

REPORT for MD126 Experiment – 24/7/05

1. Introduction

Since thirty years, radiobiologists and physicians have frequently observed cytotoxic effects on *apparently non-irradiated* cells located at the vicinity of irradiated ones. Despite a number of papers dealing with this so-called “bystander effect”, its biological interpretation and the molecular mechanisms implied are still unclear, but might be of high impact on public health if it appears that low radiation doses influence the cells metabolism. We proposed to answer the following questions :

1/ Is the vicinity of X-rays tracks able to produce DNA and/or cellular damage in non-irradiated cells?

2/ Which are the early biological sensors involved in bystander effect? Which DNA repair proteins are involved in such effect?

by producing synchrotron X-rays tracks (100 μm large) separated by 500 μm and by assessing DNA breaks in cells situated in the valley with the anti-pH2AX immunofluorescence technique.

2. Sample preparation and irradiation conditions

Set-up to irradiate cells seeded in slides was already used in previous MD experiments and used routinely at the biomedical facility.

3. Results

Irradiated X-rays tracks are clearly distinguishable by the very large amount of pH2AX foci revealing the presence of induced DSB. While the pH2AX signal in cells irradiated in the track decreased progressively with repair time at similar kinetics than “classically” irradiated cells, cells in the valley showed abnormal yields of pH2AX foci, not immediately but from 4 h after irradiation. It is noteworthy that dosimetry films revealed that X-rays tracks do not provide any scattering effect that could be responsible of secondary DNA damage.

Altogether, these data show that bystander effect does exist but is not direct inductor of DNA breaks. Bystander-DSB observed long time after irradiation may result from repair (excision-resynthesis) of numerous base damage. Hence, by-stander effect would not be energetic enough to provide DNA breaks but its biological impact is not negligible. New experiments will be proposed to better understand the real nature of by-stander effect – induced base damage and the genetic status that would be specifically sensitive to by-stander.

4. Work conditions and environment - Conclusions

All along the preparation of this experiment, Thierry Brochard was a precious help for the technical assistance and we want to thank him warmly for his efficiency. A new proposal is in preparation to complete our data and to publish these novel approach of bystander effect with synchrotron.