry Georg-August Universität Göttingen, Germany

Professional Experience:

2022-Present Affiliated Associate Professor of Medicinal Chemistry, College of Pharmacy, University of Florida
2019-Present Associate Professor of Chemistry, Whitney Laboratory for Marine Bioscience, University of Florida
2019 Associate Professor of Chemistry, Oregon State University
2015 - 2019 Adjunct Faculty, Pharmaceutical Science, College of Pharmacy, OSU
2013 - 2019 Assistant Professor of Chemistry, Oregon State University
2011 – 2013 NIH Postdoctoral Fellow, Intramural Research Trainee Award NIDDK
2008 – 2010 DFG (German Research Foundation) Fellow at SIO/UCSD
2007 – 2008 Lecturer, University of Göttingen, Germany

Postgraduate Appointments:

2011-2013 National Institutes of Health (NIDDK), MD
2010 HHMI Janelia Farm Research Campus, VA
2008-2010 UC San Diego, Scripps Inst. of Oceanography, CA

Awards and Fellowships:

2020 JNP Jack L. Beal award for best paper from a young investigator
2019-2023 American Society of Pharmacognosy (ASP) Ambassador
2019 Novo Nordisk Travel Award to attend the Copenhagen Bioscience Conference
2019 OSU Loyd F. Carter Award for Outstanding & Inspirational Teaching in Science
2018 OSU COS Research and Innovation Seed (SciRIS) Program award winner
2018 American Society of Pharmacognosy (ASP) IUPAC Award
2017 OSU's Milton Harris Faculty Teaching Award
2015 ASP John Faulkner Award
2013 Endowment: Terence Bradshaw Chemistry Professor
2012 NIH & FDA Thermo Fisher 'Glycobiology of Viruses' Best Poster Award
2011 German Research Foundation (DFG) Travel award
2008-2010 DFG Postdoctoral Research Fellowship
2007 Dissertation awarded *summa cum laude*

Research Interests:

- Natural products chemistry
- Chemical ecology

- Structure determination by spectroscopic and computational means
- Drug discovery for new cytotoxic and anti-infective leads
- Mode-of-action studies, cell biology

Membership in Professional Societies:

- German Chemical Society (GDCh)
- American Chemical Society (ACS)
- American Society of Pharmacognosy (ASP)

Teaching and Service:

2013-2019 at Oregon State University, 2019-present University of Florida:

CH335 Organic Chemistry: majors sophomore sequence (W15, W16, W17, W18, W19)

CH435/535 Organic Spectroscopy: UG/Graduate level class (F13, F14, F15, F17, F18)

CH633 Hypothesis, Evidence, and Argument in Organic Chemistry (S14, S15, W17, W18)

CH637 Selected topics in Organic Chemistry: Chemical Biology (S15, W15, W16, W19)

CHM4230/5235 Organic Spectroscopy: UG/Graduate level class (F2020, F2022)

2013-Present ACS Postdoc to Faculty Workshop (P2F) Facilitator

2017 Local organizer for the annual American Society of Pharmacognosy meeting

2020-Present ASP webinar organizer to connect the community during the COVID pandemic

Recent Publications (2007-Present):

UNDER REVIEW: Jagels, A., Adressa, D. A., Kaweesa, E. N., McCauley, M., Philmus, B., Strother, J. A., **Loesgen, S.** 2023. Metabolomics-guide discovery, isolation, structure elucidation, and bioactivity of myropeptins C-E from *Myrothecium inundatum*

UNDER REVIEW: A. Odera et al. 2023. Symbiosis-driven development in an early branching metazoan. DOI: <https://doi.org/10.1101/2022.07.21.500558>

UNDER REVIEW: McCauley, M., Goulet, T. L., Jackson, C. R., **Loesgen, S.** 2023. Systematic review of cnidarian microbiomes reveals insights into the structure, specificity, and fidelity of marine associations.

Li, Z., Xu, B., Ortega, T., Adressa, D. A., Ning, W., Wei, X., Liu, J., Tantillo, D. J., **Loesgen, S.**, Rudolf, J. D. 2023. First *trans*-eunicellane terpene synthase in bacteria. *Chem*, <https://doi.org/10.1016/j.chempr.2022.12.006>.

