

# Bulletin Board

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## CHEMICAL EFFECTS

**Biomonitoring of volatile organic compounds (VOCs) among hairdressers in salons primarily serving women of color: A pilot study**

2021-06-02

Hairdressers are exposed to volatile organic compounds (VOCs), many of which have been linked to acute and chronic health effects. Those hairdressers serving an ethnic clientele may potentially experience disproportionate exposures from frequent use of products containing VOCs or different VOC concentrations contained in products which are marketed to the specific needs of their clientele. However, no biomonitoring studies have investigated occupational exposures in this population. In the present pilot study, we sought to characterize concentrations and exposure determinants for 28 VOC biomarkers in post-shift urine samples among 23 hairdressers primarily serving an ethnic clientele. VOC biomarker concentrations among hairdressers of color were compared to concentrations among a comparison group of 17 office workers and a representative sample of women participating in the U.S. National Health and Nutrition Examination Survey. VOC biomarkers were detected in all hairdressers with higher concentrations observed among hairdressers serving a predominantly Black versus Latino clientele, and among hairdressers overall versus office workers and women in the U.S. general population. Median biomarker concentrations for acrolein, 1,3-butadiene, and xylene in hairdressers were more than twice as high as those observed among office workers. Median concentrations for 1-bromopropane, acrolein and 1,3-butadiene were more than four times higher among all hairdressers compared to those reported among women in the U.S. general population. Select salon services (e.g., sister locs, flat ironing, permanent hair coloring, permanent waves or texturizing, Brazilian blowout or keratin treatment, etc.) were also associated with higher VOC biomarker concentrations among hairdressers. This pilot study represents the first biomonitoring analysis to characterize VOC exposures among women hairdressers of color and to provide evidence that this occupational population may experience elevated VOC exposures compared to women in the U.S. general population. Results from our study represent an important first step in elucidating occupational VOC exposures in this understudied occupational group. Larger studies among a racially and ethnically diverse cohort of hairdressers are warranted

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to confirm our findings and inform future exposure interventions in this understudied occupational population.

Authors: Lydia M Louis, Lucy K Kavi, Meleah Boyle, Walkiria Pool, Deepak Bhandari, Víctor R De Jesús, Stephen Thomas, Anna Z Pollack, Angela Sun, Seyrona McLean, Ana M Rule, Lesliam Quirós-Alcalá

Full Source: Environment international 2021 Jun 2;154:106655. doi: 10.1016/j.envint.2021.106655.

**Enhanced in vitro toxicity of plastic leachates after UV irradiation**

2021-07-01

Plastics can release numerous chemicals and thereby, contribute to the chemical pollution in aquatic systems. To which extent environmental degradation processes influence the release of plastic chemicals, is currently unknown and subject of research. We therefore evaluated aqueous leachates of 12 differently formulated plastics (e.g., pre-production, post-industrial and recycled pellets as well as final products) using in vitro bioassays and chemical analysis via LC-HRMS nontarget approach. We weathered these plastics by UV irradiation (UV-C and UV-A/B) under laboratory conditions in dryness and a subsequent leaching period in ultrapure water ('atmospheric' weathering) or directly in water ('aquatic' weathering, UV-A/Baq). A dark control (DC) without UV light served as a reference treatment. Some plastics triggered several toxicological endpoints (low-density polyethylene recyclate (LDPE-R), starch blend (SB), bio-based polybutylene succinate (Bio-PBS) and polyvinyl chloride (PVC)), whereas others caused little to no effects (polyethylene terephthalate (PET), polystyrene (PS), polypropylene (PP) and LDPE). UV irradiation enhanced the plastics' toxicity, even for samples initially evaluated as toxicologically inconspicuous. The plastic samples caused oxidative stress (85%), baseline toxicity (42%), antiestrogenicity (40%) and antiandrogenicity (27%). Positive findings were measured after UV-C (63%) and UV-A/Baq (50%) treatments, followed by UV-A/B (48%) and DC (33%). Overall, we detected between 42 (DC) and 2896 (UV-A/Baq) chemical compounds. Our study demonstrates that differently formulated plastics leach toxic chemicals. UV exacerbates the plastics' toxicity by either generating active compounds and/or by facilitating their release. UV light even leads to the release of bioactive compounds from plastics of low chemical complexity. To prevent the exposure to plastic-associated chemicals, the application of chemicals could be reduced to a minimum,

**Plastics can release numerous chemicals and thereby, contribute to the chemical pollution in aquatic systems.**

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while on a regulatory level the evaluation of plastic eluates could be another focal point next to singular compounds.

