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P65 - The role of microPIXE in the study of the distribution and function of trace elements in the retina and cornea of the rat eye.

Friday, 11 July 2014 13:00 (1 hour)

Trace elements, particularly iron, zinc and copper, are known to be important in many biochemical processes essential to the functioning of living organisms. In the case of vision, zinc is known to be particularly important; deficiency can cause night blindness while excess zinc can cause retinal damage. However little is known about the spatial distribution and transport mechanisms of metals in the eye and a more detailed knowledge will contribute both to the understanding of fundamental processes in the retina and the treatment of vision dysfunction due to disorders affecting metal metabolism, for example diabetes and haemochromatosis.

In an earlier study [1] we demonstrated that microPIXE was able to observe large changes in zinc concentrations in certain layers of the rat retina in response to dark adaptation. Now we have extended this to include other metals in the retina and, for the first time, the distribution of metals in the cornea. The retina study was a collaboration where microPIXE was deployed in parallel with micro-Synchrotron XRF at the Diamond Light Source and ICP-MS analysis of whole retina. The metals of interest are at relatively low concentrations (5 - 50 ppm) in the retina, requiring long analysis times to achieve significance and an automated method was developed which permitted sequential runs of several hours on a series of samples. Spectra for each layer in the retina were extracted using masks derived using multichannel overlay maps of the major elements to provide false-colour discrimination of the different layers.

This paper outlines the methods used to obtain the microPIXE data and summarises the results. A comparison of PIXE and SR-XRF is also presented.

[1] E. Pålsgård, M. Ugarte, I. Rajta, G.W. Grime, 'The role of zinc in the dark-adapted retina studied directly using microPIXE, ', Nucl. Instr. and Meths. B 181 (2001) 489

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