

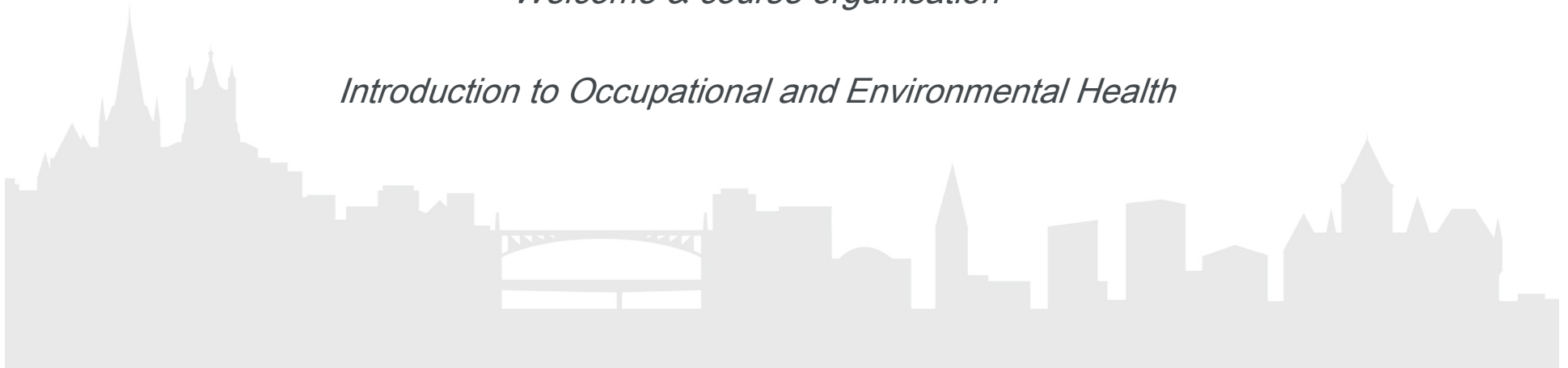
unisanté

# Occupational and Environmental Health

David Vernez

*Welcome & course organisation*

*Introduction to Occupational and Environmental Health*



# Unisanté

- About 900 employees
- All public health and community health activities in Vaud
- Affiliated to the University of Lausanne

## DSTE

- Applied research, education
- Specialized medical consultations
- Services to companies
- Hygienists, toxicologists, chemists, environmental engineers, biologist, ergonomists, physicians, psychologists...



# Course outline

## Overview of Health Risks by categories

- Chemical substances
- Physical agents
- Physico-chemical agents
- Biological

## Specific topic

- Climate change and health
- Health interventions
- Indoor air quality

Course program SIE EPFL 2025							Exercices	Theory
08.09	15.09	22.09	29.09	6.10	13.10	20.10	27.10	
Intro	Chemicals - properties	Public holiday	Chemical - intake, toxicology	Chemicals - assessment and control	Physico-chemical - particles and fibres	Public holiday	Physico-chemical - particles and fibres	
				presentation	presentation		presentation	
03.11	10.11	17.11	24.11	01.12	08.12	15.12		
Biological risks	Physical agents - noise and vibration	Physical agents - thermal	Physical agents - non ionising radiation	Physical agents - extreme environments	Climate change and health	Health risk interventions		
presentation	presentation	presentation	presentation	presentation	presentation			

# What will I learn ?

- To understand the **health impacts** of some environmental determinants
- To be able to identify **hazardous situations** associated with environmental pollutants
- To be familiar with how occupational and environmental risks **are quantified** and managed



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# Introduction

## Occupational and Environmental Health (OEH)

*Context of OEH*

*Issues at stake*

*Legal and organizational framework*

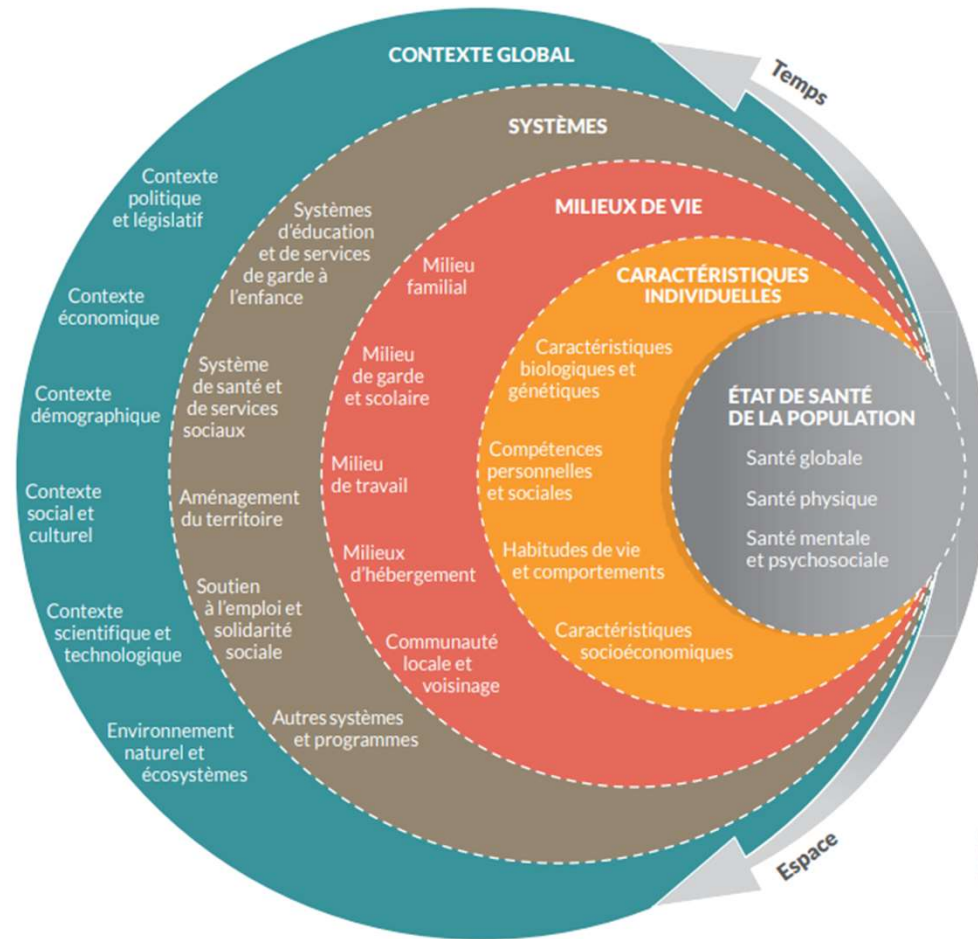
*Risk assessment*



# Context

## Concept of health determinants

- scope of health determinants across global, systemic, living environment, and individual levels
- Environment(s) is a key determinant of health
- **Public health engineering**, applies engineering principles to reduce health risks (through primary prevention)



