NEW EXPOSURES AND EVIDENCES RELATED TO OCCUPATIONAL CANCER

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EASOM Summer School
Riga, 29.08.2019
PORTRAIT OF THE EU WORKFORCE

Proportion of persons (aged 15-64) reporting exposure to risk factors for physical health, 2007 and 2013 (%)

Source: Eurostat, 2017
OCCUPATIONAL DISEASE:

- result of an exposure to risk factors arising from work activity (ILO)
- cases, to which occupational origin has been approved by the national occupational authorities

RECOGNISED OCCUPATIONAL DISEASE:

- vary with national legislations and compensation practices
  - no harmonization at EU level

WORK RELATED DISEASE:

- includes disease where work played a role
## Self reported exposures to hazards at work

### 2005 – 2015

Source: 6th EWCS, Eurofound, 2017

### Table 1: Physical environment index: proportion of workers in EU28 (%) and mean index scores (0–100), 2005–2015

<table>
<thead>
<tr>
<th></th>
<th>Proportion of workers in EU28 exposed one-quarter of the time or more (%)</th>
<th>Mean index scores (0–100)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2005</td>
<td>2010</td>
</tr>
<tr>
<td>Vibrations from hand tools, machinery</td>
<td>24</td>
<td>23</td>
</tr>
<tr>
<td>Noise so loud that you would have to raise your voice to talk to people</td>
<td>30</td>
<td>29</td>
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<tr>
<td>High temperatures which make you perspire even when not working</td>
<td>25</td>
<td>22</td>
</tr>
<tr>
<td>Low temperatures whether indoors or outdoors</td>
<td>22</td>
<td>23</td>
</tr>
<tr>
<td>Breathing in smoke, fumes (such as welding or exhaust fumes), powder or dust (such as wood dust or mineral dust)</td>
<td>19</td>
<td>17</td>
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<tr>
<td>Breathing in vapours, such as solvents and thinners</td>
<td>11</td>
<td>10</td>
</tr>
<tr>
<td>Handling or being in skin contact with chemical products or substances</td>
<td>14</td>
<td>15</td>
</tr>
<tr>
<td>Tobacco smoke from other people</td>
<td>20</td>
<td>11</td>
</tr>
<tr>
<td>Handling or being in direct contact with materials which could be infectious, such as waste, bodily fluids, laboratory materials, etc.</td>
<td>9</td>
<td>11</td>
</tr>
<tr>
<td>Tiring or painful positions</td>
<td>46</td>
<td>46</td>
</tr>
<tr>
<td>Lifting or moving people</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>Carrying or moving heavy loads</td>
<td>35</td>
<td>34</td>
</tr>
<tr>
<td>Repetitive hand or arm movements</td>
<td>62</td>
<td>63</td>
</tr>
</tbody>
</table>

**Physical environment index**

<table>
<thead>
<tr>
<th></th>
<th>2005</th>
<th>2010</th>
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</tr>
</thead>
</table>

82 | 83 | 84 |
Chemical risks

Disinfectants in hospitals

Metal cutting fluids

120,000 chemicals on the EU-market + millions of mixtures

Sectors: chemical/pharma, textile, automotive, construction, cleaning, health care, beauty etc.

- Up to 50% of all recognized occupational diseases linked to chemical exposure
- New risks: nanomaterials (i.e. Carbon nanotubes)

Fumigants
Most frequent carcinogens at work

Polycyclic Aromatic Hydrocarbons
Formaldehyde
Aromatic amines
Tetraclorethylene
Cytostatic drugs

Asbestos
Crystalline silica
Chromium VI
Cd
Ni
Mineral oils
Diesel engine exhaust

Wood dust
Tabaco smoke
Solar radiation
Shift work

In high income countries: cancers are the first cause of work related mortality

Figure 2: Burden caused by cancer and other work-related diseases by WHO regions, released in 2014. Total number of workplace fatalities was 2.3 million.

