

**Hexavalent
Chromium
& Nickel compounds
Biomonitoring in
Electroplating
workshop**

**September 2017
Diaine Annabelle**

Objective: Risk assessment for nickel and chromium exposure in electroplating activity

Context of relocation of electroplating activity from B102 to B107

Chromium and Nickel exposure in B102:

- Electroplating workshop
- **Hexavalent chromium (Cr VI)** in chromic acid plating baths
- **Soluble nickel (Ni) compounds** in nickel plating baths : sulphate, chloride, nickel sulfamate
- **6 Employees**, no subcontractors

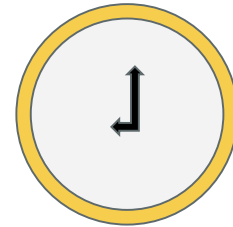


Introduction to toxicology

Toxicity

Absorption

Excretion



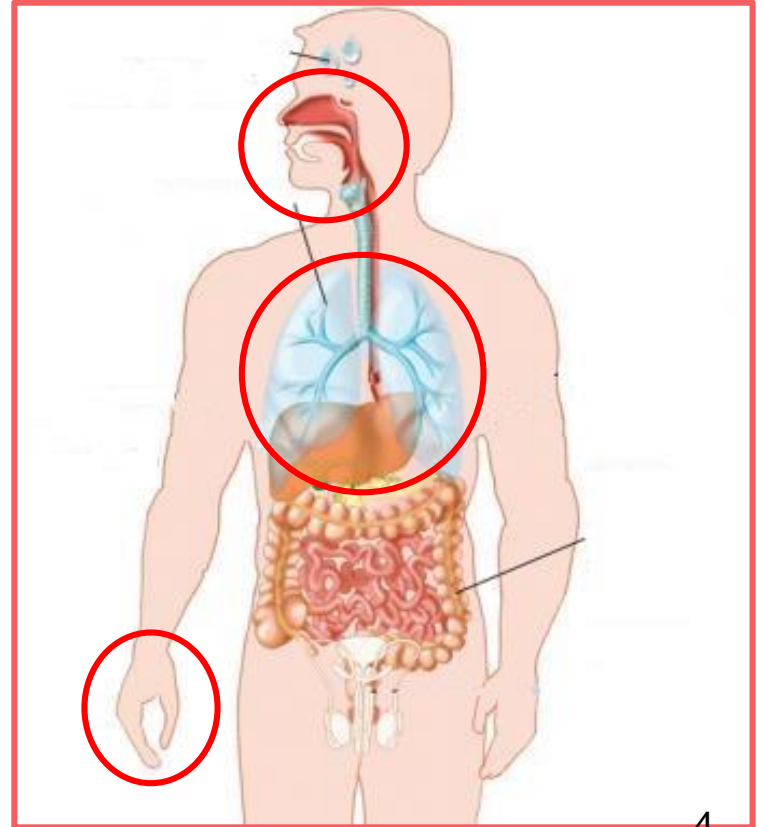
Duration of exposure

Introduction to toxicology

Toxicity

Cr VI

- ❖ Acute toxicity: digestive disorder, encephalopathy, death...
- ❖ Chronic toxicity:
Pulmonary cancer
ENT cancer
Skin and respiratory sensitisation



Introduction to toxicology

Toxicity

Ni compounds

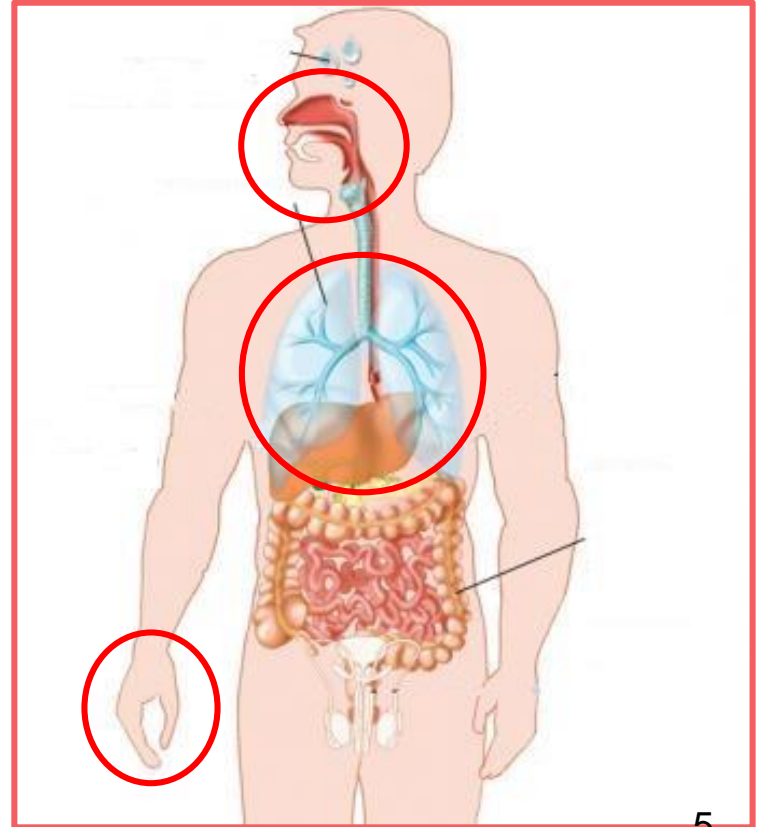
❖ Acute toxicity: none

❖ Chronic toxicity:

