

# Bulletin Board

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## CHEMICAL EFFECTS

### Persistent organic and inorganic pollutants in the effluents from the textile dyeing industries: Ecotoxicology Appraisal via a battery of Biotests

2021-03-03

Today, the textile industry is considered as a leading economic sector in Tunisia. However, this sector demands a huge volume of water and a wide spectrum of chemicals, which is converted into potentially toxic wastewater leading to environmental perturbation and human health toxicity. Assessment of the environmental risks associated with textile wastewater becomes a necessity. In this study, textile dyeing wastewater samples were collected before and after the physico-chemical treatment carried out by textile companies located in Monastir-city-Tunisia and subjected to chemical analyzes in order to determine their physicochemical characteristics and the content of metals and textile dyes. The ecotoxicological assessment was performed using four organisms, namely *Selenastrum capricornutum*, *Vibrio fischeri*, *Daphnia magna* and *Lepidium sativum*, to represent different trophic levels. Based on chemical data, some physicochemical parameters (e.g. TSS, COD and TSS levels) and metals (e.g. Cr, Hg and Sb) in the textile dyeing effluents were revealed not in compliance with the Tunisian standard. Moreover, high quantities of three disperse dyes have been detected even in the textile dyeing wastewater samples before and after treatments. The ecotoxicological data confirmed that the textile dyeing influents displayed toxic effects to all the test organisms, with *Selenastrum capricornutum* being the most sensitive organism. While, the above toxic effects were decreased slightly when evaluating the treated effluents. Metals and textile disperse dyes could be associated with the observed toxic effects of the textile influents and effluents. In fact, the treatment process applied by the evaluated companies was only partially efficient at removing metals, disperse dyes and effluent ecotoxicity, suggesting potential risks to aquatic biota. These findings emphasize the importance of applying integrated chemical and biological approaches for continuous evaluation of the toxicity of the treated effluents to predict hazards on the environment.

Authors: Nosra Methneni, José Antonio Morales González, Ahlem Jaziri, Hedi Ben Mansour, Mercedes Fernandez-Serrano

Full Source: Environmental research 2021 Mar 3;110956. doi: 10.1016/j.envres.2021.110956.

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### A putative adverse outcome pathway network for disrupted female pubertal onset to improve testing and regulation of endocrine disrupting chemicals

2021-02-26

The average age for pubertal onset in girls has declined over recent decades. Epidemiological studies in humans and experimental studies in animals suggest a causal role for Endocrine Disrupting Chemicals (EDCs) that are present in our environment. Of concern, current testing and screening regimens are inadequate in identifying EDCs that may affect pubertal maturation, not least because they do not consider early-life exposure. Also, the causal relationship between EDC exposure and pubertal timing is still a matter of debate. To address this issue, we have used current knowledge to elaborate a network of putative Adverse Outcome Pathways (pAOPs) to identify how chemicals can affect pubertal onset. By using the AOP framework, we highlight current gaps in mechanistic understanding that needs to be addressed and simultaneously point towards events causative of pubertal disturbance that could be exploited for alternative test methods. We propose six pAOPs that could explain the disruption of pubertal timing by interfering with the central hypothalamic trigger of puberty, GnRH neurons, and by so doing highlight specific modes of action that could be targeted for alternative test method development.

Authors: Delphine Franssen, Terje Svingen, David Lopez Rodriguez, Majorie Van Duursen, Julie Boberg, Anne-Simone Parent

Full Source: Neuroendocrinology 2021 Feb 26. doi: 10.1159/000515478.

### Impact of endocrine-disrupting chemicals on steroidogenesis and consequences on testicular function

2021-02-28

Testicular steroidogenesis is a tightly regulated process that produces the androgens important for the development, maintenance and function of the male reproductive system. These androgens are also essential for overall health, and well-being. Disruptions in the ability of the testis to form steroids can result in developmental abnormalities, dysfunction, and infertility. Endocrine-disrupting chemicals (EDCs) can interfere with the intricate signaling and metabolizing networks that produce androgens and promote their dysfunction. These chemicals are found ubiquitously in our environment, as they are integral components of products that are used every day. The effects of EDCs, such as bisphenols, phthalates, and alkyl chemicals, have been studied independently, revealing deleterious

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effects; but the combined influence of these structures on steroidogenesis has yet to be completely elucidated. This manuscript presents an updated review on EDC mixtures and their impact on testicular function and fertility, highlighting new findings that illustrate the anti-androgenic capabilities of EDC mixtures.

