

organisation can significantly reduce the burden above-mentioned conditions.

To address risks of public health concern generally and in relation to chemical incidence and environment, WHO has spectrum of documents and guidelines. Thus, International Health Regulations (IHR), international legal instrument that is binding on 196 countries across the globe. Their aim is to prevent and respond to acute public health risks that have the potential to cross borders and threaten people worldwide. Within the framework of IHR, handbook for inspection of ships and issuance of ship sanitation certificates became available.

Universal health coverage, global WHO initiative, addressing health determinants (health promotion and prevention of risk factors for non-communicable diseases) with the financial protection that prevents ill health leading to poverty is one general approach.

Workers' Health Global Plan of Action, aiming at national policy improvement via specific health programmes, improved surveillance and occupational services coverage, inspection and enforcement activities put emphasis on the primary prevention of occupational diseases and injuries by introducing healthy work practices and work organisation, and of a health-promoting culture at the workplace.

## REGULATION AND PRACTICE OF WORKERS' PROTECTION FROM CHEMICAL EXPOSURES DURING CONTAINER HANDLING

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**Introduction/Background:** Fumigation of freight containers to prevent spread of pests and offgassing of freight are sources of volatile chemicals that may constitute significant health risks when released. The aim of our study is to investigate the regulation and practice of container handling in Denmark with focus on preventive measures applied against chemical exposures.

**Methods:** A comprehensive systematic search of scientific literature, legislation and recommendations related to safe work with transport containers from international and Danish regulatory bodies was performed. The practice of container work was investigated in a series of semi-structured interviews with key informants including managers and safety representatives of organisations that handle containers.

**Results:** Although several international and national regulations and local safety instructions relate to container handling, the provided information is not sufficiently detailed to conduct safe practice in many aspects. In accordance with the scientific literature, the interviewees estimate that there is a high frequency of containers with hazardous chemical exposure that are regarded as potentially damaging to health, although recognisable health effects are rare. There is limited knowledge about the types of chemicals, which mostly cannot be measured by available devices at the worksite. Passive ventilation and personal protective equipment are typical preventive measures in practice, but their use is not consistent and does not necessarily ensure adequate protection.

**Conclusions:** Hazardous chemical exposure from containers does constitute a risk, about which, however, managers, workers, even occupational health professionals have limited knowledge. Detailed risk assessment and specific instructions on risk management are needed for safe handling of transport containers.

## OFFGASSING FROM FUMIGATED GOODS AND PRODUCTS: ONGOING RESEARCH PROJECT FOR FUTURE DETAILED HEALTH RISK ANALYSIS

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**Background:** Fumigation of transport containers is a common practice to protect consumer goods from pests in the shipping industry or to avoid the spread of alien species (ISPM 15 Directive, Food and Agriculture Organisation). However, little is known on the effects caused by these substances on the fumigated goods and the related health risks.

**Methods:** Several matrices (e.g. sunflower seeds, soaps, apples, et al.) were analysed with respect to their adsorption and desorption behaviour of selected fumigants (methyl bromide, phosphine, 1,2-dichloroethane). Fumigation and subsequent desorption were performed on a laboratory scale using fumigation chambers or desiccators. The fumigants used were quantified by either TD-2D-GC-MS/FPD or GC-MS instrumentation. Furthermore, the impact of the fumigation concentration and the desorption temperature

were assessed. Finally, a surface analysis of the fumigated matrices was performed using ToF-SIMS instrumentation to identify possible fumigation residues.

**Results:** The desorption of fumigants depends mainly on the treated matrix. For some matrices (e.g. sunflower seeds, soaps) it was revealed that the desorption lasts over a long period and that considerable amounts of the used fumigants are released. This may result in concentrations way above occupational exposure limits, if the fumigated goods are stored in enclosed spaces.

**Conclusions:** Considering the obtained results, fumigated consumer goods can pose a health risk to workers and consumers. However, further research is urgently required.

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**Conflict of interest:** the authors declare that they have no conflict of interest

## IDENTIFYING CHEMICAL AGENTS THAT CAUSE NEURODEGENERATION IN HUMANS: INSIGHTS GAINED FROM STUDYING GENE-ENVIRONMENT INTERACTIONS IN PARKINSON'S DISEASE

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**Introduction/Background:** Epidemiologic, animal and cell based studies suggest that pesticide exposures increase the risk of developing Parkinson's disease (PD). Most previous human studies relied on recall of chemicals exposures and did not point out specific agents or mechanisms for the action of a toxin. Experimental models on the other hand are 'better or worse' attempts of modelling a human disease. Human genetic variations that increase vulnerability to the neurotoxic effects of environmental agents can help us identify vulnerable populations and biologic mechanisms of neurodegeneration that eventually can also be targeted by therapeutics.

**Methods:** In conducted a large case controls study conducted in Central California to examine how long-term human pesticide exposure contributes to PD. We used a unique geographic information system based pesticide exposure assessment tool that incorporates land use maps and agricultural pesticide application records for California. We assessed neurodegeneration and cognitive decline due to the action of specific pesticides as well as interactions between pesticides and genetic factors that increase susceptibility or resilience to these environmental toxins. We selected genes

involved in pathogenetic pathways relevant for PD or in pesticide detoxification.

**Results:** We estimated increased risk for PD with exposures to combinations of paraquat and maneb or ziram, organophosphate and dithiocarbamate pesticides. We also showed that risks were much greater in individuals who carried genetic variants of the dopamine transporter (*DAT*), paraoxonase 1 (*PON1*), aldehydedehydrogenase (*ALDH2*) genes when exposed to pesticides that interact with these genes in biologic pathways. We also found evidence for faster cognitive decline in PD patients exposed to organophosphate pesticides.

**Discussion and Conclusions:** With our approach we were able to identify important mechanism through which environmental toxicants contribute to PD pathogenesis, especially in genetically vulnerable individuals. It allowed us to identify pesticides likely involved in neurodegeneration in populations with long-term low dose exposures.

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## FROM SYMPTOMS OF INTOXICATION TO IDENTIFICATION OF THE NOXIOUS AGENTS: CHALLENGES IN AMBIENT AND BIOMONITORING ANALYSES

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**Introduction:** The export of manufacturing production resulted in substantial increase in international trade. Increasing number of containers tainted with industrial chemicals like fumigants (i.e. methyl bromide [1] or other halo-alkanes) may endanger staff of controlling agencies, inspectorates, police, customs, docks and warehouses.

**Methods:** 4,000 container air samples were analysed (2007–2012) for the presence of fumigants and toxic industrial chemicals [2]. We recruited 164 subjects with presumed intoxication by fumigants (plus 30 controls).