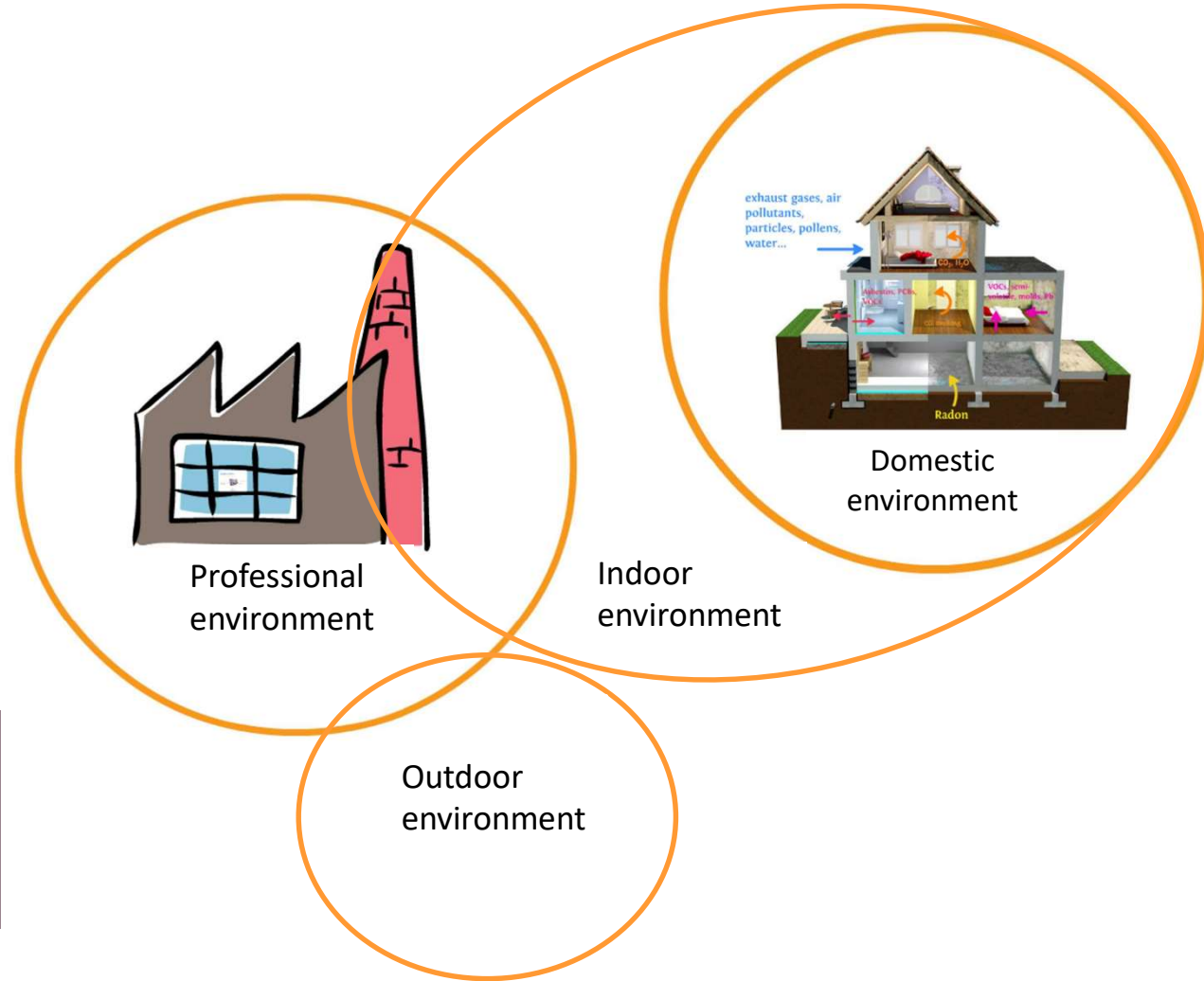
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Source: INSPQ

# Context

## Our living environment

Where do we spend our time ?



**Question**  
Can you give example of exposure situations in each domains ?

# Context - Definitions

## Occupational health

Occupational Health is the promotion and maintenance of the highest degree of **physical, mental and social well-being** of workers in all occupations by preventing departures from health, controlling risks and the adaptation of work to people, and people to their jobs.

WHO/ILO 1950

## Environmental health

Those aspects of the human health and disease that are determined by **factors in the environment**. It also refers to the theory and practice of assessing and controlling factors in the environment that can potentially affect health.

WHO 1989

# Context - Genesis of OEH

460-380 av JC

**Hippocrate**

Lead poisoning of miners and metalworkers.

Air quality in the environment.

