Bulletin de veille Perturbateurs Endocriniens N°30 - Mai 2025

Objectif : cette veille bibliographique à pour objectif la surveillance de l'actualité et de la littérature scientifique sur les perturbateurs endocriniens. Cette veille est axée sur les aspects suivants : l'exposition, la toxicité, l'évaluation, la prévention, l'épidémiologie et l'actualité.

La validation des informations fournies (exactitude, fiabilité, pertinence par rapport aux principes de prévention, etc.) est du ressort des auteurs des articles signalés dans la veille. Les informations ne sont pas le reflet de la position de l'INRS.

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Exposition professionnelle

Occupational Exposure to Pesticides Among Farmworkers in Morocco: A Study Framework for Endocrine and Epigenetic Effect Assessment.

Chbihi K, Menouni A, Berni I, Chetouani H, Abou-Said S, Amellah A, et al. *Toxics*. 2025 Apr 25;13(5).

Pesticides are compounds of major use in agriculture worldwide. Nevertheless, many pesticide chemicals are classified as endocrine disruptors and potentially carcinogens. Farmers and farmworkers are particularly exposed and are at high risk of developing health-related impairments.

In Morocco, the lack of awareness towards pesticide hazards and the inappropriate application of safety measures might increase the exposure as well as the risks of health concerns. In this paper, we present the framework of a study designed to assess pesticide exposure among Moroccan farmers and farmworkers and to evaluate potential health effects, namely endocrine and epigenetic impacts. Human biological monitoring will be conducted to determine pesticide levels in urine following the development and validation of sensitive chromatography methods (SPE, UPLC-MS/MS). Biomarkers of exposure include a set of parent and metabolite pesticide compounds (organophosphates, pyrethroids, triazines and urea-based pesticides). Thyroid and reproductive hormones (TSH, T(3), T(4), FSH and LH) as well as global and specific DNA methylation markers (5-mC, 5-hmC, N(6)-mA, THRB and LHR) are selected as biomarkers of effects. This provides guiding steps and methods to perform reliable exposure evaluation and health impact assessment. This study aims to expand the current knowledge on the endocrine and epigenetic risks related to pesticides, especially in low- and middle-income countries. Lien vers l'article

CO10.1 - Maternal occupational multi-exposure during pregnancy and intrauterine growth: analysis of the French Longitudinal Study of Children - ELFE cohort, using data-driven approaches.
Tartaglia M, Ge C, Pronk A, Costet N, Audignon-Durand S, Houot M, et al. *J Epidemiol Popul Health*. 2025 2025 May 01;73:203019.
Background and objective(s): Occupational exposures that may increase health risks are often studied independently, without considering the issue of multiple exposures, which more accurately reflects real-world workplace situations. The lack of attention to these multi-exposures could explain some of the contradictory findings in the literature regarding occupational exposures and intrauterine growth. The objective was to study maternal occupational multi-exposure during pregnancy and intrauterine growth, using data-driven approaches. Material and Methods: Analyses were conducted within the ELFE cohort (n=12,851 mothers-child pairs). Maternal occupational exposures during pregnancy to 47 factors were defined using 13 job-exposure matrices. Outcomes of interest were birthweight (BW), small for gestational age (SGA) and head circumference (HC). Occupational exposures associated with these outcomes were selected using three approaches: EWAS, LASSO, random forest. For each outcome, the five most important exposures selected as the lower median score within the 3 approaches were included in a final multivariate model with significant second-degrees interactions. Our analyses were adjusted for educational level, tobacco use, alcohol consumption, body mass index (for SGA), and more gestational age and infant's sex (for BW and HC). Results: The most important occupational factors selected to predict SGA were endocrine disruptor, job strain, kneeling or squatting, job demands, and physical effort. When combining these in a final model, no significant associations were observed. For BW, the most important variables were leaning forward or sideways, using a computer screen, ultrafine particles, physical effort, airborne germs, and repeating the same actions. The final regression model showed that using a computer screen decrease significantly BW of 22 grams (95%CI = -44;-0.57), and among women unexposed to airborne germs, that leaning forward or sideways increase significantly BW of 38 grams (95%CI = 4.6;71). Finally, for HC, exposures to repeating the same actions, oxygenated solvents, kneeling or squatting, airborne germs, and work outdoors were the most important factors. The final regression model showed repeating the same actions and work outdoors decrease significantly HC of 0.09 (95%CI = -0.16;-0.03) and 0.13 (95%CI = -0.22;-0.03) centimeters, and among women exposed to airborne germs, that oxygenated solvents decrease significantly HC of 0.13 centimeters (95%CI = -0.26;0.00). Results were confirmed for women who worked during the 3rd trimester of pregnancy. Conclusion: The results highlight potential roles of chemical, biological and postural factors for intrauterine growth and their interrelations. If confirmed by subsequent analysis, our results highlight the interest to consider multi-exposures in the prevention at the workplace. Lien vers l'article

Cadmium Associated Preeclampsia: A Systematic Literature Review of Pregnancy and Birth Outcomes.

Sardar F, Kamsani YS, Ramly F, Mohamed Noor Khan NA, Sardar R, Aminuddin AA. *Biol Trace Elem Res*. 2025 May;203(5):2505-16.

Preeclampsia (PE), caused by multiple factors, is one of the most serious complications of pregnancy. *Cadmium (Cd) is a heavy metal environmental pollutant, reproductive toxicant, and endocrine disruptor, which can increase the risk of PE. Cd toxicity due to occupational, diet, and environmental factors has worsened the risk. Studies showed elevated Cd concentration in maternal blood and placenta of PE women. However, the implicit association between Cd associated PE is still not highlighted. We systematically reviewed Cd-associated PE and its effect on pregnancy and birth outcomes. Based on "Preferred reporting items for systematic reviews and meta-analyses (PRISMA)" guidelines, eighty-six studies were identified by PubMed, Web of Science (WOS), and Scopus databases. Publications were included until October 2023 and articles screened based on our inclusion criteria. Our study identified that the exposure of controlled and uncontrolled Cd induces PE, which negatively affects pregnancy and birth outcomes. Given the serious nature of this finding, Cd is a potential adverse agent that impacts pregnancy and future neonatal health. Further comprehensive studies covering the whole trimesters of pregnancy and neonatal developments are warranted. Data on the molecular mechanisms behind Cd-induced PE is also essential for potential preventive, diagnostic, or therapeutic targets.* Lien vers l'article

Polycyclic Aromatic Hydrocarbons (PAHs) in the Environment: Occupational Exposure, Health Risks and Fertility Implications.

Montano L, Baldini GM, Piscopo M, Liguori G, Lombardi R, Ricciardi M, et al. *Toxics*. 2025 Feb 23;13(3).

Polycyclic aromatic hydrocarbons (PAHs) are a group of organic compounds with fused aromatic rings, primarily derived from combustion processes and environmental pollutants. This narrative review discusses the most relevant studies on PAHs, focusing on their sources, environmental and occupational exposure, and effects on human health, emphasizing their roles as carcinogenic, mutagenic, and teratogenic agents. The primary pathways for human exposure to PAHs are through the ingestion of contaminated food (mainly due to some food processing methods, such as smoking and high-temperature cooking techniques), the inhalation of ambient air, and the smoking of cigarettes. Coke oven workers are recognized as a high-risk occupational group for PAH exposure, highlighting the need for appropriate strategies to mitigate these risks and safeguard worker health. PAHs are metabolized into reactive intermediates in the body, which can lead to DNA damage and promote the development of various health conditions, particularly in environments with high exposure levels. Chronic PAH exposure has been linked to respiratory diseases, as well as cardiovascular problems and immune system suppression. Furthermore, this review underscores the significant impact of PAHs on reproductive health. The results of the reported studies suggest that both male and female fertility can be compromised due to oxidative stress, DNA damage, and endocrine disruption caused by PAH exposure. In males, PAHs impair sperm quality, while, in females, they disrupt ovarian function, potentially leading to infertility, miscarriage, and birth defects. Fetal exposure to PAHs is also associated with neurodevelopmental disorders. Given the extensive and detrimental health risks posed by PAHs, this review stresses the importance of stringent environmental regulations, occupational safety measures, and public health initiatives to mitigate exposure and safeguard reproductive and overall health. Lien vers l'article

Endocrine-disrupting pesticide exposure relevant to reproductive health: a case study from Costa Rica,

Apú, N., Rommes, F., Alvarado-Arias, M., Méndez-Rivera, M. and Lizano-Fallas, V., *Environmental Monitoring and Assessment*, Apr 2025, Vol. 197, no. 5.

Global pesticide use has increased significantly over the past decade, leading to greater exposure to contaminants and associated health risks. Endocrine-disrupting pesticides have gained attention due to their strong association with human reproductive impairments and rising global infertility rates. In Costa Rica, studies have reported reduced fertility among agricultural workers and a higher prevalence of male infertility in regions with intensive pesticide use. However, the prioritization of pesticides detected in human fluids, based on their potential impact on reproductive health, has not been conducted. Here, analyzing human biomonitoring studies in the country over the last 25 years, 13 pesticides were identified and prioritized. Mancozeb ranked highest (14.8%), followed by dieldrin (12.1%) and chlorothalonil (12.0%). Eight criteria were used for prioritization, with non-carcinogenic risk, reported reproductive effects, and endocrine disruptor classification as key factors. This comprehensive approach highlights how multiple criteria collectively inform pesticide prioritization in relation to reproductive health risks. The findings indicated that while Costa Rica is a regional leader in pesticide biomonitoring, significant gaps remain, including limited data on unstudied pesticides and general population exposures. Establishing robust biomonitoring programs and public health surveillance systems to generate updated data and support evidence-based prevention policies is recommended. Additionally, the results of this study provide a valuable framework for guiding future research on the potential effects of pesticide mixtures.
https://doi.org/10.1007/s10661-025-14011-8

Environmental Pollutants, Occupational Exposures, and Liver Disease,
Beier, J. I., Luo, J. Z., Vanderpuye, C. M., Brizendine, P., Muddasani, P., Bolatimi, O., Heinig, S. A., Ekuban, F. A., Siddiqui, H., Ekuban, A., Gripshover, T. C., Wahlang, B., Watson, W. H. and Cave, M. C., *Seminars in Liver Disease*, Jun 2025, Vol. 45, no. 02, p. 148-166.
Environmental pollutants significantly impact liver disease development, progression, and outcomes. This review examines the complex relationship between environmental exposures and liver pathology, from malignant conditions like hepatocellular carcinoma to steatotic and cholestatic liver diseases. Key environmental factors include air pollutants, volatile organic compounds, persistent organic pollutants, heavy metals, and per- and polyfluoroalkyl substances. These compounds can act through multiple mechanisms, including endocrine disruption, metabolic perturbation, oxidative stress, and direct hepatotoxicity. The impact of these exposures is often modified by factors such as sex, diet, and genetic predisposition. Recent research has revealed that even low-level exposures to certain chemicals can significantly affect liver health, particularly when combined with other risk factors. The emergence of exposomics as a research tool promises to enhance our understanding of how environmental factors influence liver disease. Importantly, exposure effects can vary by demographic and socioeconomic factors, highlighting environmental justice concerns. Implementation of this knowledge in clinical practice requires new diagnostic approaches, healthcare system adaptations, and increased awareness among medical professionals. In conclusion, this review provides a comprehensive examination of current evidence linking environmental exposures to liver disease and discusses implications for clinical practice and public health policy. https://doi.org/10.1055/a-2540-2861

Investigating the relationship between pesticide exposure, GSTM1 and GSTT1 polymorphisms, and oxidative stress biomarkers in affected farmers,
Hemlata, Rani, M., Kumar, A., Dhiman, S. S. and Et, C., *Toxicology and Industrial Health*, 2025 2025, Vol. 41, no. 4, p. 220-233, ill., bibliogr.
Cette étude porte sur le secteur agricole, spécifiquement les agriculteurs de l'Himachal Pradesh, en Inde, exposés professionnellement à des pesticides organophosphorés. Le risque abordé est l'exposition chronique aux pesticides et ses effets sur le stress oxydatif, mesuré par des biomarqueurs (superoxyde dismutase, catalase, malondialdéhyde) et l'influence potentielle de polymorphismes génétiques des gènes GSTM1 (glutathion S-transférase Mu 1) et GSTT1 (glutathion

S-transférase Thêta 1). L'objectif principal de l'article est d'évaluer les niveaux de métabolites urinaires des organophosphorés chez des agriculteurs exposés, d'analyser l'activité des enzymes antioxydantes, et d'étudier l'association entre les polymorphismes génétiques GSTM1/GSTT1 et le stress oxydatif. L'étude, menée sur 123 agriculteurs exposés et 112 témoins, révèle que les agriculteurs présentent des niveaux significativement plus élevés de métabolites d'organophosphorés, une diminution de l'activité de la superoxyde dismutase et de la catalase, ainsi qu'une augmentation du malondialdéhyde, marqueur de la peroxydation lipidique. Aucune association significative n'a été trouvée entre les génotypes GSTM1/GSTT1 et les biomarqueurs du stress oxydatif. Ces résultats soulignent l'importance de la prévention des risques chimiques en milieu agricole et la nécessité de stratégies adaptées pour limiter l'exposition professionnelle aux pesticides. https://doi.org/, https://doi.org/10.1177/07482337251325578

Managing adherence, exposure, and toxicity in oral anticancer therapies,
Kobayashi, K., *Journal of Pharmaceutical Health Care and Sciences*, Apr 2025, Vol. 11, no. 1.
The management of adherence, exposure risk, and adverse effects in oral anticancer agents (OAAs) is essential for optimizing patient outcomes in oncology pharmacy. This review highlights key efforts to enhance adherence, reduce occupational exposure, and improve adverse effect management in OAA therapy.(1) Adherence management.We evaluated adherence to trifluridine/tipiracil hydrochloride (TFTD) in metastatic colorectal cancer (mCRC) patients, revealing an overall adherence rate of 85.0%. Common factors affecting adherence included nausea, vomiting, and cancer-related pain. Pharmacist-led interventions, including antiemetic therapy and patient education, significantly improved compliance.(2) Exposure risk management.A study on spill kit usage found that 91.7% of incidents involved nurses, with most spills occurring in hospital wards. Following a medical safety workshop, compliance with personal protective equipment (PPE) protocols improved to 100%. These findings emphasize the need for continuous safety training and enhanced spill management protocols.(3) Adverse effect management.We examined regorafenib-induced adverse effects, particularly hand-foot skin reaction (HFSR) and hypothyroidism. HFSR occurred in 81.4% of patients, with severe cases (>= Grade 2) associated with prolonged survival. Routine thyroid function monitoring was essential, as 42.8% of patients developed thyroid dysfunction, with 5.7% requiring hormone replacement therapy. Early intervention and supportive care strategies improved treatment tolerability.This review underscores the importance of pharmacist-driven interventions in enhancing adherence, ensuring occupational safety, and managing adverse effects. Continued research and collaboration are essential to optimize OAA-based therapy and improve patient care in oncology pharmacy. https://doi.org/10.1186/s40780-025-00437-2

Pesticide Exposure in Agricultural Workplaces and Resultant Health Effects in Women,
Kumar, S. N., Khan, N. H., Reda, Y., Beigh, H. H., Bastia, B., Vaibhav, K., Jain, A. K. and Raisuddin, S., *Birth Defects Research*, Apr 2025, Vol. 117, no. 4.
Background Numerous occupational studies have highlighted the risk of cancer associated with agricultural practices and exposure to agrochemicals in males and females in the workplace. Women working in tea plantations/gardens often face educational, health, and socioeconomic challenges. They may be particularly vulnerable to the pesticide exposure owing to a lack of health awareness and education, other limitations and environmental and occupational factors. Aims The objective of the review was to highlight the problem of pesticide exposure in women working in tea plantations/gardens through a comprehensive appraisal of published literature. Materials and Methods Literature searches were performed using a range of keywords such as pesticide exposure to women, adverse birth outcomes, tea plantations/gardens, placental outcomes, cancer, and so forth using online search engines, including PubMed, Web of Science, Google Scholar, and so on. Results This review reports that women are frequently exposed to pesticides during tea leaf plucking

activities in tea plantations/gardens, which may lead to adverse pregnancy outcomes and may result in altered function of the placenta, fetal growth restrictions, low birth weight (LBW) of babies, and sex-specific differences in the fetal development. These adverse effects may pose a potential risk of poor health, type 2 diabetes mellitus, and congenital birth defects leading to neurobehavioral disorders in childhood, and even cancer later in life. Discussion The adverse effects of pesticide exposure on pregnancy and the fetus in tea plantation workers were explained through the available epidemiological data and animal studies. The mechanism of toxicity due to pesticide exposure during pregnancy may involve the disruption of signaling pathway, leading to placental toxicity, and restricted fetal development. Conclusion Considering limited epidemiological, biomonitoring, and pathological data on pesticide exposure in women working in tea plantations/gardens, there is an urgent need for well-designed cohort studies to delineate its consequences on reproductive health, pregnancy outcomes, and adverse effects in offspring.
https://doi.org/10.1002/bdr2.2460

Epidémiologie

Foreign Contaminants Target Brain Health,
Agarwal, U., Pannu, A. and Tonk, R. K., *Cns & Neurological Disorders-Drug Targets*, 2025, Vol. 24, no. 5, p. 353-374.
Neurodisease, caused by undesired substances, can lead to mental health conditions like depression, anxiety and neurocognitive problems like dementia. These substances can be referred to as contaminants that can cause damage, corruption, and infection or reduce brain functionality. Contaminants, whether conceptual or physical, have the ability to disrupt many processes. These observations motivate us to investigate contaminants and neurotoxicity collaboratively. This study investigates the link between pollutants and neuro-disease, examining transmission pathways and categorization. It also provides information on resources, causes, and challenges to minimize contamination risks. Contamination may cause various neuro-diseases, including Alzheimer's, Parkinson's, multi-system atrophy, Huntington's, autism spectrum disorder, psychiatric disorder, dementia, meningitis, encephalitis, schizophrenia, anxiety, and depression. The negative effects depend on the nature and extent of exposure. A comprehensive literature search was conducted using databases such as PubMed and Scopus, focusing on studies published till 2024. Studies were selected based on their examination of the relationship between environmental contaminants and brain health, emphasizing transmission pathways and the resulting neurological outcomes. Findings indicate that contaminants can penetrate the blood-brain barrier (BBB) via nasal, gut, and auditory routes, triggering harmful neurophysiological processes. This review highlights the urgent need for increased global awareness, policy interventions, and preventive measures to mitigate the long-term impacts of environmental contaminants on brain health, particularly in emerging nations.
https://doi.org/10.2174/0118715273338071241213101016

Phthalate Metabolites and Their Relationship with Abdominal and General Obesity: Evidence from the Aragon Workers' Health Study (AWHS),
Akritidis, J. a.-O. X., Mérida, D. a.-O., Torrijo-Belanche, C. a.-O., Moreno-Franco, B., Gimeno-Ruiz, S. a.-O., Rey-García, J. a.-O., Morales-Suarez-Varela, M. a.-O. and Guallar-Castillón, P. a.-O., no. 2072-6643 (Electronic).
BACKGROUND/OBJECTIVES: Phthalates are endocrine-disrupting chemicals that are commonly used in plastic consumer products and food packaging, with growing evidence suggesting that they have a potential role in obesity. This study aimed to investigate the association between urinary concentrations of phthalate metabolites and both general and abdominal obesity among adult males in Spain. METHODS: We analysed data from 1124 male participants of the Aragon Workers' Health Study (AWHS) collected between 2011 and 2014 in Zaragoza, Spain. Eleven urinary phthalate

metabolites were measured and adjusted for creatinine levels. Multivariate logistic regression models were used to evaluate associations between phthalate exposure and general and abdominal obesity, controlling for dietary and lifestyle factors. Dose-response relationships were explored using restricted cubic spline models. RESULTS: Higher urinary concentrations of di(2-ethylhexyl) phthalate (∑DEHP) and two of its metabolites-mono-(2-ethyl-5-oxohexyl) phthalate (MEOHP) and mono-(2-ethyl-5-hydroxyhexyl) phthalate (MEHHP)-were significantly associated with general obesity. The adjusted odds ratios were: ∑DEHP [OR = 1.26; 95% CI: 1.01, 1.58], MEOHP [OR = 1.24; 95% CI: 1.00, 1.53], and MEHHP [OR = 1.26; 95% CI: 1.03, 1.55]. In contrast, mono-isobutyl phthalate (MiBP) was inversely associated with abdominal obesity [OR = 0.73; 95% CI: 0.57, 0.93]. CONCLUSIONS: These findings suggest a positive association between exposure to DEHP and its metabolites and general obesity. This highlights the potential importance of environmental exposures as modifiable factors in obesity prevention and supports the need for further investigation in nutritional and public health contexts. FAU - Akritidis, Jordan https://doi.org/10.3390/nu17111869

Neuromotor effects of early-life exposure to a mixture of endocrine disruptors in Belgian preschool children,
Barrea, C., Dufour, P., Catherine, P., Charlier, C., Brevers, F., Parent, A. S. and Rousselle, L., *Environmental Health*, Mar 2025, Vol. 24, no. 1.
ObjectiveChildren gradually develop motor skills that enable them to move efficiently in various daily activities such as self-care, academics and sports. The impact of prenatal exposure to endocrine disruptors (EDCs) on these performances remains understudied and current results are inconsistent. This study aims at examining the neuromotor function of Belgian preschoolers exposed in utero to a mixture of some of these chemicals.MethodsFrom 2014 to 2016, 66 children (35 boys and 31 girls) were recruited for a longitudinal cohort study. Two polychlorinated biphenyls (PCBs) and four perfluoroalkyl substances (PFASs) were measured in cord serum. A standardized motor evaluation, the Movement Assessment Battery for Children II (MABC-II), and a clinical sensori-motor assessment examining minor neurological dysfunction were administered at 6 years of age. The impact of the mixture of EDCs on neuromotor outcome measures was evaluated using two validated statistical models. Sex-specific analyses were also conducted.ResultsUsing a principal component analysis, a negative association was identified between a mixture of PCB-153 and - 180 and the Total Clinical examination score in the whole population (beta (95% CI) = -15.8 (-26.51; -5.09), p = 0.005). After stratification by sex, negative associations were observed between the Gross Motor score of the MABC-II test and prenatal exposure to a mixture of PFASs and PCB-180, specifically in boys. This association was consistent across both the weighted quantile sum regression model (beta (95% CI) = -2.36 (-3.42; -0.62), p = 0.023) and the principal component approach (beta (95% CI) = -1.09 (-2.15; -0.13), p = 0.044).ConclusionOur findings suggest that the neuromotor function of young children is adversely influenced by prenatal exposure to toxicants in a sex-specific manner. https://doi.org/10.1186/s12940-025-01156-9

Prenatal PFAS exposure associates with DXA assessed markers of adiposity in 7-year-old children from the Odense Child Cohort,
Beck, I. H., Grontved, A., Palm, C. V. B., Batzella, E., Sigvaldsen, A., Dalgard, C., Jensen, R. C., Nielsen, C., Halldorsson, T. I. and Jensen, T. K., *Environmental Research*, Jun 2025, Vol. 275.
The global increase in childhood overweight and obesity presents significant public health concerns due to its long-term health implications. Emerging evidence suggests that exposure to endocrine disrupting chemicals, such as per- and polyfluoroalkylated substances (PFAS), may be obesogenic and contribute to adiposity. This study aimed to investigate the association between prenatal PFAS exposure and markers of adiposity in 7-year-old children, focusing on potential sex-specific differences. Data was analyzed from 881 mother-child pairs in the Odense Child Cohort, Denmark. Maternal serum concentrations of perfluorohexane sulfonic acid (PFHxS), perfluorooctane sulfonic

acid (PFOS), perfluorooctanoic acid (PFOA), perfluorononanoic acid (PFNA), and perfluorodecanoic acid (PFDA) were measured in early pregnancy. At age 7, body composition, including body mass index (BMI), lean mass and fat distribution (total, gynoid, and android), was assessed using dual-energy X-ray absorptiometry (DXA). The median (25th;75th percentile) concentrations of PFHxS, PFOS, PFOA, PFNA, and PFDA were 0.4 (0.2;0.5), 7.6 (5.6;10.4), 1.7 (1.1;2.3), 0.6 (0.5;0.8), and 0.3 (0.2;0.4) ng/mL, respectively. Multiple linear regressions were used to assess sex specific associations between maternal PFAS concentrations and markers of adiposity. In girls, 1 ng/mL increase in maternal PFOA was associated with 2.0 % (95 % confidence interval: 0.3; 3.7) increase in total fat, 1.3 % (-0.3; 2.9) increase in gynoid fat, and 3.8 % (0.6; 7.0) increase in android fat. Associations for PFNA and PFDA followed similar trends, whereas higher maternal PFOS concentrations were associated with lower BMI among both girls and boys. These findings suggest that prenatal exposure to certain PFAS may influence the accumulation of excess fat in girls. Our findings highlight the importance of studying sex specific differences and using accurate measures of body composition as BMI may not adequately reflect body fat in children during growth. https://doi.org/10.1016/j.envres.2025.121394

