Highlights of the review on specific work-related diseases due to biological agents

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Workshop on work-related diseases due to biological agents,

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Background

- **EU Directive 2000/54/EC on the protection of workers from risks related to exposure to biological agents at work defines 'biological agents' as micro-organisms, including those which have been genetically modified, cell cultures and human endoparasites, which may be able to provoke any infection, allergy or toxicity.**

- **Biological agents in the sense of this project are micro-organisms and other carriers of plant or animal origin that can cause (severe) health effects after exposure.**

- **Worldwide, an estimated 320,000 workers die annually from work-related infectious diseases, 5,000 of whom are in the EU.**

- **More insight and awareness of biological risks is vital for a detailed evaluation of the health effects of combined exposures.**

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Project overview: goal and overall objectives

- **Goal: To improve knowledge and awareness of exposures to biological agents and the related health problems, and help design a systematic approach for workplace prevention of these risk factors (timeline: end 2015-2017)**

- **Overall objectives:**
  - Raise awareness on the issue of 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;
  - Feed into European and national workshops on the topics covered.

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Project overview: structure
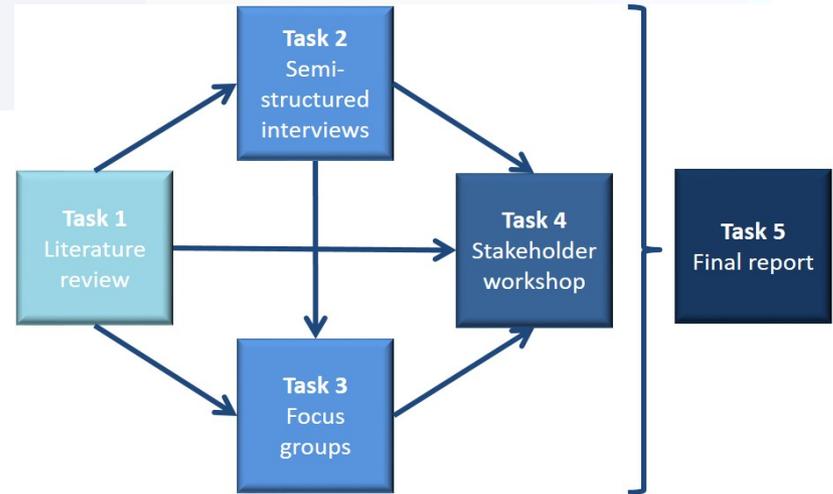
- **Task-specific objectives:**
  - Task 1: provide overview of types of biological factors and health problems relevant to workplaces (emphasis on unintentional exposures)
  - Task 2: provide information on examples of policies regarding work-related diseases due to biological agents, their success 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: Report

Overview project methodology

Task 1:
- Scientific literature search
  - Biological agents and related health effects
  - Databases
  - Monitoring systems
  - Reviews on implementation of EU Directive 2000/54/EC
- Questionnaire to national experts
- Evaluation of selected monitoring systems from DE, DK, FI, FR, NL and UK

Task 2:
Semi-structured interviews with 25 experts in Denmark, Finland, France, Germany, and The Netherlands

Task 3:
Semi-structured focus groups with intermediaries in Denmark, Finland, France, Germany and The Netherlands to identify identify specific upcoming risks and recommendations for prevention measures

Project overview: selection of sectors

Literature review (task 1)   **+**   Interviews (task 2)
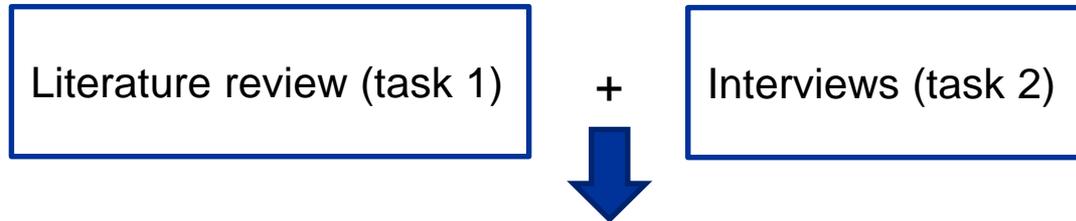
Identified high-risk sectors:
- Animal-related occupations
- Waste treatment
- Healthcare
- Arable farming
- Occupations that involve travelling for work and contact with travellers

Max. 3 sectors in focus groups
Selection of the most relevant sectors based on results task 1 & 2 and feedback from our project partners

Sectors discussed during focus groups:
- Animal-related occupations
- Waste treatment
- Healthcare

Highlights from the results

More details (will be) available via EU OSHA:

Report task 1 (published separately)

Final report

Articles on OSH wiki

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Sector of concern - Animal-related occupations (1)

