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In the present study, the authors show that treatment of adult male zebrafish (Danio rerio) with 7 weeks low-dose (0.22 nM-2.2 nM) BPA, resulted in alteration in histological structure of testis tissue and abnormality in expression levels of genes involved in testicular steroidogenesis. Furthermore, low-dose BPA treatment decreased the male locomotion during courtship; and was associated with less courtship behaviours to female but more aggressive behaviours to mating competitor. Interestingly, during the courtship test, the authors observed that female preferred control male to male under low-dose BPA exposure. Subsequently, it was found that the ability of female to choose optimal mating male through socially mutual interaction and dynamics of male zebrafish, which was based on visual discrimination. The authors concluded that the results shed light on the potential behavioural and physiological effect of low-dose BPA exposure on courtship behaviours of zebrafish, which could exert profound consequences on natural zebrafish populations.

Authors: Li X, Guo JY, Li X, Zhou HJ, Zhang SH, Liu XD, Chen DY, Fang YC, Feng XZ.


Determining time-weighted average concentrations of nitrate and ammonium in freshwaters using DGT with ion exchange membrane-based binding layers

In this study, commercially-available AMI-7001 anion exchange and CMI-7000 cation exchange membranes were utilised as binding layers for DGT
measurements of NO3-N and NH4-N in freshwaters. These ion exchange membranes are easier to prepare and handle than DGT binding layers consisting of hydrogels cast with ion exchange resins. The membranes showed good uptake and elution efficiencies for both NO3-N and NH4-N. The membrane-based DGTs are suitable for pH 3.5-8.5 and ionic strength ranges (0.0001-0.014 and 0.0003-0.012 mol L(-1) as NaCl for the AMI-7001 and CMI-7000 membrane, respectively) typical of most natural freshwaters. The binding membranes had high intrinsic binding capacities for NO3-N and NH4-N of 911 ± 88μg and 3512 ± 51 μg, respectively. Interferences from the major competing ions for membrane-based DGTs are similar to DGTs employing resin-based binding layers but with slightly different selectivity. This different selectivity means that the two DGT types can be used in different types of freshwaters. The laboratory and field experiments demonstrated that AMI-DGT and CMI-DGT can be an alternative to A520E-DGT and PrCH-DGT for measuring NO3-N and NH4-N, respectively, as (i) membrane-based DGT have a consistent composition, (ii) avoid the use of toxic chemicals, (iii) provided highly representative results (CDGT : CSOLN between 0.81 and 1.3), and (iv) agreed with resin-based DGTs to within 85-120%.

Authors: Huang J, Bennett WW, Welsh DT, Teasdale PR.

Bioaccumulation and trophic transfer of cyclic volatile methylsiloxanes were evaluated in the pelagic marine food web of Tokyo Bay, Japan.

Trophic dilution of cyclic volatile methylsiloxanes (cVMS) in the pelagic marine food web of Tokyo Bay, Japan

2016-12-05

Bioaccumulation and trophic transfer of cyclic volatile methylsiloxanes (cVMS), specifically octamethylcyclotetrasiloxane (D4), decamethylcyclopentasiloxane (D5), and dodecamethylcyclohexasiloxane (D6), were evaluated in the pelagic marine food web of Tokyo Bay, Japan. Polychlorinated biphenyl (PCB) congeners that are “legacy” chemicals known to bioaccumulate in aquatic organisms and biomagnify across aquatic food webs were used as a benchmark chemical (CB-180) to calibrate the sampled food web and as a reference chemical (CB-153) to validate the results. Trophic magnification factors (TMFs) were calculated from slopes of ordinary least-squares (OLS) regression models and slopes of bootstrap regression models, which were used as robust alternatives to the OLS models. Various regression models were developed that incorporated benchmarking to control bias associated with experimental design, food web dynamics, and trophic level structure. There was no evidence from any of the regression models to suggest biomagnification
of cVMS in Tokyo Bay. Rather, the regression models indicated that trophic dilution of cVMS, not trophic magnification, occurred across the sampled food web. Comparison of results for Tokyo Bay to results from other studies indicated that bioaccumulation of cVMS was not related to type of food web (pelagic vs demersal), environment (marine vs freshwater), species composition, or location. Rather, results suggested that differences between study areas was likely related to food web dynamics and variable conditions of exposure resulting from non-uniform patterns of organism movement across spatial concentration gradients.

Authors: Powell DE, Suganuma N, Kobayashi K, Nakamura T, Ninomiya K, Matsumura K, Omura N, Ushioka S.


