Coordinator's Welcome

Welcome to the fifth and final issue of the ERGO E-Newsletter! In case you missed our previous issues, you can find them here.

It's hard to believe 5.5 years have passed since we started our ERGO journey together. In January 2019, 15 partners from eight countries came together to break down the wall between the different research fields that investigate adverse effects of endocrine disrupting chemicals (EDCs) in different vertebrate classes. We wanted to demonstrate that it's feasible to extrapolate effects of EDCs across the vertebrate classes, that an adverse effect observed in a fish or amphibian will also raise concern for an adverse effect in humans and the other way around. I think it's fair to say that after 5.5 productive and impactful years we have made quite a few substantial holes in that wall! The One Health approach is more highly recognised today and being incorporated into several EU strategies, and I'm proud ERGO has contributed to this.

The final year of ERGO has been busy not to mention these final weeks of the project! On 11-12 June, we had our final ERGO partner meeting, it was fitting to be back in the beautiful surroundings of the University of Antwerp where we kicked-off the project. On 12 June we also held ERGO's grand finale interactive workshop on EDCs which gave us the opportunity to share and discuss the groundbreaking outputs from the project with the end users. The hybrid workshop gathered international stakeholders from industry,

policy, regulation and fellow researchers at the iconic Solvay Library in Brussels, a venue steeped in scientific heritage. Birthplace of the renowned Solvay Conferences that brought together scientists like Marie Curie, Albert Einstein and Niels Bohr, the setting was perfect for the gathering of the great minds in the ERGO project!

Next on 13-14 June, the EURION Cluster held its Final Conference at the Albert Borschette Congress Centre in Brussels. The results and achievements of ERGO and the other seven projects were presented and discussed as well as the launch of the final EURION policy brief. The brief explains how EDCs have been linked to public health issues including obesity, diabetes, neurodevelopmental delay, and fertility disorders. It also states how each of the EURION research projects have contributed research to support the development of internationally harmonised strategies and guidelines for testing EDCs and assessing these associated health risks. The Final Conference also meant it was time for EURION to "pass the baton" to the ENKORE Cluster - Endocrine Disrupting Chemicals and Knowledge on Health-Related Effects, the new group of five projects. For more information, please visit the EURION Cluster website.

Finally, I want to acknowledge everyone in our consortium, our Scientific Advisory Board, our User Reference Group, and our stakeholders for their remarkable dedication and the contributions they've made to ERGO over the last 5.5 years. ERGO would not be what it is without you all – thank you!

Assoc. Prof. Henrik Holbech, ERGO Coordinator
University of Southern Denmark (SDU)

About

ERGO aims to improve identification and hazard assessment of endocrine disrupting chemicals (EDCs) for the protection of human health and the environment. EDCs are chemicals that interfere with natural hormones, harming the endocrine system which regulates important biological functions in humans and animals. Impacts of EDCs can include breast and testicular cancers, developmental and reproductive abnormalities and even neurodevelopmental delay in children.

EDCs are often man-made and can be found in plastics, clothes, cosmetics, toys, flame retardants and many other household products. Total avoidance is not practical in modern life, but actions should be taken to reduce their availability and better protect people, animals and the environment. In 2019, the European Union-funded research project ERGO was launched to respond to these challenges.

Learn more

Project News & Highlights

ERGO Researcher Profile

Name: Lucia Vergauwen

Based in: Antwerp, Belgium

Member of ERGO partner: University of Antwerp (UA)

Research areas: Lucia's research focuses on understanding the mechanisms underlying toxicity with a focus on endocrine disruption. She uses Adverse Outcome Pathways (AOP) to support the development of testing strategies for endocrine disruption with emphasis on the use of alternatives to animal testing including in vitro and zebrafish embryo assays. In her research, she pays particular attention to comparing responses across species to support bridging the gap between human and environmental health. She also teaches Animal Physiology and Biochemistry in the University.

Academic background: Lucia has a Masters in Biomedical Sciences and obtained her PhD in Biology in the area of ecotoxicology in 2012. As a postdoc she helped set up the Zebrafishlab at UA where she is the project coordinator.

Current research role and work within ERGO: As co-principal investigator for UA, Lucia has been coordinating the development of AOPs with the partners and has been working on the development of the AOP network and its application for selection of assays and endpoints with relevance across vertebrates in ERGO's WP3. She has also been contributing to the experimental work involving fish embryo tests in WP5 and has been supporting the validation of thyroid-sensitive endpoints for addition to existing OECD fish Test Guidelines in WP7.

