Air Pollutant

1-Air pollutants, genetic susceptibility, and abdominal aortic aneurysm risk: a prospective study

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By Ma, YDY (Ma, Yudiyang) [1] , [2] , [3] ; Li, DK (Li, Dankang) [1] , [2] , [3] ; Cui, FP (Cui, Feipeng) [1] , [2] , [3] ; Wang, JN (Wang, Jianing) [1] , [2] , [3] ; Tang, LX (Tang, Linxi) [1] , [2] , [3] ; Yang, YP (Yang, Yingping) [1] , [2] , [3] ; Liu, R (Liu, Run) [1] , [2] , [3] ; Tian, YH (Tian, Yaohua) [1] , [2] , [3] **(provided by Clarivate) Source EUROPEAN HEART JOURNAL Volume 45 Issue 12 Page 1030-1039 Special Issue SI DOI 10.1093/eurheartj/ehad886 Published MAR 27 2024 Early Access JAN 2024 Indexed 2024-01-25 Document Type Article**

Abstract

Background and Aims Air pollutants are important contributors to cardiovascular diseases, but associations between long-term exposure to air pollutants and the risk of abdominal aortic aneurysm (AAA) are still unknown.Methods This study was conducted using a sample of 449 463 participants from the UK Biobank. Hazard ratios and 95% confidence intervals for the risk of AAA incidence associated with long-term exposure to air pollutants were estimated using the Cox proportional hazards model with time-varying exposure measurements. Additionally, the cumulative incidence of AAA was calculated by using the Fine and Grey sub-distribution hazards regression model. Furthermore, this study investigated the combined effects and interactions between air pollutants exposure and genetic predisposition in relation to the risk of AAA onset.Results Long-term exposure to particulate matter with an aerodynamic diameter <2.5 m [PM2.5, 1.21 (1.16, 1.27)], particulate matter with an aerodynamic diameter <10 m [PM10, 1.21 (1.16, 1.27)], nitrogen dioxide [NO2, 1.16 (1.11, 1.22)], and nitrogen oxides [NOx, 1.10 (1.05, 1.15)] was found to be associated with an elevated risk of AAA onset. The detrimental effects of air pollutants persisted even in participants with low-level exposure. For the joint associations, participants with both high levels of air pollutants exposure and high genetic risk had a higher risk of developing AAA compared with those with low concentrations of pollutants exposure and low genetic risk. The respective risk estimates for AAA incidence were 3.18 (2.46, 4.12) for PM2.5, 3.09 (2.39, 4.00) for PM10, 2.41 (1.86, 3.13) for NO2, and 2.01 (1.55, 2.61) for NOx.Conclusions In this study, long-term air pollutants exposure was associated with an increased risk of AAA incidence.

Keywords

Author Keywords

Air pollutantsAbdominal aortic aneurysmGenetic susceptibility

Keywords Plus

GENOME-WIDE ASSOCIATIONLONG-TERM EXPOSUREPOLLUTIONMETAANALYSISMORTALITYDISEASE

Air Pollutant

2-Nitromethane and dimethylformamide air pollutant detection using arsenborane nanotube based on first-principles study

By Nagarajan, V (Nagarajan, V.) [1] ; Chandiramouli, R (Chandiramouli, R.) [1] (provided by Clarivate)
Source CHEMICAL PHYSICS LETTERS Volume 863 DOI 10.1016/j.cplett.2025.141910 Article Number 141910 Published MAR 16 2025 Early Access JAN 2025 Indexed 2025-02-20 Document Type Article

Abstract

Recently, low-dimensional materials have been pioneering research toward sensing toxic pollutants in the atmosphere. In the present work, we utilized arsenborane nanotube (AsB-NT) as a sensing material toward nitromethane and dimethylformamide. Originally, the geometrical firmness of AsB-NT is verified with phononband-spectrum and cohesive formation energy. Further, the electronic characteristics of pristine AsB-NT are explored by the influence of band spectrum and projected density-of-states maps. The calculated energy band gap (Eg) value of AsB-NT is 1.221 eV which confirms the semiconducting nature of the material. Eventually, the adsorption properties of nitromethane and dimethylformamide on AsB-NT are explored based on the significant parameters namely relative Eg changes, Mulliken population analysis, and adsorption energy (Ead). The computed values of Ead in the present work are recorded in the scope of physisorption range (-0.129 eV to -0.805 eV). Overall results advocated that the novel AsB-NT is an excellent material to monitor nitromethane and dimethylformamide pollutants in the air environment.

