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### Invertebrate life cycle responses to PAC exposure

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# References

- Achazi, R. K., Chroszcz, G., Düker, C., Henneken, M., Rothe, B., Schaub, K. and Steudel, I., 1995. The effect of fluoranthene (Fla), benzo[*a*]pyrene (BaP) and cadmium (Cd) upon survival rate and life cycle parameters of two terrestrial annelids in laboratory test systems. Newsletter on Enchytraeidae 4, 7-14.
- Achazi, R. K. and Van Gestel, C. A. M., 2003. Uptake and accumulation of PAHs by terrestrial invertebrates. In Douben PET, ed., PAHs: An Ecotoxicological Perspective. John Wiley, Chichester, UK, 173-190.
- Aouadene, A., Di Giorgio, C., Sarrazin, L., Moreau, X., De Jong, L., Garcia, F., Thiery, A., Botta, A. and De Meo, M., 2008. Evaluation of the genotoxicity of river sediments from industrialized and unaffected areas using a battery of short-term bioassays. Environ. Mol. Mutagen., 49, 283-299.
- Armitage, P. D., Cranston, P. S. and Pinder, L. C. V., 1995. The Chironomidae: biology and ecology of non-biting midges. Chapman and Hall, London, UK.
- Barreira, L. A., Mudge, S. M. and Bebianno, M. J., 2007. Oxidative stress in the clam *Ruditapes decussatus* (Linnaeus, 1758) in relation to Polycyclic Aromatic Hydrocarbon body burden. Environ. Tox., 22, 203-221.
- Bartos, T., Letzsch, S., Skarek, M., Flegrova, Z., Cupr, P. and Holoubek, I., 2006. GFP assay as a sensitive eukaryotic screening model to detect toxic and genotoxic activity of azaarenes. Environ. Tox., 21, 343-348.
- Bauer, H. and Pohl, D., 1998. Bodenökologische Untersuchungen zur Wirkung und Verteilung von organischen Stoffgruppen (PAK, PCB) in ballungsraumtypischen Ökosystemen. Forschungsbericht des Projektträgers 1/98, GSF-Forschungszentrum für Umwelt und Gesundheit, Neuherberg, Germany.
- Bauer, R., Worland, M. R. and Block, W., 2001. Experimental studies on cold survival of enchytraeid cocoons. Pedobiologia, 45, 561-571.
- Bearden, A.P. and Schultz T.W., 1998. Comparison of *Tetrahymena* and *Pimephales* toxicity based on mechanism of action. SAR QSAR Environ. Res., 9: 127-153.
- Belfroid, A. C., Sijm, D. T. H. M. and Van Gestel, C. A. M., 1996. Bioavailability and toxicokinetics of hydrophobic aromatic compounds in benthic and terrestrial invertebrates. Environ. Rev., 4, 276-299.
- Bell, H. E., Liber, K., Call, D. J. and Ankley, G. T., 2004. Evaluation of bioaccumulation and photo-induced toxicity of fluoranthene in larval and adult life-stages of *Chironomus tentans*. Arch. Environ. Contam. Toxicol., 47, 297-303.

## References

- Bleeker, E.A.J., Van der Geest, H. G., Kraak, M. H. S., De Voogt, P. and Admiraal, W., 1998. Comparative ecotoxicity of NPAHs to larvae of the midge *Chironomus riparius*. *Aquatic Toxicol.*, 41, 51-62.
- Bleeker, E. A. J., Leslie, H. A., Groenendijk, D., Plans, M. and Admiraal, W., 1999a. Effects of exposure to azaarenes on emergence and mouthpart development in the midge *Chironomus riparius* (Diptera: Chironomidae). *Environ. Tox. Chem.*, 18, 1829-1834.
- Bleeker, E. A. J., Van der Geest, H. G., Klamer, H. J. C., De Voogt, P., Wind, E. and Kraak, M. H. S., 1999b. Toxic and genotoxic effects of azaarenes: isomers and metabolites. *Pol. Arom. Comp.*, 13, 191-203.
- Bleeker E. A. J., 1999c. Toxicity of azaarenes: mechanisms and metabolism. PhD thesis. University of Amsterdam, Amsterdam, The Netherlands.
- Bleeker, E. A. J., Pieters, B. J., Wiegman, S. and Kraak, M. H. S., 2002a. Comparative (photoenhanced) toxicity of homocyclic and heterocyclic PACs. *Pol. Arom. Comp.*, 22, 601-610.
- Bleeker, E. A. J., Wiegman, S., de Voogt, P., Kraak, M., Leslie, H. A., De Haas, E. and Admiraal, W., 2002b. Toxicity of azaarenes. *Rev. Environ. Contam. Toxicol.*, 173, 39-83.
- Blotevogel, J., Held, T., Rippen, G. and Wiesert, P., 2007. Heterocyclic Aromatic Compounds and other creosote-related contaminants in groundwater - TP 1: Assessment of substance properties and occurrence with regard to the potential for natural retention and degradation. Arcadis report 02 WN 0355.
- Bossuyt, B. T. A. and Janssen, C. R., 2005. Copper regulation and homeostasis of *Daphnia magna* and *Pseudokirchneriella subcapitata*: influence of acclimation. *Environ. Poll.*, 136, 135-144.
- Bowmer, C. T., Roza, P., Henzen, L. and Degeling, C., 1992. The development of chronic toxicological tests for PAH contaminated soils using the earthworm *Eisenia fetida* and the springtail *Folsomia candida*. TNO Report IMW-R 92/387. Apeldoorn, The Netherlands.
- Brennan, S. J., Brougham, C. A., Roche, J. J. and Fogarty, A. M., 2006. Multi-generational effects of four selected environmental oestrogens on *Daphnia magna*. *Chemosphere*, 64, 49-55.
- Bundy, J. G., Morriss, A. W. J., Durham, D. G., Campbell, C. D. and Paton, G. I., 2001. Development of QSARs to investigate the bacterial toxicity and biotransformation potential of aromatic heterocyclic compounds. *Chemosphere*, 42, 885-892.
- Buryskova, B., Hilscherova, K., Blaha, L., Marsalek, B. and Holoubek, I., 2006. Toxicity and modulations of biomarkers in *Xenopus laevis* embryos exposed to polycyclic aromatic hydrocarbons and their N-heterocyclic derivatives. *Environ. Tox.*, 21, 590-598.

- Campiche, S., L'Arnbart, G., Tarradellas, J. and Becker-van Slooten, K., 2007. Multigeneration effects of insect growth regulators on the springtail *Folsomia candida*. *Ecotoxicol. Environ. Saf.*, 67, 180-189.
- Chen, H. Y. and Preston, M. R., 2004. Dissolution of azaarenes from urban aerosols. *Atmospheric Environ.*, 38, 1023-1028.
- Chen, H. Y. and Preston, M. R., 1998. Azaarenes in the aerosol of an urban atmosphere. *Environ. Sci. Technol.*, 32, 577-583.
- Chen, J., Wang, L., Lu, G. and Zhao, T., 1997. Quantitative structure-activity relationship studies of selected heterocyclic nitrogen compounds. *Bull. Environ. Contam. Toxicol.*, 58, 372-379.
- Connon, R., Hooper, H. L., Sibly, R. M., Lim, F. L., Heckmann, L. H., Moore, D. J., Watanabe, H., Soetaert, A., Cook, K., Maund, S. J., Hutchinson, T. H., Moggs, J., De Coen, W., Iguchi, T. and Callaghan, A., 2008. Linking molecular and population stress responses in *Daphnia magna* exposed to cadmium. *Environ. Sci. Technol.*, 42, 2181-2188.
- Conrad, A. U., Comber, S. D. and Simkiss, K., 2002. Pyrene bioavailability: effect of sediment-chemical contact time on routes of uptake in an oligochaete worm. *Chemosphere*, 49, 447-454.
- Cornelissen, G., Gustafsson, O., Bucheli, T. D., Jonker, M. T. O., Koelmans, A. A. and Van Noort, P. C. M., 2005. Extensive sorption of organic compounds to black carbon, coal, and kerogen in sediments and soils: mechanisms and consequences for distribution, bioaccumulation, and biodegradation. *Environ. Sci. Technol.*, 39, 6881-6895.
- Crouau, Y., Chenon, P. and Gisclard C., 1999. The use of *Folsomia candida* (Collembola, Isotomidae) for the bioassay of xenobiotic substances and soil pollutants. *Appl. Soil Ecol.*, 12, 103-111.
- Crommentuijn, T., Sijm, D., De Bruin, J., Van Leeuwen, K. and Van de Plassche, E., 2000. Maximum permissible and negligible concentrations for some organic substances and pesticides. *J. Environ. Manag.* 58, 297-312.
- Cronin, M. A. and Bickham, J. W., 1998. A population genetic analysis of the potential for a crude oil spill to induce heritable mutations and impact natural populations. *Ecotoxicology*, 7, 259-278.
- De Haas, E. M., Reuvers, B., Moermond, C. T. A., Koelmans, A. A. and Kraak, M. H. S., 2002. Responses of benthic invertebrates to combined toxicant and food input in floodplain lake sediments. *Environ. Toxicol. Chem.*, 21, 2165-2171.
- De Haas, E. M., León Paumen, M., Koelmans, A. A. and Kraak, M. H. S., 2004. Combined effects of copper and food on the midge *Chironomus riparius* in whole-sediment bioassays. *Environ. Poll.*, 127, 99-107.
- De Pauw, N. and Vannevel, R. (reds.), 1990. Macro-invertebraten en waterkwaliteit; Stichting Leefmilieu, Antwerpen, Belgium.

