Chemical biological imaging by EFTEM and SIMS correlation

Trepout S[1,2], Wu TD[1,2], Ortega R[3], Marco S[1,2], Guerquin-Kern JL[1,2]

[1]*Institut Curie, Centre de Recherche, 26 rue d'Ulm, 75248 Paris Cedex 05, France*
[2]*INSERM U759, Campus Universitaire d'Orsay, Bât. 112, 91405 Orsay cedex France*
[3]*Univ. Bordeaux, CENBG, UMR 5797, F-33170 Gradignan, France*

Chemical imaging offers large possibilities for understanding biological systems, allowing the identification of chemical interactions at the subcellular level. As an original multimodal imaging approach we combine secondary ions mass spectroscopy imaging (NanoSIMS) with standard and energy filtered transmission electron microscopy (EFTEM). Ion microscopy is based on the detection by mass spectrometry (SIMS) of charged particles produced as a result of the bombardment of a sample with an incident (Cs+ or O-) ion beam. Its high sensitivity allows molecular mapping of large regions (cells or tissues) providing elemental or isotopic information. EFTEM is based on the selection of electrons having particular kinetic energies to form images. EFTEM provides chemical images of higher spatial resolution than SIMS but only on small subcellular regions and its sensitivity is lower. Thus combining both complementary methods in a multimodal approach presents advantages from two methods.

We have performed multimodal chemical imaging using EFTEM and nanoSIMS to study the interaction between the dysregulation of certain metals (iron) and the survival of dopaminergic neurons in order to better understand the process of neuronal death implicated in neurodegenerative diseases such as Parkinson's disease. Our poster will introduce the imaging techniques used in this study before showing the interest of its complementarity, both in resolution and sensitivity, for chemical mapping in biology.