ERGO Researcher Profiles

EDCs in the News

ERGO Publications

1. Tribondeau A, Du Pasquier D, Benchouaia M, Blugeon C, Buisine N and Sachs LM. (2024). Overlapping action of T3 and T4 during *Xenopus laevis* development. *Frontiers in*

Endocrinology 15: 1360188. DOI: HTTPS://DOI.ORG/10.3389/FENDO.2024.1360188. PUBLICATION LINK.

2. Pesce, E., De Los Monteros Garde, M. J. E., Rigolet, M., Tindall, A. J., Lemkine, G. F., Baumann, L. A., Sachs, L. M., & Du Pasquier, D. (2024). A novel transgenic model to study thyroid axis activity in early life stage Medaka. *Environmental Science & Technology* 58 (1), 99-109. DOI: HTTPS://DOI.ORG/10.1021/ACS.EST.3C05515. REPOSITORY LINK.
3. Volz, S. N., Poulsen, R., Hansen, M., & Holbech, H. (2024). Bisphenol A alters retinal morphology, visually guided behavior, and thyroid hormone levels in zebrafish larvae. *Chemosphere*, 348, 140776. DOI: HTTPS://DOI.ORG/10.1016/J.CHEMOSPHERE.2023.140776.
4. Kühne, R., Hilscherová, K., Smutná, M., Leßmöllmann, F., & Schüürmann, G. (2024). In silico bioavailability triggers applied to direct and indirect thyroid hormone disruptors. *Chemosphere*, 140611. DOI: HTTPS://DOI.ORG/10.1016/J.CHEMOSPHERE.2023.140611.
5. Poulsen R, Zekri Y, Guyot R, Flamant F & Hansen M. (2023). Effect of in utero and lactational exposure to a thyroid hormone system disrupting chemical on mouse metabolome and brain transcriptome. *Environmental Pollution* 1;340 (Pt 2):122783. DOI: HTTPS://DOI.ORG/10.1016/J.ENVPOL.2023.122783.
6. OECD (2023), *Detailed Review Paper (DRP) on the thyroid hormone system in fish and identification of potential thyroid hormone system related endpoints for inclusion in existing OECD fish Test Guidelines*, OECD Series on Testing and Assessment, No. 381, OECD Publishing, Paris, https://one.oecd.org/document/ENV/CBC/MONO(2023)17/en/pdf
7. Haigis, A., Vergauwen, L., LaLone, C. A., Villeneuve, D. L., O'Brien, J. M., & Knapen, D. (2023). Cross-species applicability of an adverse outcome pathway network for thyroid hormone system disruption. *Toxicological Sciences*. DOI: HTTPS://DOI.ORG/10.1093/TOXSCI/KFAD063.
8. Poulsen, R., Jackman, S. H., Hansen, M., & Helbing, C. C. (2023). Relationship between serum thyroid hormones and their associated metabolites, and gene expression bioindicators in the back skin of *Rana* [Lithobates] *catesbeiana* tadpoles and frogs during metamorphosis. *Frontiers in Endocrinology*, *13*. DOI: HTTPS://DOI.ORG/10.3389/FENDO.2022.1103051. REPOSITORY LINK.
9. Van Dingenen, I., Vergauwen, L., Haigis, A., Blackwell, B. R., Stacy, E., Villeneuve, D. L., & Knapen, D. (2023). Deiodinase inhibition impairs the formation of the three posterior swim bladder tissue layers during early embryonic development in zebrafish. *Aquatic Toxicology*, *261*, 106632. DOI: HTTPS://DOI.ORG/10.1016/J.AQUATOX.2023.106632.
10. Jensen, M., Poulsen, R., Langebæk, R., Jenssen, B. M., Moe, J. M., Ciesielski, T. M., Dietz, R., Sonne, C., Madsen, J., & Hansen, M. (2023). The metabolome of pink-footed goose: Heavy metals and lipid metabolism. *Environmental Research*, *231*, 116043. DOI: HTTPS://DOI.ORG/10.1016/J.ENVRES.2023.116043. REPOSITORY LINK
11. Pannetier, P., Poulsen, R., Gölz, L., Coordes, S., Stegeman, H., Koegst, J., Reger, L., Braunbeck, T., Hansen, M. R. H., & Baumann, L. (2023). Reversibility of thyroid hormone system-disrupting effects on eye and thyroid follicle development in zebrafish (*Danio rerio*) embryos. *Environmental Toxicology and Chemistry*, *42*(6), 1276–1292. DOI: HTTPS://DOI.ORG/10.1002/ETC.5608.
12. Ramhøj, L., Guyot, R., Svingen, T., Kortenkamp, A., Flamant, F. and Axelstad, M. (2023). Is periventricular heterotopia a useful endpoint for developmental thyroid hormone system disruption

in mouse toxicity studies? *Regulatory Toxicology and Pharmacology*, *142*, 105445. DOI: HTTPS://DOI.ORG/10.1016/J.YRTPH.2023.105445.