## References

- De Voogt, P., Wegener, J. W. M., Klamer, J. C., Zijl, G. A. V. and Govers, H., 1988. Prediction of environmental fate and effects of heteroatomic polycyclic aromatics by QSARs: the position of n-octanol/water partition coefficients. *Biomed. Environ. Sci.*, 1, 194-209.
- De Voogt, P., Bleeker, E. A. J., van Vlaardingen, P. L. A., Fernandez, A., Slobodnik, J., Wever, H. and Kraak, M. H. S., 1999. Formation and identification of azaarene transformation products from aquatic invertebrate and algal metabolism. *J. Chromat. B*, 724, 265-274.
- Didden, W. and Römbke, J., 2001. Enchytraeids as indicator organisms for chemical stress in terrestrial ecosystems. *Ecotoxicol. Environ. Saf.*, 50, 25-43.
- Di Toro, D. M., McGrath, J. A. and Hansen, D. J., 2000a. Technical basis for narcotic chemicals and Polycyclic Aromatic Hydrocarbon criteria. I. Water and tissue. *Environ. Tox. Chem.*, 19, 1951-1970.
- Di Toro, D. M. and McGrath, J. A., 2000b. Technical basis for narcotic chemicals and Polycyclic Aromatic Hydrocarbon criteria. II. Mixtures and sediments. *Environ. Tox. Chem.*, 19, 1971-1982.
- Domene, X., Alcaniz, J. M. and Andres, P., 2007. Ecotoxicological assessment of organic wastes using the soil collembolan *Folsomia candida*. *Appl. Soil Ecol.*, 35, 461-472.
- Driscoll, S. B. K. and Burgess, R. M., 2007. An overview of the development, status, and application of equilibrium partitioning sediment benchmarks for PAH mixtures. *Hum. Ecol. Risk Assess.*, 13, 286-301.
- Droge, S. T. J., León Paumen, M., Bleeker, E. A. J., Kraak, M. H. S. And Van Gestel, C. A. M., 2006. Chronic toxicity of polycyclic aromatic compounds to the springtail *Folsomia candida* and the enchytraeid *Enchytraeus crypticus*. *Environ. Toxicol. Chem.*, 25, 2423-2431.
- Ehrenfreund, P. and Foing, B. H., 1995. Search for Fullerenes and PAHs in the Diffuse Interstellar-Medium. *Planet. Space Sci.*, 43, 1183-1187.
- Ehrenfreund, P., Ruitkamp, R., Peeters, Z., Foing, B., Salama, F. and Martins, Z., 2007. The ORGANICS experiment on BIOPAN V: UV and space exposure of aromatic compounds. *Planet. Space Sci.*, 55, 383-400.
- Emery, V. L. and Dillon, T. M., 1996. Chronic toxicity of phenanthrene to the marine polychaete worm, *Nereis (Neanthes) arenaceodentata*. *Bull. Environ. Contam. Toxicol.*, 56, 265-270.
- Erickson, R. J., Ankley, G. T., DeFoe, D. L., Kosian, P. A. and Makynen, E. A., 1999. Additive toxicity of binary mixtures of phototoxic Polycyclic Aromatic Hydrocarbons to the oligochaete *Lumbriculus variegatus*. *Toxicol. Appl. Pharmacol.*, 154, 97-105.

- Escher, B. I. and Hermens, J. L. M., 2002. Modes of action in ecotoxicology: their role in body burdens, species sensitivity, QSARs, and mixture effects. *Environ. Sci. Technol.*, 36, 4201-4217.
- Escher, B.I., Bramaz, N., Eggen, R. I. L. and Richter, M., 2005. In vitro assessment of modes of toxic action of pharmaceuticals in aquatic life. *Environ. Sci. Technol.*, 39, 3090-3100.
- European Commission, 2005a. Common Implementation Strategy for the Water Framework Directive: Environmental Quality Standards (EQS), Substance Data Sheet Priority Substance No. 2: Anthracene.
- European Commission, 2005b. Common Implementation Strategy for the Water Framework Directive: Environmental Quality Standards (EQS), Substance Data Sheet Priority Substance No. 28: Polyaromatic Hydrocarbons (PAHs).
- European Commission, 2006. COM(2006)397 final. Priority substances and other pollutants. <http://ec.europa.eu/environment/water/water-framework/>
- European Commission, 2008. Draft EU risk assessment - coal-tar-pitch, high temperature, CAS [65996-32-2].
- Feldmannova, M., Hilscherova, K., Marsalek, B. and Blaha, L., 2006. Effects of N-heterocyclic polyaromatic hydrocarbons on survival, reproduction, and biochemical parameters in *Daphnia magna*. *Environ. Tox.*, 21, 425-431.
- Fisher, S. W., Chordas, S. W. and Landrum, P. F., 1999. Lethal and sublethal body residues for PCB intoxication in the oligochaete, *Lumbriculus variegatus*. *Aquat. Toxicol.*, 45, 115-126.
- Forbes, V. E. and Cold, A., 2005. Effects of the pyrethroid esfenvalerate on life-cycle traits and population dynamics of *Chironomus riparius* - Importance of exposure scenario. *Environ. Tox. Chem.*, 24, 78-86.
- Fountain, M. T. and Hopkin, S. P., 2005. *Folsomia candida* (Collembola): A "standard" soil arthropod. *Ann. Rev. Entomol.*, 50, 201-222.
- Ghosh, U., 2007. The role of black carbon in influencing availability of PAHs in sediments. *Hum. Ecol. Risk Assess.*, 13, 276-285.
- Gower, A. M. and Buckland, P. J., 1978. Water quality and the occurrence of *Chironomus riparius* Meigen (Diptera: Chironomidae) in a stream receiving sewage effluent. *Freshwat. Biol.*, 385-403.
- Guerrero, N. R. V., Taylor, M. G., Davies, N. A., Lawrence, M. A. M., Edwards, P. A., Simkiss, K. and Wider, E. A., 2002. Evidence of differences in the biotransformation of organic contaminants in three species of freshwater invertebrates. *Env. Poll.*, 117, 523-530.
- Haanstra, L., Doelman, P. and Oude Voshaar, J. H., 1985. The use of sigmoidal concentration–response curves in soil ecotoxicological research. *Plant Soil*, 84, 293-297.