- **Evidence from review:**
  - Sources: Contact with (infected) animals, animal fluids (milk, urine, blood), animal faeces, animal organs, animal feeds, plants, parasites
  - Risk of infections:
    - Bacteria-related diseases: ornithosis, salmonellosis, campylobacteriosis, yersiniosis, colibacteriosis, erysipeloid, tuberculosis, listeriosis, leptospirosis, Q-fever
    - Virus-related diseases: avian influenza, West Nile virus infection, and Newcastle disease
    - Fungal-related diseases: histoplasmosis, cryptococcosis,
    - Parasite-related diseases: Lyme disease, tick-borne encephalitis.
  - Zoonoses
  - Antibiotic resistance (e.g. MRSA)
  - Organic dust (containing endotoxin and other toxins)
  - Allergens
    - Occupational asthma in farmers and farmer's lung
    - Allergies from laboratory animals

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Sector of concern - Animal-related occupations (2)

- **High-priority current risks as identified during focus groups:**
  - Organic dust
    - In relation to animal breeding (high density, more industrialisation) → high concentrations of organic dust, bacteria and viruses spread quickly
  - Bacteria
  - Viruses
  - Zoonoses

- **Recommended policy measures aiming at prevention / reduction of exposure to organic dust:**
  - Emphasis on training and information and awareness raising, e.g.:
    - Informing farmers on regulations and rules in a clear, understandable and practical way;
    - Provide training on how to avoid exposure, lower dust concentrations, use personal protective equipment and improve hygiene.

- **Example of succesful measure laboratory animal allergy**
  - Implementation advanced compartmentation with strict cleaning and clothing regimes and good ventilation ('clean' and 'dirty' areas)
  - Same rules apply for personnel and visitors
  - Combination of organizational, technological and human factors

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Sector of concern - Waste treatment (1)

- **Evidence from literature review:**
  - Strong: exposure to bioaerosols exceeds recommended exposure levels
  - Moderate: increased risk of respiratory complaints
  - Limited: gastrointestinal disorders

  - Increased exposure to endotoxins, mycotoxins, beta-glucans via organic dust and bioaerosols related to various health outcomes
    - Adverse respiratory effects
    - Irritation of nose
    - Increase of immune system activity
  - Reported diseases
    - respiratory symptoms such as bronchitis
    - gastrointestinal symptoms such as diarrhoea and nausea,
    - Hepatitis A/B/C, HIV, and syphilis
  - Infections in the waste treatment sector often due to incidents with sharp objects (like needles, tins)

Sector of concern - Waste and wastewater treatment (2)

- **High-priority current risks as identified during focus groups :**
  - Organic dust
  - The risk of blood-borne viruses due to accidents with sharp objects

- **Workers handling waste are exposed to a wide variety of risks which makes it difficult to find the best means of prevention**

- **Experts recommended additional measures against a variety of risks during waste handling, mainly categorized as:**
  - Monitoring and inspection (e.g. clear regulations and maximum limit values)
  - Training and information (e.g. better/more training and information)
  - OSH prevention (e.g. vaccinations)
  - Developing technological solutions (e.g. improving ventilation or separating workers from waste entirely)
    - Separation is applied in composting facilities in for instance Denmark and the Netherlands

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Sector of concern - Healthcare (1)

- **Evidence from literature review:**
  - Relatively largest part of literature on healthcare
  - Healthcare workers at risk for blood-borne and other infections.
  - Primarily described diseases: influenza, tuberculosis, hepatitis and HIV
  - Regarding influenza, discussion on vaccination rates among healthcare workers and reasons for reluctance regarding vaccination
  - Risk of viral infections by needlestick injuries (hepatitis A/B/C, HIV/AIDS)
  - Surgical smoke (containing bioaerosols): significant amount of publications retrieved, may contain viable (multidrug resistant) mycobacteria tuberculosis, viral DNA of hepatitis B virus, hepatitis C virus, HIV or human papilloma virus
  - Allergens: latex glove exposure related to asthma and anaphylaxis

- **High-priority current risks as identified during focus groups:**
  - 1) viruses (especially resistant strains), 2) bacteria (especially resistant strains) and 3) allergens
  - Sector considered well regulated

Sector of concern - Healthcare (2)

- **Recommended additional policy measures:**
  - Regulation and policy planning (e.g. evaluate notification system, mandatory to use safe needle systems)
  - OSH prevention (e.g. vaccination)
  - Awareness raising (e.g. obligatory courses)
  - Training and information (e.g. targeted learning courses)
  - Financing (e.g. for development and implementation of safe needle systems)

  - Emphasis on continuous training and information, for all workers in healthcare, for medical as well as non-medical staff (e.g. cleaning personnel) and temporary workers

