

## Dr. Christa S. McArdell (formerly Bürgisser): Full publication list

### PUBLICATIONS peer-reviewed

- Kuroda K., Itten R., Kovalova L., Ort C., Weissbrodt D., McArdell C.S. (2016) Hospital-use pharmaceuticals in Swiss waters modeled at high spatial resolution. *Env. Sci. Technol.*, 50, 4742–4751, DOI: 10.1021/acs.est.6b00653.
- Singer H.P., Wössner A.E., McArdell C.S., Fenner K. (2016) Rapid screening for exposure to “non-target” pharmaceuticals from wastewater effluents by combining HRMS-cased suspect screening and exposure modeling. *Env. Sci. Technol.* 50, 6698–6707, DOI: 10.1021/acs.est.5b03332.
- Borowska E., Bourgin M., Hollender J., Kienle C., McArdell C.S., von Gunten, U. (2016) Oxidation of cetirizine, fexofenadine and hydrochlorothiazide during ozonation: Kinetics and transformation products. *Wat. Res.*, 94, 350-362, dx.doi.org/10.1016/j.watres.2016.02.020.
- Bischel H.N., Özel Duygan B.D., Strande L., McArdell C.S., Udert K.M., Kohn T. (2015) Pathogens and pharmaceuticals in source-separated urine in eThekweni, South Africa. *Wat. Res.* **85**, 57-65, dx.doi.org/10.1016/j.watres.2015.08.022
- Wittmer A., Heisele A., McArdell C.S., Böhler M., Longree P., Siegrist H. (2015) Decreased UV absorbance as an indicator of micropollutant removal efficiency in wastewater treated with ozone. *Wat. Sci. Technol.* **71.7**, 980-985, doi:10.2166/wst.2015.053.
- Udert K.M., Buckley C.A., Wächter M., McArdell C.S., Kohn T., Strande L., Zöllig H., Fumasoli A., Oberson A., Etter B. (2015). Technologies for the treatment of source-separated urine in the eThekweni Municipality. *Water South Africa* **41**(2), 212-221, dx.doi.org/10.4314/wsa.v41i2.06
- Hollender J., Bourgin M., Fenner K.B., Longrée P., McArdell C.S., Moschet C., Ruff M., Schymanski E.L., Singer H.P. (2014) Exploring the Behaviour of Emerging Contaminants in the Water Cycle using the Capabilities of High Resolution Mass Spectrometry. *Chimia* **68**(11), 1-6, doi:10.2533/chimia.2014.1.
- Lee Y., Kovalova L., McArdell C.S., von Gunten U. (2014) Prediction of micropollutant elimination during ozonation of a hospital wastewater effluent. *Wat. Res.* **64**, 134-148, dx.doi.org/10.1016/j.watres.2014.06.027.
- Helwig K., Hunter C., MacLachlan J., McNaughtan M., Roberts J., Cornelissen A., Dagot C., Evenblij H., Klepizewski K., Lyko S., Nafu I., McArdell C.S., Venditti S., Pahl O. (2013) Micropollutant Point Sources in the Built Environment: Identification and Monitoring of Priority Pharmaceutical Substances in Hospital Effluents. *J. Environ. Anal. Toxicol.* **3**(4), 177. doi:10.4172/2161 - 0525.1000177.
- Kovalova L., Siegrist H., von Gunten U., Eugster J., Hagenbuch M., Wittmer A., Moser R., McArdell C.S. (2013) Elimination of Micropollutants during Post-Treatment of Hospital Wastewater with Powdered Activated Carbon, Ozone, and UV. *Environ. Sci. Technol.* **47**, 7899–7908, dx.doi.org/10.1021/es400708w.
- Michael I., Rizzo L., McArdell C.S., Manaia C.M., Merlin C., Schwartz T., Dagot C., Fatta-Kassinos D. (2013) Urban wastewater treatment plants as hotspots for the release of antibiotics in the environment: A review. *Wat. Res.* **47**, 957-995, dx.doi.org/10.1016/j.watres.2012.11.027.
- Huntscha S., Singer H.P., McArdell C.S., Frank C.E., Hollender J. (2012) Multiresidue analysis of 88 polar organic micropollutants in ground, surface and wastewater using online mixed-bed multilayer solid-phase extraction coupled to high performance liquid chromatography–tandem mass spectrometry. *J. Chromatogr. A* **1268**, 74-83, dx.doi.org/10.1016/j.chroma.2012.10.032
- Kovalova L., Siegrist H., Singer H., Wittmer A., McArdell C.S. (2012) Hospital Wastewater Treatment by Membrane Bioreactor: Performance and Efficiency for Organic Micropollutant Elimination. *Environ. Sci. Technol.* **46**, 1536-1545, dx.doi.org/10.1021/es203495d.
- Joss A., Baenninger C., Foa P., Koepke S., Krauss M., McArdell C.S., Rottermann K., Wei Y., Zapata A., Siegrist H. (2011) Water reuse: >90% water yield in MBR/RO through concentrate recycling and CO<sub>2</sub> addition as scaling control. *Wat. Res.* **45**, 6141-6151.
- Lienert J., M. Koller, J. Konrad, C.S. McArdell, N. Schuwirth (2011) Multiple-criteria decision analysis reveals high stakeholder preference to remove pharmaceuticals from hospital wastewater. *Environ. Sci. Technol.* **45**(9): 3848–3857.
- Escher B.I., Baumgartner R., Koller M., Treyer K., Lienert J., McArdell C.S. (2011) Environmental toxicology and risk assessment of pharmaceuticals from hospital wastewater, *Water Research* **45**, 75-92.