Comprehensive Nontargeted Analysis of Drinking Water Supplies to Identify Chemicals Associated with Estrogen Receptor Agonism or Present in Regions of Elevated Breast Cancer Occurrence,
Black, G. P., Anderson, B. N., Wong, L., Alaimo, C. P., He, G. C., Denison, M. S., Bennett, D. H., Tancredi, D., Durbin-Johnson, B., Hammock, B. D., Chowdhary, P., Rubin, R. and Young, T. M., *Environmental Science & Technology*, Mar 2025, Vol. 59, no. 10, p. 5237-5248.
To explore the hypothesis that differential exposures to estrogen active chemicals may contribute to regional disparities in cancer incidence, a comprehensive targeted and nontargeted analysis was conducted over two seasons (2020) for drinking water samples from 120 households served by 8 public water systems (4 with historically elevated breast cancer incidence) and from 15 brands of retail water. All samples were analyzed using gas and liquid chromatography with high-resolution mass spectrometry and a bioassay for estrogen receptor agonism. Target compounds included disinfection byproducts, per- and polyfluoroalkyl substances (PFAS), trace elements, and compounds selected for their possible relation to breast cancer. Over 7500 GC and LC nontargeted molecular features passed all quality control filters in each sampling season and were prioritized for identification if they were related to measured estrogen receptor agonism or were present at higher levels in areas with high breast cancer incidence (n = 1036). Benzothiazole-2-sulfonic acid, acetyl tributyl citrate, and diphenyl sulfone were among the prioritized and confirmed nontarget compounds. Nine polycyclic aromatic hydrocarbons and two ketone derivatives displayed significant negative correlations with estrogen receptor agonism. Many prioritized compounds remained unidentified, as 84.4% of the LC features and 77.5% of the GC features could not be annotated with high confidence. https://doi.org/10.1021/acs.est.4c12204

Fine particulate matter components and reproductive hormones in female adults: A 15-year longitudinal cohort study,
Chen, S. Y., Guo, C., Ou, C. Q., Zheng, Y. L., Liu, Y. F., Ma, J., Lu, X. C., Huang, B. and Chan, T. C., *International Journal of Hygiene and Environmental Health*, May 2025, Vol. 266.
Background: Few cohort studies have evaluated the long-term impacts of ambient fine particulate matter (PM2.5) and its components on reproductive hormone levels in female adults. Methods: We conducted a 15-year retrospective cohort study in Taiwan between 2003 and 2017. The two-year average concentrations of PM2.5 and its components, including sulfate (SO24), nitrate (NO3), ammonium (NH4+), organic matter (OM), and black carbon (BC), were assessed at each participant's addresses. Linear mixed models were used to examine the associations of PM2.5 and its components with reproductive hormones, including follicle-stimulating hormone (FSH),

luteinizing hormone (LH), testosterone (T), estradiol (E2), and prolactin (PRL). Stratified analyses were conducted to identify vulnerable populations. Results: 17,152 female adults were included. Each interquartile range (IQR: 3.545 mu g/m3) increase in PM2.5 was associated with a 0.585 mIU/mL [95% confidence interval (CI): 0.190-0.980] increase in FSH levels. Among the five components of PM2.5, BC had the strongest positive association [each IQR (0.272 mu g/m3) increase was associated with a 0.863 mIU/mL (95% CI: 0.476-1.250) increase in FSH levels], followed by OM, SO2- NH4+. Similar associations were found for LH, with a 0.483 mIU/mL (95% CI: 0.225-0.742) and 0.684 mIU/mL (95% CI: 0.431-0.938) increase in LH levels per IQR increase in PM2.5 and BC, respectively. The pollutants were marginally associated with decreased E2 levels and increased PRL levels. Non-linear associations between PM2.5 and its components and the levels of FSH, LH, E2, and PRL were observed. These pollutants were also positively associated with T levels among young adults. Post-menopausal women were more susceptible to the chronic impacts of PM2.5 and its components. Conclusion: Our study highlighted the adverse impacts of long-term exposure to PM2.5 components on hormonal homeostasis, revealing the biological mechanism of air pollution-reproductive health associations in females. Implementing stringent control of air pollution levels can benefit reproductive health in female adults, even in moderately polluted regions.
https://doi.org/10.1016/j.ijheh.2025.114562

Intergenerational and transgenerational effects of endocrine-disrupting chemicals in the offspring brain development and behavior,
Dias, G. R. M., Giusti, F. C. V., De Novais, C. O., De Oliveira, M. a. L., Paiva, A. G., Kalil-Cutti, B., Mahoney, M. M. and Graceli, J. B., *Front. Endocrinol.*, 21 May 2025
Endocrine-disrupting chemicals (EDCs) are a group of substances that can alter normal body functioning by disrupting the various patterns of hormone secretion and action. Some of these substances are used as plasticizers (e.g., bisphenols and phthalates) and agrochemicals (e.g., vinclozolin). EDC exposure can occur by many routes, including oral by contaminated food and water, through the skin, inhalation, and by placental transfer from mother to fetus or mother to infant (via lactation). The increase in EDCs used by the industry has strongly impacted our health. An increasing number of scientific works have reported the effects of EDCs on cancer development, metabolism, heart disease, and fertility. Most recently, studies on EDCs effects on behavior and the developing brain are raising major concerns related to the formation of sex differences and to the increased prevalence of neuropsychiatric disorders. In this review, we highlight the recent findings of the effects of pre-, peri-, and postnatal exposure to the three well-studied EDCs (i.e., bisphenols (BPA, BPS, BPF, and BPAF), phthalates (DBP, BBP, DEHP, and DiPeP), and vinclozolin (VIN)) on developing brain and behavior across generations in experimental animals.
https://doi.org/10.3389/fendo.2025.1571689

Residential proximity to agricultural fields, urinary glyphosate levels and breast cancer risk: a case-control study in Argentina,
Doná, F., Lorenz, V., Stegmayer, G., Ricardo, T., D'iorio, S., Ponzo, F., Repetti, M. R., Demonte, L. D., Milesi, M. M. and Varayoud, J., no. 2673-3080 (Electronic).
Despite accumulated evidence indicating glyphosate herbicide (GLY) presents endocrine disrupting properties, there are still discrepancies. Moreover, few epidemiological studies have focused on hormone-related pathologies. This work aimed to investigate the associations between urinary GLY levels and breast cancer (BC) in women from a region of intense agricultural activity in Argentina, exploring residential proximity to agricultural fields as a potential risk factor for BC. This was a case-control study that involved 90 women from different populations in the Province of Santa Fe, Argentina. Demographic data, lifestyle factors, and residential history were obtained through a questionnaire, while medical outcomes and reproductive history were acquired from medical records. Spot urine samples were collected and the concentrations of GLY and its primary

metabolite, aminomethylphosphonic acid (AMPA) were quantified by ultra-high-performance liquid chromatography-mass spectrometry. Odds ratios were estimated to assess the strength of the association between the case/control type and each predictor. GLY concentrations were above the limit of detection (LOD) in 86.1% of samples, with a range of 0.37-10.07 µg GLY/g creatinine. AMPA was not detected in any of the samples analyzed. Although urinary GLY concentrations showed no differences between the case and control groups, women residing near agricultural fields showed an increased risk of BC (OR: 7.38, 95% CI: 2.74-21.90). These original findings show the ubiquitous presence of GLY in adult women from Argentina. Interestingly, women living near agricultural fields have a higher risk of BC, suggesting that exposure not only to GLY but also to agrochemicals in general, could predispose to the development of BC in Argentina. While this study provides valuable insights, further and broader assessments of BC distribution in relation to agrochemical exposure acroos different regions of Argentina are needed. https://doi.org/10.3389/ftox.2025.1579952

Examining the Impact of Environmental Non-Persistent Compounds: Phthalates, BPA, and Benzophenone on Endometriosis,
Fuzak, M. K. and Pollack, A. Z., *Seminars in Reproductive Medicine*, Dec 2024, Vol. 42, no. 04, p. 274-287.
Endometriosis is a debilitating condition characterized by the growth of endometrial-like tissue outside the uterus, leading to chronic pain and inflammation. While its etiology remains complex, emerging evidence implicates environmental contaminants as potential contributors. This review explores the roles of endocrine-disrupting chemicals such as phthalates, bisphenol A (BPA), and benzophenone-like ultraviolet (UV) filters in the development and progression of endometriosis. These chemicals, commonly found in everyday products such as plastics, personal care items, and sunscreen, can mimic or interfere with hormonal functions, disrupting the hormonal balance essential for reproductive health. This review included 18 peer-reviewed studies on phthalates, BPA, and UV filters from 2003 to 2023. Evidence for UV filters was inconclusive, with only two studies available. BPA was positively associated with endometriosis in four out of seven studies. Phthalates were associated with a greater odds of endometriosis in five studies, and with a reduced odds in one study, while three studies found no association with endometriosis. This underscores the need for further research with improved timing of exposure measurement. Understanding the role of phthalates, BPA, and UV filters on endometriosis is crucial for developing effective prevention strategies, potentially reducing the burden of endometriosis. https://doi.org/10.1055/s-0045-1802986

Association between mixed exposure to dioxins and dioxin-like polychlorinated biphenyls and obesity among U.S. adults.
Gao, Z. X., Zhang, P., Xu, S. Z., He, Y. S., Hu, X., Ge, M., Xu, Y. Q., He, T., Wang, P. a.-O. X. and Pan, H. a.-O., no. 1945-7197 (Electronic).
BACKGROUNDS: Previous studies have suggested the potential links between dioxins or dioxin-like polychlorinated biphenyls (DL-PCBs) and obesity. However, the combined effects of dioxins and DL-PCBs on obesity are still unclear. METHODS: Nine kinds of dioxins and DL-PCBs were measured among 852 adults using the National Health and Nutrition Examination Survey (NHANES) from 2003-2004. We conducted generalized linear regression, weighted quantile sum (WQS) regression, and Bayesian kernel machine regression (BKMR) models to evaluate the association of these chemicals with obesity, and mediation analysis was performed to explore the mediating effect of glycated hemoglobin A1c (HbA1c). RESULTS: Dioxins and DL-PCBs were identified as risk factors for obesity according to logistic regression models. Both WQS and BKMR regression indicated that combined exposure to dioxins and DL-PCBs was linked to obesity, of which 1,2,3,4,6,7,8-hpcdd showed the greatest contributions. The results from mediation analyses suggested that the relationships of dioxins with obesity or obesity indices were mediated by HbA1c, with the proportion

of mediation ranging from 5.21% to 9.04% and the beta estimates (95%CI) were 0.007 (0.002, 0.010), 0.007 (0.0005, 0.020), 0.380 (0.133, 0.800), 0.408 (0.132, 0.800), respectively. CONCLUSION: Our findings revealed that mixed exposure to dioxins and DL-PCBs is positively correlated with obesity. https://doi.org/10.1210/clinem/dgae873

Phthalates are detected in the follicular fluid of adolescents and oocyte donors with associated changes in the cumulus cell transcriptome,
Gokyer, D., Laws, M. J., Kleinhans, A., Riley, J. K., Flaws, J. A. and Babayev, E., *F&S Science*, Feb 2025, Vol. 6, no. 1, p. 30-41.
Objective: To investigate the follicular fluid (FF) phthalate levels in adolescents undergoing fertility preservation compared with oocyte donors and explore its association with ovarian reserve and cumulus cell (CC) gene expression. Design: Retrospective study and molecular analysis of CCs and FF. Subjects: Adolescents (n = 20, 16.7 +/- 0.6 years) undergoing fertility preservation and oocyte donors (n = 24, 26.2 +/- 0.4 years). Exposure: Not applicable. Main Outcome Measures: Patient demographics, ovarian stimulation, and oocyte retrieval outcomes were analyzed for each group. The FF levels of 9 phthalate metabolites were assessed individually and as molar sums representative of common compounds (all phthalates, Sigma Phthalates; di(2-ethylhexyl) phthalate (Sigma DEHP)-associated phthalate metabolites, DEHP), exposure sources (plastics, Sigma Plastic; personal care products, Sigma PCP), and modes of action (antiandrogenic, Sigma AA) and compared between the 2 groups. The transcriptome of CC associated with mature oocytes was compared between adolescents and oocyte donors using bulk ribonucleic acid sequencing. Results: The FF Sigma Plastic and Sigma PCP levels were significantly higher in adolescents than in oocyte donors. The FF Sigma DEHP, Sigma Plastic, Sigma PCP, Sigma AA, and Sigma Phthalates levels were positively associated with antral follicle count in oocyte donors when adjusted for age, body mass index, and race/ethnicity. Ribonucleic acid sequencing analysis revealed 248 differentially expressed genes in CCs of adolescents within the top quartile (n = 4) of the FF Phthalates levels compared with those of the adolescents within the bottom half (n = 9). Genes enriched in pathways involved in cell motility and development were significantly down-regulated. Conclusions: Adolescents undergoing fertility preservation cycles demonstrate higher levels of phthalate metabolites in their FF than oocyte donors. Higher phthalate levels are associated with alterations in cumulus cells transcriptome in adolescents. The phthalate metabolite levels in FF are associated with higher antral follicle count levels in oocyte donors. (c) 2024 by American Society for Reproductive Medicine.
https://doi.org/10.1016/j.xfss.2024.10.009

Unraveling the connection between endocrine-disrupting chemicals and anxiety: An integrative epidemiological and bioinformatic perspective,
Guo, Z., Tan, Y. X., Lin, C. H., Li, H. Y., Xie, Q. Q., Lai, Z. T., Liang, X., Tan, L. and Jing, C. X., *Ecotoxicology and Environmental Safety*, May 2025, Vol. 296.
Background: The evidence linking endocrine-disrupting chemicals (EDCs) to anxiety in adults is currently sparse, while the effects of various categories of EDCs on the risk of anxiety, along with the underlying mechanisms, remain poorly understood. Methods: Four EDCs-polycyclic aromatic hydrocarbons (PAHs), phenols, pesticides, and phthalates-were quantified in 3927 adults from the National Health and Nutrition Examination Survey (NHANES) (2007-2012). We employed five statistical models to assess the individual and joint impacts of EDCs on anxiety risk. Causal mediation analysis frameworks were constructed to explore the mediating role of oxidative stress (OS). We identified potential biological mechanisms linking analytes to outcomes using the Comparative Toxicogenomics Database (CTD), MalaCards, and Open Targets, followed by enrichment analyses with Gene Ontology (GO) and the Kyoto Encyclopedia of Genes and Genomes (KEGG). Results: In individual chemical analyses, nine PAHs were significantly associated with increased anxiety risk (P < 0.05). Mixed-effects analyses showed that co-exposure to EDCs positively

correlated with anxiety, primarily due to 2-hydroxyfluorene (2-FLU) and 3-hydroxyfluorene (3-FLU). Bilirubin mediated 5.42 % of the anxiety linked to the PAH mixture. The inflammatory genes TNF and IL-6 were identified as key biological stressors, with enrichment analysis indicating significant involvement in reactive oxygen species metabolic processes and the AGE-RAGE signaling pathway. Conclusion: This study highlights the association between EDCs and anxiety in a representative U.S. population, indicating that exposure to PAHs may elevate anxiety risk through OS, inflammation, and the AGE-RAGE signaling pathway. Further longitudinal study were merited to support our results. https://doi.org/10.1016/j.ecoenv.2025.118188

Fetal exposure to a mixture of endocrine-disrupting chemicals and biomarkers of male fecundity: A population-based cohort study,
Hull, S. D., Hougaard, K. S., Toft, G., Petersen, K. K. U., Flachs, E. M., Lindh, C., Ramlau-Hansen, C. H., Wise, L. A., Wilcox, A., Liew, Z., Bonde, J. P. and Tottenborg, S. S., *Andrology*, Apr 2025.
BackgroundFetal exposure to endocrine-disrupting chemicals (EDCs) has been associated with reduced male fecundity, but with few studies considering chemical mixtures.ObjectivesWe assessed the association between fetal exposure to a mixture of EDCs and biomarkers of male fecundity in young adulthood.Materials and methodsThe study population comprised 841 young adult males enrolled in the Fetal Programming of Semen Quality cohort, established as a male offspring sub-cohort within the Danish National Birth Cohort. Maternal blood samples were analyzed for concentrations of per- and polyfluoroalkyl substances (PFAS), phthalate metabolites, and triclosan. We used quantile g-computation to estimate the change in semen characteristics, testicular volume, and reproductive hormone levels with 95% confidence intervals (CI) per one-quartile increase in all chemicals within three chemical mixtures; an overall chemical mixture, a PFAS mixture, and a non-persistent chemical mixture.ResultsFetal exposure to a one-quartile increase in the overall chemical mixture was associated with 4.0 million/mL lower sperm concentration (95% CI: -9.1, 1.1), 16.1 million lower total sperm count (95% CI: -33.8, 1.6), 0.5 mL smaller testicular volume (95% CI: -1.2, 0.3), 5% higher proportion of non-progressive and immotile spermatozoa (95% CI: 0.99, 1.11), and 7% higher concentration of FSH (95% CI: 0.99, 1.16), but with limited precision. Effect sizes were greatest in magnitude for sperm concentration and total sperm count. We observed somewhat similar associations for the PFAS mixture and no associations for the non-persistent chemical mixture.DiscussionResults suggest that fetal exposure to an overall mixture of EDCs may be adversely associated with several biomarkers of male fecundity, but findings are also compatible with null associations. These associations, if true, appeared to be driven by PFAS, but misclassification due to a single measurement of the phthalate metabolites and triclosan may have attenuated the results. https://doi.org/10.1111/andr.70039

Endocrine-disrupting chemicals and clinical outcomes in children with attention-deficit/hyperactivity disorder undergoing methylphenidate treatment: A 12-month follow-up study,
Hwang, J. W., Huang, W. T., Li, C. J., Tsai, C. S., Chou, W. J., Chen, C. C., Lee, S. Y. and Wang, L. J., *Environmental Technology & Innovation*, May 2025, Vol. 38.
Endocrine-disrupting chemicals (EDCs) can interfere with the endocrine system and may influence the risk of developing attention-deficit/hyperactivity disorder (ADHD). In this 12-month prospective study, we examined trends in EDC exposure and their association with neurocognitive changes in children diagnosed with ADHD. We recruited 83 children with ADHD and 80 healthy controls, measuring urinary levels of various EDCs, including mono-methyl phthalate (MMP), monoethyl phthalate (MEP), mono-n-butyl phthalate (MnBP), monobenzyl phthalate (MBzP), monoethylhexyl phthalate (MEHP), methylparaben (MP), ethylparaben (EP), propylparaben (PP), butylparaben (BP), and bisphenol-A (BPA). ADHD symptoms and cognitive performance were assessed using the ADHD-Rating Scale (ADHD-RS), Conners' Continuous Performance Test 3rd Edition (CPT3), and Conners'

Continuous Auditory Test of AttentionTM (CATA). At baseline, children with ADHD had significantly higher levels of MnBP and MEHP compared to healthy controls. Over the 12-month methylphenidate treatment, children with ADHD showed an increase in MEP levels and a decrease in MnBP, MEHP, MP, and BPA levels. ADHD-RS scores were negatively correlated with urinary MEP levels and positively correlated with MP levels. Additionally, CATA omission errors were positively associated with MnBP levels, while detectability errors were positively correlated with MEHP levels. These findings suggest that EDC levels in children with ADHD fluctuate during treatment and are associated with changes in ADHD symptoms and neuropsychological performance. This study provides valuable insights into the evolving relationship between EDC exposure and ADHD symptoms during treatment, contributing to the evaluation of potential health risks and informing public health policy development. https://doi.org/10.1016/j.eti.2025.104111

Phosphate Flame Retardants and Plasticizers and Their Association with Reproductive and Steroid Hormone Levels among Peripubertal-Aged Children: The Hokkaido Birth Cohort Study, Ikeda, A., Yamaguchi, T., Bamai, Y. A., Roggeman, M., Ikenaka, Y., Zeng, Y., Yasuda, A., Ketema, R. M., Marsela, M., Gys, C., Den Ouden, F., Itoh, S., Nakamura, A., Kitta, T., Kon, M., Manabe, A., Covaci, A. and Kishi, R., *Environmental Science & Technology*, Mar 2025, Vol. 59, no. 10, p. 4820-4831.
This cross-sectional study investigated associations between exposure to organophosphate flame retardants and plasticizers (PFRs) and reproductive and steroid hormones in peripubertal children from the Hokkaido Birth Cohort (429 children aged 9-12 years; between September 2017 and March 2020). Thirteen urinary PFR metabolites and 14 plasma steroid hormones were investigated using LC-MS/MS and four reproductive hormones were investigated using immunoassays. Linear regression for single PFR, quantile g-computation, and Bayesian machine kernel regression (BKMR) models for the PFR mixtures were used to examine the association between hormones and PFRs. Among boys, significant positive associations were observed between estradiol and Sigma TCIPP and Sigma TBOEP, and inverse associations were identified between insulin-like factor-3 (INSL3) and Sigma TCIPP, and between luteinizing hormone (LH) and Sigma EHDPHP. The PFR mixture was associated with the trends of increasing estradiol and androstenedione, and decreasing cortisol, cortisone, LH, inhibin B, and INSL3. Among girls, androstenedione and Sigma TCIPP, testosterone and Sigma EHDPHP, (androstenedione + testosterone)/DHEA-S and Sigma TCIPP, and Sigma EHDPHP and Sigma TPHP were significantly correlated. The PFR mixture showed trends of increasing testosterone, androstenedione, and inhibin B, and decreasing cortisol, cortisone, and INSL3. Individual PFRs and PFR mixtures altered steroids and reproductive hormones in peripubertal children. https://doi.org/10.1021/acs.est.4c11436

The potential health risks of exposure to environmental chemicals - Global implications for future generations,
Kishi, R., Ikeda, A. and Ketema, R. M., *Proceedings of the Japan Academy Series B-Physical and Biological Sciences*, 2025, Vol. 101, no. 4, p. 197-215.
In 2001, we launched the Hokkaido Study, the first prospective birth cohort study in Japan. We are currently tracking the effects of environmental chemicals, using a life course approach. The study examines life circumstances after birth, and the longest follow-up to date is 20 years of age. We have measured prenatal exposure to dioxins, organochlorine pesticides, per- and polyfluoroalkyl substances, plasticizers such as di(2-ethylhexyl) phthalate, and bisphenol A. Our findings have mostly revealed that increased exposure to these environmental chemicals is linked to increased risk of lower birth size, effects on thyroid and steroid hormones, adipokine levels, as well as disruption of neurodevelopment, including causing asthma and respiratory symptoms. However, it should be noted that our findings also include protective or null findings, which may be due to low chemical concentrations or differences in prenatal or postnatal exposure. We would like to emphasize the

importance of long-term continuation of the cohort, effective utilization of the data, and application of the results to environmental and health policies. https://doi.org/10.2183/pjab.101.015

Phthalates may impact key genital measurement in three-year-old children,
L., L., *European Society of Endocrinology (ESE) and The European Society for Paediatric Endocrinology (ESPE)* (mai 2025),
Three-year-old boys are more likely to have a shorter anogenital distance when their mothers have high levels of phthalates in their urine, according to research presented at the first Joint Congress between the European Society of Paediatric Endocrinology (ESPE) and the European Society of Endocrinology (ESE). In girls, the direct exposure to phthalates was associated with a shorter anogenital distance. The findings highlight how exposure to environmental pollutants can cause alterations in genital measurements during the first three years of life, which may affect sexual development and fertility later in life. https://espe-ese-congress2025.org/wp-content/uploads/2025/05/press_release_Lucaccioni-final.pdf

