European Risk Observatory: Experts forecast on emerging biological risks

European Agency for Safety and Health at Work

Brussels, 5-6 June 2007
1. The European Risk Observatory: Experts forecast Emerging Risks from biological agents
Background: Community Strategy (1)

Community strategy on health and safety at work 2002–2006

• Emphasises the need to build “a genuine culture of risk prevention, (...) to anticipate risks and bring them under control”

• Requires the Agency to “act as a driving force in matters concerning awareness-building and risk anticipation”

• Asks the Agency to create a European Risk Observatory (ERO), to provide forward-looking information for policy-makers
Community strategy on health and safety at work 2007-2012:

Consolidates the role of the RO, as regards

- risk anticipation to include:
  - new technologies
  - biological hazards
  - complex human-machine interfaces

- the specific challenges for OSH posed by:
  - increasing women participation in the workforce
  - migrant workers
  - impact of demographic trends and the ageing workforce
ERO Challenge: Anticipating risks

• Provide an overview of OSH in EU and identify trends and their causes
• Identify new and emerging risks
• Anticipate their consequences for OSH and the world of work
• Identify where more information is needed

⚠️ Shorten the delay between identification of risk and adequate preventive actions
How the ERO works:
1. Collect
2. Analyse
3. Disseminate
4. Stimulate debate

**Collection of Statistical Data:**
- Exposure measurements
- Registers of accidents, diseases, fatalities
- Workers surveys
- Epidemiological data

**Surveys:**
- Expert forecasts
- Company surveys

**Analyses:**
- Agency
- Topic Centres

**Reviews:**
- Research
- Programmes, methods, etc.
- Case studies

**Web:**
- Statistical data
- Research
- Monitoring systems
- Links to good practices, legislation, etc.

**OSH Outlook**
- Yearly summary

**Reports**
- Thematic reports
- Expert forecast
- Policy overview

**Workshops**
Stimulate debate
http://riskobservatory.osha.europa.eu/

Avian flu - Protection of workers

The European Agency for Safety and Health at Work has collated information relating to emergency planning for outbreaks of avian influenza. This includes information for protecting workers concerned in agriculture (for example poultry workers), hospitals, diagnostic laboratories, waste management, and slaughterhouses. More information

More challenges for occupational safety and health in the future

The current trends in society and work organisation create new risks and put new demands on occupational safety and health research. An overview of what we are in for in terms of workplace safety has just been published by the European Agency for Safety and Heath at Work in a working paper for the European Commission entitled Priorities for occupational safety and health research in the EU-25.

Download the publication
Read the press release

Get ready for future OSH challenges and emerging risks!

Demographic changes as well as changes in work organisation and production methods lead to new types of occupational risks and demand new solutions. The European Agency for Safety and Health at Work has launched an on-line Risk Observatory - a data collection and analysis structure that will help identify new risks and challenges as they emerge.
What are “emerging risks”?

Both **new** and **increasing**.

**“New”:**
- previously non-existent; or
- a **long-standing** issue is now considered as a risk due to:
  - a change in social or public perceptions; or
  - new scientific knowledge.

**“Increasing”:**
- the number of hazards is growing;
- the likelihood of exposure to the hazard is increasing;
- the effect of the hazard on workers’ health is getting worse.
Expert forecasts: Delphi method

- Expert identification (520)
- Identification of risks
- Validation
- Final consultation
- Forecast by 188 experts (RR=35%)
Biological agents in the workplace

Situation in the EU (1)

- 16% of EU workers report handling dangerous substances
- Nearly one in 10 workers (9%) reports being exposed to infectious materials (such as waste, bodily fluids and laboratory materials) (1)
- More women (5%) than men (2%) report a high level of such exposure as they work more in occupations that involve biological hazards and exposure
- In France, 15% of the workforce (2.6 million workers) exposed to biological agents in their jobs in 2003 (2)
- > 50% employed in health and social work, where two thirds were in contact with biological agents
- High exposure also found in
  - agriculture,
  - manufacture of food products,
  - services to individuals and households,
  - research and development,
  - and sanitation activities.

