

# Bulletin Board

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## CHEMICAL EFFECTS

## Investigating the synergistic role of heavy metals in Arsenic-induced skin lesions in West Bengal, India

2022-11-11

Background: Arsenic toxicity is one of the major health issues throughout the world. Approximately 108 countries that account for more than 230 million people worldwide are at high risk of arsenic poisoning mainly through drinking water and diet. Chronic exposure to arsenic causes several pathophysiological end-points including skin lesions, peripheral neuropathy, cancer, etc. In India, the population living in the lower Gangetic basin possesses a great risk of arsenicosis and other diseases. Scientists are trying to understand the gene-environmental interactions behind arsenic toxicity revealing the potential role of genetic variants of individuals. Few pieces of the literature showed that the population is not exposed to a mixture of metals. Hence, in this study, an attempt has been made to explore whether some other metals play a synergistic role in As-induced toxicity.

Methods: For this, an assessment of the level of heavy metals using ED-XRF in soil, vegetables from As-exposed areas along with quantification of the heavy metal concentration in human blood and hair of the As-exposed population were conducted.

Results: Results show the concentration of urinary arsenic is very high signifying the magnitude of the exposure. In addition to this, the levels of iron (Fe), copper (Cu), chromium (Cr) were found to be very high in soil and Fe, manganese (Mn), lead (Pb) in vegetables were exceeding the WHO/FAO recommended permissible limit. However, Fe and zinc (Zn) were predominantly high in whole blood and hair of the arsenic-exposed population when compared with the control population.

Conclusion: It can be confirmed that the population from Murshidabad is exposed to As and other heavy metals through drinking water as well as food. Particularly for this population, Fe, Zn and rubidium (Rb) may play a synergistic role in arsenic-induced toxicity. However, further studies on the large population-based investigation are required to establish the chemistry of the metal toxicity.

Authors: Shuvam Banerjee, Shrinjana Dhar, M Sudarshan, Anindita Chakraborty, Sandip Bhattacharjee, Pritha Bhattacharjee

Full Source: Journal of trace elements in medicine and biology. 2022 Nov 11;75:127103. doi: 10.1016/j.jtemb.2022.127103.

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## Role of chemical exposure in the incidence of vitiligo: a case-control study in Tunisia

2023-12-18

Vitiligo is a multifactorial dermatosis with many etiological hypotheses that have been suggested for its occurrence. To our knowledge, few epidemiological studies are available on vitiligo induction factors and particularly on the role of exposure to chemicals in the onset of the disease has been found. Therefore, there is need to investigate the relationship between vitiligo and chemical exposures in order to understand this mysterious disease. We conducted a case-control study of patients with vitiligo whose diagnosis was made by a specialist in dermatology. The total study period was of 6 months extending from 1 July to 31 December 2019. The minimum sample size was determined as 46 cases and 92 controls. The control group was gender, age, and professional status matched to the vitiligo group. In the binary logistic regression model, household chemicals/colored toothpaste use, a history of a repeated antibiotic use, and an occupational exposure to phenol/catechol derivatives were significantly associated with vitiligo (three to fourfold increase). Our results suggest that chemical factors play a key role in the occurrence of vitiligo. Therefore, prevention of this dermatosis requires the identification of exposure to the incriminated chemicals in any patient followed for vitiligo. The earlier the diagnosis of 'chemical' or chemically aggravated vitiligo, the better the prognosis for this disease.

Authors: Nehla Rmadi, Nada Kotti, Emna Bahloul, Ferial Dhouib, Imen Sellami, Khadija Sellami, Kaouthar Jmal Hammami, Mohamed Larbi Masmoudi, Hamida Turki, Mounira Hajjaji

Full Source: Libyan Journal of Medicine. 2023 Dec;18(1):2132628. doi: 10.1080/19932820.2022.2132628.