Kaweesa, E. N., Padhi, A., Davis, G. N., McMillan, R. P., Brown, D. A., Nain, A. S., **Loesgen, S.** 2022. The natural product mensacarcin combats BRAF mutant and chemo-resistant melanoma by affecting cell metabolism and cellular migration. *Advances in Cancer Biology – Metastasis*, 6, 10070. <https://doi.org/10.1016/j.adcanc.2022.100070>

Maruyama, S., Mandelare-Ruiz, P. E., McCauley, M., Peng, W., Cho, B., Wang, J., Mechref, Y., **Loesgen, S.**, Weis, V. 2022. Heat stress of the algal partner hinders colonization success and alters the algal cell surface glycome in a cnidarian-algal symbiosis. *Microbiol. Spec.*, 10 (3), e01567-22. <https://doi.org/10.1128/spectrum.01567-22>

Robles, A. J., Dai, W., Haldar, S., Ma, H., Anderson, V., Overacker, R. D., Risinger, A. L., **Loesgen, S.**, Houghton, P. J., Cichewicz, R. H., Mooberry, S. L., 2021. Alkylated piperazine alkaloid, a highly effective and specific cytotoxin against Ewing sarcoma. *Cancers*, 13(24), 6176, <https://doi.org/10.3390/cancers13246176>

- Khoshbakht, M., Srey, J., Adressa, D. A., Jagels, A., **Loesgen, S.** 2021. Precursor-directed biosynthesis of aminofulvenes: new chalanilines from endo phytic fungus *Chalara* sp. *Molecules*, 26(15), 4418; <https://doi.org/10.3390/molecules26154418>
- Alouane, T., Rimbert, H., Bormann, J., González-Montiel, G. A., **Loesgen, S.**, Schäfer, W., Freitag, M., Langin*, T., Bonhomme L.*. 2021. Comparative Genomics of eight *Fusarium graminearum* strains with contrasting aggressiveness reveals an expanded open pangenome and extended effector content signatures. *Int. J. Mol. Sci.*, 22, 6257. <https://doi.org/10.3390/ijms22126257>
- Khoshbakht, M., Thanaussavadate, B., Zhu, C., Cao, Y., Zakharov, L. N., **Loesgen, S.**, Blakemore, P. R.* 2021. Total Synthesis of Chalaniline B: An Antibiotic Aminoxanthone Isolated from Vorinostat-Treated Fungus *Chalara* sp. 6661. *J. Org Chem.*, 86, 7773-7780. DOI:10.1021/acs.joc.1c00528
- Zhu, C.§, Xu, B.§, Adressa, D. A.§, Rudolf, J. D.* , **Loesgen, S.*** 2021. Discovery and biosynthesis of a structurally dynamic antibacterial diterpenoid. *Angewandte Chemie*, 60, 14163-14170. DOI: 10.1002/anie.202102453R1 and 10.1002/ange.202102453R1
- Zhu, C., Lew, C. I., Neuhaus, G. F., Adressa, D. A., Zakharov, L. N., Kaweesa, E. N., Plitzko, B., **Loesgen, S.*** 2021. Biodiversity, bioactivity, and metabolites of high desert derived Oregonian soil bacteria. *Chem. Biodiv.* 18, e2100046 DOI <https://doi.org/10.1002/cbdv.202100046>
- Wu, M.-Y., Mead, M. E., Lee, M.-K., Neuhaus, G. F., Adressa, D. A., Martien, J. I., Son, Y.-E., Moon H., Amador-Noguez, D., Han, K.-H., Rokas, A., **Loesgen, S.**, Yu, J.-H., Park, H.-S. 2021. Transcriptomic, protein-DNA interaction, and metabolomic studies of VosA, VelB, and WetA in *Aspergillus nidulans* asexual spores. *mBIO*. 12 (1): e03128-20. Doi: 10.1128/mBio.03128-20.
- Neuhaus, G.F., **Loesgen, S.*** Antibacterial Drimane Sesquiterpenes from *Aspergillus ustus*. 2021. *J. Nat. Prod.*, 84, 1, 37-45. Doi: 10.1021/acs.jnatprod.0c00910
- Wu, M., Mead, M. E., Lee, M., Neuhaus, G. F., Adressa, D. A., Martien, J. I., Son, Y., Moon, H., Amador-Noguez, D., Han, K., Rokas, A., **Loesgen, S.**, Yu, J., Park, H. 2021. Transcriptomic, protein-DNA interaction, and metabolomic studies of VosA, VelB, and WetA in *Aspergillus nidulans* asexual spores. Accepted December 21 2020. *mBIO* Preprint: [biorxiv.org/content/10.1101/2020.09.09.290809v1](https://doi.org/10.1101/2020.09.09.290809v1)
- Neuhaus, G.F., **Loesgen, S.** 2021. Antibacterial Drimane Sesquiterpenes from *Aspergillus ustus*. *Journal of Natural Products*. 2021, 84, 1, 37-45. Doi:10.1021/acs.jnatprod.0c00910
- Overacker, R.D., Plitzko, B., **Loesgen, S.** 2021. Biolayer interferometry provides a robust method for detecting DNA binding small molecules in microbial extracts. *Analytical and Bioanalytical Chemistry*, 2021, 413, 1159-1171.
- Padhi, A., Thomson, A. H., Perry, J. B., Davis, G. N., McMillan, R. P., **Loesgen, S.**, Kaweesa, E. N., Kapania, R., Nain, A. S., and Brown, D. A. 2020. Bioenergetics underlying single-cell migration on aligned nanofiber scaffolds. *American Journal of Physiology-Cell Physiology*. 318 (3), C476-C485, 3,
- González-Montiel, G. A., Kaweesa, E. N., Feau, N., Hamelin, R. C., Stone, J. K., and **Loesgen, S.** 2020. Chemical, Bioactivity, and Biosynthetic Screening of Epiphytic Fungus *Zasmidium pseudotsugae*. *Molecules*, 25, 2358. DOI:10.3390/molecules25102358
- Tivey, T. R., Parkinson, J. E., Mandelare, P. E., Adressa, D. A., Weis, V. M., **Loesgen, S.** 2020. N-linked surface glycan biosynthesis, composition, inhibition, and function in cnidarian-dinoflagellate symbiosis. *Microbial Ecology*, 80, 223-236. DOI: 10.1007/s00248-020-01487-9

