CHEMWATCH

TECHNICAL

Week of 17 April 2026

TECHNICAL

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OCCUPATIONAL

Occupational exposure to asbestos-free talc and risk of respiratory cancers, including larynx, lung and mesothelioma: a systematic review and meta-analysis

Journal of thoracic oncology : official publication of the International Association for the Study of Lung Cancer
2026 Apr 10 · 10 Apr 2026

INTRODUCTION: Evidence suggests a potential link between occupational talc exposure and increased risk of lung cancer and mesothelioma, particularly when talc is contaminated with asbestos, a known carcinogen. However, the findings remain inconclusive. To clarify this, we conducted a systematic review and meta-analysis of studies examining the incidence and mortality of lung, mesothelioma, and laryngeal cancers among workers exposed to asbestos-free talc.

METHODS: We searched MEDLINE (PubMed) and SCOPUS databases up to January 2026 for cohort and case-control studies. Study quality was assessed using a modified Newcastle-Ottawa Scale. Meta-analyses were conducted for lung using a random-effects model and crude model for laryngeal cancer, while mesothelioma findings were synthesized through a systematic review. Publication bias was evaluated using funnel plots and Egger's test.

RESULTS: We identified 13, 8, and 7 publications reporting on lung cancer, mesothelioma, and laryngeal cancer, respectively. Five studies on lung cancer in talc miners and millers and three studies in other industries were included in the meta-analysis. The pooled relative risk (RR) of lung cancer was 1.13 (95% CI: 0.97-1.33) for miners and millers, and 1.12 (95% CI: 0.79-1.57) for other workers. No publication bias was found (p = 0.45). No mesothelioma cases were reported among talc miners and millers, precluding meta-analysis. Studies on laryngeal cancer showed no association with talc exposure, RR=0 .98, 95% CI: 0.58-1.57.

CONCLUSIONS: Current evidence does not support increased risks of lung, mesothelioma, or laryngeal cancers among workers exposed to asbestos-free talc, future studies should better control for confounders, especially tobacco smoking.

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Occupational exposure to toxic particles and risk of pulmonary sarcoidosis: a systematic review and meta-analysis

BMJ open respiratory research 2026 Apr 10;13(1) · 10 Apr 2026

INTRODUCTION: The onset of sarcoidosis is likely the result of a complex genetic-environment-immunological interaction. This systematic review and meta-analysis aimed to identify occupational toxic particles associated with an increased risk of developing pulmonary sarcoidosis.

METHODS: Publications in English, published from January 2000 to January 2025, were searched in PubMed, Scopus and JSTOR. The risk of bias was assessed for all included studies. Sensitivity analyses stratified by study quality were conducted to evaluate the robustness of the findings and potential bias. To assess publication bias, a funnel plot was used when more than six studies were included in the analysis.

RESULTS: Five categories of toxic particles were identified to be associated with increased risk of the onset of sarcoidosis: chemicals, inorganic dusts, metals, mixed dusts and fumes and organic dusts. The quantitative analysis includes data from 13 studies. The results suggested that occupational silica, pesticides, mould/mildew and World Trade Center ((WTC) dust exposures were associated with increased odds of pulmonary sarcoidosis. Sensitivity analysis confirmed the robustness of the association for WTC dust and mould, whereas the risk associated with silica appeared attenuated in high-quality studies. However, gold exposure was identified as a protective factor.

CONCLUSION: Pulmonary sarcoidosis is associated with occupational silica, pesticides, WTC dust and mould. Future research should prioritise gene-environment interactions and granuloma mineralogy to refine preventive strategies and disease management.

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CHEMICAL EFFECTS

Organophosphorus flame retardants (OPFRs) in lithium-ion batteries: Classification, physicochemical properties, environmental behavior, human exposure and toxicity