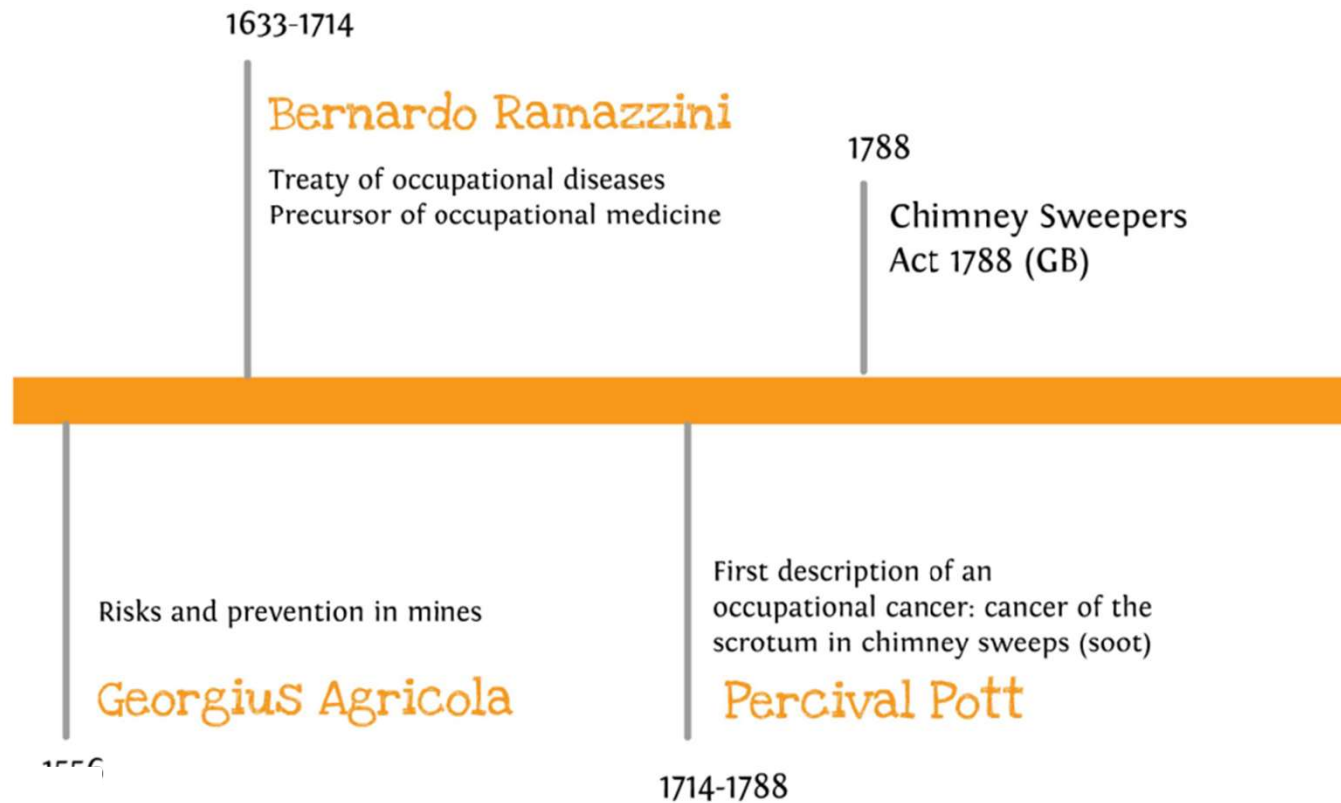
23-79 ap JC

**Pline l'ancien**

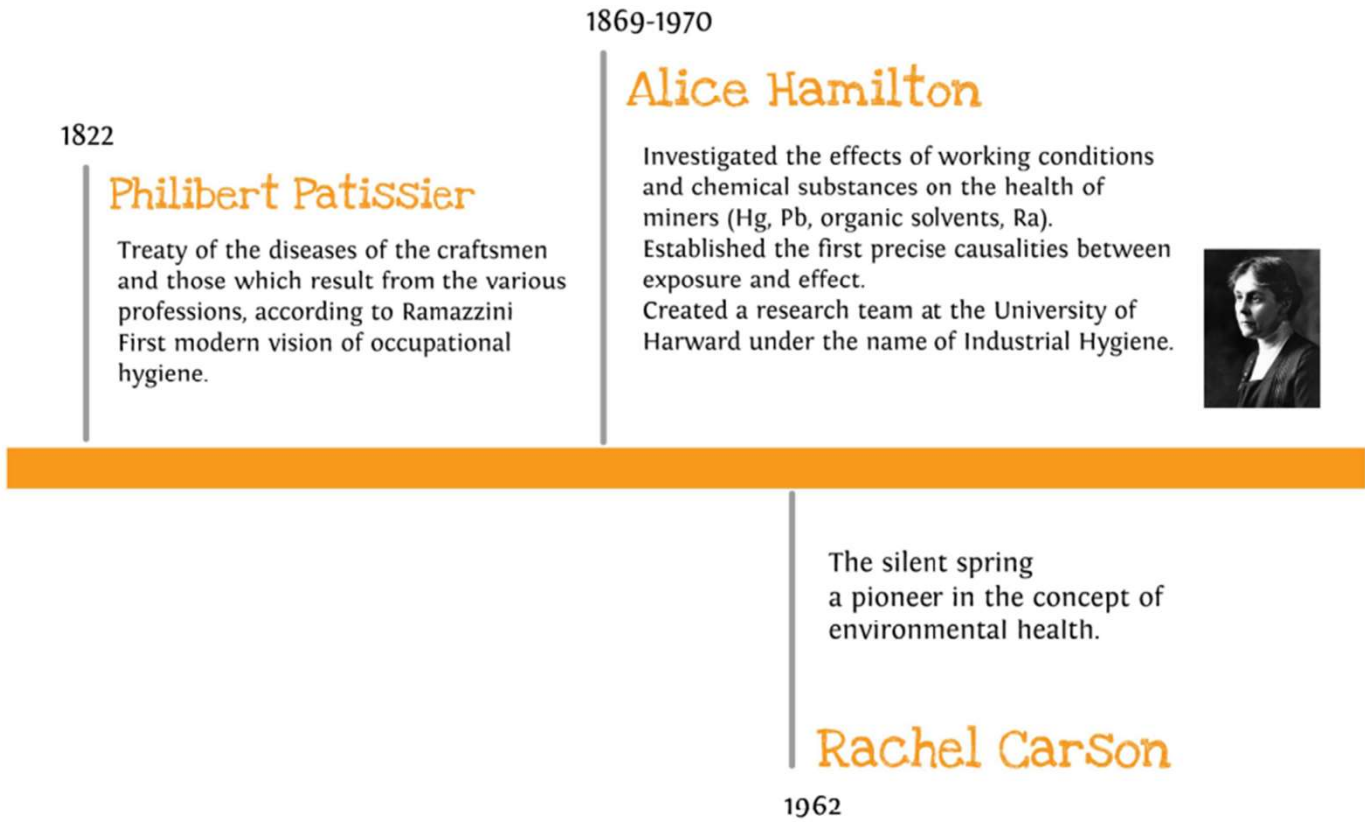
De historica naturalis  
(sheepskin bladder to protect  
against lead fumes)



# Context - Genesis of OEH



# Context - Genesis of OEH



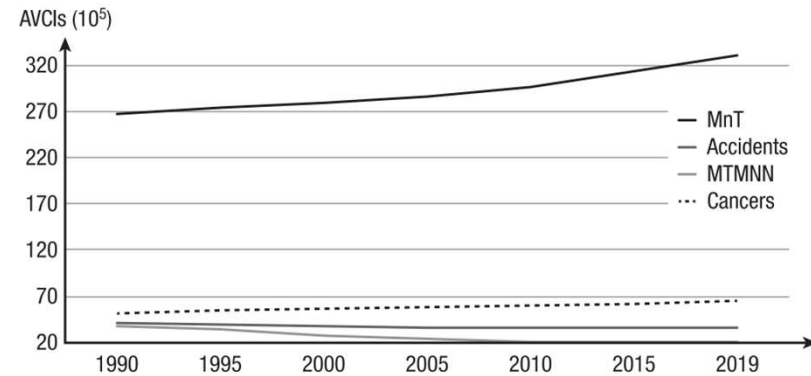
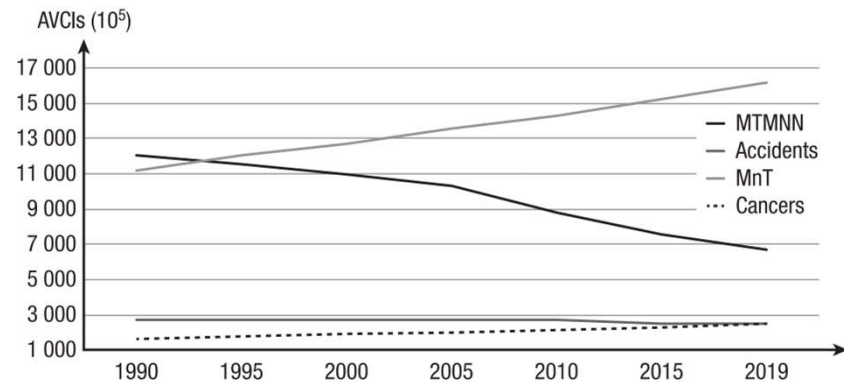
# Context – Evolution of public Health

- Public Health 1.0 (Late 19th - Mid 20th Century): Focused on environmental hygiene and combating infectious diseases (antibiotics, vaccines).
- Public Health 2.0 (Late 20th Century): Established dedicated organizations, essential functions, specific competencies, and performance standards.
- Public Health 3.0 (Current Expansion): Broadens action beyond health organizations to other sectors. Orchestrating intersectoral responses and partnerships to influence environmental, social, and economic determinants.