  - ✓Example from Finland: Best Practice Sharp Instruments in Healthcare Project → included new regulation and combined biological exposures and sharp instruments. Includes a video tutorial, constantly on display; in that way it reached also the temporary workers

Sector of concern - Arable farming

- **Evidence from literature review:**
  - Agriculture, food preparation and food management associated with allergens (from plants, animals), as well as co-existing allergenic sources (bacteria, fungi, insects)
  - Lyme disease considered to be an important health concern the coming decades
  - Tick-borne diseases and Crimean-Congo haemorrhagic fever well known in arable farming
  - In 2010, in Poland most common occupational diseases in agriculture were (allergic) pneumoconiosis (27%) and infectious and parasitic diseases (25%)
  - Farmer's lung (form of hypersensitivity pneumonitis) most common allergic complication among agricultural workers.
    - Caused by inhalation of micro-organisms from products stored in conditions favourable for growth (warm and high humidity)

Sector of concern – Occupations that involve travelling or contact with travelers

- **Evidence from literature review**
  - High risk factor because of changing patterns in human behaviour
  - Hepatitis E incidence is associated with travelling to endemic areas
  - Workers at risk: leisure and business travellers, traveling staff (e.g. airline personnel, custom workers), global trade workers, workers in war zones, epidemic control (field) epidemiologists, journalists and media professionals.
  - Reported diseases include avian influenza, Q-fever, dengue fever, Ebola/Marburg virus infection, tularaemia, legionella, measles, tuberculosis, yellow fever, SARS, cholera or meningitis
  - Travelling, especially outside Europe, generally assumed to increase the geographical spread of diseases not commonly encountered in Europe
  - Migration of immigrants/refugees to Europe may introduce diseases not commonly found in Europe

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Other occupations

- **For several occupations the risks are less clear, e.g. aquaculture, bone button makers, border guards, fertilizer workers, outdoor game managers**

- **The following risks are reported for a number of occupations:**
  - Hepatitis E virus for hunters, and sewage workers
  - Working areas with air-conditioning systems, high humidity, or systems containing stagnant warm water are amenable to Legionella
  - Allergenic agents are considered a clear risk in the fisheries sector, food industry, wood-working and metal industry.
    - Except for farmer's lung, it is rather difficult to distinguish biological allergens and the diseases related to them

- **Examples of workers at risk are:**
  - Construction workers
  - Plumbers
  - Forest workers
  - Gardeners

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Vulnerable groups (1) - Literature review

- **Evidence from literature review:**
  - Trainees and new professionals → lack of experience & knowledge
  - For most occupations, no specific information available

- **From interviews and focus groups**
  - Trainees and new professionals
  - Pregnant women, people with pre-existing diseases, like lung diseases, allergies and asthma, diabetes (because of increased risk of infections), people with (other) chronic diseases, people treated with immune-suppressants
  - Cleaning and maintenance workers
  - Temporary and undocumented workers
    - In the Netherlands, many temporary workers are working in waste treatment → often less informed and lack appropriate vaccinations
  - Foreign workers (often not speak the native language or even English)
  - Health care:
    - Workers in home care (not always good informed)
    - Health workers who travel for work

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Emerging risks (1)

- **Evidence from literature review**
  - Rift Valley fever
  - Yellow fever
  - Malaria
  - Dengue and chikungunya
  - Crimean-Congo haemorrhagic fever

- **EU-OSHA expert forecast: livestock as a reservoir of biological agents potentially resulting in global epidemics or zoonoses, e.g.**
  - SARS, avian influenza,
  - Ebola and Marburg viruses, cholera, dengue, measles, meningitis, yellow fever, Q-fever, Legionella, Tuberculosis and Tularemia

- **Experts during interviews:**
  - New viruses, especially respiratory agents
  - Zoonoses
  - Multidrug-resistant bacteria

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Emerging risks (2), as indicated during focus groups

- **Animal-related occupations**
  - Multidrug-resistant bacteria (not only MRSA) → increased use antibiotics
  - Industrialized activities (diseases spread more easily, specialized work)
  - New viruses, especially respiratory agents

  - Examples of recommended measures:
    - Design of technological solutions, e.g. automatization (e.g. robot to catch chicken)
    - Taking into account changing breeding techniques and welfare for workers when building agricultural facilities
    - Reduction of use of antibiotics, for instance by cooperation between breeders and veterinarians (new ways of caring for their animals without using antibiotics)

- **Waste treatment**
  - Exposure to a combination of biological agents
    - Increased separation of household waste (organic waste), other types of storage, less frequent collection)
  - Biomass-related allergens.