## References

- Hatch, A. C. and Burton, G. A., 1999. Photo-induced toxicity of PAHs to *Hyalella azteca* and *Chironomus tentans*: effects of mixtures and behavior. *Env. Poll.*, 106, 157-167.
- Hawthorne, S. B., Grabanski, C. B., Miller, D. J. and Kreitinger, J. P., 2005. Solid-phase microextraction measurement of parent and alkyl Polycyclic Aromatic Hydrocarbons in milliliter sediment pore water samples and determination of K-DOC values. *Environ. Sci. Technol.*, 39, 2795-2803.
- Hawthorne, S. B., Miller, D. J. and Kreitinger, J. P., 2006. Measurement of total Polycyclic Aromatic Hydrocarbon concentrations in sediments and toxic units used for estimating risk to benthic invertebrates at manufactured gas plant sites. *Environ. Tox. Chem.*, 25, 287-296.
- Hauser, B., Schrader, G. and Bahadir, M., 1997. Comparison of acute toxicity and genotoxic concentrations of single compounds and waste elutriates using the Microtox/Mutatox test system. *Ecotoxicol. Environ. Saf.*, 38, 227-231.
- Heckmann, L. H., Sibly, R. M., Connon, R., Hooper, H. L., Hutchinson, T. H., Maund, S. J., Hill, C. J., Bouetard, A. and Callaghan, A., 2008. Systems biology meets stress ecology: linking molecular and organismal stress responses in *Daphnia magna*. *Genome Biol.*, 9.
- Hellmann, H., 2003. A recent contamination trend: Polycyclic Aromatic Hydrocarbons (PAHs) in aquatic and terrestrial sediments. *Acta Hydroc. Hydrob.*, 31, 85-96.
- Helweg, C., Nielsen, T. and Hansen, P. E., 1997. Determination of octanol/water partition coefficients of polar Polycyclic Aromatic Compounds (N-PAC) by high performance liquid chromatography. *Chemosphere*, 34, 1673-1684.
- Hendriks, A. J., 1995. Modeling response of species to microcontaminants - comparative ecotoxicology by (sub)lethal body burdens as a function of species size and partition ratio of chemicals. *Ecotoxicol. Environ. Saf.*, 32, 103-130.
- Herbert, I. N., Svendsen, C., Hankard, P. K. and Spurgeon, D. J., 2004. Comparison of instantaneous rate of population increase and critical-effect estimates in *Folsomia candida* exposed to four toxicants. *Ecotoxicol. Environ. Saf.*, 57, 175-183.
- Hermens, J., Canton, H., Janssen, P. and De Jong, R., 1984. Quantitative structure-activity relationships and toxicity studies of mixtures of chemicals with anaesthetic potency: Acute lethal and sublethal toxicity to *Daphnia magna*. *Aquat. Toxicol.*, 143-154.
- Hogenboom, A. C., Van Leerdam, J. A., De Voogt, W. P., 2008. Accurate mass screening and identification of emerging contaminants in environmental samples by liquid chromatography-hybrid linear ion trap Orbitrap mass spectrometry. *J. Chromatogr. A*, in press.
- Howsam, M. and Van Straalen, N. M., 2004. Pyrene metabolism in the springtail *Orchesella cincta* L. (Collembola, Entomobryidae). *Environ. Toxicol. Chem.*, 22, 1481-1486.

- Ingersoll, C. G., Brunson, E. L., Wang, N., Dwyer, E. J., Ankley, G. T., Mount, D. R., Huckins, J., Petty, J. and Landrum, P. E., 2003. Uptake and depuration of nonionic organic contaminants from sediment by the oligochaete, *Lumbriculus variegatus*. *Environ. Tox. Chem.*, 22, 872-885.
- ISO 11267, 1999. Soil quality - Inhibition of reproduction of *Collembola (Folsomia candida)* by soil pollutants. International Organization for Standardization, Geneva, Switzerland.
- Jager, T., Sanchez, F. A. A., Muijs, B., Van der Velde, E. G. and Posthuma, L., 2000. Toxicokinetics of polycyclic aromatic hydrocarbons in *Eisenia andrei* (Oligochaeta) using spiked soil. *Environ. Toxicol. Chem.*, 19, 953-961.
- Jager, T., Crommentuijn, T., Van Gestel, C. A. M. and Kooijman, S., 2007. Chronic exposure to chlorpyrifos reveals two modes of action in the springtail *Folsomia candida*. *Environ. Poll.*, 145, 452-458.
- Jensen, J., Krogh, P. H. and Sverdrup, L. E., 2003a. Effects of the antibacterial agents tiamulin, olanquinox and metronidazole and the anthelmintic ivermectin on the soil invertebrate species *Folsomia fimetaria* (Collembola) and *Enchytraeus crypticus* (Enchytraeidae). *Chemosphere*, 50, 437-443.
- Jensen, J. and Sverdrup, L. E., 2003b. Polycyclic Aromatic Hydrocarbon ecotoxicity data for developing soil quality criteria. *Rev. Environ. Contam. Tox.*, 179, 73-97.
- Jensen, J. and Mesman, M. (eds.), 2006. Ecological risk assessment of contaminated land. Decision support for site specific investigations. RIVM Report 711701047.
- Johnsen, A. R., Wick, L. Y. and Harms, H., 2005. Principles of microbial PAH-degradation in soil. *Env. Poll.*, 133, 71-84.
- Jonassen, K. E. N., Nielsen, T. and Hansen, P.E., 2003. The application of high-performance liquid chromatography humic acid columns in determination of Koc of polycyclic aromatic compounds. *Environ. Toxicol. Chem.*, 22, 741-745.
- Jonassen, K.E.N., 2003. Determination of physico-chemical constants in sorption of polycyclic aromatic compounds to soil organic matter. Ph.D. thesis, Roskilde University, Roskilde, Denmark.
- Jonker, M. T. O., Van der Heijden, S. A., Kreitinger, J. P. and Hawthorne, S. B., 2007. Predicting PAH bioaccumulation and toxicity in earthworms exposed to manufactured gas plant soils with solid-phase microextraction. *Environ. Sci. Techn.*, 41, 7472-7478.
- Jung, D. K. J., Klaus, T. and Fent, K., 2001. Cytochrome P450 induction by nitrated polycyclic aromatic hydrocarbons, azaarenes, and binary mixtures in fish hepatoma cell line PLHC-1. *Environ. Tox. Chem.*, 20, 149-159.
- Kahl, M.D., Makynen, E. A., Kosian, P. A. and Ankley, G. T., 1997. Toxicity of 4-nonylphenol in a life-cycle test with the midge *Chironomus tentans*. *Ecotoxicol. Environ. Saf.*, 38, 155-160.