13. Flamant, F. and Ren, J. (2023). Thyroid hormone as a temporal switch in mouse development. *European Thyroid Journal*, 12(2). DOI: HTTPS://DOI.ORG/10.1530/ETJ-22-0225.
14. Horie, Y., Yamagishi, T., Yamamoto, J., Suzuki, M., Onishi, Y., Chiba, T., Miyagawa, S., Lange, A., Tyler, C. R., Okamura, H., & Iguchi, T. (2023). Adverse effects of thyroid-hormone-disrupting chemicals 6-propyl-2-thiouracil and tetrabromobisphenol A on Japanese medaka (Oryzias latipes). *Comparative Biochemistry and Physiology C-toxicology & Pharmacology*, *263*, 109502. DOI: HTTPS://DOI.ORG/10.1016/J.CBPC.2022.109502. REPOSITORY LINK.
15. Kraft, M., Gölz, L., Rinderknecht, M., Koegst, J., Braunbeck, T. and Baumann, L. (2023). Developmental exposure to triclosan and benzophenone-2 causes morphological alterations in zebrafish (*Danio rerio*) thyroid follicles and eyes. *Environmental Science and Pollution Research* 30, 33711–33724. DOI: HTTPS://DOI.ORG/10.1007/S11356-022-24531-2.

Full Publication List

EURION News

EDCs Under the Spotlight

Polybrominated diphenyl ethers (PBDE)

Image by bedrck from Pixabay

What is it?

Polybrominated diphenyl ethers (PBDE) are a group of man-made organobromine compounds that have been used as flame retardants in household textiles, electronic equipment and foams.

Where is it found?

PBDEs were used as flame retardants in polyurethane foams to make them difficult to burn and are mostly found in furniture upholstery of sofas and textiles such as carpets and mattresses. Also, found in a variety of polymer resins and plastics in electrical and electronic equipment components for televisions and computers etc.

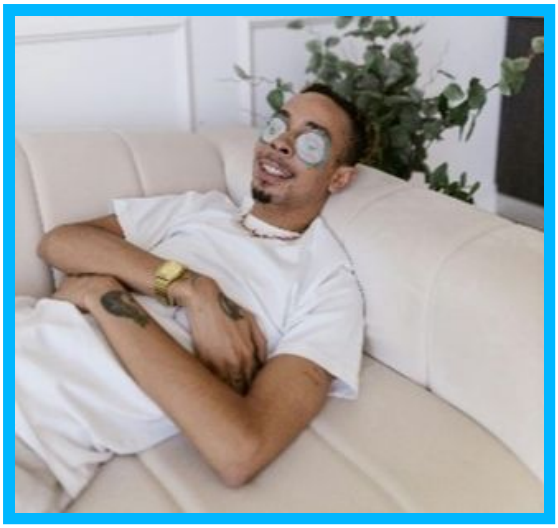
How can we be exposed to it?

PBDEs are recalcitrant and bio-accumulative, this means they resist degradation in the environment and can accumulate in the bodies of animals and humans e.g., PBDEs have been found in human blood, breast milk and body fat. The primary source of PBDE exposure is from the ingestion of contaminated dust in indoor environments. You may also be exposed from eating foods that have a high fat content, such as fatty fish or by inhalation as computers and televisions can continuously release PBDEs into the air over time.

Read Full Article

How to make your own EDC free...

Moisturiser



Ingredients:

- 2 tablespoons Almond oil
- 2 tablespoons Jojoba oil
- 1.5 teaspoons Beeswax

Materials: Microwavable bowl, spoon, glass jar

Method:

1. Warm all ingredients in the microwave until the beeswax melts.
2. Pour into a small glass jar.

Tip: The recipe makes a small batch, try this first then if you like it you can double the recipe. Using jojoba oil increases the shelf life of the moisturiser.

Source: Nontoxic for Health

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