EUROPEAN SYNCHROTRON RADIATION FACILITY

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ESRF

Experiment Report Form

ESRF	**Experiment title:** X-ray phase contrast microscopy andfluorescence study of the toxicity of Gd-based Magnetic Resonace Imaging Contrast Agents in Chang cells.	**Experiment number**: HE-2613
Beamline: ID21	**Date of experiment**: from:07/09/2007 to: 12/09/2006	**Date of report**: 13/03/2008
Shifts: 15	**Local contact(s)**: Murielle Salome	*Received at ESRF:*

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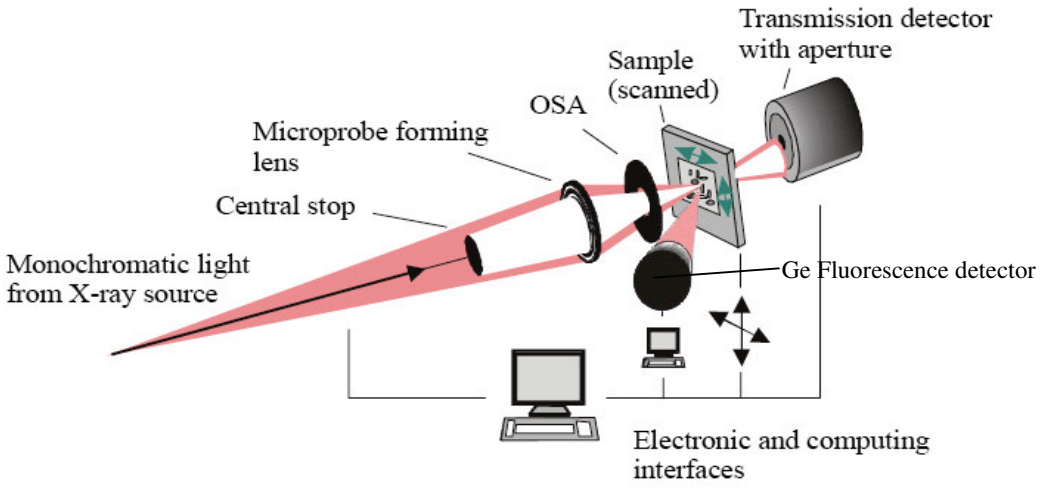
Report:

The aim of the experiment was to check the toxicity effects of several Gd-based MRI contrast agents, after the results obtained in our previous beamtime at ID21 (experiment MD-225). Some of the drugs are currently used in clinical practice.

Analysis of the data is at present still in progress. What we are seeing is a change in concentration and distribution of chemical elements inside the cells. Of particular interest is the change in Ca and K, as well as the effects on Cl.

The incident photon energy was set to 7.3 KeV, and the beam was focussed onto the sample by means of a W zone plate, 100 nm in spatial resolution, on a spot 0.3 x 1.5 μm (HOR x VERT). The flux at the SDD photodiode was 9.45 10^8 photons/s. The photodiode was masked by an aperture, and moved off-axis to allos phase contrast imaging (Kaulich, B., *et al,* Optics Express Vol 10, issue 20, 2002).The next figure shows the experimental setup.



Figuure 1: schematic of the optical layout used during MD 225

The typical data set has been acquired in 2 steps: first a suitable region of the sample was imaged using an acquisition time of 50-150 ms/pixel. Secondly, a longer acquisition was started, with accumulation times of 0.75-3 s/pixel to collect the fluorescence data. The acquisition times for each images were ranging from 5 minutes to 6 hours, depending on the resolution and on the dwell time.

Control line .

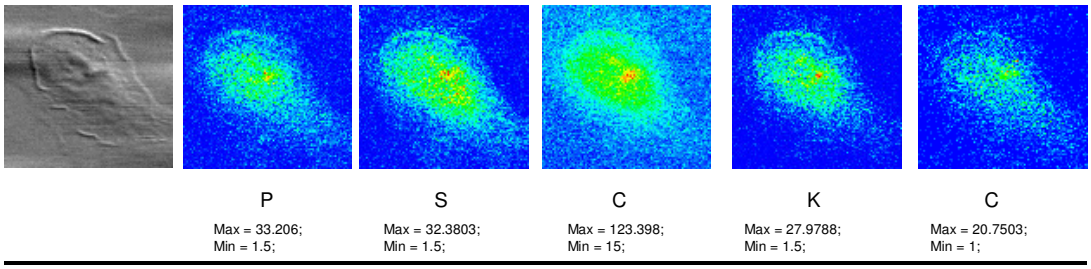


Figure 2: Control line images: phase contrast (far left), and fluorescence signal of various elements.

Chang and liver Cells

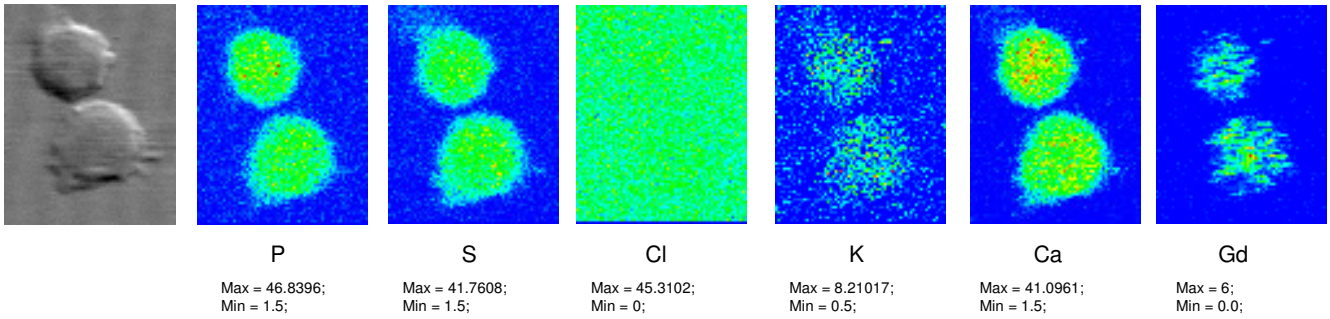


Figure 3: Typical Chang cell images: phase contrast (far left), and fluorescence signal of various elements

The images in Figure (3) are representative of the data we collected. Note the difference in Ca and K, and how the Cl signal is now spread over the whole image, while in the control line it was only inside the cells. This happens with all the drugs we have checked.

We are currently trying to understand the reasons behind this behavior. One thing that is interesting is that MRI contrast agents are being linked to fibrosis in patients with kidney problems. This might find its explanation in what we are seeing in our experiments, but we remain cautious, because we haven't completed the analysis of our data.