Keywords

Author Keywords

ArsenboraneNanotubeNitromethaneAdsorptionDimethylformamide

Keywords Plus

GENERALIZED GRADIENT APPROXIMATIONBORON-NITRIDE NANOSHEETSADSORPTIONMONOLAYERGRAPHENEDEFECTS

Air Pollutant

3-Carbon and air pollutant emissions forecast of China's cement industry from 2021 to 2035

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Source RESOURCES CONSERVATION AND RECYCLING Volume 204 DOI 10.1016/j.resconrec.2024.107498 Article Number 107498 Published MAY 2024 Early Access FEB 2024 Indexed 2024-04-29 Document Type Article

Abstract

The cement industry is a major source of carbon dioxide and air pollutant emissions. This study developed a highresolution emission inventory for China's cement industry and forecasted emissions from 2025 to 2035. The results showed that emissions in 2020 were 251, 709, 142, and 1.35 x 106 Gg for SO2, NOx, PM2.5, and CO2, respectively. The optimal model projections for 2035 showed that fuel and clinker substitutions had the best reduction effect on SO2 and CO2, with average reduction rates of -11.42 % and -7.37 %, respectively, compared to the 2035 frozen scenario. Pollutant control measures and clinker substitution had the best emission reduction effect on NOx and PM2.5, and the average reduction rates were -26.09 % and -4.23 %, respectively, compared to the 2035 frozen scenario. These results showed that the substitution of fuel and clinker has important co-benefits for air pollutants in the cement industry.

Keywords

Author Keywords

Air pollutionEmission inventoryCement industryLSTMLow carbon technology

Keywords Plus

CO2 EMISSIONSREDUCTIONFUELPROJECTIONEVOLUTION

Air Pollutant

4-Geo-spatial distribution of air pollutants in urban area and its potential health risk analysis solutions

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By Waheed, F (Waheed, Fajar) [1] ; Ehsan, N (Ehsan, Nusrat) [2] ; Nasir, R (Nasir, Rabiya) [1] ; Khan, WA (Khan, Waqas Ahmed) [3] , [4] ; Khokhar, MF (Khokhar, Muhammad Fahim) [4] ; Shahzad, L (Shahzad, Laila) [3] ; Tariq, A (Tariq, Aqil) [5] ; Afzal, H (Afzal, Hira) [6] ; Zaman, QU (Zaman, Qamar uz) [1] **(provided by Clarivate) Source URBAN CLIMATE Volume 61 DOI 10.1016/j.uclim.2025.102380 Article Number 102380 Published JUN 2025 Early Access MAR 2025 Indexed 2025-04-05 Document Type Article**

Abstract

Air quality degradation poses significant risks to human health and contributes to climate change. Unplanned urbanization, rapid population growth, reduced vegetation cover, and emissions from industries and vehicles, particularly in urban areas, have led to a considerable increase in air pollutants and emission sources which has greatly increased the prevalence of respiratory disease. For estimating the spatiotemporal burden of criteria air pollutants on community health, we monitored the seasonal variation in ambient air quality of nine administrative divisions in the northeastern regions of Pakistan from June to December 2021 from road sides. HAZ-SCANNER was used for five major air pollutants including Particulate Matter (PM10 and PM2.5), nitrogen dioxides (NO2), and carbon monoxide (CO), and a Mobile Van was used for sulfur dioxide (SO2). Overall results showed higher concentrations of air pollutants as compared to Punjab Environmental Quality Standards (PEQs). The concentration of PM2.5 ranged from 282.21 f 35.19 mu g/m3 to 350.38 f 21.32 mu g/m3. PM10 levels varied from 150.8 mu g/m3 to 404.5 mu g/m3. Additionally, NO2, SO2 and CO concentrations ranged from 128.30 f 14.24 mu g/m3 to 254.96 f 12.86 mu g/m3, 259.08 f 5.44 mu g/m3 to 137.02 f 6.10 mu g/m3 and 23.15 f 3.92 mg/m3 to 15.77 f 2.17 mg/m3, respectively. The results showed that the concentration of criteria air pollutants varied with the meteorological conditions in the study area. Pearson correlation showed a significant negative correlation with atmospheric temperature and solar radiation indicating that with an increase in temperature and solar radiation, the ambient air pollutants decreased. The PM2.5/PM10 ratio was 0.74. Health risk assessment revealed a higher health quotient for PM compared to other pollutants. This research accentuates the urgent need to address air pollution in Lahore and advocates for effective interventions to mitigate the impact on human health and promote sustainable air quality management.

