Sema Karakurt-Fischer

Schmidt Science Postdoctoral Fellow
Eawag, Microbial Community Assembly Group
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Scientific Statement

My overarching objective is to *leverage the potential of microbially-mediated processes for and beyond pollutant mitigation* for sustainable water and wastewater treatment. My approach draws upon the principles and methods of process engineering, microbial ecology, and analytical chemistry to put together a comprehensive view of how and why micropollutant biodegradation occurs in engineered aquatic and soil ecosystems. Identifying performance determining factors (e.g., oxygen availability, contact time, presence and lack of requiered biotransformation functions etc.) will allow the integration of biological treatment, e.g. biofiltration, as a reliable and predictable pillar of advanced water treatment options. To realize this vision, I do and will continue to focus on three key elements: i) conducting in-depth mechanistic and interdisciplinary studies in the laboratory and in-silico to thoroughly understand the processes involved, ii) translating these laboratory findings and predictions into applied research in the field to assess their practical feasibility and iii) collaborating and engaging with stakeholders to ensure the real-world application of these findings and maximize their impact.

Training and professional experience

Post-doctorate — 2022 – present
Eawag, CH, Department of Environmental Microbiology
Mentor: Dr. David R. Johnson, Microbial Community Assembly Group

Maternity Leave — 2021

Doctorate – Dr.Ing. in Environmental Engineering, *summa cum laude* — Dec. 2020
TU Munich, DE, Chair of Urban Water Systems Engineering
Mentors: Prof. Dr. Jörg E. Drewes, Water Recycling Group
Dr. Uwe Hübner, Advanced Water Treatment Group

Master – M.Sc. in Energy & Process Engineering — Nov. 2016
TU Berlin, DE, Faculty of Process Sciences
Mentor: Prof. Dr. Martin Jekel, Water Quality Engineering

Bachelor – B.Sc. in Chemical Engineering — Sept. 2012
Ege University, TR, Faculty of Chemical Engineering
Mentor: Prof. Dr. Mustafa Demircioglu

Bachelor – Erasmus student — 2011 – 2012
Cantabria University, ES, Department of Chemical & Biomolecular Engineering
Mentor: Prof. Dr. Inmaculada Ortiz

Research interests and competences

Micropollutant biodegradation, Adsorption - Biofiltration, Biological process optimization, In-situ oxygen delivery, Advanced wastewater treatment, Managed aquifer recharge, Defacto reuse, Water reuse, Predictive metabolism, Microbial community design, function and interactions.

Funding

Schmidt Science Fellows, Postdoctoral Fellowship, Prize: 213'000 USD — 2021
Postdoctoral funding for 25 months

TU Munich, Postdoctoral Fellowship — 2020
Postdoctoral funding for 3 months

German Academic Scholarship Foundation Fellow — 2013 – 2016
Master studies funding for 3 years

Awards and honors

Schmidt Science Fellows, Discretionary Award, Prize: 5'000 USD — 2023

Willy-Hager-Prize, Doctoral Degree Award, Prize: 6'000 € — 2021
Acknowledges excellent process engineering solutions for our society in the field of water management

TU Munich Doctoral Degree Award, Prize: 1'500 € — 2021

Berlin Water Company, Master Thesis Award, Prize 1'000 € — 2016

Travel awards for the conferences — 2017 – 2023
GDCh Water 2017, 2018, 2019, 2021, 2022, and Ecotoxicomic 2023

Community and scientific service

Mentoring women and first-generation students in science — 2019 – present

Reviewer for Environmental Science and Technology | Water — 2022 – present
Environmental Science and Technology — 2020 – present

Chair at BioRemid Conference, Muttenz, Switzerland — 2023

Organizer and chair at 12th IWA Water Reuse Conference, Berlin, Germany — 2019

Co-organization of 2 stakeholder meetings in Berlin, Germany — 2018 and 2019
as part of the BMBF - TrinkWave project
Focus: the status quo and the future of water management, water reuse
Participants: Policy makers, environmental law scholars, interdisciplinary water research scientists, water companies, and DECHEMA

Female PhD student representative — 2019
Chair of Urban Water Systems Engineering, TU Munich, Germany

Member of 'Engineers without borders', TU Berlin, Germany — 2014 – 2015

Project Europe Initiative Fellow, Berlin, Germany — 2013 – 2014
German Academic Scholarship Foundation Fellow
Diverse familial concepts and rights within the European LGBTIQ community
A family is a family is a family?