- Hollender J., Zimmermann S.G., Koepke S., Krauss M., McArdell C.S., Ort C., Singer H., Von Gunten U., Siegrist H. (2009) Elimination of organic micropollutants in a municipal wastewater treatment plant upgraded with a full-scale post-ozonation followed by sand filtration, *Environ. Sci. Technol.* **43**, 7862-7869.
- Weissbrodt D., Kovalova L., Ort C., Pazhepurackel V., Moser R., Hollender J., Siegrist H., McArdell C.S. (2009) Mass flows of X-ray contrast media and cytostatics in hospital wastewater. *Environ. Sci. Technol.* **43**, 4810-4817.
- Abegglen C., Joss A., McArdell C.S., Fink G., Schlüsener M.P., Ternes T.A., Siegrist H. (2009) The fate of selected micropollutants in a single-house MBR. *Water Research* **43**, 2036-2046.
- Kovalova L., McArdell C.S., Hollender J. (2009) Challenge of high polarity and low concentrations in analysis of cytostatics and metabolites in wastewater by hydrophilic interaction chromatography/tandem mass spectrometry. *J. Chromatography A* **1216**, 1100-1108.
- Bester K., Scholes L., Wahlberg C., McArdell C.S. (2008) Sources and Mass flows of Xenobiotics in Urban Water Cycles - an Overview on Current Knowledge and Data Gaps. *Water Air Soil Pollut: Focus* **8**, 407-423.
- Stamm C., Alder A.C., Fenner, K., Hollender J., Krauss M., McArdell C.S., Ort C., Schneider M.K. (2008) Spatial and Temporal Patterns of Pharmaceuticals in the Aquatic Environment: A Review. *Geography Compass* **2/3**, 920-955.
- Göbel A., McArdell C.S., Joss A., Siegrist H., Giger W. (2007) Fate of Sulfonamides, Macrolides and Trimethoprim in Different Wastewater Treatment Technologies. *Sci. Total Environ.* **372**, 361-371.
- Joss A., Zabczynski S., Göbel A., Hoffmann B., Löffler D., McArdell C.S., Ternes T.A., Thomsen A., Siegrist H. (2006) Biological degradation of pharmaceuticals in municipal wastewater treatment: Proposing a classification scheme. *Water Research* **40**, 1686-1696.
- Göbel A., Thomsen A., McArdell C.S., Alder A.C., Giger W., Theiß N., Löffler D. Ternes T.A. (2005) Extraction and Determination of Sulfonamides, Macrolides, and Trimethoprim in Sewage Sludge. *J. Chromatogr. A* **1085**, 179-189.
- Joss A., Keller E., Alder A.C., Göbel A., McArdell C.S., Ternes T.A., Siegrist H. (2005) Removal of pharmaceuticals and fragrances in biological wastewater treatment. *Water Research* **39**, 3139-3152.
