Biological agents and prevention of work-related diseases: a review

European Agency for Safety and Health at Work

Background of the project

- **EU OSH Strategic Framework 2014-2020**
  - One of the 3 major challenges: to improve the prevention of work-related diseases
- **Background**
  - 230,000 workers died worldwide in 2014 due to communicable diseases caused by biological agents – around 7,000 in Europe (GLOBAL ESTIMATES 2017)
  - About 15% of cancers attributed to carcinogenic infections, (Helicobacter pylori, Human papillomavirus (HPV), Hepatitis B, C, Epstein-Barr, etc.) (WHO)
  - FR (2010): 4,7 million workers (22%) exposed to biological agents
    - healthcare/social work (74.9%), agriculture (38.8 %), Horeca (44.7 %), personal services (58.8 %), green jobs (46.4%) (SUMER 2010)
  - Waste management and healthcare are growing sectors

Part of OSH overview on work-related diseases

- **2015-2019**
  - Desk research, expert interviews and focus groups
  - Description of policies or monitoring systems and data analysis
  - Workshops with experts and EU-OSHA stakeholders
- **Outputs:**
  - Seminar online summaries, literature reviews, reports, articles and recommendations, ppts for policy makers and for experts
  - Translations – portfolio approach: articles, report summaries,
  - National workshops under FAST 2019
- **Building on previous EU-OSHA work**
  - Dangerous substances incl. biological agents, etc.


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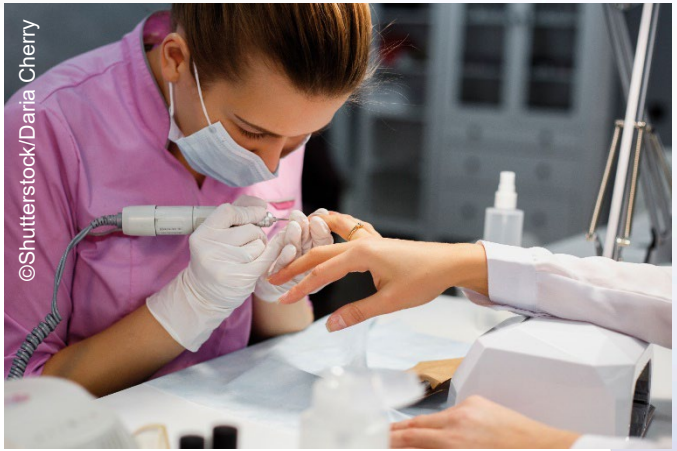
Objectives of the review

- **Raise awareness** on exposure to biological agents in exposed professions, especially those with unintentional use of biological agents;
- Increase **information on health problems** related to exposure to biological agents;
- Support efforts to **prioritise and structure the prevention** of work-related health problems linked to biological agents.



- Overview on the **current knowledge** on relevant exposures and on recognised diseases;
- Particular focus on **emerging issues and new professions**, e.g. green jobs;
- Link to biological agents directive – **unintentional exposures**;
- Collect **information from recording and compensation systems**;
- Identify **gaps in data/knowledge**.

Complementary to previous and ongoing work

EU-OSHA campaigns

European Week 2003 and HWC 2018-19

Expert Forecast: Main emerging biological risks

- Global epidemics (avian flu, HIV, etc.)
  - Workers at the frontline of contamination
- Drug-resistant micro-organisms (MRSA, tuberculosis, etc.)
- Poor Indoor Air Quality: Indoor mould
  - Poor maintenance of air-conditioning, construction & insulation technics
- Waste treatment: micro-organisms, mould, endotoxins, etc.
- Poor risk assessment: little information on dose-effect relationship; measurement is challenging; low awareness level

Selected reviews:

- Legionella and Legionnaires' disease: a policy overview
- Biological agents and pandemics: review of the literature and national policies