Journal of hazardous materials 2026 Apr 05:509:141993 · 5 Apr 2026

Lithium-ion batteries (LIBs) stand as a pivotal technology to achieve decarbonization goals amidst the challenges of climate change, and their applications and market size are expanding rapidly. Organophosphorus flame retardants (OPFRs) are crucial components for ensuring the safety performance of LIBs. These chemicals mainly include organophosphates, organophosphites, organophosphonates, and organophosphazenes, with a growing number of new OPFRs continually being synthesized and introduced into the market. OPFRs in LIBs (LIB-OPFRs) can be released into environmental media during battery production, dismantling, and recycling processes, subsequently leading to their occupational and environmental exposure in humans. This review presents the classification, physicochemical properties, environmental behavior, human exposure, and toxicity of LIB-OPFRs. Our analysis reveals that current research predominantly centers on organophosphate flame retardants, while studies on other categories of LIB-OPFRs exhibit a significant research gap. For emerging LIB-OPFRs with a dearth of relevant data, their physicochemical properties and potential toxicity are predicted in this study. Notably, all four categories of LIB-OPFRs show limited but consistent signals of toxicity, and some newly emerging LIB-OPFRs may exhibit higher toxicity compared to traditional ones. Aryl- and halogenated-OPFRs generally exhibit greater bioaccumulative potential and pose higher health risks in comparison to alkyl-OPFRs. Currently, it is imperative to enhance environmental monitoring, toxicological testing, and health risk assessment of new LIB-OPFRs, which are crucial for bridging data gaps and providing guidance for health protective measures as well as policy formulation.

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Bisphenol S and female reproductive toxicity: a scoping review of human studies

Journal of exposure science & environmental epidemiology 2026 Apr 10 · 10 Apr 2026

BACKGROUND: Bisphenol S (BPS) is a chemical analogue of Bisphenol A (BPA) used in the production of hard plastics, textiles, and thermal papers. As the use of BPA has declined, BPS human exposure has increased and is now widespread. BPS has endocrine-disrupting properties and growing evidence indicates BPS negatively impacts female reproductive health.

METHODS: We searched five biomedical databases through January 2025 for studies that assessed the effects of BPS exposure on outcomes related to female reproduction in humans. Included studies used a cohort, case-control, or cross-sectional study design, measured BPS in individuals, presented original data analyses, and adjusted for confounding variables. We tabulated study characteristics and key findings of the included studies.

RESULTS: The literature search and screening yielded thirty-four studies for inclusion. Across studies, the LOD for BPS varied widely, from 0.002 to 0.20 ng/mL, and so did the proportion of samples with detectable BPS, from 14.8% to 100%. BPS was associated with greater risk of polycystic ovarian syndrome in two studies and gestational diabetes mellitus or related biomarkers in three studies. BPS was also associated with changes in thyroid hormones, reproductive hormones, and pubertal timing, though the directions of effects for these outcomes were mixed. BPS was not associated with endometriosis, gestational hypertension, or infertility.

SIGNIFICANCE: There is evidence from human studies that BPS exposure can cause some adverse female reproduction outcomes, though data were limited in number of studies per outcome, variable limits of BPS detection, and differences in exposure to BPS across samples. Despite limitations, epidemiologic data, considered along with in vitro and animal data, is important in identifying BPS as a hazard to female reproduction.

IMPACT: Human exposure to BPS is increasing. The findings of this review of 34 epidemiologic studies suggests a link between BPS exposure and some adverse female reproductive health outcomes. This review also highlights data gaps in variable limits of BPS detection, differences in exposure, and the limited number of studies for specific outcomes. In addition to epidemiological evidence, in vitro and animal data show sufficient evidence to support BPS as a female reproductive.

OBJECTIVE: We conducted a scoping review of primary research articles related to BPS exposure and female reproductive toxicity in humans.

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ENVIRONMENTAL RESEARCH

Acute toxicity and ecological risk assessment of arsenic and bisphenol A in the Bohai Sea

Marine environmental research 2026 Apr 10:218:108057 · 10 Apr 2026

Arsenic (As) and bisphenol A (BPA), representing conventional inorganic and emerging organic pollutants respectively, are ubiquitous in coastal environments and pose potential ecological threats.

Given the semi-enclosed nature and intense anthropogenic pressures of the Bohai Sea, region-specific ecological risk assessments (ERA) are imperative for effective management. This study prioritized 24 representative native aquatic species from the Bohai Sea and curated a robust acute toxicity database for As and BPA through integrated literature mining and acute toxicity experiments. Based on species sensitivity distribution (SSD) models, hazardous concentrations for 5% of species (HC5) were derived, resulting in acute predicted no-effect concentrations (PNECacute) of 1.69 μg/L for As and 100.7 μg/L for BPA. The Risk Quotient (RQ) analysis revealed that As poses a moderate ecological risk in the three major semi-enclosed bays, while BPA currently exhibits low risk levels. These findings underscore the necessity of utilizing locally-derived toxicity data for accurate ERA and provide a scientific foundation for site-specific pollution control strategies in the Bohai Sea.

