

# Bulletin Board

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## CHEMICAL EFFECTS

**Long-term exposure of high concentration heavy metals induced toxicity, fatality, and gut microbial dysbiosis in common carp, *Cyprinus carpio***

2020-08-01

Heavy metals (HMs) in an aquatic environment mainly affects fish, and thus, fish are convenient pollution bio-indicators. In this study, the toxic effects of HM mixture (chromium [Cr], cadmium [Cd], copper [Cu]) in 0 mg/L to 3.2 mg/L concentration range was investigated in *Cyprinus carpio* (28 days). HM accumulation, histopathology, oxidative stress, and gut microbial changes were evaluated. HMs accumulated in the order of Cr > Cu > Cd, primarily in the kidneys and finally scales. Reactive oxygen species generation increased in all exposure groups up to day 14, with maximum generation at 3.2 mg/L mixture, which later decreased on day 28 in all. Malondialdehyde and superoxide dismutase levels increased from day 7 to 28 with increased HM concentrations, while total protein showed an inverse trend. Gill histopathology showed major changes such as uplifted and disintegrated primary lamella, and secondary lamella shortening. The kidneys were characterized by glomerular necrosis, Bowman's capsule expansion, and tubular space dilatation. Proteobacteria and Firmicutes abundance increased up to 59.4% and 99.16% in 0.8 mg/L and 3.2 mg/L treatment groups, respectively. This study provided a better understanding on the physiology and gut microbiota alteration in *C. carpio* under multiple HM stress.

Authors: Apurva Kakade, El-Sayed Salama, Feng Pengya, Pu Liu, Xiangkai Li  
Full Source: Environmental pollution (Barking, Essex : 1987) 2020 Aug 1;266(Pt 3):115293. doi: 10.1016/j.envpol.2020.115293.

**Safe use of chemicals and risk communication among dentists and dental students in Greece**

2020-06

Use of chemicals, most often classified for intrinsic hazards, is rather common among dentists. To date, no data have been recorded in the European Union (EU) on dentists' awareness regarding the safe use of chemicals. In the EU regulatory framework, two Regulations with wide applications, namely Regulations (EC) 1907/2006 (REACH) and 1272/2008 (CLP), have been introduced to protect human health and the environment and clearly communicate hazards posed by chemicals to workers and consumers. The aim of this study was to assess the extent

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of comprehension of hazard communication of chemicals among Greek dentists. For this, a closed-ended, anonymous and validated questionnaire was initially distributed to a total of 300 Greek dentists, both professionals and university students, over a period of 4 months. The collected data from 240 final responders were subjected to statistical analysis (frequencies, percentages, chi-square ( $\chi^2$ ) and significance ( $p < 0.05$ )). The vast majority (90%) of the interviewed dentists are not aware of the CLP. Main sources of information regarding chemical hazard and safe use was the supplier through direct communication (90%), while some dentists also consulted the product labels (39%) and the material safety data sheets (54%). Regarding hazard communication, the perceived information from the pictograms is confusing to the vast majority of the dentists (86%), especially for systemic hazards (carcinogenicity and/or reproductive toxicity). In addition, 88% of the professional dentists have not noticed any changes in the labelling of chemical products, which also shows the low input of labels to hazard communication. On the other hand, 90% of the responders always utilize personal protective equipment (PPE), although it is not clear whether this PPE is adequate. In conclusion, rising awareness campaigns are needed, in collaboration with universities and dental care professional associations, to inform dentists about the safe use of chemicals not only to ensure protection of their own health but also to contribute to environmental sustainability.

Authors: Elisabeth A Koulaouzidou, Christina Tsitsimpikou, Alexandros K Nikolaidis, Christina Karanasiou, Eleni Foufa, Konstantinos Tsarouhas  
Full Source: Toxicology and industrial health 2020 Jun;36(6):427-435. doi: 10.1177/0748233720933062.

**Removal of microplastics from secondary wastewater treatment plant effluent by coagulation/flocculation with iron, aluminum and polyamine-based chemicals**

2020-06-18

Microplastic (MP) removal by coagulation/flocculation followed by settling was studied in a secondary wastewater treatment plant (WWTP) effluent matrix. MP concentration in size range  $<10 \mu\text{m}$  in wastewater is currently unknown due to the exclusion of this size range in many studies and due to difficulties in MP quantification. WWTP effluent samples were spiked with a known amount of polystyrene spheres of two different sizes  $1 \mu\text{m}$  and  $6.3 \mu\text{m}$ . The samples were treated with inorganic and organic coagulants typically used in WWTPs, i.e., ferric chloride, polyaluminum chloride, and polyamine. The effect of pH was studied with ferric chloride by changing the pH from 7.3 to 6.5. In this study, MP removal was monitored using

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flow cytometry. The role of chemicals in MP removal at WWTPs has not been in the focus of previously reported MP studies. Our results showed that all tested coagulants enhanced the removal of MPs with dosages applicable to tertiary treatment. The highest removal efficiency obtained was 99.4%, and ferric chloride and polyaluminum chloride were more efficient than polyamine. Performances of ferric chloride and polyaluminum chloride were close to each other, with a statistically significant difference at a certain dosage range. Our findings suggest that chemical coagulation plays a key role in the removal of MPs, and the process can be optimized by selecting the right coagulant and pH.