(1) EU working condition survey 2005
(2) SUMER survey 2003
Biological agents in the workplace
Situation in the EU (2)

- 320,000 workers die worldwide every year of communicable diseases caused by biological agents (1)
- 5,000 of these fatalities in the European Union
- At least 15% of all new cases of cancer worldwide are caused by viruses, bacteria or parasites (e.g. aflatoxin B1 from Aspergillus flavus, hepatitis B, wood dust) (2)
- 1,900 cases of recognised occupational diseases due to biological agents in the EU-15 in 2001(3)
- Long workplace absences due to infectious diseases

(1) Driscoll, T., & al. ‘Review of estimates of the global burden of injury and illness due to occupational exposures’, American Journal of Industrial Medicine, 2005
(2) Bosch et al. 'Infections', UICC Handbook for Europe, International Union Against Cancer, 2004
(3) EODS, 'Occupational diseases in Europe in 2001', Eurostat
Expert forecast: Biological risks

Invited = 109 / Responses 3rd round: 36

- OSH risks linked to pandemics
- Difficult assessment of biological risks
- Drug-resistant pathogens (e.g. Methicillin Resistant Staphylococcus Aureus)
- Poor maintenance of HVAC systems: Legionnella, brucellosis
- Indoor moulds
- Biological agents in waste treatment
- Endotoxins (recycling, livestock industry, etc.)
- Combined exposure to airborne biological agents and chemicals
Pandemics and OSH risks

- New pathogens emerge: SARS, avian flu, Ebola, Marburg
- “Old” ones re-emerge: cholera, dengue, measles, yellow fever
- Over ¾ of human diseases are zoonoses
- A new contagious virus could spread worldwide in less than 3 months due to high speed/volume of international transport.
- 89 Dutch poultry workers infected with A/H7N7 in 2003
- In 2003, 2 nurses and 1 doctor died from SARS in Toronto, after contact with an infected individual from China. This outbreak led to 128 SARS infections, mostly in medical staff.
- High risk of dengue fever in international trade of goods with water:
  - In California in 2001, Aedes albopictus found in 14 tyre-resellers - was introduced by a cargo ship from China.
  - In France, first identified in 1999 in a tyre plant – a national monitoring system is now in place.
Drug-resistant micro-organisms

- Contributing factor: overuse or misuse of antibiotics
- E.g. MRSA and TB in health care, especially in hospitals – highly susceptible patients, intensive use of antimicrobials, and possible cross-infection.
- Extensively drug-resistant tuberculosis (X-DR-TB) resistant to second-line drugs has appeared worldwide.
- Need to address XDR-TB especially in areas of high HIV prevalence, as XDR-TB mortality rates are high in HIV-positive individuals.
- In farming: EU-ban since 01/06 on the use of antibiotics for non-medical purposes, but still used especially in intensive farming to compensate for overcrowded unsanitary conditions prone to infections.
- Inhalation of virginiamycin-resistant gram-positive bacteria in swine facilities may contribute to quinupristin-dalfopristin-resistant gram-positive infections in humans with few or no treatment options.
Indoor mould (1)

- 100,000 species of moulds identified but over 1.5 million may exist.
- Airborne moulds are ubiquitous indoors.
- Even in newer buildings due to new building and insulation techniques, and HVAC systems.
- Effects: Asthma, upper respiratory diseases, headaches, infections, allergies, irritation of the nose, throat, eyes and skin, sick-building syndrome.
- An increase in mould-related diseases is reported.
- In Finland, moulds caused 264 work-related diseases, of which 155 allergies in 2002, in:
  - Healthcare (hospitals, homes): 71 cases
  - Public administration: 49 cases
  - Agriculture: 43 cases
  - Education: 42 cases
  - Construction: 7 cases
Indoor mould (2)

- Health-based exposure limits are not yet established.
- Guidelines exist but are not harmonised:
  - American and Swiss indicative OELs: probable contamination source above 1,000 CFU/m³
  - In Germany: Technical Control Value (TKW) - not a binding (health-based) limit value - applies only to permanent workplaces in waste treatment plants (e.g. sort cabs or cabs): TKW=50,000 CFU/m³
  - In indoor non-industrial workplaces, according to EC:
    - Intermediate source of contamination: 500-2,000 CFU/m³
    - High source of contamination: > 2,000 CFU/m³
- BUT levels above these values do not necessarily imply that the conditions are hazardous.
- In addition to the number of CFU/m³, the main type of fungi needs be determined.
Poor maintenance of HVAC systems