- Padhi, A., Thomson, A. H., Perry, J. B., Davis, G. N., McMillan, R. P., **Loesgen, S.**, Kaweesa, E. N., Kapania, R., Nain, A. S., Brown, D. A. 2019. Bioenergetics underlying single cell migration on aligned nanofiber scaffolds. *American Journal of Physiology: Cell Physiology*. Online 25 Dec 2019. <https://doi.org/10.1152/ajpcell.00221.2019>
- Neuhaus, G. F., Adressa, D. A., Bruhn, T., **Loesgen, S.** 2019. Polyketides from marine-derived *Aspergillus porosus*: challenges and opportunities for determining absolute configuration. *J. Nat. Prod.*, 82, 2780-2789. DOI 10.1021/acs.jnatprod.9b00416
- Adressa, D. A., Connolly, L. R., Konkol, Z. M., Neuhaus, G. F., Chang, X. L., Pierce, B. R., Smith, K. M., Freitag, M., **Loesgen, S.** 2019. A metabolomics-guided approach to discover novel *Fusarium graminearum* metabolites after removal of a repressive histone modification. *Fungal Genetics and Biology* 132, 103256. DOI: 10.1016/j.fgb.2019.103256
- Overacker, R. D., Banerjee, S., Neuhaus, G. F., Milicevic Sephton, S., Herrmann, A., Strother, J. A., Brack-Werner, R., Blakemore, P. R., **Loesgen, S.** 2019. Biological Evaluation of Molecules of the azaBINOL Class as Antiviral Agents: Specific Inhibition of HIV-1 RNase H Activity by 7-Isopropoxy-8-(naphth-1-yl)quinoline. *Bioorganic & Medicinal Chemistry* 27, 3595-3604. DOI: 10.1016/j.bmc.2019.06.044
- J. Bormann, C. Heinze, C. Blum, M. Mentges, A. Brockmann, A. Alder, S. K. Landt, B. R. Josephson, D. Indenbirken, M. Spohn, B. Plitzko, **S. Loesgen**, M. Freitag, W. Schäfer: Expression of a structural protein of the mycovirus FgV-ch9 negatively affects the transcript level of a novel symptom alleviation factor and causes virus-infection like symptoms in *Fusarium graminearum*. *J. Virol.* 2018, DOI: 10.1128/JVI.00326.18
- B. Plitzko, **S. Loesgen**: Measurement of oxygen consumption rate (OCR) and extracellular acidification rate (ECAR) in culture cells for assessment of the energy metabolism. *Bio-protocol* 2018, 8(10): e2850. DOI: 10.21769/BioProtoc.2850.
- J. E. Parkinson, T. R. Tivey, P. E. Mandelare, D. A. Adressa, **S. Loesgen**, V. M. Weis: Subtle differences in symbiont cell surface glycan profiles do not explain species-specific colonization rates in a model cnidarian-algal symbiosis. *Front. Microbiol.* 2018, 9, 842. DOI: 10.3389/fmicb.2018.00842
- P. E. Mandelare, D. A. Adressa, E. N. Kaweesa, L. N. Zakharov, **S. Loesgen**: Co-culture of two Developmental Stages of a Marine-derived *Aspergillus alliaceus* Results in the Production of the Cytotoxic Bianthrone Allianthrone A. *J. Nat. Prod.* 2018, 18, 1014-1022. DOI: 10.1021/acs.jnatprod.8b00024
- B. Plitzko, E. N. Kaweesa, **S. Loesgen**: The Natural Product Mensacarcin Induces Mitochondrial Toxicity and Apoptosis in Melanoma Cells. *J. Biol. Chem.* 2017, 292, 21102-21116. DOI: 10.1074/jbc.M116.774836
- D. A. Adressa, K. Stalheim, P. J. Proteau, **S. Loesgen**: Unexpected biotransformation of the HDAC inhibitor vorinostat yields aniline-containing fungal metabolites. *ACS Chem. Biol.* 2017, DOI: 10.1021/acscchembio.7b00268
- S. Shahzad-ul-Hussan, Mallika Sastry, Thomas Lemmin, Cinque Soto, **S. Loesgen**, Danielle A. Scott, Jack R. Davison, Katheryn Lohith, Robert O'Connor, Peter D. Kwong, C. A. Bewley: NMR structures and characterization of Man-9 free and complexed with HIV-neutralizing agents. *ChemBioChem*, 2017, 18, 1-9. doi: 10.1002/cbic.201600665.

