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INSTITUT  
DE RADIOPROTECTION  
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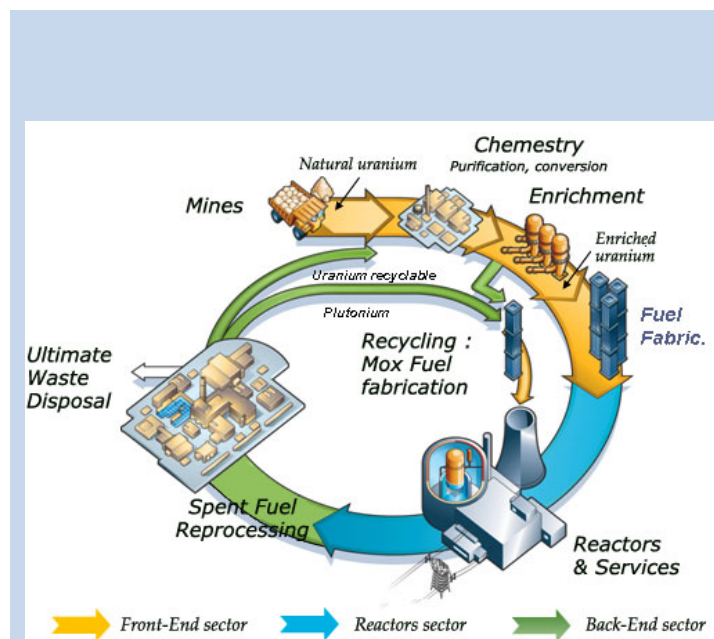
# Intercomparison of lifetime dose assessment for three example workers occupationally exposed to uranium

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# Context

## ➤ Evaluation of risk associated with radionuclide intakes

### ■ Now based on:

- Epidemiological follow-up of Hiroshima and Nagasaki A-Bomb survivors
- Dosimetric system including biokinetic models and weighting factors

### ■ Epidemiology on populations of workers of uranium cycle would help because

- Exposed to low dose rates from incorporated radionuclides,
- Non-negligible intakes,
- Thoroughly monitored by bioassay
- Extensive administrative and medical data available
- Significant part of workers exposed to internal contamination in Europe

➤ To quantify possible effects of incorporated radionuclides, absorbed doses in relevant tissues must be assessed.

# Context

## ➤ Dose assessment

### ■ Based on:

- Bioassay data (uranium activity excreted in urine...)
- Exposure conditions (duration of exposure, chemical form of uranium at the workplace...)

### ■ Difficult because

- Thousands of workers with 100,000s of bioassay
- Bioassay collected to verify that exposure complies with dose limits,
- Most of bioassay are reported as below “Reporting level”
- Exposure conditions sometimes incomplete or uninformative.

➤ Reconstruction of doses received during the whole career of the worker is subject to substantial uncertainty.

# Research work

## ■ Aims

- Identification of major sources of uncertainty
- Quantification of uncertainty on dose estimates

## ■ Mean

- Intercomparison exercise inside the Task 7.5 - Uncertainty on dose assessments of EURADOS WG 7 on internal dosimetry
- Interpretation of results targeted to assess uncertainty on dose

## ■ Data provided to the participants

- Raw data gathered by epidemiologists for three workers of the French cohort of nuclear workers:
  - One presented several acute intakes,
  - One had several bioassay but only one higher than the reporting level (RL) ,
  - The bioassay data for the third one were all below RL.

# Main results

➤ 15 participants from EURADOS WG7, 1 from NIOSH (USA)

## ■ Data sent by participants, for each worker

- Dose estimates
- Exposure condition hypotheses
- Bioassay data interpretation

## ■ Interpretation of the results

- Estimation of robust mean and robust standard deviation
- Discussion of:
  - Dose assessment procedures
  - Exposure conditions hypotheses
  - Bioassay data interpretation

# Result example for Worker 1

# Conclusion of the research work

- Significant uncertainty on dose reconstructed for uranium workers
  - Dose estimates distributed over several orders of magnitude:
    - Relative standard deviation for lung equivalent dose varies between 152% for Worker 2, 164% for Worker 1 and 346% for Worker 3.
- Concerning dose calculations
  - Identification of consensual parameters (e.g. the ICRP biokinetic and dosimetric models)
  - Definition a set of different reasonable assumptions for other parameters (e.g. treatment of data below RL, pulmonary absorption, exposure period...).

# Perspective of the research work

- To carry out a sensitivity analysis to evaluate the influence of each hypothesis on dose estimates.
- To submit an article
- To publish a EURADOS report.



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