Authors: Casandra Walker, Samuel Garza, Vassilios Papadopoulos, Martine Culty

Full Source: *Molecular and cellular endocrinology* 2021 Feb 28;111215. doi: 10.1016/j.mce.2021.111215.

## ENVIRONMENTAL RESEARCH

## Hallmarks of environmental insults

2021-02-26

Environmental insults impair human health around the world. Contaminated air, water, soil, food, and occupational and household settings expose humans of all ages to a plethora of chemicals and environmental stressors. We propose eight hallmarks of environmental insults that jointly underpin the damaging impact of environmental exposures during the lifespan. Specifically, they include oxidative stress and inflammation, genomic alterations and mutations, epigenetic alterations, mitochondrial dysfunction, endocrine disruption, altered intercellular communication, altered microbiome communities, and impaired nervous system function. They provide a framework to understand why complex mixtures of environmental exposures induce severe health effects even at relatively modest concentrations.

Authors: Annette Peters, Tim S Nawrot, Andrea A Baccarelli

Full Source: *Cell* 2021 Feb 26;S0092-8674(21)00086-6. doi: 10.1016/j.cell.2021.01.043.

### Pretreatment of industrial wastewater by natural flotation: application to pollution reduction from vegetable oil refinery wastewaters

2021-03-02

The objective of this study is to evaluate the effectiveness of the natural flotation process in reducing pollution with reasonable investment and operating costs of an industrial effluent of refining vegetable oils. Flotation tests were carried out in separating funnels and in drums of 30 l. The results obtained have shown that the volume of sludge produced during flotation is related to the pollutant load of the wastewater studied (process

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wastewater and acidic wastewater). The sludge volume is respectively 600, 12, and 120 ml/l for heavy, light, and medium loads respectively. Therefore, it is essential to find an effective way to remove oils and greases from polluted waters. Natural flotation eliminates on average 88% of COD for acid wastewater and 50% for process wastewater. However, the reduction of BOD5 showed 28 and 43% respectively for acid wastewater and process wastewater. In addition, the yield of fats and oils, TSS, and turbidity varies around 85%, 45%, and 88% respectively for acidic wastewater, while for process wastewater, elimination yields vary around 58%, 46%, and 46% respectively for the grease and oil parameters, the MES, and the turbidity. Flotation allows the elimination of 10659 Kg/day of greases and oils for process wastewater while it eliminates 5765 Kg/day for acidic wastewater. This reduces the cost of treatment related to chemicals and energy. Reducing pollution of wastewater by natural flotation could therefore help reduce the costs of treating wastewater, and recycling would then be more attractive for this purpose for the company.

Authors: Malika Kastali, Latifa Mouhir, Laila Saafadi, Levent Yilmaz, Salah Souabi

Full Source: *Environmental science and pollution research international* 2021 Mar 2. doi: 10.1007/s11356-021-12850-9.

## OCCUPATIONAL

### Inhalation of Soluble Plutonium: 53-year Follow-up of Manhattan Project Worker

2021-02-24

This whole-body tissue donor to the United States Transuranium and Uranium Registries was occupationally exposed to plutonium nitrate-dioxide mixture via chronic inhalation. This individual was involved in the Manhattan Project operations and later participated in medical follow-up studies. Soft tissues and bones collected at autopsy were analyzed for  $^{238}\text{Pu}$ ,  $^{239+240}\text{Pu}$ , and  $^{241}\text{Am}$ . Fifty-three years post-intake,  $700\pm 2$  Bq of  $^{239+240}\text{Pu}$  were still retained in the skeleton,  $661\pm 11$  Bq in the liver, and  $282\pm 3$  Bq in the respiratory tract. Bioassay measurements and organ activities at the time of death were used to estimate the intake and radiation doses using the TAURUS internal dosimetry software. For this individual, an ICRP Publication 130 Human Respiratory Tract Model with case-specific particle size of  $0.3\ \mu\text{m}$ , ICRP Publication 100 Human Alimentary Tract Model, and ICRP Publication 141 Plutonium Systemic Model adequately described long-term plutonium retention and excretion. The total cumulative  $^{239+240}\text{Pu}$  intake of 31,716 Bq was

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estimated, of which 24,853 Bq (78.4%) were contributed by inhalation of plutonium nitrate and 6,863 Bq (21.6%) of plutonium dioxide. The committed equivalent doses to the red bone marrow, bone surface, liver, lungs, and brain were 0.71 Sv, 6.5 Sv, 8.3 Sv, 3.8 Sv, and 0.068 Sv, respectively. The committed effective dose was 1.22 Sv.

