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In-vitro biotransformation of surfactants

Additional material & literature references

Official ERASM project report

Elisabeth Perdu-Durand, Susanne Demerle, Jean-Pierre Cravedi - In Vitro Biotransformation rates for Surfactants in Carp and Rainbow Trout Liver Subcellular Fractions, Final Report, ERASM, 2004

Mary Jo Bernhard, Scott D. Dyer - Follow Up on Feasibility Studies on In Vitro Biotransformation Systems: Determination of Uptake, Loss, and Bioconcentration of Two Surfactants, Final Report, Procter & Gamble, 2004

External publications

Scott D. Dyer, Mary Jo Bernhard, Christina Cowan-Ellsberry, Elisabeth Perdu-Durand, Susanne Demmerle, Jean-Pierre Cravedi. 2008. In vitro biotransformation of surfactants in fish. Part I: Linear alkylbenzene sulfonate (C12-LAS) and alcohol ethoxylate (C13EO8). Chemosphere 72, 850-862.

Scott D. Dyer, Mary Jo Bernhard, Christina Cowan-Ellsberry, Elisabeth Perdu-Durand, Susanne Demmerle, and Jean-Pierre Cravedi. 2009. In Vitro Biotransformation of Surfactants in Fish. Part II - Alcohol Ethoxylate (C16EO8) and Alcohol Ethoxylate Sulfate (C14EO2S) to Estimate Bioconcentration Potential. Chemosphere. 76: 989-998

Appendix

Data from these two publications help drive the development of the in-vitro to in-vivo extrapolation model by:

Christina E. Cowan-Ellsberry, Scott D. Dyer, Susan Erhardt, Mary Jo Bernhard, Amy L. Roe, Martin E. Dowty, Annie V. Weisbrod. 2008. Approach for extrapolating in vitro metabolism data to refine bioconcentration factor estimates. Chemosphere, 70, 1804-1817.

This model was later refined by Nichols et al:

Nichols, J. W., Huggett, D. B., Arnot, J. A., Fitzsimmons, P. N. and Cowan-Ellsberry, C. E. (2013), Toward improved models for predicting bioconcentration of well-metabolized compounds by rainbow trout using measured rates of in vitro intrinsic clearance. Environ Toxicol Chem, 32: 1611–1622.

Methods for assessing in vitro biotransformation in fish liver used modified methods from ERASM, for both liver S9 fractions and hepatocytes which have been further developed and standardised during multi-laboratory ring-trials:

> Johanning J, Hancock G, Escher B, Adekola A, Bernhard MJ, Cowan-Ellsberry C, Domoradzki J, Dyer S, Eickhoff C, Embry M, Erhardt S, Fitzsimmons P, Halder M, Hill J, Holden D, Johnson R, Rutishauser S, Segner H, Schultz I, Nichols J. Assessment of Metabolic Stability Using the Rainbow Trout (Oncorhynchus mykiss) Liver S9 Fraction. Curr Protoc Toxicol. 2012 Aug; Chapter 14:Unit 14.10.1-28.
>
> Fay KA, Nabb DL, Mingoia RT, Bischof I, Nichols JW, Segner H, Johanning K, Han X. 16 2015a. Determination of metabolic stability using cryopreserved hepatocytes from 17 rainbow trout (Oncorhynchus mykiss). Curr Protocol Toxicol 65:4.42.1-4.42.29.

Both the liver S9 and primary cryopreserved hepatocyte methods are currently undergoing validation through a multi-laboratory OECD ring-trial. In April 2014, a HESI-led in vitro ring trial was adopted as OECD Project 3.13 on "In Vitro Fish Hepatic Metabolism" and an OECD Expert Group was formed.

> Embry MR, Bernhard M, Davis JW, Domoradzki J, Fay KA, Bischof I, Halder M, Han X, Hu J, Johanning K, Laue H, Nabb D, Nichols JW, Schlechtriem C, Segner H, van der Wal L and Weeks JA (2015). *In vitro* Fish Hepatic Metabolism: Overview of Ring-Trial to Evaluate Transferability, Intra- and Interlaboratory Reproducibility. Abstract TP113, SETAC North America Annual Meeting, Salt Lake City, UT. Available at: https://c.ymcdn.com/sites/www.setac.org/resource/resmgr/Abstract_Books/SETAC-SLC-Abstract-Book.pdf
>
> Fay KA et al. (2015b). *In vitro* to *In vivo* Extrapolation of Hepatic Metabolism in Fish: An 19 Inter-laboratory Comparison of *In vitro* Methods. Abstract 294, SETAC North America 20 Annual Meeting, Salt Lake City, UT. Available at: 21 https://c.ymcdn.com/sites/www.setac.org/resource/resmgr/Abstract_Books/SETAC-SLC-22 Abstract-Book.pdf

Integration in animal alternative efforts from ECETOC to Global Partners

> De Wolf, W., Comber, M., Douben, P., Gimeno, S., Holt, M., Léonard, M., Lillicrap, A., Sijm, D., van Egmond, R., Weisbrod, A. and Whale, G. (2007). Animal use replacement, reduction and refinement: development of an integrated testing for bioconcentration of chemicals in fish. *Integrated Environmental Assessment and Management*, **3**, 3-17.
>
> **Global SETAC Advisory Group on Bioaccumulation Assessments [BSAG] since 2005.** For more information see http://www.setac.org/group/AGBioaccumulation.
>
> HESI ISLI Development of Methods for a Tiered Approach to Assess Bioaccumulation of Chemicals Committee since

Towards regulatory acceptance

In vitro data are included in EU PBT assessment Guidances and non experimental data can be used for classification purposes.

> A Bioaccumulation Workshop (September 2014) sponsored by CEFIC LRI and hosted in Helsinki by ECHA included presentations and discussions on recent developments in bioaccumulation science assessment. The workshop had 85 attendees from academia,

industry and government discussing a broad-range of topics, including field data, laboratory data, mass balance and QSAR models, in vitro testing, in vitro-to-in vivo extrapolation. A report from the meeting is available on the CEFIC-LRI website (http://cefic-lri.org/events/cefic-lri-workshopon-recent-scientific-developments-in-bioaccumulation-research/).

PBT Guidance, CLP and CSA references **Chapter R.7c: Endpoint specific guidance**