Authors: Katriina Rajala, Outi Grönfors, Mehrdad Hesampour, Anna Mikola  
Full Source: *Water research* 2020 Jun 18;183:116045. doi: 10.1016/j.watres.2020.116045.

## ENVIRONMENTAL RESEARCH

### Foamed polystyrene in the marine environment: Sources, additives, transport, behavior, and impacts

2020-08-05

Foamed polystyrene (PS) that may be either expanded (EPS) or extruded (XPS) is a rigid, lightweight insulating thermoplastic that has a variety of uses in the consumer, packaging, construction, and marine sectors. The properties of the material also result in waste that is readily generated, dispersed, and fragmented in the environment. This review focuses on foamed PS in the marine setting, including its sources, transport, degradation, acquisition of contaminants, ingestion by animals, and biological impacts arising from the mobilization of chemical additives. In the ocean, foamed PS is subject to wind-assisted transport and fracturing via photolytic degradation. The material may also act as a substrate for rafting organisms while being exposed to elevated concentrations of natural and anthropogenic surface-active chemicals in the sea surface microlayer. In the littoral setting, fragmentation is accentuated by milling in the swash zone and abrasion when beached, with wind transport leading to the temporary burial of significant quantities of material. Ingestion of EPS and XPS has been documented for a variety of marine animals, but principally those that feed at the sea surface or use the material as a habitat. As well as risking injuries due to gastro-intestinal blockage, ingestion of foamed PS exposes animals to harmful chemicals, and of greatest concern in this respect is the presence of the historical, but still recycled, flame-retardant, hexabromocyclododecane. Because foamed PS is particularly difficult to retrieve as a constituent of marine litter, means of reducing its presence

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and impacts will rely on the elimination of processes that generate foamed waste, modification of current storage and disposal practices, and the development of more durable and sustainable alternatives.

Authors: Andrew Turner

Full Source: *Environmental science & technology* 2020 Aug 5. doi: 10.1021/acs.est.0c03221.

## OCCUPATIONAL

### Progression of coal workers' pneumoconiosis absent further exposure

2020-08-11

Objectives: The natural history of coal workers' pneumoconiosis (CWP) after cessation of exposure remains poorly understood.

Methods: We characterised the development of and progression to radiographic progressive massive fibrosis (PMF) among former US coal miners who applied for US federal benefits at least two times between 1 January 2000 and 31 December 2013. International Labour Office classifications of chest radiographs (CXRs) were used to determine initial and subsequent disease severity. Multivariable logistic regression models were used to identify major predictors of disease progression.

Results: A total of 3351 former miners applying for benefits without evidence of PMF at the time of their initial evaluation had subsequent CXRs. On average, these miners were 59.7 years of age and had 22 years of coal mine employment. At the time of their first CXR, 46.7% of miners had evidence of simple CWP. At the time of their last CXR, 111 miners (3.3%) had radiographic evidence of PMF. Nearly half of all miners who progressed to PMF did so in 5 years or less. Main predictors of progression included younger age and severity of simple CWP at the time of initial CXR.

Conclusions: This study provides further evidence that radiographic CWP may develop and/or progress absent further exposure, even among miners with no evidence of radiographic pneumoconiosis after leaving the industry. Former miners should undergo regular medical surveillance because of the risk for disease progression.

Authors: Kirsten S Almborg, Lee S Friedman, Cecile S Rose, Leonard H T Go, Robert A Cohen

Full Source: *Occupational and environmental medicine* 2020 Aug 11; oemed-2020-106466. doi: 10.1136/oemed-2020-106466.