Keywords

Author Keywords

Ambient airPollutionH riskEmissionsParticulate matter

Keywords Plus

PARTICULATE MATTER PM2.5TIME-SERIES ANALYSISRESPIRATORY-DISEASESCARBON-MONOXIDEPOLLUTIONQUALITYEXPOSUREASTHMAINDICATORSCHALLENGES

Air Pollutant

5-Large-scale genome-wide association studies reveal the genetic causal etiology between air pollutants and autoimmune diseases

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By Wen, J (Wen, Jie) [1] , [2] , [3] , [4] , [5] ; Zhang, JW (Zhang, Jingwei) [3] , [4] , [5] ; Zhang, H (Zhang, Hao) [6] ; Zhang, N (Zhang, Nan) [7] ; Lei, RY (Lei, Ruoyan) [8] ; Deng, YJ (Deng, Yujia) [3] , [9] ; Cheng, Q (Cheng, Quan) [3] , [4] , [5] ; Li, H (Li, He) [1] ; Luo, P (Luo, Peng) [10] (provided by Clarivate)
Source JOURNAL OF TRANSLATIONAL MEDICINE Volume 22 Issue 1 DOI 10.1186/s12967-024-04928-y Article Number 392 Published APR 29 2024 Indexed 2024-05-10 Document Type Article

Abstract

Background Epidemiological evidence links a close correlation between long-term exposure to air pollutants and autoimmune diseases, while the causality remained unknown.Methods Two-sample Mendelian randomization (TSMR) was used to investigate the role of PM10, PM2.5, NO2, and NOX (N = 423,796-456,380) in 15 autoimmune diseases (N = 14,890-314,995) using data from large European GWASs including UKB, FINNGEN, IMSGC, and IPSCSG. Multivariable Mendelian randomization (MVMR) was conducted to investigate the direct effect of each air pollutant and the mediating role of common factors, including body mass index (BMI), alcohol consumption, smoking status, and household income. Transcriptome-wide association studies (TWAS), two-step MR, and colocalization analyses were performed to explore underlying mechanisms between air pollution and autoimmune diseases.Results In TSMR, after correction of multiple testing, hypothyroidism was causally associated with higher exposure to NO2 [odds ratio (OR): 1.37, p = 9.08 x 10-4] and NOX [OR: 1.34, p = 2.86 x 10-3], ulcerative colitis (UC) was causally associated with higher exposure to NOX [OR: 2.24, p = 1.23 x 10-2] and PM2.5 [OR: 2.60, p = 5.96 x 10-3], rheumatoid arthritis was causally associated with higher exposure to NOX [OR: 1.72, p = 1.50 x 10-2], systemic lupus erythematosus was causally associated with higher exposure to NOX [OR: 4.92, p = 6.89 x 10-3], celiac disease was causally associated with lower exposure to NOX [OR: 0.14, p = 6.74 x 10-4] and PM2.5 [OR: 0.17, p = 3.18 x 10-3]. The risky effects of PM2.5 on UC remained significant in MVMR analyses after adjusting for other air pollutants. MVMR revealed several common mediators between air pollutants and autoimmune diseases. Transcriptional analysis identified specific gene transcripts and pathways interconnecting air pollutants and autoimmune diseases. Two-step MR revealed that POR, HSPA1B, and BRD2 might mediate from air pollutants to autoimmune diseases. POR pQTL (rs59882870, PPH4=1.00) strongly colocalized with autoimmune diseases.Conclusion This research underscores the necessity of rigorous air pollutant surveillance within public health studies to curb the prevalence of autoimmune diseases.