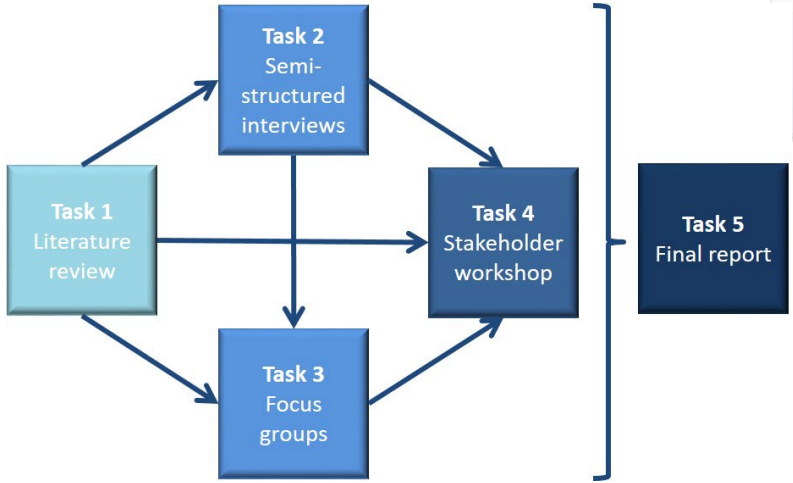
https://osha.europa.eu

Beneficiaries & intermediaries

- **Beneficiaries**
  - Policy makers at national and EU level, including social partners;
  - Legislators;
  - Researchers;
  - Actors in occupational diseases recognition and statistical data collection (e.g. national social security organisations);
  - Actors at enterprise level (e.g. health and safety manager, health and safety representative, trades union representative) and intermediaries involved in setting up company policies;
  - Sectoral organisations;
  - Policy makers in other, related areas, for example at the sectoral level, or regarding employment, public health and environmental policies.
- **Intermediaries**
  - Intermediaries involved in setting up company policies;
  - Sectoral organisations
  - Policy makers at national and EU level, incl. social partners
  - Researchers

Project overview: structure

- **Task-specific objectives:**
  - **Task 1**: provide overview of types of biological factors and health problems relevant to workplaces (emphasis on unintentional exposures)
  - **Task 2**: provide information on examples of policies regarding work-related diseases due to biological agents, their success factors and obstacles and their transferability
  - **Task 3**: learn from the experience of intermediaries to identify specific upcoming risks and lack of measures regarding work-related diseases due to biological agents
  - **Task 4**: Stakeholder workshop to present and discuss findings
  - **Task 5**: Final report summarizing results



Results

- **Workers exposed in many professions, but little information on prevalence or incidence of exposure or diseases**
- **High risk sectors: healthcare, agriculture (arable farming and livestock farming), waste and wastewater treatment, occupations that involve travelling and contact with travellers.**
- **Other professions: wood working, metal work, restauration (of artworks), archives, etc..**
- **Overall lack of awareness of the risks from biological agents in all sectors, except healthcare and laboratories**
- **Exposure to mixtures:**
  - organic dust in agriculture and other professions, causing infections and allergies
  - surgical smoke
- **Allergenic agents, sectors and occupations at clear risk:**
  - agricultural and fisheries sector, food industry, wood-working and metal industry and the waste treatment sector
  - well known allergenic occupational diseases are asthma in farmers and farmer's lung (hypersensitivity pneumonitis)

Emerging biological risks

- **Climate change** --> newly occurring microorganisms that have spread to other regions (e.g. via ticks and mosquitoes)
- **Environmental legislation leading to changing patterns in waste management**
- **Waste treatment and composting - specific allergens**
- **Changing travelling patterns and volunteer schemes** in third world countries (chikungunya, Crimean-Congo fever)
- **Migration flow to Europe** – transfer of biological agents from the Middle East and Africa
- **Multi-resistant bacteria and epidemics** (e.g. of zoonoses), risk to health professions and agriculture
- Expected increase in green jobs - increased **sensitisation to biomass-related allergens**
- Potential **re-emerging diseases**, e.g. Q-fever, tuberculosis and influenza

➢**No system in place to respond quickly to emerging risks**

Vulnerable groups

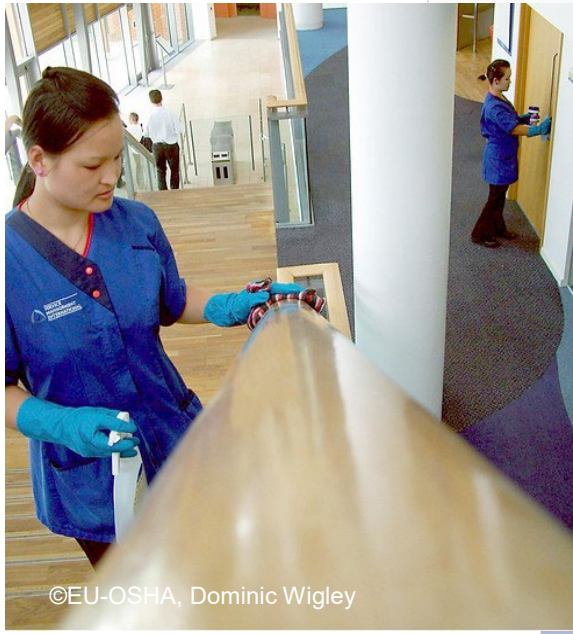
- For most occupations, no specific information
- Critical doses and circumstances of exposure may be different for these groups