Emerging risks (3), as indicated during focus groups

- **Waste treatment**
  - Examples of recommended measures:
    - Separating activities in waste treatment plants (e.g. selection and scrubbing) to prevent exposure between different waste flows in the sanitation chain
    - Chain-approach to find solutions for separating waste at the source or to process part of the waste locally (e.g. at home)

- **Healthcare**
  - Agents with antibiotic resistances (including MRSA)
  - Infectious diseases through blood-borne pathogens
  - Accidental exposure

  - Examples of recommended measures:
    - Policy measures are aimed at reduction of use/prescription of antibiotics
    - Repetitive training and instructions, e.g. on use protective measures (PPE), hygiene, how to deal with risk of increased occurrence of biological agents
    - Monitoring whether employees follow instructions and address neglect

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Monitoring systems (1)

- **A wide range of types of monitoring systems for diseases available**
  - Registration systems, information systems, surveillance systems, classification systems

- **Diseases due to to biological agents reported in generic registration systems → not specific focus on biological agents**
  - Exceptions exist in the healthcare and systems for compulsory reporting (e.g. for Hepatitis or tuberculosis)

- **Proportion of registered diseases due to biological agents generally relatively low when compared to the total number of registered diseases**

- **Underreporting of diseases (including those related to biological agents) assumed for various systems**
  - An important factor may be under-recognition, amongst others caused by a general lack of knowledge and awareness of risks caused by biological agents.

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Monitoring systems (2)

Country		List of registered diseases due to biological agents
NL	WRDs or ODs	In principle all work-related diseases, no list defined Guidelines available for Toxic inhalation fever; Zoonoses; Tuberculosis; Hepatitis A; Hepatitis B; Hepatitis C; Hepatitis E; Occupational contact dermatoses; Work-related asthma; Toxic effects on the airways; Work-related rhinitis; Toxic inhalation fever; Tetanus; Brucellosis; Viral hepatitis; Tuberculosis; Amoebiasis; Other infectious diseases caused by work in disease prevention, healthcare, domiciliary assistance and other comparable activities for which a risk of infection has been; Extrinsic allergic alveolitis; Lung diseases caused by the inhalation of dusts and fibres from cotton, flax, hemp, jute, sisal and bagasse; Allergic asthmas; Allergic rhinitis
UK	RIDDOR - Prescribed OD	Occupational dermatitis
		Occupational asthma
		Disease or acute illness caused by an occupational exposure to a biological agent (healthcare and laboratories are considered key risk occupations, specific infections mentioned are anthrax, zoonoses, bovine spongiform encephalopathy (BSE), influenza, legionella and severe acute respiratory syndrome (SARS))
	LFS – work-related illness	No list defined
	THOR GP – work-related illness	No list defined
	THOR (SWORD / EPIDERM) - work-related illness	Main categories reported to SWORD include: Allergic alveolitis, Asthma, Bronchitis/emphysema, Infectious diseases, Inhalation accidents, Benign pleural disease, Malignant mesothelioma, Lung cancer, Pneumoconiosis, Other respiratory illness
		Main categories reported to EPIDERM include: Contact dermatitis, Contact urticaria, Folliculitis/acne, Infective skin disease, Mechanical skin disease, Nail conditions, Skin neoplasia, Other dermatoses
	IIDB - Prescribed ODs	Anthrax, Glanders, Infection by leptospira. E.g. swamp fever, swineherd's disease, and Weil's disease), Ankylostomiasis, Tuberculosis (TB infection), Extrinsic allergic alveolitis (including farmer's lung), Infection by organisms of the brucella genus. Brucellosis, Infection by hepatitis A virus, Infection by hepatitis B or C, Infection by Streptococcus suis (a very rare form of meningitis from exposure to infected pigs or pork products), Avian chlamydiosis, Ovine chlamydiosis, Q fever, Orf, Hydatidosis, Lyme disease, Anaphylaxis

Monitoring systems (3)

