

1655 **METAL EXPOSURE IMPACTING BONE, HEMATOPOIESIS, AND REPRODUCTIVE FUNCTIONS AND EXPOSURE MONITORING**

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**Aim of special session** To provide current knowledge on toxic effect of metal exposure and organ toxicity.

1655a **REPRODUCTIVE TOXICITY OF METALS: CRITICAL TIME OF PRENATAL EXPOSURE**

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**Introduction** Pregnancy is a unique period of women life with an increased sensitivity to toxicants, such as heavy metals. Recently, exposure to potentially toxic metals decreased sharply in both general population and workers but, chronic exposure to low-levels remained a public health problems.

**Methods** We have conducted longitudinal studies to estimate effects of prenatal metal exposure on various pregnancy outcomes. Maternal whole blood (taken in the first, second, and third trimester of pregnancy) and umbilical cord blood samples were collected for blood metals measurement using ICP-MS devices. We collected participants' characteristics information and past reproductive and medical history using a structured questionnaire. Data about various pregnancy outcomes gathered during pregnancy and at the delivery.

**Result** We found blood metals at the early stage of pregnancy had more significant effects on pregnancy outcomes, such as low birth weight, preterm labour, preterm rupture of the membranes, and pregnancy induced-hypertension than the subsequent trimesters, or in the umbilical cord blood. In addition, the study revealed a high rate passing metals from placenta, which could increase metals level up to twice in fetal site than the maternal blood.

**Discussion** The early gestation metal exposure can be induce several adverse pregnancy outcomes. Therefore, the exposure protection or screening programs for the high-level exposure female workers, should be considered before pregnancy or as early as possible, because later intervention may not prevent adverse effects.

1655b **THE USEFULNESS OF BIOLOGICAL MONITORING IN DETERMINING MANGANESE EXPOSURE IN THE WORKPLACE**

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**Introduction** Exposure to manganese in the workplace is an occupational health concern, it is known that even at

relatively low levels of exposure subtle neurological effects have been observed in workers (Baker, *et al.*, 2014).

Various biomarkers of exposure have been explored as a way to quantitatively estimate exposure to manganese, however, identification of a biomarker for manganese exposure has been elusive.

This study involves a comprehensive collection of samples, conducted in several workplaces, in order to try and evaluate the usefulness of biological samples for in determining manganese exposures. Using optimised analytical instrumentation with low detection limits, the novel biological matrix exhaled breath condensate (EBC), as well as urine and air samples were collected.

**Methods** Three sites were visited each for a week to collect urine, EBC and air samples. A full occupational hygiene assessment was also undertaken at each site. At the first site urine samples were collected pre and post shift each day for a week, EBC samples were collected pre on a Monday morning and post on a Thursday afternoon. Air samples were collected Monday and Thursdays. At the other sites EBC and air samples were collected daily. The samples were analysed by ICP-MS. Other relevant elements such as nickel, iron, chromium and zinc were also determined.

**Results** The biomonitoring results from the first manganese welding site showed that there were higher manganese concentrations in the EBC and urine in grinders and welders compared to burners and office staff. There was not a good correlation between the air and biomonitoring samples and this will be more comprehensively studied in the next two site visits to be undertaken in 2017.

**Discussion** This study suggests that biomonitoring for manganese may be useful in certain workplace scenarios and this will be explored further.

101 **BIOLOGICAL EFFECTS OF COPPER AND ZINC CONTAINING WELDING FUMES AFTER CONTROLLED EXPOSURE OF HUMANS**

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**Introduction** Copper and zinc containing welding fumes are suspected to induce inflammatory reactions, which, in humans, may result in metal fume fever. In a series of studies, early reactions of such welding fumes were investigated.

**Methods** Exposures were performed in the Aachen Workplace Simulation Lab. 15 healthy male subjects were exposed for 6 hours to average welding fume mass concentrations up to 2.5 mg m<sup>-3</sup>. Welding fumes resulted from Metal-Inert-Gas brazing of zinc coated steel using copper welding wire or resistance spot welding of zinc-coated steel. Inflammatory markers were measured in the blood or in nasal secretions prior to exposure, directly after or 24–29 hours after exposure.

**Results** The main results of these studies were:

- exposure to zinc and copper containing welding fumes lead to an asymptomatic inflammatory reaction as shown by an increase of blood C-reactive-Protein (CRP).