## References

- Kalf, D. F., Crommentuijn, T. and Van de Plassche, E. J., 1997. Environmental quality objectives for 10 Polycyclic Aromatic Hydrocarbons (PAHs). *Ecotoxicol. Environ. Saf.*, 36, 89-97.
- Kapustka, L. A., 2004a. Do PAHs pose unacceptable ecological risks to terrestrial receptors at hazardous waste sites? *Hum. Ecol. Risk Assess.*, 10, 233-243.
- Kapustka, L. A., 2004b. Establishing Eco-SSLs for PAHs: Lessons revealed from a review of literature on exposure and effects to terrestrial receptors. *Hum. Ecol. Risk Assess.*, 10, 185-205.
- Khodadoust, A. P., Lei, L., Antia, J. E., Bagchi, R., Suidan, M. T. and Tabak, H. H., 2005. Adsorption of Polycyclic Aromatic Hydrocarbons in aged harbor sediments. *J. Environ. Eng.*, 131, 403-409.
- Kim, E. J. and Lee, S. K., 2004. Reduced viability of F-1 egg ropes in *Chironomus riparius* exposed to di-2-ethylhexyl phthalate (DEHP). *J. Environ. Biol.*, 25, 259-261.
- King, A. J., Readman, J. W. and Zhou, J. L., 2003. The application of solid-phase micro-extraction (SPME) to the analysis of polycyclic aromatic hydrocarbons (PAHs). *Environ. Geochem. Health*, 25, 69-75.
- Kitazawa, A., Amagai, T. and Ohura, T., 2006. Temporal trends and relationships of particulate chlorinated Polycyclic Aromatic Hydrocarbons and their parent compounds in urban air. *Environ. Sci. Technol.*, 40, 4592-4598.
- Klerks, P. L., 1999. Acclimation to contaminants by the grass shrimp *Palaemonetes pugio*: individual contaminants vs. mixtures. *Ecotoxicology*, 8, 277-286.
- Kolar, L., Erzen, N. K., Hogerwerf, L. and Van Gestel, C. A. M., 2008. Toxicity of abamectin and doramectin to soil invertebrates. *Env. Poll.*, 151, 182-189.
- Könemann, H., 1981. Quantitative Structure-Activity Relationships in fish toxicity studies. I. Relationship for 50 industrial pollutants. *Toxicol. Appl. Pharmacol.*, 19, 209-221.
- Kozin, I.S., Larsen, O. F. A., De Voogt, W. P., Gooijer, C. and Velthorst, N. H., 1997. Isomer-specific detection of azaarenes in environmental samples by Shpol'skii luminescence spectroscopy. *Anal. Chim. Acta*, 354, 181-187.
- Kraak, M. H. S., Ainscough, C., Fernandez, A., Van Vlaardingen, P. L. A., De Voogt, P. and Admiraal, W. A., 1997a. Short-term and chronic exposure of the zebra mussel (*Dreissena polymorpha*) to acridine: effects and metabolism. *Aquat. Toxicol.*, 37, 9-20.
- Kraak, M. H. S., Wijnands, P., Govers, H. A. J., Admiraal, W. and De Voogt, P., 1997b. Structural-based differences in ecotoxicity of benzoquinoline isomers to the zebra mussel (*Dreissena polymorpha*). *Environ. Tox. Chem.*, 16, 2158-2163.
- Kreitinger, J. P., Neuhauser, E. F., Doherty, F. G. and Hawthorne, S. B., 2007. Greatly reduced bioavailability and toxicity of Polycyclic Aromatic Hydrocarbons to *Hyalella azteca* in sediments from manufactured-gas plant sites. *Environ. Tox. Chem.*, 26, 1146-1157.

- Kristufek, V., Fischer, S., Bührmann, J., Zeltins, A. and Schrempf, H., 1999. In situ monitoring of chitin degradation by *Streptomyces lividans* pCHIO12 within *Enchytraeus crypticus* (Oligochaeta) feeding on *Aspergillus proliferans*. *Fems Microbiol. Ecol.*, 28, 41-48.
- Krogh, P. H., Lopez, C. V., Cassani, G., Jensen, J., Holmstrup, M., Schraepen, N., Jorgensen, E., Gavor, Z. and Ternara, A., 2007. Risk assessment of linear alkylbenzene sulphonates, LAS, in agricultural soil revisited: robust chronic toxicity tests for *Folsomia candida* (Collembola), *Aporrectodea caliginosa* (Oligochaeta) and *Enchytraeus crypticus* (Enchytraeidae). *Chemosphere*, 69, 872-879.
- Kuhn, E. P. and Suflita, J. M., 1989. Microbial degradation of nitrogen, oxygen, and sulfur heterocyclic compounds under anaerobic conditions: studies with aquifer samples. *Environ. Toxicol. Chem.*, 8, 1149-1158.
- Kukkonen, J. and Landrum, P. F., 1994. Toxicokinetics and Toxicity of Sediment-Associated Pyrene to *Lumbriculus-Variegatus* (Oligochaeta). *Environ. Tox. Chem.*, 13, 1457-1468.
- Kukkonen, J. V. K., Landrum, P. F., Mitra, S., Gossiaux, D. C., Gunnarsson, J. and Weston, D., 2004. The role of desorption for describing the bioavailability of select Polycyclic Aromatic Hydrocarbon and Polychlorinated Biphenyl congeners for seven laboratory-spiked sediments. *Environ. Tox. Chem.*, 23, 1842-1851.
- Kumar, S., Sikka, H. C., Dubey, S. K., Czech, A., Geddie, N., Wange, C. X. and LaVoie, E. J., 1989. Mutagenicity and tumorigenicity of dihydrodiols, diol epoxides, and other derivatives of benzo[*f*]quinoline and benzo[*h*]quinoline. *Cancer Res.*, 49, 20-24.
- Kuperman, R. G., Checkai, R. T., Simini, M., Phillips, C. I., Speicher, J. A. and Barclift, D. J., 2006. Toxicity benchmarks for antimony, barium, and beryllium determined using reproduction endpoints for *Folsomia candida*, *Eisenia fetida*, and *Enchytraeus crypticus*. *Environ. Tox. Chem.*, 25, 754-762.
- Kuperman, R. G., Checkai, R. T., Simini, M. and Phillips, C. T., 2004. Manganese toxicity in soil for *Eisenia fetida*, *Enchytraeus crypticus* (Oligochaeta), and *Folsomia candida* (Collembola). *Ecotoxicol. Environ. Saf.*, 57, 48-53.
- Lahr, J., Maas-Diepeveen, J. L., Stuijzand, S. C., Leonards, P. E. G., Druke, J. M. L., S., Espeldoorn, A., Kerkum, L. C. M., Van Stee, L. L. P. and Hendriks, A. J., 2003. Responses in sediment bioassays used in the Netherlands: can observed toxicity be explained by routinely monitored priority pollutants? *Water Res.*, 37, 1691-1710.
- Landrum, P. F., Eadie, B. J. and Faust, W. R., 1992. Variation in the bioavailability of Polycyclic Aromatic Hydrocarbons to the amphipod *Diporeia* spp. with sediment aging. *Environ. Tox. Chem.*, 11, 1197-1208.
- Landrum, P. F., Lotufo, G. R., Gossiaux, D. C., Gedeon, M. L. and Lee, J. H., 2003. Bioaccumulation and critical body residue of PAHs in the amphipod, *Diporeia* spp.: additional evidence to support toxicity additivity for PAH mixtures. *Chemosphere*, 51, 481-489.

## References

- Landrum, P. E., Leppanen, M., Robinson, S. D., Gossiaux, D. C., Burton, G. A., Greenberg, M., Kukkonen, J. V. K., Eadie, B. J. and Lansing, M. B., 2004. Comparing behavioral and chronic endpoints to evaluate the response of *Lumbriculus variegatus* to 3,4,3',4'-tetrachlorobiphenyl sediment exposures. *Environ. Tox. Chem.*, 23, 187-194.
- Lee, J. H., Landrum, P. F., Field, L. J. and Koh, C. H., 2001. Application of a Sigma polycyclic aromatic hydrocarbon model and a logistic regression model to sediment toxicity data based on a species-specific, water-only LC50 toxic unit for *Hyaella azteca*. *Environ. Tox. Chem.*, 20, 2102-2113.
- Lee, J. H., Landrum, P. F. and Koh, C. H., 2002. Toxicokinetics and time-dependent PAH toxicity in the amphipod *Hyaella Azteca*. *Environ. Sci. Technol.*, 36, 3124-3130.
- Lei, L., Khodadoust, A. P., Suidan, M. T. and Tabak, H. H., 2005. Biodegradation of sediment-bound PAHs in field contaminated sediment. *Water Res.*, 39, 349-361.
- Lemieux, C. L., Lambert, A. B., Lundstedt, S., Tysklind, M. and White, P. A., 2008. Mutagenic hazards of complex Polycyclic Aromatic Hydrocarbon mixtures in contaminated soil. *Environ. Tox. Chem.*, 27, 978-990.
- León Paumen, M., Borgman, E., Kraak, M. H. S., Van Gestel, C. A. M. and Admiraal, W., 2008a. Life cycle responses of the midge *Chironomus riparius* to Polycyclic Aromatic Compound exposure. *Env. Poll.*, 152, 225-232.
- León Paumen, M., Stol, P., Kraak, M. H. S., van Gestel, C. A. M. and Admiraal, W., 2008b. Chronic exposure of the Oligochaete *Lumbriculus variegatus* to Polycyclic Aromatic Compounds (PACs): bioavailability and effects on reproduction. *Environ. Sci. Technol.*, 42, 3434-3440.
- Leppanen, M. T. and Kukkonen, J. V. K., 1998. Relative importance of ingested sediment and pore water as bioaccumulation routes for pyrene to oligochaete (*Lumbriculus variegatus*, Müller). *Environ. Sci. Technol.*, 32, 1503-1508.
- Leppanen, M. T. and Kukkonen, J. V. K., 2004. Toxicokinetics of sediment-associated Polybrominated Diphenylethers (flame retardants) in benthic invertebrates (*Lumbriculus variegatus*, oligochaeta). *Environ. Tox. Chem.*, 23, 166-172.
- Leppanen, M. T. and Kukkonen, J. V. K., 2006. Evaluating the role of desorption in bioavailability of sediment-associated contaminants using oligochaetes, semipermeable membrane devices and Tenax extraction. *Env. Poll.*, 140, 150-163.
- Leslie, H. A., Ter Laak, T. L., Busser, F. J. M., Kraak, M. H. S. and Hermens, J. L. M., 2002. Bioconcentration of organic chemicals: is a solid-phase microextraction fiber a good surrogate for biota? *Environ. Sci. Technol.*, 36, 5399-5404.
- Leslie, H. A., Kraak, M. H. S. and Hermens, J. L. M., 2004a. Chronic toxicity and body residues of the nonpolar narcotic 1,2,3,4-tetrachlorobenzene in *Chironomus riparius*. *Environ. Tox. Chem.*, 23, 2022-2028.