Authors: Martin Šefl, Maia Avtandilashvili, Sergei Y Tolmachev

Full Source: Health physics 2021 Feb 24. doi: 10.1097/

HP.0000000000001396.

### The Perception of Occupational Safety and Health (OSH) Regulation and Innovation Efficiency in the Construction Industry: Evidence from South Korea

2021-02-27

Due to safety issues in the construction industry, interest in research on occupational safety and health (OSH) regulations remains high. Previous studies indicated that OSH regulations not only affect performance in and of themselves, but also indirectly by increasing awareness of such regulations. Studies also demonstrated that OSH regulation can affect innovation and corporate safety. However, the effect of OSH regulation on innovation remains unclear, as the relationship between the perception of OSH regulation and innovation is not fully understood. This study measures the innovation efficiency of companies in the Korean construction industry using data envelopment analysis (DEA), and investigates the relationship between innovation efficiency and companies' perceptions of OSH regulations. Results indicate that companies that positively recognize OSH regulations tend to be more innovative than those that do not. This study also validates differences in innovation efficiency depending on the perception of OSH regulations by bootstrap DEA. The results of this study suggest appropriate strategies to promote innovation in the construction industry from the perspectives of both government and practitioners in firms.

Authors: Jaeho Shin, Yeongjun Kim, Changhee Kim

Full Source: International journal of environmental research and public health 2021 Feb 27;18(5):2334. doi: 10.3390/ijerph18052334.

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### Exposure to Phthalate and Organophosphate Esters via Indoor Dust and PM10 Is a Cause of Concern for the Exposed Saudi Population

2021-02-22

In this study, we measured the occurrence of organophosphate esters (OPEs) and phthalates in the settled dust (floor and air conditioner filter dust) and in suspended particulate matter (PM10) from different microenvironments (households (n = 20), offices (n = 10) and hotels (n = 10)) of Jeddah, Saudi Arabia. Bis (2-Ethylhexyl) phthalate (DEHP) was the major pollutant (contributing >85% of total chemicals burden) in all types of indoor dust with a concentration up to 3,901,500 ng g<sup>-1</sup>. While dibutyl phthalate (DBP) and DEHP together contributed >70% in PM10 (1900 ng m<sup>-3</sup>), which indicate PM10 as a significant source of exposure for DBP and DEHP in different Saudi indoor settings. Tris (1-chloro-2-propyl) phosphate (TCPP) was the major OPE in PM10 with a concentration of up to 185 ng m<sup>-3</sup> and the occurrence of OPEs in indoor dust varied in studied indoor settings. The estimated daily intake (EDI) of studied chemicals via dust ingestion and inhalation of PM10 was below the reference dose (RfD) of individual chemicals. However, estimated incremental lifetime cancer risk (ILCR) with moderate risk ( $1.5 \times 10^{-5}$ ) for Saudi adults and calculated hazardous index (HI) of >1 for Saudi children from DEHP showed a cause of concern to the local public health.

Authors: Nadeem Ali, Nabil A Alhakamy, Iqbal M I Ismail, Ehtisham Nazar, Ahmed Saleh Summan, Syed Ali Musstjab Akbar Shah Eqani, Govindan Malarvannan

Full Source: International journal of environmental research and public health 2021 Feb 22;18(4):2125. doi: 10.3390/ijerph18042125.