- Huber M.M., Göbel A., Joss A., Hermann N., Löffler D., McArdell C.S., Ried A., Siegrist H, Ternes T.A., von Gunten U. (2005) Oxidation of Pharmaceuticals during Ozonation of Municipal Wastewater Effluents: A Pilot Study. *Environ. Sci. Technol.* **39(11)**, 4290-4299.
- Göbel A., Thomsen A., McArdell C.S., Joss A., Giger W. (2005) Occurrence and Sorption Behavior of Sulfonamides, Macrolides, and Trimethoprim in Activated Sludge Treatment. *Environ. Sci. Technol.* **39(10)**, 3981-3989.
- Göbel A., McArdell C.S., Suter M.J.-F., Giger W. (2004) Trace Determination of Macrolide and Sulfonamide Antimicrobials, a Human Sulfonamide Metabolite, and Trimethoprim in Wastewater using Liquid Chromatography coupled to Electrospray Tandem Mass Spectrometry. *Anal. Chem.* **76(16)**, 4756-4764.
- McArdell C.S., Molnar E., Suter M.J.-F., Giger W. (2003) Occurrence and Fate of Macrolide Antibiotics in Wastewater Treatment Plants and in the Glatt Valley Watershed, Switzerland. *Environ. Sci. Technol.* **37(24)**, 5479-5486.
- Giger W., Alder A.C., Golet E.M., Kohler H.-P.E., McArdell C.S., Molnar E., Siegrist H., Suter M.J.-F. (2003). Occurrence and Fate of Antibiotics as Trace Contaminants in Wastewaters, Sewage Sludges, and Surface Waters. *Chimia* **57(9)**, 485-491.
- Haller M. Y., Müller S. R., McArdell C. S., Alder A. C., Suter M. J.-F. (2002) Quantification of Veterinary Antibiotics (Sulfonamides and Trimethoprim) in Animal Manure by Liquid Chromatography - Mass Spectrometry. *J. Chromatogr. A* **952**, 111-120.
- McArdell C.S., Stone A.T., Tian J. (1998) Reaction of EDTA and Related Aminocarboxylate Chelating Agents with  $\text{Co}^{\text{III}}\text{OOH}$  (Heterogenite) and  $\text{Mn}^{\text{III}}\text{OOH}$  (Manganite). *Environ. Sci. Technol.* **32(19)**, 2923-2930.
- Suter M.J.-F., Alder A.C., Berg M., McArdell C.S., Riediker S., Giger W. (1997) Determination of Hydrophilic and Amphiphilic Organic Pollutants in the Aquatic Environment. *Chimia* **51(12)**, 871-877.
- Bürgisser C.S., Stone A.T. (1997) Determination of EDTA, NTA and Other Amino Carboxylic Acids and Their Co(II) and Co(III) Complexes by Capillary Electrophoresis. *Environ. Sci. Technol.* **31(9)**, 2656-2664.
- Borkovec M., Bürgisser C.S., Cernik M., Glättli U., Sticher H. (1996) Quantitative Description of Multi-Component Reactive Transport in Porous Media: An Empirical Approach. *Trans. Porous Media* **25(2)**, 193-204.
- Bürgisser C.S., Scheidegger A.M., Borkovec M., Sticher H. (1994) Chromatographic Charge Density Determination of Materials with Low Surface Area. *Langmuir* **10(3)**, 855-860.

