Role of trainings and education in reducing biological risks: where do we stand in Turkey?

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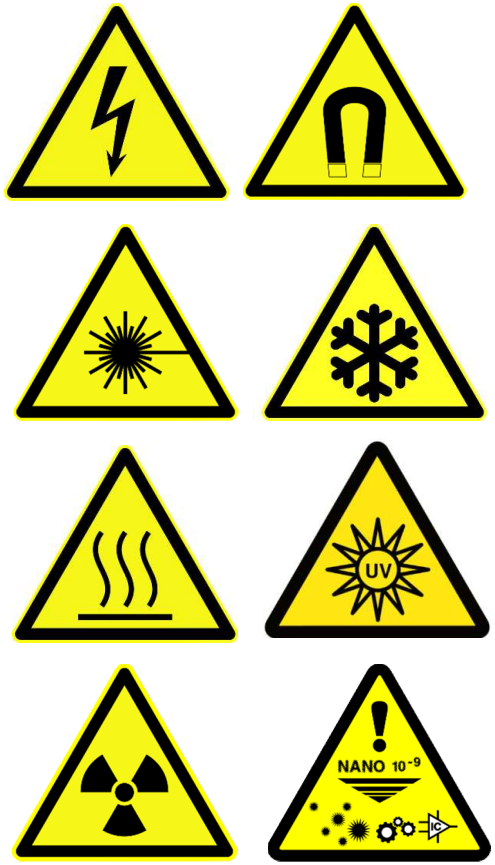
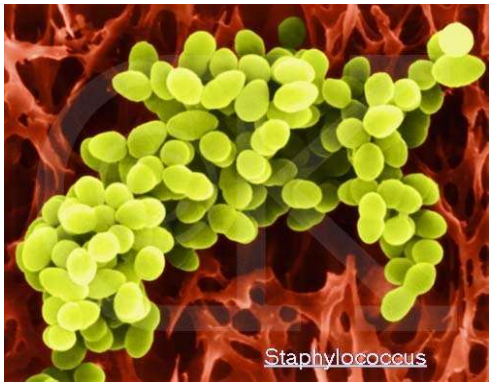
Laboratory hazards

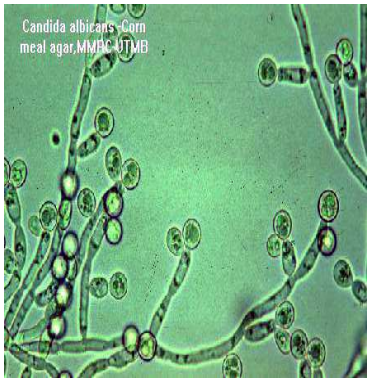
- **Chemicals**
- **Lasers**
- **Magnetic fields**
- **Thermal hazards (hot and cold)**
  - Bunsen burners
  - Hot items / Hot surfaces
  - Autoclaves
  - Ultra low freezers
  - Liquid nitrogen
- **Radiation:**
  - UV
  - Radioisotopes / X-ray machines
- **Nano materials**
- **Biological hazards**



Biological agents

- Bacteria
- Viruses
- Parasites
- Fungi
- Prion proteins
- Cells and cell lines
- Genetically modified micro-organisms
- Laboratory animal allergens





Biosafety (Biyogüvenlik)

- Containment principles, technologies, and practices that are implemented to prevent the **unintentional exposure** to biological agents and toxins, or their **accidental release**

