



RÉPUBLIQUE
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IRSN [DOSIMÉTRIE

INSTITUT DE RADIOPROTECTION
ET DE SÛRETÉ NUCLÉAIRE

BIOLOGICAL DOSIMETRY

DOSE ASSESSMENT FOLLOWING IRRADIATION



IN THE EVENT OF ACCIDENTAL IRRADIATION OF A PERSON OR SUSPECTED OVEREXPOSURE, IRSN IS ABLE TO PERFORM BIOLOGICAL DOSIMETRY ON A BLOOD SAMPLE IN ORDER TO DETERMINE THE DOSE RECEIVED.



OUR RESOURCES

The IRSN medical laboratory is equipped for **cytogenetic analysis of blood samples**. These analyses make it possible to assess radiation doses, **with a sensitivity of up to 100 mGy**.

➔ **IRSN is the only organisation in France** to perform biological dosimetry analyses.

SERVICES PROVIDED BY IRSN

The Institute carries out **individual assessments** taking into account the context of the exposure:

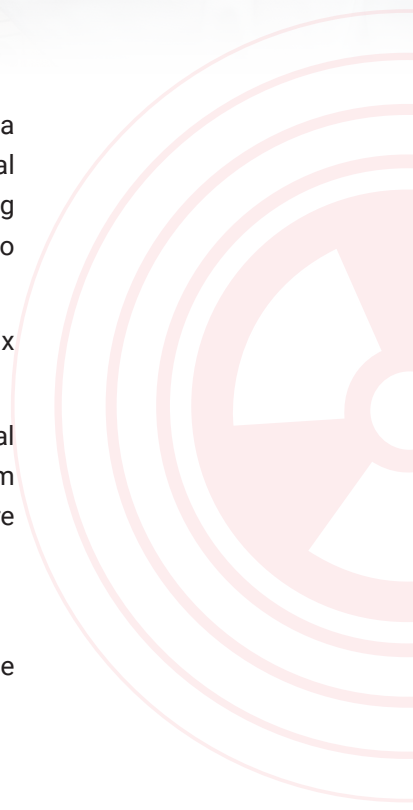
- ➔ **Homogeneous or localised, nature of the exposure source, duration of exposure, dose rate.**
- ➔ **The analysis enables the biological dose received by an individual to be estimated from reference curves established in vitro.**





PRINCIPLES OF A CYTOGENETIC DOSE ANALYSIS

- ⊕ **Biological dosimetry** complements clinical diagnosis and physical dosimetry. If a dosimeter shows an abnormally high dose, biological dosimetry can provide additional information. It is based on the count of chromosomal aberrations in circulating lymphocytes. The frequency of radiation-induced chromosome aberrations is related to the nature of the radiation source, the duration of exposure and the dose rate.
- ⊕ **Dicentric counting** is the reference technique for estimating the dose received within six (6) months after an acute accidental exposure to ionising radiation.
- ⊕ **The minimum detectable dose** depends on the number of cells observed and the natural background radiation of the population (1 dicentric per thousand cells). The minimum detectable dose is 0.1 Gy, for a recent and homogeneous irradiation, when 500 cells are observed.
- ⊕ **A doctor** must provide a prescription for the expertise.
- ⊕ **A quality insurance** procedure covers relations between the IRSN laboratory and the prescribing doctor, particularly regarding the confidentiality of the medical information

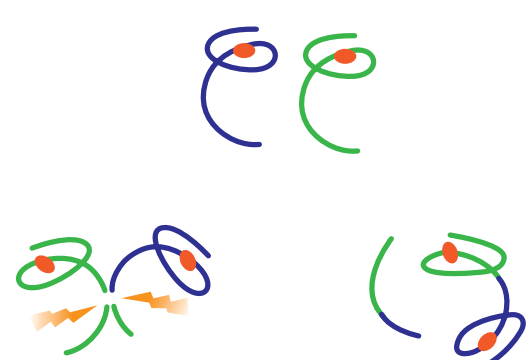
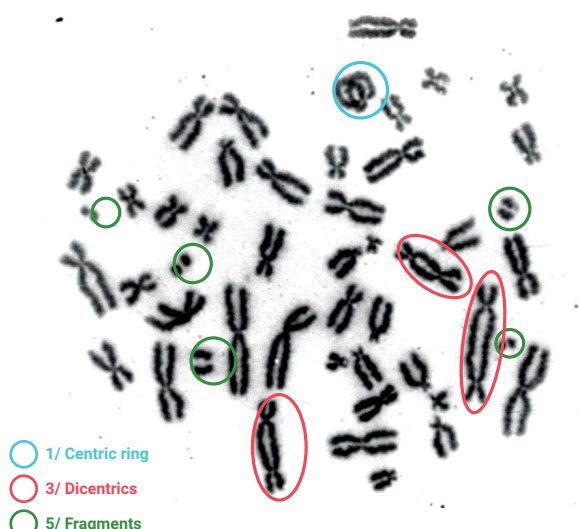


PROCEDURE FOR CYTOGENETIC DOSE ANALYSIS



Firstly, a blood sample is taken using a heparinized tube. **Then the lymphocytes are cultured.** A microscope is utilized to count the chromosomal aberrations produced by the irradiation. Five hundred cells are observed, and the result are plotted on a dose-effect reference curve. The frequency of the chromosomal aberrations enables estimation of the absorbed dose on the whole body of the concerned person.

The duration of the analysis is at least one week.



Examples of exchanges between chromosomes that can be observed after ionising radiation exposure.

Dicentric chromosome and acentric chromosome fragment.