Scheidegger A.M., Bürgisser C.S., Borkovec M., Sticher H., Meeussen H., Van Riemsdijk W. (1994) Convective Transport of Acids and Bases in Porous Media. *Water Resour. Res.* **30(11)**, 2937-2944.

Bürgisser C.S., Cernik M., Borkovec M., Sticher H. (1993) Determination of Nonlinear Adsorption Isotherms from Column Experiments: an Alternative to Batch Studies. *Environ. Sci. Technol.* **27(5)**, 943-948.

### BOOK CHAPTERS and REPORTS

Böhler, M., Fleiner, J., McArdell, C.S., Kienle, C., Schachtler, M., Siegrist, H. (2016) Biologische Nachbehandlung von kommunalem Abwasser nach Ozonung – ReTREAT. Gewässerschutz-Wasser-Abwasser 239, 49. Essener Tagung für Wasser- und Abfallwirtschaft. Ed. J. Pinnekamp, Aachen, ISBN 978-3-938996-45-4.

McArdell, C.S., Bourgin, M., von Gunten, U., Hollender, J., Kienle, Hofman-Caris R. (2015) Decision basis for implementation of oxidation technologies. Deliverable D32.3, FP7 EU project DEMEAU, Grant Agreement no. 308339, [www.demeau-fp7.eu](http://www.demeau-fp7.eu).

Fleiner J., Wittmer A., Böhler M., McArdell, C.S., Teichler R, Bourgin M., Schachtler M., Siegrist H.(2015): „Ozonung ARA Neugut, Dübendorf - Grosstechnische Optimierung der Ozondosierung“, Schlussbericht BAFU, 2015. [www.micropoll.ch/dokumente/berichte](http://www.micropoll.ch/dokumente/berichte).

Lyko S., Nafo I., Evenblij H., Cornelissen A., Igos E., Klepyszewski K., Venditti S., Kovalova L., McArdell C., Helwig K., Pahl O., Barraud O., Casellas M., Dagot C., Maftah C., Ploy M.-C., Stalder T. (2012) Pharmaceutical Input and Elimination from Local Sources. Final Report of the European cooperation project PILLS (<http://www.pills-project.eu/>).

Ernst M., Hein A., Asmin J., Krauss M., Fink G., Hollender J., Ternes T., Jørgensen C, Jekel M., McArdell C.S. (2012) Water quality analysis: Detection, fate, and behaviour, of selected trace organic pollutants at managed aquifer recharge sites. Chapter 12 in *Advances in water reclamation technologies for safe managed aquifer recharge*, C. Kazner, T. Wintgens and P. Dillon (Eds.), IWA, p. 197-226. ISBN 9781843393443.

McArdell C.S., Kovalova L., Siegrist H. Kienle C., Moser R., Schwartz T. (2011) Input and Elimination of Pharmaceuticals and Disinfectants from Hospital Wastewater. Final project report, Eawag, Dübendorf, Switzerland, accessible at <http://tinyurl.com/eawag-spitalabwasser>.

Bester K., McArdell C.S., Wahlberg C., Bucheli T.D. (2010) Quantitative Mass Flows of Selected Xenobiotics in Urban Waters and Waste Water Treatment Plants, Chapter 1 in D. Fatta-Kassinos et al. (eds.), *Xenobiotics in the Urban Water Cycle: Mass Flows, Environmental Processes, Mitigation and Treatment Strategies*. Environmental Pollution, Vol. 16, DOI 10.1007/978-90-481-3509-7\_1, © Springer Science + Business Media B.V.

Hollender, J., Singer, H., McArdell, C.S. (2008) Polar organic micropollutants in the aquatic water cycle. In: *Dangerous Pollutants (Xenobiotics) in Urban Water Cycle*, Petr Hlavinek, Ognjen Bonacci, Jiri Marsalek and Ivana Mahrikova (Eds.), Springer-Verlag, 103-116.

Hollender J., McArdell C.S., Singer H. (2007) Polar Organic Micropollutants in the Water Cycle. In *Dangerous Pollutants (Xenobiotics) in Urban Water Cycle* edited by Hlavinek P., Bonacci, O., Marsalek J., Mahrikova I. Proceedings of the NATO Advanced Research Workshop, Lednice, Czech Republic, May 2007.

McArdell C.S., Alder A.C., Göbel A., Löffler D., Suter M.J.-F., Ternes T.A. (2006) Analytical Methods. In *Human Pharmaceuticals, Hormones and Fragrances: The challenge of micropollutants in urban water management* edited by Thomas A. Ternes and Adriano Joss. ISBN: 1843390930. IWA Publishing, London, UK.

Alder A.C., Bruchet A., Carballa M., Clara M., Joss A., Löffler D., McArdell C.S., Miksch K., Omil F., Tuhkanen T., Ternes T.A. (2006) Consumption and Occurrence. In *Human Pharmaceuticals, Hormones and Fragrances: The challenge of micropollutants in urban water management* edited by Thomas A. Ternes and Adriano Joss. ISBN: 1843390930. IWA Publishing, London, UK.

Blüm W., McArdell C.S., Höhn E., Schaubhut R., Labhart W., Bertschi S. (2005) Organische Spurenstoffe im Grundwasser des Limmattales: Ergebnisse der Untersuchungskampagne 2004. Baudirektion Kanton Zürich, AWEL (Amt für Abfall, Wasser, Energie und Luft), Zürich. [www.bd.zh.ch](http://www.bd.zh.ch) > Medienforum, Dossier "Mikroverunreinigungen".