Associations between organophosphate flame retardants metabolites in follicular fluid and reproductive outcomes among women undergoing IVF/ICSI treatment in Southwest China,
Li, X. H., Qiu, J. H., Gan, Z. W., Li, S. W. and Zeng, X., *Reproductive Biology and Endocrinology*, Apr 2025, Vol. 23, no. 1.
BackgroundPrevious studies suggest organophosphate flame retardants (OPFRs) negatively affect fertility, but limited research explores their metabolites in follicular fluid and reproductive outcomes.ObjectivesTo investigate the associations between concentrations of OPFRs metabolites in follicular fluid and the outcomes of in vitro fertilization/intracytoplasmic sperm injection (IVF/ICSI) among women undergoing treatment.MethodsWomen who underwent IVF/ICSI treatment at the Reproductive Center of West China Second University Hospital, Sichuan University, China, from 2017 to 2020 were recruited. The levels of seven OPFRs metabolites were quantified in follicular fluid collected on the day of oocyte retrieval. Reproductive outcomes were assessed, including key IVF/ICSI outcomes. Results This study included 401 women. After adjusting for relevant confounders, elevated concentrations of BBOEP (beta = -0.08, 95% CI: -0.12 to 0 0.05), BEHP (beta = -0.11, 95% CI: -0.17 to 0.05), DnBP (beta = -0.23, 95% CI: -0.37 to 0.08), and DPhP (beta = -0.12, 95% CI: -0.18 to 0.06) in follicular fluid were inversely associated with the number of good embryos on day 3. Elevated BEHP concentrations were negatively associated with the total number of oocytes (beta = -0.04, 95% CI: -0.07 to 0.01). In comparison with the lowest tertile, the highest tertile of DnBP was associated with a 42% reduction in biochemical pregnancy (p-trend = 0.05). Furthermore, the BKMR models revealed inverse associations between OPFRs metabolites mixtures and the number of good embryos. Conclusion Findings suggest OPFRs may negatively affect IVF/ICSI outcomes, warranting further study on environmental impacts on fertility. https://doi.org/10.1186/s12958-025-01390-3

Association between endocrine disrupting chemicals exposure and diabetic kidney disease in adults: A national cross-sectional NHANES study,
Li, X. R., Ye, X. A., Xu, L. H. and Chen, H. Y., *Ecotoxicology and Environmental Safety*, Mar 2025, Vol. 293.
Background: Diabetic kidney disease (DKD) is a global public health concern. Environmental factors are increasingly recognized as significant risk factors that cannot be overlooked, and certain environmental pollutants exhibit endocrine-disrupting properties. Previous research on the association between endocrinedisrupting chemicals (EDCs) and DKD has been notably limited. Methods: This study investigated the association between exposure to 25 EDC metabolites and DKD in 1421 U.S. adults from the 2015-2018 National Health and Nutrition Examination Survey (NHANES). We used logistic regression, restricted cubic spline regression, weighted quantile sum (WQS) regression, and bayesian kernel machine regression (BKMR) models to assess the association

between individual and co-exposure to multiple EDCs and DKD. Subgroup analyses and interaction tests were performed to investigate whether this association was stable across the population. Additionally, mediation analysis was used to explore the mediating role of serum globulins in the association between Pb exposure and DKD. Results: In logistic regression models, N-Acetyl-S-(2-hydroxypropyl)-L-cysteine (2HPMA), N-Acetyl-S-(4-hydroxy2-butenyl)-L-cysteine (MHBMA3), Phenylglyoxylic acid (PGA), and lead (Pb) were significantly positively associated with diabetes. Restricted cubic spline (RCS) analyses also revealed significant non-linear positive associations between 2HPMA, MHBMA3, and DKD. Perfluorohexane sulfonic acid (PFHxS), n-perfluorooctanoic acid (n-PFOA), n-perfluorooctane sulfonic acid (n-PFOS), and Perfluoromethylheptane sulfonic acid isomers (SmPFOS) were significantly negatively associated with DKD. Furthermore, co-exposure to metals and metalloid was positively associated with DKD in both the WQS regression and the BKMR models, with Pb as the primary contributing factor. Mediation analysis showed that globulin mediated the association between Pb exposure and DKD, with a mediation proportion of 7.25 % (P = 0.046). Co-exposure to perfluoroalkyl and polyfluoroalkyl substances (PFASs) was negatively correlated with DKD, and subgroup analyses revealed that this correlation was more pronounced in the obese group (BMI >= 30 kg/m2). The BKMR analysis revealed potential interactions among various chemical compounds, such as N-Acetyl-S-(2-hydroxypropyl)-L-cysteine (2HPMA), 2-Methylhippuric acid (2MHA), N-Acetyl-S-(4-hydroxy-2-methyl-2-butenyl)-L-cysteine (IPM3), mercury (Hg), and cadmium (Cd), in a model simulating co-exposure to metals and metalloid, as well as to volatile organic compound metabolites (mVOCs). Conclusion: The findings suggest an association between individual or co-exposure to EDC metabolites and DKD, providing valid evidence for DKD prevention from the perspective of EDCs exposure. However, more prospective studies are needed to elucidate the potential mechanisms underlying these findings.
https://doi.org/10.1016/j.ecoenv.2025.118044

Community-based insights into the connection between endocrine-disrupting chemicals and depressive symptoms,
Liu, Y. A., Hsu, H. J., Pan, H. C., Sun, C. Y., Chen, Y. T., Lee, C. C., Su, F. C., Wei, Y. C., Hsu, C. K. and Chen, C. Y., *Current Research in Toxicology*, 2025, Vol. 8.
Background: The rising prevalence of depressive disorders has sparked concerns regarding environmental risk factors, particularly exposure to endocrine-disrupting chemicals (EDCs). However, the link between EDC exposure and depressive symptoms remains largely unexplored. Methods: The Chang Gung Community Medicine Research Center carried out a cross-sectional study across four regions in northeastern Taiwan. Out of 887 participants, 120 subjects were chosen according to their EDC exposure scores. These participants underwent urinary EDC analysis and were evaluated for depressive symptoms through the standardized Hospital Anxiety and Depression Scale - Depression subscale (HADS-D) questionnaire. Results: Participants with HADS-D scores >= 8 exhibited significantly higher EDC exposure score compared to those with lower scores. The correlation analyses identified a notible positive association between urinary monobenzyl phthalate (MBzP) levels and HADS-D scores (r = 0.244, p = 0.007). Multiple regression analysis revealed that MBzP was independently linked to increased HADS-D scores in a positive manner (beta +/- SE: 0.139 +/- 0.050, p = 0.006). Multivariable logistic regression indicated that higher MBzP (OR: 1.150, 95 % CI: 1.036-1.278, p = 0.009) and methylparaben (MP) levels (OR: 1.008, 95 % CI: 1.003-1.013, p <0.001) showed a significant correlation with the likelihood of HADS-D scores >= 8. Receiver operating characteristic curve analysis demonstrated that elevated levels of MBzP, MP and the EDCs exposure score were associated with a greater likelihood of depressive symptoms. Conclusion: Exposure to EDCs, particularly MBzP and MP, could be associated with a heightened risk of depressive symptoms. https://doi.org/10.1016/j.crtox.2025.100225

Endocrine-disrupting chemicals in human adipose tissue and associations between exposure and obesity,
Lu, Z. H., Li, A. J., Gao, Y., Shi, H. W., Shi, X. L., Li, W. J., Song, J. H. and Song, M. Y., *Journal of Environmental Sciences*, Sep 2025, Vol. 155, p. 552-561.
Bio-accumulation of endocrine-disrupting chemicals (EDCs) in human body may result in various adverse health effects. This study measured the levels of 16 EDCs in the visceral adipose tissue of 55 participants in China and investigated their association with obesity. MeP, BPP, PrP, BPA, EtP, BPE, and BPC were frequently detected in more than 50 % of the adi- pose tissues. A positive correlation between bisphenol A and body mass index (BMI) was observed in both multivariate linear regression model (beta= 0.87, 95 % confidence interval: 0.21-1.53, p = 0.011) and multivariate logistic regression analysis (odds ratio = 1.28, 95 % confidence interval: 1.01-1.62, 0.044). Restricted cubic spline regression analysis revealed a significant nonlinear association between bisphenol P and BMI. Weighted quantile sum re- gression and quantile-based g-computation revealed a slight positive trend between EDCs mixed exposure and BMI, with bisphenol A as the primary contributor to the positive corre- lation with BMI. Our findings suggest the extensive existence of environmental EDCs in the adipose tissue of the adult Chinese population and indicate that exposure to BPA in adipose tissue may be associated with the occurrence of obesity. (c) 2025 The Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences. Published by Elsevier B.V.
https://doi.org/10.1016/j.jes.2024.09.008

ENVIRONMENTAL EXPOSURE TO SELECTED NON-PERSISTENT ENDOCRINE DISRUPTING CHEMICALS AND POLYCYSTIC OVARY SYNDROME: A SYSTEMATIC REVIEW,
Ozga, M. and Jurewicz, J., *International Journal of Occupational Medicine and Environmental Health*, 2025, Vol. 38, no. 2, p. 98-121.
Polycystic ovary syndrome (PCOS) is an endocrine disorder manifesting with symptoms such as irregular menstrual cycles, hyperandrogenism, and/or polycystic ovaries. The exact cause of PCOS remains unknown, but it is believed to result from a combination of genetic predisposition, insulin resistance, low-grade inflammation, and excessive androgen production. Various environmental factors, especially endocrine-disrupting chemicals (EDCs), in addition to genetic and hormonal ones, also may influence PCOS. This is one of the first systematic reviews dealing with the exposure to non-persistent endocrine disrupting chemicals and PCOS. The review summarizes the existing knowledge about the association of EDCs with PCOS based on significant findings on the toxicity of various non-persistent environmental EDCs and polycyclic ovarian syndrome risk. A systematic search of the literature was conducted in order to identify proper studies using PubMed, Scopus, Elsevier, and Springer databases. The results of the studies suggest that there is a positive association between bisphenol A (BPA), phthalates, octocrylene, and PCOS. The data concerning triclosan and PCOS were inconclusive. Additionally, no link between the exposures to parabens and PCOS was observed. These results of the presented studies highlight the urgent need for continued research on EDCs and their role in PCOS. Int J Occup Med Environ Health. 2025;38(2):98-121
https://doi.org/10.13075/ijomeh.1896.02551

Prenatal Concentrations of Perfluoroalkyl Substances and Maternal Beta Cell Function at 7 to 9 Years of Follow-Up,
Palaniyandi, J., Bruin, J. E., Fisher, M., Borghese, M. M., Hoyeck, M. P., Panagiotopoulos, C. and Ashley-Martin, J., *Journal of Clinical Endocrinology & Metabolism*, Mar 2025.
Context Epidemiological evidence regarding prenatal per- and polyfluoroalkyl substance (PFAS) exposure and long-term maternal metabolic health outcomes is lacking. Objective Quantify associations between prenatal PFAS concentrations and maternal metabolic biomarkers of glucose homeostasis 7 to 9 years later. Methods We measured second trimester plasma concentrations of 9 PFAS in participants enrolled in the Maternal-Infant Research on Environmental Chemicals (MIREC)

study. We measured individual biomarkers of glucose homeostasis (fasting intact proinsulin, C-peptide, insulin, glucose, and hemoglobin A1C levels) in samples collected 7 to 9 years after the MIREC pregnancy (n = 258) and derived indicators of pancreatic beta cell function (proinsulin to insulin [PI:INS], proinsulin to C-peptide [PI:CP] ratios) and insulin resistance (homeostatic model assessment for insulin resistance [HOMA-IR], triglyceride-glucose index). Using multivariable linear regression models, we quantified the percent change in each outcome per doubling of individual PFAS concentrations. We used quantile g-computation and weighted quantile sum regression to evaluate the mixture of PFAS. Results Prenatal perfluorononanoic acid and perfluorodecanoic acid concentrations were associated with 13.9% (95% CI: 0.8, 28.8) and 10.5% (95% CI: -1.0, 23.4) higher HOMA-IR values as well as 11.9% (95% CI: 0.1, 25.1) and 8.9% (95% CI: -1.5, 20.3) higher fasting insulin concentrations, respectively. A doubling of perfluorooctanoic acid concentrations was associated with increases in intact proinsulin concentrations (12.8% [95% CI: -3.5, 31.8]) and beta cell function ratios (PI:INS: 11.5% [95% CI: -4.4, 30.1]; PI:CP: 13.5% [95% CI: -2.4, 32.0]). Conclusion Prenatal exposure to PFAS may impact long-term maternal insulin resistance and beta cell function, key risk factors for type 2 diabetes. These associations differ by specific PFAS.
https://doi.org/10.1210/clinem/dgaf143

Endocrine disruptors as risk factors for idiopathic premature thelarche in girls: A case-control study,
Palmieri, F. I., Gryngarten, M. G., Arcari, A. J., Umido, V. and Freire, A., *Archivos Argentinos De Pediatria*, Apr 2025.
Introduction. Idiopathic premature thelarche (IPT) is defined as breast growth in girls before age 8 without activation of the gonadotrophic axis. Among the probable etiologies, endocrine disruptors (ED) with estrogenic action have been suggested. Objective. To evaluate whether there is an association between exposure and degree of exposure to the main EDs with estrogenic action in our environment and the development of IPT. Population and methods. Structured survey of caregivers of girls aged 3 to 8 years diagnosed with IPT and controls. The exposure evaluated included different EDs: bisphenol A (BPA), phytoestrogens, phthalates, and parabens, considering the degree of exposure according to weekly frequency. Results. Caregivers of 50 cases (7.2 +/- 1.3 years) and 48 controls (6.7 +/- 1.5 years) were interviewed. An association was found between IPT and exposure to phytoestrogens in food (OR: 14.6; 95%CI 1.8-118; p<0.01), the use of BPA containers exposed to temperature changes (OR 2.6; 95%CI 1.1-6.5; p<0.05), contact with phthalates (OR 2.9; 95%CI 1.2-7.5; p<0.05) and parabens (OR 2.7; 95%CI 1.2-6,1; p<0.05). In all the detailed EDs, we also found an association of IPT according to their degree of exposure. Conclusions. Exposure and degree of exposure to different sources of phytoestrogens, BPA, parabens, and phthalates were associated with the development of IPT. https://doi.org/10.5546/aap.2024-10501.eng

One year respiratory and neurodevelopmental outcome of premature neonates after exposure to plasticizers in the neonatal intensive care unit - A prospective cohort study,
Panneel, L., Cleys, P., Bamai, Y. A., Dewispelaere, L., Laroche, S., Van Hoorenbeeck, K., Verhulst, S., Covaci, A., Mulder, A. and Jorens, P. G., *Environmental Research*, Jun 2025, Vol. 274.
Background: Premature neonates have an increased risk of long-term effects, including impaired respiratory and neurodevelopment. During NICU admission, they are exposed to endocrine-disrupting phthalates and alternative plasticizers. The objective was to study the association between cumulative NICU-based plasticizer exposure and respiratory and neurodevelopmental outcome during the first year of life. Methods: Premature neonates (gestational age 631 weeks and/or birth weight 61500 g) were prospectively enrolled at the Antwerp University Hospital, Belgium. Outcome was assessed at 12 months corrected age, using the Bayley Scales of Infant and Toddler Development-III and validated questionnaires for respiratory outcome. Urinary concentrations of plasticizers' biomarkers were measured weekly during NICU stay. Weighted

quantile sum regression was utilized to assess associations between plasticizer biomarkers' mixtures and outcome. Results: Exposure of premature neonates (n = 110) to specific plasticizer mixtures correlated with worse fine motor (B -0.96; 95%-CI -1.76, -0.15; p = 0.02) and receptive language development (B -0.77; 95%-CI -1.23, -0.32; p = 0.001), and better gross motor (B 2.24; 95%-CI 0.62, 3.86; p = 0.01) and expressive language development (B 1.50; 95%-CI 0.33, 2.67; p = 0.02). NICU exposure to different plasticizer mixtures was associated with eczema (aOR 3.12; 95%-CI 1.23, 9.11; p = 0.02), repeated ear infections (aOR 5.53; 95%-CI 1.87, 23.14; p = 0.01), and respiratory-related healthcare visits during the first year of life (aOR 8.50; 95%-CI 2.05-55.91; p = 0.01). Conclusions: Cumulative NICU exposure to phthalates and alternative plasticizers was associated with increased respiratory morbidity and eczema during the first year of life. Exposure to specific plasticizer mixtures correlated with worse or better neurodevelopment at one year of age. https://doi.org/10.1016/j.envres.2025.121266

The Role of Industrial Chemicals and Occupational Hazards in Male Infertility: A Comprehensive Review,
Parvez, K. F. and Hussain, S. S., *Metallurgical & Materials Engineering*, 2025, Vol. 31, no. 1, p. 52-65.
Infertility affects 10-15% of couples globally, often resulting from a complex interplay of factors involving both men and women. While medical assessments, including semen analyses and hormonal evaluations, are critical for diagnosing male infertility, the underlying causes frequently remain elusive. Endocrine-disrupting chemicals (EDCs), prevalent in the environment due to industrial growth, may significantly impact male reproductive health by interfering with hormonal regulation essential for spermatogenesis. This review explores the influence of occupational and environmental exposures on male fertility, emphasizing EDCs, heavy metals, and lifestyle factors such as smoking, alcohol consumption, and obesity. We analyze epidemiological studies investigating the relationships between these exposures and male infertility, revealing a concerning correlation between disrupted spermatogenesis and increasing exposure to harmful chemicals. Despite the progress made by infertility clinics in identifying potential links, the field lacks systematic studies, particularly regarding occupational exposures. This review aims to highlight the need for comprehensive research to understand the multifaceted causes of male infertility better and to encourage proactive measures for monitoring and mitigating occupational hazards. https://metall-mater-eng.com/index.php/home/article/view/1207

Endocrine-Disrupting Chemicals and the Effects of Distorted Epigenetics on Preeclampsia: A Systematic Review,
Rani, B. U., Vasantharekha, R., Santosh, W., Swarnalingam, T. and Barathi, S., *Cells*, Mar 2025, Vol. 14, no. 7.
Background: Preeclampsia (PE) is a critical complication of pregnancy that affects 3% to 5% of all pregnancies and has been linked to aberrant placentation, causing severe maternal and fetal illness and death. Objectives: This systematic review aims to elucidate the association of in-utero endocrine-disrupting chemical (EDC) exposure and microRNAs and their imprinted genes from prenatal and maternal circulation of PE patients. Methods: Databases such as PubMed, PubMed Central, ScienceDirect, the Comparative Toxicogenomics Database (CTD), ProQuest, EBSCOhost, and Google Scholar were utilized to search for articles that investigate the relationships between selected EDCs and epigenetic events such as DNA methylation and microRNAs that are associated with PE. Results: A total of 29 studies were included in the database search. Altered expression of microRNAs (miR-15a-5p, miR-142-3p, and miR-185) in the placenta of PE patients was positively associated with the urinary concentration of phthalates and phenols in the development of the disease in the first trimester. EDCs such as phenols, phthalates, perfluoroalkyl substances (PFOAs), polybrominated diphenyl ethers (PBDEs), and organochlorine phosphates (OCPs) have been reported to be associated with hypertensive disorders in pregnancy. miRNA-31, miRNA-144, miRNA-

145, miRNA-210, placental specific clusters (C14MC, and C19MC) may be used as possible targets for PE because of their potential roles in the onset and progression of PE. Conclusions: Prenatal EDC exposure, including exposure to BPA, showed association with signaling pathways including estrogen, sFlt-1/PlGF, ErbB, MAPK/ERK, and cholesterol mechanisms with placental hemodynamics. Even low EDC exposures leave altered epigenetic marks throughout gestation, which might cause PE complications. https://doi.org/10.3390/cells14070493

Association between PFAS exposure and metabolic-related biomarkers in Spanish adolescents, Rodriguez-Carrillo, A., Vela-Soria, F., Smagulova, F., Fernández, M. F. and Freire, C., *Environmental Research*, May 2025, Vol. 273.
Background: Per- and polyfluoroalkyl substances (PFAS) exert endocrine disruptive effects on the endocrine- metabolic axis. Emerging knowledge suggests that kisspeptin may play a key role in these effects. Objective: To assess the cross-sectional association of blood PFAS concentrations with kisspeptin levels, KISS1 gene DNA methylation, and metabolic-related biomarkers in adolescent males from the Spanish INMA-Granada cohort. Methods: Seven PFAS and twelve biomarkers (glucose-GLU, total cholesterol-TC, triglycerides, LDL, HDL, ALP, AST, ALT, GGT, total bilirubin-BILT, direct bilirubin-BILD, and urea) were measured in plasma and serum, respectively, from 129 adolescent males (15-17 yrs). Systolic and diastolic blood pressure (SBP, DBP), pulse, zscored body mass index, kisspeptin protein levels (n = 104) and whole blood KISS1 DNA methylation (n = 117) were determined. Linear regression models, weighted quantile sum (WQS), and Bayesian kernel machine (BKMR) were fit. Results: PFHpA was associated with lower GLU levels [% change per log-unit increase in plasma concentrations (95%CI) =-4.73 (-8.98;-0.28)], and PFUnDA with higher GLU, TC, and HDL levels. In models adjusted by kisspeptin level, PFOS was associated with higher SBP [3.42 (-0.12; 7.09)]. Additionally, PFNA and total PFAS concentrations were associated with higher kisspeptin levels [3.91 (0.55; 7.37) and 6.14 (0.47; 12.13), respectively]. Mixture models showed that combined PFAS exposure was associated with higher HDL, lower hepatic biomarkers (ALT, BILD) and higher kisspeptin levels. Conclusion: Certain PFAS (e.g. PFUnDA) and their mixture were associated with metabolic-related biomarkers, mainly GLU, HDL, and SBP. These associations may be influenced by kisspeptin levels. More studies are needed to verify these observations.
https://doi.org/10.1016/j.envres.2025.121171

Hidden link between endocrine-disrupting chemicals and pediatric obesity,
Shin, M. W. and Kim, S. H., *Clinical and Experimental Pediatrics*, Mar 2025, Vol. 68, no. 3, p. 199-222.
The increasing prevalence of pediatric obesity has emerged as a significant public health concern. Among vari ous contributing factors, exposure to endocrinedisrupting chemicals (EDCs) has gained recognition for its potential role. EDCs, including bisphenols, phthalates, per and polyfluoroalkyl substances, polycyclic aromatic hydrocarbons, and organochlorines, disrupt hormonal regulation and metabolic processes, contributing to alterations in fat storage, appetite regulation, and insulin sensitivity. This study offers a comprehensive review of the current research linking EDC exposure to pediatric obesity by integrating the findings from experimental and epidemiological studies. It also addresses the complexities of interpreting this evidence in the context of public health, highlighting the urgent need for further research. https://doi.org/10.3345/cep.2024.00556

Fetal exposure to phthalates and body mass index from infancy to adolescence. The Generation R study,
Sol, C. M., Delgado, G., Kannan, K., Jaddoe, V. W. V., Trasande, L. and Santos, S., *Environmental Research*, Jun 2025, Vol. 274.
Prenatal exposure to phthalates might influence the development of childhood obesity. Most previous studies used body mass index (BMI) at a specific age instead of BMI development, which

might be a better indicator of later health. We aimed to assess the association of prenatal phthalate exposure with longitudinal BMI development from infancy to adolescence. Among 1,379 mother-child pairs from a population-based cohort study, phthalate concentrations were measured in maternal spot urine samples, collected during first, second and third trimester. We estimated age- and sex-adjusted BMI standard deviation scores (SDS) at 6 months and 1, 2, 3, 4, 6, 10 and 13 years. We examined the associations of maternal phthalate urine concentrations during pregnancy with repeated measures of BMI using linear mixed effects models. An interquartile range higher natural logtransformed maternal first trimester high-molecular weight phthalate and di-2-ethylhexylphthalate (DEHP) urine concentrations were associated with a -0.10 (95% confidence interval (CI) -0.15 to -0.04), and -0.09 (95% CI -0.15 to -0.04) lower age- and sex-adjusted BMI at 6 months. An interquartile range higher natural logtransformed maternal first trimester phthalic acid and low-molecular weight phthalate urine concentrations were associated with a 0.11 (95% CI 0.03 to 0.18) and 0.13 (95% CI 0.04 to 0.21) higher age- and sex-adjusted BMI at 13 years old. No significant associations were observed for maternal second and third trimester phthalate urine concentrations with BMI. Thus, higher maternal phthalate metabolites urine concentrations appear to be related to lower BMI at early ages but with higher BMI at later ages.
https://doi.org/10.1016/j.envres.2025.121253