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Prenatal Exposure to Persistent Organic Pollutants and Childhood Adiposity: Findings from the MIREC Cohort

Environmental research 2026 Apr 09 · 9 Apr 2026

BACKGROUND: The rising prevalence of childhood adiposity raises concerns about the role of early-life environmental exposures. We examined associations between prenatal exposure to per- and polyfluoroalkyl substances (PFAS), polybrominated diphenyl ethers (PBDEs), and dichlorodiphenyldichloroethylene (DDE) and measures of adiposity in children up to age ▯10 years.

METHODS: First-trimester maternal plasma concentrations of target chemicals were measured in the Maternal-Infant Research on Environmental Chemicals (MIREC) cohort. Children were followed longitudinally from birth through early (▯4 years) and later childhood (▯10 years). Adiposity was assessed using body mass index (BMI), waist circumference, and waist-to-height ratio (WHtR). Associations were estimated using generalized estimating equations, linear regressions, and Bayesian Kernel Machine Regression (BKMR) for chemical mixtures, adjusting for relevant confounders.

RESULTS: Longitudinal analyses showed largely null associations, except for PFOS, which was associated with larger waist circumference in males (β per 10-fold increase: 0.55; 95% CI: 0.06, 1.04). Analyses at each age of assessment showed that maternal DDE was associated to lower BMI at birth (β: -0.19; 95% CI: -0.37, -0.02) and ΣPBDE was associated with larger waist circumference and WHtR at ▯4 years (β: 0.22; 95% CI: 0.06, 0.38 and β: 0.26; 95% CI: 0.11, 0.42, respectively). In sex-stratified analyses at ▯4 years, maternal BDE-47 and PFOS were associated with higher BMI and waist circumference in males (β: 0.24; 95% CI: 0.02, 0.46 and β: 0.51; 95% CI: 0.11, 0.90, respectively), while BDE-153 was inversely associated with BMI in females (β: -0.17; 95% CI: -0.32, -0.01). Mixture analyses suggested associations with larger waist circumference and WHtR at ▯4 years, with sex-specific, non-linear patterns.

CONCLUSIONS: In this large prospective cohort, prenatal exposure to persistent organic pollutants showed limited and sex-specific associations with adiposity, particularly at ▯4 years of age. These findings underscore the importance of considering developmental windows and mixture effects in studies of early metabolic health.

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The interaction of toxic metal exposure and oxidative balance score on semen quality: a cross-sectional study based on Shanghai volunteers, China

Environmental pollution (Barking, Essex : 1987) 2026 Apr 09 · 9 Apr 2026

Evidence on the association between toxic metal mixtures and semen quality remains limited. We investigate the relationship between single toxic metal and mixtures exposure with semen quality. Furthermore, to evaluate the role of interaction between oxidative balance score (OBS) and toxic metals on semen quality. A total of 857 volunteers were included from the Shanghai Human Sperm Bank (2020-2023). Urinary concentrations of six toxic metals (Cd, Hg, As, Pb, Al and Ba) were measured. The rate of poor semen quality was 27.3%. Regression model demonstrated a negative correlation between Pb and the normal sperm morphology (β = -0.233, 95% CI: -0.356, -0.110). Furthermore, Hg showed negative correlations with normal sperm morphology (β = -0.230, 95% CI: -0.370, -0.091), semen volume (β = -0.148, 95% CI: -0.258, -0.038), and total sperm counts (β = -0.429, 95% CI: -0.744, -0.113), and Ba was negatively associated with sperm progressive motility (β = -0.077, 95% CI: -0.153, -0.002). Notably, significant interactions were observed between OBS and Al for normal sperm morphology and between OBS and Pb for total sperm counts (all P interaction < 0.05). Moreover, quantile g-calculation model analysis showed that exposure to toxic metal mixtures was associated with an increased risk of abnormal semen quality (OR = 1.335, 95% CI: 1.048, 1.699). Additionally, the Bayesian kernel machine regression indicated that toxic metal mixtures exposure was negatively correlated with semen quality, with Pb, Hg, and Ba identified as major contributors. Both single toxic metals and mixtures are all negatively associated with semen quality. The interaction between OBS and toxic metals may play a beneficial role on semen quality.