# Context – Evolution of public health

- Public Health: Emergence of concepts like "Medicine 4.0" and "Precision Public Health," integrating digital advancements (connected objects, big data) and genomics

Evolution of the burden of disease (in DALYs): a. Worldwide, b. OCDE countries

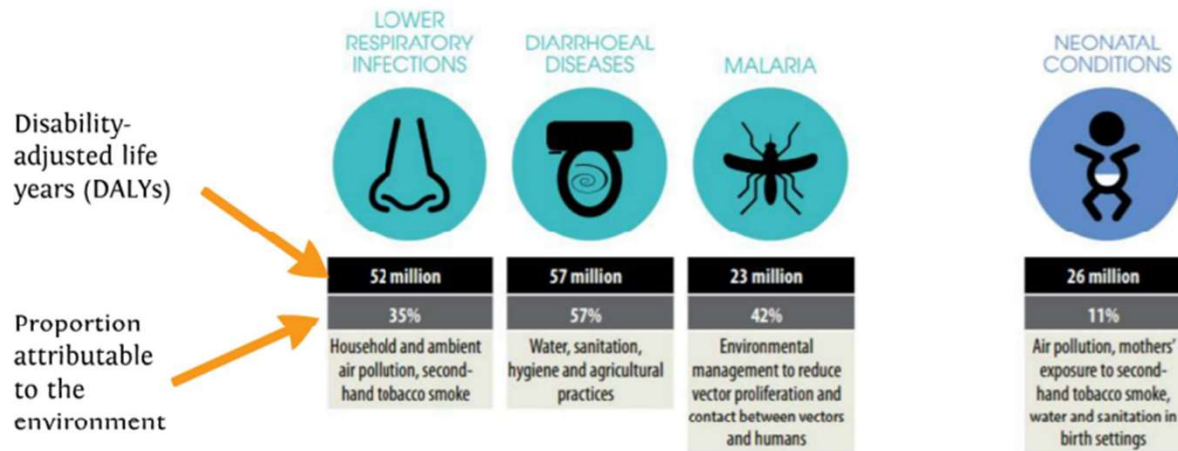


Source: environnement et santé publique (2023)

# Issues at stake

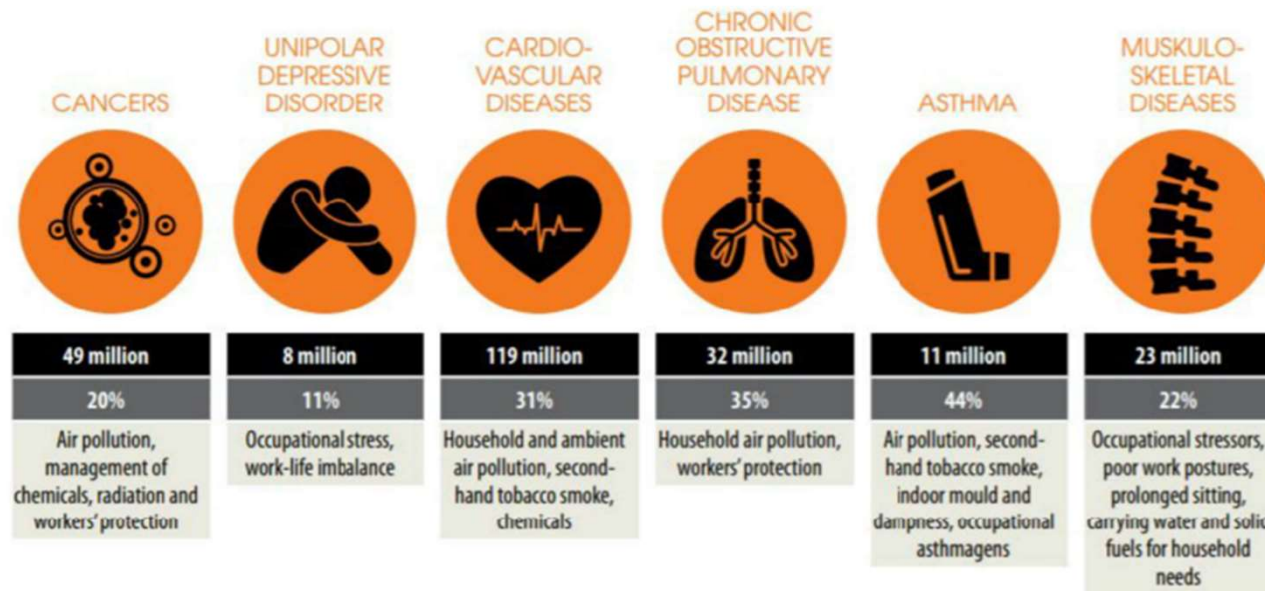
## Environment - Burden and health impacts

- 24% of all death are related to the environment



# Issues at stake

## Environment - Burden and health impacts



# Issues at stake

Occupational health – Risk factors



## Traditionals

- Chemicals
- Gases, vapors
- Mists, aerosols
- Physical agents
- Noise, vibrations
- Temperature, humidity
- Radiation
- Accidents, safety
- Ergonomics of workstations

## Emerging

- Work organization
- Psychosocial factors
- Repetitive movements
- Biological agents
- Physical effort
- Night work and flexibility
- etc.

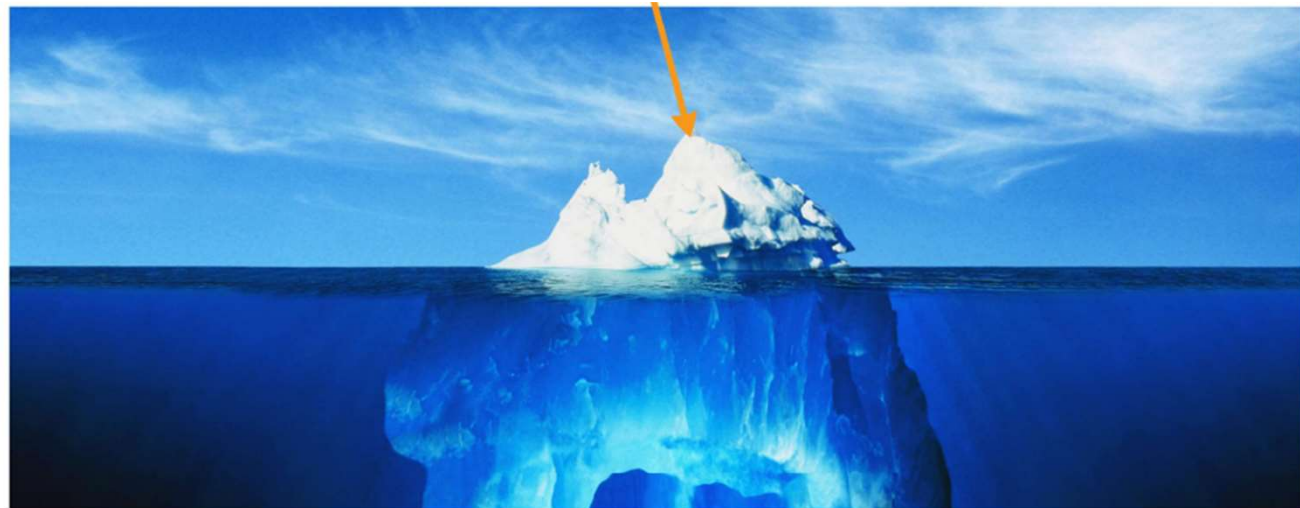
# Issues at stake

## Occupational health – Impact

- Active population  
5.07 Mio
- Accidents leading  
to work  
interruption
- Predominance of  
skin and  
respiratory  
diseases

## Occupational diseases and accident recognized/year in Switzerland (2022)

293'132 accidents  
14'251 diseases  
2'287 diseases (excluding infections)  
534 deaths



# Issues at stake

## Occupational health – Impact

Under-  
recognition  
phenomenon

### Question 1.a

Can you imagine  
situations leading to  
under-reporting of  
occupational injuries ?