## [Characteristics and Health Risk Assessment of BTESX in the Northern Suburbs of Nanjing]

2022-11-08

AMA GC5000BTX was used to monitor the mixing ratio of benzene, toluene, ethylbenzene, m,p-xylene, o-xylene, and styrene (BTESX) in the atmosphere of the northern suburb of Nanjing from January 2014 to December 2016. The temporal variation characteristics of BTESX and the influence of meteorological elements on it were analyzed, and the characteristic ratio method (T/B) was used to qualitatively analyze the source of BTESX. Finally, the human exposure analysis and evaluation method of EPA was used to evaluate the health risk of BTESX. The results

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showed that during the observation period, the average mixing ratio of BTEX was  $(7.28 \pm 6.63) \times 10^{-9}$ , and the mixing ratio of benzene was the highest at  $(2.45 \pm 3.91) \times 10^{-9}$ . The mixing ratio of other species from large to small was toluene > ethylbenzene > m,p-xylene > o-xylene > styrene, which were  $(2.41 \pm 2.61) \times 10^{-9}$ ,  $(1.37 \pm 1.28) \times 10^{-9}$ ,  $(0.51 \pm 0.48) \times 10^{-9}$ ,  $(0.3 \pm 0.36) \times 10^{-9}$ , and  $(0.22 \pm 0.42) \times 10^{-9}$ , respectively. Due to the existence of stable aromatic sources, the monthly and seasonal variation in BTEX mixing ratio was not as obvious as that of other species (NO<sub>x</sub>, CO, SO<sub>2</sub>, PM<sub>2.5</sub>, etc.). The weekend effect of BTEX and other pollutants was not significant. The mixing ratio of BTEX was largely affected by the short distance transportation of chemical enterprises and traffic trunk roads in the northeast, resulting in a large mixing ratio of BTEX in the northeast. The mixing ratio of BTEX was jointly affected by relative humidity and temperature, and its high value area was mainly located in the range of 30%-70% relative humidity. In this range of relative humidity, the high value range of BTEX volume fraction increased with the elevation of temperature. The HI (hazard index) of BTEX in different seasons was within the safety range recognized by EPA, whereas the R (carcinogenic risk of benzene) value was higher than the safety threshold specified by EPA. At the same time, the HI and R values were higher in summer, to which great attention should be paid.

Authors: Yue-Zheng Feng, Jun-Lin An, Yu-Xin Zhang, Jun-Xiu Wang  
Full Source: Huan Jing Ke Xue. 2022 Nov 8;43(11):5030-5039. doi: 10.13227/j.hj.kx.202201051.

### Potential Health Risks of Zn, Fe, and Pb in Medical Skin Creams and Cosmetic Products Derived from Plants in Iraq

2022-11-25

Medical skin creams (SC) and cosmetic products (CP) specially derived from plants have natural chemicals as ingredients which are a major source of heavy metal releases. Therefore, the presence of harmful heavy metals in these materials is a matter of concern. This study has been carried out to assess the concentrations of heavy metals such as zinc (Zn), iron (Fe), and lead (Pb) in skin creams and cosmetic products that are available in Iraqi pharmacies using atomic absorption spectroscopy. Thirty-three samples from different Iraqi pharmacies of beauty creams, including 13 samples of skin creams and ten samples of cosmetic products. Health risk parameters such as chronic daily intake (CDI), total non-cancer risk (H.I.), and total cumulative cancer risk (TCCR) have been calculated. Based on the results, it is found that the average value of Zn, Fe, and Pb concentrations for SC samples in unit mg/kg were  $65.33 \pm 14.56$ ,  $100.52 \pm$

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21.05, and  $2.62 \pm 0.64$ , respectively. At the same time, the average value of Zn, Fe, and Pb concentrations for CP samples in unit mg/kg were  $2.30 \pm 0.48$ ,  $24.18 \pm 6.87$ , and  $4.79 \pm 1.18$ , respectively. The results of health risk exposure for SC samples were higher than those for CP samples. But, the values of health risk parameters were within acceptable limits according to Environmental Protection Agency (EPA). Consequently, there is no potential health risk for using medical skin creams and cosmetic products in the present study by Iraqi people.

