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Aggregate exposure and socio-economic analysis: combined tools to prioritise options to reduce cadmium impregnation

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94th EFSA Advisory Forum meeting: 4-5 December 2024

Context

➢ **Cadmium, a metal (trace element) omnipresent in the environment (soil, water, air, biosphere)**

- Natural origin (earth's crust) and anthropogenic (agricultural and industrial activities)
- Recognised as carcinogenic, mutagenic and toxic to kidneys, bones and human reproduction

➢ **Biomonitoring and dietary exposure**

- Increase in the impregnation of the French adult population (Esteban study[1] 2021 vs. ENNS[2], 2006-2007)
- Over-exposure of consumers by diet (Total Diet Study, ANSES, 2011)

[1] *Esteban "Health study on environment, biomonitoring, physical activity and nutrition"*
[2] *ENNS « National nutrition and health study »*

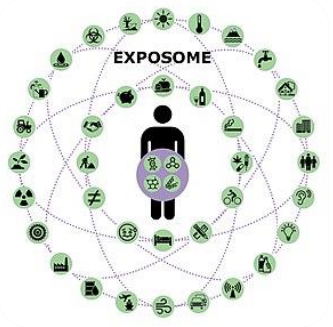
Question

- **What is/are the major source(s) of exposure to cadmium on which action should be taken to reduce human impregnation?**

  - ✓ Aggregated exposure to cadmium from different sources and routes of exposure

  - ✓ Ranking of options' efficiency to reduce human impregnation by cadmium

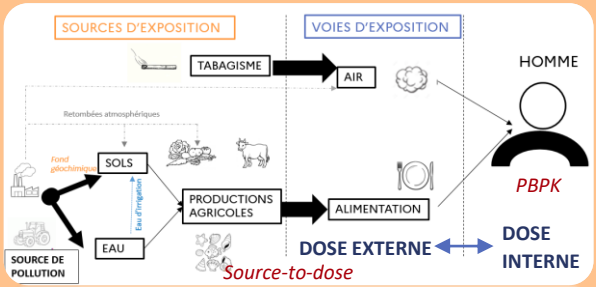
Opinion accompanied by the report of the Cd WG for autumn 2025



Methodological approach

Identifying sources and routes of human exposure to cadmium

Risk assessment from multi-sources and routes of exposure for the French population