Country		List of registered diseases due to biological agents
DE	ODs, including RODs	Occupational infectious diseases: infections in healthcare and welfare, zoonoses, worm infections among miners (Ankylostoma duodenale or Strongyloides stercoralis), tropical infections, typhus
		Occupational diseases from organic dusts: exogen-allergic alveolitis, diseases of lower respiratory tract and lungs from raw cotton, flax or hemp fibre (byssinosis), adenocarcinomas of nasal cavities from oak or beech wood dust, respiratory diseases from sensitising agents including rhinopathy, which caused cessation of all activities that may provoke manifestation or recurrence of the disease, respiratory diseases from chemically irritating or toxic agents, which caused cessation of all activities that may provoke manifestation or recurrence of the disease
		Skin disease: severe or recurrent skin disorders, which caused cessation of all activities that may provoke manifestation or recurrence of the disease
FR	rnv3p - WRDs or ODs	In principle all work-related diseases
	OSH risks, but also other diseases can be reported	Occupational tetanus, Anthrax, Spirochetoses (leptospirosis, Lyme disease), Brucelloses, Ankylostomose, Tuberculosis and other microbacteria infections, Hepatitis A, B, C, D and E, Skin mycosis, Rickettsioses and Q-fever, Poliomyelitis, Infections related to protozoa, Rage, Tularemia, Infections related to infectious agents incurred in hospitals and hospitalisation at home, Perionyxis and onyxis (fungal nail lesions), Viral keratoconjunctivitis, Pasteurelloses, Ornithosis_psittacosis, Swine erysipelas, Streptococcus infections, Hantavirus infections, Rhinitis and asthma, Hypersensitivity pneumonitis, Respiratory diseases caused by/linked to the inhalation of textile fibres
DK	WRDs or (R)ODs	Allergic rhinitis and conjunctivitis, Allergic alveolitis (including, e.g. farmers lung, mushroom-workers' lung, bird breeders' lung), Byssinosis, Asthma (allergic and non-allergic), Chronic bronchitis, COPD, Allergic and toxic dermatitis, Infectious disease from animals, humans or the environment (mostly tropical diseases). Examples are tetanus, ornithosis, Q fever, Weils disease, tuberculosis, hepatitis, malaria, trypanosomiasis, dengue fever and yellow fever, Cancer after hepatitis infection
FI	WRDs or (R)ODs	No list defined

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Monitoring systems (4)

Country	Overview of output from monitoring system
NL	Reported diseases: zoonoses, infectious diseases and hypersensitivity pneumonitis, occupational asthma, asthma aggravated by work and contact dermatitis Highest numbers for 'caregivers', patty officers (army), trained farmers, trained foresters, fishermen and hunters, farmers, cattle breeders, fishermen, hunters and gatherers, and food processing
UK	Reported diseases: occupational dermatitis, occupational asthma, allergic alveolitis, tuberculosis, rhinitis, byssinosis
DE	Reported diseases: infectious diseases, respiratory disorders and obstructive airway diseases, occupational skin diseases. The healthcare sector is a major branch with occupational infections
FR	WRD's reported in seven industry sectors: food industries, health and social action care, farming, hunting and ancillary services, retail trade and repair of domestic articles and household goods, construction, hotels and restaurants and public administration. Reported work-related infectious diseases and diseases caused by parasites were mainly cases of tuberculosis, mycoses and viral hepatitis. In addition, non-infectious diseases such as hypersensitivity pneumonitis due to exposure to organic dust (e.g. allergic alveolitis, farmer's lung, mushroom-worker's lung) were reported.
DK	In some of the sectors, like 'agriculture, forestry and fishing', 'food and beverage industry', 'restaurants and bars', and 'hotel and camping', percentage of diseases due to biological agents is relatively high
FI	Most cases in agriculture Allergic diseases reported most frequently (mainly allergic asthma and allergic rhinitis, also allergic alveolitis and laryngitis).

Monitoring systems (5)

- **To achieve a harmonisation it is recommended to**
  - Make information available to all stakeholders;
  - Use a standard set of key parameters to be monitored;
  - Use English as the overall reporting language;
  - Agree on the level of details that should be reported.

- **It would help if the output from the systems in each country would be published according to**
  - Causative agents (exposures)
  - Industries/sectors
  - Jobs/occupations
  - Age
  - Gender

- **Little information is available on exposure to biological agents at the workplace.**
  - Of evaluated countries, only in Germany, France and Finland occupational exposures monitored and registered on regular basis.
  - Exposures to biological agents are not measured frequently
    − FINJEM, MEGA database, COLCHIC database (?)
  - The classification systems that are in use in France (TOE) or in Germany (TRBAs, GESTIS) can serve as practical examples

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Policy measures (1)

- **Policy measures highlighted by experts from five countries**

- **Most policy measures were regarded successful in implementation or effectiveness, only a limited number were considered less successful.**

- **Most policy measures were considered transferable.**

- **The majority aimed to prevent specific diseases among workers, such as respiratory diseases (e.g. asthma, Farmers' lung), infectious diseases from bacteria or viruses (e.g. MRSA, Ebola, BSE, influenza, tuberculosis) and blood-borne infections (e.g., Hepatitis B, HIV).**

- **Some had a more general aim: to reduce exposure to biological agents (viruses, bacteria and moulds) among workers in specific sectors or industries.**

- **Some focused on obtaining a better understanding or control of situations:**
  - improving diagnostics in occupational health,
  - predicting epidemics, or
  - reducing exposure accidents at work.

