Louvain centre for Toxicology and Applied Pharmacology

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Evaluation of health hazards and risks of chemicals

Studies performed for industry, national and international organisms

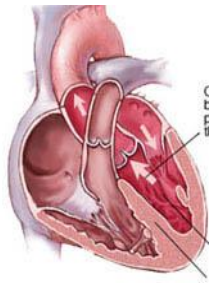
Primary studies

- **Epidemiological studies on workers exposed to industrial pollutants**

  Ex: Cd & Bone, Co & Lung

  Ex: Co & Myocardium, thyroid, red blood cells

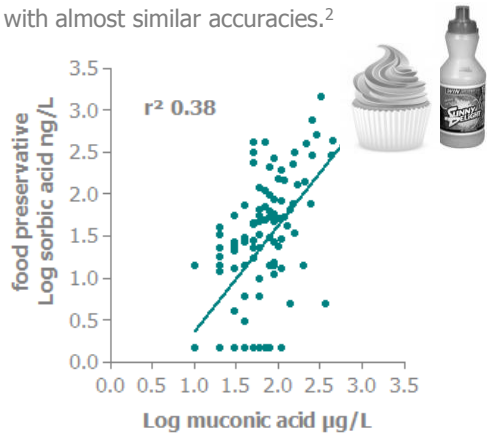
  Excessive absorption of cobalt has been associated, in the past, with cases of dilated cardiomyopathy, hypothyroidy, and polycythemia but it is unclear whether occupationally exposed populations are currently at risk.
  The results of our investigations conducted in a large cohort of workers indicate that in an occupational population where current exposure is below the ACGIH recommended limit value of 15 µg Co/L urine, cobalt is not likely to induce dilated cardiomyopathy, dysthyroidy or effects on red blood cells.[1]



- **Biological monitoring of exposure: development and validation of biological methods to evaluate intensity of exposure and to establish exposure threshold levels**

Ex: Benzene biomarkers in petrochemical workers

At low levels of benzene exposure, *t,t*-MA is not a reliable biomarker of benzene exposure because of the clear influence of SA originating from food. SPMA & B-U reflect the internal dose with almost similar accuracies.[2]

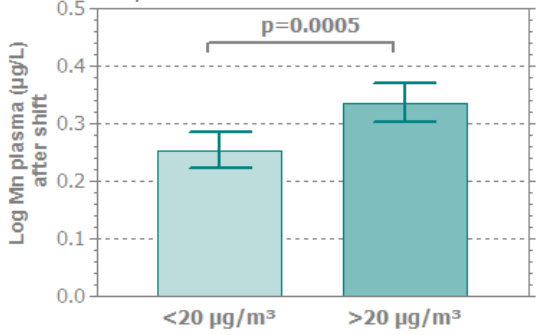


Ex: Indium biomarkers in In ingots manufacturing workers

A study on the kinetics of indium in workers mainly exposed to hardly water-soluble In compounds, showed that In in urine (In-U) and In in plasma (In-Pl) are very sensitive biomarkers to detect exposure and mainly reflect long-term exposure. In-Pl levels are particularly stable for a given individual. In-U might be more influenced than In-Pl by recent exposure. Both parameters remained high years after withdrawal from exposure, indicating a possible protracted endogenous exposure and a risk of pulmonary and systemic diseases even after work exposure has ceased.[3]

Ex: Biomarkers of manganese exposure in welders

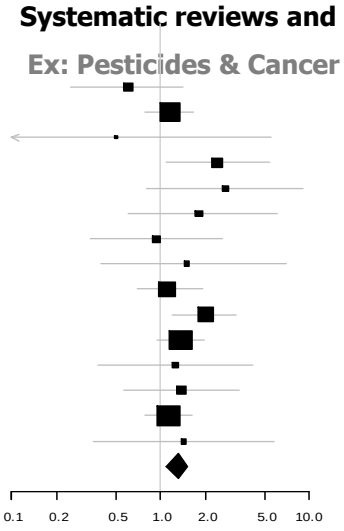
This study showed a strong correlation between Mn-air & Mn in plasma after the shift on Monday and a high specificity and sensitivity for a Mn-P value of 2 µg Mn/L to identify welders exposed to >20 µg/m³. These findings lend biological plausibility to the change for a Mn-air TLV-TWA of 20 µg/m³ proposed by ACGIH for respirable Mn particulate to achieve a better prevention of Mn neurotoxicity.[4]



Studies based on existing data

- **Systematic reviews and Meta-analyses**

Ex: Pesticides & Cancer



Forest plot of case-control studies on childhood brain tumors showing a statistically significant increased risk following parental occupational exposure to pesticides.[5]

Ex : Occupational exposure to pesticides & Parkinson disease

A significant increased risk of PD was observed when all cohort studies were combined (mRR=1.28; 95%CI: 1.03–1.59) but there was a high heterogeneity & inconsistency among studies.

The highest increased risks were observed for studies with the best design, i.e. reporting PD diagnosis confirmed by a neurologist (mRR=2.56; 95%CI: 1.46–4.48; n=4), for cohort studies reporting incidence of PD (mRR=1.95; 95%CI: 1.29–2.97; n=3) as well as for prospective cohorts (mRR=1.39; 95%CI: 1.09–1.78; n=6).[6]

- **Critical reviews**

  Ex: Ototoxicity of Toluene and Styrene.[7]

  Ex: Carcinogenic potential of formaldehyde in occupational settings.[8]

  Ex: Evaluation of potential human health effects associated with exposure to chemical agents

Methodological studies/works

- **Establishment of guidelines for the surveillance of workers exposed to chemicals**

  Ex: Management of the health risks related to chronic exposure to antimony trioxide in production workers.

- **Establishment of exposure threshold levels**

  Ex: Participation in the European ACUTEX program aimed at the development of innovative approaches to define acute exposure levels (AETLs)…. (www.acutex.eu)

Perrine Hoet

Geneviève Van Maele

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3. Hoet P. et al. Occupational exposure to indium: what does biomonitoring tell us ? Toxicol Lett 2012;213:122-28
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5. Van Maele-Fabry G. et al. Parental occupational exposure to pesticides as risk factor for brain tumors in childhood and young adults: a systematic review and meta-analysis". Environ Int 2013;56:19-31
6. Van Maele-Fabry G. et al. Occupational exposure to pesticides and Parkinson's disease: a systematic review and meta-analysis of cohort studies. Environ Int 2012;46:30-43
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8. Duhayon S. et al. Carcinogenic potential of formaldehyde in occupational settings: a critical assessment and possible impact on occupational exposure levels. IAOEH 2008;81:695-710.