Adverse Effects of Pesticides on the Ovary: Evidence from Epidemiological and Toxicological Studies,
Wang, L. P., Ma, X. C. and Liu, J., *Environment & Health*, Mar 2025.
Pesticides are widely used in agriculture, public health, and residences to control pests and insects. The safety of exposure to pesticides has raised concerns due to their presence in the environment and their potential effects on human health. The ovary is the major female reproductive organ and is considered a potential target organ for pesticide toxicity. This comprehensive Review examines the adverse effects of pesticide exposure on the ovary based on evidence from human biomonitoring, epidemiological studies, and toxicological studies. Epidemiological studies have shown that pesticide exposures are associated with early/delayed menarche, menstrual cycle disorders, early menopause, long time to pregnancy, polycystic ovary syndrome, primary ovarian insufficiency, infertility, and implantation failure in women. Both in vivo and in vitro studies have shown that exposure to pesticides disrupts the estrous cycle, reduces the follicle pool, alters hormone levels, and impairs oocyte maturation. Mechanisms of action of pesticides on ovarian function include effects on steroid receptors, hormone synthesis, oxidative stress, inflammation, epigenetic modifications, and signaling pathways. Gaps in knowledge and further research needs include prospective cohort studies with adequate sample sizes to elucidate the effects of different classes of pesticides (especially emerging insecticides, herbicides and fungicides) and mixture exposures on ovarian health, the development of effective toxicological models that can approximate or simulate realistic human exposure scenarios, and the translation of toxicological findings into measurable indicators that can be used in human health risk assessment. In summary, this Review aims to improve the understanding of the risk to women's reproductive health from exposures to pesticides and to provide insights into strategies for preventing and managing reproductive health risks. https://doi.org/10.1021/envhealth.4c00243

Association between ethylene oxide exposure and serum sex hormone levels measured in a reference sample of the US general population,
Wu, W. H., Wu, J. N., Hou, Z. B., Yan, Q., Qin, K. X., Zhao, Y., Zhang, H., Zhu, Y. K., He, J. H. and Li, J., *Frontiers in Endocrinology*, Apr 2025, Vol. 16.
Ethylene oxide (EO) is a crucial organic compound commonly utilized in industrial and medical products. Food and Drug Administration (FDA)-approved EO sterilization sterilizes about 50% of sterile medical devices in the U.S. Animal and human studies have suggested that EO exposure may

result in severe health problem. However, studies evaluating the relationship between EO exposure and sex hormones in human populations are still lacking. Therefore, further investigation into EO's effects on humans is essential. This cross-sectional study within the U.S. National Health and Nutrition Examination Survey (NHANES),2013-2016 examined the relationship between EO-hemoglobin adducts (HbEO) and sex hormones. HbEO was found to be inversely associated with estradiol (E2) and positively associated with the ratio of total testosterone (TT) to E2 and sex hormone-binding globulin (SHBG) levels in adult males. Such associations HbEO and E2 and SHBG were non-linear in male adults. However, no significant associations were found between HbEO and sex steroids across various age groups of females and all male age groups except for adults. Thus, our study provides evidence that EO may potentially serve as an endocrine disruptor in the environment, affecting the levels of sex hormones in adult males.
https://doi.org/10.3389/fendo.2025.1533516

Exploring the relationships between prenatal phthalate exposure and neonatal thyroid function: A prospective cohort study,
Xiong, Z. Y., Mahai, G., Wang, A. Z., Li, F. S., Qian, X., Huang, Y. Z., Li, Y. Y., Xia, W. and Xu, S. Q., *Journal of Hazardous Materials*, Jul 2025, Vol. 492.
Previous studies have reported the thyroid disruptive effects of prenatal phthalate exposure; however, evidence on the impact of prenatal phthalate alternative exposure on neonatal thyroid function is still limited. We aimed to investigate the associations between prenatal exposure to phthalates and phthalate alternatives (individually and as a mixture) and neonatal thyroid function, based on longitudinal data from the Wuhan Healthy Baby Cohort Study. We measured concentrations of phthalate and phthalate alternative metabolites (mPAEs) in urine samples, provided by 1202 mothers at three trimesters, and neonatal thyroid stimulating hormone (TSH) levels in heel-prick blood samples. The results suggested higher levels of some mPAEs, particularly monomethyl phthalate (MMP) and mono-2-ethyl-5-Carboxypentyl terephthalate (MECPTP), were associated with increased neonatal TSH. Interquartile range (IQR) increases of mPAEs were associated with an increase in TSH ranging from 8.21 % to 13.5 %, and the associations were more likely to occur in girls. Quantiles g-computation models revealed that joint exposure to phthalates was significantly associated with increased TSH in three trimesters, MEOHP and MMP were the most predominant contributors to the positive associations. The research results imply that prenatal phthalate exposure may interfere with thyroid hormone homeostasis, which warrants further replication. https://doi.org/10.1016/j.jhazmat.2025.138132

Microbial Disturbances Caused by Pesticide Exposure and Their Predictive Implications for Gestational Diabetes Mellitus,
Yang, X., Zhang, Y. Q., Xu, Y. F., Xu, Y. D., Zhang, M. Z., Guan, Q. Q., Hu, W. Y., Tun, H. M. and Xia, Y. K., *Environmental Science & Technology*, May 2025, Vol. 59, no. 19, p. 9449-9460.
Previous studies have suggested that pesticide exposure and gut microbiome alterations are associated with gestational diabetes mellitus (GDM) risk. Understanding the complex interactive effect of these factors on GDM is essential. In a cohort of 852 pregnant women, we assessed pesticide levels in serum and analyzed the gut microbiota using 16S rRNA and shotgun metagenomic sequencing. We explored the interactions between pesticides and gut microbiota, assessed their roles in GDM development, and proposed a predictive model based on identified biomarkers. We identified an environmental risk score (ERS), denoting the pesticide mixture level significantly associated with GDM, with the gut microbiota, particularly involving the Dorea branch, playing a crucial mediating role. In addition, we found an interactive effect of pesticide exposure and gut microbiota on GDM risk. Notably, low Prevotella enrichment combined with high ERS arisen from pesticide levels led to a 10.36-fold increased GDM risk. The identified pesticide and gut microbial biomarkers achieved high predictive accuracy for GDM (AUC: 0.833, 95% CI: 0.748-0.918).

Collectively, maternal pesticide exposure may induce disrupted microbiome-dependent glycemic alteration, necessitating future assessment of clinical implications. Potential GDM markers can serve as targets for therapeutic intervention caused by pesticides, leading to prevention. https://doi.org/10.1021/acs.est.5c01076

Associations between urinary phthalate metabolites and reproductive, adrenal, and gonadotropic hormones in peripubertal children: the Hokkaido study,
Yasuda, A., Bamai, Y. A., Yamaguchi, T., Ketema, R. M., Zeng, Y., Marsela, M., Ikenaka, Y., Nakamura, A., Kitta, T., Kon, M., Manabe, A., Kishi, R., Kojima, H. and Ikeda, A., *Environmental Research*, Jul 2025, Vol. 276.
Phthalates have raised concerns regarding the disruption of hormone synthesis and signaling. The purpose of this study was to investigate the associations between urinary phthalate metabolites and 18 hormones, including reproductive, adrenal, and gonadotropic hormones, in peripubertal children. The study comprised a crosssectional analysis of participants in the Hokkaido Birth Cohort Study. We collected data from 429 school children aged 9-12 living in Sapporo, Japan. Ten phthalate metabolites and 14 steroid hormones were analyzed using LC-MS/MS, whereas four peptide hormones were detected using immunoassays. Multivariable linear regression, quantile-based g-computation (qg-computation), and Bayesian kernel machine regression (BKMR) were used to investigate the associations between the individual phthalate metabolites and the phthalate mixtures with hormone levels, as well as with puberty based on hormone levels. In girls, we found that higher phthalate metabolite levels, as well as phthalate mixtures, were significantly associated with lower dehydroepiandrostenedione-sulfate (DHEA-S) and higher (androstenedione + testosterone)/DHEA-S. The higher phthalate mixture showed lower levels of LH, FSH, and cortisol levels among girls, whereas higher 11-deoxycortisol levels. In boys, a higher phthalates mixture was significantly associated with a higher estradiol/testosterone ratio, whereas lower levels of insulin-like factor-3 (INSL3), testosterone, (androstenedione + testosterone)/ DHEA-S, testosterone/androstenedione, and cortisol/cortisone. Higher phthalate mixtures were associated with lower prevalence of puberty in girls. These findings indicate that phthalate exposure may disrupt the hormones in children during puberty. https://doi.org/10.1016/j.envres.2025.121535

Association Between Endocrine-Disrupting Chemicals Exposure and Attention-Deficit/Hyperactivity Disorder Symptoms in Children With Attention-Deficit/ Hyperactivity Disorder,
Yeo, K. E., Lim, S., Kim, A., Lim, Y. B., Lee, C. R., Kim, J. I. and Kim, B. N., *Journal of the Korean Academy of Child and Adolescent Psychiatry*, Jan 2025, Vol. 36, no. 1, p. 18-25.
Objectives: This study investigated the relationship between exposure to endocrine-disrupting chemicals (EDCs), specifically phthalates, bisphenol A, bisphenol F, and bisphenol S, and the severity of attention-deficit/hyperactivity disorder (ADHD) symptoms using neuropsychological tests in children diagnosed with ADHD. Methods: This study included 67 medication-na & iuml;ve children with ADHD aged 6-16 years. The urinary concentrations of EDCs were measured, and ADHD symptom severity was evaluated using neuropsychological tests and clinical symptom scale measurements. The Jonckheere-Terpstra test, Pearson and Spearman correlation analyses, linear regression models, and multiple regression models were used to examine the relationship between EDC exposure and ADHD symptoms. Results: A significant correlation was observed between urinary phthalate metabolite concentrations and commission error T-scores in the visual Advanced Test of Attention test. No significant associations were found with other neuropsychological indicators or bisphenol levels. Conclusion: Phthalate exposure affects impulsivity in children with ADHD, which is consistent with the results of previous studies that used parental surveys. However, bisphenols are not clearly associated with ADHD symptoms, which is consistent with the results of previous studies. https://doi.org/10.5765/jkacap.240035

Association between per- and polyfluoroalkyl substance exposures and thyroid homeostasis parameters.
Yu, X., Liu, Y., Wang, M., Jia, P., Yang, S., Sun, F., Jin, Y., Wang, X., Guo, Z. *The Journal of Clinical Endocrinology & Metabolism*, dgae798,
CONTEXT: Prevailing studies have shown the disruption effect of per- and polyfluoroalkyl substances (PFAS) on thyroid homeostasis. However, most studies focused on individual thyroid hormones. OBJECTIVE: To explore the associations between PFAS exposures and thyroid homeostasis parameters. METHODS: A total of 2386 adults from NHANES (2007-2008 and 2011-2012) were included. Thyroid homeostasis parameters included central and peripheral thyroid hormone sensitivity, calculated by thyroid hormones. Multivariable survey-weighted linear regressions were performed to determine the association between PFAS exposure and thyroid homeostasis parameters. The weighted quantile sum (WQS) and the quantile g-computation (QGC) models were used to estimate the mixed effects of co-exposures to PFAS. RESULTS: The ratio of free triiodothyronine/free thyroxine (FT3/FT4) and the sum activity of peripheral deiodinases (SPINA-GD) were positively associated with perfluorooctanoic acid (PFOA), perfluorooctanesulfonic acid, perfluorononanoic acid and perfluorohexane sulfonic acid, respectively. However, no significant associations were observed between PFAS exposure and central thyroid sensitivity parameters. PFAS co-exposures was positively associated with FT3/FT4 (β = 0.013, P < 0.001) and SPINA-GD (β = 1.230, P < 0.001) in WQS models. Consistently, PFAS concentrations per quantile was linked to an increase in FT3/FT4 (β = 0.004, P = 0.002) and SPINA-GD (β = 0.392, P = 0.008) in GQC models, with PFOA having the highest weight in all models. CONCLUSION: This study revealed that PFAS exposures may affect peripheral thyroid hormone sensitivity instead of central among U.S. general adults, enhancing our understanding of the correlation between PFAS exposure and thyroid hormones and providing insights into potential health implications. https://doi.org/10.1210/clinem/dgae798

First evidence in the association of phenolic endocrine-disrupting chemicals with secondary non-alcoholic fatty liver disease: A case-control study in South China,
Zhang, H. L., Feng, S., Song, S. M., Zhao, Q., Gao, Y. X. and Zhang, T., *Environmental Pollution*, May 2025, Vol. 373.
The presence of phenolic endocrine disrupting chemicals (EDCs) in patients with secondary non-alcoholic fatty liver disease (S-NAFLD) and their associations with S-NAFLD incidence have not been previously documented. In this study, serum concentrations of 32 phenolic EDCs, including parabens, benzophenone-type UV-filters, bisphenols, and bisphenol A diglycidyl ether derivatives, were detected in patients with S-NAFLD as well as healthy population from South China. These target EDCs were ubiquitous in serum samples from both cohorts. Interestingly, significantly higher (p < 0.05) serum levels of most analytes were detected in individuals with S-NAFLD compared to those in the healthy population. Through multiple modeling analyses, we observed that parabens and bisphenols mixtures were positively associated with S-NAFLD incidence. A list of high-risk EDCs for S-NAFLD-related diseases was identified, including propyl paraben (PrP), butyl paraben (BuP), bisphenol A (BPA), and bisphenol AP (BPAP). Furthermore, significant positive correlations were found between the serum levels of these high-risk analytes and liver clinic indices. To the best of our knowledge, this study firstly examined the serum levels of multiple phenolic EDCs in patients with S-NAFLD, aiming to provide novel insights into high-risk EDCs associated with S-NAFLD incidence and their associations with clinic liver indices. https://doi.org/10.1016/j.envpol.2025.126086

Association between exposure to perfluoroalkyl substances (PFASs) and risk of hyperemesis gravidarum,
Zhang, L., Ma, X. X., Su, T., Wang, Y., Hai, M. M., Qi, F. F., Ma, L., Zhang, S. M. and Lin, J., *Environmental Pollution*, May 2025, Vol. 373.

The fluctuation of endocrine hormones during early pregnancy plays an important role in the pathogenesis of hyperemesis gravidarum (HG). As an endocrine disrupting chemical (EDC), perfluoroalkyl substances (PFASs) exert an impact on pregnancy-related complications by altering hormone balances throughout gestation. Despite this potential impact, the relationship between serum PFAS levels in early pregnancy and the risk of HG has not been previously investigated. A total of 98 HG cases and 495 controls were included in this study from the Xi'an Birth Cohort Study. In total, serum levels of 10 PFASs were measured using High Performance Liquid Chromatography with tandem Mass Spectrometry (HPLC-MS/MS) during early pregnancy. Binary logistic models were applied to evaluate the associations between individual PFAS levels and HG. Weighted quantile sum (WQS) regression models and Bayesian kernel machine regression (BKMR) models were performed to test the overall effect of the PFAS mixture on HG. After adjusting for confounding variables, the highest tertile concentrations of perfluoroundecanoic acid (PFUnDA) (OR: 3.49, 95 %CI: 1.31-9.29), and perfluorododecanoic acid (PFDoA) (OR: 3.13, 95 % CI: 1.40-6.98) were significantly associated with a higher risk of HG, while highest tertile of perfluorohexanoic acid (PFHxA) (OR: 0.34; 95 % CI: 0.16-0.73), and PFOS (OR: 0.35; 95 % CI: 0.13-0.97) were inversely associated with HG. The WQS index showed a positive correlation with HG risk (beta = 0.80; 95 % CI: 0.02, 1.57), with notable contributions from PFDoA (0.952), PFUnDA (0.159), and perfluorobutanoic acid (PFBA) (0.146). In addition, the joint effect of the PFAS mixture was positively associated with HG, with PFDoA (posterior inclusion probability (PIP) = 0.78) and PFUnDA (PIP = 0.75) being identified as the primary contributors. Our findings indicate that exposure to PFAS mixture during early pregnancy was associated with an increased risk of HG, with PFDoA and PFUnDA being the major contributors. https://doi.org/10.1016/j.envpol.2025.126103

Association between urinary polycyclic aromatic hydrocarbons and childhood obesity index: a cross-sectional study in China,
Zhang, Q., Wu, D., Luo, J., Chen, Z. X., Wang, Y. J., Tian, Y., He, Z. W. and Liu, Q., *Human and Ecological Risk Assessment*, Apr 2025, Vol. 31, no. 3-4, p. 587-604.
Polycyclic aromatic hydrocarbons (PAHs), known as endocrine disruptors, may be linked to obesity. This study examines the associations between four urinary PAH metabolites and the body mass index (BMI), waist-to-hip ratio (WHR), and waist-to-height ratio (WHtR) in children. Using the generalized linear model (GLM), restricted cubic spline (RCS), weighted quantile sum (WQS) regression, and Bayesian kernel machine regression (BKMR) analyses, the associations between urinary PAH metabolites and obesity indicators were revealed. A total of 1409 children (675 boys, 734 girls) with means age of 10.19 and 9.25 years, respectively, were enrolled. The study identified a significant association between the fourth quartile of 1-hydroxypyrene and elevated BMI in boys. Additionally, the third and fourth quartiles of 2-hydroxyfluorene, as well as the second quartile of 9-hydroxyphenanthrene were linked to increased BMI in boys. For girls, the upper two quartiles of 9-hydroxyphenanthrene were independently associated with higher BMI and WHtR. Although nonlinear associations were not significant using RCS, 9-hydroxyphenanthrene demonstrated a significant positive correlation with both BMI and WHtR among girls. PAH mixtures were positively correlated with BMI in both genders and with WHtR in girls, with 2-hydroxyfluorene and 9-hydroxyphenanthrene being particularly influential in obesity. Gender differences in PAHs' obesogenic effects are observed. https://doi.org/10.1080/10807039.2025.2470759

Associations of endocrine-disrupting chemicals mixtures with serum lipid and glucose metabolism among overweight/obese and normal-weight children: A panel study,
Zhang, Y. Y., Zhang, B., Yang, H. H., Liu, M., Wang, J., Zhao, L., Guo, W. T., Li, M., Lai, X. F., Yang, L. L., Meng, X., Wang, C. J., Zhang, Z. H. and Zhang, X. M., *Ecotoxicology and Environmental Safety*, Apr 2025, Vol. 294.

Background: Endocrine-disrupting chemicals (EDCs) can disturb lipid and glucose metabolism, but few studies have explored the effects of EDC mixtures and underlying inflammation mechanisms in weight-specific children. Methods: We conducted a panel study with 3 repeated visits among 144 children aged 4-12 years. For each visit, participants provided morning urine samples for 4 consecutive days and fasting blood samples on day 4. A total of 36 EDCs were measured, including 10 per- and polyfluoroalkyl substances (PFAS), 3 phenols, 3 parabens, 10 phthalates, and 10 polycyclic aromatic hydrocarbons. We used quantile g-computation, grouped weighted quantile sum (GWQS) regression, and linear mixed-effect models to evaluate and validate the associations of the mixture and individual effects of EDCs on lipid and fasting blood glucose (FBG). Further, mediation models were applied to explore the potential role of cytokines in the relationships of EDCs and outcomes. Results: A quantile increase in EDC mixtures was associated with elevated triglyceride (TG) ((3 = 0.18, 95 % CI: 0.04, 0.33) and FBG ((3 = 0.02, 95 % CI: 0.01, 0.04). Also, GWQS regression revealed that PFAS contributed the most to the overall effects for TG and FBG, followed by phenols. These associations were more pronounced in overweight/obese children. Regarding individual pollutants, we observed positive relationships of several PFAS with TG and FBG. Furthermore, chemokine ligand 2 mediated the associations of PFAS with TG among overweight/obese children. Conclusions: The present study suggested that the EDC mixtures were associated with elevated lipid and glucose levels among children, particularly for those with overweight/obesity. https://doi.org/10.1016/j.ecoenv.2025.118077

Associations between in utero exposure of per- and polyfluoroalkyl substances (PFAS) mixture and anthropometry measures at birth,
Zhao, N., Zhang, X. Z., Li, Y. H., Zhang, H. Y., Yang, E., Ding, L. and Liu, Y., *Environmental Pollution*, May 2025, Vol. 373.
In utero exposure to per-and polyfluoroalkyl substances (PFAS), which are recognized developmental toxicants, potentially leads to decreased anthropometric measures in infants at birth. We analyzed 16 PFAS in 350 cord serum samples from Jinan, China, using ultra-high-performance liquid chromatography integrated with Orbitrap mass spectrometry. Birth length, birth weight, and head circumference were extracted from medical records and converted into z-scores (BL-z, BW-z and HC-z, respectively). Multivariable linear regression (MLR) models were employed to investigate the associations between individual PFAS and these birth anthropometric z-scores. To assess the cumulative effects of PFAS, quantile g-computation (QGC) and Bayesian kernel machine regression (BKMR) models were employed. Additionally, stratified analyses were performed to derive sex-specific estimates of the associations. MLR analysis revealed significant associations between specific PFAS and reduced birth anthropometric measures varying by infant sex. For example, log2-transformed concentration of cord serum perfluorooctanoic acid (PFOA) was associated with reduced BL-z (beta =-0.12 (-0.18,-0.06), p < 0.001) and BW-z (beta =-0.20 (-0.31,-0.10), p < 0.001) in all infants. Perfluoroheptanesulfonic acid (PFHpS) was inversely associated with BL-z (beta =-0.07 (-0.13,-0.02), p = 0.03) and HC-z (beta =-0.06 (-0.11,-0.02), p = 0.01) exclusively in males. BKMR and QGC models suggested general negative dose-response pattern between exposure to PFAS mixtures and BL-z, BW-z, and HC-z in males. Conversely, these associations were not evident in females. The key PFAS identified as contributors to the joint effects, along with the directions of their estimated impacts as determined by the mixture methods, showed marginal consistency with the results obtained from the MLR models. Our study underscored that in utero exposure to certain PFAS was associated with reduced anthropometric measures at birth. Male infants were more susceptible to PFAS exposure, particularly to combined PFAS mixture effects.
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Urinary concentrations of phthalate metabolites and the survival of high-grade serous ovarian cancer with advanced stage,
Zheng, W. R., Li, Y. Z., Xu, J., Liu, K. X., Liu, F. H., Xing, W. Y., Liu, J. X., Wu, L., Li, X. Y., Huang, D. H., Gong, T. T. and Wu, Q. J., *Environmental Pollution*, Apr 2025, Vol. 370.
Phthalates have been reported to increase the risk of various hormone-dependent cancers. However, there is still a lack of evidence regarding the association between phthalates and overall survival (OS) in advanced high-grade serous ovarian cancer (HGSOC). This study investigated the relationship between urinary phthalate metabolites and OS in patients with HGSOC using a nested case-control study within the Ovarian Cancer Follow-Up Study. We matched 159 deceased patients with HGSOC to 159 survivors by age at diagnosis, body mass index, and sampling date. Spot urine samples were analyzed for ten phthalate metabolites and five classes of phthalate molar sums via mass spectrometry. Conditional logistic regression models were employed to calculate odds ratios (ORs) and 95% confidence intervals (CIs), comparing the highest tertile with the lowest. We found that the highest tertiles of mono-2-ethyl-5-oxohexyl phthalates and monoethyl phthalates were associated with poorer OS, with ORs (95%CIs) being 4.24 (1.46, 12.32) and 3.28 (1.16, 9.22), respectively. Additionally, the highest tertiles of the sum of di(2-ethylhexyl) phthalate metabolites, the sum of high-molar-weight phthalate metabolites, and the sum of 10 phthalate metabolites, were associated with worse OS, with ORs (95%CIs) were 18.4 (4.14, 81.87), 9.28 (2.87, 30.08), and 5.94 (2.00, 17.64), respectively. Our study suggests that exposure to high levels of phthalates may be associated with poorer OS in patients with advanced HGSOC, particularly exposure to di(2-ethylhexyl) phthalates. Since it is widely used in personal care products, avoiding the use of these products may improve the OS of patients with HGSOC.
https://doi.org/10.1016/j.envpol.2025.125895