D. A. Adpressa, **S. Loesgen**: Bioprospecting Chemical Diversity and Bioactivity in a Marine Derived *Aspergillus terreus*. *Chem. Biodivers.* 2016, 13, 253-259. DOI: 10.1002/cbdv.201500310.

S. Maier, T. Pflüger, **S. Loesgen**, K. Asmus, E. Brötz, T. Paululat, A. Zeeck, S. Andrade, A. Bechthold: Novel insights into the bioactivity and epoxide formation in mensacarcin by MsnO8. *ChemBioChem* 2014, 15, 749-756.

A. Kachko*, **S. Loesgen***, S. Shahzad-ul-Hussan, W. Tan, I. Zubkova, K. Takeda, F. Wells, S. Rubin, C. A. Bewley and M. E. Major: Inhibition of Hepatitis C Virus by the Cyanobacterial Protein MVL: mechanistic differences between the high- mannose specific lectins MVL, CV-N, and GNA. *Mol. Pharmaceutics* 2013, 10, 4590-4602. DOI: 10.1021/mp400399b.

M. Pancera, S. Shahzad-ul-Hussan, N. A. Doria-Rose, K. Dai, J. S. McLellan, R. P. Staube, Y. Yang, B. Zhang, **S. Loesgen**, M. N. Amin, L.-X. Wang, D. R. Burton, W. C. Koff, G. J. Nabel, J. R. Mascola, C. A. Bewley, P. D. Kwong: Structure of broadly neutralizing antibody PG16 in complex with HIV-1 gp120 V1/V2 domain reveals complex-type N-glycan recognition. *Nat. Struct. Mol. Biol.* 2013, 20, 804-813.