- Leslie, H. A., Hermens, J. L. M. and Kraak, M. H. S., 2004b. Baseline toxicity of a chlorobenzene mixture and total body residues measured and estimated with solid-phase microextraction. *Environ. Tox. Chem.*, 23, 2017-2021.
- Liber, K., Call, D. J., Dawson, T. D., Whiteman, F. W. and Dillon, T. M., 1996. Effects of *Chironomus tentans* larval growth retardation on adult emergence and ovipositing success: implications for interpreting freshwater sediment bioassays. *Hydrobiologia* 323, 155-167.
- Lima, A. L. C., Eglinton, T. I. and Reddy, C. M., 2003. High-resolution record of pyrogenic Polycyclic Aromatic Hydrocarbon deposition during the 20th century. *Environ. Sci. Technol.*, 37, 53-61.
- Liu, G. Q., Zhang, G., Li, X. D., Li, J., Peng, X. Z. and Qi, S. H., 2005. Sedimentary record of polycyclic aromatic hydrocarbons in a sediment core from the Pearl River Estuary, South China. *Mar. Pollut. Bull.*, 51, 912-921.
- Liu, M., Yang, Y., Xu, S., Hou, L., Liu, Q., Ou, D. and Jiang, H., 2004. Persistent organic pollutants (POPs) in intertidal surface sediments from the Yangtze estuarine and coastal areas, China. *J. Coast. Res.*, 162-170.
- Lock, K. and Janssen, C. R., 2003. Comparative toxicity of a zinc salt, zinc powder and zinc oxide to *Eisenia fetida*, *Enchytraeus albidus* and *Folsomia candida*. *Chemosphere*, 53, 851-856.
- Lotufo, G. R., 1998. Lethal and sublethal toxicity of sediment-associated fluoranthene to benthic copepods: application of the critical-body-residue approach. *Aquat. Toxicol.*, 44, 17-30.
- Lu, J. H., Bzdusek, P. A., Christensen, E. R. and Arora, S., 2005. Estimating sources of PAHs in sediments of the Sheboygan River, Wisconsin, by a chemical mass balance model. *J. Great Lakes Res.*, 31, 456-465.
- Lundstedt, S., White, P. A., Lemieux, C. L., Lynes, K. D., Lambert, L. B., Oberg, L., Haglund, P. and Tysklind, M., 2007. Sources, fate, and toxic hazards of oxygenated Polycyclic Aromatic Hydrocarbons (PAHs) at PAH-contaminated sites. *Ambio*, 36, 475-485.
- Lyytikäinen, M., Pehkonen, S., Akkanen, J., Leppänen, M. and Kukkonen, J. V. K., 2007. Bioaccumulation and biotransformation of Polycyclic Aromatic Hydrocarbons during sediment tests with oligochaetes (*Lumbriculus variegatus*). *Environ. Tox. Chem.*, 26, 2660-2666.
- Machala, M., Ciganek, M., Blaha, L., Minksova, K. and Vondrack, J., 2001. Aryl hydrocarbon receptor-mediated and estrogenic activities of oxygenated Polycyclic Aromatic Hydrocarbons and azaarenes originally identified in extracts of river sediments. *Environ. Tox. Chem.*, 20, 2736-2743.
- Mackay, D., Shiu, W. Y. and Ma, K. C., 1999. Physical-chemical properties and environmental fate. Chapman & Hall, New York, USA.

## References

- Martin, F. L., Pearce, T. G., Hewer, A., Phillips, D. H. and Semple, K. T., 2005. A biomarker model of sublethal genotoxicity (DNA single-strand breaks and adducts) using the sentinel organism *Aporrectodea longa* in spiked soil. *Environ. Poll.*, 138, 307-315.
- Martinez, V. G., Menger, G. J. and Zoran, M. J., 2005. Regeneration and asexual reproduction share common molecular changes: upregulation of a neural glycoepitope during morphallaxis in *Lumbriculus*. *Mech. Dev.*, 122, 721-732.
- Mayer, P., Vaes, W. H. J. and Hermens, J. L. M., 2000. Absorption of hydrophobic compounds into the poly(dimethylsiloxane) coating of solid-phase microextraction fibers: high partition coefficients and fluorescence microscopy images. *Anal. Chem.*, 72, 459-464.
- McCarty, L. S. and Mackay, D., 1993. Enhancing ecotoxicological modeling and assessment. *Environ. Sci. Technol.*, 27, 1719-1728.
- McCarty, L. S., Mackay, D., Smith, A. D., Ozburn, G. W. and Dixon, D. G., 1992. Residue-based interpretation of toxicity and bioconcentration QSARs from aquatic bioassays - Neutral narcotic organics. *Environ. Tox. Chem.*, 11, 917-930.
- McGrath, J. A., Parkerton, T. F. and Di Toro, D. M., 2004. Application of the narcosis target lipid model to algal toxicity and deriving predicted-no-effect concentrations. *Environ. Tox. Chem.*, 23, 2503-2517.
- McGrath, J. A., Parkerton, T. E., Hellweger, F. L. and Di Toro, D. M., 2005. Validation of the narcosis target lipid model for petroleum products: gasoline as a case study. *Environ. Tox. Chem.*, 24, 2382-2394.
- Meregalli, G., Pluymers, L. and Ollevier, F., 2001. Induction of mouthpart deformities in *Chironomus riparius* larvae exposed to 4-n-nonylphenol. *Env. Poll.*, 111, 241-246.
- Michael, J. P., 2000. Quinoline, quinazoline and acridone alkaloids. *Natural Product Reports*, 17, 603-620.
- Mitchelmore, C. L. and Hyatt, S., 2004. Assessing DNA damage in cnidarians using the Comet assay. *Mar. Environ. Res.*, 58, 707-711.
- Moermond, C. T. A., Roessink, I., Jonker, M. T. O., Meijer, T. and Koelmans, A. A., 2007. Impact of Polychlorinated Biphenyl and Polycyclic Aromatic Hydrocarbon sequestration in sediment on bioaccumulation in aquatic food webs. *Environ. Tox. Chem.*, 26, 607-615.
- Mount, D. R., Dawson, T. D. and Burkhard, L. P., 1999. Implications of gut purging for tissue residues determined in bioaccumulation testing of sediment with *Lumbriculus variegatus*. *Environ. Tox. Chem.*, 18, 1244-1249.
- Musch, A., 1996. Dose-time-effect relationships. In 'Toxicology, principles and applications', Riesink, R. J. M., De Vries, J. and Hollinger, M. A. (eds.), CRC Press, Boca Raton, FLA, USA, 184-237.