adapted from WHO/CDS/EPR/2006.6

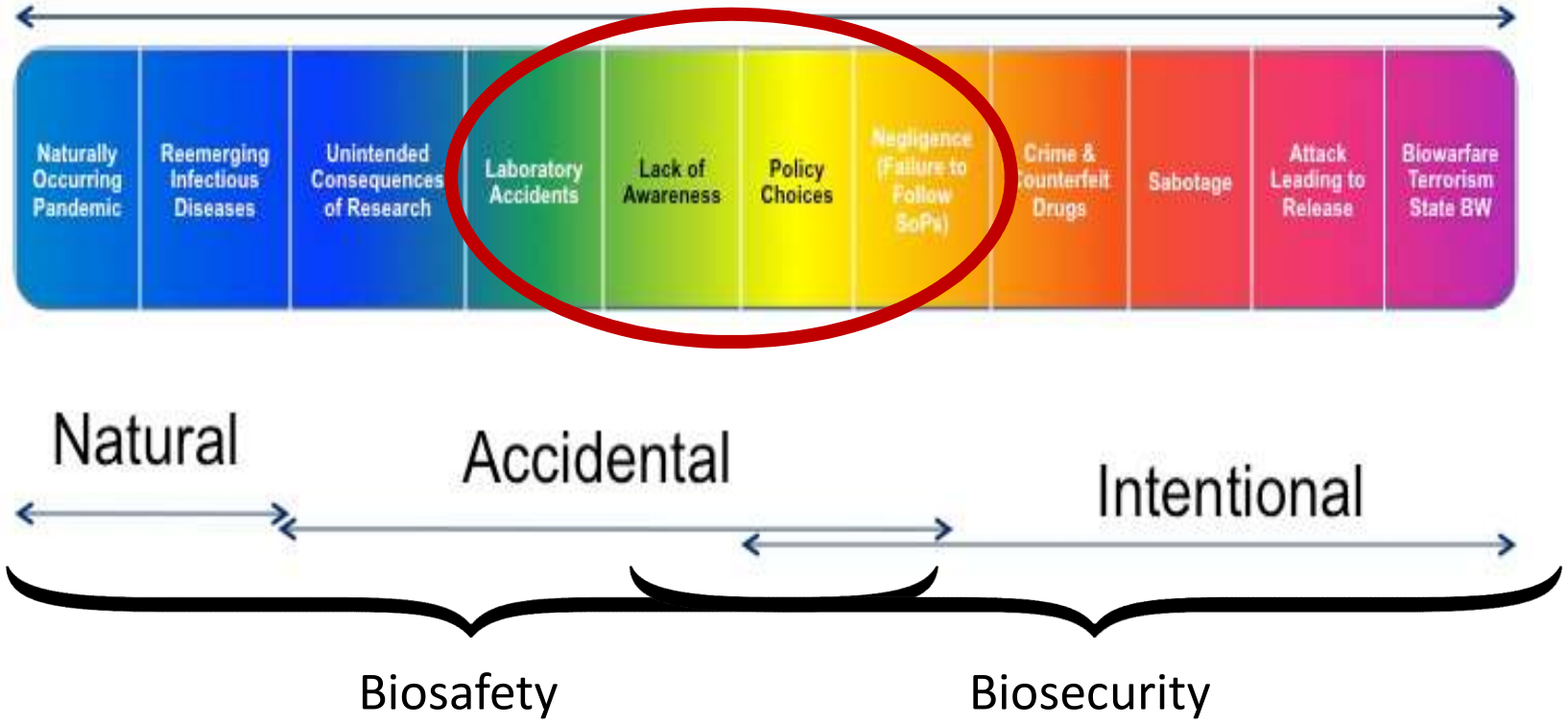
Biosecurity (Biyoemniyet)

- Protection, control, and accountability for biological agents and toxins within laboratories, in order to prevent their loss, theft, diversion of **unauthorized access**, or **intentional unauthorized release**

Biosafety is to keep bad bugs from people
Biosecurity is to keep bad people from bugs

adapted from WHO/CDS/EPR/2006.6 and CWA 15793:2011

Spectrum of biosafety & biosecurity



Threats for humans, animals and the economy

Classification: Risks Groups

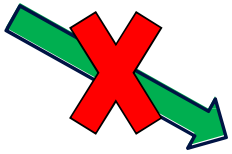
- Category 1 **(Yeast, E.coli K12, Lactobacillus bulgaricus)**
- Category 2 **(Staphylococcus aureus, Adenovirus, Epstein-Barr virus)**
- Category 3 **(M. tuberculosis, HBV, E.coli O157/H7, Leishmania brasilensis, L. donovani, Echinococcus spp., Plasmodium falciparum)**
- Category 4 **(Lassa, Marburg, Ebola, Variola major virus (small pox), Junin virus**