Alder A.C., McArdell C.S., Golet E.M., Kohler H.-P.E., Molnar E., Anh Pham Thi N., Siegrist H., Suter M.J.-F., Giger W. (2004) Environmental Exposure of Antibiotics in Wastewaters, Sewage Sludges, and Surface Waters in Switzerland. In *Pharmaceuticals in the Environment*, Kümmerer, K. (Hrsg.). Springer, Berlin Heidelberg, Deutschland, p. 55-66.

Giger W., Alder A.C., Golet E.M., Kohler H.-P.E., McArdell C.S., Molnar E., Pham Thi N.A., Siegrist H. (2003) Antibiotikaspuren auf dem Weg von Spital- und Gemeindeabwasser in die Fließgewässer: Umweltanalytische Untersuchungen über Einträge und Verhalten. In *Spurenstoffe in Gewässern*, Track, T. & Kreysa, G. (Hrsg.). Wiley-VCH & Dechema, Weinheim, Deutschland, p. 21-33.

Alder A.C., McArdell C.S., Golet E.M., Ibric S., Molnar E., Nipales N.S., Giger W. (2001) Occurrence and Fate of Fluoroquinolone, Macrolide, and Sulfonamide Antibiotics during Wastewater Treatment and in Ambient Waters in Switzerland. In: C.G. Daughton and T. Jones-Lepp (Editors), *Pharmaceuticals and Personal Care Products in the Environment: An Emerging Concern*. Washington, USA, ACS Symposium Series 791, p. 56-69.

### **PUBLICATIONS not peer-reviewed**

Böhler M., Fleiner J., Kienle, C., Langer M., McArdell, C.S., Siegrist H. (2016) Möglichkeiten der biologischen Nachbehandlung nach Ozonung. Tagungsband KomS-Technologieforum Spurenstoffe, 6. Oktober, Lahr, Deutschland.

Böhler M., Fleiner J., Teichler R., Bourgin M., McArdell, C.S., Siegrist H., Schachtler M. (2015) Praxisanwendung von Regelung und Steuerung der Ozon - Dosierung bei der Spurenstoffelimination via Absorbanz-Messung. Proceedings ISA 11. Aachener Tagung Wassertechnologie, 27. - 28. Oktober 2015, Aachen, Deutschland.

McArdell C.S. (2015) Les micropolluants dans les eaux usées et les eaux superficielles – un tour d'horizon. Brochure Eawag Journée d'info 2015 Micropolluants dans les eaux – Actions dans le domaine de l'épuration des eaux usées. 3 Sept. 2015.

McArdell C.S. (2015). The first full-scale advanced ozonation plant in the Dübendorf WWTP running; the new Swiss water protection act approved. Article in Norman Bulletin, Issue No. 4, p. 36-37. <http://www.norman-network.net>.

Kuroda K., Itten R., Kovalova L., Ort C., Weissbrodt D., McArdell C.S. (2011) Validating Modeled Input of Pharmaceuticals from Wastewater Treatment Plants and Hospitals as Point Sources into the Swiss Environment. Proceedings at the 4th IWA-ASPIRE Conference, 2-6 October 2011, Tokyo, Japan.

McArdell C.S., Lienert J. (2011) How should hospital wastewater be dealt with? Eawag Annual report 2010.

Götz C.W., Abegglen C., McArdell C.S., Koller M., Siegrist H., Hollender J., Schärer M. (2010) Mikroverunreinigungen. Beurteilung weitergehender Abwasserreinigungsverfahren anhand Indikatorsubstanzen. GWA 4, 325-333.

McArdell C.S. (2009) Local treatment of hospital wastewater? Photo story in Eawag annual report p.40/41.

McArdell C.S., Weissbrodt D., Kovalova L., Hollender J., Siegrist H. (2008) Where should hospital wastewater be treated. Eawag Annual Report 2007.

Moser, R., McArdell C.S., Weissbrodt, D. (2007) Mikroverunreinigungen: Vorbehandlung von Spitalabwasser. GWA 11, 869-875.

Hollender J., McArdell C.S., Escher, B.I. (2007) Mikroverunreinigungen. Vorkommen in Gewässern der Schweiz. GWA 11, 843-852.