Association and binding interaction between per- and polyfluoroalkyl substances and maternal thyroid hormones: A case study based on a prospective birth cohort in Wuxi, China,
Zhou, Y. H., Xu, L. L., Yan, Y., Li, Y., Wang, S. A., Ding, X. L., Zhu, P. F., Jiao, J. D., Zhang, L., Ma, J. Q. and Chen, L. M., *Environmental Research*, Jun 2025, Vol. 275.
Background and aim: The relationship between prenatal exposure to per- and polyfluoroalkyl substances (PFASs), a well-known endocrine disruptor, and thyroid hormones (THs) levels remains unclear. Therefore, this study aimed to investigate this relationship in a birth cohort during the second trimester. Method: This prospective study included 562 pregnant women in the Wuxi Birth Cohort from 2019 to 2021 and quantified the serum concentrations of 23 PFASs and 5 THs. Multiple statistical models were used to assess the associations between individual or combined PFASs concentrations and THs, while molecular docking simulated the interactions between PFASs and four thyroid-related proteins. Results: The median concentration of & sum;23PFASs was 71.91 ng/mL, with perfluorovaleric acid (PFPeA) (18.13 ng/ mL) emerging as the predominant PFAS. Most PFASs were negatively associated with maternal free thyroxine (FT4) and thyroid-stimulating hormone (TSH) levels, whereas perfluorobutane sulfonate (PFBS) was positively correlated with TSH levels. A similar trend was observed in the weighted quantile sum (WQS) model, in which combined PFASs exposure was inversely associated with the FT4 and TSH levels. Molecular docking results showed that compared with TH natural ligand thyroxine (T4), perfluorooctanoic acid (PFOA), perfluorooctane sulfonate (PFOS), and 6:2 chlorinated polyfluorinated ether sulfonate (6:2 Cl-PFESA) exhibited relatively high binding affinity with thyroid-related proteins (-6.6 to-9.8 kcal/mol vs. T4:-5.6 to-8.6 kcal/mol). Furthermore, PFASs with medium chain lengths and sulfonic acid groups exhibited enhanced protein-binding properties. Conclusion: PFASs exposure may affect THs homeostasis during pregnancy. Moreover, different types and concentrations of PFASs have different effects on THs in the maternal serum. https://doi.org/10.1016/j.envres.2025.121439

Toxicité sur l'homme

In Vitro Exposure to the Endocrine-Disrupting Chemical Climbazole Impairs Human Sperm Motility, Hormonal Signalling, and Mitochondrial Activity,
Annunzi, E., Luongo, F. P., Girolamo, F., Ponchia, R., Passaponti, S., Piomboni, P. and Luddi, A., *Cells*, Mar 2025, Vol. 14, no. 6.
This study explores the endocrine-disrupting effects of climbazole (CBZ), an environmental and lifestyle stressor, on male fertility. The impact of CBZ on sperm vitality, motility, and molecular pathways related to hormone receptors and apoptosis was evaluated, in non-capacitated and capacitated conditions. Gene expression of key components, including hormone receptors (ESR1, ESR2, FSHR, AR), apoptosis-related genes (BAX, BCL2), and COX4l1 (involved in mitochondrial function), was analyzed. Protein tyrosine phosphorylation, a marker of capacitation, was also examined using immunofluorescence and Western blot analysis. We demonstrated that CBZ significantly reduced sperm vitality at concentrations above 25 mu M and motility at 1 and 10 mu M in non-capacitated and capacitated conditions. Changes in tyrosine phosphorylation patterns were also observed. Gene expression analysis revealed an upregulation of ESR1, ESR2, FSHR, and BAX, while AR and COX4l1 expression were downregulated. These findings offer new insights into the potential endocrine-disrupting and cytotoxic effects of CBZ, highlighting its potential role in compromising male reproductive health. https://doi.org/10.3390/cells14060427

Bisphenol A and DDT disrupt adipocyte function in the mammary gland: implications for breast cancer risk and progression,
Bernhardt, S. M. and House, C. D., *Frontiers in Oncology*, Feb 2025, Vol. 15.
As breast cancer incidence continues to rise worldwide, there is a pressing need to understand the environmental factors that contribute to its development. Obesogens, including Bisphenol A (BPA) and Dichlorodiphenyltrichloroethane (DDT), are highly prevalent in the environment, and have been associated with obesity and metabolic dysregulation. BPA and DDT, known to disrupt hormone signaling in breast epithelial cells, also promote adipogenesis, lipogenesis, and adipokine secretion in adipose tissue, directly contributing to the pathogenesis of obesity. While the adipose-rich mammary gland may be particularly vulnerable to environmental obesogens, there is a scarcity of research investigating obesogen-mediated changes in adipocytes that drive oncogenic transformation of breast epithelial cells. Here, we review the preclinical and clinical evidence linking BPA and DDT to impaired mammary gland development and breast cancer risk. We discuss how the obesogen-driven mechanisms that contribute to obesity, including changes in adipogenesis, lipogenesis, and adipokine secretion, could provide a pro-inflammatory, nutrient-rich environment that promotes activation of oncogenic pathways in breast epithelial cells. Understanding the role of obesogens in breast cancer risk and progression is essential for informing public health guidelines aimed at minimizing obesogen exposure, to ultimately reduce breast cancer incidence and improve outcomes for women. https://doi.org/10.3389/fonc.2025.1490898

Insecticides and testicular health: mechanisms of injury and protective natural products,
Darwish, S. F., Moustafa, Y. M., Mageed, S. S. A., Hassan, G. S., Mangoura, S. A., Aly, S. H., Mansour, M. A., Raouf, A. A., Sallam, A. M., Fawzi, S. F., Atta, A. M., Elazazy, O., El-Dakroury, W. A., El-Demerdash, A. A., Esmat, E. M., Elrebehy, M. A. and Doghish, A. S., *Naunyn-Schmiedebergs Archives of Pharmacology*, Mar 2025.
In agriculture and public health, insecticides are vital chemicals that help manage diseases and control pests. However, their extensive use has raised concerns about their negative consequences on both humans and animals. Pesticide exposure impacts numerous human organs, including the reproductive system. Infertility is caused by reproductive system disorders, which is why they have received a lot of attention in recent decades. According to what is currently known, insecticides are

among the substances that may lower the quality of the semen produced by exposed workers. The mechanisms of this action are still unclear, even though numerous underlying mechanisms have been suggested. With an emphasis on the harmful effects of insecticides on male reproductive processes, this review provides a thorough analysis of the toxicity profile of these substances. To reduce insecticides' negative impacts on human and animal health and to direct future research initiatives, it is essential to comprehend their harmful consequences.
https://doi.org/10.1007/s00210-025-04016-y

Mechanisms of developmental neurotoxicity mediated by perturbed thyroid hormone homeostasis in the brain: an adverse outcome pathway network,
Dierichs, N., Piersma, A. H., Peeters, R. P., Visser, W. E., Meima, M. E. and Hessel, E. V. S., *Critical Reviews in Toxicology*, Mar 2025, Vol. 55, no. 3, p. 304-320.
Thyroid hormone (TH) is crucial for proper neurodevelopment. Insufficient TH concentrations in early life are associated with lower IQ and delayed motor development in children. Intracellular levels of TH are modulated via the transmembrane transport of TH and intracellular deiodination, and can mediate gene transcription via binding to the nuclear TH receptor. Chemical exposure can disrupt TH homeostasis via modes of action targeting intracellular mechanisms, thereby potentially influencing TH transport, deiodination or signaling. Understanding the cause and effect relationships of chemical hazards interfering with TH homeostasis in the developing brain is necessary to identify how chemicals might disturb brain development and result in neurodevelopmental disorders. Adverse Outcome Pathways (AOPs) can provide a template for mapping these relationships, and so far multiple AOPs have been developed for TH homeostasis and adverse effects on cognition. The present review aims to expand current AOP networks by (1) summarizing the most important factors in the regulation of brain development under influence of TH, (2) integrating human-based mechanistic information of biological pathways which can be disturbed by TH disrupting chemicals, and (3) by incorporating brain-specific TH-mediated physiology, including barriers and cell specificity, as well as clinical knowledge. TH-specific pathways in the fetal brain are highlighted and supported by distinguishing cell type specific Molecular Initiating Events (MIEs) and downstream Key Events (KEs) for astrocytes, neurons and oligodendrocytes. Two main pathways leading to adverse outcomes (AOs) in the areas of 'cognition' and 'motor function' are decreased myelination due to oligodendrocyte dysfunction, and decreased synaptogenesis and network formation via the neurons. The proposed AOP framework can form a basis for selecting developmental neurotoxic in vitro and in silico test systems for an innovative human-focused hazard testing strategy and risk assessment of chemical exposure.
https://doi.org/10.1080/10408444.2025.2461076

Per- and polyfluoroalkyl substances as persistent pollutants with metabolic and endocrine-disrupting impacts,
Gaillard, L., Barouki, R., Blanc, E., Coumoul, X. and Andreau, K., *Trends in Endocrinology and Metabolism*, Mar 2025, Vol. 36, no. 3, p. 249-261.
The widespread use of per- and polyfluoroalkyl substances (PFASs), and their resistance to degradation, renders human exposure to them inevitable. PFAS exposure disturbs endocrine function, potentially affecting cognitive development in newborns through thyroid dysfunction during pregnancy. Recent studies reveal varying male and female reproductive toxicity across PFAS classes, with alternative analogs affecting sperm parameters and legacy PFASs correlating with conditions like endometriosis. Metabolically, PFASs exposure is linked to metabolic disorders, including obesity, type 2 diabetes mellitus (T2DM), dyslipidemia, and liver toxicity, particularly in early childhood. This review focuses on the endocrine-disrupting impact of PFASs, particularly on fertility, thyroid, and metabolic functions. We highlight the complexity of the PFAS issue, given the

large number of molecules and their extremely diverse mixed effects. https://doi.org/10.1016/j.tem.2024.07.021

Impact of Persistent Endocrine-Disrupting Chemicals on Human Nuclear Receptors: Insights from In Silico and Experimental Characterization,
Ganesh, H., Moran, J., Roy, S., Mathew, J., Ackah-Blay, J., Costello, E., Shan, P. and Dakshanamurthy, S., *International Journal of Molecular Sciences*, Mar 2025, Vol. 26, no. 7.
Endocrine-disrupting chemicals (EDCs) are notable for their persistence, bioaccumulation, and associations with cancer. Human nuclear receptors (hNRs) are primary targets disrupted by these persistent EDCs, resulting in alterations to xenobiotic metabolism, lipid homeostasis, and endocrine function, which can lead to carcinogenic effects. Despite their hazardous effects, comprehensive studies on EDC interactions and their impacts on hNRs remain limited. Here, we profiled the interactions of persistent EDCs, including PFAS, plastic additives, bisphenols, polybrominated diphenyl ethers, and phthalates, with key hNRs such as PXR, CAR, PPAR alpha, PPAR gamma, PPAR delta, AR, and ROR gamma t. Through controlled molecular docking simulations, we observed strong binding of the EDCs to these receptors. Further analysis showed that EDCs exhibit strong binding activity towards hNRs by preferentially interacting with hydrophobic amino acids, namely leucine, isoleucine, methionine, and phenylalanine. PFAS demonstrated the highest binding affinity, characterized by a combination of complementary hydrophobic interactions from their fluorinated carbon chains and polar interactions from their functional groups (e.g., carboxylate, sulfonate) across all receptors. Distinct polycyclic and hydrophobic trends, contributing to strong NR binding, were evident in non-PFAS and nonplastic EDCs. The hNR activity assay in HepG2 cells revealed agonistic effects of dicyclohexyl phthalate (DCHP) and di-2-ethylhexyl phthalate (DEHP) on most receptors, except for PPAR alpha. The hNR transcription factor pathway assay in HepG2 cells demonstrated increased gene expression of VDRE and PXR, suggesting potential chronic effects on xenobiotic metabolism and calcium homeostasis. Overall, our findings demonstrate the need for further research into the endocrine disruption and carcinogenic effects of these persistent EDCs. https://doi.org/10.3390/ijms26072879

The Ovary as a Target Organ for New Generation Bisphenols Toxicity,
Glód, P., Smoleniec, J., Marynowicz, W., Gogola-Mruk, J. and Ptak, A., *Toxics*, Feb 2025, Vol. 13, no. 3.
Bisphenols (BPs) are a group of organic compounds used extensively in plastics, coatings, and epoxy resins; they have been of concern recently due to their endocrine-disrupting effects. Among these, bisphenol A (BPA) is the most studied. Regulatory measures, such as the ban on BPA use in baby bottles by the European Union and its restricted use in thermal paper, reflect the growing awareness of the health risks of BPA. To mitigate these risks, analogs such as bisphenol S (BPS), bisphenol F (BPF), and others (BPAF, BPAP, BPB, BPP, BPZ) have been developed as alternatives. Despite their intended safety, these analogs have been detected in environmental media, including indoor dust and thermal receipt paper, as well as in human biological samples. Studies report their presence in urine at levels comparable to BPA, with BPS and BPF found in 78% and 55% of samples, respectively. In addition, BPs have been found in human follicular fluid (FF) at concentrations that could exert some paracrine effects on ovarian function and reproductive health. With the increased global production of BPs, occupational exposure and environmental contamination also increase. This review summarizes what is currently known about the effects of BPs on the ovary and the mechanisms by which PBs exert ovarian toxicity, with a particular focus on oogenesis, folliculogenesis, and steroidogenesis. Further, this review emphasizes their influence on reproductive functions and the need for further biosafety evaluations. https://doi.org/10.3390/toxics13030164

Phthalates and Non-Phthalate Plasticizers and Thyroid Dysfunction: Current Evidence and Novel Strategies to Reduce Their Spread in Food Industry and Environment,
Gorini, F., Tonacci, A., Sanmartin, C. and Venturi, F., *Toxics*, Mar 2025, Vol. 13, no. 3.
Thyroid hormones (THs) play a crucial role in various biological functions, including metabolism, cell growth, and nervous system development, and any alteration involving the structure of the thyroid gland and TH secretion may result in thyroid disease. Growing evidence suggests that phthalate plasticizers, which are commonly used in a wide range of products (e.g., food packaging materials, children's toys, cosmetics, medical devices), can impact thyroid function, primarily affecting serum levels of THs and TH-related gene expression. Like phthalate compounds, recently introduced alternative plasticizers can leach from their source material into the environment, particularly into foods, although so far only a very limited number of studies have investigated their thyroid toxicity. This review aimed at summarizing the current knowledge on the role of phthalate and non-phthalate plasticizers in thyroid dysfunction and disease, describing the major biological mechanisms underlying this relationship. We will also focus on the food industry as one of the main players for the massive spread of such compounds in the human body, in turn conveyed by edible compounds. Given the increasing worldwide use of plasticizers and the essential role of THs in humans, novel strategies should be envisaged to reduce this burden on the thyroid and, in general, on human health. https://doi.org/10.3390/toxics13030222

Identification of endocrine disrupting chemicals targeting NTD-related hub genes during pregnancy via in silico analysis,
Guo, J. J., Yu, H., Guo, Y. J., Liu, J. M., Chen, Y. Z. and Li, Z. Z., *Reproductive Toxicology*, May 2025, Vol. 134.
Neural tube defects (NTDs) represent severe congenital malformations of the central nervous system with multifactorial etiology, involving intricate gene-environment interactions that remain incompletely characterized. Endocrine disrupting chemicals (EDCs) are exogenous substances with hormone-disrupting properties that are ubiquitous in our surroundings. These chemicals pose a significant threat to human health, contributing to a range of diseases. Pregnant women are particularly vulnerable to the effects of EDCs, as these substances can traverse the placental barrier and impact the development of both the placenta and fetus. This study utilized placental and fetal transcriptome data to identify hub genes associated with NTDs during pregnancy. By leveraging the Comparative Toxicogenomics Database (CTD), we predicted the EDCs targeting these hub genes and performed molecular docking to assess their interactions. Our findings revealed four hub genes (CTSC, FCER1G, ITGB2, and LYVE1) in NTDs, with 72 EDCs identified as their targets. Molecular docking demonstrated that atrazine, bisphenol A (BPA) and diuron exhibited stable affinity with the proteins encoded by hub genes. These findings provide new insights into the environmental endocrine disruptors that affect the development of NTDs during pregnancy.
https://doi.org/10.1016/j.reprotox.2025.108904

Prioritizing endocrine-disrupting chemicals targeting systemic lupus erythematosus genes via Mendelian randomization and colocalization analyses,
Hong, Y. G., Shu, W. Y., Jiang, X. Y., Wang, Y., Chen, R. J., Yang, Q. R., Wang, D. Q., Shao, C. Y., Gao, S. and Hua, C. Y., *Ecotoxicology and Environmental Safety*, Apr 2025, Vol. 295.
Background: Systemic lupus erythematosus (SLE) is a multifactorial autoimmune disease, with both genetic and environmental influences contributing to its development. Among environmental factors, endocrine-disrupting chemicals (EDCs), present in plastics, pesticides, and personal care products, have been implicated in immune disruption. This study investigated the interactions between EDCs and SLE-associated genes to elucidate their role in SLE susceptibility. Methods: We employed Mendelian randomization (MR) and colocalization analyses to explore genetic predispositions and environmental interactions in SLE. Cis-expression quantitative trait loci (cis-

eQTL) data were obtained from the eQTLGen Consortium, and genome-wide association study (GWAS) data for SLE were acquired from the IEU Open GWAS database. MR analysis was performed to establish causal links between gene expression and SLE, and colocalization analysis was used to validate these associations. Results: Our analysis identified 18 genes causally associated with SLE. Among them, five genes (CDCA7, HOXA1, LRRC37A4P, HOXA5, and DND1P1) showed strong evidence of colocalization with SLE. Further, 28 EDCs, including bisphenol A, bisphenol S, and endosulfan, were found to interact with these key genes, potentially influencing immune function and exacerbating the genetic susceptibility to SLE. Conclusions: This study highlights the complex interactions between EDCs and genetic predisposition in SLE. The findings provide valuable insights into how environmental exposures, particularly EDCs, may contribute to the development and progression of autoimmune diseases like SLE. These results suggest potential targets for future therapeutic interventions and underscore the need for further research on gene-environment interactions in SLE. https://doi.org/10.1016/j.ecoenv.2025.118126

Impact of endocrine disruptors in cosmetics on reproductive function in males and females, Lasaneya, A., Saikia, Q., Dutta, S. and Kalita, J. C., *Journal of Environmental Science and Health Part C-Toxicology and Carcinogenesis*, Apr 2025, Vol. 43, no. 2, p. 184-207.
The cosmetic and personal care product (PCP) industries have bloomed in the last ten years. Many new brand names have established themselves with various lucrative advertisements, luring youths into their primary customers. Many chemicals infused into daily day-night creams or shampoo conditioners have been established as Endocrine Disrupting Chemicals (EDC). The unseen side of the coin has been flipped in this article in an attempt to relate the rising infertility issue with these products. The study aims to explore the potential adverse effects and risk assessment of the EDCs of cosmetics and personal care products, which highlights a thorough review to indicate whether chemicals such as parabens, phthalates, or UV filters are safe for reproductive physiology. EDCs may cause severe negative impacts on the reproductive systems of both males and females which include reproductive problems such as polycystic ovarian syndrome, hypospadias, cryptorchidism, ovarian cancer, endometriosis, and poor sperm quality. Despite the widespread usage and purchase of cosmetic products in the present world, little research has been conducted on the possible effects of cosmetic EDCs on health. Consequently, further in-depth research needs to be performed in this field for a better understanding of the reproductive risks caused by cosmetic EDCs.
https://doi.org/10.1080/26896583.2025.2498831

Plastic chemicals disrupt molecular circadian rhythms via adenosine 1 receptor in vitro, Mcpartland, M., Ashcroft, F. and Wagner, M., *Environment International*, Apr 2025, Vol. 198.
The adenosine 1 receptor (A1R) is a G protein-coupled receptor that transduces signals to regulate sleep-wake cycles and circadian rhythms. Plastic products contain thousands of chemicals, known to disrupt physiological function. Recent research has demonstrated that some of these chemicals are also A1R agonists, however, the extent to which such activation propagates downstream and results in cellular alterations remains unknown. Thus, we investigate whether chemicals extracted from polyurethane (PUR) and polyvinyl chloride (PVC) plastics disrupt circadian rhythms via agonism of A1R. We confirm that plastic chemicals in both plastics activate A1R and inhibit intracellular cAMP in U2OS cells. Notably, this inhibition is comparable to that induced by the highly specific A1R agonist 2 '-MeCCPA. To assess circadian disruption, we quantify temporal expression patterns of the clock genes PER2 and CRY2 at 4-h intervals over 48 h. Here, exposure to plastic chemicals shifts the phase in the oscillatory expression cycles of both clock genes by 9-17 min. Importantly, these effects are dosedependent and reversible when A1R is inhibited by a pharmacological antagonist. This demonstrates that plastic chemicals can disrupt circadian processes by interfering with A1R signaling and suggests a novel mechanism by which these and other chemicals may contribute to non-communicable diseases. https://doi.org/10.1016/j.envint.2025.109422

Parabens exposure and its impact on diabesity: A review,
Ramalho, A., Vale, A., Carvalho, F., Fernandes, E. and Freitas, M., *Toxicology*, Aug 2025, Vol. 515.
Parabens are a family of alkyl esters of 4-hydroxybenzoic acid. The most commonly used include methylparaben, ethylparaben, propylparaben, and butylparaben. These compounds have been reported to disrupt the endocrine system and are believed to affect the central nervous, immune, and reproductive systems, as well as lipid homeostasis, glucose levels, and thyroid function. Given these effects, parabens pose potential health risks, including their possible link to conditions like diabesity - a term describing the dual condition of type 2 diabetes mellitus and obesity. This review explores current literature on how parabens may influence key mechanisms in diabesity, such as gluconeogenesis, glycogenolysis, adipogenesis, insulin resistance, and inflammation. Understanding their role in these metabolic pathways is critical for assessing their contribution to the diabesity epidemic and guiding future research for minimizing their harmful health impacts.
https://doi.org/10.1016/j.tox.2025.154125

Mechanisms of toxicity caused by bisphenol analogs in human in vitro cell models,
Rifa, R. A., Rojo, M. G. and Lavado, R., *Chemico-Biological Interactions*, May 2025, Vol. 412.
Bisphenol analogs, structurally similar to bisphenol A (BPA), are widely used in various industries as a safer alternative to BPA. However, these alternatives also present risks, such as inflammation and potential connections to chronic diseases like cancer and diabetes, highlighting the need for further research into their toxicity mechanisms. Building on our previous cytotoxicity research, this study delves into the mechanisms of toxicity associated with bisphenol analogs (bisphenol AF, bisphenol AP, bisphenol E, and bisphenol P) on human in vitro cell models (HepaRG, Caco-2, HMC3, and HMEC-1). In this study, we assessed the impact of these compounds on key cellular stress markers: reactive oxygen species (ROS) production, mitochondrial membrane potential (Delta Psi m), and mitochondrial calcium levels. Results revealed dose-dependent increases in oxidative stress and decrease in mitochondrial membrane potential (Delta Psi m), with Caco-2 cells (enterocytes) exhibiting the highest sensitivity, indicating tissue-specific vulnerability. Notably, bisphenol AF, bisphenol AP and bisphenol P were identified as the most potent analogs in inducing ROS, affecting mitochondrial integrity and calcium homeostasis among all cell models. This research highlights the importance of understanding analog-specific and cell-specific responses to bisphenol compounds, providing a foundation for improved regulatory strategies to mitigate health risks associated with their exposure. https://doi.org/10.1016/j.cbi.2025.111475

Endocrine disruption potential of dust in children's indoor environments: Associations with multiple chemicals from various compound classes across exposure matrices used for health risk assessment,
Sjöström, Y., Holmes, B., Ricklund, N., Struwe, N., Hagström, K., Hagberg, J. and Larsson, M., *Environmental Research*, Aug 2025, Vol. 278.
Indoor dust contains a complex mixture of chemicals, including endocrine-disrupting chemicals (EDCs), which may pose risks to children's health. As children spend most of their time indoors and have frequent dust contact, their exposure is heightened. This study quantified the endocrine disrupting potential of dust from children's indoor environments in Sweden, and assessed associations with flame retardants and plasticizers in dust, handwipes, and urine. Fifty dust samples from 18 homes and 11 preschool units were analyzed for estrogen, anti-androgen, and thyroid receptor activities using human osteosarcoma cell-based luciferase reporter assays. Associations were evaluated with 21 legacy and 18 emerging halogenated flame retardants (HFRs) and 11 organophosphate esters (OPEs) in dust and handwipes, as well as nine plasticizers (eight phthalates and di-isononyl cyclohexane 1,2dicarboxylate (DiNCH)) in dust, and 14 plasticizer metabolites in urine. Samples for biological and chemical analyses were collected from the same designated areas

within a limited time frame. Most dust samples exhibited estrogen receptor agonist (ER) and androgen receptor antagonistic (anti-AR) activity, while thyroid receptor (TR) induction was low. Preschool dust showed significantly higher estrogenic activity than home dust. No seasonal variation was observed. Associations were observed between dust hormonal activities and urinary plasticizer metabolites, as well as HFR and OPE concentrations in dust and handwipes. Relative potency (REP) analyses of 36 HFRs and OPEs revealed notable anti-AR activity for 2,2 ',4,4 '-tetra-bromodiphenyl ether (BDE-47) (REP values .85 f .10 (EC25) and .93 f .07 (EC50)) and 2,2 ',4,4 ',6-pentabromo diphenyl ether (BDE-100) (REP values 2.74 f .29 (EC25) and 3.23 f .42 (EC50)). Additionally, BDE-100 showed low ER induction. https://doi.org/10.1016/j.envres.2025.121614

Re-Evaluating the Use of Glyphosate-based Herbicides: Implications on Fertility,
Stone, A. M., Camp, O. G., Biernat, M. M., Bai, D., Awonuga, A. O. and Abu-Soud, H. M., *Reproductive Sciences*, Apr 2025, Vol. 32, no. 4, p. 950-964.
Glyphosate-based herbicides (GBHs) are the most widely used herbicides in the United States, accounting for 19% of estimated global use. Although the Environmental Protection Agency (EPA) has reaffirmed that the active ingredient glyphosate (GLY) is safe for humans, recent studies on exposure have suggested association with cancer, metabolic disorders, endocrine disruption and infertility, Alzheimer's and Parkinson's disease, and psychological disorders. Current literature on the effects of GLY exposure on reproductive function suggests potential clinical implications on women's reproductive health, including polycystic ovarian syndrome (PCOS), endometriosis, infertility, and adverse pregnancy outcomes. The continued debate surrounding GLY exposure increasingly exemplifies the public health issue surrounding its consequences on female reproductive health, human fertility, and the potential epigenetic effects. In this review, we discuss the potential mechanisms of toxicity and endocrine disruption of GLY on the female reproductive tract and highlight possible implications of GLY exposure on reproductive health outcomes. GLY adversely affects the female reproductive system through increased oxidative stress, endocrine disruption of reproductive hormones, histological changes in ovarian and uterus tissue, and diminished ovarian function in human cell lines and animals. We conclude that increased research efforts are warranted regarding the safety and efficacy of GBH as it pertains to female reproduction, as well as investments in cost-effective alternatives with the potential to reduce GBH usage.
https://doi.org/10.1007/s43032-025-01834-6

Bisphenol A and its replacement chemicals as endocrine disruptors and obesogens,
Tang, Y. Q., Qin, G. Y., Qian, N. N., Zeng, X. Y., Li, R. and Lai, K. P., *Environmental Chemistry and Ecotoxicology*, 2025, Vol. 7, p. 696-705.
Bisphenol A (BPA) is a common material widely used in the plastic production and processing industry. As BPA is an environmental endocrine disruptor that causes metabolic disorders, leading to the progression of diseases such as obesity, type 2 diabetes, and cardiovascular diseases, its use has been banned in many countries. Chemicals such as bisphenol S, bisphenol F (BPF), bisphenol AF, and tetramethyl BPF have been used to replace BPA. Given the similar chemical structures of BPA and its replacement chemicals, previous studies have demonstrated the potential risks of endocrine disruption and obesity. This review aims to summarize the endocrine-disrupting effects and the underlying mechanisms of BPA and its replacement chemicals based on existing experimental and epidemiological studies and to investigate BPA and its replacement chemicals linked to endocrine disruption and obesity to provide better recommendations for the safe use of BPA and its replacement chemicals. https://doi.org/10.1016/j.enceco.2025.04.001

Lifestyle and Environmental Factors Affecting Male Fertility, Individual Predisposition, Prevention, and Intervention,
Tesarik, J., *International Journal of Molecular Sciences*, Mar 2025, Vol. 26, no. 6.