Respiratory and skin sensitisation

Pulmonary cancer (Oxide and sulphate nickel +++)

Nasal cavity cancer



Introduction to toxicology

Absorption

Chromium VI

Respiratory: 50-85%

Digestive: 10%

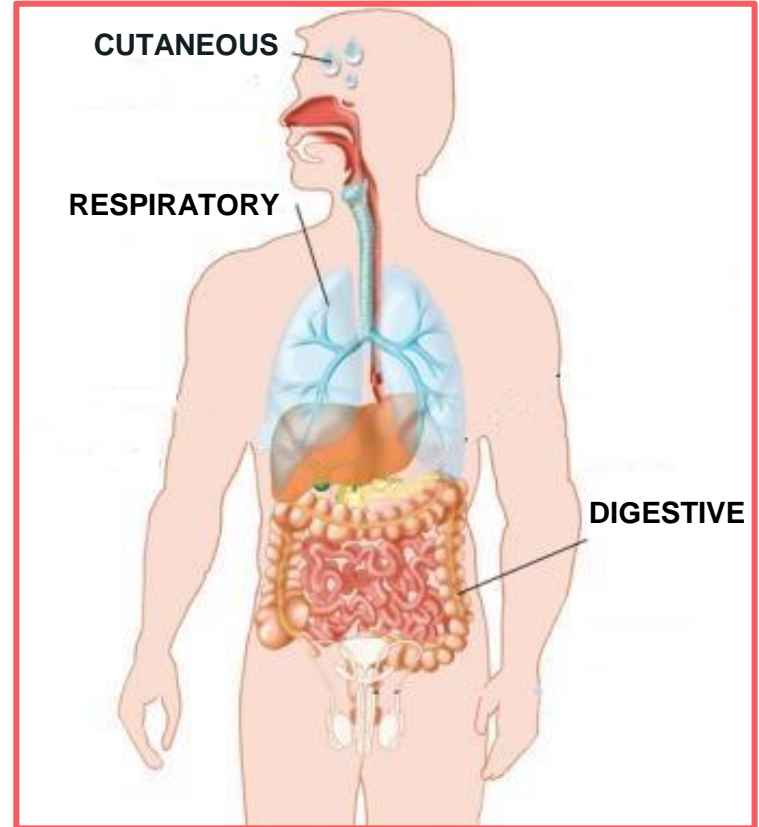
Cutaneous: 4%

Nickel compounds

Respiratory: 25-60%

Digestive <10%

Cutaneous < 1%



Introduction to toxicology

Excretion

Metabolism of

- Chromium VI in Chromium III
- Nickel compounds in Nickel metal

Urinary elimination for Nickel and Chromium III

Received dose

suva

First assessment by metrology in ambient air in 2015

Results << Interpretative Standards (*AEV from SUVA 2015 ref 1903.f*)

- Analysis of Chromium VI $< 1 \mu\text{g.m}^{-3}$ (*AEV SUVA: $5 \mu\text{g.m}^{-3}$*)
- Analysis of Nickel between < 1 and $2 \mu\text{g.m}^{-3}$ (*AEV SUVA: $50 \mu\text{g.m}^{-3}$*)

→No acute toxicity

→Chronic toxicity?

Objective: Risk assessment for nickel substances and hexavalent chromium exposure in electroplating activity

Advantages of biomonitoring vs metrology:

- More precise results for low received doses
- Considering all routes of absorption, all sources of exposure and individual factors
- Point zero before relocation and impact of relocation on chemical exposure

Methods

Chromium	Nickel
2 Urinary tests T_0 and T_1	
Not specific to occupational exposure and not specific to Cr VI compound	Not specific to occupational exposure and sulfate nickel compound
Sample after break from work T_0	
Sample at the end of the week of work T_1	
Dietary and lifestyle questionnaire	
Last month exposure to all Chromium forms (Cr 0, III, VI)	Recent exposure to all Nickel compounds

Versatile activity : traceability by tracking invoicing of 102 activities

Results compared to interpretative standards:

- ❑ Results not complete

- ❑ T_0 compared to RBV (limit in average population)

Nickel : 1 μ g/L-0,7 μ g/L- 1,8 μ g/L < French RBV 3 μ g/L

Chromium : 0,2 μ g/L - 0,3 μ g/L - 0,2 μ g/L - < French RBV 0,65 μ g/L

- ❑ T_1 compared to LBV (limit in occupational exposure)

Nickel : 0,4 μ g/L

Swiss IBV: 40 μ g/L

Chromium : 0,3 μ g/L

French IBV: 2,5 μ g/L

Continuation:

Depends on the results

- Workstation visit if results over interpretative values
 - Review of hygiene measures
 - Review of particularly exposing tasks
- Probable regular biomonitoring
- **In any cases: Maximum reduction in the risk exposure**
 - Maximum substitution of Chromium VI and Nickel
 - Process automation testing

Thank you for your attention