

# Bulletin Board

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## Technical

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## CHEMICAL EFFECTS

**Disinfection performance of chlorine dioxide gas at ultra-low concentrations and the decay rules under different environmental factors**

2020-005-15

Gaseous chlorine dioxide ( $\text{ClO}_2$ ) is one of the most promising air disinfectants. In this study, an ultra-low concentration of  $\text{ClO}_2$  gas ( $< 1.2 \text{ mg/m}^3$ ) was generated in an office at various levels of humidity and illuminance to investigate the decay law. The disinfection efficiency and metal corrosiveness of ultra-low concentrations of  $\text{ClO}_2$  gas were also studied using an experimental chamber. At 48% and 75% humidity, the decay rate constants of  $\text{ClO}_2$  gas were  $0.0034 \text{ min}^{-1}$  and  $0.0036 \text{ min}^{-1}$ , respectively. The rate of decline of the  $\text{ClO}_2$  concentration increased as the humidity of the environment increased. The decay rate constant of  $\text{ClO}_2$  gas at an illuminance of 76 lux and 3429 lux was  $0.0034 \text{ min}^{-1}$  and  $0.00427 \text{ min}^{-1}$ , respectively; hence, the decay rate increased with increased illumination. At a humidity of 72% and illuminance of 2112 lux, the decay rate constant reached  $0.00880 \text{ min}^{-1}$ . The effects of humidity and illuminance on the attenuation of the  $\text{ClO}_2$  concentration were strongly synergistic. When the gas concentration was maintained below  $0.9 \text{ mg/m}^3$ , the disinfection rate of  $\text{ClO}_2$  on bacteria (*P. aeruginosa*, *V. mimicus* and *S. aureus*) exceeded 99.9%; thus,  $\text{ClO}_2$  gas exhibited a high disinfection efficiency. In addition, there was no corrosion to various metals by  $\text{ClO}_2$  under the same conditions. Consequently, gaseous  $\text{ClO}_2$  at ultra-low concentrations has a high sterilisation efficiency and is non-corrosive to metals.

Authors: Peiyong Ning, Dan Shan, Enlv Hong, Lumin Liu, Yun Zhu, Runmeng Cui, Yuhui Zhou, Baiqi Wang

Full Source: Journal of the air and waste management association [1995]. 2020 May 15. doi: 10.1080/10962247.2020.1769768. Online ahead of print.

**Hepatoprotective effect of Atorvastatin on cadmium chloride induced hepatotoxicity in rats**

2020-05-11

**Aims:** Cadmium chloride has various industrial applications and considered an industrial and environmental pollutant. The aim of this study was to evaluate the effect of atorvastatin on Cadmium chloride-induced hepatotoxicity in male rats.

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**Materials and methods:** Fifty-six adult male rats, randomly were divided into 8 groups. Groups 1-3 were received atorvastatin (20 mg/kg) intragastrically for 15 days during which Cadmium chloride (1, 2, and 3 mg/kg) were given intraperitoneally from days 8 to 15. Groups 4-6 were as first three groups but animals were received vehicle of atorvastatin. Group 7 was received vehicle of atorvastatin and vehicle of Cadmium chloride and Group 8 was received atorvastatin and vehicle of Cadmium chloride according to timeline of other groups. On day 16, under full anesthesia, blood sampling was prepared from heart, and livers were dissected out to analyses the biochemical and histopathology studies.

**Key findings:** Cadmium chloride significantly increased aspartate transaminase (AST), alanine transaminase (ALT), and alkaline phosphatase (ALP) in the serum. Malondialdehyde (MDA) significantly increased and superoxide dismutase (SOD), glutathione peroxidase (GPx), and glutathione (GSH) significantly decreased the in the liver following Cadmium chloride administration. Atorvastatin significantly improved the levels of MDA, SOD, GPx, GSH, but not ALT, AST, and ALP in Cadmium chloride-treated rats. In histopathological studies, atorvastatin could not improve injured liver tissues induced by Cadmium chloride.