AGGREGATE EXPOSURE

Assessing and testing the contribution of sources

Analysis of options for action using a socio-economic analysis

Understand the risk situations

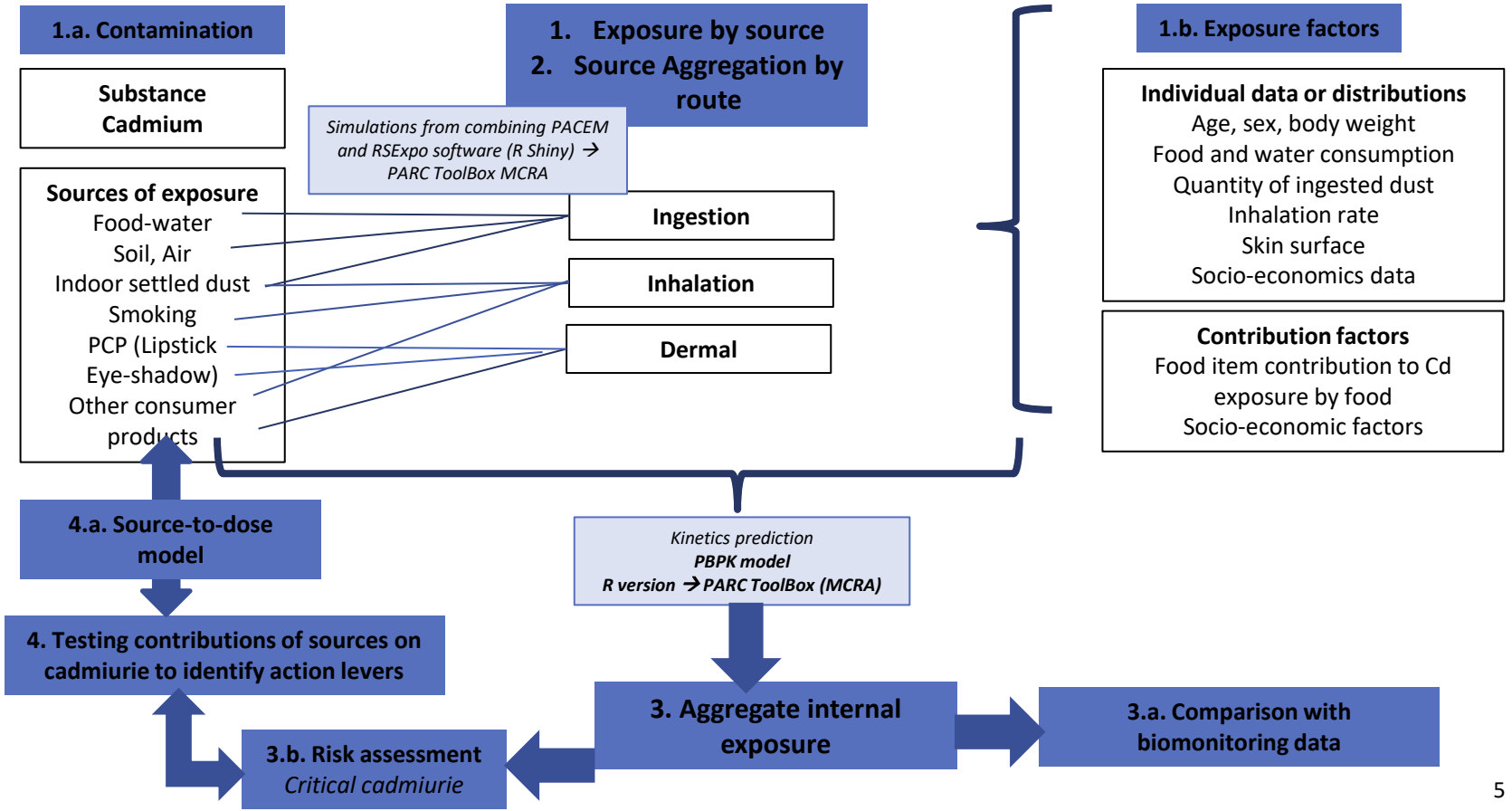
Identify action options

Analyse the various socio-economic implications of action options

Put the action options analysed into perspective

Recommendations to prioritise options to reduce cadmium impregnation

Methodology: Aggregate chronic risk assessment for cadmium in the French adult and child population



Analysis of options for action using a socio-economic analysis

Key principles

Complementary to health risk assessment

Context-sensitive

Plurality of options considered

Global approach to change, or the lack of it

Indicative and flexible toolbox

Multi-disciplinary, multi-source approach

Dialogical analysis

Uncertainties to be considered and clarified

Analysis of options for action using a socio-economic analysis

1 - Understand the risk situations

- Analysis of the **predominant sources and routes of exposure** to cadmium in the French population
- Analysis of **risk factors** and their **distribution** among subgroups / territories to identify **action targets**, e.g.:

Soil fertilizers and amendments

Foodstuffs and food contact materials

Industries, services, transport, waste, recycling

Tobacco products

Secondary prevention and care of exposed individuals

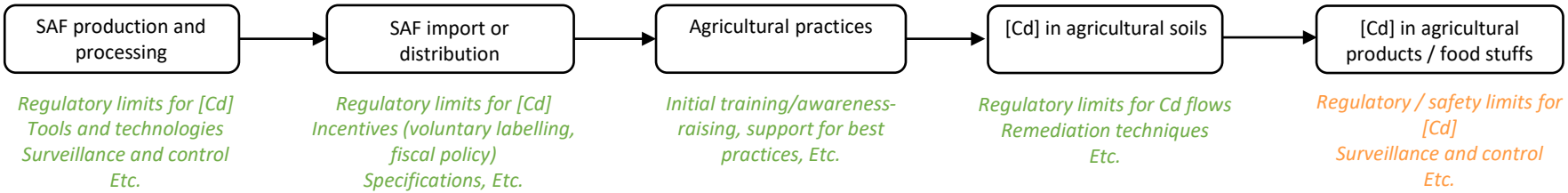
Analysis of options for action using a socio-economic analysis