Using change-point models to estimate empirical critical loads for nitrogen in mountain ecosystems

2016-12-05
To protect ecosystems and their services, the critical load concept has been implemented under the framework of the Convention on Long-range Transboundary Air Pollution (UNECE) to develop effects-oriented air pollution abatement strategies. Critical loads are thresholds below which damaging effects on sensitive habitats do not occur according to current knowledge. In this study, the authors use change-point models applied in a Bayesian context to overcome some of the difficulties when estimating empirical critical loads for nitrogen (N) from empirical data. The method was tested using simulated data with varying sample sizes, varying effects of confounding variables, and with varying negative effects of N deposition on species richness. The method was applied to the national-scale plant species richness data from mountain hay meadows and (sub)alpine scrubs sites in Switzerland. Seven confounding factors (elevation, inclination, precipitation, calcareous content, aspect as well as indicator values for humidity and light) were selected based on earlier studies examining numerous environmental factors to explain Swiss vascular plant diversity. The estimated critical load confirmed the existing empirical critical load of 5-15 kg N ha(-1) yr(-1) for (sub)alpine scrubs, while for mountain hay meadows the estimated critical load was at the lower end of the current empirical critical load range. Based on these results, the
This study examined the applicability of a freeze-dried bioluminescent bioreporter, Pseudomonas putida mt-2 KG1206 (called KG1206), to the biomonitoring of groundwater samples from monitoring wells near gasoline leakage sites.

2016-12-05

This study examined the applicability of a freeze-dried bioluminescent bioreporter, Pseudomonas putida mt-2 KG1206 (called KG1206), to the biomonitoring of groundwater samples. Samples were collected from the monitoring wells of gas station tanks or old pipeline leakage sites in Korea. In general, the freeze-dried strain in the presence of pure inducer chemicals showed low bioluminescence activity and a different activity order compared with that of the subcultured strain. The effects of KNO3 as a bioluminescence stimulant were observed on the pure inducers and groundwater samples. The stimulation rates varied according to the type of inducers and samples, ranging from 2.2 to 20.5 times (for pure inducers) and from 1.1 to 11 times (for groundwater samples) the total bioluminescence of the control. No considerable correlations were observed between the bioluminescence intensity of the freeze-dried strain and the inducer concentrations in the samples ($R^2 < 0.1344$). However, samples without a high methyl tertiary butyl ether (MTBE) level and those from the gas station leakage site showed reasonable correlations with the bioluminescence activity with $R^2$ values of 0.3551 and 0.4131, respectively. These results highlight the potential of using freeze-dried bioluminescent bacteria as a rapid, simple, and portable tool for the preliminary biomonitoring of specific pollutants at contaminated sites.

Authors: Ko KS, Kong IC.
The authors hypothesised that males may be more susceptible than females to diesel exhaust neurotoxicity, because of a lower level of expression of paraoxonase 2 (PON2), an intracellular anti-oxidant and anti-inflammatory enzyme. Acute exposure of C57BL/6 mice to DE (250-300μg/m(3) for 6h) caused significant increases in lipid peroxidation and of pro-inflammatory cytokines (IL-1α, IL-1β, IL-3, IL-6, TNF-α) in various brain regions (particularly olfactory bulb and hippocampus). In a number of cases the observed effects were more pronounced in male than in female mice. DE exposure also caused microglia activation, as measured by increased Iba1 (ionised calcium-binding adapter molecule 1) expression, and of TSPO (translocator protein) binding. Mice heterozygotes for the modifier subunit of glutamate cysteine ligase (the limiting enzyme in glutathione biosynthesis; Gclm(+/-) mice) appeared to be significantly more susceptible to DE-induced neuroinflammation than wild type mice. The authors concluded that these findings indicate that acute exposure to DE causes neuroinflammation and oxidative stress in brain, and suggest that sex and genetic background may play important roles in modulating susceptibility to DE neurotoxicity.

Authors: Cole TB, Coburn J, Dao K, Roqué P, Chang YC, Kalia V, Guilarte TR, Dziedzic J, Costa LG.