**Significance:** Atorvastatin has beneficial effects in improving Cadmium chloride-induced antioxidative enzymes disturbance which may be contribute to improving liver function in male rats.

Authors: Zahra Goodarzi, Esmaeil Karami, Sedighe Yousefi, Alireza Dehdashti, Ahmad Reza Bandegi, Ali Ghanbari

Full Source: Life Sciences. 2020 May 11;117770. doi: 10.1016/j.lfs.2020.117770. Online ahead of print.

## ENVIRONMENTAL RESEARCH

**Organizational culture and the adoption of anti-smoking initiatives at small to very small workplaces: an organizational level analysis**

2020-12-19

**Introduction:** Many workplaces have adopted anti-smoking initiatives to reduce smoking behavior, but small workplaces are less likely to adopt these initiatives. One factor that could influence adoption is organizational culture, defined as the values and assumptions shared by members of an organization. The aim of this study was to examine the types of organizational culture associated with smoking policy strength and adoption of smoking cessation activities at small (20-99 employees) and

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very small (<20 employees) workplaces. Two study hypotheses were made: An increase in clan culture (characterized by participation in decision-making and human resources development) will be associated with an increase in smoking policy strength (H1) and higher odds of having cessation activities in the workplace (H2).

**Methods:** Between June and October 2017, executives and employees coming from small and very small workplaces participated in separate surveys. Executives answered questions about their workplace's anti-smoking initiatives, while employees completed a 12-item questionnaire about organizational culture. We aggregated employee data to perform linear and logistic regression at the organizational level.

**Results:** Organizational culture was not significantly associated with smoking policy strength, therefore H1 was not supported. Counter to H2, an increase in clan culture was associated with lower odds of offering smoking cessation activities (OR=0.06; 95% CI: 0.01-0.58).

**Conclusions:** We did not find support for the hypothesized relationships. External factors and additional cultural characteristics may explain study findings. Continued research on culture and ways to improve tobacco control within smaller workplaces is needed.

Authors: Christine M Kava, Edith A Parker, Barbara Baquero, Susan J Curry, Paul A Gilbert, Michael Sauder, Daniel K Sewell

Full Source: Tobacco Prevention and Cessation. 2018 Dec 19;4:39. doi: 10.18332/tpc/100403. eCollection 2018.

### The role of environmental factors to transmission of SARS-CoV-2 (COVID-19)

2020-05-15

The current outbreak of the novel coronavirus disease 2019 (COVID-19) in more than 250 countries has become a serious threat to the health of people around the world. Human-to-human transmission of the Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) occurs most often when people are in the incubation stage of the disease or are carriers and have no symptoms. Therefore, in this study, was discussed the role of environmental factors and conditions such as temperature, humidity, wind speed as well as food, water and sewage, air, insects, inanimate surfaces, and hands in COVID-19 transmission. The results of studies on the stability of the SARS-CoV-2 on different levels showed that the resistance of this virus on smooth surfaces was higher than others. Temperature increase and sunlight can facilitate the destruction of SARS-COV-2 and the stability of it on surfaces. When the minimum ambient air temperature increases by 1 °C, the cumulative number

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of cases decreases by 0.86%. According to the latest evidence, the presence of coronavirus in the sewer has been confirmed, but there is no evidence that it is transmitted through sewage or contaminated drinking water. Also, SARS-COV-2 transmission through food, food packages, and food handlers has not been identified as a risk factor for the disease. According to the latest studies, the possibility of transmitting SARS-COV-2 bioaerosol through the air has been reported in the internal environment of ophthalmology. The results additionally show that infectious bio-aerosols can move up to 6 feet. There have been no reports of SARS-COV-2 transmission by blood-feeding arthropods such as mosquitoes.

Authors: Hadi Eslami, Mahrokh Jalili

Full Source: AMB Express. 2020 May 15;10(1):92. doi: 10.1186/s13568-020-01028-0.

### PHARMACEUTICAL/TOXICOLOGY

#### Effects of stretching on muscle activation in gas cylinder handling

2020-05-11

**Background:** Previously, a stretching regimen was designed for manual material handling (MMH) of gas cylinders as a potential ergonomic solution for reducing occupational injury. No studies have made use of objective process measures, such as muscle activation levels, for evaluation of effects of stretching programs.