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PHARMACEUTICAL/TOXICOLOGY

ATF3 links endoplasmic reticulum stress to ferroptosis via transcriptional activation of ALOX12 in benzene-induced hematotoxicity

Ecotoxicology and environmental safety 2026 Apr 10:316:120130 · 10 Apr 2026

As a Class I human carcinogen ubiquitous in both industrial and household environments, benzene can cause hematopoietic damage even at low concentrations. However, its precise hematological toxicological molecular mechanism remains incompletely understood. Here, we demonstrate that hydroquinone (HQ), a benzene metabolite, induces ferroptosis and endoplasmic reticulum stress (ERs) in TK6 cells. Mechanistically, through a combination of RNA-Seq and database analyses, we identified ATF3 as a central molecular switch linking ERs to ferroptosis following HQ treatment, with its activation mediated by the PERK pathway. Using oxidative lipidomics, we further identified ALOX12 as a key lipid peroxidase involved in promoting ferroptosis. Moreover, chromatin immunoprecipitation sequencing (ChIP-Seq) and dual-luciferase reporter assays revealed that ATF3 directly binds to the ALOX12 promoter, triggering its transcriptional activation, which in turn accelerates lipid peroxidation and ultimately leads to ferroptosis. In a mouse model of benzene-induced hematotoxicity, knockdown of ATF3 effectively inhibits bone marrow ferroptosis and markedly ameliorates hematopoietic impairment. Importantly, our cohort study revealed that the higher of ATF3, ALOX12, MDA, and lower GSH/GSSG was significantly associated with hematotoxicity in workers exposed to benzene. Collectively, these findings suggest the ATF3-

ALOX12 signal axis may represent promising biomarkers for monitoring early hematopoietic damage resulting from low-dose benzene exposure in environmentally exposed populations.

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Puerarin alleviates crystalline silica-induced pulmonary fibrosis by suppressing mtDNA leakage-induced senescence and EMT in alveolar type II cells

Ecotoxicology and environmental safety 2026 Apr 11:316:120127 · 11 Apr 2026

Silicosis, caused by inhalation of crystalline silica (SiO2), remains a serious and persistent public health concern. Puerarin (Pue), a bioactive isoflavone derived from Pueraria lobata, is known for its anti-inflammatory and antioxidant properties; however, its protective effects and underlying mechanisms in silicosis have not been fully elucidated. In this study, alveolar type II (AT2) cells and male C57BL/6 J mice were used to investigate the anti-aging and anti-fibrotic effects of Pue and Pue-enriched Pueraria lobata tea (Plt) in experimental silicosis. Transcriptomic and molecular analyses revealed that SiO2 exposure induced epithelial-mesenchymal transition (EMT) and cellular senescence in AT2 cells, accompanied by mitochondrial DNA (mtDNA) leakage into the cytoplasm and activation of the cGAS-STING signaling pathway. Pharmacological inhibition of mtDNA transcription and replication attenuated mtDNA leakage, thereby alleviating AT2 cell senescence and EMT. Notably, Pue significantly reduced senescence and EMT by suppressing mtDNA leakage in SiO2-exposed AT2 cells. Consistently, both Pue and Pue-enriched Plt ameliorated pulmonary aging and fibrosis in SiO2-inhaled C57BL/6 J mice. Collectively, these findings suggest that Pue and Plt alleviate SiO2-induced pulmonary fibrosis by mitigating mtDNA leakage-induced senescence and EMT, highlighting a potential preventive and interventional strategy based on natural bioactive compounds for SiO2-induced pulmonary fibrosis.

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Bisphenol TMC disrupts the structure and esterase-like function of human serum albumin: Implications for the safety of BPA alternatives

International journal of biological macromolecules 2026 Apr 10 · 10 Apr 2026

Bisphenol TMC (BPTMC) is a substitute for bisphenol A (BPA) and serves predominantly in plastic manufacturing. It has been identified in various environmental matrices and in the human body. In this study, a comprehensive strategy involving spectroscopic techniques, atomic force microscopy (AFM), and computational simulations were employed to elucidate the impact of BPTMC on human serum albumin (HSA) at the structural and functional levels. The results indicate that BPTMC can spontaneously bind to the binding site I of HSA with an association constant (Ka) of 7.417 × 105 M-1 at 298 K, primarily through hydrophobic interactions. The larger negatively charged surface and smaller HOMO-LUMO energy gap (ΔEgap = 5.352 eV) of BPTMC enable it to exhibit stronger binding affinity for HSA than BPA (5.422 eV). AFM and spectroscopic analyses revealed that BPTMC alters the morphology, the environment of aromatic residues, and secondary structure of HSA. This interaction reduces the α-helix content 19.1%, consequently leading to a less stable and less compact conformation. Activity assays indicated that BPTMC enhances the esterase-like activity of HSA. Computational simulations confirmed these findings and the above findings and highlight that the Lys199-BPTMC interaction as critical for enzymatic activation induced by BPTMC. In summary,

this work clarifies the underlying molecular interaction mechanism of BPTMC with HSA, thus raising concerns about the assumed safety of BPA structural analogues.

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