# Issues at stake

## Occupational health – impact (perceived)

- > 30% of European workers declare that work affects their health
- Prevalence of EU workers exposed >25% of the time

*Traditional risks still present, little change over time*

	2005	2010	2015
<i>Proportion of workers in EU28 exposed one-quarter of the time or more (%)</i>			
Vibrations from hand tools, machinery	24	23	20
Noise so loud that you would have to raise your voice to talk to people	30	29	28
High temperatures which make you perspire even when not working	25	22	23
Low temperatures whether indoors or outdoors	22	23	21
Breathing in smoke, fumes (such as welding or exhaust fumes), powder or dust (such as wood dust or mineral dust)	19	17	15
Breathing in vapours, such as solvents and thinners	11	10	11
Handling or being in skin contact with chemical products or substances	14	15	17
Tobacco smoke from other people	20	11	9
Handling or being in direct contact with materials which could be infectious, such as waste, bodily fluids, laboratory materials, etc.	9	11	13
Tiring or painful positions	46	46	43
Lifting or moving people	8	9	10
Carrying or moving heavy loads	35	34	32
Repetitive hand or arm movements	62	63	61

European Working Conditions Survey (EWCS 2015)

# Issues at stake

## Occupational health – Attributable fraction

- Lack of indicators, indirect relationships, non-specific diseases, lack of knowledge

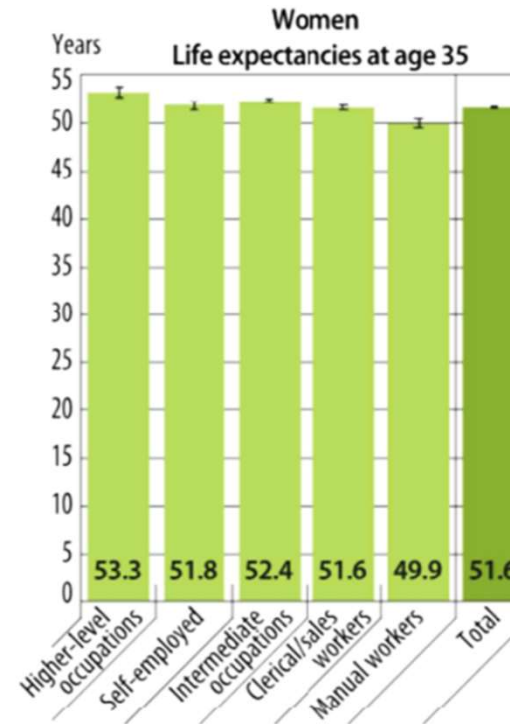
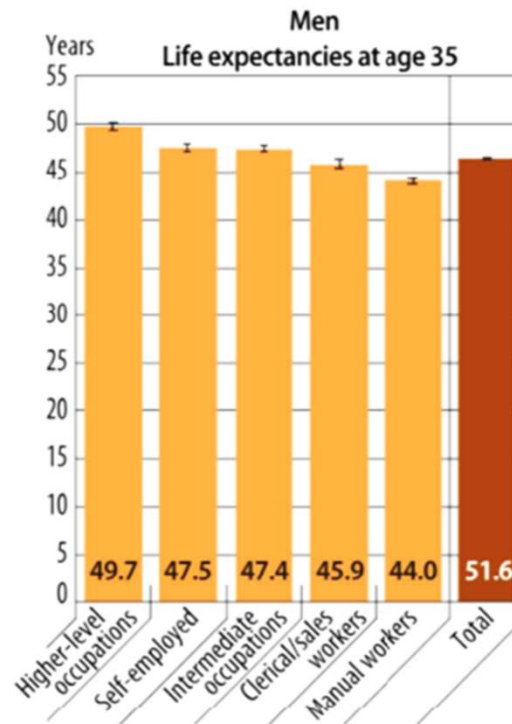
Disease	portion attributable to work
musculoskeletal disorders (MSD)	33 %
cardiovascular diseases	5-20 %
of which night work	7 %
psychological diseases	10 %
cancers (mortality)	4-10 %



# Issues at stake

## Occupational health – Impact

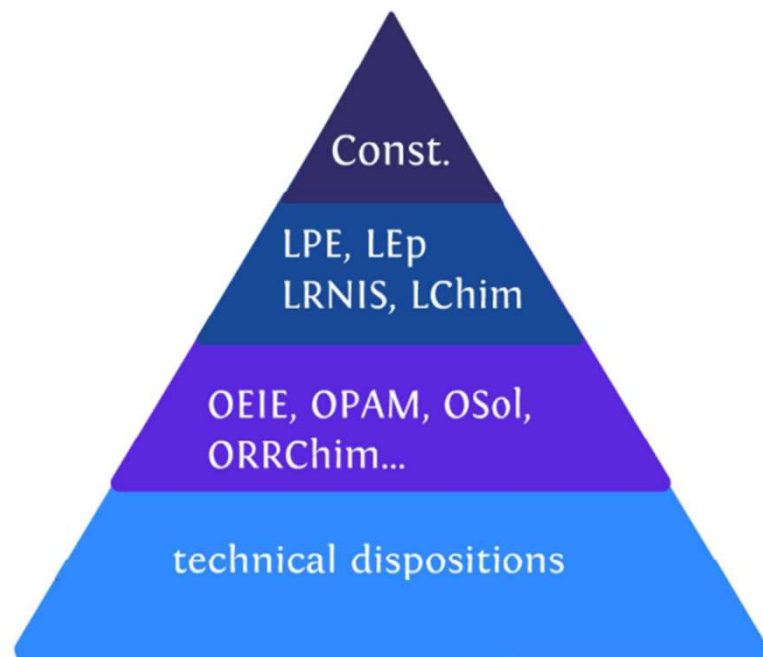
Life expectancy at the age of 35 (France) per sex and occupational class



Source: Bonnet et al. 2023

# Legal framework (in Switzerland)

## Environnement - health related legislation



Legislation (LPE): protection of humans, animals and plants. Conservation of resources and biodiversity

Executive authorities (Federal offices)

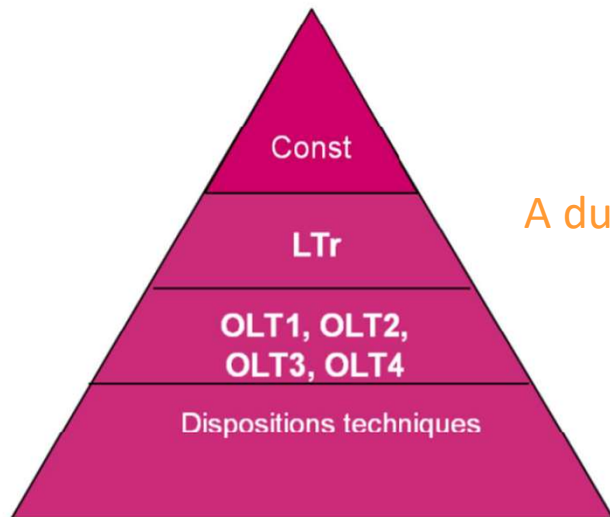
FOEN (environment) soil, water, air, natural hazards, environmental and health protection

FOPH (health): health and accident insurance, chemicals, medicines, health promotion, radiation protection, etc.