Hanke I., Singer H., McArdell C.S., Brennwald M., Traber D., Muralt R., Herold T., Oechslin R., Kipfer R. (2007) Arzneimittel und Pestizide im Grundwasser. GWA 3, 187-196.

Schärer M., Müller S., Carrard M., Ort C., Siegrist H., Escher B., Hollender J., McArdell C.S. (2006) Projekt "Strategie MicroPoll" GWA 7, 551-555.

McArdell C.S., Molnar E., Schaffner C., Giger W., and Hoehn E. (2005) Organische Spurenstoffe im Grundwasser des Limmattales. *EAWAG Jahresbericht 2005*, 47.

Ternes T.A., Joss A., Kreuzinger N., Miksch K., Lema J.M., Von Gunten U., McArdell C.S., and Siegrist H. (2005) Removal of Pharmaceuticals and Personal Care Products: Results of the POSEIDON Project. In *Water Environment Federation WEFTEC 2005*, Conference Proceeding, Washington, DC.

Giger W., Alder A.C., McArdell C.S., Molnar E., Golet E.M., Göbel A. (2005) Antibiotikarückstände in Abwasser und Gewässern - Umweltanalytische Studien über Einträge und Verhalten. *Gas Wasser Abwasser (GWA)* 1, 17-23.

Göbel A., Thomsen A., McArdell C.S., Joss A., Siegrist H., Giger W. (2004) Antibiotika in der Abwasserreinigung. *EAWAG Jahresbericht*, 48.

Siegrist H., Joss A., Alder A., McArdell C.S., Göbel A., Keller E., Ternes T.A. (2004) Mikroverunreinigungen-Abwasserentsorgung vor neuen Anforderungen? *EAWAG news* 57d 7-10. Micropollutants – new challenge in

wastewater disposal? *EAWAG news* 57e, 7-10. Micropollutants – le traitement des eaux usées face à un nouveau défi? *EAWAG news* 57f, 7-10.

Joss A., Alder A., Huber M., Göbel A., von Gunten U., Keller E., McArdell C.S., Ternes T.A., Siegrist H. (2004) Abbau von Mikroverunreinigungen in der kommunalen Abwasserreinigung. Verband Schweizer Abwasser- und Gewässerschutzfachleute, p. 1-9.

Giger W., Alder A.C., Golet E.M., Kohler H.-P., McArdell C.S., Molnar E., Schaffner C. (2003) Neue Verunreinigungen in Abwasser und Gewässern. *Bulletin ETH Zürich* Nr. 289 Mai 2003, 46-49.

Molnar E., McArdell C.S., Alder A.C. and Giger W. (2002). Auftreten und Verhalten von Makrolid-Antibiotika in Abwasser und Fließgewässer im Glatttal – Einfluss der Abwasserumleitung ins Limmattal. *EAWAG Jahresbericht*, 35-36.

McArdell C.S. (2002) Antibiotics - The Flipside if the Coin. *EAWAG news* 53e, September: p. 21-23.

McArdell C.S., Molnar E., Nipales N.S., Giger W. (2000) Makrolid- und Sulfonamid-Antibiotika als Mikroverunreinigungen in kommunalem Abwasser und Oberflächengewässern. *EAWAG Jahresbericht*, 23-24.

Nipales N.S., McArdell C.S., Molnar E., Giger W. (2000) Occurrence of Macrolide and Sulfonamide Antibiotics in the Aquatic Environment of Switzerland. American Chemical Society National Meeting; San Francisco, CA. *Division of Environmental Chemistry Preprints of Extended Abstracts* **40(1)**, 104-106.

Buerge I.J., McArdell C.S., Hug S.J. (1999) Formation of Chromium(III) Carboxylate Complexes Analyzed by Capillary Electrophoresis. Chapter 4 in Ph.D. thesis I. Bürge, Diss ETH No. 13139.

Bürgisser C.S. (1994) Transportverhalten von nicht-linear sorbierenden Stoffen in chromatographischen Säulen am Beispiel der Adsorption an Cristobalit. *Diss. ETH Nr. 10653*, Eidgenössische Technische Hochschule (ETH), Zürich.

Bürgisser C., Scheidegger A., Borkovec M., Sticher H. (1991) Transport- und Adsorptionsverhalten von Cadmium in Säulen. *Mitteilungen Dt. Bodenkundl. Gesellsch.* **66(1)**, 283-286.