RG	Individual risk	Community risk[a]	Microorganism	Treatment and prevention[b]
1	No or very low	No or very low	Unlikely to cause human or animal disease	-
2	Moderate	Low	Can cause disease	*Often* Available
3	High	Low	Usually causes serious human disease	*May be* Available
4	High	High	Usually causes serious human disease	*Not usually* available

Directive 2000/54/EC of the European Parliament

Biosafety Levels

Risk category 1,2,3,4



Biosafety level 1,2,3,4

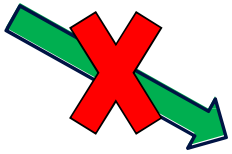
- **A robust risk assessment → Biosafety Level:**
  - activities being conducted
  - the biological agent(s) involved
  - the at-risk host (s)
  - the specific primary and secondary engineering controls that are in place

Biosafety Levels

Biosafety level	Laboratory type	Laboratory practices	Safety equipment
Basic – Biosafety Level 1	Basic teaching, research	GMT	None; open bench work
Basic – Biosafety Level 2	Primary health services;diagn. research	GMT plus protective clothing, biohazard sign	Open bench plus BSC for potential aerosols
Containment Biosafety Level 3	Special diagnostic, research	As Level 2 plus special clothing, controlled access, directional air flow	BSC and/or other primary devices for all activities
Maximum Biosafety Level 4	Dangerous pathogens unit	As level 3 plus airlock entry, shower exit, special waste disposal	Class III BSC Positive presure suit + BSC II Double door autoclave Filtered air

Biosafety Levels

Risk category 1,2,3,4



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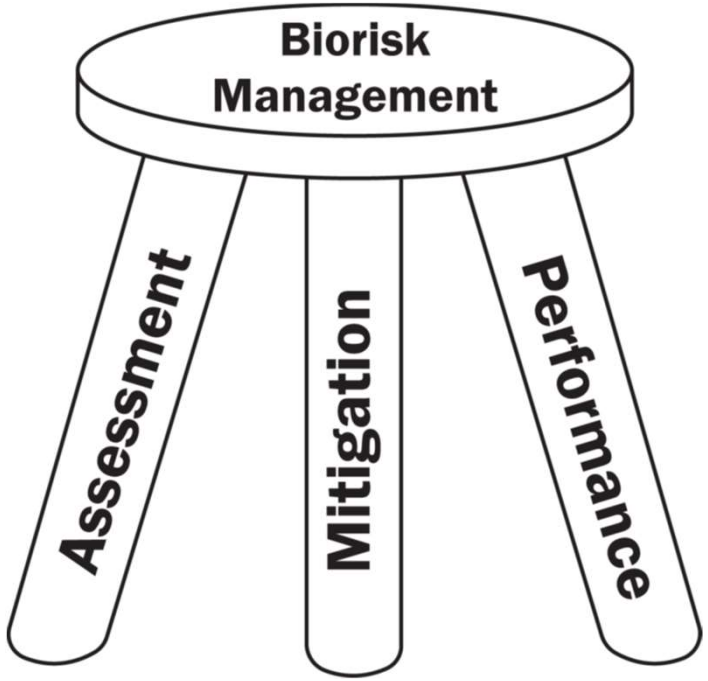
Risk Assessment

At the most basic level, assessing a risk involves answering the following questions (Kaplan and Garrick 1981):

1. **What can go wrong?**
2. **How likely is it?**
3. **What are the consequences?**

Consequences of exposure/ release	Severe	Moderate	High	Very high
	Minor to Major	Low	Moderate	High
	Negligible	Very low	Low	Moderate
		Unlikely to happen	Possibly could happen	Likely could happen
		Likelihood of exposure/release		