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Policy measures (2)
Facilitating and hindering factors

- **On the level of the policy measure:**
  - Most significant facilitating factor:
    - good fit with targeted group in terms of content (e.g. clear rules, guidelines) and distribution (e.g. practical, ready-to-use, and easily accessible demonstrations), and organisation (e.g. applicability)
  - Most significant barriers:
    - ineffectiveness of the policy measure
    - policy measure negatively affected workers' work or working comfort (e.g. always perform activities at low temperature rooms)

- **On the level of the potential user and involved parties:**
  - Main facilitating factors:
    - highly motivated or interested target group
    - co-operative target organisations
    - direct feedback mechanisms between experts and target group
  - Co-operation with a variety of expert organisations (high quality, multidisciplinary approach) considered critical

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Policy measures (3)
Facilitating and hindering factors

- **On the level of the potential user and involved parties:**
  - Main obstacles:
    - communication problems with target group (e.g. language barrier among foreign workers)
    - overall lack of awareness of health risks among workers
- **On the level of the organisational context:**
  - Facilitating factors:
    - Sufficient resources (e.g. colleagues, experts to consult, time, and finances)
    - Organisations feeling responsible for improving working conditions
  - Hindering factors
    - Lack of resources
    - Not working together with shared goal
    - Policy measures not designed for employee, but to improve quality of final product or consumer/patient safety
- **On the level of the socio-political context:**
  - Facilitating factors:
    - National involvement or attention
    - Awareness of risks and prevention measures for biological agents

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Policy measures (4)
Facilitating and hindering factors

- **On the level of implementation strategy:**
  - Facilitating factors
    - Organisational support for policy measures and/or support for workers
    - Research on causes of a problem and effectiveness of preventive measures ('evidence'/proof of quality)
    - Participation of target group (e.g. experts/expert organisations, management, employees)
    - Active dissemination of project/research results (e.g. publications, lectures, presentations)
    - Translation of national measures into practical guidelines for use at the local level (e.g. at farms) and support at national and organisational level

  - (Main) hindering factors:
    - Lack of evidence
    - Implementation as an ongoing effort (repetitive and time-consuming).

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Examples of sector-transcending policy measures (1)

- **FI: Strategic training for occupational healthcare on how to manage issues with biological exposure agents, both prevention and provision of care**
  - Target population: occupational healthcare physicians, nurses, other OSH experts, physiotherapists, psychologists at occupational health centres
  - Policy measure: Training and information as a statutory element in all sectors and industries; Proactive and preventive measures (info on risks involved and essential protective measures; Provision of care (assistance after an accident or an uncontrollable situation with exposure)

- **FI: Measures to improve effectiveness of screening practices for diagnosing occupational asthma or identify at-risk individuals**
  - Target population: physicians in occupational healthcare
  - Policy measure: Revision of guidelines on determining which screening practices to use to diagnose occupational asthma or identify at-risk individuals

- **FR: Measures to predict flu epidemics**
  - Regional groups of flu observation: surveillance by field actors, grouped with viral surveillance of Institute Pasteur and pharmaceutical statistics
  - Model with premature warning criteria about duration, intensity and peak of epidemics

- **FR: Measures to prevent biological agents exposure at work by INRS**
  - Target population: occupational doctors, prevention stakeholders, workers, etc.
  - Policy measure: Training program for risk awareness and assessment of biological agents at work

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http://osha.europa.eu

Examples of sector-transcending policy measures (2)

- **Experts during focus groups suggested that for sector-transcending risks, the scope should be broadened for more effective development of new solutions or preventive policy measures**

- **Suggested different approaches for occupational risk prevention:**
  - Combined risk approach, taking a broader scope including more (diverse) risks (biological risk, physical risk, chemical risk, and/or risks from multiple biological agents)
  - Process approach, including all steps and tasks of a worker (locally), seeing all possible risks the worker encounters
  - Chain approach, including a whole chain of events or route or a biological agent from a source to the moment it becomes a health problem for workers (and/or the general public)
    - For the purpose of preventing exposure to blood-borne viruses for waste workers, next to developing measures to prevent needle-stick accidents during their work of waste collecting and sorting, it could also be beneficial to provided patients with home care with information on how to throw out used needles in a safe way
    - To tackle the issue of antibiotic resistance several sectors (healthcare, animal-related occupations and waste treatment) should be involved

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Examples of practical tools

- **FIOH has developed the FINJEM, the Finnish Job Exposure Matrix, which contains information on exposures to organic dusts and exposures to microbiological agents**

- **Other relevant databases (although not all publicly available) for information on (exposure to) biological agents are:**
  - French Thesaurus of Occupational Exposures (TOE) (rnv3p)
  - French COLCHIC and SCOLA databases
  - German MEGA database
  - German GESTIS Biological Agents Database

- **Examples of tools for risk assessment:**
  - Blueprint Risk Inventarisation and Evaluation (RI&E) for biological agents (developed by NECORD, NL)
  - Guidance on allergens (developed NECORD, NL)
  - www.nkal.nl/tools.asp

Examples of practical measures (1)

- **Health surveillance (screening activities) at sector level to identify and prevent work-related diseases at an early stage:**
  - NL: Screening for sensitisation among bakery workers
  - NL: periodic health check for construction workers
  - FIN: health surveillance by occupational health service in farmers

- **Involvement of target group for effective implementation of control measures**
  - DN: which farmers tested different types of respiratory protective equipment (masks). Difference noticed when wearing the masks (no coughing at home after work when wearing a mask) was reason to keep using these masks after the research project had ended.