HIGH – High income countries, AFRO – African Region (low-and middle-income countries), AMRO – Region of the Americas (low-and middle-income countries), EMRO – Eastern Mediterranean Region (low-and middle-income countries), EURO – European Region (low-and middle-income countries), SEARO – South-East Asia Region (low-and middle-income countries), WPRO – Western Pacific Region (low-and middle-income countries).
NOCCA (Nordic Occupational Cancer Study): a mapping on cancers by occupations

Source: https://astra.cancer.fi/NOCCA/full-article.html

- Relates localizations of cancers to the patients’ professional activities, 15 million persons involved in the last four decades - from early 60th to late 90th
- 2.8 million cancers in 5 countries: Iceland, Norway, Sweden, Finland, Denmark

Results confirm already known connections:
- mesothelioma – asbestos – plumbers, sailors,
- skin cancers – fishermen, outdoors farmers,
- nasal fossae cancers - wood industry,
- numbers of cancers – building industry

New data:
- cancers of mouth, vagina – higher prevalence in women working in chemical industry
- skin cancers, breast cancers (M+W), ovarian cancer – printing industry,
- thyroid cancers – women in agriculture

If people stop getting cancer, we stop making profits. So, we need to make sure everyone focuses on 'the cure', not the cause.
EUROPEAN REGULATION

Framework Directive 89/391/EEC

- avoiding risks
- evaluating the risks
- combating the risks at source
- adapting the work to the individual
- adapting to technical progress
- replacing the dangerous by the non-or the less dangerous
- developing a coherent overall prevention policy
- prioritizing collective protective measures (over individual protective measures)
- giving appropriate instructions to the workers
Carcinogens & Mutagens Directive
2004/37/EC
2019/983/EC (to comply with limit values till 11.07.2021)

The revision of the Carcinogens Directive

Adopted in 1990
(Modestly) amended in 1997 and 1999
Revision was considered as a priority by 2002
It was completely paralysed by the «better regulation» offensive
By 2016, the Commission was obliged to adopt a first proposal for the revision of the directive during the Dutch presidency
The proposal was minimalist
It was improved by the agreement between European Parliament and Council and adopted in December 2017

• **Annex I** includes the list of identified “Process Generated Substances” and clarifies the scope. Today only for 5 PGSs (i.e. work involving exposure to hardwood dust)

• **Annex II** includes practical recommendation for the health surveillance of workers (non-binding measures !)

• **Annex III** includes Binding Occupational Exposure Limit Values (BOELVs). Only 3 carcinogens in 25 years (1990-2016):
  • Benzene
  • Vinyl Chloride Monomer
  • Hardwood dust

• **2021**: Cadmium, Beryllium, Arsenic acid, Formaldehyde, 4,4’-methylene-bis(2-chloraniline) (MOCCA)
• Registration: Manufacturers and importers of chemicals > 1 tpa are required to register their substances to demonstrate they can be used safely

• Evaluation of some substances by Member States / European Chemicals Agency

• Authorisation only for substances of very high concern

• Restrictions when risks are unacceptable

• Main uses: chrome plating but also present in welding fumes
• Carcinogenic to humans
• REACH authorisations:
  • Only those companies who were granted authorisation can keep using Cr VI for plating
  • Only uses applied for are permitted
Diesel Engine Exhaust Emissions (DEEE)

- Diesel current hot topic at EU level (Diesel gate)
- DEEE are a complex mixture of substances in the gaseous and particulate phases generated from the combustion of diesel fuel in diesel engines
- IARC group 1 (carcinogenic to humans) and also inflammatory lung effects and cardiovascular effects
- over 3.6 million workers exposed in the EU: mining, construction workers, woodworking, professional driving, agriculture, car repair shops, etc.
- controversy about carcinogenicity of Old vs New Diesel engines
- DEEE might be included in the Carcinogens Directive with a occupational exposure limit value to protect exposed workers (230,000 deaths could be avoided over the coming 60 years)
Tiny particles with one or more external dimensions between 1-100 nanometres, natural (volcano emissions), products of human activities (diesel exhaust fumes, tobacco smoke) or specially manufactured for a particular purpose (used for decades - synthetic amorphous silica concrete, tyres and food products, more recently discovered – nano-titanium dioxide as UV blocking agent in paints or sunscreen, nano-silver as antimicrobial in textile and medical applications, carbon nanotubes widely used for their mechanical strength, light weight and heat-dissipation properties and electrical conductivity in applications as electronics, energy storage, spacecraft and vehicle structures and sports equipment).

Their properties differ from the same material at larger scale because of other physical or chemical characteristics like shape and surface area.