- **Trainees and new professionals, young workers** → lack of experience & knowledge
- **Pregnant women**
- **People with pre-existing diseases,** like lung diseases, allergies and asthma, chronic diseases
- **People treated with immunosuppressants,** especially fungal diseases
- **Cleaning and maintenance workers,** working at different workplaces and for different employers
- **Temporary and undocumented workers**
- **Foreign workers**
- **Healthcare:**
  - Workers in home care (not always well informed)
  - Health workers who travel for work

Monitoring of diseases (1)

- **A selection of monitoring systems analysed and described (DE, DK, FI, FR, NL, UK)**
- **Wide range of types of monitoring systems for diseases**
- **Diseases due to biological agents reported in generic registration systems → no specific focus on biological agents**
  - Exceptions in healthcare and systems for compulsory reporting (e.g. for hepatitis or tuberculosis)
- **Proportion of diseases due to biological agents relatively low, except allergic diseases**
- **Unequal coverage of zoonoses**
- **Coverage of sectors and occupations unequal**
  - e.g. agriculture, self-employed

‼ **Underreporting of diseases (including those related to biological agents)**



Monitoring of diseases (2)

- **Systems used for monitoring diseases / exposures vary widely:**
  - Differences in what is monitored, how frequently and level of detail
  - Under-reporting
  - Little information on exposure to biological agents at the workplace
- **Unclear how data from monitoring systems is linked to prevention at the workplace**
- **Data from national registration systems on occupational diseases and causes can be a valuable source of information**
  - Data often not publicly available
  - Available in NL and UK
  - Difficult for companies or branch organisations to access information relevant for their sector
- **Risk of biological agents often not a high priority on the national political agenda due to lack of clear evidence, occupational exposure limit (OEL) values and evaluation methods**

Monitoring of exposures to biological agents

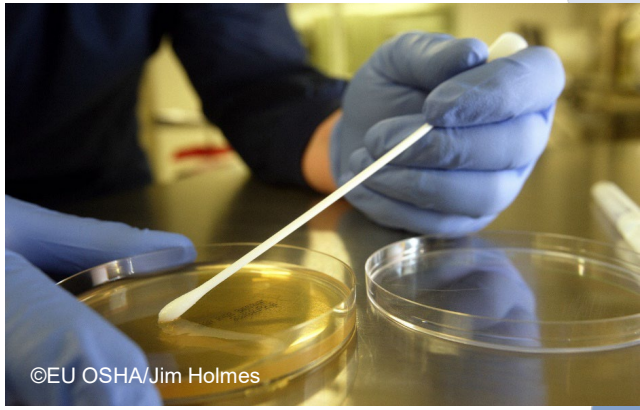
- **Information on exposure to biological agents limited**
  Monitoring systems do not exist in all countries
  - Of evaluated countries, only in Germany, France and Finland occupational exposures monitored and registered on regular basis.
- **Exposures not measured frequently**
- **Possible to derive occupational exposure limits (OELs) for biological agents that have toxic or allergenic effects as for chemicals (e.g. endotoxins) BUT**
  - Lack of data on exposure and effects (exposure-effect relationships)
  - Lack of knowledge on exposure and pathogenicity

- **Innovative measurement methods for identification and exposure easurement**
- **FINJEM, MEGA database, COLCHIC database**
- **French TOE as a basis for categories of exposure**

Challenges for measurement of biological agents

- Exposure depends on growth conditions, availability of water and other substrates
- Dependent on temperature/season of the year.
- ! A measurement can only be regarded as a snapshot of the concentration in the air.
- Measurement methods record concentrations in air, but not from contaminated surfaces or instruments and through skin
- Cultivation and colony counting does not capture substances generated by the organisms, or toxic/allergenic compounds. Some cannot be measured through cultivation

