

Curriculum Vitae

Name and title:

Krug, Harald F. Prof. Dr.

Date and place of birth:

30.09.1952, Edermünde-Besse, Germany

Affiliation:

Empa – Swiss Federal Laboratories for Materials Science and Technology

Current Position:

International Research Cooperations Manager

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<http://www.empa.ch/web/empa/international-research-cooperations>

Scientific Vita:

1978: first state examination in Biology/Chemistry at the University of Kassel (passed with distinction)

1982: doctoral degree at the University of Göttingen, Institute of Zoology (highest degree)

1983: Postdoctoral Stipend at the GSF Forschungszentrum Munich

1986: Group leader position at the KfK, Institute for Genetics and Toxicology of Nuclides

1996: Head of Dep. of Molecular and Environmental Toxicology

1996: Habilitation "Environmental Toxicology" at the University of Karlsruhe

2001-2006: Speaker of the Study Group "Biochemical Pharmacology and Toxicology" of the GBM (German Society for Biochemistry and Molecular Biology; <http://www.gbm-online.de/pharmakologie-und-toxikologie.html>)

since 2002: Academic member of the DECHEMA Working Group "Responsible Production and Use of Nanomaterials" (<http://www.processnet.org/Fachgemeinschaften/Chemische+Reaktionstechnik/Responsible+Production+and+Use+of+Nanomaterials.html>) and since 2005 member of the steering committee of this working group

since 2004: Member of the Council of the European Academy for the Research on the Consequences of Scientific and Technological Advance (<http://www.europaeische-akademie-aw.de>)

Project Group: Nanomaterials, Nanodevices, Nanocomputing

since 2005: appointed as a member of the "Nanobotschafter (Nano ambassador)", an initiative of the "Deutsches Museum" in Munich (<http://www.nanobotschafter.de/>)

March 2006-July 2009: appointed as the manager of the consortium "NanoCare", a research project of the German Ministry for Education and Research (<http://www.nanopartikel.info>)

September 2006: appointment to the EMPA in St. Gallen (Switzerland)

since January 2007: Head of Materials-Biology Interactions Lab at Empa, St. Gallen (<http://www.empa.ch/web/empa/particles-biology-interactions>)

March 2007: appointed as member of the Action Group "NanoDialog"

of the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) (http://www.bmu.de/fileadmin/bmu-import/files/pdfs/allgemein/application/pdf/nanokomm_abschlussbericht_2008.pdf)

July 2007: appointed as member of the "Commission for Environmental Toxicology" of the Federal Office for the Environment (BAFU) of Switzerland (<http://www.bafu.admin.ch/>)

August 2008: appointed as "Titularprofessor" at the Medical Faculty, University of Berne

September 2008: founder member of the IANH, the „International Alliance for NanoEHS Harmonization“

October 2008: elected as a member of the foundation board of the "GEN SUISSE" foundation (<http://www.gensuisse.ch/>)

January 2009 – February 2014: appointed as member of the scientific board of the CNT-Initiative INNO-CNT, a BMBF-funded activity of the German Industry

January 2009: appointed as member of the ad-hoc working group of the DFG on "Food and Nanotechnology"

January 2010 – June 2013: Head of Department "Materials meet Life" at Empa, St. Gallen (<http://www.empa.ch/web/empa/materials-meet-life>)

December 2009 – May 2014: Member of the Board of Directors at Empa by the ETH-Board, Switzerland

Since January 2010: appointed as member of the EASAC-JRC Expert Group to study nanoparticles toxicity in order to assess the possible impact of nanomaterials on human health (<http://www.easac.eu/home/reports-and-statements/detail-view/article/first-joint.html>).

Since May 2010: appointed as member of the working group of the Federal Office for Internal Affairs on "Kommunikation and Dialog" regarding the Swiss Action Plan for Nanomaterials.