- Munzinger, A., 1990. Effects of nickel on *Daphnia magna* during chronic exposure and alterations in the toxicity to generations preexposed to nickel. *Water Res.*, 24, 845-852.
- Nam, J. J., Thomas, G. O., Jaward, F. M., Steinnes, E., Gustafsson, O. and Jones, K. C., 2008. PAHs in background soils from Western Europe: Influence of atmospheric deposition and soil organic matter. *Chemosphere*, 70, 1596-1602.
- Nash, J. P., Kime, D. E., Van der Ven, L. T. M., Wester, P. W., Brion, F., Maack, G., Stahlschmidt-Allner, P. and Tyler, C. R., 2004. Long-term exposure to environmental concentrations of the pharmaceutical ethynylestradiol causes reproductive failure in fish. *Environ. Health Perspect.*, 112, 1725-1733.
- Neilson, A. H., 1998. *The Handbook of Environmental Chemistry: PAHs and related compounds*, Volume 3. Springer Verlag, Berlin, Germany.
- Nielsen, T., Clausen, P. and Jensen, F. P., 1986. Determination of basic azaarenes and polynuclear aromatic hydrocarbons in airborne particulate matter by gas chromatography. *Anal. Chim. Acta*, 187, 223-231.
- Nielsen, T., Feilberg, A., Binderup, M. L. and Tønnesen, J., 1999. Impact of regulations of traffic emissions on PAH level in the air. Environmental Project Report 447. Danish Environmental Protection Agency, Copenhagen, Denmark.
- Northcott, G. L. and Jones, K. C., 2001. Partitioning, extractability, and formation of nonextractable PAH residues in soil. 1. Compound differences in aging and sequestration. *Environ. Sci. Technol.*, 35, 1103-1110.
- OECD, 2004a. Guideline 218: Sediment-water Chironomid toxicity test using spiked sediment. Organisation for Economic Co-operation and Development, Paris, France.
- OECD, 2004b. Guideline 220: Enchytraeid reproduction test. Organisation for Economic Co-operation and Development, Paris, France.
- OECD, 2006. Guideline 225: Sediment-water *Lumbriculus* toxicity test using spiked sediment. Organisation for Economic Co-operation and Development, Paris, France.
- OECD, 2006. OECD document No 55: Detailed review paper on aquatic arthropods in life cycle toxicity tests with an emphasis on developmental, reproductive and endocrine disruptive effects. Organisation for Economic Co-operation and Development, Paris, France.
- Osborne, P. J., Preston, M. R. and Chen, H. Y., 1997. Azaarenes in sediments, suspended particles and aerosol associated with the River Mersey estuary. *Mar. Chem.*, 58, 73-83.
- Oshiro, Y., Sato, S., Kurahashi, N., Tanaka, T., Kikuchi, T., Tottori, K., Uwahodo, Y. and Nishi, T., 1998. Novel antipsychotic agents with dopamine autoreceptor agonist properties: Synthesis and pharmacology of 7-[4-(4-phenyl-1-piperazinyl)butoxy]-3,4-dihydro-2(1*H*)-quinoline derivatives. *J. Med. Chem.*, 41, 658-667.
- Papa, E., Pilutti, P. and Gramatica, P., 2008. Prediction of PAH mutagenicity in human cells by QSAR classification. *SAR QSAR Environ. Res.*, 19, 115-127.

## References

- Parkerton, T. F., Stone, M. A. and Letinski, D. J., 2000. Assessing the aquatic toxicity of complex hydrocarbon mixtures using solid phase microextraction. *Toxicol. Lett.*, 112, 273-282.
- Paskova, V., Hilscherova, K., Feldmannova, M. and Blaha, L., 2006. Toxic effects and oxidative stress in higher plants exposed to Polycyclic Aromatic Hydrocarbons and their N-heterocyclic derivatives. *Environ. Tox. Chem.*, 25, 3238-3245.
- Pearlman, R. S., Yalkowsky, S. H. and Banerjee, S., 1984. Water solubility of polynuclear aromatic and heteroaromatic compounds. *J. Phys. Chem. Ref. Data*, 13, 555-562.
- Peeters, E., Dewitte, A., Koelmans, A. A., Van der Velden, J. A. and Den Besten, P. J., 2001. Evaluation of bioassays versus contaminant concentrations in explaining the macroinvertebrate community structure in the Rhine-Meuse delta, the Netherlands. *Environ. Tox. Chem.*, 20, 2883-2891.
- Peijnenburg, W., de Groot, A., Jager, T. and Posthuma, L., 2005. Short-term ecological risks of depositing contaminated sediment on arable soil. *Ecotoxicol. Environ. Saf.*, 60, 1-14.
- Penttinen, O. P. and Kukkonen, J., 1998. Chemical stress and metabolic rate in aquatic invertebrates: threshold, dose-response relationships, and mode of toxic action. *Environ. Tox. Chem.*, 17, 883-890.
- Pereira, W. E., Rostad, C. E., Garbarino, J. R. and Hult, M. F., 1983. Ground water contamination by organic bases derived from coal-tar wastes. *Environ. Tox. Chem.*, 2, 283-294.
- Pereira, W. E., Rostad, C. E., Leiker, I. J., Updegraff, D. M. and Bennet, J. L., 1988. Microbial hydroxylation of quinoline in contaminated groundwater: evidence for incorporation of the oxygen atom of the water. *Appl. Environ. Microbiol.*, 54, 827-829.
- Pery, A. R. R., Mons, R., Flammarion, P., Lagadic, L. and Garric, J., 2002. A modeling approach to link food availability, growth, emergence, and reproduction for the midge *Chironomus riparius*. *Environ. Toxicol. Chem.*, 21, 2507-2513.
- Pery, A. R. R., Ducrot, V., Mons, R. and Garric, J., 2003. Modelling toxicity and mode of action of chemicals to analyse growth and emergence tests with the midge *Chironomus riparius*. *Aquat. Toxicol.*, 65, 281-292.
- Poerschmann, J., Gorecki, T. and Kopinke, F. D., 2000. Sorption of very hydrophobic organic compounds onto poly(dimethylsiloxane) and dissolved humic organic matter. 1. Adsorption or partitioning of VHOC on PDMS-coated solid-phase microextraction fibers - A never-ending story? *Environ. Sci. Technol.*, 34, 3824-3830.
- Posthuma, L., Suther II, G. W. and Traas, T. P. (eds.), 2001. *Species Sensitivity Distributions in ecotoxicology*. CRC Press, Boca Raton, FLA, USA.

- Postma, J. F. and Davids, C., 1995. Tolerance induction and life-cycle changes in cadmium-exposed *Chironomus riparius* (Diptera) during consecutive generations. *Ecotoxicol. Environ. Saf.*, 30, 195-202.
- Prevedouros, K., Brorstrom-Lunden, E., Halsall, C. J., Jones, K. C., Lee, R. G. M. and Sweetman, A. J., 2004. Seasonal and long-term trends in atmospheric PAH concentrations: evidence and implications. *Env. Poll.*, 128, 17-27.
- Reineke, A. K., Goen, T., Preiss, A. and Hollender, J., 2007. Quinoline and derivatives at a tar oil contaminated site: hydroxylated products as indicator for natural attenuation? *Environ. Sci. Technol.*, 41, 5314-5322.
- Ristola, T., Pellinen, J., Ruokolainen, M., Kostamo, A. and Kukkonen, J. V. K., 1999a. Effect of sediment type, feeding level, and larval density on growth and development of a midge (*Chironomus riparius*). *Environ. Toxicol. Chem.*, 18, 756-764.
- Ristola, T., Kukkonen J. V. K. and Pellinen J., 1999b. Body residues and responses of the midge *Chironomus riparius* to sediment-associated 2,4,5-trichlorophenol in subchronic and chronic exposures. *Arch. Environ. Contam. Toxicol.*, 37, 42-49.
- Roelofs, D., Aarts, M. G. M., Schat, H. and Van Straalen, N. M., 2008. Functional ecological genomics to demonstrate general and specific responses to abiotic stress. *Funct. Ecol.*, 22, 8-18.
- Römbke, J. and Moser, T., 2002. Validating the enchytraeid reproduction test: Organization and results of an international ringtest. *Chemosphere*, 46, 1117-1140.
- Sanchez, P., Alonso, C., Fernandez, C., Vega, M. M., Garcia, M. P. and Tarazona, J. V., 2005. Evaluation of a multi-species test system for assessing acute and chronic toxicity of sediments and water to aquatic invertebrates - Effects of pentachlorophenol on *Daphnia magna* and *Chironomus prasinus*. *J. Soils Sed.*, 5, 53-58.
- Sartoros, C., Yerushalmi, L., Beron, P. and Guiot, S. R., 2005. Effects of surfactant and temperature on biotransformation kinetics of anthracene and pyrene. *Chemosphere*, 61, 1042-1050.
- Schuler, L. J., Wheeler, M., Bailer, A. J. and Lydy, M. J. Toxicokinetics of sediment-sorbed benzo[a]pyrene and hexachlorobiphenyl using the freshwater invertebrates *Hyalella azteca*, *Chironomus tentans*, and *Lumbriculus variegatus*. *Environ. Tox. Chem.*, 2003, 22, 439-449.
- Schuler, L. J., Landrum, P. F. and Lydy, M. J., 2004. Time-dependent toxicity of fluoranthene to freshwater invertebrates and the role of biotransformation on lethal body residues. *Environ. Sci. Technol.*, 38, 6247-6255.
- Schultz, T. W., Cronin, M. T. D., Walker, J. D. and Aptula, A. O., 2003. Quantitative structure-activity relationships (QSARs) in toxicology: a historical perspective. *J. Mol. Struct.: THEOCHEM*, 622, 1-22.