- Ultrafine resistance spot welding particles with similar composition and number concentration but lower mass concentration do not induce such reactions.
- Both, copper and zinc are individually able to induce such inflammation reactions. However, copper seems to have a higher potential for this induction.
- The inflammatory reaction is also reflected by an increase of Serum Amyloid A (SAA) and Interleukin 6 in the blood and by an increase of Interferon- $\lambda$  and CRP in nasal secretions.

**Discussion** Since increases of CRP, SAA, and IL-6 indicate an increased risk for cardiovascular disease, exposure to zinc and copper containing welding fumes may have to be considered for the prevention of work related cardiovascular disease. Future studies should investigate, if the observed inflammatory reaction persists after repeated exposure

### 31 THE ASSOCIATION OF BLOOD LEAD LEVEL AND SERUM LIPID CONCENTRATIONS MAY BE MODIFIED BY METALLOTHIONEIN 2A POLYMORPHISMS

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**Introduction** Lead in blood can stimulate lipid oxidation in phosphatidylcholine and increase peroxidation in lipids. Metallothionein (MT) is a cysteine rich protein that can influence the detoxification of heavy metals and scavenge oxidative stress for free radicals. One of the most expressive functional genes in humans is the MT2A gene.

This study aims to determine if the association of the blood lead level and lipid biomarkers was influenced by MT2A polymorphisms.

**Methods** We recruited 677 participants after informed consent was obtained. All of the samples collected were analysed for lipid biomarkers and blood lead levels and were genotyped for MT2A polymorphisms by RT-PCR. A short questionnaire collected the medical history and alcohol and cigarette consumption information. The data were used for descriptive analyses and linear regression models.

**Result** The investigation revealed that lead elevated concentration increased low-density lipoprotein cholesterol (LDL-C) and decreased high-density lipoprotein cholesterol (HDL-C) by multiple linear models. The carriers of the rs10636 GC-rs28366003 AA genetic combination may be less susceptible to lead elevated concentration on HDL-C than other types.

**Conclusion** In conclusion, the association of the blood lead level and HDL-C may be modified by the MT2A genetic combination: the rs10636 GC-rs28366003 AA genotype could play a protective role in lead elevated concentration on HDL-C in humans.

### 623 ACUTE INTOXICATION WITH ARSINE GAS, A CASE REPORT

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**Introduction** Arsine gas is an arsenic compound conjugated with the hydrogen ion generated from several chemical reactions. The arsine gas poisoning is infrequent and usually generated on unexpected reactions from industrial process. Once it's absorbed into de body, inhibits many enzymatic systems lowering the intracellular glutathione concentration, this causes a oxidative stress damage and hematic, renal, mucosa and erythrocytes cellulary death. Clinically manifests itself with the triad of abdominal pain, oliguria and jaundice, secondary to massive intravascular haemolysis, renal acute injury, hepatic damage and central nervous system injury.

**Methods** We presented a clinical curse of a patient part of a outbreak of workers exposed to an incidental formation of arsine gas while performance a cadmium extraction process after adding metallic zinc. After a few hours the patient suffered headache, epistaxis, fatigue, mucus dark diarrhoea, vomiting and red urine.

**Results** The patient evolved to hematuria with posterior oliguria, Generalised muscle weakness, dyspnoea and anasarca. Laboratory test showed urine blood test positive, with blood haemoglobin of 6.6 g/dL, and an haematocrit of 19.3%, Lactic dehydrogenase of 1469 U/L, blood creatinine: 14.7 mg/dL, total urinary arsenic on 10th day: 8.6  $\mu$ g/L, with the diagnosis of: massive intravascular haemolysis with acute pre renal injury secondary to arsine gas poisoning. The treatment consisted in daily haemodialysis and blood transfusions until stabilisation of the concentration of red blood cells and complementary sustainability management. The patient where stabilised, however, the renal function where no fully recovered.

**Conclusion** Although this pathology has a high mortality, the patient showed a favourable response to treatment, he was the only survivor of the three workers exposed directly to the gas arsine formation after adding zinc.

### 1387 CORRELATION BETWEEN CLINICAL ASSESSMENT OF PARKINSONISM, SELF-REPORTED SYMPTOMS AND MOTOR DYSFUNCTION IN A MANGANESE-EXPOSED COMMUNITY

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**Introduction** Exposure to high levels of manganese has been associated with progressive parkinsonism. Following complaints by residents in a South African town where a large manganese smelter operates, we designed a study to investigate neurological health effects (motor and cognitive) in adults. The objective of this analysis reported was to evaluate the correlation between parkinsonism and self-reported symptoms and health status, and fine-motor control.