Lesson Tasks

- Risks and safety measures in the research lab.
- Organization laboratory and instrumentation.
- Agent risk.
- Emergency plan.
- Waste management.
In this lesson you will learn:

- Purpose of safety.
- Field of application of safety.
- Protections versus risk.
- Types of Protections.
- Learn about the proper use of the correct PPE for specific risk.

... I HOPE SO!
**Safety Organization**

The sequence of events
"SAFETY" is defined as the total absence of danger, however it is a utopia. Thus practically unattainable, it must be understood as a dynamic system that covers four main areas.

Types of Risk

- The types of risk present in SISSA can be classified into:
  - Conventional Risk:
    - common to Companies with mechanical/electrical systems and similar workshops/laboratories;
  - Specific risk:
    - specific to Neuroscience laboratories.
• Mainly physical and electrical risk and allergy risk!
Electrophysiology

- Mainly laser risk!

Molecular Biology Labs
Precautions for safeguard maternity

*Risk factors that are not compatible with being pregnant:*
- dangerous chemical agents
- dangerous physical agents
- biological agents
- being in a standing position for more than half the working day

As a consequence, *it is forbidden for them to work in the laboratories during pregnancy and up until seven months after the birth.*

The female worker who finds herself in these working conditions must:
- immediately inform the **COMPETENT PHYSICIAN and the Head of Lab** of her pregnancy.

Residual risk

- If after putting in place all necessary measures to prevent, though small, still remains a **RESIDUAL RISK**
  - so you need to use **PROTECTIONS**
    - **COLLECTIVE**
    - **INDIVIDUAL**
First CPD, after PPE

CPD Collective Protection Devices (hoods, ...)  
PPE Personal Protective Equipment (mask, googles, gloves, ...)

Collective Protection Devices
The fume hood: where does it go?

Intended use: containment and extraction of hazardous fumes
Actual use: a really expensive storage closet

Ever wonder where it all goes?

Chemicals casually laying about: Will kill you instantly Slow and agonizing death

Two chemicals that should never even be that close together

No idea.

Layers of research
It spins by itself Magic!

(What is this anyway? A trap door?)

Ramblings of a mad man

The hot plate/trimmer: abused more than the undergrad interns.

REMEMBER to take it away.

Never leave unidentifiable material in the lab or inside the hood, for safety and disposal reason.

Fume cupboards

Should not be used as storage areas: when you leave something under the hood let it evaporate (empty gas cartridges, containers with residues of solvents,...)

REMEMBER to take it away.

Never leave unidentifiable material in the lab or inside the hood, for safety and disposal reason.
140mm between the hood and the bench
300mm from the side walls
1000mm buffer zone between operators

Raise at least 2cm large tools
Placement

CPD: act directly on the source of pollution to stop its spread.

Chemicals

- Typology
- Toxicity
- Physical state
- Concentration
- Frequency of use
- Exposure time
**Personal Protective Equipment (art.74 Dlgs.81/2008)**

"any equipment designed to be worn or held by the worker to protect him **against one or more risks** which may endanger the safety or health at work, and any addition or accessory designed for this purpose"

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**Residual Risk Vs Health**

You MUST normally use PPE during the following activities in SISSA labs:

- Use of dangerous chemical agents;
- Use of hazardous biological agents;
- Use of hazardous non-ionizing radiations;
- Use of cryogenic liquids;
- ...
Find the differences!

Wear a lab coat!
**Lab coat rack**

WHEREIN THE PURPOSE OF THE LAB COAT IS UTTERLY DEFEATED.

BLOOD STAIN (OR IS IT KETCHUP?)

INSIDE OF COATS TOUCHING THE DIRTY OUTSIDE OF OTHER COATS. WHAT'S WRONG WITH THIS PICTURE?

BELONGED TO GRAD STUDENT WHO LEFT YEARS AGO. NOW GIVEN TO UNEXPECTED VISITORS.

GUESSES WHICH ONE IS THE PROFESSOR'S LAB COAT? HINT: THE ONE THAT'S STILL WET.

NAME TAGS WOULD WORK IF IT WEREN'T FOR THE ONE PERSON WHO JUST GRABS ANY COAT (YOU KNOW WHO YOU ARE).

TOP LAYER HANGING ON BY STATIC FRICTION ALONE.

Lab coat rack image.