Current lifestyles bring about an increasing prevalence of unhealthy habits that can negatively affect male fertility. Cigarette smoking, alcohol intake, stress, inadequate physical activity, an unequilibrated diet leading to obesity, and use of mobile telephones and portable electronic devices can affect the male reproductive system through multiple mechanisms. Moreover, the modern man is often exposed to environmental factors independent of his will, such as air pollution, exposure to heat or toxicants in his workplace, or the presence of harmful chemicals in food, beverages, agricultural and industrial products, etc. The susceptibility to these factors depends on genetic and epigenetic predisposition, potentially present systemic disease and medication, and local affections of the genitourinary system. The multifaceted nature of both the causative factors and the susceptibility background makes the resulting fertility disturbance highly individual and variable among different men exposed to the same conditions. This paper critically reviews the current knowledge of different causative and susceptibility factors with a special attention to the molecular mechanisms of their action. Finally, strategies for the prevention of abnormalities due to lifestyle and environmental factors and available treatment modalities for already-present abnormalities are exposed. https://doi.org/10.3390/ijms26062797

Environmentally-relevant doses of bisphenol A and S exposure in utero disrupt germ cell programming across generations resolved by single nucleus multi-omics.
Zhao, L., Shi, M., Winuthayanon, S., Maclean Ii, J. A., Law, N. C. and Hayashi, K. a.-O. X., no. 1552-9924 (Electronic).
BACKGROUND: Exposure to endocrine-disrupting chemicals (EDCs), such as bisphenol (BP) A, disrupts reproduction across generations. Germ cell epigenetic alterations are proposed to mediate these transgenerational defects. Previously, we have shown that prenatal exposure to environmentally relevant doses of BPA or its substitute, BPS, caused transgenerationally maintained reproductive impairments associated with neonatal spermatogonial epigenetic changes in male mice. However, the mechanisms sustaining these changes across generations remain unclear. OBJECTIVES: This study aimed to systematically elucidate the mechanism of transgenerational inherence by prenatal BPA and BPS exposure in the murine germline from F1 to F3 generations at both transcriptomic and epigenetic levels. METHODS: Pregnant CD-1 females (F0) were orally administered BPA or BPS at doses of 0 (vehicle control), 0.5, 50, or 1000 µg/kg/b.w./day from gestational day 7 to birth. Sperm counts and motility were examined in F1, F2, and F3 adult males. THY1(+) germ cells on postnatal day 6 from F1, F2, and F3 males at a dose of 50 µg/kg/b.w./day were used for analysis by single-nucleus (sn) multi-omics (paired snRNA-seq and snATAC-seq on the same nucleus). RESULTS: Prenatal exposure to BPA and BPS with 0.5, 50, and 1000 µg/kg/b.w./day reduced sperm counts in mice across F1 to F3 generations. In the F1 generation, BPA or BPS exposure with 50 µg/kg/b.w./day disrupted the balance between maintaining the undifferentiated and differentiating spermatogonial populations. Differentially accessible peaks (DAPs) by snATAC-seq were primarily located in the promoter regions, with elevated activity of key transcription factors, including SP1, SP4, and DMRT1. Notably, similar gene expression and chromatin changes were observed in directly exposed F1 and F2 generations but differed in the indirectly exposed F3 generation. Approximately 80% of DAPs in F1 and F2 spermatogonia overlapped with histone post-translational modifications linked to transcription activation (e.g., H3K4me1/2/3 and H3K27ac). Across F1 to F3 generations, although BPA exerted more potent effects on gene expression in F1 spermatogonia, BPS induced longer-lasting effects. Interestingly, DMRT1 motif activity was persistently elevated in all three generations following ancestral BPA or BPS exposure. DISCUSSION: Our work provides the first systematic analyses of transgenerational gene and chromatin dynamics following prenatal exposure to BPA or BPS. These results suggest that prenatal exposure to environmentally relevant doses of BPA or BPS alters chromatin accessibility and transcription factor motif activities, consequently contributing to disrupted transcriptional levels in neonatal

spermatogonia, and some are sustained to F3 generations, ultimately leading to the reduction of sperm counts in adults. https://doi.org/10.1289/EHP16981

Méthodes

Mise à jour de l'essai n° 421 : Essai de dépistage de la toxicité pour la reproduction et le développement. Lignes directrices de l'OCDE pour les essais de produits chimiques, Section 4,
OCDE (25 juin 2025),
La présente ligne directrice décrit les effets d'un produit chimique d'essai sur le fonctionnement de la reproduction chez le mâle et la femelle. Elle a été mise à jour par l'ajout de paramètres relatifs à la détection des perturbateurs endocriniens, en particulier la mesure de la distance ano-génitale et l'examen de la persistance du mamelon chez les petits, ainsi qu'un examen thyroïdien.
https://doi.org/10.1787/9789264264397-fr

Mise à jour de l'essai n° 422 : Étude combinée de toxicité à doses répétées et de dépistage de la toxicité pour la reproduction et le développement. Lignes directrices de l'OCDE pour les essais de produits chimiques, Section 4,
OCDE (25 juin 2025),
La présente ligne directrice décrit les effets d'un produit chimique d'essai sur le fonctionnement de la reproduction chez le mâle et la femelle. Elle a été mise à jour par l'ajout de paramètres relatifs à la détection des perturbateurs endocriniens, en particulier la mesure de la distance ano-génitale et l'examen de la persistance du mamelon chez les petits, ainsi qu'un examen thyroïdien.
https://doi.org/10.1787/9789264264410-fr

Bioinformatics analysis to identify environmental endocrine chemicals that target endometriosis genes,
Du, K. L., Xiong, H. W., Zhang, X. C., Luo, R. H. and Zhou, B. X., *Ecotoxicology and Environmental Safety*, Apr 2025, Vol. 295.
Endometriosis (EMS) significantly impacts women's health and is influenced by genetic factors and environmental endocrine-disrupting chemicals (EDCs), which interfere with hormonal balance. Using the Gene Expression Omnibus database, we identified differentially expressed genes and applied analytical methods, including WGCNA, GO, KEGG, and LASSO regression, to predict six key genes associated with EMS: ADAMS, IRAK3, NTRK3, PIK3CG, STK38, and TLR4. By integrating the Comparative Toxicogenomics Database and Endocrine Disruption Exchange Database, we identified 35 EDCs potentially linked to these genes. This study highlights the relationship between EMS and EDCs, offering insights into its pathogenesis and potential therapeutic targets for improved treatment. https://doi.org/10.1016/j.ecoenv.2025.118136

Preparation of novel cationic porous polymers for effective pre-concentration and sensitive detection of endocrine disruptors in water and fish,
Fan, C. C., Dong, Y. L., Li, Z., Wang, Q. Q., Wang, Z., Wu, Q. H. and Wang, C., *Analytica Chimica Acta*, Jun 2025, Vol. 1353.
Background: Phenolic endocrine disrupting chemicals (EDCs) that are widely present in water environment can mimic hormones and interfere with the endocrine system, posing a severe threat to human health. Therefore, there is an urgent need to develop sensitive methods to effectively monitor phenolic EDCs in environment water and seafood products. In this study, a novel quaternary ammonium cationic porous polymer (AC-HCP3) was synthesized and a new analytical method was established by using AC-HCP3 as solid phase extraction adsorbent in combination with high-performance liquid chromatography, achieving the sensitive and reliable detection of phenolic EDCs in fish and environmental water. Results: The developed AC-HCP3 has high stability, positive ionic

feature and good recycle utilization, achieving high enrichment efficiency that is unsusceptible to pH for several EDCs, including bisphenol F, bisphenol A, bisphenol B, and p-tert-butylphenol. The high enrichment efficiency is proved to be the synergistic effects of it-it conjugation, hydrogen bonding, and electrostatic interactions. Based on AC-HCP3, a feasible and practical detection method was established and employed for determining several phenolic EDCs in fish (Basa fish and tilapia) and environmental water. The method achieved low detection limits of 1.67-7.80 ng g- 1 for fish and 0.004-0.02 ng mL-1 for environmental water, with recoveries of 80.7 %-118 % and relative standard deviations <= 8.40 %. The adsorption capacity of AC-HCP3 ranged from 68.73 to 128.53 mg g-1. Compared with other reported methods, the developed method offers high sensitivity, efficiency and applicability. Significance: Herein, for the first time, we designed and synthesized a novel ionic porous polymer (AC-HCP3) through simple preparation process (one-step Friedel-Crafts alkylation reaction). The AC-HCP3 displayed an outstanding adsorption effect in harsh environments such as strong acids and alkalis. This work not only provides a feasible approach for the construction of ionic porous polymers, but also provides an alternative approach for the effective monitoring of phenolic EDCs in complex food and environmental samples. https://doi.org/10.1016/j.aca.2025.343956

Caenorhabditis elegans as a Model to Assess the Potential Risk to Human Health Associated with the Use of Bisphenol A and Its Substitutes,
Kaiglová, A., Bardyová, Z., Hockicková, P., Zvolenská, A., Melnikov, K. and Kucharíková, S., *International Journal of Molecular Sciences*, Mar 2025, Vol. 26, no. 5.
Given its simplicity, Caenorhabditis elegans appears to be a promising model for future research on endocrine disruptors, including bisphenol A and its supposedly safer alternatives. The aim of this study was to investigate the impact of embryonic exposure of C. elegans to different concentrations (0.5, 1.0, and 5 mu M) of bisphenol A and its analogs (bisphenol S, bisphenol F, and bisphenol AF) on selected biological characteristics of the nematode C. elegans and to compare them with an unexposed control group. Embryonal exposure of C. elegans to bisphenol A, as well as bisphenol S, F, and AF at concentrations of 0.5, 1.0, and 5 mu M resulted in a significant influence on the percentage of hatched eggs and habituation to anterior stimuli (with significant results ranging from p <= 0.05 to p <= 0.001). The growth of C. elegans was also significantly impaired by bisphenol A, S, and AF in some concentrations (with p-values ranging from p <= 0.05 to p <= 0.001). Our findings confirm prior research that bisphenol A and its supposedly safer analogs exert a detrimental effect on diverse biological processes. Therefore, bisphenol A analogs should be employed with caution, particularly until a comprehensive risk assessment has been conducted. https://doi.org/10.3390/ijms26052013

Concentrations of arsenic (As), cadmium (Cd) and lead (Pb) in blood, hair and semen of stallions in Finland,
Oztas, T., Akar, M., Virkanen, J., Beier, C., Goericke-Pesch, S., Peltoniemi, O., Kareskoski, M. and Björkman, S., *Journal of Trace Elements in Medicine and Biology*, Jun 2025, Vol. 89.
Heavy metal contamination poses significant environmental and health risks to both humans and animals. This study investigates the concentrations of arsenic (As), cadmium (Cd), and lead (Pb) in blood, hair, and semen samples collected from 16 breeding stallions in Western Finland to assess whether concentrations in hair and serum samples represent concentrations in semen. The analysis was conducted using an inductively coupled plasma mass spectrometry (ICP-MS) system. Results showed that hair samples exhibited the highest concentrations of heavy metals, particularly Pb and As, while semen showed the lowest levels. No significant correlations were found between the concentrations of heavy metals in blood and semen, or between hair and semen, indicating that blood and hair may not reliably predict metal content in semen. This study is the first to compare Pb, As, and Cd levels in hair, blood, and semen of Finnish stallions and highlights hair as a promising noninvasive biomarker of heavy metal exposure. The results underline hair's potential as a reliable

long-term biomarker due to its ability to accumulate metals over time.
https://doi.org/10.1016/j.jtemb.2025.127633

Development of Methods for the Early Detection of Chemical Hazard and the Prevention of Pre-disease, Focusing on Environment, Food, and Health,
Sone, H., *Yakugaku Zasshi-Journal of the Pharmaceutical Society of Japan*, 2025, Vol. 145, no. 3, p. 201-221.
Based on the perspectives of the environment, food, and health, this review reflects on previous research examining stem cells for the early detection of chemical hazards and the development of preventive health tools. The risks posed by endocrine-disrupting chemicals in the environment are investigated, including studies on 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD), phthalate esters, and bisphenol A. Building on the findings of these studies, this review identifies emerging challenges in the field of endocrine-disrupting chemical research. Moreover, this paper explores innovative testing methods aimed at accurately evaluating the impact of chemicals on human health. The key topics covered include the implementation of developmental neurotoxicity testing methods, the species-specific effects of methylmercury, nanomaterials and the application of human pluripotent cells to assess the effects of low-dose radiation. Additionally, this review highlights transformative approaches in chemical health impact assessment that integrate cell science and artificial intelligence, and addresses challenges related to the application of multi-omics technologies in environmental health and toxicology. https://pubmed.ncbi.nlm.nih.gov/40024733/

Using transcriptomics data and Adverse Outcome Pathway networks to explore endocrine disrupting properties of Cadmium and PCB-126,
Wiklund, L., Wincent, E. and Beronius, A., *Environment International*, Mar 2025, Vol. 197.
Omics-technologies such as transcriptomics offer valuable insights into toxicity mechanisms. However, integrating this type of data into regulatory frameworks remains challenging due to uncertainties regarding toxicological relevance and links to adverse outcomes. Furthermore, current assessments of endocrine disruptors (EDs) relevant to human health require substantial amounts of data, and primarily rely on standardized animal studies. Identifying EDs is a high priority in the EU, but so are efforts to replace and reduce animal testing. Alternative methods to investigate EDs are needed, and so are health risk assessment methods that support uptake of novel mechanistic information. This study aims to utilize Adverse Outcome Pathways (AOPs) to integrate transcriptomics data for identifying EDs, by establishing a link between molecular data and adverse outcomes. Cadmium (Cd) and 3,3 ',4,4 ',5-pentachlorobiphenyl (PCB126) were used as model compounds due to their observed effects on the endocrine system. An AOP network for the estrogen, androgen, thyroid, and steroidogenesis (EATS)-modalities was constructed. RNA sequencing (RNA-Seq) was conducted on zebrafish (Danio rerio) embryos exposed to Cd or PCB126 for 4 days. RNA-Seq data were then linked to the AOP network via Gene Ontology (GO) terms. Enrichment Maps in Cytoscape and the QIAGEN Ingenuity Pathway Analysis (IPA) software were also used to identify potential ED properties and to support the assessment. Potentially EATS-related GO Biological Process (BP) terms were identified for both compounds. A lack of accurate standardized terms in KEs of the AOP network hindered a data-driven mapping approach. Instead, manual mapping of GO BP terms onto the AOP network revealed more connections, underscoring the need for harmonizing AOP development for regulatory use. Both the Enrichment Maps and the IPA results further supported potentially EATS-related effects of both compounds. While AOP networks show promise in integrating RNA-Seq data, several challenges remain.
https://doi.org/10.1016/j.envint.2025.109352

Magnetic cationic covalent organic framework for efficient enrichment and detection of phenolic endocrine disruptors in foodstuffs,

Xu, J. Q., Li, W. R., Sun, M., Li, Q. Y., Jiang, F., Wu, Y. N. and Li, G. L., *Journal of Chromatography A*, May 2025, Vol. 1748.
Endocrine disrupting chemicals (EDCs) have received significant attention in the food field due to their potential health risks. Herein, we proposed a novel core-shell structure magnetic cationic covalent organic framework (EBDHTA-iCOF@Fe3O4) designed for the efficient enrichment of trace-level EDCs in foodstuffs and analyzed using HPLC-MS/MS. Due to the phenolic EDCs structure possessing hydroxyl functional groups which become protonated under alkaline conditions, resulting in the formation of negatively charged anions. The EB-DHTAiCOF@Fe3O4 positively charged surface can have a good enrichment effect on EDCs with phenolic structures through electrostatic interactions, pi- pi interactions, and hydrogen bonding. This unique combination of interactions enhances the iCOF ability to selectively capture and enrich phenolic EDCs from complex matrices, thereby improving the sensitivity and efficiency of their detection in analytical applications. Under optimal magnetic solid-phase extraction (MSPE) conditions, the method showed excellent linearity (5-250 mu g kg-1, R2 >= 0.9993) and a low detection limit (0.03-1.2 mu g kg-1) for phenolic EDCs, with recovery rates between 86.0 % and 106.8 % and a relative standard deviation under 5.8 %. The approach highlights the potential of the ionic covalent organic framework as an adsorbent for MSPE, offering a promising approach for the detection and analysis of trace-level EDCs in foodstuffs.
https://doi.org/10.1016/j.chroma.2025.465827

Unraveling ER dimerization dynamics in endocrine disruption based on a BRET-focused approach,
Yum, S., Lee, H. K., Kwon, Y. K., Lee, G. Y., Lee, H. Y., Youn, H. and Youn, B., *Animal Cells and Systems*, Dec 2025, Vol. 29, no. 1, p. 282-295.
Endocrine-disrupting chemicals (EDCs) are exogenous compounds that interact with the estrogen receptor (ER), thereby disrupting estrogen-mediated signaling. In a previous study, we employed a bioluminescence resonance energy transfer (BRET) system to assess ER dimerization for detecting EDCs. To further determine whether the BRET assay could be used independently to identify EDCs, we investigated ER-EDC interactions before and after dimerization. Results from isothermal titration calorimetry (ITC) and dynamic light scattering (DLS) revealed that ER dimerization can be mediated by EDCs. Consequently, the BRET assay proved effective in detecting dimerization and clarifying its relevance to EDC-induced signaling disruption. Additionally, to examine EDC-induced transcriptional changes, we performed chromatin immunoprecipitation sequencing (ChIP-seq), followed by gene ontology (GO) analysis. These analyses demonstrated that EDCs affect various signaling pathways, including those involved in antibody-dependent cytotoxicity, bone morphogenetic protein (BMP) signaling in cardiac induction, and hepatocyte growth factor receptor signaling. Overall, this study elucidates the molecular mechanisms by which EDCs influence ER dimerization and signaling. These findings highlight the utility of the BRET-based assay for EDC detection and contribute to a deeper understanding of the systemic effects of EDCs on endocrine disruption.
https://doi.org/10.1080/19768354.2025.2481984

A fluorescence biosensor with a dual-function DNA probe targeting the activated estrogen receptor for estrogenic activity evaluation,
Zhang, Q., Li, Y. W., Li, J. L., Ma, J. T., Li, M. J. and Guo, L. H., *Environmental Research*, May 2025, Vol. 273.
Rapid screening and evaluation of endocrine disruption chemicals including environmental estrogens (EEs) is crucial for environmental safety and public health. Conventional methods such as animal tests and cell assays are costly, time consuming, and hardly reproducible. In this work, a fluorescence biosensor mimicking the molecular interactions in the estrogen receptor (ER) signaling pathway was developed for the rapid evaluation of estrogenic activity of environmental chemicals. The key element of the biosensor is a dual-function DNA probe composed of an ER binding sequence and a dye-binding sequence. The ER binding sequence is part of the estrogen response element in

the ER signaling pathway and used to bind the activated ER. The dye-binding sequence consists of six thymine bases which the OliGreen fluorescent dye binds to selectively and thus labels non-covalently. In the presence of an estrogenic chemical, ER is activated and then complexed with the DNA, leading to a reduction in the fluorescence anisotropy of OliGreen. Detection of estradiol produced a dose-response curve with an EC50 of 3 nM and lower limit of 0.5 nM, whereas a known ER antagonist did not show any response. Five emerging contaminants including resorcinol bis(diphenyl) phosphate (RDP), triphenyl phosphate (TPHP), tris (2-chloroisopropyl) phosphate (TCIPP), perfluoro-nonenoxybenzene sulfonate (OBS) and perfluorooctanoic acid (PFOA) were evaluated by the biosensor, and the results were consistent with those of the cell assays. Detection of RDP, TPHP and OBS in spiked river water samples resulted in recovery rates of 103%, 93%, and 98%, respectively. The biosensor detection is significantly faster, more robust and easier to carry out than the cell assays, and may provide a new high throughput technique for the screening of estrogenic chemicals and environmental contaminants.
https://doi.org/10.1016/j.envres.2025.121163

Simultaneous determination of multiple endocrine disrupting chemicals in human amniotic fluid samples by solid phase extraction coupled with liquid chromatography tandem mass spectrometry (LC-MS/MS),
Zhao, L., Lin, Z., Ju, D., Ni, J. Y., Ma, Y. X., Chen, B., Li, X. Z., Sun, C. C., Zheng, J. Q., Zhang, H. P., Hou, S. K., Li, P. H., Song, S. J. and Guo, L. Q., *Talanta*, Oct 2025, Vol. 293.
Prenatal exposure to endocrine-disrupting chemicals (EDCs) may lead to immediate and long-term adverse health effects in the offspring. The occurrence levels of EDCs in amniotic fluid (AF) have significant influence on fetus prior to birth. In this study, an analytical method for simultaneous determination of a total of 59 widely concerned EDCs, including 11 bisphenols (BPs), 4 parabens, 11 phthalate metabolites (mPAEs), 7 organophosphate metabolites (mOPEs), 8 polycyclic aromatic hydrocarbons metabolites (OH-PAHs) and 18 perfluorinated compounds (PFASs), in human AF samples was developed employing solid phase extraction (SPE) coupled with liquid chromatography tandem mass spectrometry (LC-MS/MS). Key parameters of SPE procedures were carefully investigated. The developed method enabled the determination of 59 EDCs in a low sample volume (500 mu L) with LOD and LOQ values in the range of 0.02-0.2 ng/mL and 0.07-0.66 ng/mL, respectively. The recoveries (60.95 %-144.74 %) and precisions (<44 %) were obtained. To further verify the method, AF samples from Tianjin of China were collected and analyzed. The detected concentrations of BPs, parabens, mPAEs, mOsPEs, and PFASs ranged from < LOD-60.48 ng/mL, indicating satisfying performance for field samples. Furthermore, the results of AGREEprep, ComplexGAPI and BAGI exhibited good environmental friendliness and applicability of the developed method. https://doi.org/10.1016/j.talanta.2025.128088

