Results Comparing fast rotating and day shift nurses, significant differences were found in the levels of steroid hormones. Multiple linear regression analysis, considering hormones or vitamin D as dependent variable and work-shift type as independent variable, showed no differences between the two group as concerns the levels of stress hormones, whereas a significant increase of corticosterone and a marginal decrease of vitamin D were observed in fast rotating shift nurses, after adjusting for age, body mass index, tobacco smoking, and sampling time.
Conclusion This work shows that the a rapid rotating shift-work schedule '1–1–1' does not modify the global steroid hormone homeostasis; however, further work is needed to investigate the meaning of the observed increase of corticosterone levels.

1281 MIRNAS IN EXTRACELLULAR VESICLESMEDIATE THE EFFECT OF PARTICULATE MATTER EXPOSURE ON COAGULATION IN A LARGE SAMPLE OF OVERWEIGHT/OBESE ADULTS

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Introduction In Italy about 45% of people aged ≥18 years are overweight/obese and might thus be more susceptible to the adverse health effects of air pollution exposure. Particulate matter ≤10 μm (PM10) represents a common pollutant of living and working environments and has been associated with increased risk of cardiovascular diseases (CVD) and hypercoagulability. Extracellular vesicles (EV) might play an important role in PM-related CVD, as they can travel in body fluids and transfer miRNAs between cells. We investigated whether PM10 exposure is associated with changes in fibrinogen levels, EV release, and EV-miRNA content in a large sample of overweight/obese adults.
Methods EV concentrations were quantified by nanoparticle tracking analysis and flow cytometry. To identify altered levels of EV-miRNAs, we profiled miRNAs of 883 subjects by the QuantStudio 12K Flex Real Time PCR System. The top 40 EV-miRNAs were validated through custom miRNA plates. Statistical analyses included multiple linear regressions, mediation analysis and bioinformatics analysis.
Results In a sample of 1630 overweight/obese subjects from the SPHERE (**S**usceptibility to **P**article **H**ealth **E**ffects, mi**R**NAs and **E**xosomes) study, short-term exposure to PM10 was associated with increased release of EVs, especially those from monocyte/macrophage components (CD14+) and platelets (CD61+). Nine EV-miRNAs (let-7c-5p; miR-106a-5p; miR-143–3 p; miR-185–5 p; miR-218–5 p; miR-331–3 p; miR-642–5 p; miR-652–3 p; miR-99b-5p) were downregulated in response to PM10 exposure and exhibited putative roles in CVD. Five of these nine EV-miRNAs were mediators in the positive association between PM10 exposure and fibrinogen levels.
Conclusions Our study sheds some light on the potential mechanisms underlying the adverse cardiovascular health effects of air pollution exposure. Our results were obtained in a hypersusceptible population and thus strengthen the relevance of health promotion interventions for both the general public and the working population, as they might be particularly feasible in the workplace.

1282 URINARY 8-OXO-7,8-DIHYDRO-2′-DEOXYGUANOSINE IN TUNISIAN ELECTRIC STEEL FOUNDRY WORKERS EXPOSED TO POLYCYCLIC AROMATIC HYDROCARBONS AND METALS

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Background Electric steel foundry workers are potentially exposed to several toxic chemicals including polycyclic aromatic hydrocarbons (PAHs) and metals. This study was aimed to assess PAHs and metals exposure in foundry workers and its association with the oxidative DNA damage evaluated as urinary 8-oxo-7,8-dihydro-2'deoxyguanosine (8-oxodG).
Methods Ninety-four male workers from an electric steel foundry entered the study. Sixteen unmetabolized PAHs (U-PAHs), 8 hydroxylated PAH metabolites (OHPAHs), 12 metals and 8-oxodG were investigated in urine samples.
Results Among U-PAHs, urinary naphthalene was the most abundant compound, followed by phenanthrene; benzo[a]pyrene level was <0.30 ng/L. Median 1-hydroxypyrene (1-OHPYR) was 0.52 μg/L. Job title was a significant determinant for almost all U-PAHs and metals: employees in the steel smelter workshop had higher levels of high-boiling U-PAHs, maintenance workers and workers from the galvanization and rolling workshop were the most exposed to metals. Median 8-oxodG level was 3.20 μg/L. No correlation between 8-oxodG and 1-OHPYR or any OHPAH was found. Significant correlations between 8-oxodG and some U-PAHs and metals were found, particularly acenaphthylene, phenanthrene, anthracene, fluoranthene, pyrene, chromium, manganese, cobalt, zinc, arsenic, barium, thallium, and lead.
Conclusions The oxidative DNA damage was moderate and in the range reported in other occupational fields and in the general population. These results indicate that the investigated biomarkers were only minor contributors to urinary 8-oxodG.