Since June 2010: appointed as Advisory Board Member of the NANOTEC-Institute in Bangkok, Thailand
(http://www2.nanotec.or.th/en/?page_id=120)

2011 - 2015: appointed as scientific board member of the Nano EHS funding program of the Austrian Government (<http://www.ffg.at/nano-ehs>)

Since 2011: appointed as speaker of the scientific board of the German NanoCare/NanoNature Funding program (BMBF; <http://www.ptj.de/nanocare>; <http://www.ptj.de/nanonature>)

Since 2012: appointed as member of the international board for CAAT_{EU}, the Center for Alternatives to Animal Testing, Johns Hopkins University (<http://caat.jhsph.edu/about/advisoryboard.html>)

January 2013 – March 2013: visiting professor at the NANOTEC-Institute at the Thailand Science Park in Bangkok

June 2013: invited to be a member of the editorial board of the new journal "Nano Convergence", published by Springer

June 2013: appointed as member of the IUPAC-expert group on recent advances in nanoparticles and colloidal systems and their impact on human health (https://iupac.org/projects/project-details/?project_nr=2013-007-1-700)

January 2014: appointed as Co-Editor-in-Chief for the Journal STAM (Science & Technology of Advanced Materials) published by Empa

<p>Scholarships / Awards:</p>	<p>and NIMS (Japan) http://tandfonline.com/action/journalInformation?show=editorialBoard&journalCode=tsta20</p> <p>January 2014: Founder of the Company “NanoCASE”, consulting and evaluation of processes and products with nanomaterials (www.nanocase.ch).</p> <p>June 2014: new position as International Research Cooperations Manager at Empa</p> <p>Since November 2015: Member and chair of the Advisory Board “Umwelt” of the German BAM (https://www.bam.de/SharedDocs/DE/Downloads/organigramm.pdf?blob=publicationFile&v=8)</p> <p>Since June 2016: Member of the international Scientific Board of the newly established Database on Nanotechnology of SpringerNature (http://nano.nature.com/)</p> <p>1979 – 1980: Graduate scholarship, DFG</p> <p>1983 – 1985: Ph.D. fellowship, GSF National Research Center for Environment and Health</p> <p>1994: Price of the "Stiftung für Verhalten und Umwelt (VERUM)" at the 1st Int. Congress on Environmental Hygiene</p> <p>1998/2000: best scientific presentations at the conferences of the Int. Acad. Tumor Marker Oncol. (IATMO) and the International Conference on the Bioscience of Lipids</p> <p>2003: third price within the "Cinema of the Cell" Bioclip contest of the ELSO (Eur. Life Scientist Org.; http://www.else.org)</p> <p>2004: one of five best presentations at the STS Conference in Weimar</p> <p>2006: one of the best presentations at the MRIEM Conference in Paris</p> <p>2006: DGK-Symp. cfi-Award (1.000€)</p> <p>2007: Scientific Award of Baden-Württemberg for Alternative Methods for Animal Testing (25.000€)</p>
<p>Memberships :</p>	<p>DECHEMA (incl. Fachsektion Nanotechnologie) Environmental Mutagen Society (GUM) German Society for Biochemistry and Molecular Biology (GBM) German Society for Cell Biology (DGZ) International Society for Aerosols in Medicine (ISAM) Signal Transduction Society (STS) Society of Hygiene, Environmental and Public Health Sciences – GHUP</p>
<p>Research Fields:</p>	<p>Biological mechanisms of action of alkylated metal compounds Cellular mechanisms of polybrominated diphenylethers main topics: cellular signalling cascades, hormone disrupting activity, stress and cell cycle Mechanisms of action of synthetic lipids main topic: induction of apoptosis in tumour cells Nanotoxicology: effects of nanomaterials on cells and tissues</p>

Teaching:

Lectures at the TU Munich, 1984 - 1985:

Part of the lecture on "Environmental Biochemistry" of Prof. Dr. Jürgen Berndt

Teaching at the Fridericiana Karlsruhe since WS 1989/90:

Lecture "General Toxicology of Metals"

Lecture "General Environmental Toxicology"

Lecture "Molecular Toxicology of Xenobiotics"

Practical Course "Molecular Toxicology of Metals"

Practical Course "Cell Cycle and Apoptosis"

Lecture „Toxicology of Mycotoxins“

Teaching at the ETH Zürich since SS 2007 – SS 2014:

Lecture "FRONTIERS IN NANOTECHNOLOGY" Part
Nanotoxicology

Examination in "Umwelttoxikologie" – Diploma and Ph.D. students;
Koreferent for numerous Diploma and doctoral theses.

Training of lab assistants in biology of the FZK.

Invited lecturer at the Fortbildungszentrum für Technik und Umwelt
(FTU), the Sozial- und Arbeitsmedizinische Akademie Baden-
Württemberg e.V., Stuttgart, and the "Haus der Technik", Essen.

Invited lecturer of the CCMX-SPERU Course activities for students

Since Fall Semester 2008: Professorship at the University of Berne,
lectures in "Climate, environment and human health" at the
Oeschger Center, in "Nanotoxicology" at the Graduate School for
Cellular and Biomedical Sciences (GCB) of the University of Bern
(http://www.gcb.unibe.ch/content/index_eng.html)

Reviewing:

Referee for the following scientific journals

ACS Nano

Analytical and Bio-analytical Chemistry

Angewandte Chemie Int. Ed.