Authors: Dhuha Jalil Lawi, Waleed Salah Abdulwhaab, Ali Abid Abojassim  
Full Source: Biological trace element research. 2022 Nov 25. doi: 10.1007/s12011-022-03493-z. Online ahead of print.

### ENVIRONMENTAL RESEARCH

#### EI/IOT of PFCs: Environmental impacts/interactions, occurrences, and toxicities of perfluorochemicals

2022-11-24

Various studies have been conducted on the perfluorochemicals (PFCs) family over the years. These compounds have been sought in various industrial aspects involving the synthesis of everyday utilities due to their broad range of applications. As a result, PFCs have built up in the environment, causing concern. The presence of PFCs in various environmental media, such as terrestrial and marine settings, as well as the mechanisms of transport, bioaccumulation, and physio-chemical interactions of PFCs within plants, aquatic organisms, microplastics, and, ultimately, the human body, are discussed in this review, which draws on a variety of research publications. The interaction of PFCs with proteins, translocation, and adsorption by hydrophobic interactions were observed, and this had an impact on the natural functioning of biological processes, resulting in events such as phylogenetic clustering, competitive inhibition, and many others, posing potential hazards to human health and other relevant organisms in the ecosystem. However, further research is needed to have a better knowledge of PFCs and their interactions so that low-cost treatments can be developed to eliminate them. It is therefore, future research should focus on the role of soil matrix as a defensive mechanism for PFCs, as well as the impact of PFC chain length rejection.

Authors: Armel Nganda, Manish Kumar, Vismaya Uday, Pankaj Srivastava, Bhaskar Jyoti Deka, Faiza Zitouni, Jurgen Mahlkecht  
Full Source: Environmental research. 2022 Nov 24;114707. doi: 10.1016/j.envres.2022.114707.

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### Toxicity determination, pollution source delineation, and microbial diversity evaluation of PAHs-contaminated sediments for an urban river

2022-11-07

The Feng-Sang River is a metropolitan river in Kaohsiung City, Taiwan. In this study, Feng-Sang River sediments were analyzed to investigate the distributions and sources of polycyclic aromatic hydrocarbons (PAHs). The Sediment Quality Guidelines (SQGs), potentially carcinogenic PAHs (TEQ<sub>carc</sub>), and toxic equivalence quotient (TEQ) were applied to evaluate influences of PAHs on ecosystems and microbial diversities. Results indicate that PAHs concentrations varied between seasons and locations. The concentrations of  $\Sigma 16$  PAHs ranged from 73.6 to 603.8 ng/kg in dry seasons and from 2.3 to 199.3 ng/kg in wet seasons. This could be because of the flushing effect during wet seasons, which caused the movement and dilution of the PAH-contaminated sediments. Diagnostic ratio analysis infers that high PAHs levels were generated by combustion processes and vehicle traffic, and results from multivariate descriptive statistical analysis also demonstrate that the vehicular traffic pollution could be the major emission source of PAHs contamination. Comparisons of PAHs with SQGs indicate that PAHs concentrations in sediment were below the effects range low (ERL) values, and thus, the immediate threat to organisms might not be significant. The diagnostic ratio analyses are effective methods for PAH source appointment. The metagenomic assay results imply that sediments contained essential microbial species with eminent diversity. The detected PAH-degrading bacteria (*Desulfatiglans*, *Dechloromonas*, *Sphingomonas*, *Methylobacterium*, *Rhodobacter*, *Clostridium*, and *Exiguobacterium*) played a key role in PAHs biotransformation, and *Dechloromonas* and *Rhodobacter* had a higher relative abundance. Results of microbial diversity analyses indicate that the contaminated environment induced the changes of governing microbial groups in sediments. PRACTITIONER POINTS: Diagnostic ratio analyses are effective methods for PAHs source appointment. Microbial composition in sediments are highly affected by anthropogenic pollution. Combustion and vehicle traffic contribute to urban river sediments pollution by PAHs. *Dechloromonas* and *Rhodobacter* are dominant PAHs-degrading bacteria in sediments.