# Legal framework

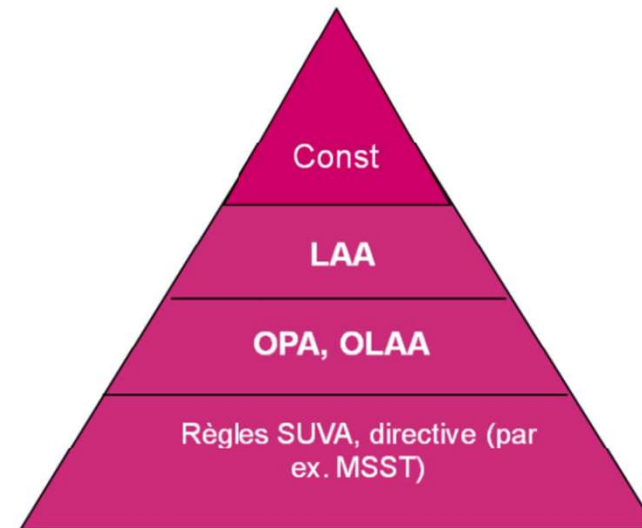
## Occupational health – work-related legislation

Labor Law (LTr): Health protection, working hours and rest periods, approval of plans



A dual system

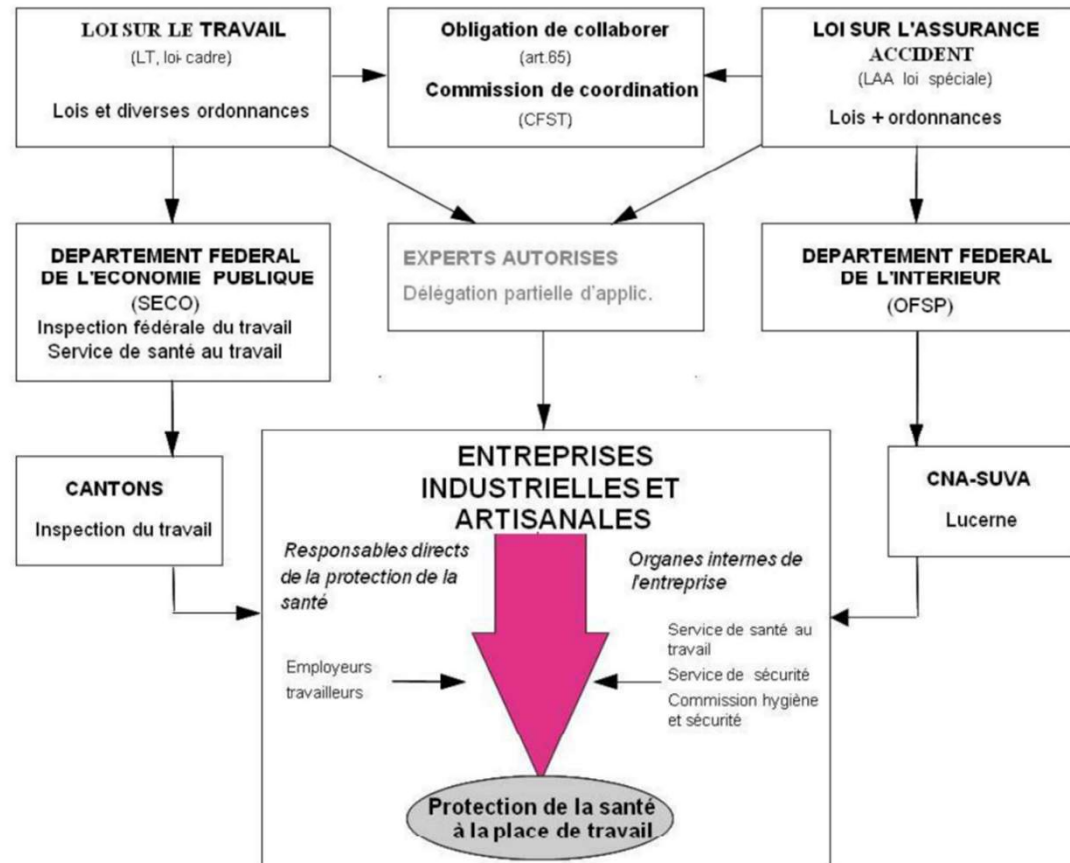
Accident insurance Law (LAA): recognition, prevention and occ. Disease



# Legal framework

## Occupational health – organization of the legal system

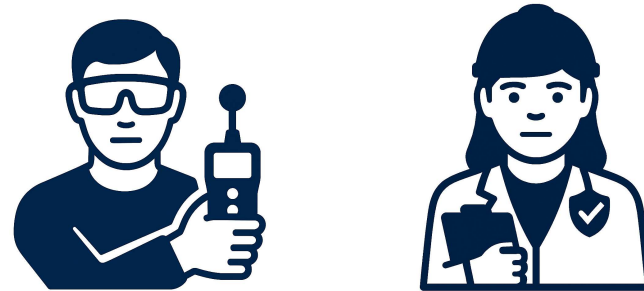
*Common ground: “the employer is obliged to take, in order to prevent occ. accidents and diseases, all measures which experience has shown to be necessary, which the state of the arts allows to be applied, and which are suitable of the given conditions” (Art. 82 LAA).*



# Legal framework

## Occupational health – Directive CFST 6508

- Applicable to all enterprises
- Except companies with fewer than 5 workers and subject to a premium rate of up to 5‰  
355'000 enterprises
- Defines the company's obligations in terms of safety organization and the use of specialists.  
Safety engineers/officiers, hygienists, occupational physicians
- Obligations according to the size of the company and the presence of specific hazards  
Solvents or chemicals in large quantities  
Special or industrial waste  
Work with harmful substances according to the exposure limit values at the workplace...