Authors: Kristina Klein, Delia Hof, Andrea Dombrowski, Peter Schweyen, Georg Dierkes, Thomas Ternes, Ulrike Schulte-Oehlmann, Jörg Oehlmann  
Full Source: *Water research* 2021 Jul 1;199:117203. doi: 10.1016/j.watres.2021.117203.

### Potential Chemicals from Plastic Wastes

2021-05-26

Plastic is referred to as a “material of every application”. From the packaging and automotive industries to the medical apparatus and computer electronics sectors, plastic materials are fulfilling demands efficiently. These plastics usually end up in landfills and incinerators, creating plastic waste pollution. According to the Environmental Protection Agency (EPA), in 2015, 9.1% of the plastic materials generated in the U.S. municipal solid waste stream was recycled, 15.5% was combusted for energy, and 75.4% was sent to landfills. If we can produce high-value chemicals from plastic wastes, a range of various product portfolios can be created. This will help to transform chemical industries, especially the petrochemical and plastic sectors. In turn, we can manage plastic waste pollution, reduce the consumption of virgin petroleum, and protect human health and the environment. This review provides a description of chemicals that can be produced from different plastic wastes and the research challenges involved in plastic waste to chemical production. This review also provides a brief overview of the state-of-the-art processes to help future system designers in the plastic waste to chemicals area.

Authors: Ravindra Prajapati, Kirtika Kohli, Samir K Maity, Brajendra K Sharma

Full Source: *Molecules* (Basel, Switzerland) 2021 May 26;26(11):3175. doi: 10.3390/molecules26113175.

### Occurrence, patterns, and sources of hazardous organic chemicals in edible insects and insect-based food from the Japanese market

2021-05-31

Due to the growth of the world’s population, edible insects have been considered a valuable alternative food source for humans. Japan has a long-lasting traditional culture of eating wild insects, a practice that has recently evolved towards farming and selling reared edible insects. In this study, we investigated the contamination loads, profiles, and possible sources of organophosphorus flame retardants (PFRs), plasticizers, and

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selected persistent organic pollutants (POPs) in insect foods available on the Japanese market. Medians of selected POPs in the dataset were up to 1.3 ng/g lw, while medians of PFRs and plasticizers were 12 and 486 ng/g ww, respectively. CB-153, p,p'-DDE, BDE-47, tris(1-chloro-2-propyl)-phosphate (TCIPP), and bis(2-ethylhexyl)-phthalate (DEHP) were the dominant compounds in the analyzed samples, a pattern comparable to previous investigations on organic chemicals in edible insects. Our overall results suggest that POPs were likely accumulated by the insects during rearing or from the wild environment, while PFRs and plasticizers derived from post-harvesting industrial handling and seasoning. Differences in pollution patterns and the absence of correlations between PFR and plasticizer loads in insects and in food packaging suggest that the transfer of contaminants from food contact materials is not a main source of contamination.

Authors: Giulia Poma, Yukiko Fujii, Siebe Lievens, Jasper Bombeke, Beibei Gao, Yunsun Jeong, Thomas Jacob McGrath, Adrian Covaci

Full Source: *Food and chemical toxicology : an international journal published for the British Industrial Biological Research Association* 2021 May 31;112311. doi: 10.1016/j.fct.2021.112311.

### ENVIRONMENTAL RESEARCH

#### Long-term exposure to low-level air pollution and incidence of asthma: the ELAPSE project

2021-06-04

Background: Long-term exposure to ambient air pollution has been linked to childhood-onset asthma, although evidence is still insufficient. Within the multicentre project Effects of Low-Level Air Pollution: A Study in Europe (ELAPSE), we examined the associations of long-term exposures to particulate matter with a diameter <2.5 µm (PM<sub>2.5</sub>), nitrogen dioxide (NO<sub>2</sub>) and black carbon (BC) with asthma incidence in adults. Methods: We pooled data from three cohorts in Denmark and Sweden with information on asthma hospital diagnoses. The average concentrations of air pollutants in 2010 were modelled by hybrid land-use regression models at participants’ baseline residential addresses. Associations of air pollution exposures with asthma incidence were explored with Cox proportional hazard models, adjusting for potential confounders.