Effects of structurally different noncoplanar and coplanar 
PCBs on HELF cell proliferation, cell cycle, and potential 
molecular mechanisms

2016-12-05

Polychlorinated biphenyls (PCBs) are a group of chemicals that persist in 
the environment, indoors, and humans. Lung exposure to airborne and 
food contaminants, such as PCBs, may cause possible lung disorders, such 
as cancer. In the present study, the authors investigated the effects of 
structurally different lower chlorinated (≤4Cl), noncoplanar PCB40, and 
coplanar PCB77 on human lung fibroblast cell line (HELF) cell proliferation, 
cell cycle progression, and possible molecular mechanisms. Noncoplanar 
PCB40 and coplanar PCB77 exhibited concentration- and time-dependent 
biphasic dose-response effects on HELF cell proliferation. Noncoplanar 
PCB40 and coplanar PCB77 induced 23 and 45% cytotoxicity at higher 
concentrations than the control. The flow cytometry analysis showed that 
exposure to PCB40 caused a significant increase in time spent in the G1 
phase but decreased length of the S phase in a concentration- and time-
dependent manner, whereas PCB77 exposure decreased time spent in 
the G1 and S phases but increased time spent in the G2 phase. Western 
blot analysis indicated that PCB77 increased the expression of cyclin E, 
CDK2, p21, and caspase-9, while PCB40 decreased the expression of these 
proteins (except CDK2 and p21). An increase in CDK expression after 
exposure to PCB77 suggests that it may cause carcinogenic effects on 
HELF cells at higher doses. Our results also demonstrate that the different 
cytotoxic effects induced by coplanar and nonplanar PCBs were correlated 
with their structural characteristics; the coplanar congener was more 
cytotoxic than the nonplanar congener. The study elaborates threshold 
levels for these chemicals and suggests that the cytotoxicity mechanisms 
by which PCB congeners act on HELF cells depend on their planarity 
and chemical structures. Furthermore, the study will be important for 
developing antidotes to the adverse effects and risk assessment practices 
for PCBs.

Authors: Hashmi MZ, Zhang J, Li B, Su X, Tariq M, Ahmad N, Malik RN, Ullah 
K, Chen C, Shen C.

[Epub ahead of print]
There is evidence of mercury in some Chinese folk prescriptions (CFP)s in China. In this study, the authors report a case of a 35-year-old rural woman, who took almost 35g of Hg2O orally to treat her itchy skin followed a folk prescription of an unlicensed practitioners engaging in quackery (UPEQ), which lead to dark red bloody stool and mucus, nausea, and numbness. She sought help from general hospitals, which brought her only misdiagnosis. Only after a mercury level test conducted by Chongqing Prevention and Treatment Centre for Occupational Diseases (CPOD) confirmed her mercury intoxication, she was treated.

Mercury poisoning caused by Chinese folk prescription (CFP): A case report and analysis of both CFP and quackery

2016-12-05
There is evidence of mercury in some Chinese folk prescriptions (CFP)s in China. In this study, the authors report a case of a 35-year-old rural woman, who took almost 35g of Hg2O orally to treat her itchy skin followed a folk prescription of an unlicensed practitioners engaging in quackery (UPEQ), which lead to dark red bloody stool and mucus, nausea, and numbness. She sought help from general hospitals, which brought her only misdiagnosis. Only after a mercury level test conducted by Chongqing Prevention and Treatment Centre for Occupational Diseases (CPOD) confirmed her mercury intoxication, she was treated.

Biopersistence and Translocation to Extrapulmonary Organs of Titanium Dioxide Nanoparticles after Subacute Inhalation Exposure to Aerosol in Adult and Elderly Rats

2016-12-05
The increasing industrial use of nanoparticles (NPs) has raised concerns about their impact on human health. Since aging and exposure to environmental factors are linked to the risk for developing pathologies, the authors address the question of TiO2 NPs toxicokinetics in the context of a realistic occupational exposure. They report the biodistribution of titanium in healthy young adults (12-13-week-old) and in elderly rats (19-month-old) exposed to 10mg/m(3) of a TiO2 nanostructured aerosol 6 hours/day, 5 days/week for 4 weeks. Ti content in major organs was measured using inductively coupled plasma mass spectrometry immediately and up to 180 days after the end of exposure. Large amounts of titanium were initially found in lung which were slowly cleared during the post-exposure period. From day 28, a small increase of Ti was found in the spleen and liver of exposed young adult rats. Such an increase was however never found in their blood, kidneys or brain. In the elderly group, translocation to extra-pulmonary organs was significant at day 90. Ti recovered from the spleen and liver of exposed elderly rats was higher than in exposed young adults. These data suggest that TiO2 NPs may translocate from the lung to extra-pulmonary organs where they could possibly promote systemic health effects.