Keywords

Author Keywords

Air pollutantsAutoimmune diseaseMendelian randomizationTWASCausal relationship

Keywords Plus

USE REGRESSION-MODELSMENDELIAN RANDOMIZATIONR PACKAGEVARIANTSPROTEINAREASBIAS

Air Pollutant

6-Agricultural machinery could contribute 20% of total carbon and air pollutant emissions by 2050 and compromise carbon neutrality targets in China

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By Zhuang, MH (Zhuang, Minghao) [1] , [2] ; Wang, X (Wang, Xu) [1] , [2] ; Yang, Y (Yang, Yi) [3] ; Wu, YF (Wu, Yifei) [1] , [2] ; Wang, LG (Wang, Ligang) [4] ; Lu, X (Lu, Xi) [5] , [6] , [7] (provided by Clarivate)
Source NATURE FOOD Volume 6 Issue 5 DOI 10.1038/s43016-025-01163-6 Published MAY 2025 Early Access APR 2025 Indexed 2025-05-02 Document Type Article

Abstract

Agricultural mechanization has benefitted food security in China, but carbon dioxide (CO2) and air pollutant emissions from fuel combustion are often overlooked. Here we show that emissions of CO2 and air pollutants from agricultural machinery increased nearly sevenfold and four- to sevenfold, respectively, during 1985-2020, driven largely by rapid advancement in the mechanization level. If unabated, annual emissions of CO2, PM2.5 and NOx from agricultural machinery in 2050 could reach 213.6 Mt, 55.4 Gg and 902.8 Gg, contributing similar to 21%, similar to 4% and similar to 17% of China's total emissions under a dual-carbon goal scenario, respectively. However, adoption of renewable energy sources could mitigate 65-70% of these emissions. Our study highlights that China's agricultural machinery could become a large source of emissions that-without mitigation-may hinder China's carbon neutrality targets and degrade air quality.

Keywords

Keywords Plus

ENERGY-USETRACTORSINTENSIFICATIONTECHNOLOGIESCONSUMPTIONCHALLENGESVEHICLESHYBRIDGASESCO2

Air Pollutant

7-Synergistic reduction of air pollutants and carbon emissions in Chengdu-Chongqing urban agglomeration, China: Spatial-temporal characteristics, regional differences, and dynamic evolution

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By Xiang, SJ (Xiang, Shujiang) [1] ; Huang, XJ (Huang, Xianjin) [1] , [2] ; Lin, NN (Lin, Nana) [1] ; Yi, ZY (Yi, Zeyu) [1] **(provided by Clarivate) Source JOURNAL OF CLEANER PRODUCTION Volume 493 DOI 10.1016/j.jclepro.2025.144929 Article Number 144929 Published FEB 15 2025 Early Access FEB 2025 Indexed 2025-03-01 Document Type Article**

Abstract

Promoting the development of synergistic reduction of air pollutants and carbon emissions (SRAPCE) is crucial to respond to environmental protection and climate change. However, there is still a lack of comprehensive analysis of SRAPCE at the county scale based on an exploratory spatial-temporal data analysis (ESTDA) framework. Besides, there are few studies on urban agglomerations in western China. To fill the research gap, this study selected Chengdu-Chongqing Urban Agglomeration (CCUA) as an example, and measured SRAPCE level in 156 counties of CCUA and explored spatial-temporal characteristics, regional differences, and dynamic evolution of SRAPCE in CCUA at the county scale by ESTDA framework. The study showed that: (1) SRAPCE level in counties of CCUA is mainly in moderate imbalance, accounting for 61.54%-73.72%, and shows the obvious spatial heterogeneity, with a pattern of "high in the middle and low at the edge". (2) The average overall Gini coefficient of SRAPCE is 0.19, elucidating a level of spatial imbalance, and its largest contribution degree is intra-regional differences. (3) Global Moran's I of SRAPCE ranges from 0.299 to 0.387, exhibiting a positive spatial correlation. There is a significant spatial agglomeration phenomenon, mainly dominated by HH and LL. (4) There are 98 counties with low relative length and medium relative length, which accounts for 62.82%, suggesting local spatial structure of SRAPCE is fairly steady. There are 136 counties with low tortuosity and medium tortuosity, which account for 87.18% of the total, suggesting the volatility of SRAPCE is fairly steady in the direction of local spatial dependence. There are 104 counties with collaboration growth type, which accounts for 66.67%, suggesting the pattern changes of SRAPCE exhibit a high level of spatial integration. The spatial-temporal cohesion index is 93.85%, and the spatial-temporal flux index is 6.15%, suggesting that local spatial correlation pattern of SRAPCE exhibits path dependences and space-locking characteristics to some extent. The research findings could provide scientific support for CCUA to achieve sustainable development and formulate environmental management policies, and inspirations for other urban agglomerations.