- Poor maintenance of HVAC systems leads to the growth and indoor spread of biological agents.
- These agents may cause symptoms in indoor workers that are wrongly assimilated to flu-like diseases.
- In hospitals, it can also spread legionella, aspergillosis and drug-resistant microorganisms (e.g. MRSA, extensively drug-resistant tuberculosis)
- Workers involved in maintenance of HVAC are also at risk!
Waste treatment activities: Overview (1)

- New but steadily growing industry
- In Germany: 300,000 workers in waste management*
- New environmental policies from the 1990s address OSH issues insufficiently.
- New waste handling and treating technologies even increase risks for workers.
- In Denmark: collection of solid waste is one of the most hazardous jobs**:
  - illness rate twice as high as in other jobs
  - and infectious diseases rate six times as high.
- The risks are linked to:
  - nature of the waste (chemical, biological risks)
  - work processes (noise, vibration, falls, cuts, MSDs)
  - work organisation (traffic, simultaneous activities, workload difficult to plan in advance)

* Le risque biologique encouru par les salariés en Europe, Europgip, 2007
** Mapping health and safety standards in the UK waste industry. Bomel Limited,HSE
Waste treatment: Biological agents (2)

- Major health problems due to complex mixtures of dangerous substances: airborne microorganisms, including mould, and their toxic products such as endotoxins and VOCs.
- Exposure occurs through bioaerosols and organic dust.
- Health effects: upper airway inflammations, ODTS, pulmonary diseases, allergic reactions, skin diseases, irritation of the eyes and mucous membranes, and gastrointestinal problems.
- Handling hospital waste and needlestick injuries may lead to hepatitis and HIV/AIDS.
Waste treatment: Prevention (3)

- Not possible to eliminate biohazards completely - inherent to waste management – but possible to reduce the generation of dust and aerosols.
- Example of preventive measures from the MS:
  - mechanical presorting before hand-sorting,
  - sorting cabins with proper ventilation
  - local exhaust ventilation for sorting lines
  - closed vehicles equipped with air filters
  - use of adequate protective clothing and proper gloves
- Hygiene plans, regular cleaning and decontamination measures contribute to reduce the exposure.
- Prevention should be adapted to the particularity of each branch and activity.
Endotoxins

- Mostly found in organic dust, which is widespread in occupational settings: farming, swine and poultry housings, waste and sewage treatment, and even indoor workplace with mould growth.
- Responsible for many of the virulent effects of gram-negative bacteria
- Effects: ODTS, chronic bronchitis, allergies, asthma-like symptoms, fever – can contribute to toxic infections, organ failure, septic shock, and even death.
- Paradox: May induce but also protect from asthma, respiratory allergies and sensitisation allergens
- The lack of reliable, harmonised quantitative exposure assessment methods hampers the risk assessment.

需 for standardised measurement methods
Assessment of biological risks (1)

Directive 2000/54/EC: Employers must assess the risks BUT:

- The state of knowledge on biohazards is still scarce
- Employers’ and workers’ awareness for biological agents is low, in particular where their presence is unintentional
- Need for validated, harmonised measurement methods, incl. sampling techniques, to enable the exposure assessment
- Need for more epidemiological and clinical data to establish reliable dose-effect relationships

Challenges:

- Microorganisms’ concentrations vary - when to measure?
- Which agent accounts for which health effect(s)? At which exposure dosis? What about individual susceptibility?
- Even if no (viable) micro-organism is detected, its metabolites or toxins may exert a toxic or allergic effect.
- Effect of combined exposures, incl. chemicals?

? OELs: a (feasible) help for the risk assessment?
Assessment of biological risks (2):
Good Practice from the Member States

- **Germany:**
  - These have proven suitable for use in livestock buildings and confirmed the high concentrations of airborne biological agents reported in the literature for this sector.

- **Netherlands:** In the agricultural sector, the project “Dust? Deal with it!” (‘Stof? Pak ‘t aan’) aims at assessing the risks from organic dust. Results available at [http://www.pakstofaan.nl/](http://www.pakstofaan.nl/)

- **France:** A risk assessment guideline has been developed for butcheries.
Expert forecast on emerging biological risks related to occupational safety and health (OSH)

About 320,000 workers worldwide die every year of communicable diseases, some 5,000 of them in the European Union (1). In the last 10 years, media coverage has raised public awareness of biological hazards, such as anthrax due to bioterrorist activities, severe acute respiratory syndrome (SARS) and the threat of avian flu. But biological agents are ubiquitous and, in many workplaces, workers face very harmful biological risks.