## References

- Shor, L. M., Kosson, D. S., Rockne, K. J., Young, L. Y. and Taghon, G. L., 2004. Combined effects of contaminant desorption and toxicity on risk from PAH contaminated sediments. *Risk Anal.*, 24, 1109-1120.
- Sibley, P. K., Benoit, D. A. and Ankley, G. T., 1997. The significance of growth in *Chironomus tentans* sediment toxicity tests: relationship to reproduction and demographic endpoints. *Environ. Toxicol. Chem.*, 16, 336-345.
- Sibley, P. K., Ankley, G. T. and Benoit, D. A., 2001. Factors affecting reproduction and the importance of adult size on reproductive output of the midge *Chironomus tentans*. *Environ. Toxicol. Chem.*, 20, 1296-1303.
- Siiim, B. G., Hicks, K. O., Pullen, S. M., Van Zijl, P. L., Denny, W. A. and Wilson, W. R., 2000. Comparison of aromatic and tertiary amine *N*-oxides of acridine DNA intercalators as bioreductive drugs-Cytotoxicity, DNA binding, cellular uptake, and metabolism. *Biochem. Pharmacol.*, 60, 969-978.
- Smith, B.P.C. and Kokkinn M., 2004. The use of emergence as an end-point for sediment toxicity tests using the Australian chironomid *Chironomus maddeni*. *Transact. Royal Soc. South Australia*, 128, 213-218.
- Srogi, K., 2007. Monitoring of environmental exposure to Polycyclic Aromatic Hydrocarbons: a review. *Environ. Chem. Lett.*, 5, 169-195.
- Street, G. T., Lotufo, G. R., Montagna, P. A. and Fleeger, J. W., 1998. Reduced genetic diversity in a meiobenthic copepod exposed to a xenobiotic. *J. Exp. Mar. Biol. Ecol.*, 222, 93-111.
- Staempfli, C., Tarradellas, J. and Becker-van Slooten, K., 2007. Effects of dinoseb on energy reserves in the soil arthropod *Folsomia candida*. *Ecotoxicol. Environ. Saf.*, 68, 263-271.
- Stroomborg, G. J., Ariese, F., Van Gestel, C. A. M., Van Hattum, B., Velthorst, N. H. and Van Straalen, N. M., 2003. Pyrene biotransformation products as biomarkers of polycyclic aromatic hydrocarbon exposure in terrestrial Isopoda: Concentration-response relationship, and field study in a contaminated forest. *Environ. Toxicol. Chem.*, 22, 224-231.
- Stroomborg, G. J., Zappey, H., Steen, R. J. C. A., Van Gestel, C. A. M., Ariese, F., Velthorst, N. H. and Van Straalen, N. M., 2004. PAH biotransformation in terrestrial invertebrates - a new phase II metabolite in isopods and springtails. *Comp. Biochem. Physiol. C: Toxicol. Pharmacol.*, 138, 129-137.
- Sverdrup, L. E., Kelley, A. E., Krogh, P. H., Nielsen, T., Jensen, J., Scott-Fordsmand, J. J. and Stenersen, J., 2001. Effects of eight Polycyclic Aromatic Compounds on the survival and reproduction of the springtail *Folsomia fimetaria* L. (Collembola, Isotomidae). *Environ. Tox. Chem.*, 20, 1332-1338.
- Sverdrup, L. E., Jensen, J., Kelley, A. E., Krogh, P. H. and Stenersen, J., 2002a. Effects of eight Polycyclic Aromatic Compounds on the survival and reproduction of *Enchytraeus crypticus* (Oligochaeta, Clitellata). *Environ. Tox. Chem.*, 21, 109-114.

- Sverdrup, L. E., Nielsen, T. and Krogh, P. H., 2002b. Soil ecotoxicity of Polycyclic Aromatic Hydrocarbons in relation to soil sorption, lipophilicity, and water solubility. *Environ. Sci. Technol.*, 36, 2429-2435.
- Sverdrup, L. E., Jensen, J., Krogh, P. H. and Stenersen, J., 2002c. Studies on the effect of soil aging on the toxicity of pyrene and phenanthrene to a soil-dwelling springtail. *Environ. Tox. Chem.*, 21, 489-492.
- Sverdrup, L. E., Krogh, P. H., Nielsen, T. and Stenersen, J., 2002d. Relative sensitivity of three terrestrial invertebrate tests to Polycyclic Aromatic Compounds. *Environ. Tox. Chem.*, 21, 1927-1933.
- Sverdrup, L. E., Ekelund, F., Krogh, P. H., Nielsen, T. and Johnsen, K., 2002e. Soil microbial toxicity of eight polycyclic aromatic compounds: effects on nitrification, the genetic diversity of bacteria, and the total number of protozoans. *Environ. Tox. Chem.*, 21, 1644-1650.
- Swartz, R. C., Schults, D. W., Ozretich, R. J., Lamberson, J. O., Cole, F. A., Dewitt, T. H., Redmond, M. S. and Ferraro, S. P., 1995. Sigma-PAH - a model to predict the toxicity of Polynuclear Aromatic Hydrocarbon mixtures in field-collected sediments. *Environ. Tox. Chem.*, 14, 1977-1987.
- Taylor, E. J., Blockwell, S. J., Maund, S. J. and Pascoe, D., 1993. Effects of lindane on the life-cycle of a fresh-water macroinvertebrate *Chironomus riparius* Meigen (Insecta, Diptera). *Arch. Environ. Contam. Toxicol.*, 24, 145-150.
- Ter Laak, T. L., Durjava, M., Struijs, J. and Hermens, J. L. M., 2005. Solid phase dosing and sampling technique to determine partition coefficients of hydrophobic chemicals in complex matrixes. *Environ. Sci. Technol.*, 39, 3736-3742.
- Ter Laak, T. L., Barendregt, A. and Hermens, J. L. M., 2006. Freely dissolved pore water concentrations and sorption coefficients of PAHs in spiked aged, and field-contaminated soils. *Environ. Sci. Technol.*, 40, 2184-2190.
- Thomsen, M., 2002. QSARs in environmental risk assessment. PhD thesis. Roskilde University, Roskilde, Denmark.
- Tominaga, N., Kohra, S., Iguchi, T. and Arizono, K., 2003. A multi-generation sublethal assay of phenols using the nematode *Caenorhabditis elegans*. *J. Health Sci.*, 49, 459-463.
- Uhler, A. D., Emsbo-Mattingly, S., Liu, B., Hall, L. W. and Burton, D. T., 2005. An integrated case study for evaluating the impacts of an oil refinery effluent on aquatic biota in the Delaware River: advanced chemical fingerprinting of PAHs. *Hum. Ecol. Risk Assess.*, 11, 771-836.
- Van Beelen, P., Verbruggen, E. M. J. and Peijnenburg, W., 2003. The evaluation of the equilibrium partitioning method using sensitivity distributions of species in water and soil. *Chemosphere*, 52, 1153-1162.