**Objective:** Examine acute effects of stretching on muscle activation levels and driver perceived level of exertion in gas cylinder handling during simulated delivery operations.

**Methods:** A within-subject experiment was conducted with eight male participants being subjected randomly to two conditions over a two-day period: stretching before delivery trials and no stretching. Surface electromyography and the Borg CR-10 scale for perceived exertion were used.

**Results:** Generally, results were variable among muscle responses. The extensor muscle bundle in the forearm was found to show a significant decrease ( $p = 0.0464$ ) in activation level because of stretching. The anterior deltoid and trapezius significantly increased ( $p < .0001$ ) the EMG activation level with stretching. Also counter to expectations, participants rated perceived exertion significantly higher ( $p = 0.0423$ ) for trials preceded by stretching.

**Conclusions:** This research indicates a muscle stretching regimen in advance of MMH activities has mixed effects on activation levels across

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muscles. It is possible that effects are attributable to body posture positions, or manner of muscle use, during actual work activities. Findings indicate that stretching prior to work activity does have an impact on specific muscle activation.

Authors: Amy Wadeson, Melissa M White, Wenjuan Zhang, Mei Y Lau, David B Kaber

Full Source: Work (Reading, Mass). 2020 May 11. doi: 10.3233/WOR-203159. Online ahead of print.

### Association of twenty-three plasma elements with fasting serum glucose among Chinese population from four different areas with different pollution level

2020-05-11

**Background:** Association between fasting serum glucose (FSG) and certain mineral elements has been extensively reported. Investigation regarding multi-element exposure among subjects with different exposure level is warranted to confirm the association and further explore dose-dependent relationship.

**Methods:** A total of 3488 participants were recruited from four counties of Hunan province, South China. Basic characteristics were collected by face to face interview and 23 elements in plasma were determined by inductively coupled plasma mass spectrometry. We applied fully adjusted generalized linear regression model and multivariable restricted cubic spline function to test the association and dose-response relationship of FSG with 23 elements.

**Results:** The results indicated that FSG was positively associated with plasma <sup>78</sup>Se level [regression coefficient (β), 0.001; 95 % confidence interval (CI), 0.001, 0.001] in a dose-dependent manner, robust to the adjustment for suspected covariates and stratification by age, gender, BMI and smoking status. A negative association was found between FSG and plasma <sup>208</sup>Pb (β, -0.004; 95 % CI, -0.016, -0.002), <sup>52</sup>Cr (β, -0.002; 95 % CI, -0.004, -0.001) and <sup>47</sup>Ti (β, -0.001; 95 % CI, -0.002, -0.001).

**Conclusion:** <sup>78</sup>Se was positively while <sup>208</sup>Pb, <sup>52</sup>Cr and <sup>47</sup>Ti were negatively associated with FSG in the present study. However, prospective studies are needed to confirm the results.

Authors: Qican He, Bingzhi Chen, Zhijun Huang, Jia Zhao, Meian He, Dan Luo, Qi Li, Yuefeng He, Jing Wang, Xiang Chen, Minxue Shen, Yanying Duan  
Full Source: Journal of trace elements in medicine and biology: Organ of the Society for Minerals and Trace Elements (GMS). 2020 May

A total of 3488 participants were recruited from four counties of Hunan province, South China.

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11;61:126510. doi: 10.1016/j.jtemb.2020.126510. Online ahead of print.

### The role of Influenza vaccination in mitigating the adverse impact of ambient air pollution on lung function in children: new insights from the seven northeastern cities study in China

2020-05-07

**Background:** Ambient air pollution exposure and influenza virus infection have been documented to be independently associated with reduced lung function previously. Influenza vaccination plays an important role in protecting against influenza-induced severe diseases. However, no study to date has focused on whether influenza vaccination may modify the associations between ambient air pollution exposure and lung function.

