

Report on the Case Study: “Sr-90 Contamination”

Case Study Summary

- A family living in a rural area, engaged in agricultural activities, had their evacuation delayed for three days following a nuclear accident involving fallout, due to adverse weather conditions.
- Contamination by Sr-90 is hypothesised, consistent with the release of fission products after an accident.
- The analysis focuses on a 40-year-old male.

Assumptions for the Analysis

The chemical form of Sr-90 is unknown; however, regarding the physical form, it is reasonable to assume that it is mainly particulate: an explosion at a facility caused dispersion of Sr-90 into the environment, followed by deposition onto the ground through precipitation (presumably intense, given that evacuation was not possible).

Ingestion is hypothesised as the intake pathway. This is supported by the nasal swab sample, which shows a strong asymmetry between the nostrils, ruling out inhalation contamination. Additionally, since evacuation did not occur promptly, the family likely did not receive the warning to avoid consuming home-grown products (rural areas often lack rapid notification systems). This would allow Sr-90 to enter the food chain, making ingestion the plausible intake route.

It is further assumed that the entire intake occurred at **T = 0**.

Evacuation prevented any additional intake during the subsequent measurement period, and an intake prior to the accident is considered unlikely, since Sr-90 is a fission product and thus not naturally present in the environment.

Methodological Approach

The **Mc** for a special monitoring scenario was calculated, yielding a value lower than that of the first measurement (urine sample collected 3 days after the event, 24-hour sample).

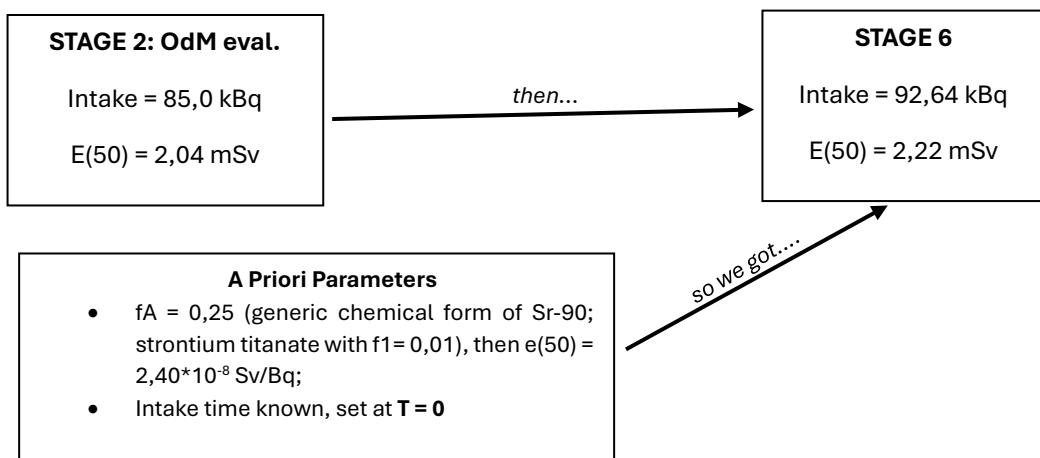
$$Mc = m(3) * \frac{E_{rif}}{e(50)} = 50 \left[\frac{Bq}{d} \right] < 1020 \left[\frac{Bq}{d} \right]$$

Subsequently, an order-of-magnitude estimate of the intake and **E(50)** was performed, assuming no further intake after the accident and considering a generic chemical form of Sr-90 (strontium titanate was excluded, as it would be an unusual form for an accident of this type).

Since this is a **special monitoring** case, it was necessary to continue the analysis through **IDEAS Stage 4**, and later **Stage 6** (pure ingestion).

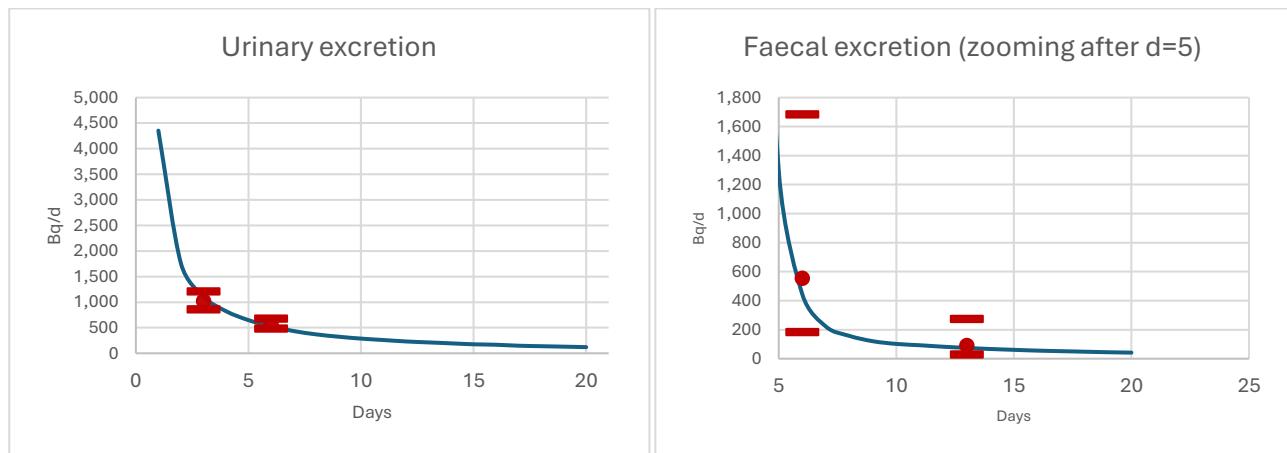
Contamination by Sr-90 – Michele Anastasi

The Stage 6A calculation was performed using the above parameters, obtaining the reported results:



Given that the dose exceeds **1 mSv**, the analysis proceeded to **IDEAS Level 2**, specifically moving to **Stage 6B**, which requires verifying the following criteria—both fully satisfied:

- Criterion 1: P-value check, equal a 0,91 (observed chi-q = 0,532 + 3 degree of freedom), satisfied.
- Criterion 2: graphical interpolation check, satisfied.



Final results

Since the final dose is **below 6 mSv**, no further stages are required. The final assessed quantities are:

Intake	92,6 kBq
E(50)	2,22 mSv
Intake route	Ingestion
fA	0,25