Teaching and supervision

Courses developed and thaught
Sanitation in the global south, Master's level, TU Munich — 2019 – 2020

Courses thaught
Practical course microbiology, Bachelor's level, ETH Zurich — 2020
Engineered natural treatment systems, Master's level, TU Munich — 2018 – 2019

Hydrochemistray lab, Bachelor's level, TU Munich	2017 – 2019
Managed aquifer recharge workshop, Master's level, TU Munich	2018

Master thesis supervision
Nicolas Pfeiffer (2023, Eawag), Alexandra Schmuck (2020, TU Munich), Emil Bein (2019, TU Munich), Mario Gramm (2019, TU Munich), Daniela Schweiger (2018, TU Munich), Dennis Goessl (2018, TU Munich), Jad Arbash (2018, TU Munich), Ludwig Schmid (2018, TU Munich), Sofia Ganthaler (2018, TU Munich), and Joshua Gallegos (2017, co-supervisor, TU Munich)

Study project supervision
Alexandra Schmuck (2020, TU Munich), Gloria Tessaro (2020, TU Munich), Geronimo Etchechury (2019, TU Munich), Sarah Stanoyevic (2019, co-supervisor, TU Munich), and Jinny Chaohensiri (2017, co-supervisor, TU Munich)

Bachelor thesis supervision
Lisa Pöll (2020, co-supervisor, TU Munich), Daniel Nieß (2018, TU Munich) and George Schücking (2018, co-supervisor, TU Munich)

Research assistant supervision
Amr Souf (2019-2020, TU Munich), Anastasia Ruf (2017-2019, TU Munich), Katharina Sendlhofer (2018, co-supervisor, TU Munich), and Eric Ziemensdorf (2017, co-supervisor, TU Munich)

Selected oral presentations

Karakurt-Fischer*, S.; Johnson, D.; Fenner, K.; Hafner, J., **2023**. The path forward for enhanced pollutant degradation - rational assembly of synthetic bacterial communities. Gordon Research Seminar: Applied and Environmental Microbiology. United States. **Invited talk.*

Karakurt-Fischer, S.; Robinson, S.; Johnson, D.; Fenner, K., **2022**. Identifying potential blockbuster trifluoroacetate precursors. 3rd International Conference on Microbial Ecotoxicology (Ecotoxicomic), France.

Karakurt-Fischer*, S., **2022.** Development and validation of a novel treatment concept for planned potable reuse based on sequential managed aquifer recharge technology for more sustainable water management. Jahrestagung GDCh Wasser, Germany. **Willy-Hager-Prize talk.*

Karakurt, S.; Sanz-Prat, A.; Ergh, M.; Rien, C.; Selinka, H.C.; Hübner, U.; Drewes, J. E., **2019**. Coupling high-rate infiltration trench technology with a plug-flow bioreactor (SMARTplus) for indirect potable reuse via groundwater recharge. 12th IWA International Water Reuse Conference, Germany.

Karakurt, S.; Schmid, L; Hübner, U.; Drewes, J. E., **2019**. The status of de facto potable reuse – A national reconnaissance of Germany. 12th IWA International Water Reuse Conference, Germany.