Biorisk Management

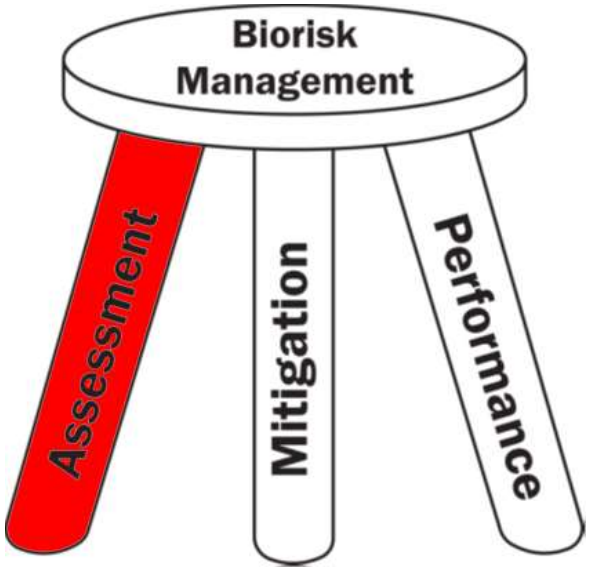


- **Biorisk management** is a system to control safety and security risks associated with the handling, storage and disposal of biological agents and toxins in laboratories

- **The AMP model** was first articulated by the World Health Organization in its Biorisk Management Advanced Trainer Programme, developed and first executed in 2010

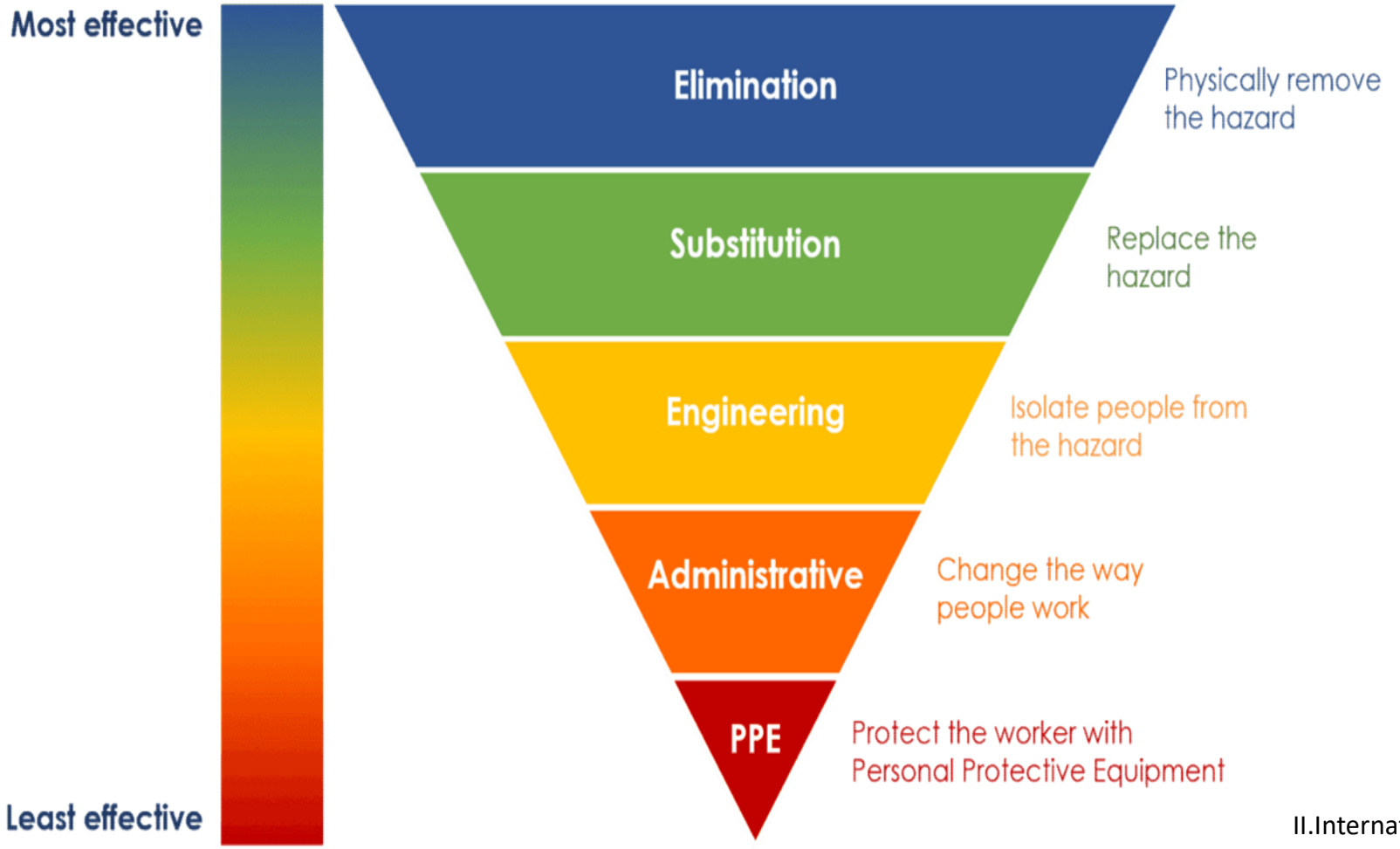
http://www.who.int/ihr/training/biorisk_management/en/

