



SUPPLEMENTARY MATERIAL FOR:

Jolliet, O. and M. Small. 2010. Integrated environmental assessment, Part IV: Human health risk assessment. *Journal of Industrial Ecology*.

Summary

This appendix contains references to the research literature related to this column's discussion of human health risk assessment.

Texts and Collected Volumes on Human Health Risk Assessment

- Edler, L. and C.P. Kitsos, Eds. 2005. Recent advances in quantitative methods in cancer and human health risk assessment. Chichester, UK: John Wiley & Sons, Ltd..
- Hayes, A.W., Ed. 2007. Principles and methods of toxicology, 5th Edition. Boca Raton, FL: CRC Press (London: Taylor and Francis Group, LLC).
- Hodgson, E., Ed. 2004. A textbook of modern toxicology, 3rd Edition. Hoboken, NJ: John Wiley & Sons.
- Nielsen, E., G. Ostergaard and J.C. Larsen. 2008. Toxicological risk assessment of chemicals: A practical guide. New York: Informa Healthcare.
- Paustenbach, D.J., Ed. 2009. Human and ecological risk assessment: Theory and practice, 2nd Edition. New York: John Wiley & Sons.
- Rothman, K.J., S.Greenland and T.L. Lash. 2008. Modern epidemiology, Third Edition. Philadelphia: Lippincott Williams & Wilkins.

Synthesis and Uncertainty Methods for Cancer Risk Assessment

- Boyce, C.P. 1998. Comparison of approaches for developing distributions for carcinogenic slope factors. *Human and Ecological Risk Assessment* 4(2): 527-577.

- Casman, E.A. and M.G. Morgan. 2005. Use of expert judgment to bound lung cancer risks. *Environmental Science & Technology* 39(16): 5911-5920.
- Cox, L.A. 2006. Quantifying potential health impacts of cadmium in cigarettes on smoker risk of lung cancer: A portfolio-of-mechanisms approach. *Risk Analysis* 26(6): 1581-1599.
- David, R.M., H.J. Clewell, P.R. Gentry, T.R. Covington, D.A., Morgott, and D.J. Marino. 2006. Revised assessment of cancer risk to dichloromethane II. Application of probabilistic methods to cancer risk determinations. *Regulatory Toxicology and Pharmacology* 45(1): 55-65.
- EPA. 2005. Guidelines for Carcinogen Risk Assessment. U.S. Environmental Protection Agency, Risk Assessment Forum, EPA/630/P-03/001F, Washington, DC. <http://www.epa.gov/iris/cancer032505-final.pdf>.
- Evans, J. S., J. D. Graham, G. M. Gray, and R. L. Sielken Jr. 1994. A distributional approach to characterizing low-dose cancer risk. *Risk Analysis* 14(1): 25-34.
- Kirman, C.R., L.M. Sweeney, M.J. Teta, R.L. Sielken, C. Valdez-Flores, R.J. Albertini, and M.L. Gargas 2004. Addressing nonlinearity in the exposure-response relationship for a genotoxic carcinogen: cancer potency estimates for ethylene oxide. *Risk Analysis* 24(5): 1165-1183.
- Moschandreas D.J., and S. Karuchit. 2002. Scenario-model-parameter - A new method of cumulative risk uncertainty analysis. *Environment International* 28(4), 247-261.
- Piegorsch, W.W., R.W. West, W. Pan and R.L. Kodell. 2005. Low dose risk estimation via simultaneous statistical inferences. *Applied Statistics* 54(1): 245-258.
- Sielken, R. L. Jr., R. S. Bretzlaff, and D. E. Stevenson. 1995. Challenges to default assumptions stimulate comprehensive realism as a new tier in quantitative cancer risk assessment. *Regulatory Toxicology and Pharmacology* 21: 270-280.
- Small, M.J. 2008. Methods for assessing uncertainty in fundamental assumptions and associated models for cancer risk assessment. *Risk Analysis* 28(5): 1289-1307.