Archives of Toxicology

Beilstein Journal on Nanotechnology

BioNanoMaterials

ChemBioChem

Chemosphere

Critical Reviews in Toxicology

Current Medicinal Chemistry

Environment International

Environmental Health Perspectives

Environmental Pollution

Environmental Science and Pollution Research

Environmental Sciences Europe

Environmental Science and Technology

European Journal of Pharmaceutics and Biopharmaceutics

International Journal of Hygiene and Environmental Health

Journal of the American Chemical Society

Journal of Nanoparticle Research

Nanomedicine

Nanotoxicology

Nature

Nature Nanotechnology

Particle & Fibre Toxicology

Science and Technology of Advanced Materials

Signal Transduction

Toxicology

Toxicology and Environmental Health

Toxicology Letters

Toxicological Science

*Umweltwissenschaften und Schadstoff-Forschung (UWSF) –
Zeitschrift für Umweltchemie und Ökotoxikologie*

and for the funding organisations

- Deutsche Krebshilfe e.V.
- Schweizerischer Nationalfonds SNF
- “Particle and Surface Engineering” Education and Research Unit (ERU) of the Competence Centre for Material Science and Technology (CCMX) in Switzerland
- Deutsche Bundesstiftung Umwelt (DBU)
- Fonds zur Förderung der wissenschaftlichen Forschung Österreich (FWF)
- “NanoCare” BMBF, Germany

**Peer-reviewed Publications
(since 2006):**

- Crawford, S.E., Hartung, T., Hollert, H., Mathes, B., van Ravenzwaay, B., Steger-Hartmann, T., Studer, C., Krug, H.F. (2017): Green Toxicology: a strategy for sustainable chemical and material development. **Environ. Sci. Eur.** 29(1), 16.
- Elliott, J.T., Rösslein, M., Song, N.W., Toman, B., Kinsner-Ovaskainen, A., Maniratanachote, R., Salit, M.L., Petersen, E.J., Sequeira, F., Romsos, E.L., Kim, S.J., Lee, J., Von Moos, N.R., Rossi, F., Hirsch, C., Krug, H.F., Suchaoin, W., Wick, P. (2017): Toward achieving harmonization in a nano-cytotoxicity assay measurement through an interlaboratory comparison study. **ALTEX** 34(2), 201-218.
- Krug, H.F., Nau, K. (2017): Zuverlässigkeit in der Nanosicherheitsforschung. **Chemie Ingenieur Technik** 89(3), 215-223.
- Kühnel, D., Marquardt, C., Nau, K., Krug, H.F., Paul, F., Steinbach, C. (2017): Environmental benefits and concerns on safety: communicating latest results on nanotechnology safety research—the project DaNa2.0. **Environ. Sci. Pollut. Res.** 24(12), 11120-11125.
- Pelaz B, Alexiou C, Alvarez-Puebla RA et al. (2017): Diverse Applications of Nanomedicine. **ACS Nano** 11(3), 2313-2381 (86 Authors).
- Schmutz, M., Som, C., Krug, H.F., Nowack, B. (2017): Digging below the surface: the hidden quality of the OECD nanosilver dossier. **Environ. Sci.: Nano** online first, <http://dx.doi.org/10.1039/C7EN00088J>
- Steinbach, C., Bohmer, N., Krug, H.F., Kühnel, D., Nau, K., Paul, F., Reithel, S., Marquardt, C. (2017): DaNa 2.0 - verlässliche Informationen zur Sicherheit von marktüblichen Nanomaterialien. **Chemie Ingenieur Technik** 89(3), 232-238.
- Nau, K., Krug, H.F. (2016): Sichere Nanomaterialien? **Physik J.** 15, 29-34.
- Nau, K., Bohmer, N., Kühnel, D., Marquardt, C., Paul, F., Steinbach, C., Krug, H.F. (2016): The DaNa2.0 knowledge base on nanomaterials - communicating current nanosafety research based on evaluated literature data. **J. Mat. Edu.** 38, 93-108.
- Gordon, S., Daneshian, M., Bouwstra, J., Caloni, F., Constant, S., Davies, D.E., Dandekar, G., Guzman, C.A., Fabian, E., Haltner, E., Hartung, T., Hasiwa, N., Hayden, P., Kandarova, H., Khare, S., Krug, H.F., Kneuer, C., Leist, M., Lian, G., Marx, U., Metzger, M., Ott, K., Prieto, P., Roberts, M.S., Roggen, E.L., Tralau, T., van den, B.C., Walles, H., Lehr, C.M. (2015): Non-animal models of epithelial barriers (skin, intestine and lung) in research, industrial applications and regulatory toxicology. **ALTEX** 32, 327-378.
- Grafmüller, S., Manser, P., Diener, L., Diener, P.A., Maeder-Althaus, X., Maurizi, L., Jochum, W., Krug, H.F., Buerki-Thurnherr, T., von