Biorisk Management - Assessment

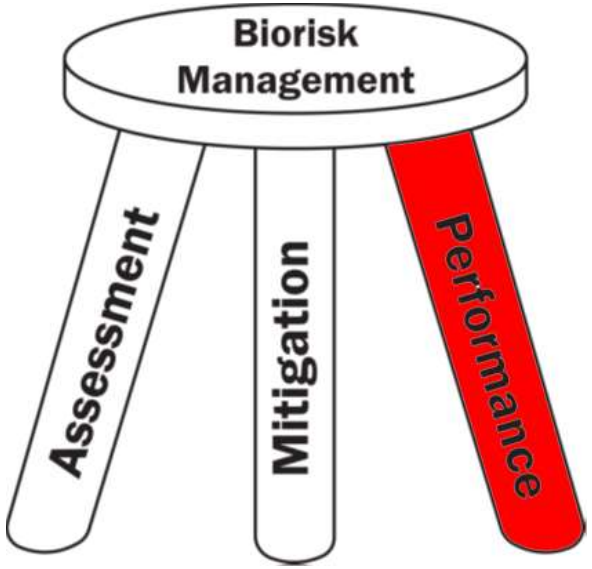


- A risk assessment is the fundamental process to help determine, mitigate, and manage laboratory risks to an acceptable or manageable level

Biorisk management: Mitigation



Biorisk Management - Performance



- The primary goal is to ensure that the implemented mitigation measures are indeed reducing or eliminating risk

Final target

Key success factors

- Commitment by the top management
- Roles and responsibilities are clearly set out and understood
- Focus on continual improvement

Biomedical laboratories and Biorisks, Turkey

- Biosafety and Biosecurity education and training, although there is a rise in the high containment laboratory numbers in the last decade, has not been systematically and specifically settled in Turkey

Numbers of BSL2 laboratories	**> 1000**
Numbers of BSL3 laboratories	**9**

Challenges ahead: Current risks

Mechanical pipetting still present in 30 %
Microinsinerator/ disposable spreaders present in 30 %
Appropriate biosafety cabinets present only in 7 %
Certified/Educated staff in charge only in 46 %
Biosafety training rate of laboratory staff 28 %
Compliance with BSL2 certification present only in 2%
Non-compliance with GLP present in 50%
No centralized national database for laboratory-acquired infections
Workers in BSL-3 laboratories are not under medical surveillance and not provided relevant vaccines

Challenges ahead: laboratory diagnosis

Emerging/Re-emerging diseases determined in Turkey,
in the last 15 years:
Avian Influenza
Chikingunya Fever
Crimean-Congo Hemorrhagic Fever
Hanta
Papatasi Fever
West Nile fever

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Challenges ahead: education and training

- Biosafety and Biosecurity training and certification
- For every researcher/staff in touch with infectious agents
- Trainings must be compatible with the lab's BioSafetyLevel
- Refresher trainings
- **Biosafety Expert**

Marmara University Institute of Health Sciences

Biosafety and Biosecurity MSc Program

- National Biosafety and Biosecurity Association
- Integration to regional BS Federations
- Awareness among researchers and **Funders**
- Contributions for Legal/State level regulations

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