1 - Understand the risk situations

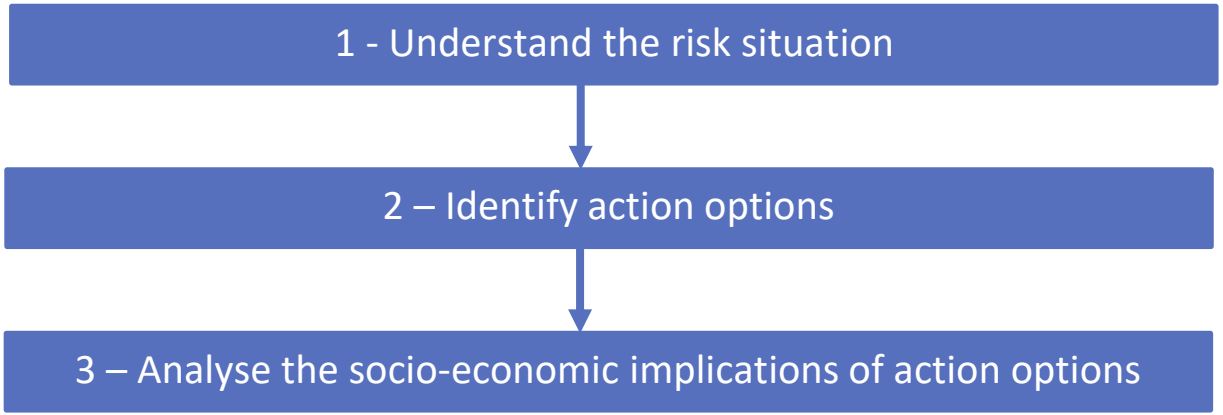
2 – Identify action options

- General description of the **sectors / activities concerned**
- Identification of **options for action** in France

=> E.g. from soils amendments and fertilizers (SAF) until foodstuffs *(simplified illustration)*



Analysis of options for action using a socio-economic analysis



Analysis of various dimensions of action options :

- Potential health benefits of options : nature, scale, associated costs (avoided)
    - If possible, use aggregate exposure modeling to estimate the effects of actions
- Other potential impacts (+/-) of the action option (including inaction)
- Applicability of the action :
    - Stakeholders and positioning
    - Technical feasibility
    - Associated costs

Collection of international / French data from documents (academic literature, grey literature), databases, hearings)

Analysis of options for action using a socio-economic analysis

1 - Understand the risk situation

2 – Identify action options

3 – Analyse the socio-economic implications of action options

4 – Put the action options analysed into perspective

Tableau 3. Exemple de tableau de synthèse des résultats-clés d'une ASEOA

Option d'action	Cible	Type d'action	Implication A	Implication B	…
Option A					
Option B					
…					

Source : adapté de CCNPPS, 2011 : 34 ; Chatterji et al., 2013

Identification and explanation of uncertainties

IN CONCLUSION

Develop an approach linking human impregnation data and environmental data

Vast amount of data needed (building a consumer product database,…) and different models (exposures, PBPK etc.)

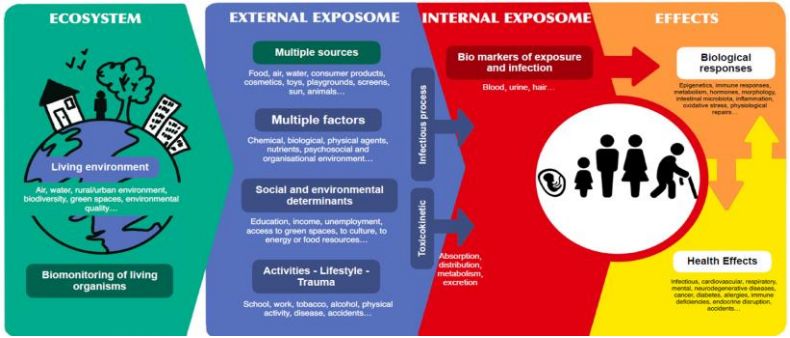
Estimate the contribution of the sources of exposure on cadmiurie

Identify and analyse effectiveness of preventive measures for Cd in public health

The diversity of action options to be analysed is also a challenge.

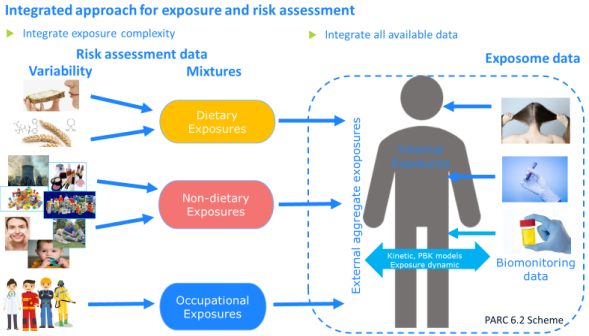
PERSPECTIVES

➢ **Approach in line with the integration of the Exposome in ANSES activities (ANSES, Report 2022)**



➢ **Case study for PARC Task 6.2 "Integrative exposure and risk assessment"**

- Designing a risk assessment of new-generation chemical substances to better protect health and the environment
- + link with occupational exposure



Ongoing work - RESULTS FOR 2025

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