BIOLOGICAL DOSIMETRY. APPLICATIONS

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BIOLOGICAL DOSIMETRY: DEFINITION

Technique which allows the evaluation of the degree of exposure to ionizing radiation through the study of the related biological effects.

OBJECTIVES

- Predict the health effects
- Evaluate the risks
- Achieve protection against ionizing radiation
BIOLOGICAL DOSIMETER

Biological effect that can be used as a “quantitative” system in the estimation of received dosage

The most used biological dosimeter is the study of chromosomal alterations
WHAT ARE THE EFFECTS OF IONIZING RADIATION?

Chromosomic aberrations

UNSTABLES
- dicentric chromosomes
- micronucleus

ESTABLES translocacions
THE MAIN BIOLOGICAL TECHNIQUES USED AS BIOLOGICAL DOSIMETERS

STABLE ALTERATIONS (chronic exposure or acute recurrent exposure)

1. Chromosomic banding
2. FISH

UNSTABLE ALTERATIONS (acute exposure)

1. Dicentric chromosomes analysis
2. Binucleated cells or micronucleus analysis
<table>
<thead>
<tr>
<th>WHY?</th>
<th>G0 permanent status</th>
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<tbody>
<tr>
<td></td>
<td>Continuous circulation around the body</td>
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<td>Phytohemagglutin test (PHA)</td>
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Which cells are analyzed? LINOCITES
TECHNIQUE CHOICE FACTORS:

- Time of exposure
- Exposed body area
- Time passed between the exposure and the measurement

Exposure to nuclear accidents or long time exposure

- Dicentric chromosomes or micronucleus analysis

Longer time exposure

- FISH

If the received radiation is not homogeneous in the whole body

- There is not a most adequate technique for the cytogenetic study
APPLICATIONS

Nuclear accidents

Missions to the Poles

Medical exposure

Space missions

Long time exposure
MEDICAL APPLICATIONS: EXAMPLES

Establish a **dosage-effect relationship** for patients who are exposed to radiation in order to **treat cancer (radiotherapy)**.

Measure the radiation absorbed by **medical staff**.
LIMITATIONS

- It is difficult to establish a direct dosage-effect relationship
- Accumulated radiation is not considered
- Many of the measured effects are unstable in time
BIBLIOGRAPHY