Results: Of 98 326 participants, 1965 developed asthma during a mean follow-up of 16.6 years. We observed associations in fully adjusted models with hazard ratios of 1.22 [95% CI 1.04-1.43] per 5 µg/m<sup>3</sup> for PM<sub>2.5</sub>,

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1.17 [95% CI 1.10-1.25] per  $10 \mu\text{g}/\text{m}^3$  for  $\text{NO}_2$  and 1.15 [95% CI 1.08-1.23] per  $0.5 \times 10^{-5} \text{ m}^{-1}$  for BC. Hazard ratios were larger in cohort subsets with exposure levels below the European Union and US limit values and possibly World Health Organization guidelines for  $\text{PM}_{2.5}$  and  $\text{NO}_2$ .  $\text{NO}_2$  and BC estimates remained unchanged in two-pollutant models with  $\text{PM}_{2.5}$ , whereas  $\text{PM}_{2.5}$  estimates were attenuated to unity. The concentration-response curves showed no evidence of a threshold. Conclusions: Long-term exposure to air pollution, especially from fossil fuel combustion sources such as motorised traffic, was associated with adult-onset asthma, even at levels below the current limit values.

Authors: Shuo Liu, Jeanette Therning Jørgensen, Petter Ljungman, Göran Pershagen, Tom Bellander, Karin Leander, Patrik K E Magnusson, Debora Rizzuto, Ulla A Hvidtfeldt, Ole Raaschou-Nielsen, Kathrin Wolf, Barbara Hoffmann, Bert Brunekreef, Maciej Strak, Jie Chen, Amar Mehta, Richard W Atkinson, Mariska Bauwelinck, Raphaëlle Varraso, Marie-Christine Boutron-Ruault, Jørgen Brandt, Giulia Cesaroni, Francesco Forastiere, Daniela Fecht, John Gulliver, Ole Hertel, Kees de Hoogh, Nicole A H Janssen, Klea Katsouyanni, Matthias Ketzel, Jochem O Klompaker, Gabriele Nagel, Bente Oftedal, Annette Peters, Anne Tjønneland, Sophia P Rodopoulou, Evangelia Samoli, Doris Tove Kristoffersen, Torben Sigsgaard, Massimo Stafoggia, Danielle Vienneau, Gudrun Weinmayr, Gerard Hoek, Zorana Jovanovic Andersen

Full Source: The European respiratory journal 2021 Jun 4;57(6):2003099. doi: 10.1183/13993003.03099-2020.

### ATR-FTIR and LC-Q-ToF-MS analysis of indoor dust from different micro-environments located in a tropical metropolitan area

2021-08-20

Indoor dust is an important matrix that exposes humans to a broad spectrum of chemicals. The information on the occurrence of contaminants of emerging concern (CECs), their metabolites, and re-emerging contaminants in indoor dust is rather limited. As the indoor environment is exposed to various chemicals from personal care products, furniture, building materials, machineries and cooking/cleaning products, there is a high chance of the presence of hazardous contaminants in indoor dust. In the present study, dust samples were collected from four different micro indoor environments (photocopying centres, residential houses, classrooms, and ATM cabins) located in an urban environment located in India's southwestern part. The collected samples were subjected to ATR - FTIR and LC-Q-ToF-MS analyses. The ATR - FTIR analysis indicated

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the presence of aldehydes, anhydrides, carboxylic acids, esters, sulphonic acids, and asbestos - a re-emerging contaminant. A total of 19 compounds were identified from the LC-Q-ToF-MS analysis. These compounds belonged to various classes such as plasticisers, plasticiser metabolites, photoinitiators, personal care products, pharmaceutical intermediates, surfactants, and pesticides. To the best of our knowledge, this is the first report regarding the presence of CECs in indoor environments in Kerala and also the suspected occurrence of pesticides (metaldehyde and ethofumesate) in classroom dust in India. Another important highlight of this work is the demonstration of ATR-FTIR as a complementary technique for LC-Q-ToF-MS in the analysis of indoor pollution while dealing with totally unknown pollutants. These results further highlight the occurrence of probable chemically modified metabolites in the tropical climatic conditions in a microenvironment.