What are emerging risks?

An emerging OSH risk is any risk that is both new and increasing. New means that:

- the risk was previously non-existent;
- or the long-standing issue is now considered to be a risk due to new scientific knowledge or public perceptions.

The risk is increasing if:

- the number of hazards leading to the risk is rising;
- the likelihood of exposure is rising;
- or the effect of the hazard on workers’ health is getting worse.

How to identify emerging risks?

The Community strategy 2002-06 called on the agency to ‘set up a risk observatory to anticipate new and emerging risks’. The expert forecast was formulated within this context, from the results of three consecutive questionnaire-based surveys using the Delphi method. Under this method, the results of the previous survey round are fed back to the experts for further evaluation until a consensus is achieved. A five-point Likert scale was used to rate the risks. Thirty-six experts from 26 Member States, as well as Switzerland, participated in the survey. These experts had at least five years’ experience in the field of OSH and biological risks.

What are the emerging biological risks?

Two of the major concerns highlighted – the OSH risks linked to global epidemics and to drug-resistant organisms in the workplace – illustrate how important it is that biological risks are dealt with in an interdisciplinary manner, with experts from many different branches working together. 

Global epidemics

Even in the 21st century, new pathogens, such as SARS and avian flu, are emerging. Outbreaks of diseases such as cholera and yellow fever are also re-emerging. When a pathogen emerges – given the speed and volume of international traffic and trade – it can spread around the world rapidly, starting a new pandemic. As many of these diseases are zoonoses (diseases transmitted from animals to humans), the workers most at risk are those in contact with infected animals, or with faeces, dust or surfaces contaminated by their secretions. Workers involved in global trade and those exposed to infected people such as healthcare staff and aircrew are other high-risk groups.

Drug-resistant organisms

Antimicrobial agents have reduced the threat of infectious diseases. However, this achievement is put at risk from the emergence and worldwide spread of antimicrobial-resistant organisms, mainly as a result of the overuse or misuse of antibiotics. Healthcare workers are at risk due to the emergence of organisms such as methicillin-resistant staphylococcus aureus (MRSA) and extensively drug-resistant tuberculosis (XDR-TB). Resistant organisms also pose a risk to workers in contact with animals. Drug-resistant organisms lead to severe infections that would not otherwise occur and to more failures in treatment.

Poor risk assessment

This is the second most important issue identified in the survey. Despite the obligation to assess biological risks laid down by Directive 2000/54/EC, knowledge and information about biological hazards is still relatively undeveloped. Inappropriate assessment of biological risks is difficult. Better methods for international air quality

Similar exposure also occurs in traditional workplaces such as offices, which are developing together with the sector. Airborne risk factors for example, are ubiquitous indoors. Exposure to mould can lead to asthma, upper respiratory tract diseases, headaches, flu-like symptoms, infections, allergic diseases, and irritation of the nose, throat, eyes and skin. And it has been linked to respiratory diseases. More than 100,000 species of moulds have been identified but there may be as many as 15 million worldwide. Airborne moulds are also found in sewage and sewage treatment, cotton mills and the agricultural sector.

Poor maintenance of water and air conditioning systems also lead to indoor and outdoor spreading of biological risks.

This puts workers at risk of developing legionnaire disease. Some symptoms of indoor workers wrongly assumed to be caused by stress diseases are, in fact, often the result of biological agents that have developed in poorly maintained air-conditioning systems.

Endotoxins

Endotoxins can be found in all occupational settings where organic dust is present. Those at risk include workers in the livestock industry, scientists working with rodents, workers in waste and sewage treatment, and even indoor workers. The clinical effect range from fever, infectious diseases, toxic effects, allergies, CO2, chronic bronchitis, and asthma-like symptoms, to spasmodic shock, organ failure and even death.

Combined exposure to biological agents and chemicals

If the risks from biological agents are difficult to assess, those resulting from combined exposure to biological agents and chemicals pose even more problems. While the range of potential health effects is wide, it is difficult to determine which of these constraints accounts for which health effects.