Mandatory call to recognized specialists

Mandatory risk assessment

# Legal framework

## Occupational health – recognition of specialists

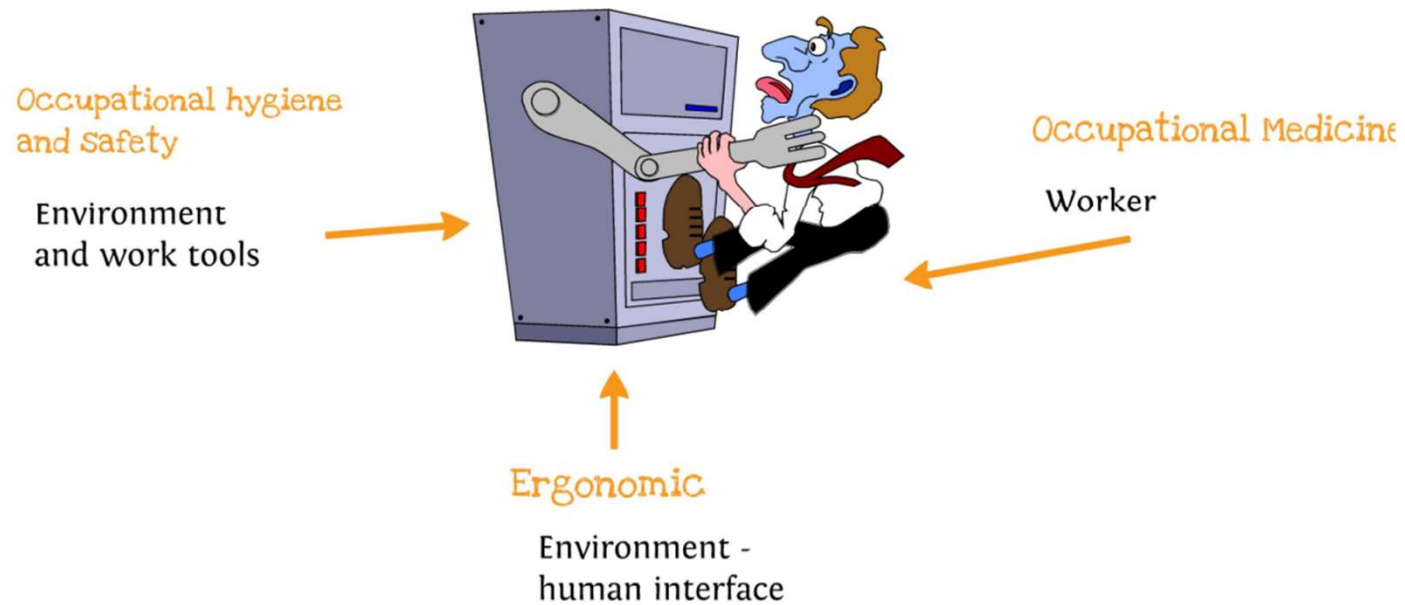
- A multi-disciplinary domain
- Recognized specialist covers only a part of it



recognized specialists in occupational health and safety

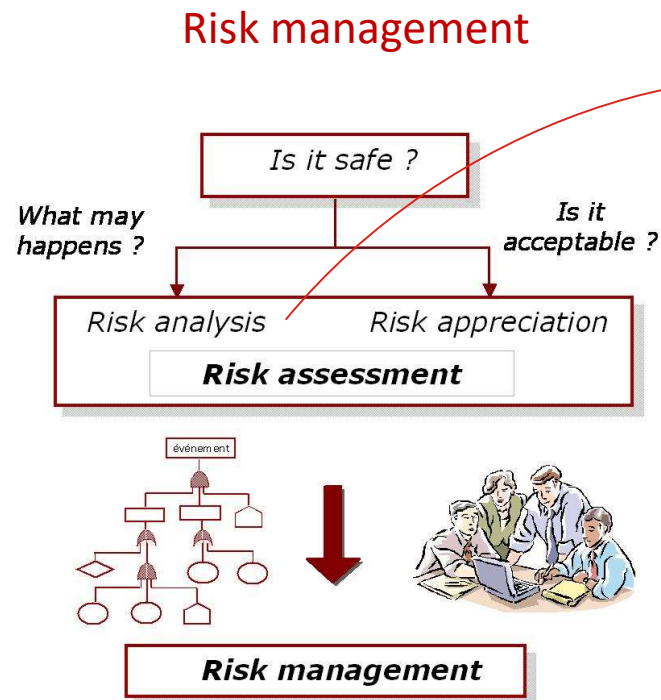
# Legal framework

Occupational health – domains of the different specialists

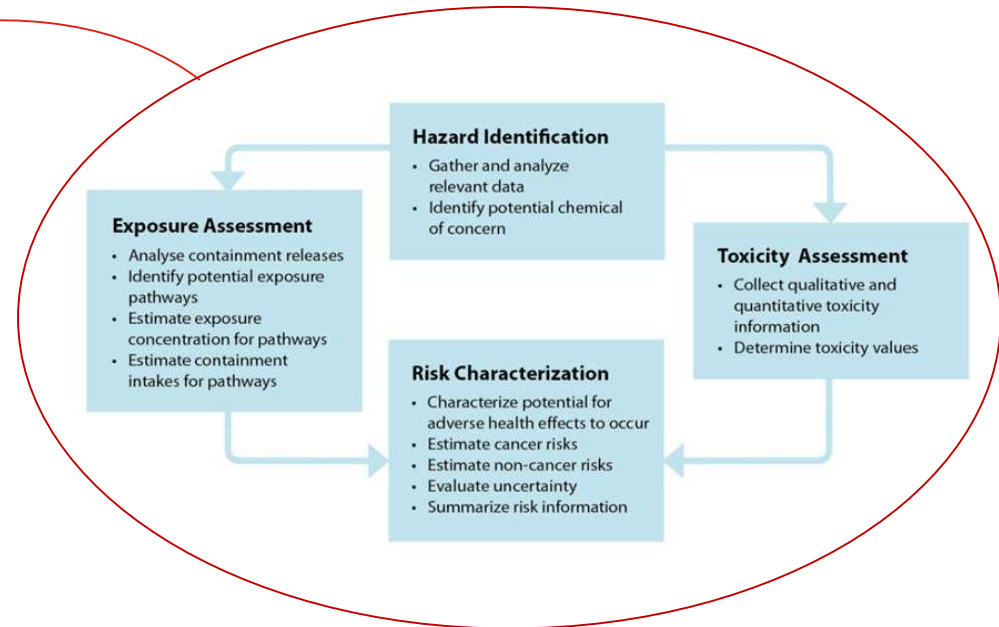


# Risk assessment

## General framework and principles



## Risk analysis (chemical risk)



# Risk assessment

## Example - emergency care facility

### Assessment process

- Delimit the assessment perimeter
- Identify hazards
- Quantify the risk
- Assess the risk

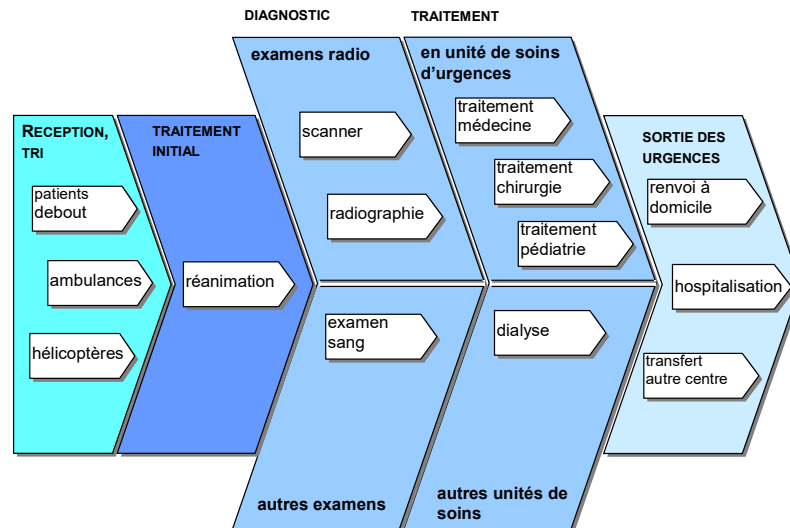


# Risk assessment

## Example - emergency care facility

### Limits

- Activities relating to the treatment of patients



- Included
  - All service personnel
  - All materials and equipment necessary for the care and treatment
- Excluded
  - external staff
  - processes other than the management and treatment of patients

