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New age pathologists with the synchrotron: How to apply the synchrotron-based X-ray fluorescence analysis to pathological diagnosis

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We have been making a diagnostic guideline of the diseases caused by the intracellular localization and quantity of the trace element not being appropriate using a synchrotron-generated microbeam X-ray in the Spring-8 JASRI and the KEK Tsukuba from 2006. Over 80 specimens have been analyzed. We show here the data using the BL37XU beamline in the SPring-8, a third-generation synchrotron radiation facility (Hyogo, Japan) and KEK Tsukuba, and the method to apply the samples to pathological diagnosis. Briefly, samples are common pathological specimens. They were processed to the formalin-fixed paraffin-embedded tissue (FFPE) sections with 2-micrometer (mm) thickness, then removed paraffin with xylene, and then rehydrated with ethanol. In the SPring-8 JASRI, a third-generation synchrotron radiation facility (Hyogo, Japan), we used The BL37XU beamline, which is for trace element analysis. The beam was with a measured flux of more than 1011 photons/s at 10 keV using Pt-coated Kirkpatrick-Baez focusing optics at a glancing angle of 2.8 mrad. Sample were mounted on the XY-scanning stage, and X-ray fluorescence was detected with an energy-dispersive X-ray detector (single-element silicon drift detector, Roentec, Berlin Germany) oriented perpendicular to the incident beam. The resultant fluorescence X-ray emission was analyzed with energy dispersive spectrometry (XEDS). The fluorescence counts were extracted from energy dispersive spectra by setting regions about the respective X-ray emission lines. The data sets from each pixel were quantitatively false-colored and used to construct a picture like as an impressionistic photomosaic using LabView (National Instruments Japan, Tokyo) and IGOR pro (WaveMetrics, Inc. Lake Oswego USA).

Biography

Akihiro Matsuura has completed his MD at the age of 24 years, then PhD at the age of 27 years from Sapporo Medical School and postdoctoral studies from Memorial Sloan-Kettering Cancer Center under Prof. Edward A Boyse. Then, he worked as a research associate at the Molecular Genetics Lab under Prof Fung-Win Shen of Tampa Bay Medical Institute. He is the professor of Molecular Pathology of Graduate School of Medicine, Fujita Health University from 2000. He has run synchrotron analysis more than 100 times, and published more than 139 papers.

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