## References

- Van Brummelen, T. C., Van Gestel, C. A. M. and Verweij, R. A., 1996a. Long-term toxicity of five Polycyclic Aromatic Hydrocarbons for the terrestrial isopods *Oniscus asellus* and *Porcellio scaber*. *Environ. Tox. Chem.*, 15, 1199-1210.
- Van Brummelen, T. C., Verweij, R. A., Wedzinga, S. A. and van Gestel, C. A. M., 1996b. Polycyclic aromatic hydrocarbons in earthworms and isopods from contaminated forest soils. *Chemosphere*, 32, 315-341.
- Van Gestel, C. A. M. and Hensbergen, P. J., 1997. Interaction of Cd and Zn toxicity for *Folsomia candida* Willem (Collembola: Isotomidae) in relation to bioavailability in soil. *Environ. Tox. Chem.*, 16, 1177-1186.
- Van Herwijnen, R., Van de Sande, B., Van der Wielen, F. W. M., Springael, D., Govers, H. A. J. and Parsons, J. R., 2003. Influence of phenanthrene and fluoranthene on the degradation of fluorene and glucose by *Sphingomonas* sp. strain LB126 in chemostat cultures. *Fems Microbiol. Ecol.*, 46, 105-111.
- Van Herwijnen, R., De Graaf, C., Govers, H. A. J. and Parsons, J. R., 2004. Estimation of kinetic parameter for the biotransformation of three-ring azaarenes by the phenanthrene-degrading strain *Sphingomonas* sp. LH128. *Environ. Tox. Chem.*, 23, 331-338.
- Van Leeuwen, C. J., Aldenberg, T., Verhaar, H. J. M. and Hermens, J. L. M., 1992. Application of QSARs, extrapolation and equilibrium partitioning in aquatic effects assessment. I. Narcotic industrial pollutants. *Environ. Tox. Chem.*, 11, 267-282.
- Van Metre, P. C. and Mahler, B. J., 2005. Trends in hydrophobic organic contaminants in urban and reference lake sediments across the United States, 1970-2001. *Environ. Sci. Technol.*, 39, 5567-5574.
- Van Schooten, F. J., Maas, L. M., Moonen, E. J. C., Kleinjans, J. C. S. and Vanderoost, R., 1995. DNA dosimetry in biological indicator species living on PAH-contaminated soils and sediments. *Ecotoxicol. Environ. Saf.*, 30, 171-179.
- Van Straalen, N. M. and Roelofs, D., 2006. An introduction to ecological genomics. Oxford University Press, New York, USA.
- Van Vlaardingen, P. L. A. and Verbruggen, E. M. J., 2007. Guidance for the derivation of environmental risk limits within the framework of 'International and national environmental quality standards for substances in the Netherlands (INS)', revision 2007. RIVM Report 601782001.
- Verbruggen, E. M. J., 2004. Environmental risk limits for mineral oil (Total Petroleum Hydrocarbons). RIVM Report 601501021.
- Verrhiest, G., Clement, B. and Blake, G., 2001. Single and combined effects of sediment-associated PAHs on three species of freshwater macroinvertebrates. *Ecotoxicology*, 10, 363-372.

- Vogt, C., Nowak, C., Diogo, J. B., Oetken, M., Schwenk, K. and Oehlinann, J., 2007. Multi-generation studies with *Chironomus riparius* - Effects of low tributyltin concentrations on life history parameters and genetic diversity. *Chemosphere*, 67, 2192-2200.
- Walton, B. T., Ho, C. H., Ma, C. Y., O'Neill, E. G. and Kao, G. L., 1983. Benzoquinolinediones: Activity as insect teratogens. *Science*, 222, 422-423.
- Wang, D. and Wang, Y., 2008. Nickel sulfate induces numerous defects in *Caenorhabditis elegans* that can also be transferred to progeny. *Environ. Poll.*, 151, 585-592.
- Warshawsky, D., 1992. Environmental sources, carcinogenicity, mutagenicity, metabolism and DNA-binding of nitrogen and sulfur heterocyclic aromatics. *J. Environ. Sci. Health., Part C: Environ. Carcinog. Ecotoxicol. Rev.*, 1-71.
- Watts, M. M., Pascoe D. and Carroll K., 2001. Chronic exposure to 17 alpha-ethinylestradiol and bisphenol A-effects on development and reproduction in the freshwater invertebrate *Chironomus riparius* (Diptera: Chironomidae). *Aquatic Toxicol.*, 55, 113-124.
- Westerhoff, P., Yoon, Y., Snyder, S. and Wert, E., 2005. Fate of endocrine-disruptor, pharmaceutical, and personal care product chemicals during simulated drinking water treatment processes. *Environ. Sci. Technol.*, 39, 6649-6663.
- Wiegand, C., Pehkonen, S., Akkanen, J., Penttinen, O. P. and Kukkonen, J. V. K., 2007. Bioaccumulation of paraquat by *Lumbriculus variegatus* in the presence of dissolved natural organic matter and impact on energy costs, biotransformation and antioxidative enzymes. *Chemosphere*, 66, 558-566.
- Wiegman, S., Van Vlaardingen, P. L. A., Bleeker, E. A. J., De Voogt, P. and Kraak, M. H. S., 2001. Phototoxicity of azaarene isomers to the marine flagellate *Dunaliella tertiolecta*. *Environ. Tox. Chem.*, 20, 1544-1550.
- Wilcke, W., 2000. Polycyclic aromatic hydrocarbons (PAHs) in soil - a review. *J. Plant Nutr. Soil Sci.-Zeitschrift Fur Pflanzenernahrung Und Bodenkunde*, 163, 229-248.
- Wild, S. R. and Jones, K. C., 1995. Polynuclear Aromatic-Hydrocarbons in the United-Kingdom environment - a preliminary source inventory and budget. *Env. Poll.*, 88, 91-108.
- Wiles, J. A. and Krogh, P. H., 1998. Testing with the collembolans *Isotoma viridis*, *Folsomia candida*, and *Folsomia fimetaria*. In Løkke H, van Gestel CAM, eds., *Handbook of Soil Invertebrate Toxicity Tests*. John Wiley, Chichester, UK, 131-156.
- Wilhelm, M., Matuschek, G. and Kettrup, A., 2000. Determination of basic nitrogen-containing Polynuclear Aromatic Hydrocarbons formed during thermal degradation of polymers by high-performance liquid chromatography-fluorescence detection. *J. Chromatogr. A*, 878, 171-181.
- Willumsen, P. A., Johansen, J. E., Karlson, U. and Hansen, B. M., 2005. Isolation and taxonomic affiliation of N-heterocyclic aromatic hydrocarbon-transforming bacteria. *Appl. Microbiol. Biotechnol.*, 67, 420-428.

## References

- Wood, A. W., Chang, R. L., Levin, W., Ryan, D. E., Thomas, P. E., Lehr, R. E., Kumar, S., Schaefer-Ridder, M., Engelhart, U., Yagi, H., Jerina, D. M. and Conney, A. H., 1983. Mutagenicity of diol-epoxides and tetrahydro-epoxides of benz[a]acridine and benz[c]acridine in bacteria and in mammalian cells. *Cancer Res.*, 43.
- Xiao, B. H., Yu, Z. Q., Huang, W. L., Song, J. Z. and Peng, P. A., 2004. Black carbon and kerogen in soils and sediments. 2. Their roles in equilibrium sorption of less-polar organic pollutants. *Environ. Sci. Technol.*, 38, 5842-5852.
- Xu, S. S., Liu, W. X. and Tao, S., 2006. Emission of Polycyclic Aromatic Hydrocarbons in China. *Environ. Sci. Technol.*, 40, 702-708.
- Xue, W. L. and Warshawsky, D., 2005. Metabolic activation of Polycyclic and Heterocyclic Aromatic Hydrocarbons and DNA damage: A review. *Toxicol. Appl. Pharmacol.*, 206, 73-93.