- Mandach, U., Wick, P. (2015): Bidirectional Transfer Study of Polystyrene Nanoparticles across the Placental Barrier in an Human Placental Perfusion Model. **Environ. Health Perspect.**, 123, 1280-1286.
- Grafmüller, S., Manser, P., Diener, L., Maurizi, L., Diener, P.A., Hofmann, H., Jochum, W., Krug, H.F., Buerki-Thurnherr, T., von Mandach, U., Wick, P. (2015): Transfer studies of polystyrene nanoparticles in the ex vivo human placenta perfusion model: key sources of artifacts. **Sci. Technol. Adv. Mater.** 16, 044602.
- Krug, H.F. (2015a): Focus on materials challenges for protection - environment and health. **Sci. Technol. Adv. Mater.** 16, 030301.
- Krug, H.F. (2015b): Nanotechnologie versus Nanotoxikologie - Wohin geht die Reise? **Praxis der Naturwissenschaften - Chemie in der Schule** 64, 11-17.
- Patel, P., Krug, H.F. (2015): Perovskites: Is there a reason for concern? **MRS Bulletin** 40, 638-640.
- Rösslein, M., Elliott, J.T., Salit, M., Petersen, E.J., Hirsch, C., Krug, H.F., Wick, P. (2015): Use of Cause-and-Effect Analysis to Design a High-Quality Nanocytotoxicology Assay. **Chem. Res. Toxicol.** 28, 21-30.
- Bruinink, A., Bitar, M., Pleskova, M., Wick, P., Krug, H.F., Maniura-Weber, K. (2014): Addition of nanoscaled bioinspired surface features: A revolution for bone-related implants and scaffolds? **J Biomed. Mater. Res A**, 102, 275-294.
- Krug, H.F. (2014): Nanosafety research - are we on the right track? Some thoughts based on a comprehensive literature review. **Angew. Chem. Int. Ed.**, 53, 12304-12319.
<http://dx.doi.org/10.1002/anie.201403367R1>,
- Nowack, B., Müller, N., Krug, H.F., Wick, P. (2014): How to consider engineered nanomaterials in major accident regulations? **Environ. Sci. Eur.** 26, 2
- Rösslein, M., Salit, M., Petersen, E.J., Hirsch, C., Krug, H.F., Wick, P. (2014): The use of cause-and-effect analysis to design a high quality nano-cytotoxicology assay. **Chem. Res. Toxicol.** submitted,
- Wick, P., Louw-Gaume, A.E., Kucki, M., Krug, H.F., Kostarelos, K., Fadeel, B., Dawson, K.A., Salvati, A., Vazquez, E., Ballerini, L., Tretiach, M., Benfenati, F., Flahaut, E., Gauthier, L., Prato, M., Bianco, A. (2014): Classification framework for graphene-based materials. **Angew. Chem. Int. Ed.**, 53, 7714-7718.
- Buerki-Thurnherr, T., Xiao, L., Diener, L., Arslan, O., Hirsch, C., Maeder-Althaus, X., Grieder, K., Wampfler, B., Mathur, S., Wick, P., and Krug, H.F. (2013): In vitro mechanistic study towards a better understanding of ZnO nanoparticle toxicity. **Nanotoxicology**, 7, 402-416
- Grafmüller, S., Manser, P., Krug, H.F., Wick, P., von Mandach, U. (2013): Determination of the Transport Rate of Xenobiotics and Nanomaterials Across the Placenta using the ex vivo Human Placental Perfusion Model. **J Vis. Exp.** (76), e50401, doi:10.3791/50401
- Marquardt, C., Kühnel, D., Richter, V., Krug, H.F., Mathes, B., Steinbach, C., and Nau, K. (2013): Latest research results on the effects of nanomaterials on humans and the environment: DaNa - Knowledge Base Nanomaterials. **J. Phys. (Conf. Ser.)** 429, 012060
- Roesslein, M., Hirsch, C., Kaiser, J.P., Krug, H.F., Wick, P. (2013): Comparability of in vitro tests for bioactive nanoparticles: a