- Alternative methods
  - (electron)microscope counting
  - DNA sequencing or staining
- Focus on more general markers for exposure (like endotoxins, glucans, peptidoglycans)
- Stimulate development of standardised measurement methods and OELs for these markers



Monitoring systems - recommendations

- **To achieve comparability**
  - Make information available to all stakeholders
  - Use a standard set of key parameters
  - Agree on the level of detail.
  - Consider providing information in English
- **Output from the systems in each country should be published according to**
  - Causative agents (exposures)
  - Industries/sectors
  - Jobs/occupations
  - Age
  - Gender
- **All sectors and occupations and all groups of workers to be covered by disease monitoring, recording and recognition**
- **Good examples: Classification systems in France (TOE) or in Germany (TRBAs, GESTIS)**

Monitoring systems – recommendations (2)

- **Regular revision and update of the lists of occupational diseases**
- **Emphasis on respiratory diseases and skin diseases and on exposures to service workers**
- **Better use of the information in existing databases**
- **'ODIT' instrument (Spreeuwers et al. 2009)** - tool to assess quality of registration systems for occupational disease and ability to provide information for prevention
- **Defined indicators for high and low quality**
- **Detection of new and/or emerging risks requires a different strategy / instruments than current risks**
  - Training and commitment from (occupational) physicians
  - FR, BE/NL: examples of detection systems (RNV3P, Signaal)

Better prevention needed

- **Respecting the hierarchy of prevention measures**
  - Most measures identified in the review related to PPE and other individual measures
  - Awareness-raising needed about the existing legal framework
  - Applying collective rather than personal measures
- **Lack of access to appropriate PPE or lack of appropriate storage areas for PPE**
- **Plans to deal with accidental exposure**
- **Measures for safe waste collection and handling and transport of biological agents**
- **OSH services needed for workers in exposed sectors**
- **Right to appropriate health surveillance**
  - needs to lead to prevention measures
  - right for other workers when a health problem is identified
  - prescreening for allergy vs. prevention measures

Better prevention (2)

- **Hygiene measures**
  - separation of break and changing rooms
  - appropriate washing and toilet facilities
  - separation of work and other clothing
- **Differentiation between ‘clean’ and ‘dirty’ areas (black-white areas)**
  - especially in waste management and farming
  - avoiding contamination
- **Vaccination**
  - right for workers to be informed about advantages/disadvantages
  - information in annexes to biological agents Directive (label)
  - reasons for low vaccination rates?
- **Protection from accidental exposure**
  - needlestick injuries, cuts, bites
  - diseases transmitted by vectors (e.g. Ticks)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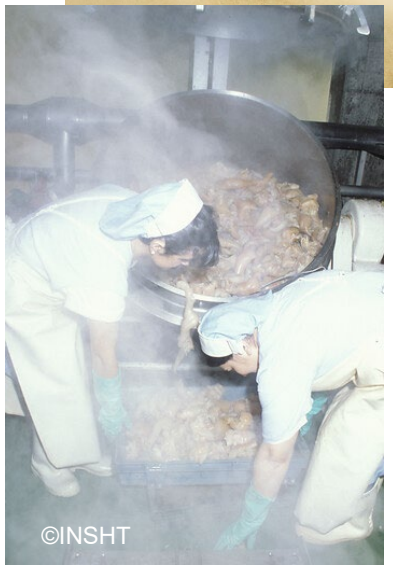
Importance of allergens

- **Multifactorial - exact cause of the allergy cannot easily be identified**
- **Causes: organic dust, moulds in buildings, flour dust, industrial enzymes, specific bacteria occurring for example in waste management, wood processing and metalwork**
- **Sectors at risk: waste and wastewater treatment, construction, fisheries, food industry, textile industry, wood-working, metal industry**