Further information

This expert forecast on biological risks is the second of a series of four reports. ‘Physical risks’ has been published, ‘Chemical risks’ and ‘Psychosocial risks’ are set to follow.

The full report ‘Expert forecast on emerging biological risks related to occupational safety and health’ is available at: http://biosafety.ohsca.eu/ExpertForecast/2012/

All work carried out by the European Risk Observatory is available at: http://biosafety.ohsca.eu/ExpertForecast/2012/

Emerging Risks

Published Information

- Chemical risks
- Biological risks
- Physical risks
- Organisational, social and human risks

In this section you will find information published about research relating to emerging risks. The information is categorised by type of risk.

Some of the information represents a high degree of agreement and might take the form of review documents, guidelines, state of the art reports, etc. It generally comes from national or international level organisations whose responsibilities can cover making or enforcing policy, issuing guidelines or raising public awareness, etc. Examples include national labour inspectorates, government ministries and departments, etc.

On the other hand, some articles relate to issues where there is still some discussion ongoing or where there is significant diverging opinion. It should therefore be treated with caution. Sources can include research institutes, universities, and other national organisations whose role is biased towards research. Every effort is made to ensure that the source is reputable and all the information has undergone some type of scientific validation, such as peer review, prior to publication.

Agency report: Priorities for OSH research

- **IEQ: a research priority of the US National Occupational Research Agenda (NORA):**
  Better IEQ means health benefits for over 15 millions of the 89 millions US indoor workers, and economic benefits of USD 5 - 75 billion annually.

- **OSH risks of global epidemics**

- **Exposure assessment to biological agents, in particular in indoor workplaces including offices, construction, maintenance, recycling and processing of waste, agriculture, laboratories dealing with animals, and the food industry**
Agency report: “Respiratory disorders”

**AIM:**
To combine information from several data sources to give a complete picture of the situation in different Member States and the overall trends

**CONTENT:**
- Characteristics of respiratory disorders
- Prevalence by sector, gender, age, employment status
- Which outcome/health effect is monitored?
- What is the trend?
- Data on costs (if available)?
- International, European and national policies and practices for workers’ protection
Agency report: “Gender issues in OSH”

• Estimates that 1% of cancers in women is work-related are based on research in the 70s among men

  ⇒ Do not reflect changes in the participation of women in the labour market!

• Need for gender-specific occupational cancer research:
  – Gender differences in metabolism, genetics, and other biological factors
  – Gender differences in jobs and tasks within similar jobs
  – Risks of gynecological cancers cannot be studied among men
  – Participation in recently developed industries (e.g. semiconductor industry) not previously studied
  – Possible exposure and modifying factors from home responsibilities
2. Good practice information
European week campaigns

So far…

• 2000: Turn your back on MSDs
• 2001: Success is no accident
• 2002: Working on stress
• 2003: Dangerous substances – Handle with care
• 2004: Building in safety
• 2005: Stop that noise!
• 2006: Safe start
• 2007: Lighten the load

In the future:

• 2008: Risk assessment incl. biological risks
• 2009: Maintenance
European Week 2003: “Dangerous substances – Handle with care!”

- **Press material**
- **Website:** dedicated multilingual information resource
  http://ew2003.osha.eu.int
- **Six Fact sheets**
  - Introduction to DS in the Workplace
  - Elimination and Substitution of DS
  - Communication of information about DS
  - Respiratory sensitizers
  - Skin sensitizers
  - Biological agents
- **A Report:** Case studies of successful communication measures for the transmission of information on DS
- **Magazine**
Good Practice

Dangerous Substances

- Introduction
- Occupational Exposure Limit information
- 'SME Friendly' material
- Information by Sector
- Index by Providers
- Index by Topic
- A-Z list
- Frequently asked questions
- Forums

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Biological agents and hazards

The information provided here is broken down by country of origin. We have tried to keep these topics clear and simple.

European Organisations

EU (51)

Member States

Austria (5)
Belgium (7)
Germany (32)
Denmark (3)
Spain (16)
Finland (1)
France (36)
Ireland (4)
Italy (8)
Netherlands (1)
Portugal (3)
Sweden (7)
Czech Republic (3)
Estonia (1)
Hungary (1)
Lithuania (13)
Malta (1)
Poland (15)
Slovenia (1)

[OSHA website content related to biological agents and hazards]
Introduction

The theme for the European Week for Safety at Work 2003 is the prevention of risks from hazardous substances. The Agency is producing a series of fact sheets focusing on the communication of occupational safety and health-related information on dangerous substances including biological agents. Biological agents are found in many sectors. As they are rarely visible, their risks are not always appreciated. They include bacteria, viruses, fungi (yeasts and moulds) and parasites.