**Methods:** We undertook a cross-sectional study of 6740 children aged 7-14 years into Seven Northeast Cities (SNEC) Study in China during 2012-2013. We collected information from parents/guardians about sociodemographic factors and influenza vaccination status in the past three years. Lung function was measured using portable electronic spirometers. Machine learning methods were used to predict 4-year average ambient air pollutant exposures to nitrogen dioxide (NO<sub>2</sub>) and particulate matter with an aerodynamic diameter <1 μm (PM<sub>1</sub>), <2.5 μm (PM<sub>2.5</sub>) and <10 μm (PM<sub>10</sub>). Two-level linear and logistic regression models were used to assess interactions between influenza vaccination and long-term ambient air pollutants exposure on lung function reduction, controlling for potential confounding factors.

**Results:** Ambient air pollution were observed significantly associated with reductions in lung function among children. We found significant interactions between influenza vaccination and air pollutants on lung function, suggesting greater vulnerability to air pollution among unvaccinated children. For example, an interaction (p<sub>interaction</sub> = 0.002) indicated a -283.44 mL [95% CI: -327.04, -239.83] reduction in forced vital capacity (FVC) per interquartile range (IQR) increase in PM<sub>1</sub> concentrations among unvaccinated children, compared with the -108.24 mL [95%CI: -174.88, -41.60] reduction in FVC observed among vaccinated children. Results from logistic regression models also showed stronger associations between per IQR increase in PM<sub>1</sub> and lung function reduction measured by FVC and peak expiratory flow (PEF) among unvaccinated children than the according ORs among vaccinated children [i.e., Odds Ratio (OR) for PM<sub>1</sub> and impaired FVC: 2.33 [95%CI: 1.79, 3.03] vs 1.65 [95%CI: 1.20, 2.28]; OR for PM<sub>2.5</sub> and impaired PEF:

We undertook a cross-sectional study of 6740 children aged 7-14 years into Seven Northeast Cities (SNEC) Study in China during 2012-2013.

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1.45 [95%CI: 1.12,1.87] vs 1.04 [95%CI: 0.76,1.43]. The heterogeneity of the modification by influenza vaccination of the associations between air pollution exposure and lung function reduction appeared to be more substantial in girls than in boys.

**Conclusion:** Our results suggest that influenza vaccination may moderate the detrimental effects of ambient air pollution on lung function among children. This study provides new insights into the possible co-benefits of strengthening and promoting global influenza vaccination programs among children.

Authors:Kangkang Liu, Bo-Yi Yang, Yuming Guo, Michael S Bloom, Shyamali C Dharmage, Luke D Knibbs, Joachim Heinrich, Ari Leskinen, Shao Lin, Lidia Morawska, Bin Jalaludin, Iana Markevych, Pasi Jalava, Mika Komppula, Yunjiang Yu, Meng Gao, Yang Zhou, Hong-Yao Yu, Xiao-Wen Zeng, Guang-Hui Dong

Full Source: Environmental Research. 2020 May 7;187:109624. doi: 10.1016/j.envres.2020.109624. Online ahead of print.

## OCCUPATIONAL

## Lung function and functional exercise capacity in underground semi-precious stone mineworkers

2020-05-13

**Background:** Semi-precious stone mining may cause occupational lung disease. The impact of inhaling silica on workers' exercise capacity has only been partially studied.

**Objectives:** To study lung function, exercise capacity, and identify factors associated with functional impairment.

**Methods:** In a cross-sectional study of 193 current miners from Ametista do Sul, Rio Grande do Sul, Brazil, medical and occupational data were collected. The diagnosis of silicosis was established by the history of dust exposure and chest radiographic findings. All workers performed a spirometry and a 6-minute walk test (6MWT).

**Results:** Of the sample 51 (26.4%) had silicosis. Time working in mine was  $14.7 \pm 8.7$  years. Spirometry showed a normal, restrictive or obstructive ventilatory pattern in 75.1 %, 13 % and 9.3 % of the workers, respectively. The diagnosis of silicosis and length of time working in mining negatively affected lung function, although exercise capacity was preserved. In the multivariate analysis, time working in mining, diagnosis of silicosis and education remained significant for forced expiratory volume in one second (FEV1;  $r = 0.60$ ;  $r^2 = 0.36$ ;  $p < 0.001$ ) and age and height for distance in 6MWT ( $r = 0.66$ ;  $r^2 = 0.43$ ;  $p < 0.001$ ).