**Objectives: The natural history of coal workers' pneumoconiosis (CWP) after cessation of exposure remains poorly understood.**

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### Occupational Exposure to Mycotoxins-Different Sampling Strategies Telling a Common Story Regarding Occupational Studies Performed in Portugal (2012-2020)

2020-08-11

In occupational settings where exposure to organic dust occurs (e.g., intensive animal production, waste management, farming and many others) workers can also be exposed to mycotoxins. However, recognizing exposure to mycotoxins in workplace environments does not happen commonly and, consequently, remains as a not identified occupational risk factor. In the last decade, work developed in different occupational settings, using different sampling approaches reported that occupational exposure to mycotoxins occurs and it's of utmost importance to be seen as an occupational concern that needs to be tackled. This paper intends to discuss the several possibilities available for assessing and characterizing the occupational exposure to mycotoxins through the description of the advantages and limitations of the different sampling strategies. Overlooking the approaches and the main achievements used in several field campaigns developed in Portugal, the knowledge obtained will be used to support the identification of the main aspects to consider when designing new occupational studies. The need for additional research work will also be discussed where new directions to follow will be debated.

Authors: Susana Viegas, Carla Viegas, Carla Martins, Ricardo Assunção  
Full Source: Toxins 2020 Aug 11;12(8):E513. doi: 10.3390/toxins12080513.

### Referral to radioisotope examination as a source of additional radiation exposure for staff

2020

Background: Every exposure of human to ionizing radiation increases the likelihood of deterministic sequelae. At the same time, it is associated with the risk of stochastic effects. Consequently, this can lead to cancer, mainly of the hematopoietic system. Organs or tissues show a different affinity for gamma radiation. There are many technical and organizational measures which minimize the impact of this radiation on people and especially on the staff of the nuclear medicine laboratory.

Materials and methods: The study was based on 208 referrals to the scintigraphic laboratory, which were executed between 26.09.2018 and 13.11.2018 in the Department of Nuclear Medicine of Military Medical Academy Memorial Teaching Hospital of the Medical University

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of Lodz - Central Veterans` Hospital. Referrals concerned scintigraphic tests of bones, salivary glands, parathyroid glands, myocardial perfusion, somatostatin receptor analogues, renoscintigraphic and lymphoscintigraphic tests. In case of each referral, radiation power was measured at a distance of approx. 10 cm with the use of a calibrated Geiger-Muller detector. Measurements were performed immediately after the end of the last examination each day. Daily measurement of the background radiation dose was also a standard procedure. For calculations, this value was averaged to 0.18 $\mu$ Sv/h. Based on the above measurements, a statistical analysis of all data was performed. Obtained data was also analysed after it was ascribed to the person complexing radiopharmaceuticals on a given day. The annual dose for a radiopharmacist is 0.12 mSv, for a technician 0.35 mSv and for a doctor 0.45 mSv.

Results: The average radiation dose received every working day by the staff was 11.49  $\mu$ Sv/h. After considering the average distance from the potential source of exposure (50 cm), this power decreased to 0.46 $\mu$ Sv/h. In order to calculate the quarterly and annual radiation dose, it was assumed that the employee worked 250 days a year. Conclusions: Medical records may pose an additional personnel exposure to ionizing radiation. Physicians are the most vulnerable group of employees. The way of radiopharmacists work contributes to the contamination of medical records.

Authors: Pawel Gadzicki, Wiesław Tryniszewski, Michał Łwiczewski  
Full Source: Nuclear medicine review. Central & Eastern Europe 2020;23(1):21-24. doi: 10.5603/NMR.a2020.0003.

## PHARMACEUTICAL/TOXICOLOGY

### Serum Perfluoroalkyl Substances, Vaccine Responses, and Morbidity in a Cohort of Guinea-Bissau Children

2020-08

Background: Perfluoroalkyl substances (PFAS) are a group of widely used persistent chemicals with suspected immunotoxic effects.

Objectives: The present study aimed to examine the association between infant PFAS exposure and antibody responses to measles vaccination as well as morbidity in a low-income country.

Methods: In a randomized controlled trial, children from Guinea-Bissau, West Africa, were followed from inclusion (4-7 months of age) through 2 years of age. Half the children received two measles vaccinations (at inclusion and at 9 months of age), and the other half received only one (at

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9 months of age). In a subset of 237 children, six PFAS were quantified in serum at inclusion, and measles antibody concentrations were assessed at inclusion and at approximately 9 months and 2 years of age. At inclusion and at the 9-month visit, mothers were interviewed about infant morbidity. Results: All but one child had detectable serum concentrations of all six PFAS, although levels were lower than seen elsewhere. A doubling in perfluorooctane sulfonic acid (PFOS) and perfluorodecanoic acid (PFDA) were associated with 21% (95% CI: 2, 37%) and 25% (95% CI: 1, 43%), respectively, lower measles antibody concentrations at the 9-month visit among the children who had received a measles vaccine at inclusion. Elevated serum PFAS concentrations were also associated with reduced prevaccination measles antibody concentrations and increased morbidity. Discussion: The present study documents that PFAS exposure has reached West Africa and that infants show PFAS-associated increases in morbidity and decreases in measles-specific antibody concentrations before and after vaccination. These findings support the evidence on PFAS immunotoxicity at comparatively low serum concentrations. <https://doi.org/10.1289/EHP6517>.

