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