# Risk assessment

## Example - emergency care facility

### Hazard identification

- Mechanical  
*moving beds, movement of people, syringes, cuts*
- Chemical  
*drugs, anesthetic gases, allergens ...*
- Physical  
*noise, radiation, pressure vessels ...*
- Biological  
*Pathogens (blood, urine, aerosols ...)*
- Mental / emotional  
*Difficult situations, assault, travails in emergencies, responsibilities, management by upstream*



# Risk assessment

- Moving beds

N°.	Activity	Nr.	Hazardous event or hazardous phenomenon	Damage	quant.		Zone	Comments
					G	P	1-3	
2.4	send to a nursing unit or examination	2.4.2	being cheated on foot	crushing (toe, foot)	IV	B	2	already occurred, beds of 200-300 kg

- Contaminated objects

3.2	patient care	3.2.1	cut with a potentially contaminated object (broken glass, scalpel)	hand cut, viral infection (hepatitis B)	III	B	1	
				hand cut, viral infection AIDS)	I	C	I	low risk of HIV transmission

- Every risk is a study by itself !

# Risk assessment

## Example - emergency care facility

- Chronic discomfort, work environment (stress, fatigue, ...)
- Small and frequent accidents (mechanical, assault)
- **Serious but rare accidents (contamination)**

### Question 1.b

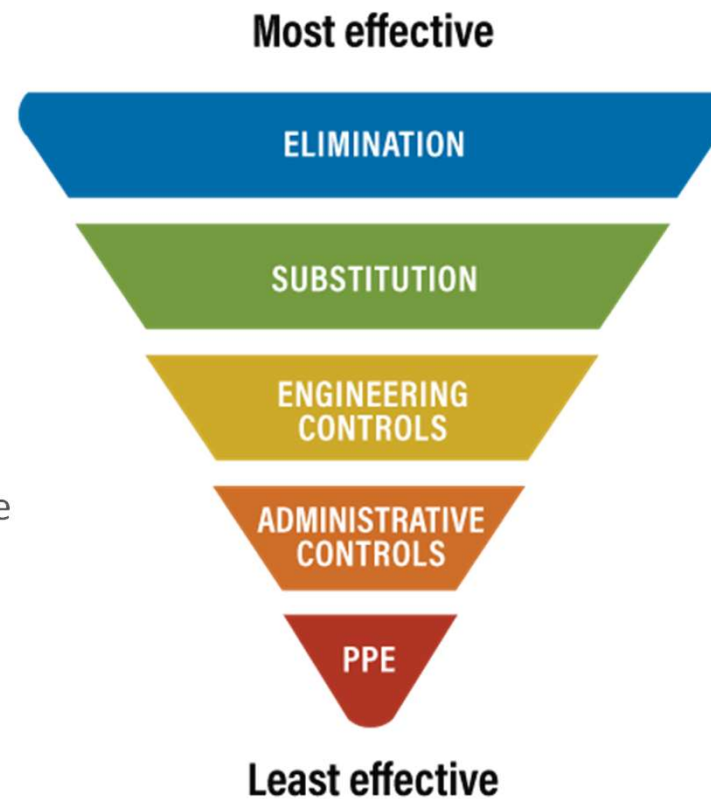
How do you rank chronic exposures ?

		SEVERITY				
		V	IV	III	II	I
L I K E L I H O O D D E	A	0.1.2, 1.2.2, 3.1.3, 3.4.4, 5.1.1, 5.5.1	0.1.4, 1.1.1, 1.3.1, 3.2.3,			
	B	0.1.5, 0.1.7, 1.2.1, 2.1.2, 3.1.5, 3.2.11, 3.4.1	0.1.1, 0.1.6, 1.2.2, 1.4.2, 1.4.3, 1.4.4, 1.5.1, 2.2.3, 2.2.4, 2.3.2, 2.3.3, 2.4.1, 2.4.2, 2.4.3, 2.4.4, 3.1.1, 3.1.2, 3.1.4, 3.4.2, 3.4.3, 5.3.7, 0.1.8	3.2.1 a, 3.2.5, 3.3.3, 5.3.3,		
	C	3.2.13, 5.4.1	0.1.3, 2.1.1, 3.1.4, 3.2.9, 3.2.15, 5.3.2, 5.3.5, 5.3.6	1.1.2, 1.4.1, 1.4.5 a, 2.2.1 a, 2.2.2, 2.3.1, 3.2.2 a, 3.2.4 a, 3.2.7, 3.3.2 a, 5.5.3		3.2.1 b, 5.3.1,
	D		5.2.1, 5.2.2, 5.3.2	3.2.6, 5.3.8, 5.4.2, 3.2.14		1.4.5 b, 2.2.1 b, 3.2.2 b, 3.2.4 b, 3.2.10, 3.3.2 b, 5.3.4,
	E		3.2.8	3.2.12		3.3.1,

# Risk assessment

## Hierarchy of control measures

- Source Control: Elimination, Substitution (replacing dangerous substances), Engineering controls (e.g., local exhaust ventilation, enclosure/containment)
- Pathway Control: General ventilation, engineering modifications, isolation
- Administrative/organizational measures (reduce exposure time, training, information),
- Personal Protective Equipment (PPE) (e.g., respirators, hearing protection)



Source: CCOHS

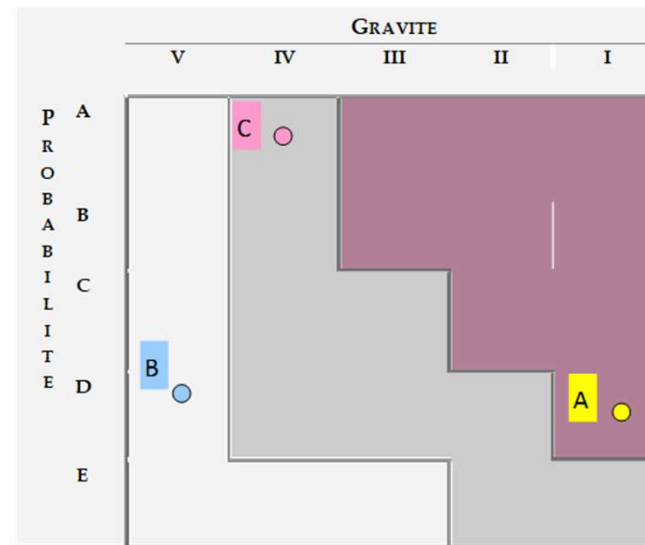
# Risk assessment

## Example – Industrial bakery

- A transportation company and fuel delivery (truck) commissioned an analysis of occupational risks by a safety engineer.
- The risk matrix obtained highlights three main hazards.

### Question 1.c

what preventive measures would you recommend and why ?



- A** getting caught/dragged into the dough mixer
- B** being exposed to heat (working near ovens)
- C** slipping on the tiles, risk of falling or hitting a sharp edge (furniture, machines)