- **The Finnish Occupational Health Services (OHS) for providing information, education, raising awareness, advice and guidance in regard to personal protection equipment, monitoring and performing frequent health checks on farms example of successful system to reach sector as a whole**

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Examples of practical measures (2)

- **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,

- **'ODIT' instrument (Spreeuwers et al. 2009) can serve as tool to assess (and improve) quality of registration systems for occupational disease with respect of their ability to provide appropriate information for prevention on a national level.**
  - Defined indicators to indicate 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 required.
  - FR, BE/NL: examples of detection systems (Rnv3p, Signaal) can serve as a starting point

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Examples of practical prevention measures (1)

- **Measures to limit dust in stables on pig farms, to prevent respiratory diseases among farmers:**
  - Pamphlet about working in the piggery
  - Consultants explaining to farmers what conclusions they should draw

- **Measures to prevent laboratory animal allergies in academic setting:**
  - Equipment for cleaning cages
  - Ventilation systems
  - Protective clothing

- **Measures to prevent needle-stick accidents among healthcare staff**
  - Vaccination
  - Information
  - Training
  - Safe needle systems

Examples of practical prevention measures (2)

- **Measures to prevent infection with the Ebola virus among healthcare workers:**
  - Quick assessment (evaluation) on what is needed and training to all related fields
  - Guideline on personal protective equipment (PPE)
  - Development of protective clothing, by a workgroup in contact with manufacturers

- **Measures to prevent infectious diseases in hospitals:**
  - Seasonal flu shots

- **Measures to reduce exposure to biological agents (often endotoxin) in agricultural companies with ill workers (respiratory diseases, fever):**
  - Research and advice: local measurements, advice and assistance in improving work processes to prevent infection

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Conclusions

Conclusions (1)

- **Associations between occupation and diseases resulting from biological agents (excl. allergens) are clear for some occupations**
  - High risk sectors include healthcare workers, workers in agriculture (arable farming and livestock farming), waste treatment workers and travelling occupations.
  - Overall lack of awareness of the risks from biological agents assumed in all sectors, except healthcare and laboratories.

- **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)

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Conclusions (2)

- **Trainees and new professionals identified as a vulnerable group due to lack of experience and knowledge**

- **Emerging biological risks**
    - Attention should be paid to multi-resistant bacteria and epidemics (e.g. of zoonoses)
    - Waste treatment and composting associated with specific allergens;
    - Expected increase in green jobs may result in increased prevalence of sensitization to biomass-related allergens.
    - No system in place that enables the various stakeholders to respond quickly when emerging risks are perceived.
    - Potential re-emerging risks are Q-fever, tuberculosis and influenza

Conclusions (3)

- **Systems used for monitoring diseases / exposures vary widely:**
  - Differ with respect to what is monitored, how frequently it is monitored and at what level of detail
  - Under-reporting an issue
  - Little information on exposure to biological agents at the workplace
  - Unclear how data from monitoring systems is linked to prevention at the workplace

- **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**

- **Lack of good quantitative data on exposure and associated effects (exposure-effect relationships) hampers the derivation of OELs for biological agents that have toxic or allergenic effects**

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Conclusions (4)

- **Classification of biological agents according to level of risk requires a risk assessment for each individual biological agent at a certain workplace.**
  - often not feasible due to the large variation of biological agents at workplaces
  - for many biological agents no specific data is available

- **Due to the large variation in conditions of workplaces in which biological agents pose a risk to workers, a uniform preventive approach will be difficult to realise.**
  - Generalised approach is not expected to be suitable

- **Overall, the policy examples mentioned by experts for all sectors were/are successful regarding implementation and effectiveness:**
  - Facilitating factors:
    - good national visibility and approachability of experts,
    - availability of research results and reports,
    - lobbying groups, media attention and public awareness.
  - Hindering factors:
    - 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.