Authors: Jin-Min Li, Chao-Ling Yao, Wei-Han Lin, Rao Y Surampalli, Tian C Zhang, Tsung-Yu Tseng, Chih-Ming Kao  
Full Source: Water Environment Research. 2022 Nov 7;94(11):e10810. doi: 10.1002/wer.10810.

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### PHARMACEUTICAL/TOXICOLOGY

#### Toxicokinetics of silver element following inhalation of silver nitrate in rats

2022-11-27

Silver (Ag) and its compounds are priority contaminants, for which toxicological effects are well documented, but their toxicokinetics are not fully documented for a proper risk assessment. While the toxicokinetics of insoluble Ag nanoparticles (Ag NPs) was recently documented, there is a lack of data on the kinetic behavior of the soluble form, such as one of the mostly used silver nitrate (AgNO<sub>3</sub>) form. This study aimed to better document the toxicokinetics of Ag element following inhalation of soluble AgNO<sub>3</sub> for comparison with a previous study on the kinetics of inhaled Ag NPs using a similar experimental design. We exposed male Sprague-Dawley rats to AgNO<sub>3</sub> during 6 continuous hours (typical of a daily worker exposure) to determine the kinetic time courses of Ag element in blood, tissues, and excreta over a 14-day period post-exposure. Only a small fraction of Ag was found in lungs following the onset of the 6-h inhalation of AgNO<sub>3</sub> (on average ( $\pm$  SD)  $0.3 \pm 0.1\%$  at the end of the 6-h inhalation). Blood profiles of Ag element showed peak levels right after the end of the 6-h inhalation period and levels decreased rapidly thereafter. Toxicokinetic parameter values calculated from the average blood-concentration profiles showed a mean residence time (MRT) of 135 h and mean half-life ( $t_{1/2}$ ) of 94 h, with AUC of  $2.5 \text{ mg/L} \times \text{h}$  and AUMC of  $338 \text{ mg/L} \times \text{h}^2$ . In terms of percent of inhaled dose, highest levels of Ag in extrapulmonary organs were found in liver, which represented on average ( $\pm$  SD)  $1.6 \pm 0.6\%$  of calculated inhaled dose followed by the kidney with  $0.1 \pm 0.08\%$ . Peak levels in the GI tract (including contents) were found at the end of the 6-h inhalation and represented  $20 \pm 15.6\%$  of the inhaled dose. The dominant excretion route of Ag was through feces. The time course of Ag element in the GI tract and feces following AgNO<sub>3</sub> inhalation is also compatible with an intestinal reabsorption of Ag. When compared to results of Ag NPs of a prior study with the same design, this study showed differences in the kinetics of soluble AgNO<sub>3</sub> compared to insoluble Ag NPs, with higher levels in blood, GI tract, and extrapulmonary tissues but lower levels in lungs following AgNO<sub>3</sub> exposure.

Authors: Sandra Nirina Andriamasinoro, Denis Dieme, Sami Haddad, Michèle Bouchard  
Full Source: Archives of Toxicology. 2022 Nov 27. doi: 10.1007/s00204-022-03424-w.

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**Bioaccumulation and toxicity of terbuthylazine in earthworms (*Eisenia fetida*)**

2022-11-23

Terbuthylazine is an effective and widely used s-triazine herbicide. However, limited data exists on its toxicity and bioaccumulation in earthworms (*Eisenia fetida*). In this study, we investigated the bioaccumulation, antioxidant enzyme activity, detoxification enzyme activity, and DNA damage in earthworms when exposed to terbuthylazine. The results indicated that terbuthylazine in soil had low bioaccumulation in earthworms and the biota-soil accumulation factors of terbuthylazine declined with an increasing soil terbuthylazine concentration. In the enzyme activity assays, the superoxide dismutase (SOD), catalase (CAT), and glutathione-S-transferase (GST) activities showed upward trends when compared with the control. The carboxylesterase (CarE) activity increased on day 21. The 8-hydroxy-2-deoxyguanosine (8-OHdG) content, a DNA damage bioindicator, was higher than that of the control on day 21. Combined with the integrated biological response index version 2 analysis, these results can provide a comprehensive evaluation of the toxicological effects that terbuthylazine has on earthworms and soil ecosystems.

