Innovative methods for early detection and interpretation of chemical exposure using human biological monitoring.

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Primary objective(s):The overall objective of this project is to develop sampling and analytical methods that allow for the early detection of chemical exposures in the workplace. The project's goal is to go beyond the current targeted sampling...

Ethical review	Approved WMO
Status	Recruiting
Health condition type	Other condition
Study type	Observational invasive

Summary

ID

NL-OMON56958

Source
ToetsingOnline

Brief title
Early detection of work-related risks.

Condition

- Other condition

Synonym
Occupational diseases

Health condition

Toekomstige beroepsziekten

Research involving
Human

Sponsors and support

Primary sponsor: Universiteit Utrecht
Source(s) of monetary or material Support: Arbo Unie,Ministerie van SZW;Health Holland

Intervention

Keyword: Metabolomics, Occupational Health

Outcome measures

Primary outcome

The primary study parameters encompass data regarding metabolome including endogenous metabolites (amino acids, organic acids, nucleic acids, fatty acids, amine, sugars, vitamins, pigments, antibiotics, etc.) as well as exogenous chemicals (e.g., pharmaceuticals, pesticides, plasticizers, flame retardants, preservatives, and microbial metabolites) derived from blood samples.

Secondary outcome

Not secondary study parameters will be involved in this study. However, other parameters which are considered:

- Food and drink consumption in the last year

- Lifestyle and alcohol consumption

- General health status and occurence of health outcomes

Study description

Background summary

Health of workers can be affected by the working environment. According to RIVM 4.7% of workers suffer from a work-related disease. This resulted in 6,877,500 missed working days. In addition, 22.3% of all incapacitated workers were due to a work-related disease. An estimated 4000 deaths per year are work related,

of which 3000 are due to exposure to hazardous chemicals. This is an enormous burden for workers,
employers, the health care system and society. An early warning system for (hazardous) chemical exposures and associated biological effects is needed to prevent diseases due to hazardous chemicals. This is more important as changes in working conditions result in the rise of new occupational health risks as emphasized in the European Agency for Safety and Health at Work*s (EU-OSHA*s) project report on *Methodologies to identify work-related diseases: Review on sentinel and alert approaches*.

Occupational physicians perform periodic medical examinations (in Dutch, Preventieve Medische Onderzoeken (PMO)) and periodic occupational health examinations (in Dutch, Periodiek Arbeidsgezondheidskundig Onderzoek, PAGO) where often blood analyses are performed. Next to conventional clinical parameters limited targeted screening of exposures is performed (e.g. benzene, PAHs, PFAS, etc.). Although this may suffice for known risks, the limitation is that exposures may go unnoticed, as (hazardous) chemicals not included in a targeted screening are missed, though these can be the hazardous chemicals impacting health, while there is a huge number of hazardous chemicals that hardly can be captured in a targeted screening.

Technologies based on Mass Spectrometry (MS) offer an opportunity to agnostically screen for the presence of hazardous compounds (non-targetted screening (NTS)). To aid occupational health professionals, regulatory bodies and policy makers in i) evaluating risk for workers in a certain environment, ii) understanding prevalence of chemical exposures among workers, and iii) identifying emerging chemicals of concern, we propose to link in this project routine occupational health examinations with an innovative non-targeted screening (NTS) using innovative metabolomics/exposomics technologies and computational workflows.

Study objective

Primary objective(s):
The overall objective of this project is to develop sampling and analytical methods that allow for the early detection of chemical exposures in the workplace. The project's goal is to go beyond the current targeted sampling and analytical approaches focusing on a single component. As exposures in the workplace often involve multiple known and unknown compounds, measurement techniques that can scan for many chemicals at the same time have the potential to play a role in the early detection of (novel) occupational exposures. Identification of such chemicals will help to identify emerging exposures of concern within occupational settings.

Secondary Objective(s):
• Developing a computational pipeline to predict possible risks due to chemicals used at work and possible biotransformation of these chemicals

• Inventory of endogenous metabolites serving as early warning for presence of toxic compounds
• In case of uncertainty of possible transformation processes, an in-vitro transformation experiment can be conducted;

Study design

We will recruit participants employed by three companies which names will only be mentioned in the protocol within the Netherlands' chemical industry from September to December 2024, facilitated by occupational physicians from Arbo Unie who will conduct medical examinations under the Periodic Occupational Health Examination (PAGO) program. Due to privacy concerns, we maintain confidentiality regarding the companies' names and will only share the names with METC NedMec in the protocol.

Our target study population comprises 400 employees aged 18-67 years, potentially exposed to hazardous substances. Participants will provide informed consent, complete a comprehensive questionnaire covering general information, lifestyle and nutrition habits, and health status, and provide a blood sample for research purposes.

Following the blood collection process, samples will be dispatched to the 'Exposome Scan Facility' in Leiden for analysis. Utilizing liquid and gas chromatography coupled with high-resolution mass spectrometry, we aim to detect and characterize workers' metabolic profiles.

The identified chemicals and their metabolites will be cross-referenced with existing knowledge on potential health risks. This will be facilitated by employing a recently developed automated network assembly method for informed evidence synthesis and the AOP-helpFinder tool to associate chemicals and metabolites with Adverse Outcome Pathway (AOP) events, enhancing our ability to assess potential health impacts accurately.

Study burden and risks

The extent of the burden and risks associated with participation are minimal in this study. The participants will be asked to follow their normal routines. The only burden that we ask the participants via informed consent is if they are willing to donate blood (6 ml) and fill out a short questionnaire for research purposes. Participants can withdraw their participation in the study at any point in time during the study.

The benefit of this study is, however, that it has the capacity to take prevention and early detection of occupational diseases to the next level. An early warning system for (hazardous) chemical exposures and associated biological effects is needed to prevent diseases due to hazardous chemicals.

This is more important as changes in working conditions result in the rise of new occupational health risks as emphasized in the European Agency for Safety and Health at Work*s (EU-OSHA*s) project report on *Methodologies to identify occupational diseases: Review on sentinel and alert approaches*. For the workers who participate in this study, and all other workers in the same field, this study gives handles to detect occupational exposures early, thereby preventing or limiting the burden of occupational diseases.

Contacts

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Trial sites

Listed location countries

Netherlands

Eligibility criteria

Age
Adults (18-64 years)
Elderly (65 years and older)

Inclusion criteria

It concerns a population eligible for a periodic occupational health examination (PAGO) that the employer must offer to its employees according to

Article 18 of the Occupational Health and Safety Act.

Exclusion criteria

In this study, no exclusion criteria are applied.

Study design

Design

Study type: Observational invasive

Masking:	Open (masking not used)
Control:	Uncontrolled
Primary purpose:	Prevention

Recruitment

NL

Recruitment status:	Recruiting
Start date (anticipated):	12-11-2024
Enrollment:	400
Type:	Actual

Medical products/devices used

Registration:	No

Ethics review

Approved WMO

Date:	21-08-2024
Application type:	First submission
Review commission:	METC NedMec

Study registrations

Followed up by the following (possibly more current) registration

No registrations found.

Other (possibly less up-to-date) registrations in this register

No registrations found.

In other registers

Register	ID
CCMO	NL87020.041.24