Authors: Gaté L, Disdier C, Cosnier F, Gagnaire F, Devoy J, Saba W, Brun E, Chalansonnet M, Mabondzo A.

with chelation therapy with sodium dimercaptosulphonat and showed significant improvements. The authors concluded that confused by differences between TCM and CFP, people might take dangerous remedies without realising the consequences; not only could it exacerbate their primary disease, but it could lead to unexpected and disastrous results.

Authors: Mo T, Sun S, Wang Y, Luo D, Peng B, Xia Y.

Alterations in high-density lipoprotein proteome and function associated with persistent organic pollutants

2016-12-05

There is a growing body of evidence that persistent organic pollutants (POPs) may increase the risk for cardiovascular disease (CVD), but the mechanisms remain unclear. High-density lipoprotein (HDL) acts protective against CVD by different processes, and we have earlier found that HDL from subjects with CVD contains higher levels of POPs than healthy controls. In the present study, the authors have expanded analyses on the same individuals living in a contaminated community and investigated the relationship between the HDL POP levels and protein composition/function. HDL from 17 subjects was isolated by ultracentrifugation. HDL protein composition, using nanoliquid chromatography tandem mass spectrometry, and antioxidant activity were analysed. The associations of 16 POPs, including polychlorinated biphenyls (PCBs) and organochlorine pesticides, with HDL proteins/functions were investigated by partial least square and multiple linear regression analysis. Proteomic analyses identified 118 HDL proteins, of which ten were significantly (p<0.05) and positively associated with the combined level of POPs or with highly chlorinated PCB congeners. Among these, cholesteryl ester transfer protein and phospholipid transfer protein, as well as the inflammatory marker serum amyloid A, were found. The serum paraoxonase/arylesterase 1 activity was inversely associated with POPs. Pathway analysis demonstrated that up-regulated proteins were associated with biological processes involving lipoprotein metabolism, while down-regulated proteins were associated with processes such as negative regulation of proteinases, acute phase response, platelet degranulation, and complement activation. These results indicate an association between POP levels, especially highly chlorinated PCBs, and HDL protein alterations that may result in a less functional particle. Further studies are needed to determine causality and the importance of other
This study examines the effects of short-term PM2.5 on hospitalisation for cardiovascular diseases, its modifications by season and temperature, and whether these effects are heterogeneous across different regions in New York State.

Seasonal and temperature modifications of the association between fine particulate air pollution and cardiovascular hospitalization in New York state

2016-12-05

It is known that extreme temperature and ambient air pollution are each independently associated with human health outcomes. However, findings from the few studies that have examined modified effects by seasons and the interaction between air pollution and temperature on health endpoints are inconsistent. This study examines the effects of short-term PM2.5 (particulate matter less than or equal to 2.5μm in aerodynamic diameter) on hospitalisation for cardiovascular diseases (CVDs), its modifications by season and temperature, and whether these effects are heterogeneous across different regions in New York State (NYS). The authors used daily average temperature and PM2.5 concentrations as exposure indicators and performed a time series analysis with a quasi-Poisson model, controlling for possible confounders, such as time-relevant variables and dew point, for CVDs in NYS, 1991-2006. Stratification parametric models were applied to evaluate the modifying effects by seasons and temperature. Across the whole year, a 10-μg/m(3) increment in PM2.5 concentration accounted for a 1.37% increase in CVDs (95% confidence interval (CI): 0.90%, 1.84%) in New York City, Long Island & Hudson. The PM2.5 effect was strongest in winter, with an additional 2.06% (95% CI: 1.33%, 2.80%) increase in CVDs observed per 10-μg/m(3) increment in PM2.5. Temperature modified the PM2.5 effects on CVDs, and these modifications by temperature on PM2.5 effects on CVDs were found at low temperature days. These associations were heterogeneous across four PM2.5 concentration regions. PM2.5 was positively associated with CVD hospitalisations. The short-term PM2.5 effect varied with season and temperature levels, and stronger effects were observed in winter and at low temperature days.

