Background
Chemical risk is the result of occupational exposure to a chemical agent. This exposure can induce several effects which can cause fatal intoxications.

Purpose:
- Assess the risks related to the chemical reagents used in the control laboratory.
- Propose preventive measures to reduce his risks.

Materials and methods

OPERA Tool: “First Chemical Risk Assessment Tool by Activity Analysis”.

Aim of the tool: Quantify the level of severity of the chemical risk and to guide its reduction.

1/ Quantification of the level of severity is established by giving the informations on the label of the chemical product, or on the Material Safety Data Sheet (MSDS):
- Nature of the risk (Factor A)
- Nature of the safety (Factor B)
- Conditions of use products (Factor C)
- Respect of safety measures (Factor D)

2/ Calculation of Level of severity:

\[
\text{Severity} = \left[ (A/B) + C \right] \times D
\]

Results

- OPERA Analysis
  - Analysis is established for 85 chemical reagents in the laboratory.
  - 24% of the totality of the reagents: Non-hazardous

Table 1: Examples of chemical reagents depending on the severity

<table>
<thead>
<tr>
<th>Level of risk</th>
<th>Example of chemical reagents in laboratory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very low risk</td>
<td>Potassium nitrate</td>
</tr>
<tr>
<td></td>
<td>Zinc powder</td>
</tr>
<tr>
<td>Low risk</td>
<td>Silver nitrate</td>
</tr>
<tr>
<td></td>
<td>Potassium hydroxide</td>
</tr>
<tr>
<td></td>
<td>Sodium carbonate anhydrous</td>
</tr>
<tr>
<td>Medium risk</td>
<td>Benzoic acid</td>
</tr>
<tr>
<td></td>
<td>Hydrogen peroxide</td>
</tr>
<tr>
<td></td>
<td>Magnesium acetate</td>
</tr>
<tr>
<td>High risk</td>
<td>Nitrobenzene</td>
</tr>
<tr>
<td></td>
<td>Boric acid</td>
</tr>
<tr>
<td></td>
<td>Chloroform</td>
</tr>
<tr>
<td>Very high risk</td>
<td>Ethyl acrylate</td>
</tr>
<tr>
<td></td>
<td>Ammonium persulfate</td>
</tr>
<tr>
<td></td>
<td>Formaldehyde</td>
</tr>
</tbody>
</table>

Figure 1: Classification of preventive actions

4/ Two scales of values have been established: the first allows to qualify the level of severity of the risk and the second makes to prioritize the setting up of an action.

- Level of severity Evaluation of severity Priority of an action
  - 1 ≤ Severity < 5 Very low severity Not priority
  - 5 ≤ Severity < 20 Low severity Recommended
  - 20 ≤ Severity < 40 Medium severity Needed
  - 40 ≤ Severity < 60 High severity Urgent
  - 60 < Severity Very high severity Immediate

Preventive actions for reduction of chemical risks
- Use of personal protective equipment: mask, gloves
- Use of collective Equipment: Hood

Figure 2: Percentage of the severity of the risk after implementation of preventive actions

Conclusion
The level of severity of reagent is manageable by acting on two risk factors:
- The respect of the safety measure of each chemical.
- The exposure of the operator to the operations carried out.