RESEARCH GROUP

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Environmental Health



The Environmental Health (EH) research group focuses on the assessment of effects of exposure to pollutants and the development of relevant tools for hazard assessment. This includes the understanding of biological effects at the molecular, cellular/tissue and organism level (for fresh water invertebrates), the distribution of pollutants in the environment (particularly for what concerns airborne pollutants), as well as the integration into risk assessment for human health and the environment.
Pollution is a ubiquitous phenomenon involving many different exposure routes and can affect humans and wildlife. For what concerns humans, either the occupational setting or the exposure in daily life as consumers are equally relevant to our work. Our expertise and projects are covering the development of relevant in vitro models for human safety considering different barriers and tissues, but also model organisms relevant for eco-toxicology.
Based on its strong focus and expertise in chemical safety, our group collaborates with regulatory agencies, both national and international, providing state-of-the art chemical safety and risk assessments in different areas (e.g. contaminated sites, indoor air quality, worker and consumers, food safety).

MAIN expertise fields

Our main expertise fields are the following:

- Development of complex 3D in vitro models for human hazard assessment.
- Establishment of relevant endpoints in such in vitro models.
- Establishment of novel aquatic invertebrate models for eco-toxicology.
- Studying the interaction of particulate materials (particulate matter, nanomaterials) with biological systems.
- Exposure assessment and measurement of air quality (outdoor, indoor).
- Risk assessment for workers and consumer.
- Regulatory toxicology and chemical safety assessment (REACH European regulatory, CLP regulatory, Pesticides, Occupational Safety and Health, and indoor air quality, food).

Our team supports industries to apply the developed methodologies in an industrial setting and scale up these assays to meet the industrial standard formats. The assays can be applied early in product development to understand potential hazards of new chemicals, materials and products and to support a save-by-design approach. We supports RDI projects regarding regulatory aspects and chemical safety, and provides guidance, expertise and advices to authorities and public agencies.

RESEARCH CHALLENGES

- Complex *in vitro* assays enabling the replacement of animal experiments.
- Development of *in vitro* methods that are completely free of animal derived products, further supporting the 3Rs principles.
- Introduce higher invertebrate organisms (e.g. *Gammarus* spp.) as relevant and valuable models for eco-toxicology.
- Advance the understanding of the biological effects of Engineered Nano-Materials (ENMs).
- Development of Test Guidelines and Guidance Documents for ENMs supporting the work done under OECD.

APPLICATION AREAS

- Chemical industry
- Pharmaceutical industry
- Cosmetic industry
- Producing industry
- Authorities and public bodies

MAIN ASSETS

Our main assets consist of:

- 3D *in vitro* models for respiratory irritation, inflammation and barrier integrity.
- 3D *in vitro* models for respiratory sensitization.
- 3D *in vitro* models for intestinal inflammation / uptake.
- Hardware for allowing more realistic exposure of the advanced *in vitro* models (e.g. variable pressure incubator).
- Eco-toxicological invertebrate models covering the entire water column (bacteria, algae, daphnids, gammarids).
- Gene reporting cellular assay for the detection of endocrine effects.
- Environmental monitoring vehicle.
- Advanced expertise and equipment for the characterization, visualization and tracking of pollutants (including nanoparticles).
- Advanced expertise on the generation and characterization of aerosol of chemicals and nanomaterials.
- Collaboration with European and national regulatory agencies in the field of chemicals safety.

EQUIPMENT

- Vitrocell exposure systems for *in vitro* exposure of cells to gases, liquids and powders in 6-well, 12-well and 24-well formats.
- Zeiss 880 Laser Scanning Confocal Microscope with Airyscan and live cell imaging cababilities.
- Nanotracking analysis (NTA).
- Enhanced Hyperspectral Darkfield Microscopy coupled to RAMAN spectroscopy (Cytoviva).
- Cytofluorimeter.
- Luminex technology for the measurement of inflammatory markers and direct detection of RNA.
- Transcriptomics.
- Proteomics.
- Analytical chemistry.
- single particle Inductively Coupled Plasma - Mass Spectrometry (spICP-MS).
- Environmental monitoring vehicle (gases, condensed (nano)-particle analyzer, biometeorology).

SELECTED PUBLICATIONS

- An improved *in vitro* coculture system for the detection of respiratory sensitizers, Chary, A., Serchi, T., Moschini, E., Hennen, J., Cambier, S., Ezendam, J., Blömeke, B., Gutleb, A.C. 2019. ALTEX 36, 403-418. doi:10.14573/altex.1901241
- Added value of complexity: How complex should an *in vitro* model be? The experience on a 3D alveolar model, Marescotti, D., Serchi, T., Luettich, K., Xiang, Y., Moschini, E., Talikka, M., Martin, F., Baumer, K., Dulize, R., Peric, D., Bornard, D., Guedj, E., Sewer, A., Cambier, S., Contal, S., Chary, A., Gutleb, A.C., Frentzel, S., Ivanov, N.V., Peitsch, M.C., Hoeng, J. 2019. ALTEX 36, 388-402. doi:10.14573/altex.1811221
- Endothelial responses of the alveolar barrier in vitro in a dose-controlled exposure to diesel exhaust particulate matter, Klein SG, Cambier S, Hennen J, Legay S, Serchi T, Nelissen I, Chary A, Moschini E, Krein A, Blömeke B, Gutleb AC., Part Fibre Toxicol. 2017 Mar 6;14(1):7. doi: 10.1186/s12989-017-0186-4. PMID: 28264691
- Respiratory sensitization: toxicological point of view on the available assays, Chary A, Hennen J, Klein SG, Serchi T, Gutleb AC, Blömeke B., Arch Toxicol. 2018 Feb;92(2):803-822, doi: 10.1007/s00204-017-2088-5. Epub 2017 Oct 16. PMID: 29038838
- Gammarus fossarum (Crustacea, Amphipoda) as a model organism to study the effects of silver nanoparticles, Mehennaoui K, Georgantzopoulou A, Felten V, Andreï J, Garaud M, Cambier S, Serchi T, Pain-Devin S, Guérold F, Audinot JN, Giambérini L, Gutleb AC., Sci Total Environ. 2016 Oct 1;566-567:1649-1659, doi: 10.1016/j.scitotenv.2016.06.068. Epub 2016 Jun 18. PMID: 27328878
- Effects of silver nanoparticles and ions on a co-culture model for the gastrointestinal epithelium, Georgantzopoulou A, Serchi T, Cambier S, Leclercq CC, Renaut J, Shao J, Kruszewski M, Lentzen E, Grysan P, Eswara S, Audinot JN, Contal S, Ziebel J, Guignard C, Hoffmann L, Murk AJ, Gutleb AC, Part Fibre Toxicol. 2016 Feb 17;13:9, doi: 10.1186/s12989-016-0117-9. PMID: 26888332
- An improved 3D tetraculture system mimicking the cellular organisation at the alveolar barrier to study the potential toxic effects of particles on the lung, Klein SG, Serchi T, Hoffmann L, Blömeke B, Gutleb AC, Part Fibre Toxicol. 2013 Jul 26;10:31, doi: 10.1186/1743-8977-10-31. PMID: 23890538

Partners

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