- common assay to detect reactive oxygen species as an example. **Int. J. Mol. Sci.** 14, 24320-24337.
- Roesslein, M., Richter, V., Wick, P., Krug, H.F. (2013): Nanomaterials and Ceramic Nanoparticles – Use without Side-Effects? **J. Ceram. Sci. Tech.** 4, 123-130.
- Som, C., Nowack, B., Krug, H.F., Wick, P. (2013): Toward the Development of Decision Supporting Tools That Can Be Used for Safe Production and Use of Nanomaterials. **Acc. Chem. Res.** 46, 863-872.
- Tuomela, S., Autio, R., Buerki-Thurnherr, T., Arslan, O., Kunzmann, A., Andersson-Willman, B., Wick, P., Mathur, S., Scheynius, A., Krug, H.F., Fadeel, B., Lahesmaa, R. (2013): Gene expression profiling of immune-competent human cells exposed to engineered zinc oxide or titanium dioxide nanoparticles. **PLoS ONE.** 8, e68415.
- Andersson-Willman, B., Gehrmann, U., Cansu, Z., Buerki-Thurnherr, T., Krug, H.F., Gabrielsson, S., Scheynius, A. (2012): Effects of subtoxic concentrations of TiO₂ and ZnO nanoparticles on human lymphocytes, dendritic cells and exosome production. **Toxicol. Appl. Pharmacol.** 264, 94-103.
- Gasser, M., Wick, P., Clift, M.J., Blank, F., Diener, L., Yan, B., Gehr, P., Krug, H.F., Rothen-Rutishauser, B. (2012): Pulmonary surfactant coating of multi-walled carbon nanotubes (MWCNTs) influences their oxidative and pro-inflammatory potential in vitro. **Part Fibre Toxicol** 9, 17-29.
- Krug, H.F. (2012): Caspase-10 is the key initiator caspase involved in tributyltin-mediated apoptosis in human immune cells. **J. Toxicol.**, 2012: 395482.
- Krug, H.F., Nau, K., Steinbach, C., Klose, R., Förster, A. (2012): Ten years of successful safety research. **chemie report** 9/2012, 4-6.
- Hirsch, C., Kaiser, J.P., Wessling, F., Fischer, K., Roesslein, M., Wick, P., Krug, H.F. (2011): A novel comprehensive evaluation platform to assess nanoparticle toxicity in vitro. **J. Phys.(Conf. Ser.)** 304, 012053
- Hirsch, C., Roesslein, M., Krug, H.F., and Wick, P. (2011): Nanomaterial cell interactions: are current in vitro tests reliable? **Nanomedicine (Lond)**, 6: 837 - 847.
- Krug, H.F., Wick, P. (2011): Nanotoxicology: an interdisciplinary challenge. **Angew. Chem. Int. Ed Engl.** 50, 1260-1278.
- Krug, H.F., Wick, P. (2011): Nanotoxikologie - eine interdisziplinäre Herausforderung. **Angew. Chem.** 123, 1294-1314.
- Kunzmann, A., Andersson, B., Thurnherr, T., Krug, H.F., Scheynius, A., Fadeel, B. (2011): Toxicology of engineered nanomaterials: Focus on biocompatibility, biodistribution and biodegradation. **Biochim. Biophys. Acta** 1810, 361-373.
- Kunzmann, A., Andersson, B., Vogt, C., Feliu, N., Ye, F., Gabrielsson, S., Toprak, M.S., Buerki-Thurnherr, T., Laurent, S., Vahter, M., Krug, H.F., Muhammed, M., Scheynius, A., Fadeel, B. (2011): Efficient internalization of silica-coated iron oxide nanoparticles of different sizes by primary human macrophages and dendritic cells. **Toxicol Appl. Pharmacol.** 253, 81-93.
- Nowack, B., Krug, H.F., Height, M. (2011): 120 Years of Nanosilver History: Implications for Policy Makers. **Environ Sci Technol** 45, 1177-1183.
- Roebben, G., Ramirez-Garcia, S., Hackley, V., Roesslein, M., Klaessig, F., Kestens, V., Lynch, I., Garner, C., Rawle, A., Elder, A., Colvin, V., Kreyling, W., Krug, H.F., Lewicka, Z., McNeil, S.,

