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Letter to the Editor

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Dear Editor

This letter is not response for some article but it is a trial to clarify the significance of the field of Radio-dosimetry. Indeed, more than 400 radiation overexposure events were registered in the second half of the last century up to now due to the improper use and disposal of radiation sources. The number of people were exposed to high ionizing radiation can not be ignored. In addition, few of these events were considered as catastrophic radio accidents: happened: the detonation of the atomic bomb in Hiroshima and Nagasaki, Techa River basin, Mayak facilities and Chernobyl and Fukushima reactors explosions [1]. In these accidents, tens of thousands of survivors had been living in contaminated environment. Not only the workers in the nuclear facilities, who have historical dose records in these accidents, but also the populations in the surrounding are exposed to the released radiation. On the other hand, the radiation's with all types are now widely used in many fields in daily life like industry, radiotherapy, medical diagnostic, food sterilization and agriculture. Consequently, the number of overexposure events expects to increase. Due to the spreading and excess of cancer patients and the aberrations of burgeons, it was necessary to find a tool (radiation dosimeter) able to estimate the individual past absorbed dose in these epidemiological regions [2,3].

The development of the dosimeter is related to the implementation of dose measurement techniques and to the applications of radiation. Each type of application requires a definite dosimeter with specified characteristics. In general, the function of the dosimeter depends on measuring the physical- or chemical- or biological- changes which are produced under the influence of the exposed radiation.

This letter dealing with the "Retrospective Assessment", i.e., evaluate the level of exposures to ionizing radiation in a past radiation events (include occupational exposures that occurred several decades, explosions of nuclear weapons, releases from nuclear installations and accidents with radioactive sources). It helps to supply dosimetric information for epidemiological studies or to support the judgement about induction of cancer cases by occupational exposures. Nowadays, the well-established retrospective biological dosimetry depends only on mammalian resources are only two techniques: Electron Paramagnetic Resonance (EPR) [4-7] and Fluorescence *In Situ* Hybridisation (FISH) techniques [8].

The EPR is the only physical method available to carry out biological dosimetry retrospectively [1-3]. Although invasive, it offers high accuracy and is useful as a reference for validating biological methods. The method of retrospective EPR dosimetry using calcified tissues (bone, enamel, dentine) is based on the measurement of radiation-induced radicals in hydroxyapatite [$Ca_{10}(PO_4)_6(OH)_2$]. During the mineralization process of biological hydroxyapatite, carbonate ions are incorporated into the crystalline lattice, substituting for phosphate and hydroxyl ions. Upon absorption of ionising energy by the hydroxyapatite crystal, the carbonate ions capture free electrons in the crystal matrix to form free-radical centres. The dose dependent formation of carbonate radical centres can be quantified through the use of EPR spectrometry [9,10].

In case of FISH technique, the chromosome aberration analysis in human lymphocytes to detect and quantify radiation exposures was used. This technique is applied for persons who did not wear a personal dosimeter and also for dose reconstruction of sub-groups of larger exposed populations. In its conventional form, chromosome analysis is largely based on the counting of uniformly stained dicentrics in metaphase preparations of peripheral lymphocytes. It is the method of choice for estimating absorbed doses within some weeks after acute, largely uniform whole-body exposures. A quantification of partial-body exposures or non-uniform distribution of the dose is more complicated but can be achieved by using specific mathematical approaches for a distribution analysis of dicentrics. For longer times after exposure, lymphocytes with dicentrics start to be eliminated from the peripheral blood due to a smaller chance of survival. For such periods, Fluorescence *In Situ* Hybridisation (FISH) with composite whole chromosome-specific DNA probes (chromosome painting) as a rapid and precise scoring method of reciprocal translocations and insertions is applied. These aberration types are commonly classified as stable since their frequency is believed to remain essentially unchanged with time.

In conclusion, a lot of research need to develop new systems to detect a prompt accident and construct integrated biokinetics models of retrospective dosimetry in case of radioactive isotopes intake [11].

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