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**Gloves**

<table>
<thead>
<tr>
<th>Chemical group</th>
<th>Latex</th>
<th>Nitrile</th>
<th>Neoprene</th>
<th>PVC</th>
<th>PVA</th>
<th>Butyl</th>
</tr>
</thead>
<tbody>
<tr>
<td>solvents</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>ketones</td>
<td>x</td>
<td></td>
<td>x</td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>acids</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>hydrocarbons</td>
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<td>x</td>
<td></td>
<td></td>
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<tr>
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<td></td>
<td>x</td>
</tr>
<tr>
<td>organic solvents</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
</tbody>
</table>

Chemical resistant chart.
Acceptable Quality Levels

• AQL (acceptable quality level) is an arbitrary, self-imposed specification that allows manufacturers to monitor their production processes on an ongoing basis.

• The meaning of this is that if you use very hazardous substances, it is better to use 2 pairs of gloves!
How to use the mask

Class | filter penetration limit (max conc.)
-------|------------------------------------
FFP1   | at least 80% airborne (4xTLV)
FFP2   | at least 94% airborne (10x TLV)
FFP3   | at least 99% airborne (30xTLV)

How to wear the mask
General Operating Rules (1)

- Leave backpacks and coats out of working zone and regularly use personal protection equipment (PPE).
- Avoid wearing open shoes, sandals, or high-heel shoes; long hair should be gathered up and held back; dangling jewellery (earrings, bracelets, etc.) may present risks.

General Operating Rules (2)

- Maintain neat and clean jobs, surfaces decontaminated.
- Use only automatic pipettes, NEVER MOUTH.
- It is FORBIDDEN TO EAT, DRINK, SMOKE and make-up in the labs!
- Read the instruction manual of the instruments, labels and consult safety data sheets.
- Do not use gloves with telephone, handles, etc...
- Do not throw anything down the sink.
- Wash your hands before leaving the laboratory.
- Document and communicate all laboratory near-misses and incidents.
Lab tasks involving increased risk

Laboratory members understand that:
1. Require adequate training and safety equipment (gloves, lab coat, goggles, hood, etc.)
2. Must be carried out only after informing surrounding lab workers who will provide help in case of an accident
3. Must be performed only during normal working hours (8.00-17.30) when Emergency personnel is present.

You are absolutely forbidden to work by yourself (especially during off-hours) in refrigeration room, or when engaging in complex and dangerous operations!

Whenever a piece of equipment is left on outside the normal working hours of the lab, attach a card to it with information about its task, how to turn it off, and the name of the person to contact in case of emergency.
So at the end, in laboratory...

“... the first ingredient in your experiment, is your brain!”

Safety Signs

- **Fire Emergency Signs**: Square form, white on a red background
- **Danger Signs**: Triangular form, black on a yellow background
- **Prohibitory Signs**: Circular form, red edging on a white background
- **Mandatory or Warning Signs**: Circular form, white on a blue background
- **Rescue and Emergency Signs**: Square or rectangular form, white on a green background
Some signs...

It highlights the need to gather at the meeting point of the color on the operational areas covered.

Safety Prank
UV

- All major internationally recognized technical standards discourage significantly the use of germicidal lamps (255nm, band UV-C).
- Italian tipycal need.
- The UV can not replace daily disinfection.

It's dangerous for other operators!

SISSA plug

- White plug: normal
- Green plug: under generator
  - Start in few minutes (freezer and refrigerator)
- Red plug: UPS
  - (long analysis instruments)
- Black plug: clear ground
  - Pay attention the difference: in corridor are black plugs with dirty ground
Electrical Systems

- Electrical installations must be constructed and maintained so as to prevent the following risks:
  - direct contact (contact with a part of the system normally live, as a conductor, a clamp, the attack of a lamp, a fuse, etc., become casually accessible)
  - indirect contact (contact with a part of the system does not normally live, such as the carcass of an engine, but which has accidentally taken a dangerous voltage for an insulation failure)
  - fire or explosion (due to overload or short circuit)

Electrical system Risk (1)

- Do not use multiple mobile sockets, adapters, extension connections, etc. in humid, wet, cold, hot or dusty environment, with corrosive emanations, with risk of fire, with danger of explosion.
- Do not feed more appliances from a single wall outlet.
**Electrical system Risk (2)**

- Do not connect an appliance to a plug not suitable: danger of fire or deterioration of the power system.
- Check that the connected loads do not exceed in total the current value of the socket.

**Electrical system Risk (3)**

- You can not insert a plug from 16A (large and distant) into a socket from 10A (tight holes and close).
- Do not insert the plugs of the German type (Shuko) in Italian type sockets because you do not allow earthed of the appliance (tabs on the sides).
**Electrical system Risk (4)**

- Should not be carried out maneuvers on switches, plug sockets, electrical equipment with wet hands.
- Plugs should be inserted and turned off from the sockets with appliances SWITCHED OFF with the power switch on the appliance itself.