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Recommendations

Recommendations (1)

- **Chain approach for sector-transcending risks:**
  - The whole chain of events during which exposure and thus related health effects can occur,
  - enables action to resolve the problem, or even better to prevent the problem from occurring, on multiple levels (shackles of the chain)

- **Process approach / broader scope / higher level solutions**
  - Suitable for developing policy measures at a local level
  - Traces the steps of a worker performing tasks to discover all possible risks → complete overview of situations for which measures are needed.
  - A broader scope when developing preventive measures, targeting multiple biological agents (or organic dust as a 'container') and/or risks (biological, chemical, physical/ mechanical)
  - For multi-exposure risks as organic dust, find solutions on a higher level than the individual level (PPE), by developing technological solutions that separate the workers from the biological agents entirely

Recommendations (2)

- **In order to optimise implementation and effectiveness of policy measures:**
  - A systematic approach with regard to design and implementation of OSH policy is advisable, as well an analyses of the facilitating and hindering factors prior to implementation, so that a targeted implementation strategy can be developed regarding its purpose and objectives.
  - Attention should be paid to factors at the level of the policy itself, the potential user and parties involved, the organisation, the socio-political context and the implementation strategy.
  - It is recommended that companies and/or sectors of industry receive guidance on how to set up surveillance programs and how to design programs to control and/or prevent exposure in specific work environments.

Recommendations (3)

- **Effective information exchange strategy on policy measures and lessons learned between counties**
  - filling the gaps by additional research
  - study how the existing data, knowledge, experiences and best practices on preventive measures in different sectors can be collected
  - share in a way that it reaches and benefits policy makers and workers

- **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 the (previous) work environment of a patient
  - Among new / young workers in relevant sectors/occupations, preferably as part of the vocational education.

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Recommendations (4)

- **Control banding:**
  - Qualitative assessment of biological risks at the workplace by using e.g. risk assessment tools in combination with options for control measure as a first step to reduce the risks.
    - Existing tools / best practices could be implemented sector/national/European wide
  - Combination of control banding with available exposure data may be a way forward towards a more quantitative assessment

- **Exposure assessment:**
  - Instead of assessing exposure levels for individual biological agents, focus on more general markers for exposure to biological agents (like endotoxins, glucans, peptidoglycans)
  - Stimulate development of standardised measurement methods and OELs for these markers

- **Small and medium enterprises (SMEs):**
  - SMEs are generally less aware of risks due to biological agents
  - less easy to reach with for instance a campaign
  - have less (financial) means to implement control measures
  - specific attention needed to ensure a safe work environment

Recommendations (5) - Optimisation of implementation

- **Optimise implementation and effectiveness of policy measures:**
    - A systematic approach with regard to design and implementation of OSH policy, as well an analyses of facilitating and hindering factors prior to implementation, so that a targeted implementation strategy can be developed regarding its purpose and objectives.
    - Attention paid to factors at level of the policy, the potential user and parties involved, the organisation, the socio-political context and the implementation strategy.
    - Companies and/or sectors of industry receive guidance on how to set up surveillance programs and how to design programs to control and/or prevent exposure in specific work environments

Recommendations (6) - Knowledge exchange

- **Developing effective information exchange strategy on policy measures and lessons learned between counties**
  - Alongside filling in gaps by additional research, to study how the already existing data, knowledge, experiences and best practices on preventive measures to protect workers against occupational risks of exposure to biological agents in different sectors can be collected and shared in a way that it reaches and benefits policy makers and workers in practice

- **Raising more awareness:**
  - Among occupational physicians with regard to observing an increase in incidence of known diseases in novel occupational settings.
  - Among general practitioners with regard to the possible link between observed health effects and (previous) work environment of a patient
  - Among new / young workers in relevant sectors/occupations, preferably as part of professional education

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Recommendations (8) - National level

- **Good national visibility and approachability of experts of specialised institutions would facilitate influencing the agenda-setting process as well as the availability of robust evidence in policy formation and evaluation**

- **Other visibility factors are lobbying groups drawing attention to the issue, intensive or repeated media attention and public awareness.**

- **Proper dialogue and better collaboration between relevant stakeholders at several levels is required for shaping policy agendas and influencing policy formation and change**

- **A better-organised system to promote two-way communication among all involved parties seems critical for more successfully influencing the policy process at a national level**

- **Preventive measures should ideally be developed in view of a combined-risk approach (including multiple biological agents) to protect against all possible risks**

Recommendations (9) – European level

- **Consider wider definition of biological agents:**
  - In addition to living (micro)organisms, substances or structures that originate from living or dead organisms, allergens and carriers of a variety of biological agents (like bioaerosols or organic dust);
  - Broader definition of biological agents as used in the Directive is already applied (in different forms) in various Member States.

- **A wider range of occupations considered to be 'at risk' should be taken into account in European legislation**
  - Take into account unintentional exposure situations
  - Take into account "risky" jobs (e.g. maintenance workers, cleaners)

- **Emerging risks: development of an European (or even global) (warning) system would make it possible to respond to these emerging risks more quickly and in a more structured way**

Thank you for your attention!

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