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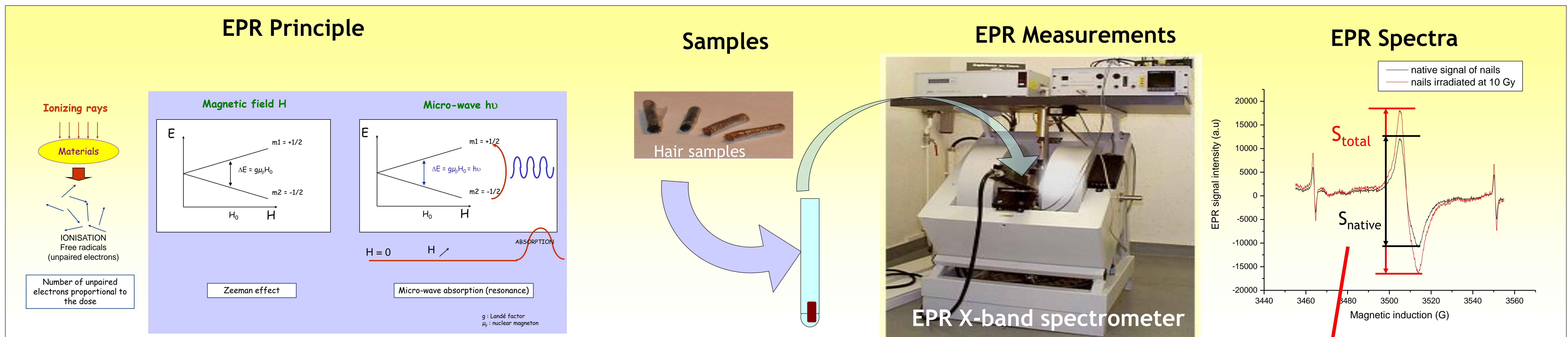
Protocol for emergency dosimetry based on EPR spectrometry on nails and hairs

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CONTEXT

In the case of a radiological accident due to an external overexposure involving a limited number of persons from the public or workers without dosimeters, dosimetry by Electronic Paramagnetic Resonance (EPR) spectrometry on tooth enamel, among other techniques such as biological dosimetry, can be an efficient tool. However, for an accident involving a large number of victims, most of dosimetric techniques are limited by the necessary short delay of the answer or the invasive sampling. Indeed, in this specific case, it is very important in a first time and as quick as possible to sort population according to the severity of the exposure. Nevertheless, EPR dosimetry on materials easily sampled on the victims (hairs or nails) may be a pertinent tool. In this context, the objective of this work was to study the EPR properties of nails or hairs to propose a first protocol for fast triage of population.



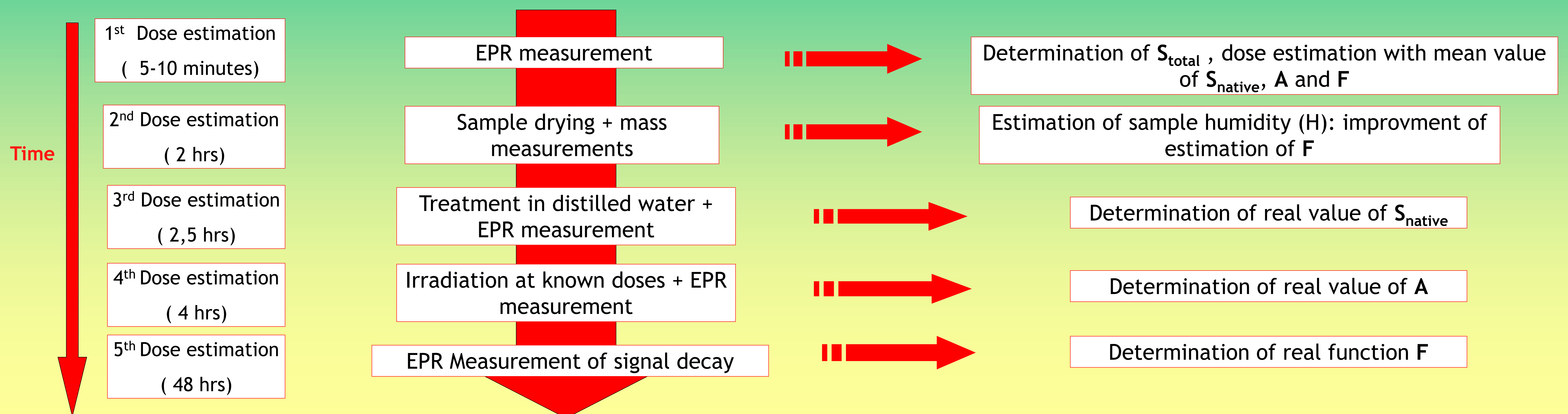
EPR Dose estimation

$$\text{Dose} = (S_{\text{total}} - S_{\text{native}}) \cdot F(t, T^\circ, H) \cdot A \quad \text{with} \quad S_{\text{total}} = S_{\text{RIS}} + S_{\text{native}}$$

S_{RIS} : peak to peak amplitude of Radio-Induced Signal (RIS), S_{total} : peak to peak amplitude of total EPR signal, S_{native} : peak to peak amplitude of native signal (before irradiation), F : fading correction factor depending on time elapsed between irradiation and measurement t , temperature T° and humidity H and A : dose coefficient

Dose estimation Protocol

The protocol can be divided in different stages. A first estimation can be done very quickly using averaged value of main characteristics (fading constant, radiation sensitivity, amplitude of background signal) previously determined on a large set of samples. At each next stage, the determination of the real values of the different constants for each sample allows to increase the accuracy of the dose estimation.



Conclusion

This study showed that it was possible, starting from EPR measurement of nails or hairs, to carry out a population triage according to the severity of the exposure