1286 CLOSING THE GAPS BETWEEN OCCUPATIONAL AND ENVIRONMENTAL EXPOSURES AND HUMAN HEALTH

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Introduction The World Health Organisation has ranked environmental exposures among the top risk factors for chronic disease mortality. Worldwide 55 million people die each year from non-communicable diseases (NCD) including cancer, diabetes, chronic cardiovascular, respiratory, and neurological diseases.
Methods The EU-funded project Diagnosis, Monitoring and Prevention of Exposure Related Non-Communicable Diseases (DiMoPEx) aims at developing new concepts for a better understanding of health-environment (including gene-environment) interactions in the aetiology of NCDs. The project is advancing within several working groups, which cover the areas of exposure assessment, toxicology, epidemiology, ethical issues, biomarkers of genetic effects and epigenetic and clinical characteristics of NCDs.
Results DiMoPEx partners have identified some of the emerging research needs, including evidence-based exposure data, animal models reflecting total human life-span and low dose cumulative exposures. From the perspective of epidemiology the gaps between risk factor and health outcome may be bridged by biomarker-based research in which well-designed experimental exposure studies and biomarkers of early response should play a central role. DiMoPEx identified several drawbacks in existing studies on exposure-NCD association, e.g. inappropriate study design or suboptimal patient recruitment and sample collection as well as poor data interpretation. As a consequence such studies sometimes do not provide results of desired quality. In occupational and environmental health the use of biomarkers is embedded in a process called human biological monitoring with its standard performance rules. Studies addressing health outcomes in relation to exposures in the living and working environment often do not sufficiently account for existing knowledge regarding proper exposure measures in their study design (e.g. recording only ever/never exposed or self-reporting of chemicals which can lead to exposure misclassification).
Discussion DiMoPEx will focus on closing the gap between exposure and disease by extracting and organising evidence-base exposure data, which may support the diagnosis and prevention of NCDs.

1302 DEVELOPMENT OF A PORTABLE ANALYZER FOR ON-SITE BIOMONITORING OF WORKERS EXPOSED TO RESPIRABLE CRYSTALLINE SILICA

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Introduction Respirable crystalline silica (RCS) exposure is considered as one of the most significant occupational health problems in the United States. Recent National Institute for Occupational Safety and Health (NIOSH) field studies identified overexposure to RCS in oil and gas extraction workers, with exposures exceeding occupational RCS exposure levels by factors of 20 or more in sand moving and transfer belt operations. To facilitate on-site screening of workers to identify early (i.e., preclinical) biological responses to RCS exposure, there is a strong need for field-portable diagnostic instruments and methods, particularly for workers in mining, oil and gas extraction, and construction industries.
Methods A portable analyzer for on-site biomonitoring using a lab-on-a-chip (LOC) device was developed, and its performance in measurement of an inflammatory biomarker for inhalation of RCS aerosol was evaluated.
Results The overall performance of the portable analyzer with the LOC device had accuracy and precision comparable to laboratory testing results. It runs on a LabView-based program that controls variable parameters: on/off sequence, reagent flow speed, pump run time and optical detection. The pump input to the LOC and a portable analyzer are coupled to the LOC device with PEEK tubing, for automated ELISA testing in the field.
Conclusion This is the first field-portable analyzer capable of on-site screening of workers to identify early (i.e., preclinical) biological responses to RCS exposure. Our work supports application of the analyzer together with the developed LOC as a portable monitor for on-site detection of lung inflammation in workers exposed to RCS, with minimum user intervention. Development of a device for detecting exposure-related biomarkers of biological processes (e.g., inflammation) that are predictive of the pathogenicity of exposure to RCS and other airborne toxicants would offer an important new approach for silicosis prevention.

1400 BENZENE EXPOSURE AND HUMAN HEALTH RISK ASSESSMENT VIA BIOLOGICAL MONITORING AMONG WORKERS AT GASOLINE STATIONS

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Introduction A low benzene concentrations in working environment at gasoline stations has been reported with a concern as human carcinogen. Trans, trans-Muconic acid (tt-MA), a metabolite widely used biomarker, is suggested for detection of low benzene exposure. This study aimed to investigate health risk on benzene exposure via biomarker detection and inhaled benzene concentration among gasoline station workers.
Methods The study was conducted among 235 gasoline station workers in Thailand. Spot urine was collected from workers at the end of shift-work and analysed for tt-MA concentration using HPLC. Benzene concentration was measured by personal air sampling and analysed using GC-FID. Additional data was collected by questionnaires and observations. Health risk assessment was performed with applied 5 × 5 risk matrix considering the likelihood of exposure frequency (t,t-MA and benzene level) and severity of adverse symptoms related to benzene toxicity.
Results Gasoline station workers (85.11%) had experiences of adverse symptoms from mild to severe level. Urinary t,t-MA was detected in 73.62% of workers whereas only 9.25% of them had tt-MA higher than the recommended value (>500 µg/g Creatinine). The risk matrix using tt-MA levels identified worker's health risk was unacceptable levels (low to high risk; 69.79%). Considering the matrix using benzene concentration which was presented at lower than the occupational exposure level (<0.1 ppm), 65.53% of workers had health risk from that exposure concentration. This semi-quantitative risk assessment showed the significant correlation to the human health