### PHARAMACEUTICAL/TOXICOLOGY

#### Diclofenac-induced cytotoxicity in cultured carp leukocytes

2020-12-31

Diclofenac is a drug commonly used in human and veterinary medicine for the treatment of diseases associated with inflammation and pain. Medicinal products enter waste and surface waters on an everyday basis and contaminate the aquatic environment. Fish are therefore permanently exposed to these chemicals dissolved in their aquatic environment. To simulate variable environmental conditions, the aim of our study was to examine adverse effects of diclofenac under different temperatures of cell incubation (18, 21, 24, 27 and 30 °C). Cyto-toxic and -static effects of

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diclofenac in concentrations of 0.001 mcg/ml, 0.01 microg/ml, 0.1 mcg/ml, 1 mcg/ml, 10 mcg/ml and 100 mcg/ml for the carp (*Cyprinus carpio*) cultured leukocytes were quantified using detection of lactate dehydrogenase released from damaged cells. Overall DCF cytotoxicity was relatively low and its impact was pronounced at higher temperature and DCF concentration. Cells growth inhibition is changing more rapidly but it is high mainly at the highest concentration from low temperature. DNA fragmentation was not detected in tested leukocyte cell line. CYP450 increased diclofenac cytotoxicity only at the highest concentration but at incubation temperatures 18 and 27 °C. Leukocyte viability is essential for immune functions and any change can lead to reduction of resistance against pathogens, mainly in cold year seasons, when the immune system is naturally suppressed.

Authors: M Nemcova, J Pikula, J Zukal, V Seidlova

Full Source: *Physiological research* 2020 Dec 31;69(Suppl 4):S607-S618. doi: 10.33549/physiolres.934609.

### Altered microbiomes in thirdhand smoke-exposed children and their home environments

2021-03-02

**Introduction:** Tobacco smoke contains numerous toxic chemicals that accumulate in indoor environments creating thirdhand smoke (THS). We investigated if THS-polluted homes differed in children's human and built-environment microbiomes as compared to THS-free homes.

**Methods:** Participants were n = 19 THS-exposed children and n = 10 unexposed children ( $\leq 5$  years) and their caregivers. Environmental and biological samples were analyzed for THS pollutants and exposure. Swab samples were collected from the built-environment (floor, table, armrest, bed frame) and child (finger, nose, mouth, and ear canal), and 16S ribosomal RNA genes were analyzed for bacterial taxa using high-throughput DNA sequencing.

**Results:** Phylogenetic  $\alpha$ -diversity was significantly higher for the built-environment microbiomes in THS-polluted homes compared to THS-free homes ( $p < 0.014$ ). Log<sub>2</sub>-fold comparison found differences between THS-polluted and THS-free homes for specific genera in samples from the built-environment (e.g., *Acinetobacter*, *Bradyrhizobium*, *Corynebacterium*, *Gemella*, *Neisseria*, *Staphylococcus*, *Streptococcus*, and *Veillonella*) and in samples from children (esp. *Corynebacterium*, *Gemella*, *Lautropia*, *Neisseria*, *Rothia*, *Staphylococcus*, and *Veillonella*).

**Conclusion:** When exposed to THS, indoor and children microbiomes are altered in an environment-specific manner. Changes are similar to

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those reported in previous studies for smokers and secondhand smoke-exposed persons. THS-induced changes in child and built-environmental microbiomes may play a role in clinical outcomes in children. Impact: Despite smoking bans, children can be exposed to tobacco smoke residue (i.e., thirdhand smoke) that lingers on surfaces and in settled house dust. Thirdhand smoke exposure is associated with changes in the microbiomes of the home environment and of the children living in these homes. Thirdhand smoke is associated with increased phylogenetic diversity of the home environment and changes in the abundances of several genera of the child microbiome known to be affected by active smoking and secondhand smoke (e.g., *Corynebacterium*, *Staphylococcus*, *Streptococcus*). Thirdhand smoke exposure by itself may induce alterations in the microbiome that play a role in childhood pathologies.

Authors: Scott T Kelley, William Liu, Penelope J E Quintana, Eunha Hoh, Nathan G Dodder, E Melinda Mahabee-Gittens, Samuel Padilla, Shawn Ogden, Sia Frenzel, Laura Sisk-Hackworth, Georg E Matt

Full Source: *Pediatric research* 2021 Mar 2. doi: 10.1038/s41390-021-01400-1.

**Introduction:** Tobacco smoke contains numerous toxic chemicals that accumulate in indoor environments creating thirdhand smoke (THS).