Legislation

European legislation aims to control the health risks from biological agents at workplaces.

The relevant Directive classifies biological agents into four risk categories according to their potential to cause diseases and the possibilities of prevention and treatment. The list of biological agents provides indications of allergic potential and toxic effects. Measures proposed include confinement categories for laboratory work and industrial processes.

The Directive also lays down requirements for notification of selected activities to authorities. For workers likely to be exposed to certain biological agents, employers are required to keep records including information about employee health and welfare. Workers have to be provided with access to their personal data.

These regulations are minimum requirements and have been implemented into national legislation. Some Member States have introduced Codes of Practice and guidelines for safe handling of biological agents including selected sectors and occupations. It is therefore important to refer to the relevant national regulations related to biological hazards at workplaces.

Occupational exposure limits

Currently, no occupational exposure limits have been set for biological agents, although work is under way to set limits for their toxins. The essential difference between biological agents and other hazardous substances is their ability to replicate. A small amount of a microorganism can multiply in very short time under favourable conditions.

Risk assessment, prevention and control

The directive requires the employer to:
1. assess the risks posed by biological agents,
2. measure the risks posed by them,
3. take the necessary preventive measures,
4. take an effective substitution,
5. take an effective adaption or minimisation.

When exposure to biological agents occurs:

Whenever people are in contact with:
- natural or organic materials like soil, dust, plant materials (hay, straw, cotton, etc.),
- substances of animal origin (blood, hair, etc.),
- food,
- organic dust (e.g. flour, paper dust, animal dander),
- water, wastewater,
- blood and other body fluids.

They may be exposed to biological agents.

When a work activity involves the deliberate, intentional use of biological agents, such as cultivating a microorganism in a microbiological laboratory or using it in food production, the biological agent will be known, can be monitored more easily and preventive measures can be tailored to the risk it poses to the organism. Information about the nature and effects of the biological agent used should then be included in the inventory of hazardous substances.

When the occurrence of the biological agent is an unintentional consequence of the work – this is the case in some agricultural activities – the assessment of risks that workers are exposed to will be more difficult. Nevertheless, for some of the activities involved, information on exposure and protection measures is available.

Control measures must be tailored to the working process, and the workers must be well trained to follow safe working practices.

The steps needed to reduce the risks to workers will depend on the particular biological hazard, but there are a number of common actions that can be applied:
1. Many biological agents are communicated via air, such as exhaust or forced draught. Avoid the formation of aerosols and dusts, also when cleaning or during maintenance.
2. Good housekeeping, hygiene working procedures and use of relevant warning signs are key elements of safe and healthy working conditions.
3. Many microorganisms have developed mechanisms to survive in heat, dehydration or radiation, for example by producing spores. Include decontamination procedures, use of appropriate equipment for cleaning and decontamination of fluids and materials.
4. Take appropriate hygiene measures.

In some cases preventive measures include vaccination to be provided to workers on a voluntary basis.

Record your findings

Review and revise your assessment where necessary, when there are significant changes in materials, equipment, work methods, locations of people involved or if there are accidents or complaints associated with the work.
EW 2008: Risk Assessment

- Report: Review of existing and developing regulations for biological agents, incl. OELs
- 2 web articles:
  - Risk assessment of biological agents
  - Prevention of accidents in laboratories, incl. biological hazards:
    Legislation, Examples of laboratory accidents, Examples of prevention measures

“A 22-year-old employee at Primate Research Center in the US died of complications from the herpes B virus. Her eye was splashed with an unknown substance as she was moving a caged rhesus. This substance inflamed her eye and she died four weeks later. She did not wear eye goggles...”
What can we do together?

- Promote your web information through our website
- Welcome your contribution for the European week 2008 on Risk Assessment:
  - Good practice award
  - Article in the Magazine
  - Speech at the closing event
- You are welcome to use and promote our material!
- ...
Thank you for your attention!

Let’s stay in touch!

http://osha.europa.eu/OSHA