EUROPEAN SYNCHROTRON RADIATION FACILITY

INSTALLATION EUROPEENNE DE RAYONNEMENT SYNCHROTRON

ESRF

Experiment Report Form

The double page inside this form is to be filled in by all users or groups of users who have had access to beam time for measurements at the ESRF.

Once completed, the report should be submitted electronically to the User Office using the **Electronic Report Submission Application:**

http://193.49.43.2:8080/smis/servlet/UserUtils?start

Reports supporting requests for additional beam time

Reports can now be submitted independently of new proposals – it is necessary simply to indicate the number of the report(s) supporting a new proposal on the proposal form.

The Review Committees reserve the right to reject new proposals from groups who have not reported on the use of beam time allocated previously.

Reports on experiments relating to long term projects

Proposers awarded beam time for a long term project are required to submit an interim report at the end of each year, irrespective of the number of shifts of beam time they have used.

Published papers

All users must give proper credit to ESRF staff members and proper mention to ESRF facilities which were essential for the results described in any ensuing publication. Further, they are obliged to send to the Joint ESRF/ ILL library the complete reference and the abstract of all papers appearing in print, and resulting from the use of the ESRF.

Should you wish to make more general comments on the experiment, please note them on the User Evaluation Form, and send both the Report and the Evaluation Form to the User Office.

Deadlines for submission of Experimental Reports

- 1st March for experiments carried out up until June of the previous year;
- 1st September for experiments carried out up until January of the same year.

Instructions for preparing your Report

- fill in a separate form for each project or series of measurements.
- type your report, in English.
- include the reference number of the proposal to which the report refers.
- make sure that the text, tables and figures fit into the space available.
- if your work is published or is in press, you may prefer to paste in the abstract, and add full reference details. If the abstract is in a language other than English, please include an English translation.

ESRF	**Experiment title:** Evaluating microbeam radiation therapy (MRT) for malignant brain tumors and vascular malformations: an animal experimental study.	**Experiment number**: MD 131-4
Beamline: ID 17	**Date of experiment**: from: June 18 to: June 22, 2007	**Date of report**: Sep. 15, 2007
Shifts: 12	**Local contact(s)**: Elke Bräuer-Krisch	*Received at ESRF:*

Names and affiliations of applicants (* indicates experimentalists):

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Report:

These experiments were in part repeats of the experiments conducted during MD 131-1 in spring 2005, to increase the number of animals in the experimental groups using C6 glioma in Wistar rats. Thus, bidirectional microbeam radiation therapy (MRT) was administered in one single session, with skin entry doses of 350 Gy resulting at peak doses of 750 GY at the location of the tumour. We used 10 by 14 mm arrays of 50 quasiplanar microbeams, with a beam width of 24.75 micrometer and a centre-to-centre distance between the microbeams of 211 micrometer, generated by the TECOMET collimator at ID 17.

Having made the observation in our last experiments that glutamine seems to protect memory fucntion afterh MRT, while administration of BSO increased survival but impaired memory early after MRT, we introduced an experimental group in which we combined BSO and glutamnine administration. However, we as a result the survival time of our animals decreased (Fig. 1). We will continue to investigate the combination of both or similar agents by tetsing different time windows.

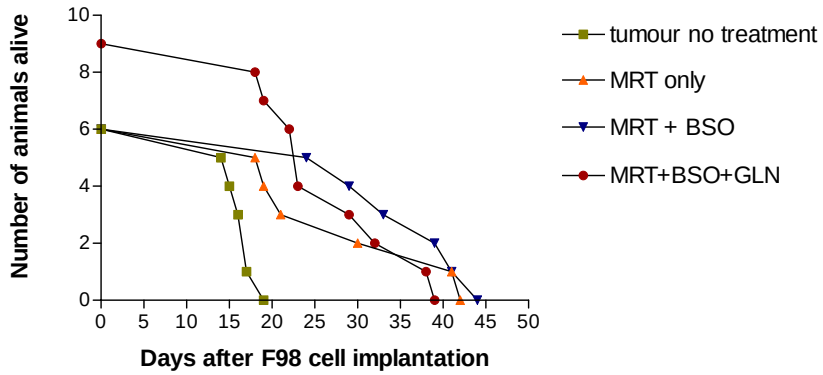

Figure 1: Survival of Fischer rats with F98 glioma from the MD 131-4 experiments.