Use of Physiologically-Based Pharmacokinetic (PBPK) Modeling in Toxicology

- Chiu, W.A., H.A. Barton, R.S. DeWoskin, P. Schlosser, C.M. Thompson, B. Sonawane, J.C. Lipscomb and K. Krishnan. 2007. Evaluation of physiologically based

- pharmacokinetic models for use in risk assessment. *Journal of Applied Toxicology* 27(3): 218-237.
- Clewell III, H.J., P.R. Gentry, T.R. Covington and J.M. Gearhart. 2000. Development of a physiologically based pharmacokinetic model of trichloroethylene and its metabolites for use in risk assessment. *Environmental Health Perspectives* 108(suppl 2): 283-305.
- Clewell, H.J. 3rd, M.E Andersen, and H.A Barton. 2002. A consistent approach for the application of pharmacokinetic modeling in cancer and noncancer risk assessment. *Environmental Health Perspectives* 110(1): 85–93.
- Kimbell, J.S., R.P. Subramaniam, E.A. Gross, P.M. Schlosser and K.T. Morgan. 2001. Dosimetry modeling of inhaled formaldehyde: comparisons of local flux predictions in the rat, monkey, and human nasal passages. *Toxicological Sciences* 64: 100-110.
- Krishnan, K and G. Johanson. 2005. Physiologically-based pharmacokinetic and toxicokinetic models in cancer risk assessment. *Journal of Environmental Science and Health, Part C: Environmental Carcinogenesis and Ecotoxicology Reviews* 23(1): 31-53.

Metrics for Human Health Risk Assessment

- Clauser SB. 2004. Use of cancer performance measures in population health: a macro-level perspective. *Journal of the National Cancer Institute Monographs* 33:142-154.
- Gold M, Stevens D, and D. Fryback. 2002. HALYs and QALYs and DALYs, oh my: Similarities and differences in summary measures of population health. *Annual Review of Public Health* 23: 115 -34.
- Hofstetter P and JK. Hammitt. 2002. Selecting human health metrics for environmental decision-support tools. *Risk Analysis* 22: 965-983.
- Knol, A.B., A.C. Petersen, J.P. van der Sluijs and E. Lebret 2009. Dealing with uncertainties in environmental burden of disease assessment. *Environmental Health* 8(21).
- Rice, G., Heberling, M. T., Rothermich, M., Wright, J. M., Murphy, P., Craun, M. F. and G. F. Craun. 2006. The role of disease burden measures in future estimates of endemic waterborne disease. *Journal of Water and Health* 4(Suppl. 2): 187–200.

- Swain, E. B., P. M. Jakus, G. Rice, F. Lupi, P. A. Maxson, J. M. Pacyna, A. Penn, S. J. Spiegel, and M. M. Veiga. 2007. Socioeconomic consequences of mercury use and pollution. *Ambio* 36(1): 45-61.
- Wong, E. Y., R. A. Ponce, S. Farrow, S. M. Bartell, R. C. Lee, and E. M. Faustman 2003. Comparative risk and policy analysis in environmental health. *Risk Analysis* 23: 1337–1349.

Application in Life Cycle Impact Assessment

- Bare, J.C. 2006. Risk assessment and life-cycle impact assessment for human health cancerous and noncancerous emissions: Integrated and complementary with consistency within the USEPA. *Human and Ecological Risk Assessment* 12: 493–509.
- Bennett, D., T. McKone, J. Evans, W. Nazaroff, M. Margni, O. Jolliet and K. R. Smith 2002. Defining Intake Fraction. *Environmental Science & Technology* 36(9): 207A-211A.
- Burke, T.A., J. Doull, T. McKone,,D. Paustenbach, R. Scheuplein, H.A. Udo de Haes and J.S. Young. 1996. Human Health Impact Assessment In Life Cycle Assessment: Analysis By An Expert Panel. Washington, D.C.: ILSI Health and Environmental Sciences Institute.
- Crettaz, P., L. Rhomberg, K. Brand D.W. Pennington and O. Jolliet. 2002. Assessing Human Health Response in Life Cycle Assessment using ED10s and DALYs: Carcinogenic Effects; *International. Journal of Risk Analysis* 22(5): 931-946. Non-Carcinogenic Effects; *International. Journal of Risk Analysis* 22(5): 947-963.
- Hauschild, M., M. Huijbregts, O. Jolliet, M. Margni, M. MacLeod, D. van de Meent, R. Rosenbaum, and T. McKone. 2008. Building a model based on scientific consensus for life cycle impact: Assessment of chemicals: The search for harmony and parsimony. *Environmental Science & Technology* 42(19): 7032-7036.
- Huijbregts, M.A., L.J. Rombouts, A.M. Ragas and D. van de Meent, D. 2005. Human-toxicological effect and damage factors of carcinogenic and noncarcinogenic chemicals for life cycle impact assessment. *Integrated Environmental Assessment and Management* 1(3): 181-244.