- Nel, A., Patri, A., Wick, P., Wiesner, M., Xia, T., Oberdörster, G., Dawson, K. (2011): Interlaboratory comparison of size and surface charge measurements on nanoparticles prior to biological impact assessment. **J. Nanoparticle Res.** 13, 2675-2687.
- Som, C., Wick, P., Krug, H.F., Nowack, B. (2011): Environmental and health effects of nanomaterials in nanotextiles and facade coatings. **Environ Int.**
- Thurnherr, T., Brandenberger, C., Fischer, K., Diener, L., Manser, P., Maeder-Althaus, X., Kaiser, J.P., Krug, H.F., Rothen-Rutishauser, B., Wick, P. (2011): A comparison of acute and long-term effects of industrial multiwalled carbon nanotubes on human lung and immune cells in vitro. **Toxicol Lett** 200, 176-186.
- Gasser, M., Rothen-Rutishauser, B., Krug, H.F., Gehr, P., Nelle, M., Yan, B., Wick, P. (2010): The adsorption of biomolecules to multiwalled carbon nanotubes is influenced by both pulmonary surfactant lipids and surface chemistry. **J Nanobiotechnology.** 8, 31.
- Wick, P., Malek, A., Manser, P., Meili, D., Maeder-Althaus, X., Diener, L., Diener, P.A., Zisch, A., Krug, H.F., von Mandach, U. (2010): Barrier capacity of human placenta for nanosized materials. **Environ. Health Perspect.** 118, 432-436.
- Belyanskaya, L., Weigel, S., Hirsch, C., Tobler, U., Krug, H.F., Wick, P. (2009): Effects of carbon nanotubes on primary neurons and glial cells. **Neurotoxicology** 30, 702-711.
- Fleischer, T., Krug, H.F. (2009): Risikopotenzial von Nanomaterialien. **internist. prax.** 49, 453-462.
- Fleischer, T., Krug, H.F. (2009): Risikopotenzial von Nanomaterialien. **Arzneimittel-, Therapie-Kritik & Medizin und Umwelt** 41, 185-194.
- Kaiser, J.P., Krug, H.F., Wick, P. (2009): Nanomaterial cell interactions: how do carbon nanotubes affect cell physiology? **Nanomed.** 4, 57-63.
- Krug, H.F., Som, C. (2009): Nanotechnologie und Textilien - Funktionell, aber auch sicher? **Textilpflege Schweiz** 104, 8-11.
- Nau, K., Krug, H.F. (2009): The NanoCare project: a German initiative on health aspects of synthetic nanoparticles. **J. Phys. (Conf. Ser.)** 170, 4pp.
- Spohn, P., Hirsch, C., Hasler, F., Bruinink, A., Krug, H.F., Wick, P. (2009): C60 fullerene: a powerful antioxidant or a damaging agent? The importance of an in-depth material characterization prior to toxicity assays. **Environ. Pollut.** 157, 1134-1139.
- Thurnherr, T., Su, D., Diener, L., Weinberg, G., Manser, P., Pfänder, N., Arrigo, R., M.E., S., Wick, P., Krug, H.F. (2009): Comprehensive evaluation of in vitro toxicity of three large-scale produced carbon nanotubes on human Jurkat T cells and a comparison to crocidolite asbestos. **Nanotoxicology** 3, 319-338.
- Behra, R., Krug, H.F. (2008): Nanoecotoxicology: Nanoparticles at large. **Nature Nanotech.** 3, 253-254.
- Diabaté, S., Mühlhopt, S., Paur, H.R., Krug, H.F. (2008): The response of a co-culture lung model to fine and ultrafine particles of incinerator fly ash at the air-liquid interface. **ATLA** 36, 285-298.
- Fritsch, S., Marquardt, C., Krug, H.F., Weiss, C., Diabate, S. (2008): Generation of reactive oxygen species - a major operating mechanism for fly ash particles. **Naunyn-Schmiedeberg's Archives of Pharmacology** 377, 84.
- Krug, H.F. (2008): Nanotechnologie - Zwerge erobern den Alltag.

Chemie Ingenieur Technik 80, 1653-1660.

Malek, A., Wick, P., Manser, P., Meili, D., Maeder-Althaus, X., Zisch, A., Krug, H.F., von Mandach, U. (2008): Placenta perfusion system: A human ex vivo model system to study the maternal - Fetal barrier capacity for nanosized materials. **Placenta** 29, A67.