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**Electrical system Risk (5)**

- Never unplug the equipment by pulling on the electrical cable!
Maintenance and repairs

- In the event of fault does not intervene, stop what are you doing and promptly report the problem to authorized personnel.
- Immediately let the Supervisor know about any electrical equipment malfunctions.
- THE ELECTRICAL SYSTEM MUST BE MAINTAINED AND MODIFIED ONLY BY PROFESSIONAL PERSONNEL!

“Bones” Safety

Sai che devi usare il laser.
In case of ALARM DETECTOR CO2, O2, in the absence of technical personnel:
- people inside the room must leave immediately after having the windows open, if possible without personal risk, and closing the laboratory door behind you;
- no one is allowed to enter in the laboratory;
- promptly notify the SSP Officer (#739 - #555) or the Technical Officer at the Presidio (#681).

The following actions are prohibited:
- alert directly to the switchboard of the Fire Brigade;
- occupy the telephone lines;
- perform actions dangerous for your safety.

Only trained and equipped with breathing apparatus can access to the premises to verify the incident and open windows for ventilation, allowing the fastest possible.
In case of accident

• NO PANIC!
• ALERT the Safety Service and the Supervisor!
• According to the type of substance concerned shall apply normal first aid procedures:
  • Procedures for inhalation / ingestion / contact eye / skin contact (#911);
  • Procedures recovery kit (collection) in case of spillage;
  • Procedures handling and identification systems for waste disposal.

Useful phone numbers

| Members of the FIRST AID UNIT (from 09 to 17 working days) | 040 3787 911 |
| Members of the EMERGENCY MANAGEMENT TEAM (from 09 to 17 working days) | 040 3787 555 |
| CONTROL ROOM (24H24H) | 040 3787 681 |
| BIGIARINI TULLIO (safety@sissa.it) | 040 3787 739 |
| SISSA COMPETENT PHYSICIAN antfiorito@yahoo.it | 040 399 2518 347 4287695 |
| SISSA INFIRMARY only Wednesday | 040 3787 495 |
Meeting point SISSA

Never stop to think!
Special waste management

- **Harmful chemical waste**: put solid waste in the bin with a blue ribbon (CER 150110*) or in the bin with a white ribbon (CER 150202*).
- Incompatible chemicals have to be storage differentiated, both of the substances and the waste.

Chemical Waste Disposal

<table>
<thead>
<tr>
<th>CER 150110*</th>
<th>CER 160302*</th>
<th>CER 670704*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material contaminated with dangerous chemical substances</td>
<td>Absorbing material contaminated with dangerous chemical substances</td>
<td>Chemical liquid waste</td>
</tr>
<tr>
<td>Pipettes, tips, tubes, glass and plastic bottles contaminated by dangerous chemical substances</td>
<td>Paper and gloves contaminated by dangerous chemical substances, agarose and acrylamide gels</td>
<td>Methanol, dyes, acids, PFA, bromamine, benzylchloroform, Tris buffers, NaOH...</td>
</tr>
</tbody>
</table>

Close the plastic box and deposit in the designated temporary disposal room. Close the plastic box and deposit in the designated temporary disposal room. Close securely and deposit the tank in the designated temporary disposal room.

Transfer the waste in the temporary disposal room (room 458)
**Biological Waste Disposal**

**Biohazard Waste disposal**

- **Solid waste**: Petri dishes, tubes, gloves, paper contaminated by biological fluids, cellular lines, bacteria or viruses.
- **Liquid waste**: Supernatants from cell and bacterial cultures, blood.

**Sharp objects**: collect material cutting (blades, needles, pipettes Pasteur) in specific plastic yellow container.
Pay attention!

- We need to know where they are came from!
- Don’t write the DATA!
Right waste in right bin!

What’s wrong with you?
What’s wrong with you?

Biological waste:

dispose of waste in the cardboard box with yellow bag. When the box is full for ¾ close properly, write the name of the laboratory and put it in temporary storage.
Large glass and plastic containers

For disposal, either intact or broken, use the 220 liter bin dedicated in the temporary disposal room (room 458).

Path waste and sample
THIS AREA IS UNDER VIDEO SURVEILLANCE

Safety is not a game

Albania 2001  Aquila 2009  SPP Sissa
Romania 2011  Finale Emilia 2012

Questions?