Authors: M Vishnu Sreejith, K S Aradhana, M Varsha, M K Cyrus, C T Aravindakumar, Usha K Aravind

Full Source: The Science of the total environment 2021 Aug 20;783:147066. doi: 10.1016/j.scitotenv.2021.147066.

### Mitigation of organophosphorus insecticides from environment: Residual detoxification by bioweapon catalytic scavengers

2021-05-31

Organophosphorus insecticides (OPIs) have low persistence and are easily biodegradable in nature. The United States and India are the major countries producing OPIs of about 25% and 17% of the world, respectively. OPIs commonly used for agricultural practices occupy a major share in the global market, which leads to the increasing contamination of OPIs residues in various food chains. To overcome this issue, an enzymatic degradation method has been approved by several environmental toxic, and controlling agencies, including United States Environmental Protection Agency (USEPA). Different catalytic enzymes have been isolated and identified from various microbial sources to neutralize the toxic pesticides and/or insecticides. In this review, we have gathered information on OPIs biotransformation and their residual toxicity in the environment. Particularly, it focuses on OPIs degrading enzymes such as chlorpyrifos hydrolase, diisopropylfluorophosphatase, organophosphate acid anhydrolase, organophosphate hydrolases, and phosphotriesterases like lactonases specific activity either P-O link group type or P-S link group of pesticides. To summarize, the catalytic degradation of organophosphorus insecticides is not only profitable but also environmentally friendly. Hence,

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the enzymatic catalyst is an ultimate and super bio-weapon to mitigate or decontaminate various OPIs residues in both terrestrial and aqueous environments.

Authors: Murali Krishna Paidi, Praveen Satapute, Muhammad Salman Haider, Shashikant Shiddappa Udikeri, Ramachandra Yarappa Lakshmikantha, Dai-Viet N Vo, Muthusamy Govarthanan, Sudisha Jogaiah  
Full Source: Environmental research 2021 May 31;111368. doi: 10.1016/j.envres.2021.111368.

## OCCUPATIONAL

**[Analysis on monitoring results of individual dose of occupational external radiation among radiation workers in Lanzhou in 2019]**

2021-05-20

Objective: To analyze the individual dose level of occupational external radiation of radiation workers in Lanzhou in 2019, so as to provide reference for radiation protection and occupational health management. Methods: In April 2020, a total of 1460 radiation workers in Gansu Provincial Center for Disease Control and Prevention in 2019 were selected as the research objects. The unit nature, hospital level and occupational category of the monitored workers were collected, and the monitoring results of external radiation personal dose in 2019 were analyzed and compared. Results: In the occupational external radiation monitoring of radiation workers in Lanzhou in 2019, the effective dose of 48 persons was 1.0~5.0 mSv, the effective dose of 2 persons was 5.0~10.0 mSv, the annual collective effective dose was 308.21 people·mSv, and the average annual effective dose of monitored persons was 0.21 mSv/a. There was significant difference in the distribution of annual effective dose per capita among different occupational groups ( $H=34.43$ ,  $P<0.05$ ). The annual effective dose per capita of nuclear medicine personnel was higher (0.56 mSv/a), followed by interventional radiology (0.33 mSv/a). The ratio of annual collective dose to total annual collective dose with annual individual dose more than 5 mSv (SR{5}) and the ratio of the number of staff with annual individual dose more than 1mSv to the total number of monitored personnel (NR{1}) were higher in nuclear medicine and interventional radiology personnel. The average annual effective dose distribution of diagnostic radiologists in different level hospitals was statistically significant ( $H=16.46$ ,  $P<0.05$ ). The average annual effective dose in private hospitals, community hospitals and health

**Objective: To analyze the individual dose level of occupational external radiation of radiation workers in Lanzhou in 2019, so as to provide reference for radiation protection and occupational health management.**

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centers was higher (0.32 mSv), followed by county hospitals (0.23 mSv). Conclusion: The individual dose of occupational external radiation of radiation workers in Lanzhou is generally low, and the annual effective dose of nuclear medicine and interventional radiology workers is high. The management of radiation protection should be emphasis on this people. And it is suggested to strengthen the supervision of private hospitals and update and maintain the equipment of community health centers.