Agenda

Journées d'étude : Travail et risques pour la reproduction,
ISTNF Santé Travail (13 et 14 novembre 2025 2025),
Dans le cadre des Septentrionales, le professeur Paul Frimat (ISTNF) et le docteur Sylvain Chamot (UPJV/CHU Amiens /Péritox) organisent deux journées d'études sur les facteurs professionnels de risques pour la reproduction les 13 et 14 novembre 2025, à Amiens. Cette manifestation est destinée aux médecins du travail, aux infirmiers de santé au travail, et aux internes. Elle est organisée en format hybride, et un replay sera mis à disposition de tous les participants.
En savoir plus et s'inscrire https://istnf.fr/actu-216/travail-et-risques-pour-la-reproduction

Le 21ème colloque scientifique de l'ADEREST aura lieu les 27 & 28 novembre 2025 à Besançon
ADEREST (2025),
Au programme notamment une conférence sur : "Les PFAS : quels enjeux en santé au travail ?" proposée par Myriam RICAUD (INRS) https://www.aderest.org/colloque-1/le-colloque

Safer Chemicals Podcast - PFAS, Chromium VI and worker safety: June committee updates,
ECHA (13 juin 2025),
The episode talk about :
The evolving PFAS restriction proposal, with a focus on medical devices, lubricants, and the electronics and semiconductor sectors
SEAC's conclusions on the transport sector and the socio-economic analysis of PFAS uses
The new restriction proposal on Chromium VI substances and what the conformity check entails
A deep look at occupational exposure limits (OELs), including the latest recommendation for bisphenol A (BPA) and how these limits protect workers across the EU
The episode also touches on the challenges of group restrictions, the importance of stakeholder input, and how lessons learnt in Europe may shape global chemical safety standards.
https://podcast.ausha.co/scpodcast/june-rac-seac#msdynmkt_trackingcontext=f37d42fc-3897-433f-9a0d-6f6c0a370200

ENDO 2025. The Signature Annual Meeting in Endocrinology,
Endocrine Society (12-15 juillet 2025),
With over 7,000 attendees, nearly 2,500 abstracts and over 200 other sessions, ENDO is the leading global meeting on endocrinology research and clinical care. ENDO's comprehensive program provides attendees the opportunity to learn about the latest developments in hormone science and medicine from renowned investigators, expert clinicians, and educators from all over the world. In San Francisco, USA, July 12-15, 2025. https://www.endocrine.org/meetings-and-events/endo-2025

Webinar. Communicating about EDCs & Health: Why words matter, 8 juillet 2025.
Exposure to endocrine disrupting chemicals (EDCs) can affect every aspect of human life, including sexual development, neurodevelopment, and metabolic health. Scientists working to understand and address the effects of EDCs on human health sometimes face difficult choices about how to communicate the results of their work. In this webinar, Dr. Kevin Elliott and Dr. Laura Vandenberg will discuss the range of ways in which scientists can present information on research findings. They will explain how a given frame can have both beneficial and harmful effects. For example, framing an EDC-related health outcome as a disease or disability can help to focus public attention on hazards of toxic chemicals and promote action to protect human health. At the same time, this framing can be used to stigmatize and harm individuals and communities. The speakers will share a range of strategies available to researchers to communicate responsibly and effectively.
https://doi.org/https://www.healthandenvironment.org/che-webinars/96990

Compte rendu du Séminaire scientifique « PRÉVENIR » : Reprotoxiques, environnement et travail. 9e Journée de l'Institut Santé-Travail Paris-Est (IST-PE). Créteil, 28 novembre 2024,
Djebien, K., *IC RST - Suivi pour vous, Références en santé au travail*, 2025 2025, no. 181, p. 105-111, 4.
Ce séminaire scientifique des plateformes PREVENIR (PRÉVention, ENvIronnement, Reproduction) a montré que les liens entre expositions environnementales et effets sur la fertilité et la descendance sont très étudiés contrairement aux liens avec les expositions professionnelles. Certains mécanismes reprotoxiques transgénérationnels commencent à être identifiés chez l'animal et fortement suspectés chez l'homme. La réglementation évolue pour renforcer la prévention et la réparation des expositions à des substances toxiques pour la reproduction. Malgré la présence possible de

polluants dans le lait maternel, la pratique de l'allaitement maternel est à encourager. https://doi.org/, https://www.inrs.fr/media.html?refINRS=TD%20326

Actualités

Analyse des résultats de l'expertise collective de l'Inserm sur les effets des pesticides sur la santé. *ANSES* (24 avril 2025),
Surveiller et prendre en compte les effets indésirables des produits phytopharmaceutiques est primordial pour ajuster leurs emplois et leurs autorisations de mise sur le marché si nécessaire. Au travers de son dispositif de phytopharmacovigilance, l'Anses a analysé les résultats d'un travail scientifique d'envergure : l'expertise collective de l'Inserm sur les liens entre l'exposition aux pesticides et la santé humaine mise à jour en 2021. A l'issue de cette analyse, l'Agence identifie plusieurs signaux sanitaires dont un signal fort concernant la famille des pyréthrinoïdes, utilisée dans des produits phytopharmaceutiques mais également dans des biocides et des médicaments vétérinaires. L'Anses rappelle l'importance de revoir régulièrement les évaluations des substances et produits au vu de nouvelles données. https://www.anses.fr/fr/content/analyse-des-resultats-de-lexpertise-collective-inserm

Comment les PFAS menacent aussi la santé des travailleurs,
Actu Environnement (24 juin 2025),
Les polluants éternels sont aussi un enjeu en matière de santé au travail, avec une fréquence et un niveau d'exposition plus important qu'en population générale. L'INRS mène actuellement des travaux pour mieux connaître cette exposition. Interview de Myriam Ricaud, responsable du pôle risques chimiques à l'INRS. sur ce sujet. https://www.actu-environnement.com/ae/news/pfas-sante-securite-travail-prevention-inrs-46395.php4

Common phthalate plasticizers pose health risks, EPA finds,
Chemical and engineering news, 13 juin 2025.
On June 4, along with the draft risk assessments for DEHP and DBP, the EPA released an addendum to a document that describes how it characterizes cumulative risk specifically for phthalates that affect the male reproductive system. The addendum provides a new option for cumulative risk characterization and clarifies a previous one that the EPA outlined in January. The agency plans to get input on both options from its Science Advisory Committee on Chemicals during a meeting Aug. 4–8. The committee will also peer-review all documents released so far that are related to risk evaluations of DEHP and DBP, as well as DCHP.. https://cen.acs.org/policy/chemical-regulation/Common-phthalate-plasticizers-pose-health/103/web/2025/06

Easy Targets: How Endocrine-Disrupting Chemicals Affect Reproductive Endocrinology,
Endocrine News, juin 2025.
Endocrine-disrupting chemicals have been implicated in a wide range of poor health outcomes, including infertility and obesity. Endocrine News speaks to Almudena Veiga-Lopez, DVM, PhD, the chair of an upcoming ENDO 2025 symposium on these chemicals' effects on reproductive organs, which are particularly vulnerable to EDCs.
https://doi.org/https://endocrinenews.endocrine.org/easy-targets-how-endocrine-disrupting-chemicals-affect-reproductive-endocrinology/

Éviter les isoflavones dans les menus des restaurations collectives.
ANSES (24 mars 2025),

Les isoflavones naturellement présentes dans certains végétaux peuvent avoir des effets nocifs sur la santé, en particulier sur le système reproducteur, si elles sont consommées en trop grande quantité. Le soja étant la principale source d'isoflavones, l'Anses recommande de ne pas servir d'aliments à base de soja en restauration collective pour éviter une surconsommation. Elle invite également les producteurs et les industriels de l'agroalimentaire à revoir les techniques de production et de transformation du soja, pour diminuer les teneurs en isoflavones dans les aliments. https://www.anses.fr/fr/content/eviter-les-isoflavones-dans-les-menus-des-restaurations-collectives

Exposure to 'Forever Chemicals' May Affect Thyroid Health,
Endocrine news, avril 2025.
A recent study entitled "Association Between Per- and Polyfluoroalkyl Substance Exposures and Thyroid Homeostasis Parameters," published in the Journal of Clinical Endocrinology & Metabolism, has found that exposure to per- and polyfluoroalkyl substances (PFAS) — a group of synthetic chemicals used in industrial and consumer products — may alter thyroid hormone sensitivity, potentially affecting metabolism and overall endocrine health.
https://endocrinenews.endocrine.org/exposure-to-forever-chemicals-may-affect-thyroid-health/

Kiabi rappelle des sacs pour enfants à cause de la présence d'un perturbateur endocrinien,
Ouest France, 13 juin 2025.
L'enseigne de prêt-à-porter Kiabi rappelle, depuis jeudi 12 juin, deux modèles de sacs pour enfants en forme de jouets « pop-it », commercialisés dans toute la France. En cause : un risque chimique.
https://www.ouest-france.fr/economie/consommation/rappel-produit/kiabi-rappelle-des-sacs-pour-enfants-a-cause-de-la-presence-dun-perturbateur-endocrinien-10aa716c-4837-11f0-af40-cc57d5421e95

Mind Bending: How Endocrine-Disrupting Chemicals Could Affect Brain Development,
Endocrine News, avril 2025.
Andrea C. Gore, PhD, of the University of Texas in Austin, discusses her recent Journal of the Endocrine Society paper, which found that early-life exposure to a class of endocrine-disrupting chemicals called polychlorinated biphenyls – banned for decades but persistent in the environment — may lead to behavioral problems later in life. https://endocrinenews.endocrine.org/mind-bending-how-endocrine-disrupting-chemicals-could-affect-brain-development/

New research probes how PFAS-contaminated dust threatens Maine farmworkers,
Environmental Health News, 19 juin 2025.
A new study in Unity, Maine, will examine how soil particles contaminated with PFAS chemicals become airborne, raising concerns for farmworker exposure and long-term health risks.
https://www.ehn.org/new-research-probes-how-pfas-contaminated-dust-threatens-maine-farmworkers

Perturbateurs endocriniens : un escape game pour sensibiliser aux risques sanitaires proposé par la ville de Lyon (69),
ARS Auvergne Rhône Alpes (mai 2025),
La ville de Lyon propose l'escape game "Sauve qui PE !" pour sensibiliser sur les perturbateurs endocriniens, avec le soutien de l'ARS Auvergne-Rhône-Alpes. Cet événement ludique vise à mobiliser les jeunes et le grand public sur les risques liés à leur exposition. https://www.auvergne-rhone-alpes.ars.sante.fr/perturbateurs-endocriniens-un-escape-game-pour-sensibiliser-aux-risques-sanitaires-propose-par-la

PFAS : Une contamination inquiétante de l'alimentation européenne révélée par une nouvelle enquête de Générations Futures,
Générations Futures (juin 2025),
Que savons-nous réellement de la présence des PFAS dans nos aliments ? Afin d'avoir une vision élargie des contaminations PFAS dans les denrées alimentaires, Générations Futures a compilé les données et analyses officielles disponibles dans plusieurs pays européens. Ce travail révèle des informations inquiétantes concernant l'exposition des européens aux PFAS via l'alimentation et l'inaction des autorités sur ce problème. Un rapport est disponible en téléchargement.
https://www.generations-futures.fr/actualites/pfas-alimentation/

Retrait des produits à base de flufenacet, un pesticides PFAS perturbateur endocrinien et contaminant des eaux souterraines,
Générations Futures (juin 2025),
Générations Futures condamne les déclarations irresponsables de la ministre de l'agriculture Annie Genevard et demande un délais de grâce pour l'écoulement des stocks le plus court possible.
https://www.generations-futures.fr/actualites/flufenacet-genevard/

Sécurité des jouets : l'UE renforce enfin sa réglementation contre les substances toxiques,
Générations futures (avril 2025),
Générations Futures salue l'accord provisoire conclu le 11 avril entre le Parlement européen et le Conseil sur la refonte des règles européennes en matière de sécurité des jouets. Cette révision, attendue depuis longtemps, vient renforcer la protection de la santé des enfants face aux substances toxiques présentes dans leurs jouets. L'accord élargit significativement la liste des substances chimiques interdites dans les jouets. Outre les substances cancérigènes, mutagènes ou toxiques pour la reproduction (CMR) déjà interdites, les nouvelles règles bannissent également : Les perturbateurs endocriniens ; Les substances nocives pour le système respiratoire ; Les produits chimiques toxiques pour la peau ou d'autres organes ; Les substances per- et polyfluoroalkylées (PFAS), ces « polluants éternels » ; Les catégories les plus dangereuses de bisphénols ; Les parfums allergènes dans les jouets destinés aux enfants de moins de 36 mois et dans les jouets conçus pour être mis en bouche https://www.generations-futures.fr/actualites/jouets-pfas/

Silent Disruptors: How Environmental Chemicals Threaten Thyroid Health and Development,
Endocrine News, avril 2025.
It is well documented that endocrine-disrupting chemicals (EDCs) are virtually inescapable in everyday life since they are present in everything from food packaging and clothing to flame retardants toys. An upcoming ENDO 2025 session, "Thyroid Disruptors," examines how EDCs affect thyroid function in pregnancy, childhood, and the link to an increased thyroid cancer risk in populations with a high environmental exposure. https://endocrinenews.endocrine.org/silent-disruptors-how-environmental-chemicals-threaten-thyroid-health-and-development/

The story of a Swedish town that suffers the world's worst PFAS contamination,
Envrionmental Health News (24 juin 2025),
Residents of a Swedish town exposed for decades to toxic PFAS in their drinking water won a landmark court case that determined the chemicals' presence in their blood qualifies as a legal injury, even without a diagnosed illness. https://www.ehn.org/the-story-of-a-swedish-town-that-suffers-the-world-s-worst-pfas-contamination?vgo_ee=VuGwcLtAf6t%2FkR926JXONckqYNJJF6gTEG52ZkUAtGyu2ph2%2BjhIFC2Y4Q%3D%3D%3AiDHQCht7JFs9DVF0nmYbmyDIvSXmdzrN

Research Progress in Current and Emerging Issues of PFASs' Global Impact: Long-Term Health Effects and Governance of Food Systems,
Lee, J. C., Smaoui, S., Duffill, J., Marandi, B. and Varzakas, T., *Foods*, Mar 2025, Vol. 14, no. 6.
Per- and polyfluoroalkyl substances (PFASs) are found everywhere, including food, cosmetics, and pharmaceuticals. This review introduces PFASs comprehensively, discussing their nature and identifying their interconnection with microplastics and their impacts on public health and the environment. The human cost of decades of delay, cover-ups, and mismanagement of PFASs and plastic waste is outlined and briefly explained. Following that, PFASs and long-term health effects are critically assessed. Risk assessment is then critically reviewed, mentioning different tools and models. Scientific research and health impacts in the United States of America are critically analyzed, taking into consideration the Center for Disease Control (CDC)'s PFAS Medical Studies and Guidelines. PFAS impact and activities studies around the world have focused on PFAS levels in food products and dietary intake in different countries such as China, European countries, USA and Australia. Moreover, PFASs in drinking water and food are outlined with regard to risks, mitigation, and regulatory needs, taking into account chemical contaminants in food and their impact on health and safety. Finally, PFAS impact and activities briefings specific to regions around the world are discussed, referring to Australia, Vietnam, Canada, Europe, the United States of America (USA), South America, and Africa. The PFAS crisis is a multifaceted issue, exacerbated by mismanagement, and it is discussed in the context of applying the following problem-solving analytical tools: the Domino Effect Model of accident causation, the Swiss Cheese Theory Model, and the Ishikawa Fish Bone Root Cause Analysis. Last but not least, PFASs' impacts on the Sustainable Development Goals (SDGs) of 2030 are rigorously discussed. https://doi.org/10.3390/foods14060958

Bisphenols. New environmental, pathophysiological and social perspectives
Moreno-Gomez-Toledano, R. Londres (Royaume-Uni), IntechOpen. Livre de 175 pages. Avril 2025
In an era where environmental challenges are more pressing than ever, Bisphenols - New Environmental, Pathophysiological and Social Perspectives offers a multidisciplinary exploration of bisphenols' complex and pervasive world. From the historical evolution of bisphenol A (BPA) to the emergence of structurally similar alternatives, this book delves deep into the scientific, social, and institutional responses to these controversial compounds. With contributions from renowned experts, this work unravels the intricate biochemical interactions of bisphenols, their environmental impact, and their far-reaching implications for public health. From molecular insights to translational research, readers will discover how these substances intertwine with risks such as breast cancer and non-communicable diseases. By exploring both the current state of research and the pressing need for further investigation, this work emphasizes the importance of continued scientific inquiry and collaboration in addressing the risks associated with bisphenols. It serves as a reminder of the ongoing efforts required to improve policies, increase awareness, and reduce the harmful effects of endocrine disruptors for the well-being of new generations. This book challenges us to recognize that, as we uncover the potential dangers of bisphenols, the actual cost of inaction will be measured in the health of future generations. https://www.intechopen.com/books/12651

Identification et substitution des perturbateurs endocriniens

Welcome to the PFAS Guide,
Chemsec (*Pour assister les entreprises qui souhaiteraient identifier les PFAS susceptibles d'être présents dans leurs produits et process, Chemsec a mis en ligne le guide PFAS qui comprend notamment : une base de données permettant d'effectuer des recherches par secteurs, types d'articles et fonctions, des ressources et rapports sectoriels, des informations sur les méthodes d'analyse chimique. ChemSec publie sur son site des vidéos support pour la substitution des PFAS*

pour diverses applications : les textiles techniques, les gaz fluorés, les fluoropolymères, les panneaux solaires. https://pfas.chemsec.org/

4 new pesticides ignite debate over PFAS definition,
Chemical and engineering news, 24 juin 2025.
All four pesticides proposed for registration by the US Environmental Protection Agency in the past 2 months contain at least one fully fluorinated methyl or methylene group, but the agency says they are not per- and polyfluoroalkyl substances. https://cen.acs.org/environment/pesticides/4-new-pesticides-ignite-debate/103/web/2025/06

Bulletin d'information n°24 - Substitution des substances chimiques,
INERIS (mars 2025),
Au sommaire : Des résines époxy exemptes de bisphénols pour les matériaux composites ; - xIngenious Plank : des revêtements de sol sans plastifiants ; Substitution des PFAS : NOF Metal Coatings propose une nouvelle gamme de revêtements de finition ; Des mousses à base de farine de soja pour lutter contre les incendies sans avoir recours aux PFAS
https://substitution.ineris.fr/sites/substitution-portail/files/newsletter/newsletter24_fr.pdf

Community Rolling Action Plan (CoRAP) update covering the years 2025, 2026 and 2027,
ECHA (25 mars 2025),
The Community rolling action plan (CoRAP) update for the years 2025-2027 lists 28 substances suspected of posing a risk to human health or the environment, for evaluation by 8 Member State Competent Authorities, under the substance evaluation process of the REACH Regulation (EC) No 1907/2006 (Articles 44 to 48). The plan contains 13 newly allocated substances, and 18 substances already included in the previous CoRAP 2024-2026 update, published on 19 March 2024. The initial ground for concern contains the notion of "potential endocrine disruptor" for 6 substances.
https://echa.europa.eu/documents/10162/879660/corap_update_2025-2027_en.pdf/2a2c35da-f341-d0b1-6802-9aab4685e576#msdynttrid=qOufos35noZeBurOmZdj_7NnUHFPqkQfpXS-UQLOQHk

Endocrine Disruptor Lists. List updates,
EDLists (juin 2025),
June 2025
List I
Tris(4-nonylphenyl, branched) phosphite: Group entry has been updated to reflect that the ED properties is demonstrated independently of the presence of 4-NP in the composition of the substance (SVHC - ED ENV).
List II
3-iodo-2-propynylbutylcarbamate (IPBC) added: Concluded ED in BPC opinion. Not yet legally adopted.
Cyprodinil added: Concluded ED in EFSA opinion. Not yet legally adopted.
Fenoxaprop-P added: Concluded ED in EFSA opinion. Not yet legally adopted.
Buprofezin added: Concluded ED in EFSA opinion. Not yet legally adopted.
Ethiprole added: Concluded ED in EFSA opinion. Not yet legally adopted.
Tris(2-ethylhexyl) phosphate added: Substance evaluation under REACH initiated (CoRAP).
Triethyl phosphate added: Substance evaluation under REACH initiated (CoRAP).
Potassium dicyanoargentate added: Substance evaluation under REACH initiated (CoRAP).
Tris(4-nonylphenyl, branched) phosphite removed: Group entry in SVHC identification updated and added to list I (see list I)
Benzotriazole; sodium 1H-benzotriazolide; potassium 1H-benzotriazolide; and other inorganic salts added: ED ENV 1 CLH intention submitted

Sodium chlorate added: ED HH CLH intention submitted
Sodium perchlorate added: ED concern in REACH substance evaluation substantiated (2016)
Ammonium Perchlorate added: ED concern in REACH substance evaluation substantiated (2016)
1-[4-(1,1-dimethylethyl)phenyl]-3-(4-methoxyphenyl)propane-1,3-dione added: Additional concern (ED ENV) identified during REACH substance evaluation.
Tris(2-ethylhexyl) benzene-1,2,4-tricarboxylate (TOTM) added: Additional concern (ED ENV) identified during REACH substance evaluation.
List III
Tris(4-nonylphenyl, branched) phosphite changed status to list I: Group entry in the SVHC identification (ED ENV) has been updated to reflect that the ED properties is demonstrated independently of the presence of 4-NP in the composition of the substance. List I has been updated with information.
Resorcinol added by France
Methyl 4-hydroxybenzoate added by France
https://edlists.org/list-updates

Occupational exposure limit for Bisphenol A (BPA),
ECHA (18 juin 2025),
RAC adopted its opinion on the scientific evaluation of a limit value for 4,4'-isopropylidenediphenol (Bisphenol A) and screening of other bisphenols. The committee recommends setting an OEL value of 24 µg/m³ to protect workers from the effects of BPA on fertility. This limit value would also protect against other effects of BPA.
Additionally, the RAC recommended that a statement is added in the legislative provisions for BPA to protect unborn and breastfed children from the potential harm caused by exposure to BPA in the womb or early in life.
Lastly, following a simple screening of some relevant studies on other bisphenols, RAC agreed that the recommended limit for BPA may not be stringent enough to protect against Bisphenol S (BPS), Bisphenol F (BPF), and Bisphenol AF (BPAF). https://echa.europa.eu/-/highlights-from-june-2025-rac-and-seac-meetings#msdynmkt_trackingcontext=f37d42fc-3897-433f-9a0d-6f6c0a370200

Outil Repérage des perturbateurs endocriniens en entreprise. Outil d'aide à l'évaluation du risque chimique.,
Institut national de recherche et de sécurité (INRS) (avril 2025),
Cet outil d'aide au repérage des perturbateurs endocriniens en milieu de travail rassemble 344 substances chimiques, produites en grande quantité et classées pour leurs effets avérés ou potentiels de perturbation endocrinienne (par l'Anses et/ou par le site institutionnel EDLists). Pour chaque substance, les principaux secteurs industriels et usages (passés et actuels) concernés sont recensés. Sont également renseignés pour chaque substance, le numéro CAS, la catégorie au regard des effets de perturbation endocrinienne sur la santé, et le cas échéant, la classification CMR (règlement européen CLP), le ou les tableaux de maladies professionnelles ainsi que la fiche toxicologique associés. La genèse de cet outil est détaillée dans la page Perturbateurs endocriniens. Repérage et inventaire https://www.inrs.fr/risques/perturbateurs-endocriniens/reperage-inventaire.html. Les secteurs du traitement des déchets, des eaux usées, de la gestion des sites et sols pollués et de l'entretien et de la maintenance n'ont pas été investigués dans cet outil compte tenu de la diversité des polluants rencontrés. https://www.inrs.fr/media.html?refINRS=outil16

Pepper 2025 : Appel à méthodes d'essai pour la perturbation endocrinienne (20 juin 2025),
Chaque année, Pepper soutient la validation de méthodes d'essai innovantes pour la perturbation endocrinienne – et le cycle de sélection 2025 est maintenant ouvert ! https://ed-pepper.eu/call-for-methods-2025/