- McKone T.E, A.D. Kyle, O. Jolliet, S.I. Olsen and M. Hauschild. 2006. Dose-response modeling for life cycle impact assessment. *International Journal of Life Cycle Assessment* 11(2): 138-140.
- Pennington D.W, M. Margni, J. Payet and O. Jolliet. 2006. Risk and regulatory hazard-based toxicological effect indicators in life-cycle assessment (LCA). *Human and Ecological Risk Assessment* 12(3): 450-475.
- Rogers, K. and T.P. Seager. 2006. Environmental decision-making using life cycle impact assessment and stochastic multiattribute decision analysis: A case study on alternative transportation fuels. *Environmental Science & Technology*. 43(6): 1718–1723.
- Rosenbaum, R., T., Bachmann, M. Huijbregts, O. Jolliet, R. Juraske, A. Köhler, H. Larsen, M. MacLeod, M. Margni, T. McKone, J. Payet, M. Schuhmacher, D. van de Meent and M. Hauschild. 2008. USEtox—The UNEP-SETAC toxicity model: recommended characterisation factors for human toxicity and freshwater ecotoxicity in Life Cycle Impact Assessment. *International Journal of Life Cycle Assessment* 13(7): 532-546.

Emerging Risks and Methods

- Grieger K, SF. Hansen and A. Baun. 2009. The known unknowns of nanomaterials: describing and characterizing uncertainty within environmental, health and safety risks. *Nanotoxicology* 3:1–12.
- Kandlikar, M., G. Ramachandran, A. Maynard, B. Murdock and W. Toscano. 2007. Health risk assessment for nanoparticles: A case for using expert judgment. *Journal of Nanoparticle Research*, 9(1): 137-156.
- Kavlock, R.J., G. Ankley, J. Blancato, M. Breen, R. Conolly, D. Dix, K. Houck, E. Hubal, R. Judson, J. Rabinowitz, A. Richard, R. Woodrow Setzer, I. Shah, D. Villeneuve and E. Weber. 2008. Computational Toxicology—A State of the Science Mini Review. *Toxicological Sciences*, 103(1): 14-27.
- National Research Council (NRC). 2007. *Toxicity Testing in the 21st Century: A Vision and a Strategy*. National Academies Press, Washington, DC.
- R. D. Phillips, T. Bahadori, B.E. Barry, J.S. Bus, T.W. Gant, J.M. Mostowy, C. Smith, M. Willuhn and U. Zimmer. 2009. Twenty-first century approaches to toxicity testing,

- biomonitoring, and risk assessment: perspectives from the global chemical industry. *Journal of Exposure Science and Environmental Epidemiology*, 19: 536–543.
- Slikker, W., M.E. Andersen, M.S. Bogdanffy, J.S. Bus, S.D. Cohen, R.B. Conolly, R.M. David, N.G. Doerrler, D.C. Dorman, D.W. Gaylor, D. Hattis, J.M. Rogers, R.W. Setzer, J.A. Swenberg, and K. Wallace. 2004. Dose-dependent transitions in mechanisms of toxicity: Case studies. *Toxicology and Applied Pharmacology*, 201(3): 226-294.
- Wiesner, M. R., G. V. Lowry, P. Alvarez, D. Dionysiou, and P. Biswas. 2006. Progress and research needs towards assessing the risks of manufactured nano-materials. *Environmental Science and Technology* 40(14): 4336–4345.
- Worth, A.P. 2010. The role of QSAR methodology in the regulatory assessment of chemicals. Ch 13, pp. 367-382 in *Recent Advances in QSAR Studies*, T Puzyn et al. (eds.), Netherlands: Springer.