Schröder, T., Niemeier, N., Afonin, S., Ulrich, A.S., Krug, H.F., Br„se, S. (2008): Peptoidic amino- and guanidinium-carrier systems: targeted drug delivery into the cell cytosol or the nucleus. **J. Med. Chem.** 51, 376-379.

Krug, H.F., Diabat, S., Wörle-Knirsch, J.M., Mühlhopt, S., Paur, H.R. (2007): Synthetische Nanopartikel am Arbeitsplatz und in der Umwelt. **Arbeitsmed. Sozialmed. Umweltmed.** 42, 4-14.

Krug, H.F., Fleischer, T. (2007): Nanotechnologie - Eine Bestandsaufnahme. **umwelt medizin gesellschaft** 20, 44-50.

Pulskamp, K., Diabaté, S., Krug, H.F. (2007): Carbon nanotubes show no sign of acute toxicity but induce intracellular reactive oxygen species in dependence on contaminants. **Toxicol. Lett.** 168, 58-74.

Pulskamp, K., Wörle-Knirsch, J.M., Hennrich, F., Kern, K., Krug, H.F. (2007): Human lung epithelial cells show biphasic oxidative burst after single-walled carbon nanotube contact. **Carbon** 45, 2241-2249.

Schmid, M., Zimmermann, S., Krug, H.F., Sures, B. (2007): Influence of platinum, palladium and rhodium as compared with cadmium, nickel and chromium on cell viability and oxidative stress in human bronchial epithelial cells. **Environ. Int.** 33, 385-390.

Schröder, T., Schmitz, K., Niemeier, N., Balaban, T.S., Krug, H.F., Schepers, U., Br„se, S. (2007): Solid-phase synthesis, bioconjugation, and toxicology of novel cationic oligopeptoids for cellular drug delivery. **Bioconjug. Chem.** 18, 342-354.

Strack, S., Detzel, T., Wahl, M., Kuch, B., Krug, H.F. (2007): Cytotoxicity of TBBPA and effects on proliferation, cell cycle and MAPK pathways in mammalian cells. **Chemosphere** 67, S405-S411.

Wörle-Knirsch, J.M., Kern, K., Schleh, C., Adelhelm, C., Feldmann, C., Krug, H.F. (2007): Nanoparticulate vanadium oxide potentiated vanadium toxicity in human lung cells. **Environ. Sci. Technol.** 41, 331-336.

Fritsch, S., Diabate, S., Krug, H.F. (2006): Incinerator fly ash provokes alteration of redox equilibrium and liberation of arachidonic acid in vitro. **Biol. Chem.** 387, 1421-1428.

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- Brune H, Ernst H, Grunwald A, Grünwald W, Hofmann H, Janich P, Krug HF, Mayor M, Schmid G, Simon U, Vogel V, Gethmann CF (eds.) **Nanotechnology. Assessment and Perspectives.** Springer, Berlin, 2006
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- Krug, H.F. and Wörle-Knirsch, J.M. (2006) 'Cause I'm CNT, not dynamite. **nanotoday**, 1 (4), 48.
- Krug, H.F. and Wörle-Knirsch, J.M. (2007) Risikoforschung und toxikologische Bewertung von Nanomaterialien. In: nano – Chancen und Risiken aktueller Technologien (Gazsó, A., Greßler, S. and Schiemer, F., eds.). Springer Wien New York, pp. 101-114
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**Third Party Funding
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Environmental Toxicology of Nanomaterials. Krüger, P and Krug, H. F. Frankfurt, DECHEMA.

Klein, C.L., Comero, S., Locoro, G., Gawlik, B.M., Linsinger, T., Stahlmecke, B., Romazanov, J., Kuhlbusch, T., Van Doren, E., De Temmermann, P.J., Mast, J., Wick, P., Krug, H.F., Friedrichs, S., Maier, G., Werner, J., Hund-Rinke, K., Kördel, W. (2011): NM-Series of representative manufactured nanomaterials: NM-300 silver characterisation, stability, homogeneity. European Commission. JRC Ispra, JRC 60709; EUR 24693 EN, 86 pp., European Union.

Steinbach, C., Mathes, B., Krug, H.F., Wick, P., Kühnel, D., Nau, K. (2012): Die Sicherheit von Nanomaterialien in der Diskussion. **Deutsche Apothekerzeitung** 152, 2024-2026.