Mechanism-Driven Design of Isothiazolinone Alternatives,
Hu, C. Y., Tang, L. Z., Sun, B. L., Wang, J. L., Zhou, B. S. and Chen, L. G., *Environmental Science & Technology*, Mar 2025, Vol. 59, no. 14, p. 6983-6992.
The extensive application of isothiazolinones has led to widespread pollution and poses a threat to ecological health, creating a need for the development of green alternatives. With the objective of devising chemical design strategies, we initially explored the structure-activity relationship (SAR) and structure-toxicity relationship (STR) of isothiazolinones. By comparing the antimicrobial activities of commercial isothiazolinone analogues, chlorine substitutions were identified as key determinants of pathogen growth inhibition potency. The variability of reproductive endocrine-disrupting toxicity was primarily driven by the length of the alkyl carbon chain, based on interactions with molecular initiating events and disturbances in sex hormones. Inspired by the SAR and STR guidelines, two new isothiazolinones (i.e., Target 1 and Target 2) were designed and synthesized. Compared to the commercial analogue dichloro-octylisothiazolinone, Target 1, which has a shorter alkyl chain and the same chlorine count, demonstrated slightly stronger antimicrobial activity, significantly lower endocrine-disrupting toxicity, and longer environmental persistence. Meanwhile, Target 2, containing ether bonds within a shorter alkyl chain and the same chlorine count, exhibited weaker antimicrobial activity, significantly lower endocrine-disrupting toxicity, and slightly longer environmental persistence. Overall, this study proposes a mechanism-driven design strategy for isothiazolinone alternatives that successfully reduces endocrine toxicity while maintaining antimicrobial activity. https://doi.org/10.1021/acs.est.4c12683

A critical review to identify data gaps and improve risk assessment of bisphenol A alternatives for human health,
Mhaouty-Kodja, S., Zalko, D., Tait, S., Testai, E. and Et, C., *Critical Reviews in Toxicology*, 2024, Vol. 54, no. 10, p. 696-753, ill., bibliogr.
Cette revue critique évalue les risques des alternatives au bisphénol A (BPA) pour la santé humaine, en examinant six substances prioritaires identifiées par les agences réglementaires européennes : BPE, BPAP, BPP, BPZ, BPS-MAE et TCBPA. Utilisés dans l'industrie du plastique, des résines époxy et des papiers thermiques, ces composés exposent potentiellement les travailleurs à divers dangers. L'analyse porte sur leur toxicocinétique, leurs effets perturbateurs endocriniens, leur immunotoxicité, leur neurotoxicité et leur génotoxicité. L'étude révèle d'importantes lacunes scientifiques, particulièrement concernant leur métabolisme et leurs effets immunologiques. Certaines alternatives, notamment le TCBPA et le TBBPA, montrent des activités œstrogéniques ou anti-androgéniques préoccupantes pour les travailleurs exposés. Cette recherche, menée dans le cadre du Partenariat européen pour l'évaluation des risques liés aux produits chimiques (PARC), vise à combler ces lacunes et à améliorer les méthodologies d'évaluation des risques en utilisant de nouvelles approches méthodologiques (NAM). https://doi.org/10.1080/10408444.2024.2388712

Evaluation de l'exposition et prévention

Development and validation of a survey on reproductive health behaviors to reduce exposure to endocrine-disrupting chemicals in Koreans,
Kim, H. J., Kim, S. H., Choi, S. Y. and Shin, G., *Frontiers in Reproductive Health*, Mar 2025, Vol. 7.
Introduction Recently, issues related to climate change and endocrine-disrupting chemicals have come to the forefront. In particular, the pursuit of convenience has led to increased exposure to endocrine-disrupting chemicals in daily life, posing threats to reproductive health, including infertility and cancer. Therefore, this study aims to develop a questionnaire to assess the reproductive health behaviors of Koreans for reducing exposure to endocrine-disrupting chemicals, and to verify its reliability and validity.Materials and method This methodological study involved 288 adult men and women in South Korea and conducted item analysis, exploratory factor analysis,

and confirmatory factor analysis.Results The developed survey questionnaire consists of four factors and 19 detailed items related to reproductive health behaviors and reproductive health promotion behaviors through the main exposure routes of endocrine-disrupting chemicals: food, respiratory pathways, and skin absorption.Conclusion Based on the results of this study, it is hoped that research on reproductive health behaviors aimed at reducing EDC exposure will expand, considering various environments such as national and ethnic differences.
https://doi.org/10.3389/frph.2025.1519896

Filling gaps in population estimates of phthalate exposure globally: A systematic review and meta-analysis of international biomonitoring data,
Acevedo, J. M., Kahn, L. G., Pierce, K. A., Albergamo, V., Carrasco, A., Manuel, R. S. J., Rosenberg, M. S. and Trasande, L., *International Journal of Hygiene and Environmental Health*, Apr 2025, Vol. 265.
Many phthalates have been identified as endocrine-disrupting chemicals because they alter hormone functions throughout the lifespan. Nationally representative biomonitoring data are available from the United States, Canada, and Europe, but data elsewhere are sparse, making extrapolations of related disease and disability burdens difficult. We therefore examined trends in urinary phthalate metabolite concentrations in nonoccupationally exposed populations in countries other than the United States, Canada, and Europe, where representative data are already available at the country level. We systematically reviewed studies published between 2000 and 2023 and analyzed changes in urinary phthalate metabolite concentrations across time using mixed-effects meta-regression models with and without a quadratic term for time. We controlled for region, age, and pregnancy status, and identified heterogeneity using Cochran's Q-statistic and I2 index. Our final analysis consisted of 216 studies. Non-pregnant and youth populations exhibited nearly 2.0-fold or greater difference in concentration compared to pregnant and adult populations. Phthalates with significant regional differences had 10-fold higher concentrations in the Middle East and South Asia than in other regions. Our meta-regressions identified an exponential increase in DBP exposure through MnBP concentration internationally (beta: 0.65 ng/mL/year2) and in Eastern and Pacific Asia (EPA) (beta: 0.78 ng/mL/year2). Most DEHP and DnOP metabolites significantly declined internationally and in EPA, while MEP concentration declined by 10.62 ng/mL in Latin America and 8.98 ng/mL in Africa over time. Our findings fill gaps in phthalate exposure data and set the stage for further analysis of the attributable disease burden and cost at regional and international levels, especially in low- and middle-income countries. https://doi.org/10.1016/j.ijheh.2025.114539

Suspect screening of bisphenol A (BPA) structural analogues and functional alternatives in human milk from Canada and South Africa. LID - [doi],
Chi, Z. H., Liu, L., Zheng, J., Tian, L., Chevrier, J., Bornman, R., Obida, M., Goodyer, C. G., Hales, B. F. and Bayen, S. a.-O., no. 1559-064X (Electronic).
BACKGROUND: Plastic-related contaminants, such as bisphenols, can enter the maternal body and be transferred to breast milk. While common bisphenols such as bisphenol A, S, F and AF have been detected in previous studies, there is limited knowledge about the occurrence of other structurally similar compounds in human milk with potential endocrine-disrupting properties. OBJECTIVE: In this study, we investigated structural analogues and functional alternatives of bisphenol A (BPA) in 594 human milk samples collected from Canada (Montreal) and South Africa (Vhembe and Pretoria) using LC-Q-TOF-MS through suspect screening. METHODS: Suspect screening was performed using data collected from the milk samples using a customized database library (204 compounds). A retrospective semi-quantitative approach was then applied to estimate the levels of TGSA, D-8 and D-90 in human milk. RESULTS: This work revealed the presence of eleven compounds, including four compounds commonly used in thermal labels, four ultraviolet filters, and three synthetic antioxidants or metabolites. Retrospective semi-quantification of D-8, D-90 and TGSA revealed levels of up to 1.24, 1.98, and 0.72 ng/mL in milk, respectively. IMPACT STATEMENT: Several

structural analogues and functional alternatives of bisphenol A were identified in human milk through non-targeted screening. Two other phenolic compounds (Irganox 1010 and BHT-COOH) were identified in human milk for the first time. This study highlights the importance of novel strategies in human milk biomonitoring to identify emerging contaminants to which breastfeeding infants are exposed. https://doi.org/10.1038/s41370-025-00782-2

Release of Bisphenol A from Dental Materials: Risks and Future Perspectives,
Tichy, A. a.-O., Srolerova, T. a.-O. and Schwendicke, F. a.-O., no. 1544-0591 (Electronic).
The gradual phaseout of dental amalgam has contributed to a significant increase in the use of resin-based materials. While these materials offer several desirable properties, concerns persist regarding their biocompatibility, particularly the release of bisphenol A (BPA). BPA is an endocrine-disrupting chemical linked to adverse effects on human health, including reproductive, developmental, and metabolic disorders. Although food contact materials are the primary source of human BPA exposure and the contribution of dental materials is minor, the associated risks cannot be dismissed due to BPA's nonmonotonic dose-response relationship. In 2023, the European Food Safety Authority proposed a 20,000-fold reduction in the tolerable daily intake of BPA to 0.2 ng/kg body weight, citing immune system effects at extremely low doses. This proposal has sparked regulatory and scientific debate, as adopting such a stringent limit would effectively ban the use of BPA in food contact materials and many other products. Given this context, it is essential to assess the release of BPA from dental materials both in vitro and in vivo. However, data interpretation is complicated by methodological inconsistencies, including variations in material composition, specimen preparation, choice of extraction media, experimental duration, and analytical methods. In addition, pivotal differences in reporting results make it difficult to synthesize findings and draw reliable conclusions. This review examines the controversy surrounding BPA, critically evaluates evidence on its release from dental materials, and explores mitigation strategies. By highlighting gaps in knowledge and proposing future research directions, this review aims to provide clinicians, researchers, and policymakers with a clearer understanding of BPA-related complexities, ultimately contributing to patient safety and material innovation. https://doi.org/10.1177/00220345251337

Are Sleeping Children Exposed to Plasticizers, Flame Retardants, and UV-Filters from Their Mattresses?,
Vaezafshar, S., Wolk, S., Simpson, K., Akhbarizadeh, R., Blum, A., Jantunen, L. M. and Diamond, M. L., *Environmental Science & Technology*, Apr 2025, Vol. 59, no. 16, p. 7909-7918.
Our research found that children aged 1-4 years are being exposed to elevated levels of semivolatile organic compounds (SVOCs) in their sleeping microenvironment (SME). We detected 21 SVOCs in four classes (ortho-phthalates, organophosphate esters, benzophenones, and salicylates) in 16 new children's mattresses. One mattress exceeded the Canadian regulatory limit of 0.1% (by weight) for children's mattresses for di-n-butyl phthalate (DnBP), while five had >0.1% diisobutyl phthalate (DiBP), di-n-octyl phthalate (DnOP), and diisononyl phthalate (DiNP), which are regulated in children's toys but not in mattresses. One mattress contained high levels of tris(2-chloroethyl) phosphate (TCEP), which has been prohibited from use in Canada since 2014. Five mattresses had from 1 to 3% of several organophosphate esters. No consistent trend was found between the number or concentrations of SVOCs in mattress covers and their polymer type, e.g., rigid polyvinyl chloride vs flexible polypropylene-polyethylene, identified using Fourier transform infrared spectroscopy (FTIR). Twelve out of 45 SVOCs measured were emitted from eight mattresses tested at room temperature, rising to 20 detected at body temperature, and 21 were detected at body temperature and when body weight was applied. Given the likelihood of exposure, these results show the need for stricter regulations of all harmful chemicals in children's mattresses and improved oversight by manufacturers to minimize the use of harmful chemicals, especially when they are not needed. https://doi.org/10.1021/acs.est.5c03560

Toxicité sur les animaux

Tetramethyl bisphenol F exposure induces human ovarian granulosa cell senescence and mouse ovarian damage by regulating ESRRB signalling,
Fan, H. Y., Li, C. M., Lv, Y. F., Qi, T. Y., Huang, Y. Z., Ma, L. J., Lan, Y. B., Chen, P. Q., Lou, Z. and Zhou, J. H., *Ecotoxicology and Environmental Safety*, Mar 2025, Vol. 292.
Tetramethyl bisphenol F (TMBPF), regarded as a promising alternative to bisphenol A (BPA) across multiple industries, is now incorporated into polymer coatings for metal cans used in food and beverage packaging. Recent research has highlighted possible health risks associated with TMBPF, yet its impact on ovarian function and the mechanisms involved remain inadequately understood. This study provides a thorough evaluation of TMBPF's effects on granulosa cells (GCs) and uncovers its transgenerational influence on female reproductive health. We exposed pregnant CD1 mice to TMBPF at doses of 50 mu g/kg/day or 200 mu g/kg/day from gestational day 7 (GD7) through postnatal day 21 (PND21). Our findings indicated that maternal exposure to TMBPF adversely affects the reproductive system of the F1 generation by elevating the levels of E2, FSH, and LH, reducing the ovarian index, and increasing the number of collagen fibers in the ovarian stroma. The human granulosa-like tumor cell line KGN was employed as an experimental model to assess the toxic effects of TMBPF on GCs. The findings revealed that sublethal concentrations of TMBPF induced mitochondrial dysfunction, cellular senescence, and disrupted redox homeostasis in GCs in vitro. Our transcriptome sequencing analyses indicated that ESRRB upregulation might play a critical role in TMBPF-induced cellular senescence. Additionally, TMBPF exposure induced KGN cells senescence and senescent cell accumulation in F1 mouse ovaries by promoting ESRRB/p21 signalling. Collectively, our results indicate that TMBPF disrupts hormone levels in the ovaries, accelerates GCs senescence and promotes ovarian fibrosis, adversely affecting ovarian function in offspring. This study provides new insights into the potential effects of TMBPF exposure on the reproductive system and the related mechanisms. https://doi.org/10.1016/j.ecoenv.2025.117940

Atrazine's effects on mammalian physiology,
Holliman, A. G., Mackay, L., Biancardi, V. C., Tao, Y. X. and Foradori, C. D., *Journal of Toxicology and Environmental Health-Part B-Critical Reviews*, Mar 2025.
Atrazine is a chlorotriazine herbicide that is one of the most widely used herbicides in the USA and the world. For over 60 years atrazine has been used on major crops including corn, sorghum, and sugarcane to control broadleaf and grassy weed emergence and growth. Atrazine has exerted a major economic and environmental impact over that time, resulting in reduced production costs and increased conservation tillage practices. However, widespread use and a long half-life led to a high prevalence of atrazine in the environment. Indeed, atrazine is the most frequent herbicide contaminant detected in water sources in the USA. Due to its almost ubiquitous presence and questions regarding its safety, atrazine has been well-studied. First reported to affect reproduction with potential disruptive effects which were later linked to the immune system, cancer, stress response, neurological disorders, and cardiovascular ailments in experimental models. Atrazine impact on multiple interwoven systems broadens the significance of atrazine exposure. The endeavor to uncover the mechanisms underlying atrazine-induced dysfunction in mammals is ongoing, with new genetic and pharmacological targets being reported. This review aims to summarize the prominent effects of atrazine on mammalian physiology, primarily focusing on empirical studies conducted in lab animal models and establish correlations with epidemiological human studies when relevant. In addition, current common patterns of toxicity and potential underlying mechanisms of atrazine action will be examined.
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Propylparaben negatively impacts IN VITRO preimplantation mouse embryo development,

Lai, N. Z. E., Bashir, S. T., Ziv-Gal, A., Sivagaru, M. and Nowak, R. A., *Reproductive Toxicology*, Apr 2025, Vol. 133.
Parabens are chemicals widely used in personal care products and food as antimicrobial preservatives. They exhibit potential estrogenic activity by binding to estrogen receptors 1 and 2, classifying them as endocrinedisrupting chemicals. Given the substantial daily exposure of women to parabens, it is crucial to investigate their effects on the female reproductive system. Previous studies in mouse models have shown that paraben exposure impacts ovarian development, resulting in an increase in cystic follicles and a decrease in corpora lutea. However, the effects of parabens on embryo development have not been extensively studied. This study aimed to determine the impact of propylparaben exposure on preimplantation embryo development in vitro. We tested the effects of 0 (0.075 % DMSO), 0.5 mu g/mL, 5.0 mu g/mL, 10 mu g/mL, and 15 mu g/mL propylparaben on rate of development of mouse zygotes to hatched blastocyst stage, quantified the number of inner cell mass (ICM) and trophectoderm (TE) cells in hatched blastocysts, and the distribution of cytoskeletal F-actin. The percentage of hatched blastocysts was significantly decreased at 0.5 mu g/mL and 10 mu g/mL compared to controls. Propylparaben treatment did not alter TE cell numbers. However, treatment with 0.5 or 15 mu g/mL significantly decreased the number of ICM cells compared to controls. Additionally, the intensity of phalloidin fluorescence staining for Factin was significantly reduced at 10 mu g/mL and 15 mu g/mL propylparaben. In summary, our findings show that propylparaben exposure disrupts ICM formation, impacts the cytoskeletal filamentous actin (F-actin) network, and alters the rate of hatched blastocyst development in preimplantation mouse embryos. https://doi.org/10.1016/j.reprotox.2025.108876

Effects of Chemical Speciation on Chronic Thyroid Toxicity of Representative Perfluoroalkyl Acids,
Li, J., Wang, Q., Hu, C. Y., Sun, B. L., Yang, Z. X., Zhou, B. S., Leung, K. M. Y. and Chen, L. G., *Environmental Science & Technology*, Mar 2025, Vol. 59, no. 14, p. 6959-6970.
Acute exposure studies have reported that chemical speciation significantly affects the developmental toxicity of perfluoroalkyl acids (PFAAs). However, the mechanisms underlying the chronic toxicity of PFAAs as a function of chemical speciation remain unknown. With an aim to gain more insights into the PFAA structure-toxicity relationship, this study exposed adult zebrafish to the acids and salts of perfluorooctanoate (PFOA), perfluorobutanoate (PFBA), and perfluorobutanesulfonate (PFBS) at environmentally realistic concentrations for 5 months. In the F0 generation, PFAA acids induced hypothyroidism symptoms more potently than their salt counterparts. After parental exposure, a chemical speciation-dependent transfer behavior was noted, with a greater burden of PFAA acids in the offspring. Similarly, PFAA acids were associated with higher risks of transgenerational defects and thyroid dysfunction during offspring embryogenesis. PFAA acids bound to thyroid receptor beta (TR beta) more strongly than their salts. An antagonistic interaction of PFOA and PFBS with TR activity was observed in vitro via the reduction of TR beta accessibility to target genes. CUT&Tag sequencing revealed disturbances due to PFAAs on the genomic target profile of TR beta, indicating that PFOA and PFBS interfere with multiple thyroidal and nervous processes. In conclusion, current findings provided evidence regarding the critical effects of chemical speciation on PFAA toxicity, highlighting the need to perform discriminative risk assessment and chemical management.
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Maternal di(2-ethylhexyl) phthalate exposure increases the risk of congenital heart disease in mice offspring,
Shi, H. Q., Zhang, Z. H., Shen, A. N., Ding, T., Zhao, R., Shi, Y., Zhao, J. Y., Cai, K. and Wang, F., *Pediatric Research*, Mar 2025.
BackgroudEpidemiological data suggest that maternal occupational exposure to mixed phthalates comprising di(2-ethylhexyl) phthalate (DEHP) increases the risk of congenital heart disease (CHD). In

this study, we used mice as an animal model to validate impact of first-trimester DEHP exposure on the risk of CHD in offspring, to elucidate the possible mechanisms and to provide a potential feasible intervention.Methods and resultsEight-week-old C57BL/6J pregnant mice were randomly divided into standard and DEHP diet groups. The incidence of CHD in DEHP diet group offspring was up to 14.41% observed via Hematoxylin-eosin (HE) staining. Quantitative PCR analysis revealed that expression of key genes involved in cardiogenesis were suppressed at the transcriptional level, which may be due to decreased nuclear translocation of p65. The inhibition of DEHP on key genes was rescued to some extent by choline through driving p65 into nuclear. In the mice, supplementation of choline during DEHP exposure reduced the incidence of CHD in offspring from 14.41% to 4.63%.ConclusionsOur study demonstrates that mice first-trimester DEHP exposure significantly increases the risk of CHD in the offspring via inhibiting mRNA levels of key genes in cardiogenesis, and choline could protect against the pathogenesis.ImpactOur study provides key mechanistic insights into the risk of CHD by DEHP exposure during early pregnancy, and provides choline as a potentially effective intervention.DEHP suppressed the expression of key genes involved in embryonic cardiac septum development at the transcriptional level via inhibiting nuclear translocation of p65.Choline can play a role in rescuing the inhibition of DEHP on cardiogenesis genes via driving p65 translocate into the nuclear. https://doi.org/10.1038/s41390-025-03997-z

Impact of the environmental endocrine disruptor 4-octylphenol on reproductive function in pubertal male mice,
Zhao, Z. J., Chi, J. Y., Zhang, F. F., Song, Y. L., Xv, W. D., Li, Y. and Shi, H., *Environmental Research*, Jul 2025, Vol. 276.
4-Octylphenol, a major environmental degradation product of alkylphenols (Aps) used in industry, is an endocrine-disrupting chemical with significant estrogenic activity. It is one of the most toxic Aps, poorly biodegradable in the environment, and can accumulate in organisms through the food chain, thereby affecting the male reproductive system. In this study, the effect of 4-octylphenol on male reproductive health was analyzed. Male pubertal mice were exposed to 4-octylphenol at doses of 0, 1, 10, and 100 mg/kg once daily for 28 days. Our findings indicated that pubertal exposure to 4-octylphenol has significant negative effects on the male reproductive system. Pubertal mice exposed to 4-octylphenol exhibited dose-dependent reproductive toxicity. In the medium-and high-dose groups, a significant reduction in testicular mass, structural damage to the seminiferous tubules, increased oxidative stress and apoptosis within the testicular tissue, and a decline in sperm quality were observed. Additionally, autophagy processes in the testicular tissue, germ cell proliferation, and meiotic processes are inhibited. Serum testosterone and estradiol levels decreased, whereas oxidative stress levels in the testes and spermatozoa increased. In contrast, the low-dose group showed only a reduction in body weight, a decrease in motile sperm count, and mild oxidative stress in the testes without significant pathological changes in Western blot experiments. These results indicate that 4-octylphenol exposure during puberty caused reproductive toxicity in male mice.
https://doi.org/10.1016/j.envres.2025.121530

Developmental programming: mechanisms of early exposure to real-life chemicals in biosolids on offspring ovarian dynamics†,
Zhou, Y. R., Halloran, K. M., Bellingham, M., Lea, R. G., Evans, N. P., Sinclair, K. D., Smith, P. and Padmanabhan, V., *Biology of Reproduction*, Jun 2025, Vol. 112, no. 6, p. 1229-1242.
Female reproductive capacity is shaped by ovarian reserve and patterns of follicle development. Ovarian reserve depletion occurs by follicle activation and atresia, which are affected by environmental chemicals (ECs). Because humans are simultaneously exposed to hundreds of ECs, real-life exposure models are essential to assess patterns of atresia after EC exposure. Previous findings demonstrate maternal preconceptional and gestational EC exposure via biosolids increases activation rate and reduces primordial follicle pool in juvenile, but not adult sheep. We hypothesized

that this shift involves changes in death and proliferative pathways that impact follicle atresia from juvenile to adult life. Ovaries were collected from juvenile (9.5 weeks) and adult (2.5 years) offspring from ewes grazed on biosolids-treated pasture (BTP) or inorganic fertilizer-treated pasture (Control). Follicular atresia was assessed through morphological characteristics and molecular death pathways, including expression of markers for apoptosis (CASP3), autophagy (LC3), ferroptosis (GPX4), and proliferation (Ki67). There were higher levels of apoptosis and autophagy, and lower proliferation, in juvenile BTP offspring compared to controls. In adult BTP offspring, apoptosis and proliferation were similar, autophagy was lower, and ferroptosis was higher compared to controls. Apoptosis was lower and ferroptosis was higher in adults than juveniles, regardless of treatment. Adult BTP offspring had lower autophagy and similar proliferation levels than juvenile BTP offspring. These findings suggest that lower autophagy and lack of decrease in proliferation contribute to normalization of activation rate and ovarian pool in BTP adult offspring and supportive of lasting impacts of gestational EC exposure on offspring follicular health. Sentence Preconceptional and gestational exposure to biosolids influenced the health status of developing follicles in offspring in a reproductive life-stage specific manner that involved cell death and cell proliferative pathways.
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