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**Conclusions:** Our results show impaired lung function and preserved exercise capacity in current mineworkers exposed to silica. Length of time working in mining, presence of silicosis and lower education were factors associated with reduced lung function.

Authors: Tamires Patrícia Souza, Guilherme Watte, Jorge Alan de Souza, José da Silva Moreira, Marli Maria Knorst

Full Source: Work (Reading, Mass). 2020 May 13. doi: 10.3233/WOR-203163. Online ahead of print.

## Impacts of pm2.5 on respiratory system among traffic policemen

2020-05-12

**Background:** Malaysian traffic policemen are constantly exposed to unhealthy air in the outdoor environment, which results in various health problems. This study investigates the relationship of the personal exposure level to PM2.5 and lung functions in traffic policemen in Kuala Lumpur and Johor Bahru.

**Methods:** A pulmonary function test using a spirometer was carried out to measure the lung function of the traffic policemen. The personal exposure level to PM2.5 was measured using a pump with a PVC filter and 5.0 $\mu$ m pore size. A questionnaire requesting the background data, such as age, height, and weight, was also used for testing lung function abnormalities.

**Results:** The PM2.5 personal exposure level was found to be significantly related to lung function (predicted FEV1 and predicted FVC) at  $p$ -value  $< 0.05$ .

**Conclusions:** Traffic policemen are mainly exposed to physical hazards from traffic pollutants emitted by vehicles, such as fine particles and particulate matter. The findings of this study indicate that there is a trend of lung function deterioration among traffic policemen. These baseline data can serve as a reference for the top management of traffic police to aid in the development of occupational safety and health guidelines for police officers, as the traffic police are not covered by the Occupational Safety and Health Act (OSHA, Act 514 1994).

Authors: MJ Putri Anis Syahira, K Karmegam, M Y Nur Athirah Diyana, R Imiza, M T Shamsul Bahri, H Vivien, H Nurul Maizura, S Sivasankar

Full Source: Work (Reading, Mass). 2020 May 12. doi: 10.3233/WOR-203147. Online ahead of print.

The personal exposure level to PM2.5 was measured using a pump with a PVC filter and 5.0 $\mu$ m pore size.

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### **AltraxChimi, a web application for the management and the interpretation of occupational exposure measurements to chemical substances**

2020-05-12

In most occupational settings, several chemical agents are commonly found, and the associated exposure risk for workers must be assessed. For this purpose, air samples can be collected and analyzed. AltraxChimie is a web application that helps industrial hygienists in the organization of the air sampling strategy and in the subsequent phases of data management, analysis, and communication. AltraxChimie contains a database of more than 550 chemical substances and their respective French Occupational Exposure Limit Values (OELV): Custom OELVs can also be defined by the user. AltraxChimie helps with the definition of key features of the sampling strategy, in particular by promoting a methodology for the design of Similar Exposure Groups (SEGs). Once measurement data are entered, they can be analyzed to obtain exposure diagnostics. Data management features allow for the easy storage and retrieval of measurements, and comprehensive dashboards help industrial hygienists (IHs) in the communication of results. Finally, with AltraxChimie it is also possible to assess exposure to multiple chemical substances and their additive effects. While most free software applications for the assessment of chemical exposure focus on the statistical computation of specific indicators, AltraxChimie offers several tools to assist IHs in the exposure assessment workflow. AltraxChimie is available without registration from INRS at <https://altrax.inrs.fr>.

Authors: Frédéric Clerc, Andrea Emili, Gautier Mater

Full Source: International journal of environmental research and public health. 2020 May 12;17(10):E3375. doi: 10.3390/ijerph17103375.

**AltraxChimie helps with the definition of key features of the sampling strategy, in particular by promoting a methodology for the design of Similar Exposure Groups (SEGs).**