Authors: Shun Li, Ye Yuan, Xing Wang, Leiming Cai, Jiao Wang, Yuanji Zhao, Lei Jiang, Xu Yang

Full Source: Environmental Toxicology and Pharmacology. 2022 Nov 23;97:104016. doi: 10.1016/j.etap.2022.104016.

## OCCUPATIONAL

**Cytotoxic effects of crystalline silica in form of micro and nanoparticles on the human lung cell line A549**

2022-11-26

Airborne crystalline silica (SiO<sub>2</sub>) particles are one of the most common pollutants in stone industries. Limited studies have investigated the health effects of crystalline SiO<sub>2</sub> nanoparticles. Hence, the objective of this study was to study the cytotoxicity of SiO<sub>2</sub> in nano and micron sizes. A mineral quartz sample in the range of 0.2-0.8 mm sizes was purchased. These particles were ground at about 5 and 0.1 microns. Human cell line A549 was exposed to micro and nanometer particles at concentrations of 10, 50, 100, and 250 µg/ml for 24 and 72 h. Subsequently, the cytotoxicity of exposed cells was investigated by measuring cell survival, ROS generation, mitochondrial permeability, and intracellular glutathione content. The

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results showed that crystalline SiO<sub>2</sub> nano and microparticles decreased cell survival, increased ROS generation, damaged the mitochondrial membrane, and lowered the antioxidant content of these cells in a concentration- and time-dependent manner. The toxicity of crystalline SiO<sub>2</sub> microparticles at concentrations ≤50 µg/mL was greater than for nanoparticles, which was the opposite at concentrations ≥100 µg/mL. Exposure time and concentration were crucial factors for the cytotoxicity of exposed A549 cells to crystalline SiO<sub>2</sub> particles, which can affect the severity of the effect of particle size. Due to the limitation of exposure concentration and test durations in this study, further studies on the parameters of nanoparticle toxicity and underlying mechanisms could advance our knowledge.

Authors: Athena Rafiepour, Mansour R Azari, Fariba Khodaghohi

Full Source: Toxicology and industrial health. 2022 Nov 26;7482337221140644. doi: 10.1177/07482337221140644.

**Toxic Metals in Particulate Matter and Health Risks in an E-Waste Dismantling Park and Its Surrounding Areas: Analysis of Three PM Size Groups**

2022-11-21

Heavy metals generated from e-waste have created serious health risks for residents in e-waste disposal areas. This study assessed how airborne toxic metals from an e-waste dismantling park (EP) influenced surrounding residential areas after e-waste control. PM<sub>2.5</sub>, PM<sub>10</sub>, and total suspended particles (TSP) were sampled from 20 sites, including an EP, residential areas, and an urban site; ten kinds of metals were analyzed using ICP-MS and classified as PM<sub>2.5</sub>, PM<sub>2.5-10</sub>, and PM<sub>10-100</sub>. Results showed that metals at the EP tended to be in coarser particles, while metals from residential areas tended to be in finer particles. A source analysis showed that metals from the EP and residential areas may have different sources. Workers' cancer and non-cancer risks were higher when exposed to PM<sub>2.5-10</sub> metals, while residents' risks were higher when exposed to PM<sub>2.5</sub> metals. As and Cr were the most strongly associated with cancer risks, while Mn was the most strongly associated with the non-cancer risk. Both workers and residents had cancer risks (>1.0 × 10<sup>-6</sup>), but risks were lower for residents. Therefore, e-waste control can positively affect public health in this area. This study provides a basis for further controlling

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heavy metal emissions into the atmosphere by e-waste dismantling and encouraging worldwide standardization of e-waste dismantling.

Authors: Yingjun Wu, Guiying Li, Taicheng An

Full Source: International journal of environmental research and public health. 2022 Nov 21;19(22):15383. doi: 10.3390/ijerph192215383.