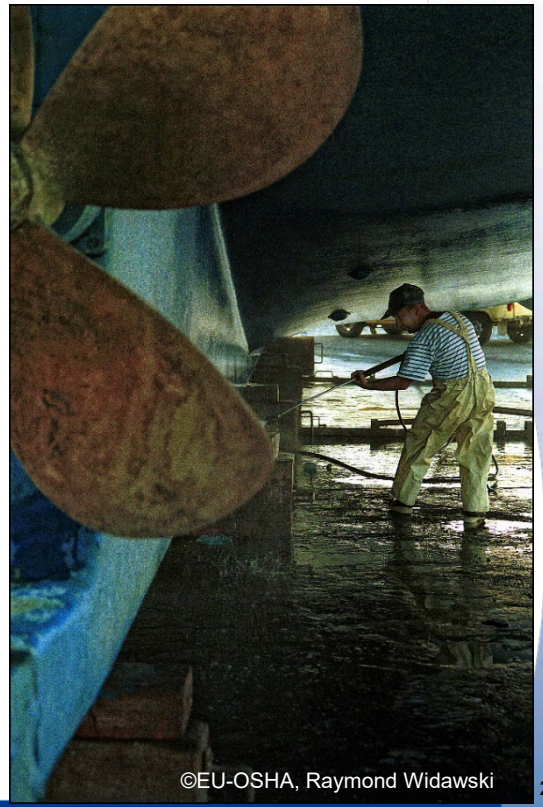
! **Allergies most recognised diseases, e.g. farmers lung**

- **Prevention:**
  - Dust- and aerosol-avoiding measures
  - Ventilation
  - Closed systems
  - Hygiene measures
  - PPE
  - Black-white areas



Conclusions

- **Classification of biological agents according to level of risk requires a risk assessment for every biological agent at a workplace**
  - often not feasible due to the large variation of biological agents at workplaces
  - for many biological agents no data available
- **Huge variation in conditions of workplaces means a uniform preventive approach is difficult to realise.**
- **Policies mentioned by experts for all sectors successful**
  - Facilitated by:
    - good national visibility and approachability of experts,
    - availability of research results and reports,
    - lobbying groups, media attention and public awareness.
  - Obstacles:
    - a lack of effective methods to collect quantified data,
    - lack of a clear reporting system for emerging diseases and risky situations from local to national level
    - lack of collaboration between ministries, expert organisations and other relevant stakeholders.



Good practice examples

- **OSH services for farming sector – Finland**
  - Consultation and health checks for farmers
- **Technical rules for biological agents, GESTIS database – Germany**
  - Guidance for different sectors and biological agents
- **Cooperation of committees for hazardous substances and for biological agents - Germany**
  - Guidance for protection of workers from sensitisers
- **Prevention in animal laboratories – Netherlands**
  - Mixture of organisational, technical and personal measures to protect workers from allergies
  - Apply to workers, clients and providers
- **Sentinel and alert systems**
  - RNV3P – France
  - THOR – UK
  - SIGNAAL – Belgium and Netherlands

Synergies with public health needed!

- **Compulsory reporting in public health for some diseases and exposures:**
  - Pandemics such as avian influenza
  - Tuberculosis
  - Brucellosis, etc…
- **Monitor spread and outbreaks of diseases**
- **Sentinel approach as in public health notification systems could be followed**
- **Expert networks in public health and occupational hygiene, e.g. regarding antibiotics and multiple resistance**
- **General practitioners can act as mediators for the prevention message and are important carriers of information**
- **Clear intervention plan when a new risk is identified – from first signs to alert for prevention**

Recommendations – awareness-raising and communication

- **Better link between research community, authorities and the OSH experts at workplaces**
- **Information exchange needed between countries**
  - filling the gaps by additional research
  - existing data, knowledge, experiences and best practices in different sectors
  - more systematic assessments of specific exposures or specific occupations
  - communication to benefit policy makers and workers/employers

- **Raising more awareness:**
  - among occupational physicians - observing an increase in incidence of known diseases in novel occupational settings
  - among general practitioners - possible link between observed health effects and (previous) work environment of a patient
  - among new / young workers in relevant sectors and occupations, through e.g. vocational education
  - among employers on their legal obligations

Recommendations – European level

- **Consider wider definition of biological agents:**
  - In addition to living (micro)organisms, substances or structures from living or dead organisms (such as exotoxins), allergens and mixtures of biological agents (bioaerosols or organic dust)
  - Broader definition of biological agents already applied in various Member States
  - Synergy of requirements for chemical agents and biological agents
- **A wider range of occupations considered to be 'at risk' should be taken into account in the Directive or guidance**
  - Take into account unintentional exposure situations
  - Take into account "risky" jobs (e.g. maintenance workers, cleaners)
- **Include reference to vulnerable groups**
- **Emerging risks:**
  - European (or even global) (warning) system would make it possible to respond to emerging risks more quickly and in a more structured way
  - Alert function in existing or new systems

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