Keywords

Author Keywords

Air pollutionCarbon emissionsSynergistic reductionESTDACounty scaleChengdu-chongqing urban agglomerationSpatial-temporal dynamic

8-Three-dimensional bioprinting biphasic multicellular living scaffold facilitates osteochondral defect regeneration

By Yu, XG (Yu, Xingge) [1] , [2] , [3] , [4] , [5] , [6] ; Gholipourmalekabadi, M (Gholipourmalekabadi, Mazaher) [7] , [8] ; Wang, XD (Wang, Xudong) [1] ; Yuan, CY (Yuan, Changyong) [9] , [10] ; Lin, KL (Lin, Kaili) [1] (provided by Clarivate) **Source INTERDISCIPLINARY MATERIALS Volume 3 Issue 5 Page 738-756 DOI 10.1002/idm2.12181 Published SEP 2024 Early Access JUN 2024 Indexed 2024-06-08 Document Type Article**

Abstract

Due to tissue lineage variances and the anisotropic physiological characteristics, regenerating complex osteochondral tissues (cartilage and subchondral bone) remains a great challenge, which is primarily due to the distinct requirements for cartilage and subchondral bone regeneration. For cartilage regeneration, a significant amount of newly generated chondrocytes is required while maintaining their phenotype. Conversely, bone regeneration necessitates inducing stem cells to differentiate into osteoblasts. Additionally, the construction of the osteochondral interface is crucial. In this study, we fabricated a biphasic multicellular bioprinted scaffold mimicking natural osteochondral tissue employing three-dimensional (3D) bioprinting technology. Briefly, gelatin-methacryloyl (GelMA) loaded with articular chondrocytes and bone marrow mesenchymal stem cells (ACs/BMSCs), serving as the cartilage layer, preserved the phenotype of ACs and promoted the differentiation of BMSCs into chondrocytes through the interaction between ACs and BMSCs, thereby facilitating cartilage regeneration. GelMA/strontium-substituted xonotlite (Sr-CSH) loaded with BMSCs, serving as the subchondral bone layer, regulated the differentiation of BMSCs into osteoblasts and enhanced the secretion of cartilage matrix by ACs in the cartilage layer through the slow release of bioactive ions from Sr-CSH. Additionally, GelMA, serving as the matrix material, contributed to the reconstruction of the osteochondral interface. Ultimately, this biphasic multicellular bioprinted scaffold demonstrated satisfactory simultaneous regeneration of osteochondral defects. In this study, a promising strategy for the application of 3D bioprinting technology in complex tissue regeneration was proposed.

Three-dimensional bioprinting biphasic multicellular living scaffold facilitates osteochondral regeneration and achieves osteochondral interface reconstruction. Specifically, the interaction of articular chondrocytes and bone marrow mesenchymal stem cells (BMSCs) in the cartilage layer enhances cartilage regeneration. In the subchondral bone layer, the osteogenic differentiation of BMSCs is regulated by strontium-substituted xonotlite nanowires-modified gelatin-methacryloyl bioinks to stimulate subchondral bone regeneration.

Keywords

Author Keywords

3D bioprintingbiphasic scaffoldsinterface reconstructionmulticellularityosteochondral defects

Keywords Plus

MESENCHYMAL STEM-CELLSSTRONTIUMCARTILAGEOSTEOARTHRITIS