Karakurt, S.; Sanz-Prat, A.; Greskowiak, J.; Ergh, M.; Gerdes, H.; Massmann, G.; Rien, C.; Selinka, H.C.; Hübner, U.; Drewes, J. E., **2019**. Kopplung der modifizierten Sickerschlitzgraben Technologie mit einem Plug-Flow-Bioreaktor Konzept zur indirekten Wasserwiederverwendung durch Grundwasseranreicherung, GDCh Wasser, Germany.

Karakurt, S.; Hellauer, K.; Hübner, U.; Jekel, M.; Drewes, J. E., 2017. Großtechnische Validierung der sequentiellen Grundwasseranreicherung. GDCh Wasser, Germany.

Publications in peer-reviewed journals

Karakurt-Fischer, S.*; Johnson, D.; Fenner, K.; Hafner, J., **2023**. Making waves: Enhancing pollutant biodegradation via rational engineering of microbial consortia. *Water Research* 247:120756. https://doi.org/10.1016/j.watres.2023.120756

Karakurt-Fischer, S.; Rien, C.; Sanz-Prat, A.; Szewzyk, R; Hübner, U.; Drewes, J. E.; Selinka, H.C.*, **2021**. Fate and transport of viruses within a high rate plug-flow biofilter designed for non-membrane based indirect potable reuse applications. *Environmental Science & Technology Water* 1 (5), 1229–1239. https://doi.org/10.1021/acsestwater.0c00305

Karakurt-Fischer, S.; Bein, E.; Drewes, J. E.; Hübner, U.*, **2020**. Characterizing a novel *in-situ* oxygen introduction device for establishing controlled redox zonation within a high infiltration rate biofilter. *Water Research* 182:116039. https://doi.org/10.1016/j.watres.2020.116039

Karakurt-Fischer, S.; Sanz-Prat, A.; Greskowiak, J.; Ergh, M.; Gerdes, H.; Massmann, G.; Ederer, J.; Regnery, J.; Hübner, U.; Drewes, J. E.*, **2020**. Developing a novel biofiltration treatment system by coupling high-rate infiltration trench technology with a plug-flow porous-media bioreactor. *Science of the Total Environment* 722:137890. https://doi.org/10.1016/j.scitotenv.2020.137890

Karakurt, S.; Schmid, L.; Hübner, U.; Drewes, J. E.*, **2019**. Dynamics of wastewater effluent contributions in streams and impacts on drinking water supply via riverbank filtration in Germany – A national reconnaissance. *Environmental Science & Technology* 53 (11), 6154-6161. https://pubs.acs.org/doi/abs/10.1021/acs.est.8b07216

Hellauer, K.; **Karakurt, S.**; Sperlich, A.; Burke, V.; Massmann, G.; Hübner, U.; Drewes, J. E.*; **2018**. Establishing Sequential Managed Aquifer Recharge Technology (SMART) for Enhanced Removal of Trace Organic Chemicals: Experiences from field studies in Berlin, Germany. *Journal of Hydrology* 563, 1161–1168. https://doi.org/10.1016/j.jhydrol.2017.09.044

Reports and publications in trade journals

Drewes, J. E.; **Karakurt, S.**; Schmid, L.; Bachmaier, M.; Hübner, U.; Clausnitzer, V.; Timmermann, R.; Schätzl, P.; McCurdy, S., **2018**. Dynamik der Klarwasseranteile in Oberflächengewässern und mögliche Herausforderungen für die Trinkwassergewinnung in Deutschland-UBA Abschlussbericht. https://www.umweltbundesamt.de/publikationen/dynamik-der-klarwasseranteile-in

Helmecke, M.; Drewes, J. E.; **Karakurt, S.**; Hübner, U.; Timmermann, R., **2018**. Klarwasser in Flüssen: Herausforderung für die Trinkwassergewinnung, DVGW energie | wasser-praxis.

Drewes, J. E.; Hübner, U.; Zhiteneva, V.; **Karakurt, S.**, **2017**. Characterization of unplanned water reuse in the EU. Technical University of Munich (Prepared for the European Commission DG Environment). https://data.europa.eu/doi/10.2779/597701

References

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