N. M. Haste, W. Thienphrapa, D. N. Tran, **S. Loesgen**, P. Sun, S.-J. Nam, P. R. Jensen, W. Fenical, G. Sakoulas, V. Nizet, M. E. Hensler: Activity of the thiopeptide antibiotic nosiheptide against contemporary strains of methicillin-resistant *Staphylococcus aureus*. *J. Antibiot.* 2012, 65, 593–598.

L. Kaysser, P. Bernhardt, S.-J. Nam, **S. Loesgen**, J. G. Ruby, P. Skewes-Cox, W. Fenical, B. S. Moore: Merochlorins A–D, cyclic meroterpenoid antibiotics biosynthesized from divergent pathways involving vanadium-dependent chloroperoxidases. *J. Am. Chem.* 2012, 134, 11988-11991.

G. Sakoulas, S.-J. Nam, **S. Loesgen**, W. Fenical, P. R. Jensen, V. Nizet, M. Hensler: Novel Bacterial Metabolite Merochlorin A Demonstrates in vitro Activity against Multi-Drug Resistant Methicillin-Resistant *Staphylococcus aureus*. *PLoS ONE* 7(1): e29439. 2012. doi:10.1371/journal.pone.0029439

A. Edlund, **S. Loesgen**, W. Fenical, P. R. Jensen: Geographic Distribution of Secondary Metabolite Genes in the Marine Actinomycete *Salinispora arenicola*. *Appl. Environ. Microbiol.* 2011, 77, 5916-5925.

S. Loesgen, T. Bruhn, K. Meindl, I. Dix, B. Schulz, A. Zeeck, G. Bringmann: (+)-Flavipucine, the Missing Member of the Pyridione Epoxide Family of Fungal Antibiotics. *Eur. J. Org. Chem.* 2011, 26, 5156-5162.

B. Schulz, S. Draeger, T. E. dela Cruz, J. Rheinheimer, K. Siems, **S. Loesgen**, J. Bitzer, O. Schloerke, A. Zeeck, I. Kock, H. Hussein, J. Dai, K. Krohn: Screening strategies for obtaining novel, biologically active, fungal secondary metabolites from marine habitats. *Botanica Marina* 2008, 51, 219-234.

S. Lösgen, J. Magull, B. Schulz, S. Draeger, A. Zeeck: Isofusidienols, Novel Chromone-3-oxepines Produced by the Endophytic Fungus *Chalara* sp. *Eur. J. Org. Chem.* 2008, 698-703.

S. Lösgen, O. Schlörke, K. Meindl, R. Herbst-Irmer, A. Zeeck: Structure and Biosynthesis of Chaetocyclinones, New Polyketides Produced by an Endosymbiotic Fungus. *Eur. J. Org. Chem.* 2007, 2191-2196.

S. Lösgen: Isolation and Structure Elucidation of Secondary Metabolites of Fungi associated with marine Algae and Semisynthetic Studies on the Cytotoxic Polyketide Mensacarcin. Book in German. Sierke Verlag Göttingen Göttingen 2007 (ISBN 3-940333-18-6).

Research Support:

Current:

Co-PI, NSF IOS-2124120 (08/15/2021-08/14/2024) "*Cell biology of cnidarian-dinoflagellate symbiosis: Signaling, regulation and host response pathways*" \$597,545

PI, NSF NEF-2025476 (10/01/2020-09/30/2023) "*Chemistry of cnidarian symbiosis: microbiomes role in association, morphogenesis, and protection*" \$499,868

PI, NSF CH-1808717, CH-2020110 (10/01/2018-01/31/2023) "*New tools to Access the Fungal Metabolome and its Ecological Function*" \$505,147

Past:

Co-PI, NSF DBI-1560356 (02/16/2016-02/28/2022) "*REU Site: Marine Biodiversity: lessons from molecules, development, and behavior*" \$431,912

Co-PI, NIH T32 Training grant to OSU (2019-2024) \$1,200,000

Co-PI, NSF IOS 1557804 (02/01/2016-01/31/2019) "*Glycan recognition and the role of innate immunity in cnidarian-dinoflagellate symbioses*" \$583,279