Authors: Hsu WH, Hwang SA, Kinney PL, Lin S.
The objective of this study was to evaluate the influence of former occupational Mn exposure on olfaction within the framework of a prospective cohort study among an elderly German population. Information on job tasks with recognised Mn exposure and data on odour identification assessed with Sniffin’ sticks was collected during the second follow-up of the Heinz Nixdorf Recall Study. The study population consisted of 1385 men aged 55-86 years, 354 of whom ever worked in jobs with potential Mn exposure (median 58.3μg/m(3) years, interquartile range 19.0-185μg/m(3) years). Multiple exposure measures, including job tasks, cumulative Mn exposure, and Mn determined in blood samples (MnB) archived at baseline, were used to estimate effects of Mn on olfaction. Having ever worked as welder was associated with better olfaction compared to other blue-collar workers without Mn exposure. Blue-collar workers identified less odours in comparison to white-collar workers. Concentrations of previous Mn exposure >185μg/m(3) years or MnB ≥15μg/L were not associated with impaired olfaction. In addition to a strong age effect, participants with lower occupational qualification identified less odours. The authors found no relevant association of former Mn exposure at relatively low levels with impaired olfaction. Possible neurotoxic Mn effects may not be persistent after cessation.


Occupational health risk assessment and exposure to floor dust PAHs inside an educational building

2016-12-05

Polycyclic aromatic hydrocarbons (PAHs) settled in floor dust play an important role in human health. Although many studies investigated
This study evaluated the effects of occupational exposures to coke oven emissions (COEs) and benzo[a]pyrene (B[a]P) on the prevalence of hypertension and abnormal electrocardiogram (ECG) in coke oven workers.

Effects of Coke Oven Emissions and Benzo[a]pyrene on Blood Pressure and Electrocardiogram in Coke Oven Workers

2016-12-05

This study evaluated the effects of occupational exposures to coke oven emissions (COEs) and benzo[a]pyrene (B[a]P) on the prevalence of hypertension and abnormal electrocardiogram (ECG) in coke oven workers. Eight hundred and eighty coke oven workers and 710 oxygen employees were recruited in the exposed and control groups, respectively. Blood pressure (BP), ECG, blood lipid levels, and glucose levels of all subjects were measured. COE and B[a]P concentrations at the bottom, side, and top of the oven and control plants were estimated by weighing and high-performance liquid chromatography. The COE concentration at the top and side was higher than that at the bottom (P < 0.05). The
In this study, the authors examine what non-genotoxic carcinogens are and discuss chemical regulatory requirements and limitations.

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both a possible structure of the future IATA for NGTxC and associated OECD Test Guideline development priorities.

Authors: Jacobs MN, Colacci A, Louekari K, Luijten M, Hakkert BC, Paparella M, Vasseur P.

New human biomonitoring methods for chemicals of concern-the German approach to enhance relevance

2016-12-05

In Germany strong efforts have been made within the last years to develop new methods for human biomonitoring (HBM). The German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB) and the German Chemical Industry Association e. V. (VCI) cooperate since 2010 to increase the knowledge on the internal exposure of the general population to chemicals. The projects aim is to promote human biomonitoring by developing new analytical methods. Key partner of the cooperation is the German Environment Agency (UBA) which has been entrusted with the scientific coordination. Another key partner is the “HBM Expert Panel” which each year puts together a list of chemicals of interest to the project from which the Steering Committee of the project chooses up to five substances for which method development will be started. Emphasis is placed on substances with either a potential health relevance or on substances to which the general population is potentially exposed to a considerable extent. The HBM Expert Panel also advises on method development. Once a method is developed, it is usually first applied to about 40 non-occupationally exposed individuals. A next step is applying the methods to different samples. Either, if the time trend is of major interest, to samples from the German Environmental Specimen Bank, or, in case exposure sources and distribution of exposure levels in the general population are the focus, the new methods are applied to samples from children and adolescents from the population representative 5th German Environmental Survey (GerES V). Results are expected in late 2018. This study describes the challenges faced during method development and solutions found. An overview presents the 34 selected substances, the 14 methods developed and the 7 HBM-I values derived in the period from 2010 to mid 2016.

Authors: Kolossa-Gehring M, Fiddicke U, Leng G, Angerer J, Wolz B.
Tobacco use and its impact on pulmonary health among elderly population in rural area of Muzaffarnagar - A cross-sectional study

2016-12-05
The tobacco use is significant in Indian rural population. Among them, elderly people in rural area are at special risk due to ageing and other factors. The impact of tobacco use on elderly health, therefore, needs to be studied in depth in rural context. In this study, the authors examined the patterns of tobacco use and its consequent impact on pulmonary health of the elderly. A community-based cross-sectional study was done (April 1st to September 30th, 2014) in the field practice area (village Bilaspur) of Rural Health Training Centre (RHTC) of Muzaffarnagar Medical College, Muzaffarnagar. A simple random sampling was used and elderly of 60 years and above were interviewed by semi-structured interview schedule. The data were analysed by software Epi-info. version 7.1.3.3. The prevalence of tobacco usage among elderly was 56.7%, in which smoking was the dominant one (37%) and majority being in the form of Bidi (56.7%). Tobacco usage was significantly associated not only with age, sex, and caste (p<0.05 each), but occupational and socio-economic status (p<0.01 each) also; however, literacy was the most significant factor (p<0.0001) among all. The tobacco usage in smoking form was highly significantly associated with the presence of chronic obstructive pulmonary disease (p<0.0001), elucidating a significant impact on their pulmonary health. The rural elderly people need health education regarding curtailing the use of tobacco for their better health from health clinics.