Authors: Clara Amalie Gade Timmermann, Kristoffer Jarlov Jensen, Flemming Nielsen, Esben Budtz-Jørgensen, Fiona van der Klis, Christine Stabell Benn, Philippe Grandjean, Ane Bærent Fisker  
Full Source: Environmental health perspectives 2020 Aug;128(8):87002. doi: 10.1289/EHP6517.

### Toxicity prediction and effect characterization of 90 pharmaceuticals and illicit drugs measured in plasma of fish from a major European river (Sava, Croatia)

2020-08-02

Chemical analysis of plasma samples of wild fish from the Sava River (Croatia) revealed the presence of 90 different pharmaceuticals/illicit drugs and their metabolites (PhACs/IDrugs). The concentrations of these PhACs/IDrugs in plasma were 10 to 1000 times higher than their concentrations in river water. Antibiotics, allergy/cold medications and analgesics were categories with the highest plasma concentrations. Fifty PhACs/IDrugs were identified as chemicals of concern based on the fish plasma model (FPM) effect ratios (ER) and their potential to activate evolutionary conserved biological targets. Chemicals of concern were also prioritized by calculating exposure-activity ratios (EARs) where plasma concentrations of chemicals were compared to their bioactivities in comprehensive ToxCast suite of in vitro assays. Overall, the applied prioritization methods indicated stimulants (nicotine, cotinine) and

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allergy/cold medications (prednisolone, dexamethasone) as having the highest potential biological impact on fish. The FPM model pointed to psychoactive substances (hallucinogens/stimulants and opioids) and psychotropic substances in the cannabinoids category (i.e. CBD and THC). EAR confirmed above and singled out additional chemicals of concern - anticholesteremic simvastatin and antiepileptic haloperidol. Present study demonstrates how the use of a combination of chemical analyses, and bio-effects based risk predictions with multiple criteria can help identify priority contaminants in freshwaters. The results reveal a widespread exposure of fish to complex mixtures of PhACs/IDrugs, which may target common molecular targets. While many of the prioritized chemicals occurred at low concentrations, their adverse effect on aquatic communities, due to continuous chronic exposure and additive effects, should not be neglected.

Authors: Olga Malev, Mario Lovrić, Draženka Stipanićev, Siniša Repec, Dalma Martinović-Weigelt, Davor Zanella, Tomislav Ivanković, Valnea Sindićić, Đuretec, Josip Barišić, Mei Li, Göran Klobučar

Full Source: Environmental pollution (Barking, Essex : 1987) 2020 Aug 2;266(Pt 3):115162. doi: 10.1016/j.envpol.2020.115162.

### Smoking Prevalence, Knowledge and Perceptions on Tobacco Control Among Healthcare Professionals: A Survey in an Italian Cancer Center

2020-08-13

Smoking is recognized as the major cause of lung cancer. Healthcare professionals play an important role in lung cancer prevention policies, as they act as a source of guidance for patients and advocates. The following survey evaluated prevalence, knowledge, and attitudes toward tobacco smoking among a sample of workers in "IRCCS Istituto Tumori "Giovanni Paolo II" of Bari, an Italian cancer hospital. An anonymous questionnaire was completed by 104 healthcare professionals to collect personal and occupational data about smoking status, knowledge about the harms of smoking, current legislation in place, Second-Hand Smoke (SHS) awareness, and, for ex-smokers, the reasons for quitting. Among participants, 17.8% were current smokers, 26.2% former smokers, and 56% never smoked. Only 40% acknowledged that the smoking ban is generally respected, and 63.2% reported that they smoke during working hours. Most of the participants perceived tobacco control policy as an efficient way to protect public health. Currently, the implementation of Italian anti-smoking legislation has so far improved neither smoking cessation rates nor the will to quit smoking completely. Our experience highlights that to date the anti-smoking strategies have limited efficacy

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even in a cancer center; in fact, there is still a large prevalence of smokers among hospital personnel. Therefore, it is strongly suggested that interventions be shared with all healthcare workers, specifically aimed at developing a culture of health promotion.

Authors: Daniela Bafunno, Annamaria Catino, Vito Lamorgese, Vito Longo, Michele Montrone, Francesco Pesola, Pamela Pizzutilo, Patrizia Petrillo, Niccolò Varesano, Antonella Zacheo, Gabriella Del Bene, Vittoria Lapadula, Angelica Mastrandrea, Donata Ricci, Alessandra Di Lauro, Sandro Cassiano, Domenico Galetta

Full Source: Journal of community health 2020 Aug 13. doi: 10.1007/s10900-020-00907-8.