Authors: F Wang, H Y Yang, J Wang, J L Wu

Full Source: Zhonghua lao dong wei sheng zhi ye bing za zhi = Zhonghua laodong weisheng zhiyebing zazhi = Chinese journal of industrial hygiene and occupational diseases 2021 May 20;39(5):379-382. doi: 10.3760/cma.j.cn121094-20200528-00298.

**Pesticide exposure and related health problems among farmworkers' children: a case-control study in southeast Iran**

2021-06-04

Pesticides are potentially hazardous chemicals that can cause injury to human health and the environment. The purpose of this study was to evaluate organophosphate pesticides (OPPs) and organochlorine pesticides (OCPs) exposure in farmworkers' children aged 6 to 11 years in Jiroft city in southeastern Iran. One hundred twenty farmworkers' children as case and 53 non-farmworkers' children aged 6 to 11 years as control were selected and the serum levels of OCPs were measured by using gas chromatography in all participants. In addition, erythrocyte acetylcholinesterase (AChE) and arylesterase activity of paraoxonase-1 (PON-1) were measured to evaluate OPPs effects. Catalase [CAT], superoxide dismutase3 (SOD3), glutathione peroxidase (GPx3) activities, and the levels of serum malondialdehyde (MDA), total antioxidant capacity (TAC), nitric oxide (NO), and protein carbonyl (PC) were measured to investigate OCPs and OPPs effects on oxidative stress (OS). The serum levels of beta-HCH, 4,4 DDE, and 4,4 DDT in the case group were significantly higher than the control group. In addition, in the case group, AChE, PON-1, CAT, SOD3, and GPx3 activities and the levels TAC were significantly lower, while MDA, PC, and NO levels were significantly higher than the control group. OCPs as illegal pesticides are present in southeast Iran and children are exposed to OCPs and OPPs in the studied area. In

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addition, higher serum levels of pesticides may be a major contributor in OS development, as a cause of many diseases.

Authors: Danial Abdollahdokht, Gholamreza Asadikaram, Moslem Abolhassani, Hossein Pourghadamyari, Mojtaba Abbasi-Jorjandi, Sanaz Faramarz, Mohammad Hadi Nematollahi

Full Source: Environmental science and pollution research international 2021 Jun 4. doi: 10.1007/s11356-021-14319-1.

## PHARMACEUTICAL/TOXICOLOGY

### Triiodothyronine ameliorates silica-induced pulmonary inflammation and fibrosis in mice

2021-05-26

Environmental exposure to silica or particles is very common in natural, agricultural and industrial activities. Chronic silica exposure can lead to silicosis, which remains one of the most serious interstitial lung diseases all through the world, while viable therapeutic choices are restricted. Triiodothyronine (T3) has been shown to exert a defensive role in many pulmonary diseases, however, rare data are available regarding the role of T3 on silica-induced injury. We constructed an experimental silicosis mouse model and T3 was intraperitoneally administrated after instillation of silica to observe the effect of T3 on silica-induced lung inflammation and fibrosis. Our results showed that the silicosis mouse model was accompanied by changes in thyroid morphology and function, and T3 supplement reduced silica-induced lung damage, inflammation and collagen deposition. The protective properties of T3 on silica-induced lung injury could be partially mediated through thyroid hormone receptors. And the mechanism by which T3 treatment ameliorated silica-induced fibrosis appeared to be via the reduction of glycolysis. Also, T3 could sufficiently postpone the progression of pulmonary fibrosis in established silicosis. Our findings reveal that administration of T3 could down-regulate the inflammatory response, pulmonary fibrosis and other lung damage caused by silica. The reduction of glycolysis may be one of the mechanisms.

Authors: Meng Yang, Dongming Wang, Shiming Gan, Bin Wang, Linling Yu, Yujia Xie, Lieyang Fan, Jixuan Ma, Weihong Chen

Full Source: The Science of the total environment 2021 May 26;790:148041. doi: 10.1016/j.scitotenv.2021.148041.

**Environmental exposure to silica or particles is very common in natural, agricultural and industrial activities.**