The most important effect has been found in lungs – inflammation, tissue damage (platinum nanoparticles), fibrosis (asbestos like-effect) and tumor generation (lungs, kidneys, heart, brain, skeleton and soft tissues – platinum nanoparticles).
Acrylamide


- Water soluble white crystalline solid
- Chemical used in paper and pulp industries, construction, foundry, oil drilling, textiles, cosmetics, food processing (coffee, French fries, chips), plastics, mining and agricultural industries – in making paper, dyes and plastics, treating drinking water and wastewater.
- Carcinogenic in rodents, probably carcinogenic in humans
- Cutaneous malignant melanoma in men (HR: 1.13, 95% CI: 1.01-1.26)
- Esophageal tumors: the highest quartile of acrylamide intake compared to the lowest, particularly in overweight or obese individuals
- Further studies are suggested in human beings to show detrimental effect of acrylamide.
N,N-dimethylformamide


- Colourless liquid, common solvent for chemical reactions
- Common and cheap reagent in research laboratories:
  - Separating and suspending carbon nanotubes
  - Utilized as standard in proton NMR spectroscopy for a quantitative determination of an unknown compound
  - A source of carbon monoxide ligands
  - Common solvent used in electrospinning
- Overall cancer mortality (HR: 2.72, 95% CI: 1.09-6.81) in workers with exposure 7.5-<15 mg/l and HR: 2.41, 95% CI: 1.03-5.66) in workers with exposure ≥15 mg/l) compared to non-exposed workers
- Hepatocellular cancer mortality (HR: 3.73, 95% CI: 1.05-13.24) in workers with exposure 7.5-<15 mg/l compared to non-exposed workers
- Lung cancer mortality (HR: 14.36, 95% CI: 1.41-146.86) in workers with exposure 7.5-<15 mg/l compared to non-exposed workers
**Night shift work**


- **BACKGROUND:** It is plausible that night shift work could affect breast cancer risk, possibly by melatonin suppression or circadian clock disruption, but epidemiological evidence is inconclusive.

- **METHODS:** Using serial questionnaires from the Generations Study cohort, we estimated hazard ratios (HR) and 95% confidence intervals (95%CI) for breast cancer in relation to being a night shift worker within the last 10 years, adjusted for potential confounders.

- **RESULTS:** Among 102,869 women recruited in 2003-2014, median follow-up 9.5 years, 2059 developed invasive breast cancer. The HR in relation to night shift work was 1.00 (95%CI: 0.86-1.15). There was a significant trend with average hours of night work per week (P = 0.035), but no significantly raised risks for hours worked per night, nights worked per week, average hours worked per week, cumulative years of employment, cumulative hours, time since cessation, type of occupation, age starting night shift work, or age starting in relation to first pregnancy.

- **CONCLUSIONS:** The lack of overall association, and no association with all but one measure of dose, duration, and intensity in our data, does not support an increased risk of breast cancer from night shift work in women.
Cell phones emit radiofrequency radiation, a form of non-ionizing, electromagnetic radiation of low frequency (and therefore low energy).

RELATIONSHIP BETWEEN CELL PHONE USE AND THE RISK OF CANCEROUS BRAIN TUMORS (such as gliomas), as well as benign tumors (such as acoustic neuroma and parotid gland tumors):

1. INTERPHONE (case control study): *significant, although modest, increase in the risk of glioma among small proportion of participants – inconclusive results, no relationship between the brain tumor location and regions of the brain, exposed to the highest level of radiofrequency radiation; reported suggestions of an increased risk of glioma*

2. DANISH STUDY (cohort study): *no association between cell phone use and the incidence of glioma even among people who had been cell phone subscribers for >13 years.*

3. MILLION WOMEN STUDY (cohort study): *self-reported cell phone use was not associated with an increased risk of glioma.*

WHY SUCH INCONSISTENT FINDINGS? Recall bias, inaccurate reporting, morbidity and mortality among study participants with brain tumor, participation bias, changing technology and methods of use.
CONCLUSIONS

- Cancer is the first cause of death at work
- Occupational cancers (and the huge associated costs for society) can be avoided
- EU legislation: a major battleground for eliminating work related cancer and other occupational diseases (asbestos, non ionizing radiation, night work, ionizing radiation, long term effects of electromagnetic fields, etc...)
- Most of the „public health” campaigns against cancer are concentrating on individual behavior and detection and are not insisting on primary prevention at the workplace.
TRAINING AND EDUCATION

1. EXPOSURE

- Symptoms and signs
- Workplace Risk Assessment
- MSDS Material Safety Data Sheet
- Home and Social Environment?

2. HEALTH STATUS

- Specialists in occupational medicine
- GPs, Clinical medical specialists
Thank you very much for your attention.

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