BWPLUS BWB 20013 Health effects due to inhalable fine particles from technical combustion devices: in vitro studies on the effects of fine and ultrafine particles in cultivated lung cells. (Diabaté und Krug, 11/2001 – 03/2004; 240.000,-€)

BWPLUS BWR 24013: Toxikologie (poly)bromierter cyclischer Kohlenwasserstoffe (Flammschutzmittel) – Wirkmechanismen in vitro (Strack und Krug, 09/2004 – 08/2007; 200.000,-€)

DFG KR 2207/1-1: Identifizierung des molekularen Targets bei der Apoptoseinduktion durch Alkylphosphocholine (Krug, 01/2003 – 02/2006; 105.000,-€)

DFG CFN E1.3: Transport of nanoparticles into cells: mechanism and toxicological aspects (Krug, 2004 – 2009; 260.000,-€)

BfR WK-1-1328-182: In vitro exposure of lung cells to aerosol at the air-liquid layer as an alternative for inhalation experiments with animals. (Diabaté, 2004 – 2007; 140.000,-€)

EU 6th FP - IMPART: Improving the understanding of the impact of nanoparticles on human health and the environment (Krug, 02/2005 – 10/2008; 70.000,-€)

BMBF - NanoCare: (Krug, Konsortialleitung und eigener Projektanteil 340.000,-€, 3/2006 – 2/2009)

HGF – Nanotechnology and health - Technological options, risk evaluation and precautionary strategies (lead-managed: ITAS; Krug: 49.000,-€, 4/2006 – 3/2009)

EU 7th FP – NanoImpactNet: Europe-wide Cooperation and coordination in the study of the Health and Environmental Impact of Nanomaterials

EU 7th FP – NANOMMUNE: Comprehensive assessment of hazardous effects of engineered nanomaterials on the immune system; started 1st of September 2008; 485.000,-€

BMBF - DaNa: Acquisition, evaluation and public orientated presentation of societal relevant data and findings for nanomaterials) (Krug, Partner within the German Project Consortium 250.000,-CHF, 8/2009 – 7/2013)

CCMX – VIGO: A new evaluation tool for determination, description and comparison of the biological effects of nanoparticles/nanomaterials (Krug, 900.000,- CHF, 2/2010 – 2/2014)

BMBF – DaNa II: Acquisition, evaluation and public orientated presentation of societal relevant data and findings for nanomaterials) (Krug, Partner within the German Project Consortium 370.000,-CHF, 8/2013 – 7/2017)

EU 7th FP – Graphene Flagship; started 1st of October 2013; 450.000,-€

CCMX – NanoScreen: Conceived Evonik in 2016 to be an industrial partner with a contribution of 250.000 € (9/2014 – 8/2019)

BMBF – DaNa III: Acquisition, evaluation and public orientated presentation of societal relevant data and findings for nanomaterials) (Krug - NanoCASE, Partner within the German Project Consortium 190.000,- €, 8/2017 – 7/2019)

OECD Project “Advancing Adverse Outcome Pathway (AOP) Development for Nanomaterial Risk Assessment and Categorisation” (Krug – NanoCASE, Partner for Swiss Delegation, 25.000 CHF, 6/2017 – 5/2018)

(Under)-Graduate education:

22 Diploma students:

Andrea Käfer (1991)
Frank Zauke (1993)
Heike Dieterich (1994)
Tatjana Treiber (1995)
Isabelle Heinisch (1996)
Arnt Luchmann (1996)
Ariane Tomsche (2001)
Claudia Ball (2002)
Carolin Oberle (2002)
Marco Sander (2002)
Christian Nollert (2002)
Young-Moo Choi (2003)
Dirk Blindow (2003)
Gerald Haring (2004)
René Benz (2004)
Karin Pulskamp (2004)
Dariush Etehadieh (2005)
Carsten Schleh (2005)
Anna-Maria Kovacs (2005)
Nicole Jänsch (2006/07)
Sylvia Özdemir (2006/07)
Christoph Wettstein (2008)

20 Ph.D. students:

Uta Brückner-Nieder (1992)
Andrea Käfer (1994)
Thomas Ade (1996)
Frank Zaucke (1997)
Verena Höcke (1998)
Marion Mögel (1998)
Astrid Matzke (1999)
Anne Regelin (2001)
Jörg Trapp (2002)
Ralf Wottrich (2003)
Carolin Oberle (2006)
Susanne Fritsch (2008)
Karin Pulskamp (2008)
Nicole Niemeier (2009)
Katrin Fischer (2009)
Anne-Kathrin Born (2009)
Markus Rottmar (2011)
Michal Gasser (2011)
Stefanie Grafmüller (2015)
Lea von Moos (2016)