Authors: Davey S, Singh JV, Raghav SK, Muzammil K, Shankar R.

Bioaccumulation and cancer risk of polycyclic aromatic hydrocarbons in leafy vegetables grown in soils within automobile repair complex and environ in Uyo, Nigeria

2016-12-05
Using gas chromatography-mass spectrometry and an incremental lifetime cancer risks (ILCRs) assessment model, the bioaccumulation and cancer risk of 16 USEPA priority polycyclic aromatic hydrocarbons (PAHs) in leafy vegetables (Vernonia amygdalina and Lasianthera africanum) grown in soils within an automobile repair complex environment in Uyo, Nigeria was studied. The total PAHs concentrations recorded for soils ranged
In this study, the authors analysed 300 urine samples from the years 2007 to 2015 for 21 phthalate metabolites.

Phthalate metabolites in 24-h urine samples of the German Environmental Specimen Bank (ESB) from 1988 to 2015 and a comparison with US NHANES data from 1999 to 2012

2016-12-05
The German Environmental Specimen Bank (ESB) continuously collects 24-h urine samples since the early 1980s in Germany. In this study, the authors analysed 300 urine samples from the years 2007 to 2015 for 21 phthalate metabolites (representing exposure to 11 parent phthalates) and combined the data with two previous retrospective measurement campaigns (1988 to 2003 and 2002 to 2008). The combined dataset comprised 1162 24-h urine samples spanning the years 1988 to 2015. With this detailed set of human biomonitoring data, the authors describe the time course of phthalate exposure in Germany over a time frame of 27 years. For the metabolites of the endocrine disrupting phthalates di(2-ethylhexyl) phthalate (DEHP), di-n-butyl phthalate (DnBP) and
butylbenzyl phthalate (BBzP) roughly a ten-fold decline was observed in median metabolite levels from their peak levels in the late 1980s/early 1990s compared to most recent levels from 2015. Probably, bans (first enacted in 1999) and classifications/labelling (enacted in 2001 and 2004) in the European Union lead to this drop. A decline in di-isobutyl phthalate (DiBP) metabolite levels set in only quite recently, possibly due to its later classification as a reproductive toxicant in the EU in 2009. In a considerable number of samples collected before 2002 health based guidance values (BE, HBM I) have been exceeded for DnBP (27.2%) and DEHP (2.3%) but also in recent samples some individual exceedances can still be observed (DEHP 1.0%). A decrease in concentration for all low molecular weight phthalates, labelled or not, was seen in the most recent years of sampling. For the high molecular weight phthalates, DEHP seems to have been substituted in part by di-isononyl phthalate (DiNP), but DiNP metabolite levels have also been declining in the last years. Probably, non-phthalate alternatives increasingly take over for the phthalates in Germany. A comparison with NHANES (National Health and Nutrition Examination Survey) data from the United States covering the years 1999 to 2012 revealed both similarities and differences in phthalate exposure between Germany and the US. Exposure to critical phthalates has decreased in both countries with metabolite levels more and more aligning with each other, but high molecular weight phthalates substituting DEHP (such as DiNP) seem to become more important in the US than in Germany.

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and analysis by ultra-high performance liquid chromatography-tandem mass spectrometry (UHPLC-MS/MS) was developed and validated. The most influential parameters affecting the extraction method were optimised. The method was validated using matrix-matched calibration and recovery assays. Limits of detection ranged from 0.2 to 4 ng g\(^{-1}\), limits of quantification from 0.5 to 12 ng g\(^{-1}\), and inter- and intra-day variability was under 15\% in all cases. Recovery rates for spiked samples ranged from 92.1 to 113.8\%. The method was applied for the determination of the selected compounds in human hair. Samples were collected weekly from six randomly selected volunteers (three men and three women) over a three-month period. All the analysed samples tested positive for at least one of the analysed compounds.

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