Summarizing all MD 131 experiments, we have learned that administration of a radiosensitizer (BSO) does indeed significantly increase survival with the MRT protocol tested, in both C6 glioma and the highly aggressive F98 glioma (Figs. 2 and 3).

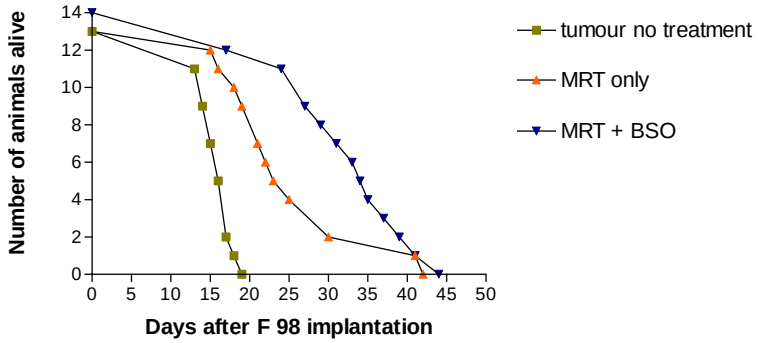

Figure 2: Survival of Fischer rats with F98 glioma from all MD 131 experiments.
F98 glioma generated by implantation of 100,000 tumour cells is a highly aggressive tumour that is far advanced at the time of therapy.

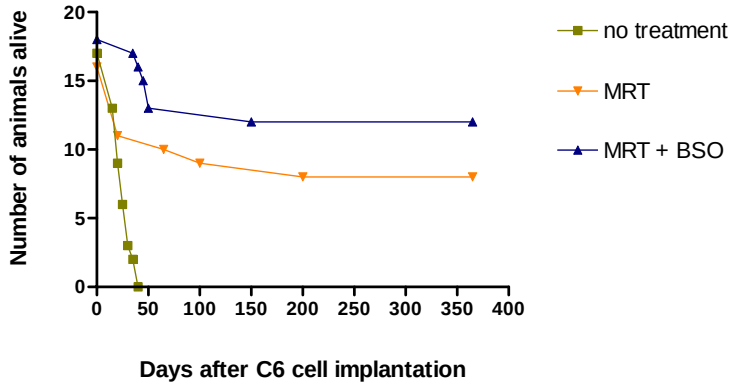

Figure 3: Survival of Fischer rats with C6 glioma from all MD 131 experiments.
C6 glioma generated from 100,000 implanted tumour cells is a less aggressive model of human malignant gliomas.

Considering the results and observations from our experiments MD 275 that were run in pararllel with the last MD 131 experiments, we feel that it is important to understand more about how MRT works, including adverse effects of planned therapy and unintended irradiation of tumour-free tissue, before recommending clinical trials. It is also necessary to test different beam geometries to find the most advantageous therapy protocols.

One very important requirement for making MRT safe is that images of the tumour can be acquired immediately before therapy and the shift between imaging and therapy modes can be conducted in a short time. The alternative option would be to create an advanced registration system for patient coordinates such as is used already in the hospital environment, which would allow image acquisition at a time ‘A’ and tretament at a subsequent time ‘B’, at which the patient would be brought back into the exactly same position as registered when acquiring the images. It is conceivable that the images could be acquired even at a different location, as long as the registration systems for spatial coordinates and the image acquisition and reconstruction systems are compatible.

We wish to thank Mr. Dominique Dallery and Dr. Geraldine LeDuc for their dedicated collaboration in preparing our experiments. We are grateful to Mr. Dallery and Ms. Anka Honkimaki for taking care of our animals during the experiments and to Ms. Catherine Massart for her kind and efficient support in the cell culture facility. We also would like to thank Dr. Herwig Requard for always finding a way to accommodate the time requirements of all the participants in our international research group (which we know is not an easy task at all). All the members of our research team felt well supported and taken care of by the friendly reception they received at the ESRF.